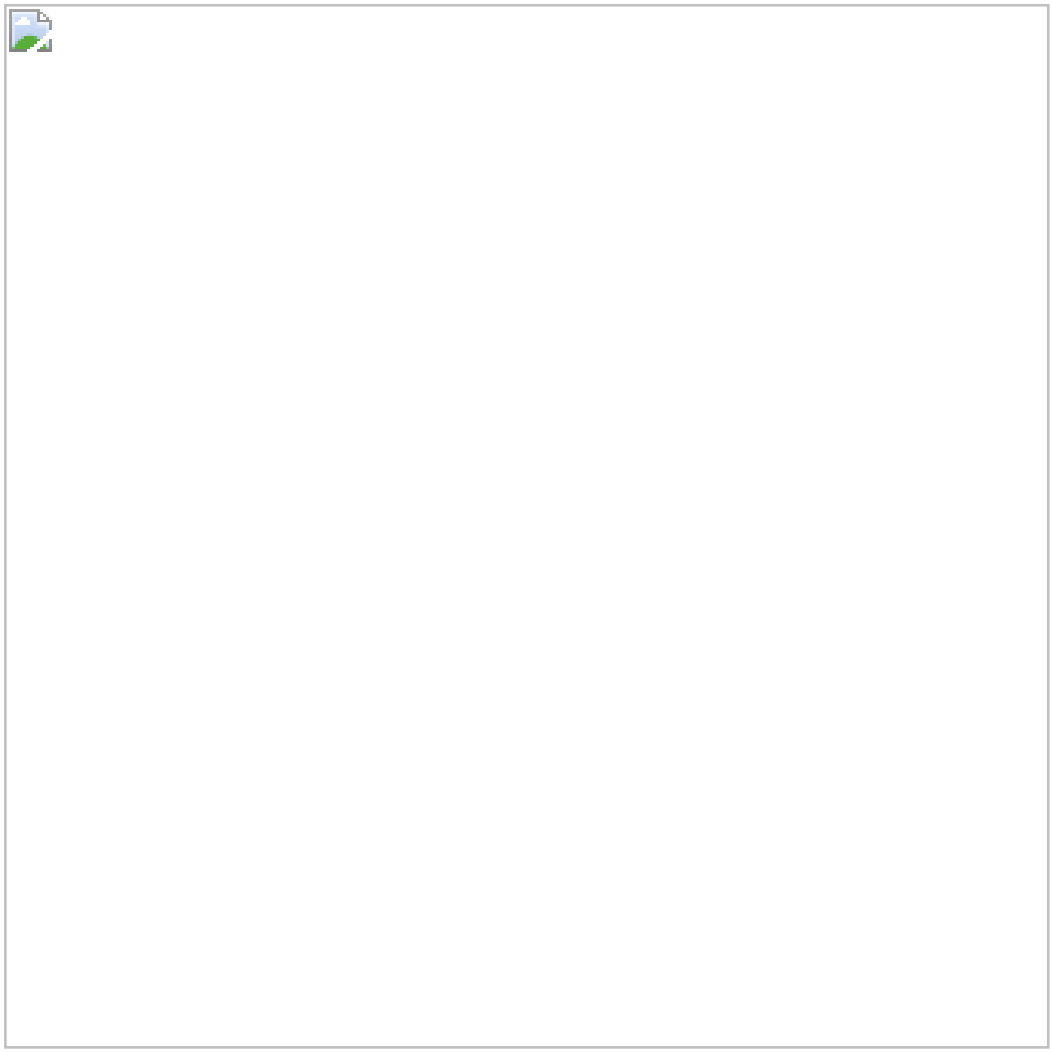

Revision of some Malagasy forage grasses and their relatives within Brachiaria, Echinochloa, Moorochloa, and Urochloa

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Revision of some Malagasy forage grasses and their relatives within Brachiaria, Echinochloa, Moorochloa, and Urochloa

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Abstract

VORONTSOVA, M.S. (2022). Revision of some Malagasy forage grasses and their relatives within Brachiaria, Echinochloa, Moorochloa, and Urochloa. *Candollea* 77: 199–236. In English, English and French abstracts. DOI: http://dx.doi.org/10.15553/c2022v772a7

This work presents a revision of 31 species of Malagasy panicoid grasses (*Poaceae* subfam. *Panicoideae*, tribe *Paniceae*) traditionally placed in the genera *Brachiaria* (Trin.) Griseb. and *Urochloa* P. Beauv., including nine species endemic to the island of Madagascar, and 14 endemic to Madagascar and the surrounding islands. Phylogenetic research is ongoing and only a partial rearrangement of generic concepts is presented. Six new combinations are published, placing Malagasy and regional endemics previously known as *Brachiaria* in the genera *Echinochloa* P. Beauv. and *Urochloa* respectively: *Echinochloa hubbardii* (A. Camus) Voronts., *E. leandriana* (Bosser) Voronts., *E. serpens* (Kunth) Voronts., *Urochloa humbertiana* (A. Camus) Voronts., *U. nana* (Stapf) Voronts., and *U. pseudodichotoma* (Bosser) Voronts. *Moorochloa eruciformis* (Sm.) Veldkamp is accepted. Four names are placed in synonymy for the first time, 18 lectotypes are designated for names used in Madagascar, and known occurrences are mapped.

Résumé

VORONTSOVA, M.S. (2022). Révision de certaines graminées fourragères et apparentées à Madagascar dans les genres Brachiaria, Echinochloa, Moorochloa et Urochloa. *Candollea* 77: 199–236. En anglais, résumés anglais et français. DOI: http://dx.doi.org/10.15553/c2022v772a7

Ce travail présente une révision de 31 espèces de graminées panicoïdes malgaches (*Poaceae* subfamily *Panicoideae*, tribe *Paniceae*) traditionnellement placées dans les genres *Brachiaria* (Trin.) Griseb. et *Urochloa* P. Beauv. dont neuf espèces endémiques de l'île de Madagascar, et 14 endémiques de Madagascar et des îles environnantes. La recherche phylogénétique est en cours et seul un réarrangement partiel des concepts génériques est présenté. Six nouvelles combinaisons sont publiées, plaçant les endémiques malgaches et régionaux précédemment connus sous le genre *Brachiaria* dans les genres *Echinochloa* P. Beauv. et *Urochloa* respectivement: *Echinochloa hubbardii* (A. Camus) Voronts., *E. leandriana* (Bosser) Voronts., *E. serpens* (Kunth) Voronts., *Urochloa humbertiana* (A. Camus) Voronts., *U. nana* (Stapf) Voronts. et *U. pseudodichotoma* (Bosser) Voronts. L'espèce *Moorochloa eruciformis* (Sm.) Veldkamp est acceptée. Quatre noms sont placés en synonymie pour la première fois, 18 lectotypes sont désignés ici pour les noms utilisés à Madagascar, et les occurrences connues sont cartographiées.

Keywords

POACEAE – *Panicoideae* – *Brachiaria* – *Echinochloa* – *Moorochloa* – *Urochloa* – Madagascar – New combinations – Taxonomy – Typification

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Introduction

The *Poaceae* are recognised as probably the best documented large family of angiosperms and a model group (Hodkinson, 2018), responsible for the majority of human calorie intake as rice (*Oryza sativa* L.), wheat (*Triticum aestivum* L.), and sugar cane (*Saccharum officinarum* L.), as well as being architects of grasslands and savannas across the world (Kellogg, 2015). The ongoing taxonomic and phylogenetic research on the *Poaceae* diversity and evolutionary history has been compiled into the updated phylogenetic family classification, with the majority of Madagascar's *Poaceae* placed in the subfam. *Panicoideae* (Kellogg, 2015; Soreng et al., 2017). Of the tropical lineages in the *Panicoideae*, tribe *Paniceae* with c. 1,227 species (fide Soreng et al., 2017) comprises the commercially significant tropical forage grasses previously placed in the genus *Brachiaria* (Trin.) Griseb., now referrable to the monophyletic *Urochloa* P. Beauv. s.l. (Kellogg, 2015) in the subtribe *Melinidinae*. The full evolutionary history however remains unclear, with a significant number of superficially similar panicoid grasses not yet assigned to tribes with any degree of confidence (Zuloaga et al., 2018).

The *Urochloa* (*Brachiaria*) forages are significant for tropical pastures worldwide, and for pastoral livelihoods in sub-Saharan Africa (Bogdan, 1977). Much of the taxonomic research effort into *Urochloa* s.l. has been focused on Asia and the Americas (Morrone & Zuloaga, 1992, 1993; Veldkamp, 1996; Torres Gonzales & Morton, 2005), with tropical African and Indian Ocean taxa being treated more briefly in the context of flora projects (Fish et al., 2015; Sosef, 2016; Bosser & Renvoize, 2018). The basic biodiversity documentation of these forages and related taxa remains incomplete especially in Madagascar, where the phylogenetic placement of endemic species has not been fully established (Hackel et al., 2018) and a full *Poaceae* inventory has not been attempted (Vorontsova et al., 2016). Malagasy grasses with panicoid spikelets arranged in panicles were described by Camus as *Panicum* L. for largely open panicles (Vorontsova, 2018), *Brachiaria* (Camus, 1925, 1935, 1947, 1950, 1954, 1957) for compact racemes with lower glumes towards the rhachis, and *Urochloa* for compact racemes with lower glumes away the rhachis (Clayton & Renvoize, 1982). It has largely been assumed that all species of *Brachiaria* fall within the expanded and monophyletic *Urochloa* s.l., but the situation in Madagascar is more complex with a significant number of panicoid grasses falling within the *Boivinellinae* and therefore not belonging to either *Panicum* s.str. or *Urochloa* s.l. (Hackel et al., 2018).

This treatment follows Vorontsova (2018) for *Panicum* s.l. and aims to establish species concepts for all Malagasy grasses traditionally placed in the genera *Brachiaria* and *Urochloa*. For six clear members of the *Urochloa* and *Echinochloa* clades where morphology is in agreement with DNA sequence data, new combinations are made to place species in the correct genera. Species belonging to parts of the *Boivinellinae* and the *Melinidinae* where evolutionary history is not yet clear are retained in the genus "*Brachiaria*" pending future arrangement of the generic concepts (Appendix). There is currently no reliable set of characters that can consistently separate members of the *Urochloa* clade from the other taxa, although most species of *Urochloa* have racemes with a winged rhachis. *Echinochloa* P. Beauv. is easily distinguished by its lack of ligule. The genus *Moorochloa* Veldk., represented here by a single species in Madagascar, is an independent origin of *Brachiaria*-like grasses in the *Melinidinae* with spikelets disarticulating above the glumes, inconspicuous callus, and a chartaceous to cartilaginous, shiny, smooth and muticous upper lemma (Veldkamp, 2004).

Materials and methods

This study focuses on Madagascar and only the species occurring on Madagascar are included. Synonymy is restricted to names applied to collections made in Madagascar. Species descriptions were compiled from specimens collected in Madagascar and the Mascarenes and held at P: please note that the descriptions aim to represent these species both in Madagascar and the Mascarenes; morphological variability occurring outside these areas may not be represented here. For a full account of *Poaceae* of the Mascarene islands see Bosser & Renvoize (2018).

The distinction between grasses native to Madagascar, naturalised, or even recently planted introductions are not always easy to infer. Since during practical work in Madagascar there is no choice but deal with introduced taxa alongside native, this treatment records all species occurrences including those known to be introduced. Five of the species treated here have been listed by Bogdan (1977) in the top 45 tropical forage grasses: *Urochloa arrecta* (Hack. ex T. Durand & Schinz) Morrone & Zuloaga, *U. brizantha* (Hochst. ex A. Rich.) R.D. Webster, *U. eminii* (Mez) Davidse [listed as the synonym *Brachiaria decumbens* Stapf], *Urochloa mutica* (Forssk.) T.Q. Nguyen, and *U. trichopus* (Hochst.) Stapf [listed as the synonym *U. mosambicensis* (Hack.) Dandy].

The weakest aspects of the descriptions previously published for these species (Camus, 1925, 1935, 1947, 1950, 1954, 1957; Clayton & Renvoize, 1982; Clayton et al., 2006; Bosser & Renvoize, 2018) were the data on field growth and habit, as Camus did not personally carry out field observations, and her herbarium-based descriptions were used to compile the later datasets. Creeping grasses of the forest understory such as *Brachiaria bemarivensis* A. Camus can appear to be annual on specimens while the same culms can in fact continue growing for multiple years, rooting at culm nodes. The descriptions presented here incorporate ten years of field observations made across Madagascar and present updates especially regarding the annual/perennial habit and growth form.

Please note that this is a temporary generic classification, an intermediate stage of the work to place Malagasy biodiversity into monophyletic genera; the genus "*Brachiaria*" represents species yet to receive their updated generic names.

Key to the species of Brachiaria s.l., Echinochloa p.p., Moorochloa, and Urochloa p.p. in Madagascar

1. Spikelets ≥ 3 mm long 2
1a. Spikelets < 3 mm long 17
2. Spikelets in a dense and tidy imbricate arrangement of evenly sized racemes; rhachis narrowly winged to broad and foliaceous, (0.5–)0.8–3.5 mm wide 3
2a. Spikelets not overlapping or overlapping untidily, racemes usually decreasing in length towards apex of synflorescence; rhachis narrow or triquetrous, < 0.8 mm wide (rarely narrowly winged up to 1 mm wide) 10
3. Lower glume turned away from rhachis, turned towards viewer and therefore visible on majority of spikelets; upper lemma rugulose, with a mucro 0.3–1.2 mm long 4
3a. Lower glume turned towards rhachis, turned away from viewer and not immediately visible on majority of spikelets; upper lemma smooth to rugulose, without or with a minute mucro 5
4. Lower glume ¼–⅓ as long as spikelet; spikelets acute, usually without a setose fringe ... 26. ***Urochloa panicoides***
4a. Lower glume ⅔–¾ as long as spikelet; spikelets acuminate, usually with a prominent setose fringe ..... 31. ***Urochloa trichopus***
5. Spikelets 3–4 mm long 6
5a. Spikelets 4–6 mm long 8
6. Rhachis margins with yellow bulbous based trichomes; lower glume ⅔–¾ as long as spikelet ..... 23. ***Urochloa jubata***
6a. Rhachis margins scaberulous or with translucent trichomes; lower glume ⅓–½ as long as spikelet 7
7. Spikelets 2.5–3.7 mm long; lower glume 5–7-veined; mostly prostrate plants of low elevations ..... 19. ***Urochloa distachyos***
7a. Spikelets 3.5–4 mm long; lower glume 3-veined; mostly erect plants of High Plateau ..... 16. ***Urochloa arrecta***
8. Rhachis scaberulous; spikelets not obviously plump, acute ..... 27. ***Urochloa plantaginea***
8a. Rhachis ciliate; spikelets plump and subacute 9
9. Rhachis 1–1.5 mm wide; upper glume and lower lemma cartilaginous, dully shining ..... 17. ***Urochloa brizantha***
9a. Rhachis 2–3.5 mm wide; upper glume and lower lemma membranous, not shining ..... 20. ***Urochloa eminii***
10. Spikelets with a prominent ciliate rim ⅔ from base, with dense white trichomes 1–2 mm long ..... 9. ***Brachiaria subrostrata***
10a. Spikelets with a no ciliate rim, glabrous to evenly pilose, with trichomes < 1 mm long 11
11. Lower glume ⅔ to as long as spikelet 12
11a. Lower glume up to ½ as long as spikelet 14
12. Spikelets dorsally compressed; glumes acuminate to mucronate ..... 21. ***Urochloa glumaris***
12a. Spikelets laterally compressed; glumes pinched at apices 13
13. Leaf blades linear or rolled, 3–6 mm wide; plants with no smell ..... 1. ***Brachiaria antsirabensis***
13a. Leaf blades lanceolate, 12–20 mm wide; plants scented ..... 6. ***Brachiaria fragrans***
14. Spikelets oblong; upper lemma smooth and shiny ..... 10. ***Brachiaria tsiafajavonensis***
14a. Spikelets ellipsoid; upper lemma rugulose to rugose ... 15
15. Stoloniferous perennials; leaf blades linear; spikelets arranged in several untidy rows ..... 24. ***Urochloa mutica***
15a. Loosely tufted annuals; leaf blades lanceolate; spikelets paired 16
16. At least some pedicels longer than spikelets ..... 18. ***Urochloa deflexa***
16a. All pedicels shorter than spikelets ..... 29. ***Urochloa ramosa***
17. Spikelets ≤ 2 mm long 18
17a. Spikelets > 2 mm long 24
18. Spikelets on a single raceme not overlapping, with gaps between 19
18a. Spikelets on a single raceme imbricate or overlapping, with no gaps between most spikelets 21
19. Lower glume absent or up to ⅓ of spikelet length, with no veins; leaf blades thickly chartaceous; spikelets single ..... 11. ***Brachiaria umbellata***
19a. Lower glume ½–⅔ as long as spikelet, 3-veined; leaf blades membranous to chartaceous; spikelets paired 20
20. Spikelets apically rounded, whiteish, usually > 15 per inflorescence; leaf blades 1–7 × 0.3–1 cm ..... 2. ***Brachiaria bemarivensis***
20a. Spikelets apically acute, green, ≤ 15 per inflorescence; leaf blades 0.5–1.5 × 0.1–0.45 cm ... 5. ***Brachiaria epacridifolia***
21. Mat-forming plants not rising > 5 cm above ground level; ligule absent ..... 14. ***Echinochloa serpens***
21a. Plant with erect flowering culms; ligule present 22
22. Leaf blades linear; loosely tufted annuals with no stolons; spikelets tidily imbricate on evenly sized racemes ..... 15. ***Moorochloa eruciformis***

22a. Leaf blades lanceolate to elliptic or ovate; stoloniferous annuals or perennials; spikelets untidily overlapping on racemes, these decreasing in length going up synflorescence 23

23. Inflorescence 5–35 cm long; spikelets elliptic to oblong, apically rounded; upper lemma smooth with no mucro ..... 3. ***Brachiaria comorensis***

23a. Inflorescence 3–5 cm long; spikelets ovate, apically acute; upper lemma finely rugulose, mucronate ..... 30. ***Urochloa reptans***

24. Spikelets densely covered with white to pink trichomes, with short white trichomes in lower part and dense white to pink trichomes c. 2 mm long in upper third; lower lemma grooved and mucronate .... 8. ***Brachiaria perrieri***

24a. Spikelets glabrous or evenly pubescent; lower lemma not grooved or mucronate 25

25. Lower glume ⅔–¾ as long as spikelet 26

25a. Lower glume minute or up to ⅔ as long as spikelet .. 29

26. Rhachis margins ciliate with yellow bulbous-based trichomes ..... 23. ***Urochloa jubata***

26a. Rhachis margins scaberulous or with linear translucent trichomes 27

27. Spikelets dorsally compressed; ligule absent ..... 13. ***Echinochloa leandriana***

27a. Spikelets laterally compressed; ligule a truncate membrane 28

28. Leaf blades linear, 3–7 cm long ..... 1. ***Brachiaria antsirabensis***

28a. Leaf blades lanceolate, 0.8–3 cm long ..... 4. ***Brachiaria dimorpha***

29. Spikelets within a single raceme not overlapping 30

29a. Spikelets within a single raceme overlapping or imbricate 34

30. Culms woody; plants resembling a miniature bamboo ..... 7. ***Brachiaria fruticulosa***

30a. Culms herbaceous; plants a mat forming, stoloniferous, or annual grasses 31

31. Spikelets plump, apiculate; upper lemma rugose ..... 29. ***Urochloa ramosa***

31a. Spikelets not obviously plump, apically rounded to subacute; upper lemma usually smooth, sometimes finely rugulose 32

32. Leaf blades membranous; lower glume ½–⅔ as long as spikelet ..... 2. ***Brachiaria bemarivensis***

32a. Leaf blades chartaceous; lower glume ¼–⅓ as long as spikelet 33

33. Leaf blades 1–5 mm wide; open and partly closed canopy habitats in southern Madagascar < 800 m elevation ..... 22. ***Urochloa humbertiana***

33a. Leaf blades 6–12 mm wide; forest shade in central, northern, and eastern Madagascar at 650–2300 m elevation ..... 10. ***Brachiaria tsiafajavonensis***

34. Inflorescence capitate, with up to 15(–30) spikelets on each culm ..... 12. ***Echinochloa hubbardii***

34a. Inflorescence racemose, with > 15 spikelets on each culm 35

35. Racemes 1–2; plants sprawling branched at every node ..... 28. ***Urochloa pseudodichotoma***

35a. Racemes > 2; plants sprawling to erect, not branching at every node 36

36. Plants annual, with no stolons 37

36a. Plants perennial, stoloniferous or rarely annuals 38

37. Spikelets subsessile and tidily imbricate on appressed racemes ..... 15. ***Moorochloa eruciformis***

37a. Spikelets on pedicels of uneven length, partly overlapping, racemes divergent ..... 29. ***Urochloa ramosa***

38. Racemes 5–20; spikelets in several untidy rows ..... 24. ***Urochloa mutica***

38a. Racemes 2–7; spikelets in 2 rows or not arranged in rows 39

39. Leaf blades 6–12 mm wide; spikelets oblong; species of forests ..... 10. ***Brachiaria tsiafajavonensis***

39a. Leaf blades 3–7 mm wide; spikelets ellipsoid; species of open areas 40

40. Spikelets neatly imbricate ..... 19. ***Urochloa distachyos***

40a. Spikelets overlapping untidily ..... 25. ***Urochloa nana***

Taxonomic treatment

1. ***Brachiaria antsirabensis*** A. Camus in Bull. Soc. Bot. France 77: 640. 1931.

   Lectotypus (designated here): **Madagascar. Reg. Amoron'i Mania [Prov. Fianarantsoa]:** env. d'Ambositra, 1500 m, I.1914, *Perrier de la Bâthie 10758* (P [P00450157]!; isolecto-: K [K000244724 fragm.]!, P [P00450158]!).

Loosely tufted stoloniferous perennial, ascending to erect, to c. 30 cm high, culms weakly branched, wiry, glabrous. *Leaf sheath* glabrous or with ciliate margins. *Ligule* a truncate membrane. *Leaf blade* linear, flat or rolled, chartaceous, 3–7 × 0.3–0.6 cm, glabrous to pubescent on both sides, retrorse at maturity. *Inflorescence* racemose, often condensed, ascendent, 2–7 cm long, peduncle pubescent. *Racemes* 2–6, 0.5–1.5(–2.5) cm long, roughly even in length, on a common axis 1–5 cm long, with no secondary branching, rhachis narrow, ciliate, spikelets overlapping untidily with adjacent spikelets, single or paired, subsessile. *Spikelets* laterally compressed, ovate, apiculate, 2.7–3.3 mm long, olive green. *Lower glume* ⅔–¾ as

long as spikelet, herbaceous, keeled, pinched at apex, 7-veined, glabrous to pubescent, orientation relative to rhachis variable. *Upper glume* ¾ as long as spikelet, herbaceous, 7-veined, glabrous to pubescent. *Lower floret* male, palea as long as lemma, anthers 3.2–2.3 mm long. *Lower lemma* herbaceous, 7-veined, glabrous to pubescent. *Upper lemma* acute, smooth, shiny, white to brown.

Distribution and ecology. – Endemic to open highland savanna with *Loudetia simplex* (Nees) C.E. Hubb. and secondary grassland in central Madagascar, often on rocky slopes, near ericoid vegetation, or under tapia, at elevations of 800–1800 m (Fig. 1).

Notes. – This distinctive species is easy to recognise by its dense untidy inflorescences of overlapping spikelets. It shares laterally compressed spikelets and short upper glumes with its closest relative *Brachiaria dimorpha* A. Camus, another highland endemic (Hackel et al., 2018). Not fire resistant (*Perrier de la Bâthie 10758*). Somewhat swollen stolons may act as food storage. Not common or locally abundant, does not seem to become ecologically dominant.

The specimen designated here as the lectotype [P00450157] has superior quality flowering material than the duplicates, and it has previously been labelled as the holotype.

Additional specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** rte. de Moramanga-Lac Alaotra, PK 15, VI.1959, *Bosser 13044* (P); sur le Mongoro, XII.1927, *Perrier de la Bâthie 18344* (P). **Reg. Amoron'i Mania [Prov. Fianarantsoa]:** Fandriana, I.1953, *Bosser 5073* (TAN); Marovitsika (Anjiro), XI.1953, *Bosser 7135* (P); ibid. loco, III.1953, *Bosser 7140* (TAN); Ambositra, Imerina-Imady, I.1961, *Bosser 14884* (P); Faliarivo, env. d'Ambositra, III.1934, *Humbert 14518* (P); 6 km from Ivato towards Ambatofinandrahana, 24.II.2013, *Vorontsova et al. 992* (K, TAN). **Reg. Analamanga [Prov. Antananarivo]:** Ankazobe, Manerinerina, rte. de Majunga, PK 135, I.1967, *Morat 2657[b]* (P); entre Arivonimamo et Soamananety, 29.I.1960, *Peltier 1826* (P). **Reg. Itasy [Prov. Antananarivo]:** Nanisana, 14.I.1951, *Benoist 698* (P); ibid. loco, 14.I.1951, *Benoist s.n.* (P); Arivonimamo, Antongona, I.1956, *Bosser 8933* (P, TAN); massif de l'Antongona, 4.XII.1959, *Peltier & Peltier 1573* (P). **Reg. Vakinankaratra [Prov. Antananarivo]:** Ambatolampy, I.1953, *Bosser 4748* (TAN); ibid. loco, II.1953, *Bosser 4782* (TAN); ibid. loco, II.1953, *Bosser 4810* (P, TAN); ibid. loco, II.1953, *Bosser 5062* (TAN); Faratsiho, Ankaratra, I.1955, *Bosser 7633* (P); Behenjy, Andosy, *Cornet 13* (TAN); Amboasary (Behenjy), 28.XII.1963, *Peltier 4517* (P). Sine loco: "Central Madagascar", *Baron 3713* (K, P).

2. ***Brachiaria bemarivensis*** A. Camus in Bull. Soc. Bot. France 72: 369. 1925 (Fig. 2A–C).

Lectotypus (designated here): **Madagascar. Reg. Boeny [Prov. Mahajanga]:** Haute Bemarivo, II.1907, *Perrier de la Bâthie 11295* (P [P00450163]!; isolecto-: P [P00450164, P00450165]!). **Syntypus:** ibid. loco, III.1907, *Perrier de la Bâthie 11136* [as *11135*] (P [P02040451, P02040452]!).

= *Brachiaria bemarivensis* subsp. *ankarafantsikaensis* A. Camus in Naturaliste Malgache 5: 147. 1953. **Lectotypus** (designated here): **Madagascar. Reg. Boeny [Prov. Mahajanga]:** Ankarafantsika près de Marovoay, III.1910, *Perrier de la Bâthie 11223* (P [P00450162]!; isolecto-: P [P02040448, P00450167, P00450168]!). **Syntypus:** ibid. loco, III.1910, *Perrier de la Bâthie 11225* (P [P00450160, P00450161, P00450166]!).

= *Acroceras parvulum* A. Camus in Bull. Soc. Bot. France 101: 28. 1954, **syn. nov. Holotypus: Madagascar. Reg. Anosy [Prov. Toliara]:** vallée du Mandrare, affl. de la Manampanihy, montagne au S de Tanandava, c. 500 m, III.1947, *Humbert 20486* (P [P00450108]!).

= *Brachiaria benoistii* A. Camus in Bull. Soc. Bot. France 101: 28. 1954. **Lectotypus** (designated here): **Madagascar. Reg. Atsinanana [Prov. Fianarantsoa]:** env. d'Ambila, 17.III.1951, *Benoist 813* (P [P00450169]!). **Syntypus:** ibid. loco, 4.V.1928, *Decary 6383* (P [P00450170!]).

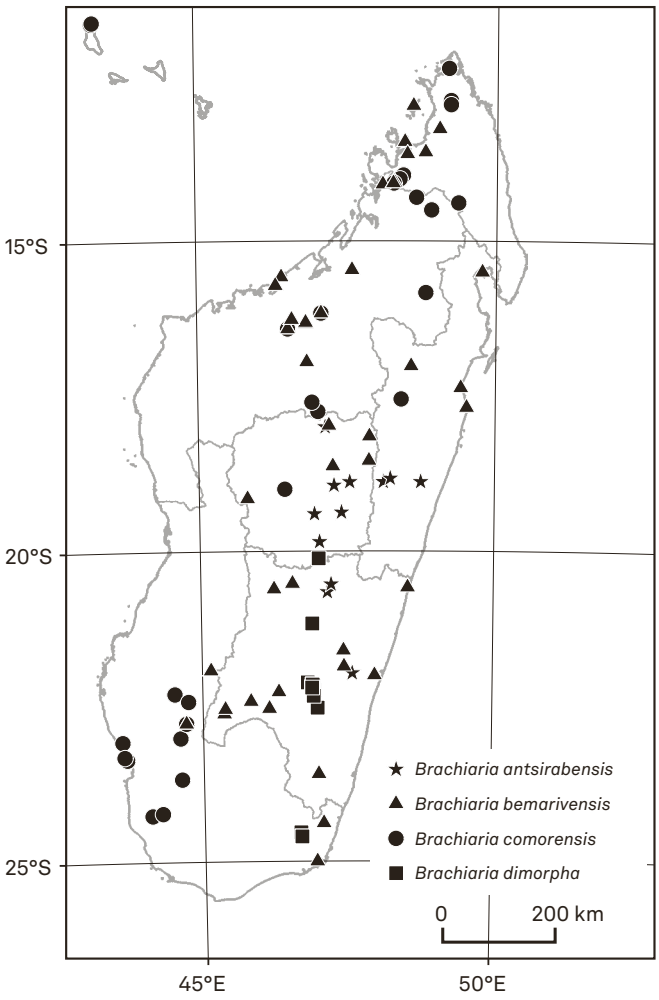

Fig. 1. – Distribution maps. *Brachiaria antsirabensis* A. Camus (stars), *B. bemarivensis* A. Camus (triangles), *B. comorensis* (Mez) A. Camus (circles), and *B. dimorpha* A. Camus (squares). [Map: Sarah Z. Ficinski]

Mat-forming annual to short-lived stoloniferous perennial, prostrate with ascending flowering culms, to 0.6 m high, culms branched, rooting at lower nodes, glabrous. *Leaf sheath* sparsely hirsute, sometimes with bulbous-based trichomes towards apex. *Ligule* a lacerate ciliolate membrane. *Leaf blade* ovate to elliptic, membranous, 1–7 × 0.3–1 cm, often tinged with purple, glabrous to sparsely hirsute on both sides, sometimes with bulbous-based trichomes at base. *Inflorescence* racemose, slender, open, 5–12 cm long. *Racemes* 1–10, 2–6 cm long, decreasing in length upwards, lowermost raceme roughly equal to inflorescence axis in length, on a common axis 0–7 cm long, sometimes with secondary branches, rhachis narrow, scaberulous, spikelets widely spaced paired, sessile and shortly pedicelled in each pair. *Spikelets* elliptic, apically rounded, 1.7–2.3 mm long, whiteish, sometimes tinged with purple. *Lower glume* ½–⅔ as long as spikelet, membranous, obtuse to acute, 3-veined, glabrous or with shiny elongated prickle hairs, with fine white trichomes at apex, orientation relative to rhachis variable. *Upper glume* as long as spikelet, membranous, 5-veined, glabrous or with shiny elongated pricke hairs, detaching early. *Lower floret* male, palea ½ as long as lemma, anthers 3, 0.7 mm long. *Lower lemma* membranous, 5-veined, glabrous or with shiny elongated prickle hairs. *Upper lemma* rounded, smooth, shiny, pale becoming brown at maturity, with a green apical crest.

Distribution and ecology. – Common across Madagascar except the arid west and southwest, in the shade, forest edges, and forest understory, on dunes, sand, rocks, and roadsides, at elevations of 0–1600 m (Fig. 1).

Notes. – This attractive, fragile creeping plant with membranous leaf blades forms common ground cover across much of Madagascar. Young foliage is often tinged with red. Plant size, leaf width, and inflorescence size vary considerably.

It seems that environmental stress can result in culms with a single raceme only, and these have been described as *Brachiaria benoistii* A. Camus and *Acroceras parvulum* A. Camus. These collections have a single main inflorescence axis and poorly developed racemes, and have been collected from the east coast. These are not recognised here as a distinct taxon because no differences other than the inflorescence structure have been observed.

In the protologue of *Brachiaria bemarivensis*, Camus cites two collection numbers from forests in Bemarivo: *Perrier de la Bâthie 11135* and *11295*. *Perrier de la Bâthie 11135* is almost certainly a transcription error for *11136* corrected here: the handwritten numbers 5 and 6 appear similar on the sheets, and *11135* is a collection of *Schizachyrium* Nees. The chosen lectotype is the best quality sheet from the collection that lacks ambiguity. The respective lectotypes designated here for *Brachiaria bemarivensis* subsp. *ankarafantsikaensis* A. Camus [P00450163] and *B. benoistii* [P00450162] represent the best preserved material annotated by Camus.

The name "Brachiaria bemarivensis var. benoistii (A. Camus) Bosser" appears on some herbarium sheets held at P and annotated by Bosser (e.g. *Benoist 813*, P [P00450169]) but this name does not appear to have been published and is therefore an invalid name (nomen nudum in sched.).

Selected specimens examined. – **Madagascar. Reg. Amoron'i Mania [Prov. Fianarantsoa]:** Itremo, Andohatanimena, 19.II.2014, *Nanjarisoa et al. 147* (K, TAN). **Reg. Analamanga [Prov. Antananarivo]:** Anjozorobe, Analabe, III.1952, *Bosser 2408* (P); Tampoketsa d'Ankazobe, III.1962, *Bosser 15985* (P); Belobaka, Analandraisoa, forêt d'Analandraisoa, IV.1963, *Bosser 17650* (P). **Reg. Analanjirofo [Prov. Toamasina]:** Fenoarivo Est, XI.1954, *Bosser & Descoings 78* (P); Mahavelona, XII.1962, *Bosser 16869* (P); Maroantsetra, Nosy Mangabe, V.1988, *Schatz et al. 2325* (MO, P, TAN). **Reg. Anosy [Prov. Toliara]:** Beroroha, vallée du Mandrare, affl. de la Manampanihy, S de Tanandava, 11.III.1947, *Humbert 71* (P); Taolagnaro, Mahatalaky. Sainte Luce, 23.I.2012, *Rakotonirina et al. 741* (P). **Reg. Atsimo-Andrefana [Prov. Toliara]:** Sakaraha, forêt du Zombitsy, III.1964, *Bosser 19375* (P, TAN). **Reg. Betsiboka [Prov. Mahajunga]:** env. de Maevatanana, III.1900, *Perrier de la Bâthie 1032* (P). **Reg. Boeny [Prov. Mahajunga]:** Ankarafantsika National Park office, 14.II.2017, *Vorontsova & Duncan-Rice 2090* (K, P, TAN). **Reg. DIANA [Prov. Antsiranana]:** vallée de l'Ifasy en aval d'Anaborano, 31.III.1951, *Humbert & Capuron 25898* (K, P); RS Manongarivo, Bekolosy, near village of Ambalafary, 12.III.1993, *Malcomber et al. 2234* (MO, P); ibid. loco, 12.V.2014, *Vorontsova & Onjalalaina 1470* (P, TAN). **Reg. Ihorombe [Prov. Fianarantsoa]:** plateaux et vallées de l'Isalo, 29.I.1955, *Humbert 29811* (K, P). **Reg. Fitovinany [Prov. Fianarantsoa]:** env. d'Ambila, 17.III.1951, *Benoist 813* (P).

3. ***Brachiaria comorensis*** (Mez) A. Camus in Rev. Int. Bot. Appl. Agric. Trop. 27: 280. 1947 (Fig. 2D, 3).

   ≡ *Panicum comorense* Mez in Bot. Jahrb. Syst. 57: 185. 1921.

   Lectotypus (designated here): **Tanzania. Reg. Tanga:** Usambara, Mlalo, IV.1892, *Holst 549* [*459*] (B [B 10 1037908] image!; isolecto-: B [B 10 1037909] image!, P [P00450172]!, US [US-80594 fragm.]!). **Syntypus: Comoros. Grande Comore:** sine loco, V.1850, *Boivin s.n.* (P [P00216299]!).

   = *Brachiaria capuronii* A. Camus in Bull. Mus. Natl. Hist. Nat., sér. 2, 29: 278. 1957. **Lectotypus** (designated here): **Madagascar. Reg. Atsimo-Andrefana [Prov. Toliara]:** vallée de l'Hazoroa, bassin de l'Onilahy, au S de Sakaraha, 500–600 m, 30.III.1955, *Humbert & Capuron 29688* (P [P00450171]!; isolecto-: MO, P [P03652846, P03652847]!).

   = *Brachiaria decaryana* A. Camus in Bull. Mus. Natl. Hist. Nat., sér. 2, 29: 278. 1957. **Lectotypus** (designated here): **Madagascar. Reg. Sofia [Prov. Mahajanga]:** Ankaizinana, 1000 m, 27.IV.1923, *Decary 2078* (P [P00450173]!; isolecto-: P [P00450174]!).

Annual to short-lived stoloniferous perennial, ascending, to 0.6 m high, culms weakly branched, rooting at lower nodes,

Fig. 2. – A–C. *Brachiaria bemarivensis* A. Camus; **D.** *Brachiaria comorensis* (Mez) A. Camus; **E, F.** *Brachiaria dimorpha* A. Camus. [**A:** *Vorontsova et al. 1012*; **B, C:** *Vorontsova et al. 1770;* **D:** *Morris et al. 3*; **E, F:** *Nanjarisoa et al. 73*] [Photos: Maria S. Vorontsova]

Fig. 3. – *Brachiaria comorensis* (Mez) A. Camus. **A.** Habit; **B.** Ligule; **C.** Panicle; **D.** Panicle branch; **E.** Spikelet; **F.** Lower glume, ventral view; **G.** Upper glume, ventral view; **H.** Lower lemma, ventral view; **I.** Upper floret, ventral view; **J.** Upper floret, lateral view; **K.** Upper lemma, ventral view; **L.** Upper lemma, dorsal view; **M.** Upper palea, ventral view; **N.** Upper palea, dorsal view. Scale bars: A, C = 3 cm; B = 3.3 mm; D = 2.5 mm; E–N = 0.8 mm. [**A–C, E–N:** *Wohlhauser 60254*, K; **D:** *Nanjarisoa et al. 193,* K] [Drawing: Lucy T. Smith]

glabrous. *Leaf sheath* glabrous to sparsely pubescent towards apex. *Ligule* a truncate membrane with no trichomes. *Leaf blade* elliptic, membranous, 2.5–15 × 0.5–1.3 cm, glaucous underneath, glabrous to sparsely pubescent on both sides. *Inflorescence* racemose, slender, often incompletely exserted in shade, 5–35 cm long. *Racemes* 5–20, 2–12 cm long, flexuous, decreasing in length upwards, lowermost raceme roughly equal to inflorescence axis in length, on a common axis 3–20 cm long, often with numerous secondary branches, rhachis narrow, scaberulous, spikelets overlapping untidily with adjacent spikelets, single, pedicels up to twice as long as spikelet. *Spikelets* elliptic to oblong, apically rounded, 1.5–1.8 mm long, whiteish with a green tinge, sometimes tinged with purple. *Lower glume* ¼–⅓ as long as spikelet, membranous, obtuse to acute, 1-veined, glabrous, clasping, orientation relative to rhachis variable. *Upper glume* as long as spikelet, membranous, 3-veined, veins raised, glabrous. *Lower floret* infertile, palea absent. *Lower lemma* membranous, 5-veined, veins raised, depressed between veins. *Upper lemma* obtuse, smooth, shiny, pale becoming brown at maturity.

Distribution and ecology. – West and eastern tropical Africa and the Comoro Islands. In Madagascar is common in low elevation and sometimes mid-elevation seasonal forest understory and shade, dry and seasonally wet habitats, in the north and south, at elevations of 0–800 m (Fig. 1).

Notes. – Superficially similar to *Brachiaria bemarivensis* due to shared broad membranous leaf blades and small white apically rounded spikelets, but can be reliably distinguished in a variety of ways: bulbous-based trichomes on leaf surfaces (versus leaf surfaces with linear trichomes in *B. bemarivensis*), spikelets overlapping (not with gaps between adjacent spikelets within a single raceme), lower glume ¼–⅓ of the spikelet length with a single vein (⅓–½ and with 3 veins), glumes and lower lemma smooth (with enlarged prickle hairs). Often seen sterile or with immature inflorescence emerging from leaf sheaths.

It is not clear why the African floras (Hutchinson & Dalziel, 1972; Clayton & Renvoize, 1982; Clayton, 1989) placed this species in the genus *Panicum* in spite of its clearly racemose inflorescences while Bosser (1969) omitted it altogether. Appears to be absent from Mauritius and La Reunion (Bosser & Renvoize, 2018). The first sequence analysis by Hackel et al. (2018) demonstrated that it is sister to the Malagasy forest endemic *Brachiaria tsiafajavonensis* A. Camus, see discussion under that species.

The lectotype of *Panicum comorense* Mez at B [B 10 1037908] designated here is the best preserved material seen by Mez. The correct collection number seems to be *Holst 549*, although the second duplicate at B and the fragment at US are labelled as *Holst 459*.

Selected specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** lac Alaotra (S-169), *Jard. Bot. Tananarive 3407* (P). **Reg. Atsimo-Andrefana [Prov. Toliara]:** plateau Mahafaly à l'W de Betioky, III.1955, *Humbert & Capuron 29445* (K, MO, P, TAN); PK 32, rte. pour Ifaty, 21.IV.2014, *Nanjarisoa et al. 193* (K, TAN); Beza Mahafaly Reserve, parcelle 1, 13.II.1990, *Phillipson 3486* (K, P). **Reg. Betsiboka [Prov. Mahajanga]:** bois Firingalava, III.1898, *Perrier de la Bâthie 552* (P). **Reg. Boeny [Prov. Mahajanga]:** Ambato-Boeni, bassin supérieur de Bemarivo, III.1907, *Perrier de la Bâthie 11245* (P). **Reg. Bongolava [Prov. Antananarivo]:** Sakay, 1.I.1970, *Bosser 20264* (P). **Reg. DIANA [Prov. Antsiranana]:** Daraina, forêt de Bekaraoka, Andranotsimaty, 13.III.2003, *Gautier et al. 4359* (G, P); Ambanja, Befalafa, moyen Ambahatra, cours moyen du Bassin-versant, 2.V.1999, *Wohlhauser & Andriamalaza 60086[b]* (G, P); Ambahatra cours moyen, plateau d'Anketraka Be, 8.V.2000, *Wohlhauser 60254* (G, K, P). **Reg. Ihorombe [Prov. Fianarantsoa]:** Parc National Isalo, Canyons des Singes, 25.IV.2018, *Rakotomalala et al. 160* (K, P, TAN). **Reg. Sofia [Prov. Mahajanga]:** Bealanana, Ambatoria, Ankaizina, V.1952, *Bosser 2661* (P).

4. ***Brachiaria dimorpha*** A. Camus in Bull. Soc. Bot. France 72: 621. 1925 (Fig. 2E–F, 4).

   Lectotypus (designated here): Madagascar. **Reg. Ihorombe [Prov. Fianarantsoa]:** massif d'Andringitra, 2000 m, I.1923, *Perrier de la Bâthie 14333A et B* [*14333*] (P [P03124753]!; isolecto-: K [K000244728]!, P [P03124768, P03124773]!). **Syntypi:** ibid. loco, 2400 m, II.1922, *Perrier de la Bâthie 14333A* (P [P03124774]!); ibid. loco, 2300 m, II.1922, *Perrier de la Bâthie 14333B* (P [P01973887]!).

Stoloniferous mat-forming perennial, prostrate with ascending flowering culms, to 10–40 cm high, culms branched, rooting at nodes, glabrous. *Leaf sheath* glabrous or sparsely pubescent. *Ligule* a truncate membrane. *Leaf blade* lanceolate, thickly chartaceous, 0.8–3 × 0.1–0.4 cm, glabrous to pubescent on both sides. *Inflorescence* racemose, slender, contracted, 1.5–10 cm long. *Racemes* 1–5, 0.3–3 cm long, much shorter than inflorescence axis, appressed, on a common axis 1–9 cm long, with no secondary branching, rhachis narrow, glabrous, spikelets overlapping with adjacent spikelets, paired, subsessile, on pedicels of uneven length. *Spikelets* somewhat laterally compressed, ovate, apically acute, 2.3–2.7 mm long, light green to purple. *Lower glume* ⅔–¾ as long as spikelet, membranous, keeled, acute to apiculate, 3–7-veined, glabrous to scaberulous, orientation relative to rhachis variable. *Upper glume* almost as long as spikelet, membranous, 3–5-veined, glabrous to sparsely pubescent. *Lower floret* male, palea as long as lemma, anthers 3, c. 1.5 mm long. *Lower lemma* membranous, 5-veined, glabrous to sparsely pubescent. *Upper lemma* acute, smooth, shiny, white to brown.

Distribution and ecology. – Endemic to the mountains of south-eastern Madagascar, open grassland and ericoid vegetation on rocks and by the sides of streams, peaty areas, often on gneiss, in areas protected from fire, at elevations of 1500–2500 m (Fig. 1).

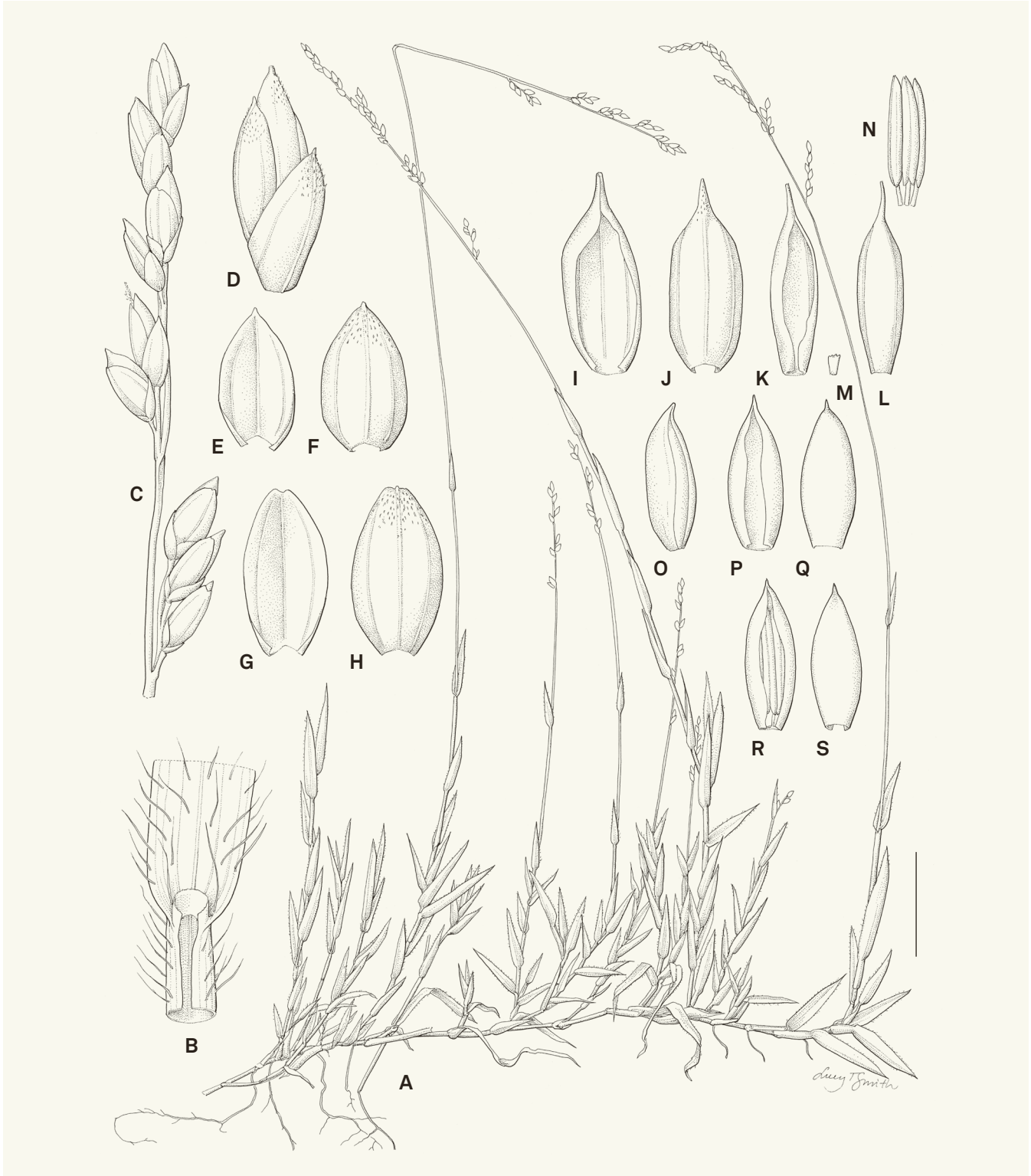

Fig. 4. – *Brachiaria dimorpha* A. Camus. **A.** Habit; **B.** Ligule; **C.** Panicle branch; **D.** Spikelet; **E.** Lower glume, ventral view; **F.** Lower glume, dorsal view; **G.** Upper glume, ventral view; **H.** Upper glume, dorsal view; **I.** Lower lemma, ventral view; **J.** Lower lemma, dorsal view; **K.** Lower palea, ventral view; **L.** Lower palea, dorsal view; **M.** Lower floret lodicule; **N.** Lower floret stamens; **O.** Upper floret, ventral view; **P.** Upper lemma, ventral view; **Q.** Upper lemma, dorsal view; **R.** Upper floret, after removal of the lemma; **S.** Upper palea, dorsal view. Scale bars: A = 3 cm; B = 2.5 mm; C = 3.3 mm; D–S = 1.5 mm. [*Nanjarisoa et al. 82,* K] [Drawing: Lucy T. Smith]

Notes. – *Brachiaria dimorpha* is a distinctive species forming dense, almost moss-like cushions of vegetation with short erect inflorescences in open high elevation areas. This compact morphology changes in the shade under thickets of *Erica* L. to produce long leafy shoots. It is abundant and sometimes dominant on the 2000 m plateau of the Andringitra National Park. This species is shorter and grows at higher elections than its only known relative *B. antsirabensis* A. Camus, which shares its laterally compressed spikelets with short upper glumes.

There has been some confusion with the numbering of the original material by Perrier de la Bâthie. The protologue lists collections from three elevation ranges: up to 2000 (*14333*), 2300 (*14333B*), and 2400 (*14333A*). According to the label of P03124773 the numbers A and B were originally used by Perrier de la Bâthie to distinguish the plants he judged to be perennial (A) and annual (B). Herbarium sheets labels have three or four different numbers: *14333A* [P03124774], *14333B* [P01973887], *14333A et B* [P03124753, P03124768, P03124773], and *14333* (duplicate outside P with the same data as *A et B*). The A and B sheets are annotated with the date February 1922, while *A et B* are annotated with January 1923 so it is possible that Perrier de la Bâthie later concluded that no distinction can be made between the annual and perennial plants. The lectotype designated here [P03124753] is already labelled as type, has the most comprehensive material, and is labelled as *A et B*. The original material is here interpreted as three different collection numbers characterised by the three different elevations, following the protologue.

Selected specimens examined. – Madagascar. **Reg. Anosy [Prov. Toliara]:** massif de l'Andohahela; vallée supérieure de la Sakamalio, I.1934, *Humbert 13565* (P). **Reg. Ihorombe [Prov. Fianarantsoa]:** Sud-Andringitra, Andrianony, Manjarivolo, 2.XI.1970, *Guillaumet 3491* (P); pic d'Ivohibe, XI.1924, *Humbert 3311* (P); Massif de l'Andringitra, vallées de la Riambava et de l'Antsifotra, 27.XI.1924, *Humbert 3697* (K, P); Andringitra NP, plateau E of camp 3, 13.XII.2013, *Vorontsova et al. 1258* (K, TAN). **Reg. Vakinankaratra [Prov. Antananarivo]:** massif de l'Ibity, VI.1968, *Morat 2862* (P).

5. ***Brachiaria epacridifolia*** (Stapf) A. Camus in Bull. Mus. Natl. Hist. Nat., sér. 2, 22: 297. 1950.

   ≡ *Panicum epacridifolium* Stapf in Bull. Misc. Inform. Kew 1919: 266. 1919.

   Lectotypus (designated here): Madagascar. **Reg. Vakinankaratra [Prov. Antananarivo]:** cîme au N d'Ambana, près d'Antsirabe, Ankaratra, rocailles, III.1912, 2000 m, *Perrier de la Bâthie 11160 [80]* (K [K000805466]!; isolecto-: P [P00450175, P02022202]!). **Syntypus**: Madagascar: "Central Madagascar", s.d., *Baron 4318* (K [K000244698]!, P [P00450176 fragm.]!).

   = *Brachiaria epacridifolia* var. *glabra* A. Camus in Bull. Mus. Natl. Hist. Nat., sér. 2, 22: 297. 1950. **Lectotypus** (designated here): Madagascar. **Reg. Analamanga [Prov. Antananarivo]:** Analabe au N de Tananarive, 1500 m, II.1928, *Perrier de la Bâthie 18437* (P [P01973847]!; isolecto-: P [P01973859]!). **Syntypus: Madagascar. Reg. Vakinankaratra [Prov. Antananarivo]:** Ankaratra, 2000 m, XII.1920, *Perrier de la Bâthie 13384* (P [P01973848]!).

Stoloniferous mat-forming perennial, prostrate with ascending flowering culms, to 10 cm high, culms much branched, rooting at nodes, glabrous. *Leaf sheath* glabrous to pubescent. *Ligule* a miniscule truncate membrane. *Leaf blade* lanceolate to ovate, chartaceous, 0.5–1.5 × 0.1–0.45 cm, glabrous to pubescent on both sides. *Inflorescence* racemose, slender, open, 2–10 cm long. *Racemes* 1–6, 1–5 cm long, decreasing in length upwards, retrorse at maturity, on a common axis 0.5–6 cm long, with no secondary branching, rhachis narrow, glabrous, spikelets not overlapping with adjacent spikelets, paired, on pedicels of uneven length, rarely more than 15 spikelets per synflorescence. *Spikelets* ovate, apically acute, c. 2 mm long, dark green. *Lower glume* ½–⅔ as long as spikelet, membranous, acute, 3-veined, glabrous to finely scaberulous or verucculose at maturity, orientation relative to rhachis variable. *Upper glume* as long as spikelet or slightly shorter, membranous, 5-veined, glabrous to finely scaberulous or verucculose at maturity. *Lower floret* infertile, palea absent. *Lower lemma* membranous, 5-veined, glabrous to finely scaberulous or verucculose at maturity. *Upper lemma* acute, smooth, shiny, white to yellowish.

Distribution and ecology. – Malagasy endemic restricted to northern, central, and south-eastern highlands, in humid and gallery forest shade and also open areas, on rocks, ericoid vegetation, sides of streams, and secondary vegetation, on laterite, gneiss, and clay, at elevations of 1300–2200 m (Fig. 5).

Notes. – *Brachiaria epacridifolia* (Stapf) A. Camus is easy to recognise by its distinctive, tidy branches and spikelets, short and somewhat retrorse racemes at maturity, and its cushion habit. Its inflorescences are often poorly developed without clear racemes, justifying an alternative placement in the genus *Panicum* under a morphological classification system. It is commonly seen in shady forest understory and near forest edges. The mature inflorescences of *B. epacridifolia* somewhat resemble those of *Trichanthecium parvifolium* (Lam.) Zuloaga & Morrone but its spikelets are less rounded, and the plant is not glaucous.

The lectotype of *Brachiaria epacridifolia* designated here [K000805466] is the best preserved original material with notes in Stapf's hand. Many of Perrier de la Bâthie's duplicates at K lack the five-digit collection numbers corresponding to those at P but are instead annotated with a different series of two-digit "provisional" numbers. For the chosen lectotype its numbers from both series are cited, with the provisional Kew number given in square brackets. None of the original material

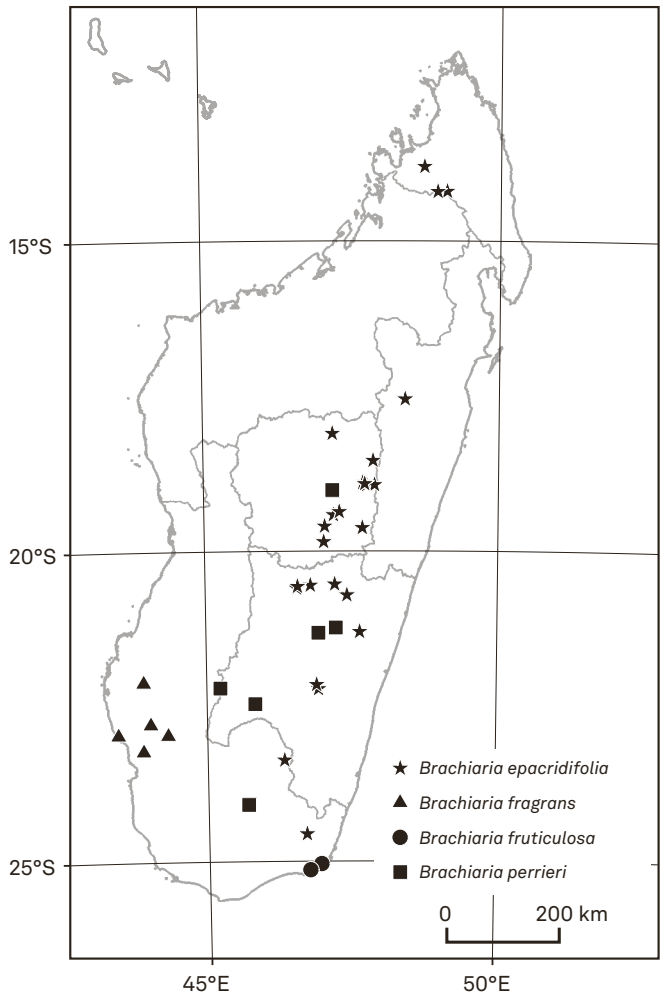

Fig. 5. – Distribution maps. *Brachiaria epacridifolia* (Stapf) A. Camus (stars), *B. fragrans* A. Camus (triangles), *B. fruticulosa* A. Camus (circles), and *B. perrieri* A. Camus (squares).

found for *B. epacridifolia* var. *glabra* A. Camus bears any note of this varietal epithet on the sheet; the lectotype designated here [P01973847] is annotated as *Panicum epacridifolium* Stapf in Camus' handwriting.

Selected specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** Lac Alaotra, *Jard. Bot. Tananarive 3425* (P). **Reg. Analamanga [Prov. Antananarivo]:** mont Angavokely, VI.1947, *Humbert 20844* (K, P); Ankazobe, Ankafobe, endophyte plot AN30, VI.2016, *Vorontsova et al. 1923* (K, TAN). **Reg. Anosy [Prov. Toliara]:** massif du Kalambatitra, mont Analatsitendrika, XI.1933, *Humbert 11922* (P); mont Itrafanaomby, XII.1933, *Humbert 13484* (P). **Reg. Amoron'i Mania [Prov. Fianarantsoa]:** Itremo, Ambatoantrano, III.2014, *Nanjarisoa et al. 129a* (K, TAN). **Reg. DIANA [Prov. Antsiranana]:** massif du Tsaratanana, plateaux supérieurs et hauts sommets de l'Amboabory à l'Antsianongatalata, XI.1937, *Humbert 18373bis* (P); montagnes au N de Mangindrano; jusqu'aux sommets d'Ambohimirahavavy, XI.1951, *Humbert & Capuron 25292* (P). **Reg. Haute Matsiatra [Prov. Fianarantsoa]:** Andringitra National Park, VI.1965, *Morat 1304* (P). **Reg. Sofia [Prov. Mahajanga]:** Tsaratanana Reserve, Misorobe, walking from camp 2 towards camp 1 and Mangindrano, XI.2017, *Vorontsova et al. 2113* (K, MO, P, TAN). **Reg. Vakinankaratra [Prov. Antananarivo]:** Ankaratra, au dessus de Manjakatompo, III.1961, *Bosser 15277* (P). **Reg. Vatovavy [Prov. Fianarantsoa]:** Ranomafana, Ifanadiana, I.1964, *Bosser 18779* (P).

6. ***Brachiaria fragrans*** A. Camus in Bull. Soc. Bot. France 82: 22. 1935 (Fig. 6).

   Lectotypus (designated here): Madagascar. **Reg. Atsimo-Andrefana [Prov. Toliara]:** plateau calcaire au N du Fiherenana, forêt sèche de Fandrare à 40 km NE de Tulear, 400–700 m, III.1934, *Humbert 14315* (P [P00450177]!; isolecto-: K [K00024472]!, P [P00450178, P00450179]!).

Stoloniferous perennial, ascending, to 2 m high, culms not branched, rooting at lower nodes, with a knotty rootstock, glabrous. *Leaf sheath* glabrous with ciliate margins. *Ligule* a ciliolate membrane. *Leaf blade* lanceolate, basally asymmetric and often cordate on one side, chartaceous, 8–18 × 1.2–2 cm, glaucous underneath, glabrous on both sides, often with bulbous-based trichomes near base. *Inflorescence* racemose, contracted, rarely fully exserted, 5–10 cm long. *Racemes* 3–4, 1–3.5 cm long, decreasing in length upwards, on a common axis 2–8 cm long, with no secondary branching, rhachis narrow, scaberulous, spikelets overlapping untidily with adjacent spikelets, paired, on pedicels of uneven length. *Spikelets* laterally compressed, ovate, apically acute, 3.5–4 mm long, white. *Lower glume* c. ⅔ as long as spikelet, chartaceous, (3–)5-veined, scaberulous, thick keel developing into a small apical wing, orientation relative to rhachis variable. *Upper glume* ¾ as long as spikelet, chartaceous, 5-veined, scaberulous, pinched at apex. Lower floret male, palea as long as lemma, anthers 3, c. 2.5 mm long. *Lower lemma* chartaceous, 5-veined, scaberulous, pinched at apex. *Upper lemma* acute, matte, smooth but not shiny, with an apical crest and minute trichomes at apex.

Distribution and ecology. – Endemic to the understory of seasonally dry forest and scrub to the north of Toliara, on rocks and limestone soils, at elevations of 30–700 m (Fig. 5).

Notes. – *Brachiaria fragrans* A. Camus seems to possess a property rarely seen in the *Poaceae*: an odour. On P03175998, Camus noted: "plante très intéressante découverte par le Professeur Humbert à 40 km, de Tulear, au N de Fiherenana, sur le calcaire. Fleurs assez odorantes [a very interesting plant discovered by Professor Humbert 40 km from Tulear, to the N of Fiherenana, on limestone. Quite fragrant flowers]" while the type collection labels cite "fleurs à fine odeur de Lis! [flowers with a fine scent of lily!]" This mysterious species was not found in the wild during several expeditions searching for it conducted by the author.

The closest relatives of *Brachiaria fragrans* in the *Boivinellinae* (Appendix) are also unusual Malagasy

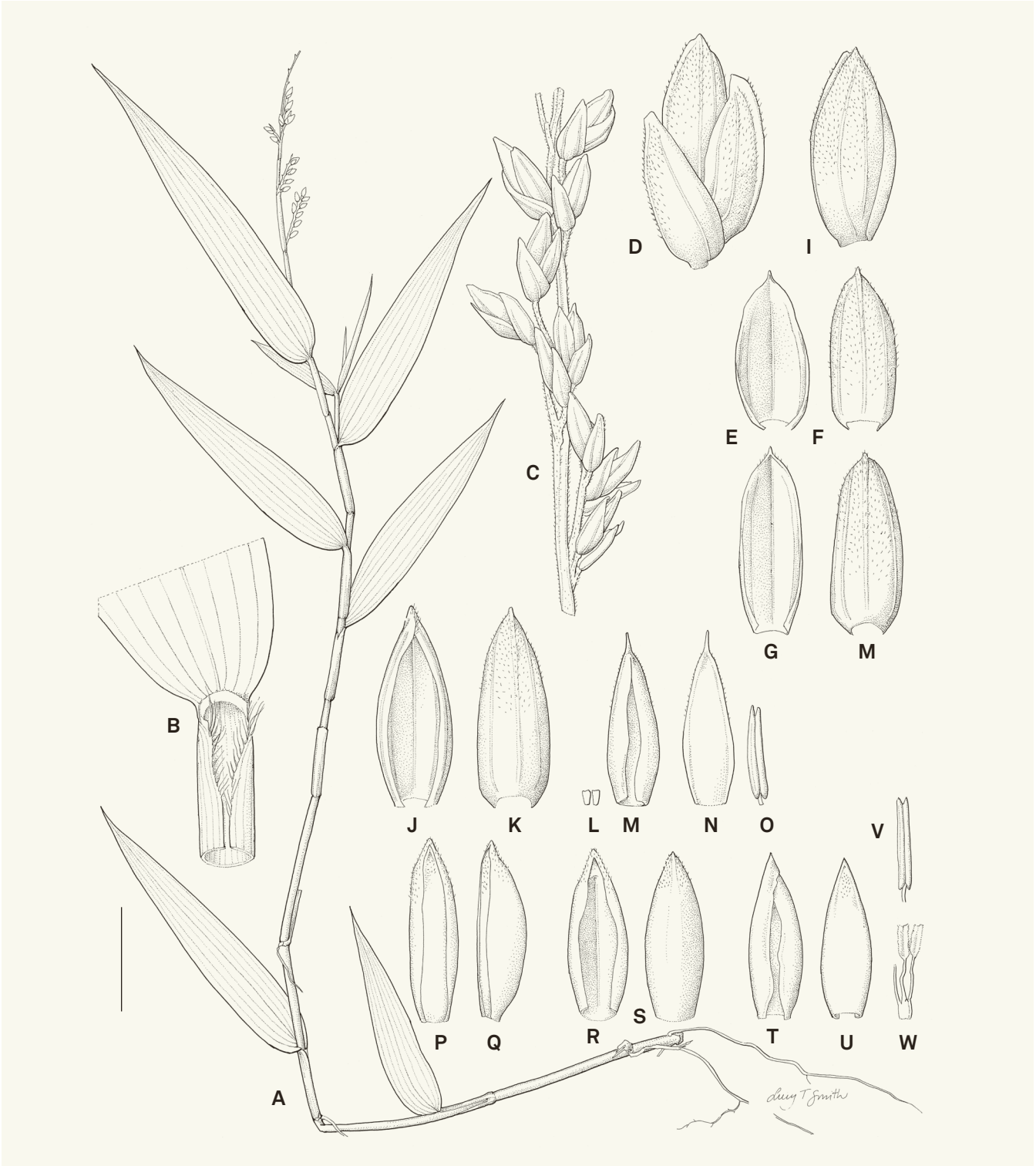

Fig. 6. – *Brachiaria fragrans* A. Camus. **A.** Habit; **B.** Ligule; **C.** Panicle branch; **D.** Spikelet; **E.** Lower glume, ventral view; **F.** Lower glume, dorsal view; **G.** Upper glume, ventral view; **H.** Upper glume, dorsal view; **I.** Spikelet, glumes removed; **J.** Lower lemma, ventral view; **K.** Lower lemma, dorsal view; **L.** Lower floret lodicule; **M.** Lower palea, ventral view; **N.** Lower palea, dorsal view; **O.** Lower floret stamen; **P.** Upper floret, ventral view; **Q.** Upper floret, lateral view; **R.** Upper lemma, ventral view; **S.** Upper lemma, dorsal view; **T.** Upper palea, ventral view; **U.** Upper palea, dorsal view; **V.** Upper floret stamen; **W.** Upper floret gynoecium. Scale bar: A = 3 cm; B = 3.3 mm; C = 4 mm; D–W = 1.6 mm. [*Humbert 14315,* K] [Drawing: Lucy T. Smith]

endemics. The only related species bearing some morphological resemblance it is *B. bemarivensis,* also a broad-leaved grass with spikelets that look white when fresh. The spikelets of *B. fragrans* are significantly larger, however, and resemble the genus *Acroceras* Stapf with their pinched upper glume and lower lemmas, and a crested upper lemma. *Brachiaria fragrans* differs from *Acroceras ivohibense* A. Camus by its white (not brown) spikelets and partly (not fully) exerted inflorescences.

Additional specimens examined. – **Madagascar. Reg. Atsimo-Andrefana [Prov. Toliara]:** 50 km de Tulear, rte. de Sakaraha, III.1960, *Bosser 14058* (P); rte. Tulear PK 55, III.1964, *Bosser 19160* (P); Toliara ville, vallée du Fiherenana, XI.1933, *Humbert 11587* (P); gorges du Fiherenana entre Beantsy et Anjamala, I.1947, *Humbert 19919* (P); gorges de la Manombo, I.1947, *Humbert 19972* (P); Morombe, 15 km de Befandriana, 5.IV.1955, *Humbert 29739* (P); à 50 km de Tulear, rte. Tulear à Sakaraha, III.1960, *Keraudren-Aymonin 751* (P).

7. ***Brachiaria fruticulosa*** A. Camus in Bull. Mus. Natl. Hist. Nat., sér. 2, 29: 276. 1957.

   Lectotypus (designated here): **Madagascar. Reg. Anosy [Prov. Toliara]:** Mont Ankazovandamena, près de la Baie des Galions (Ronofotsy) au SW de Fort-Dauphin, 100–450 m, 21.II.1955, *Humbert & Capuron 29066* (P [P02344007]!; isolecto-: P [P02344004, P02344009]!).

Loosely tufted perennial, scrambling or erect, to 2 m high, culms woody, branched, resembling a bamboo, glabrous. *Leaf sheath* glabrous or hirsute with ciliate margins. *Ligule* a truncate membrane, with a tissue rim and a line of cilia outside of leaf. *Leaf blade* narrow-lanceolate, chartaceous, 2–7 × 0.3–0.7 cm, glabrous on both sides. *Inflorescence* racemose, slender, open, difficult to see among branches, 5–8 cm long. *Racemes* 2–4, 1–5 cm long, decreasing in length upwards, on a common axis 1–5 cm long, with no secondary branching, rhachis narrow, smooth or minutely scaberulous, spikelets not overlapping with adjacent spikelets, single or paired, on pedicels of uneven length. *Spikelets* elliptic, apically obtuse, 2.5–2.8 mm long, whiteish. *Lower glume* ⅓ as long as spikelet, membranous, obtuse, 3-veined, scaberulous towards apex, with hyaline margins, the orientation relative to rhachis variable. *Upper glume* as long as spikelet, membranous, 5-veined, scaberulous towards apex, with an apical crest. *Lower floret* infertile, palea absent. *Lower lemma* chartaceous, 5-veined, scaberulous. *Upper lemma* acute, smooth with minute trichomes towards apex, shiny, pale, with a green apical crest.

Distribution and ecology. – Known from the type only, southeastern Madagascar, seasonal forest shade on gneiss, at elevations of 100–450 m (Fig. 5).

Notes. – This mysterious species does not seem to have been seen again after the sole collection event in 1955. While the inflorescences have some superficial resemblance to the Malagasy highland endemic *Panicum andringitremse* A. Camus, the hard woody knotted rootstock, and the bamboo-like branching structure do not bear clear resemblance to any other species. No original field notes are available but the specimens suggest a small bamboo-like habit, partly erect and partly scrambling in shade over rocks, perhaps similarly to *Oldeania ibityensis* (A. Camus) D.Z. Li et al. Without the availability of DNA sequences it is difficult to be confident of its origins and taxonomic placement. The spikelet structure marks it clearly as a member of the tribe *Paniceae*, most likely the *Boivinellinae*, perhaps affiliated with the other bamboo-like scramblers in the genus *Pseudolasiacis* (A. Camus) A. Camus, although *Pseudolasiacis* are larger plants with bigger leaf blades and inflorescences, known from higher elevation habitats.

The lectotype designated here [P02344007] has the best preserved material and is annotated by Camus.

8. ***Brachiaria perrieri*** A. Camus in Bull. Soc. Bot. France 77: 639. 1931.

   Holotypus: Madagascar. Reg. Haute Matsiatra [Prov. Fianarantsoa]: près d'Ambalavao, 800 m, VIII.1923, *Perrier de la Bâthie 14438* (P [P00450187]!; iso-: P [P00450188]!).

Loosely tufted annual, erect, 10–45 cm high, culms not branched, sometimes rooting at lower nodes, pubescent, nodes bearded. *Leaf sheath* pubescent. *Ligule* a line of hairs. *Leaf blade* ovate, chartaceous, 1–4 × 0.3–1.3 cm, densely pilose on both sides. *Inflorescence* racemose, slender, contracted, 3–6 cm long. *Racemes* 5–12, 1–1.8 cm long, roughly even in length, appressed, on a common axis 1.5–5 cm long, with no secondary branching, rhachis narrow, ciliate, spikelets overlapping with adjacent spikelets, single, subsessile, in 2 rows. *Spikelets* ovate, apically acute, 2–3 mm long, densely covered with white to pink trichomes. *Lower glume* c. ⅔ as long as spikelet, membranous, acute, 3-veined, densely pilose with white cilia, turned towards rhachis. *Upper glume* almost as long as spikelet, herbaceous, apiculate, 5-veined, veins poorly visible, with short white trichomes in lower part and dense white to pink trichomes c. 2 mm long in upper third. *Lower floret* male, palea as long as lemma. *Lower lemma* herbaceous, grooved, with a mucro c. 0.5 mm, 5-veined, veins poorly visible, pilose with sparse white trichomes in lower part and dense pink trichomes c. 2 mm long in upper part. *Upper lemma* apiculate, minutely striate.

Distribution and ecology. – Occurs across the central and southern part of the highlands, sometimes further south, on inselbergs and rocky slopes often associated with *Styppeiochloa* De Winter, commonly found on open wet rock after the rains, at elevations of 800–1500 m (Fig. 5).

Notes. – Attractive plant tinged with pink, and an easy to recognise endemic species. All collections have been made in the rainy period between January and March. Related to the endemic genus *Yvesia* A. Camus.

The sheet P00450187 is considered here as the holotype because it is labelled as "type" in Camus' hand and there is no evidence that he used the duplicate for describing the new species.

Selected specimens examined. – Madagascar. **Reg. Androy [Prov. Toliara]:** Ampandrandava entre Bekily et Tsivory, III.1943, *Seyrig 565* (P). **Reg. Haute Matsiatra [Prov. Fianarantsoa]:** environs d'Ambalavao, II.1956, *Bosser 8998* (P); Isorana, II.1961, *Bosser 15180* (P); rte. Ambalavao-Ihosy PK 543, II.1963, *Bosser 17875* (P); Ambalavao, Iarintsena, Tananomby, 15.III.2010, *Rakotoarivelo et al. 225* (MO, P). **Reg. Ihorombe [Prov. Fianarantsoa]:** entre Ambalavao et Ihosy PK 547, II.1962, *Bosser 15630* (P); S du radier d'Ampandrabe, Horombe, II.1965, *Morat 2127* (P); Horombe plateau, II.1967, *Morat 2646* (P); mont Belamboany, III.1912, *Perrier de la Bâthie 11919* (P); Bonnet du Pape, RN 7, 22.III.2010, *Ramandimbisoa et al. 130* (MO, P). **Reg. Itasy [Prov. Antananarivo]:** PK 23 rte. de Arivonimamo, I.1957, *Bosser 10665* (P); Arivonimamo, Andranomena, 12.III.2011, *Ramahefaharivelo 396* (MO, P).

9. ***Brachiaria subrostrata*** A. Camus in Bull. Soc. Bot. France 73: 691. 1927 (Fig. 7, 8A–B).

Lectotypus (designated here): Madagascar. **Reg. Vakinankaratra [Prov. Antananarivo]:** Betafo, bords de chemins, 1200 m, III.1920, *Perrier de la Bâthie 13064* (P [P00450190]!; isolecto-: K [K000244725, K000244726]!, P [P00450191, P00450192]!). **Syntypus: Madagascar. Reg. Analamanga [Prov. Antananarivo]:** Tananarive, III.1921, *Perrier de la Bâthie 13661* (P [P01914074, P00450193, P00450194, P00450195]!).

Stoloniferous mat-forming perennial, prostrate with ascending flowering culms, to 7–10 cm high, culms branched at base, rooting at lower nodes, glabrous, nodes bearded. *Leaf sheath* pilose. *Ligule* a line of hairs. *Leaf blade* narrowly lanceolate, chartaceous, 1.5–7 × 0.3–0.7 cm, pilose on both sides. *Inflorescence* racemose, subcapitate, on a pilose peduncle, 1.5–3.5 cm long. *Racemes* 2–5, 0.5–2 cm long, appressed, decreasing in length upwards, on a common axis 0.5–2 cm long, with no secondary branching, rhachis triquetrous, scaberulous with some long cilia, spikelets overlapping untidily with adjacent spikelets, single or paired, on pedicels of uneven length. *Spikelets* obovate, apically acuminate, 3–3.5 mm long, green, with a prominent ciliate rim ⅔ from base. *Lower glume* c. ¼ as long as spikelet, membranous, rounded to acute, with no venation, glabrous to pubescent, orientation relative to rhachis variable. *Upper glume* as long as spikelet, herbaceous, long-acuminate, 5–7-veined, veins green and prominent, with cross veins near apex, with short white trichomes in lower part and dense white trichomes 1–2 mm long on the rim. *Lower floret* infertile, palea c. ⅓ as long as spikelet. *Lower lemma* herbaceous, long-acuminate, 5-veined, with short white trichomes in lower part and dense white trichomes 1–2 mm long on rim. *Upper lemma* obtuse, minutely striate.

Distribution and ecology. – Common component of moist highland roadside grazing lawns. Known only from lawns, grazed or otherwise physically disturbed open ecosystems, hence associated with human habitation, at elevations of 1200–1600 m (Fig. 9).

Notes. – Range restricted but commonly encountered aesthetically appealing species easily recognisable by a ciliate rim clearly visible on the apical parts of its spikelets. The spikelets detach as a single unit just below the glumes, and the spreadout cilia are likely involved in the seed dispersal process (Fig. 7, 8A–B).

The morphology of *Brachiaria subrostrata* A. Camus is fairly similar to its closest relatives in the chloroplast marker phylogeny by Hackel et al. (2018): the abundant *B. umbellata* (Trin.) Clayton with glabrous spikelets, and the annual *Yvesia madagascariensis* A. Camus. These are likely to fall in the same clade as the rare endemic annual *Brachiaria perrieri* A. Camus, which also has attractive long cilia on its spikelets, in common with *B. subrostrata* and *Yvesia madagascariensis*. *Brachiaria subrostrata* roots at the nodes and seems to flower early on in its life cycle, and is also frequently recorded as annual. These four species could potentially be assigned to a new genus once thorough sampling of continental African *Brachiaria* is added to the analyses.

The lectotype is selected for its best quality flowering material and broadest duplicate distribution. The syntype collection *Perrier de la Bâthie 13661* bears an original note "probablement d'introduction récente" which likely reflects Perrier's erroneous assumption that roadside plants are not native. It is not included in his inventory of plants introduced to Madagascar (Perrier de la Bâthie, 1931, 1932), and is acknowledged as endemic by both Camus (1927) and Bosser (1969).

Selected specimens examined. – Madagascar. **Reg. Analamanga [Prov. Antananarivo]:** rte. de Manankavaly, III.1959, *Bosser 12860* (P); env. de Tananarive, PK 13 rte. de Tamatave, II.1969, *Bosser 19298* (P); Antananarivo centre, V.1903, *Perrier de la Bâthie 15805* (P); Tzimbazaza, outside the herbarium building, 22.II.2013, *Vorontsova & Besnard 988* (K, TAN); Antananarivo-ville, I.1916, *Waterlot s.n.* (P). **Reg. Vakinankaratra [Prov. Antananarivo]:** Manandona, 2.V.2014, *Nanjarisoa et al. 218* (K, TAN); Antsirabe II, Vinanikarena village, 5.III.2017, *Solofondranohatra et al. 803* (K, P, TAN); Ambohimandroso, Analamahitsy village, 26.IV.2017, *Solofondranohatra et al. 884* (K, P, TAN); road to Ibity PA from Antsirabe, 28.II.2019, *Vorontsova et al. 2397* (K, TAN).

10. ***Brachiaria tsiafajavonensis*** A. Camus in Bull. Soc. Bot. France 72: 622. 1925 (Fig. 10).

Lectotypus (designated here): Madagascar. **Reg. Vakinankaratra [Prov. Antananarivo]:** mont Tsiafajavona, forêt, 2000 m, V.1922, *Perrier de la Bâthie 14717* (P [P00450196]!; isolecto-: P [P00450197]!).

Fig. 7. – *Brachiaria subrostrata* A. Camus. **A.** Habit; **B.** Ligule; **C.** Leaf; **D.** Spikelet; **E.** Lower glume, dorsal view; **F.** Upper glume, dorsal view; **G.** Lower lemma, dorsal view; **H.** Upper floret, dorsal view; **I.** Upper lemma, dorsal view; **J.** Caryopsis. [Drawing: Roger Lala Andriamiarisoa]

Fig. 8. – A, B. *Brachiaria subrostrata* A. Camus; **C.** *Brachiaria tsiafajavonensis* A. Camus; **D–F.** *Brachiaria umbellata* (Trin.) Clayton.
[**A:** *Vorontsova et al. 2397*; **B:** *Rokiman et al. 2045*; **C:** *Vorontsova et al. 697*; **D:** *Vorontsova et al. 1900*; **E:** Mandena 2.XI.2011; **F:** *Hall et al. 17*]
[Photos: Maria S. Vorontsova]

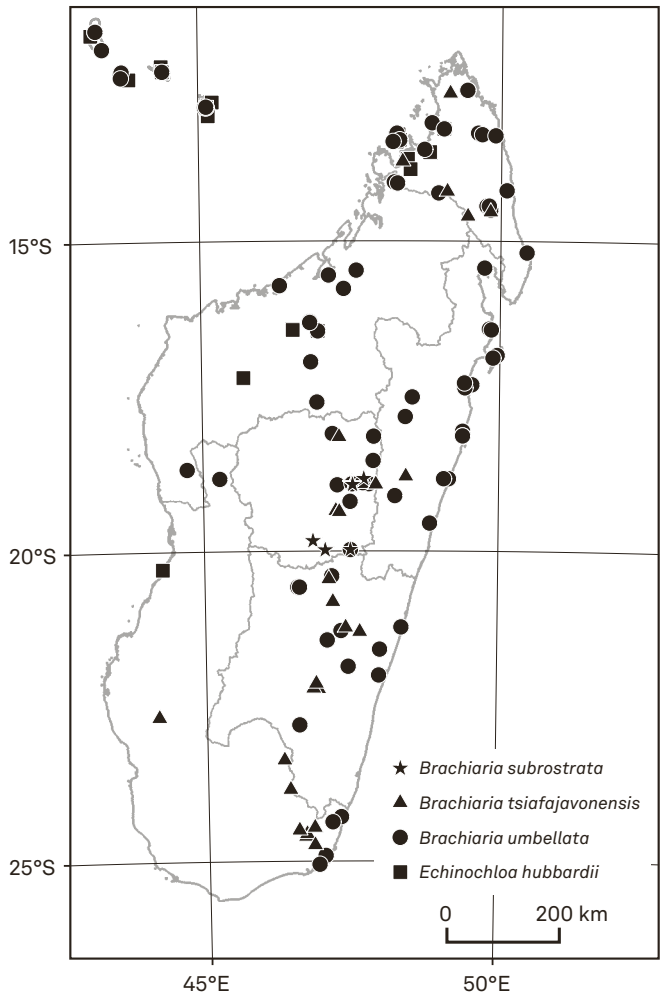

Fig. 9. – Distribution maps. *Brachiaria subrostrata* A. Camus (stars), *B. tsiafajavonensis* A. Camus (triangles), *B. umbellata* (Trin.) Clayton (circles), and *Echinochloa hubbardii* (A. Camus) Voronts. (squares).

Stoloniferous mat-forming perennial, prostrate with ascending flowering culms, to 0.5 m high, culms weakly branched, rooting at lower nodes, glabrous. *Leaf sheath* glabrous to hirsute. *Ligule* a truncate membrane. *Leaf blade* lanceolate, chartaceous, 4–16 × 0.6–1.2 cm, glabrous to hirsute on both sides. *Inflorescence* racemose, slender, contracted, 10–20 cm long. Racemes 3–7, 3–10 cm long, flexuous, appressed, decreasing in length upwards, on a common axis 5–15 cm long, frequently with short secondary branches, rhachis narrow, scabrous and sometimes pubescent, spikelets overlapping with adjacent spikelets near base of synflorescence, single, on pedicels of uneven length. *Spikelets* oblong, apically subacute, 2.8–3.5 mm long, whiteish. *Lower glume* c. ¼ as long as spikelet, membranous, obtuse to acute, 1–3-veined, glabrous separated from rest of spikelet by an internode c. 0.25 mm long, orientation relative to rhachisvariable. *Upper glume* as long as spikelet, herbaceous, 5-veined, veins dark green, glabrous. *Lower floret* infertile, palea ⅓–½ as long as lemma. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* obtuse to acute, smooth, shiny, pale, with apical green crest and some trichomes.

Distribution and ecology. – Madagascar endemic occurring in the central highlands, northern, and eastern areas, in the shade under mature wet mid-elevation and montane forest, often associated with isolated forest fragments, on gneiss and clay, at elevations of 650–2300 m (Fig. 9).

Notes. – *Brachiaria tsiafajavonensis* is a fairly common species of upland wet forest understory recognised by its oblong spikelet shape as well as its wide leaf blades. Forms with dark purple stripes across the spikelets are sometimes found. It differs from the southern low elevation species *B. humbertiana* A. Camus by its fully smooth upper lemma, plant rooting at lower nodes, and lower glume only ¼ of the spikelet length, as well as the internode between the glumes shorter than that of *B. humbertiana*. The plastid DNA regions analysed by Hackel et al. (2018) indicate a close relationship with the drier habitat species *B. comorensis* (Mez) A. Camus, with similarly broad leaf blades, and elliptic-oblong spikelets, glumes shorter than ⅓ of the spikelet length, and smooth upper lemmas.

Selected specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** Mantadia NP, Tsakoka trail, 16.III.2016, *Vorontsova et al. 1856* (K, P, TAN); Mantadia NP, c. 1 km past the entrance to the Chute Sacrée, 5.VIII.2019, *Vorontsova et al. 2403* (K, TAN). **Reg. Amoron'i Mania [Prov. Fianarantsoa]:** env. D'Ambositra, mont Vatomavy, 23.VII.1928, *Humbert & Swingle 4810* (P). **Reg. Anosy [Prov. Toliara]:** Mandrare, vallée de la Manambolo, XII.1953, *Bosser 5238* (P); massif du Beampingaratra, vallée de la Maloto, 31.X.1928, *Humbert 6313* (P); Andohahela NP, Manongotry, 28 km before Ranomafana, 1.XI.2011, *Vorontsova et al. 697* (K, TAN). **Reg. DIANA [Prov. Antsiranana]:** montagne d'Ambre, VII.1953, *Bosser 5338* (K, P). **Reg. Ihorombe [Prov. Fianarantsoa]:** Andringitra PN, forêt de Ravaro, 9.I.2000, *Messmer et al. 834* (P). **Reg. Itasy [Prov. Antananarivo]:** massif de l'Ankaratra, flanc oriental du Tsiafajavona, 15.VII.1928, *Decary et al. 4570* (K, P). **Reg. SAVA [Prov. Antsiranana]:** pentes occidentales du massif de Marojejy, à l'E de Ambalamanasy II, 30.XI.1948, *Humbert & Capuron 22281* (P). **Reg. Sofia [Prov. Mahajanga]:** montagnes au N de Mangindrano jusqu'aux sommets de Ambohimirahavavy, 19.I.1951, *Humbert & Capuron 25249* (P). **Reg. Vakinankaratra [Prov. Antananarivo]:** Manjakatompo, III.1961, *Bosser 15116* (K, P). **Reg. Vatovavy [Prov. Fianarantsoa]:** Ranomafana PN, bords de la Namorona, I.1964, *Bosser 18926* (P).

11. ***Brachiaria umbellata*** (Trin.) Clayton in Kew Bull. 34: 559. 1980 (Fig. 8D–F, 11A).

≡ *Panicum umbellatum* Trin., Gram. Panic.: 238. 1826.

Holotypus: Mauritius: sine loco, 1825, *Sieber Hb. Maur. II. No. 34* (LE Herbarium Trinii 996.1 microfiche!; iso-: BR [BR0000008756435] image!, G [G00022428, G00022429] image!, H [H1048911, H1568372] image!, K [K000244716]!, L [L0043864, L0043865, L0043866] image!, MO [MO-1742146] image!, P [P00450345, P00450346]!, US [US-2903023 fragm., US-144576]!,

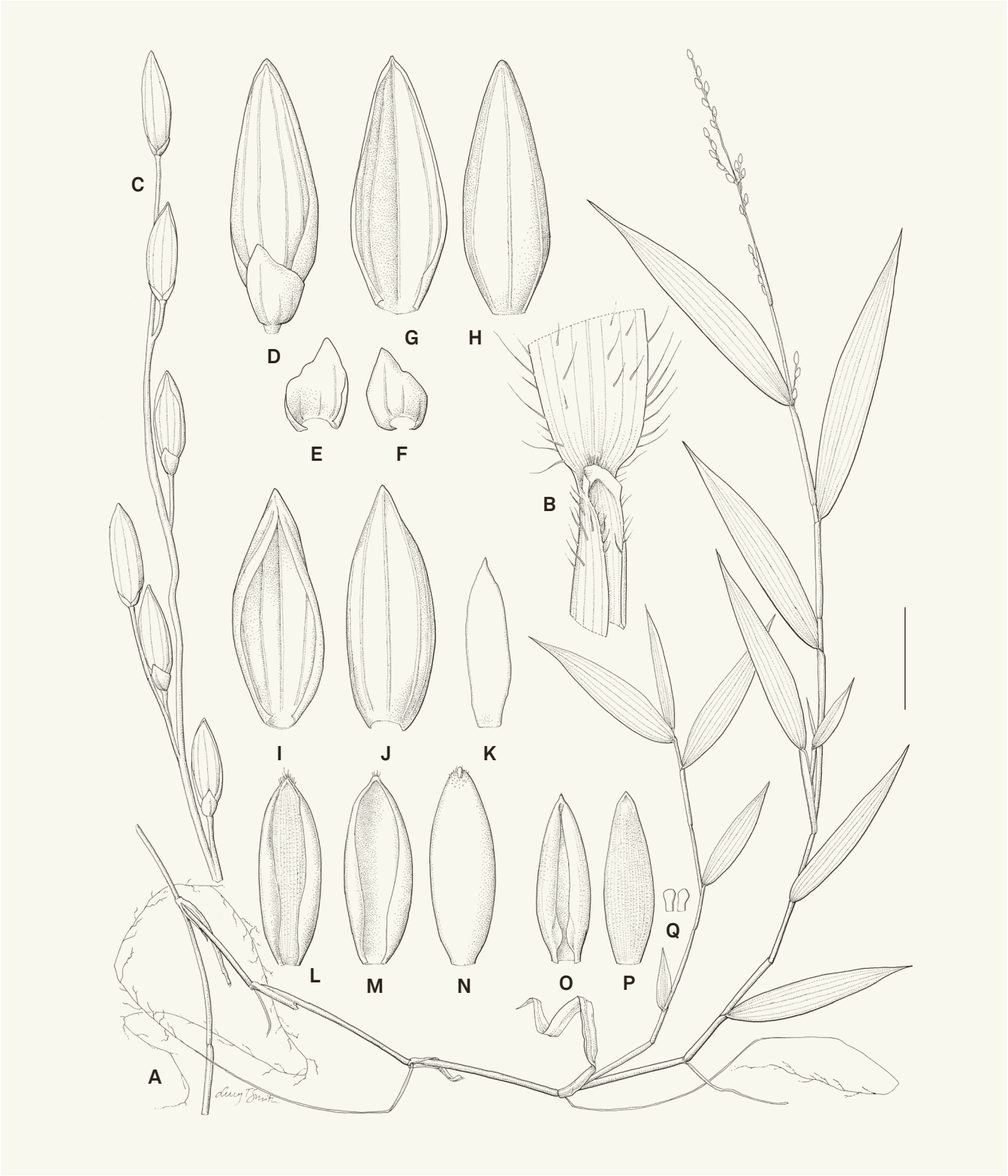

Fig. 10. – *Brachiaria tsiafajavonensis* A. Camus. **A.** Habit; **B.** Ligule; **C.** Panicle branch; **D.** Spikelet; **E.** Lower glume, ventral view; **F.** Lower glume, dorsal view; **G.** Upper glume, ventral view; **H.** Upper glume, dorsal view; **I.** Lower lemma, ventral view; **J.** Lower lemma, dorsal view; **K.** Lower palea; **L.** Upper floret, ventral view; **M.** Upper lemma, ventral view; **N.** Upper lemma, dorsal view; **O.** Upper palea, ventral view; **P.** Upper palea, dorsal view; **Q.** Upper floret lodicules. Scale bar: A = 2.5 cm; B = 3.3 mm; C = 2 mm; D–Q = 1.5 mm. [*Bosser 15116,* K] [Drawing: Lucy T. Smith]

W [W0000261, W0000262, W0000263, W0000264, W18890211252, W18890236430, W18890236431, W18890236432, W18890236433] image!).

= *Panicum nossibense* Steud., Syn. Pl. Glumac. 1(6): 419. 1854. = *Panicum umbellatum* subsp. *nossibense* (Steud.) A. Camus in Notul. Syst. (Paris) 15: 414. 1959. **Lectotypus** (designated here): **Madagascar. Reg DIANA [Prov. Antsiranana]:** Nosy Be, VI.1847, *Boivin 1962* or *s.n.* (P [P00450237]!; isolecto-: K [K000805712]!, P [P00450238, P00450239]!, US [US-1389878 fragm.]!, W [W0023752] image!).

Stoloniferous mat-forming perennial, prostrate with ascending flowering culms, to 30 cm high, culms much branched, rooting at nodes, glabrous or finely pilose. *Leaf sheath* glabrous to pubescent. *Ligule* a line of hairs. *Leaf blade* narrow-lanceolate, thickly chartaceous, 1–3(–4) × 0.2–0.6 cm, glabrous to pubescent on both sides. *Inflorescence* racemose, slender, open or contracted, 1.5–5.5 cm long. *Racemes* 4–8, 1.5–5.5 cm long, erect, decreasing in length upwards, on a common axis 0–2 cm long, sometimes with secondary branches, rhachis narrow, with trichomes 1–2 mm long, spikelets not overlapping with adjacent spikelets, single, on pedicels of uneven length, bare at base. *Spikelets* elliptic, apically acute, 1.5–2 mm long, drying whiteish, often with a purple tinge. *Lower glume* absent or ⅛–⅓ as long as spikelet, membranous, obtuse to emarginate, with no veins, glabrous, orientation relative to rhachis variable. *Upper glume* as long as spikelet or a little shorter, membranous, 3–5-veined, glabrous or sometimes finely pilose. *Lower floret* infertile, palea absent. *Lower lemma* membranous, 5-veined, glabrous or sometimes finely pilose. *Upper lemma* acute, shiny to rugulose.

Distribution and ecology. – Madagascar, Comores, Seychelles, Mauritius, Rodrigues. Its status as an island group endemic is not clear: scattered records from Malawi, Mozambique, Tanzania, and Zimbabwe are most likely repeated introductions (Fig. 9).

Forms the dominant ground cover across significant areas of Madagascar and surrounding islands except the arid southwest. Abundant especially in sandy coastal areas but also on highland grazing lawns not affected by fire, and mid-elevation forest clearings, at elevations 0–1600 m. Common lawn grass. Apparently unable to tolerate the aridity of the southwest.

Notes. – Abundant and ecologically significant species. Introduced as a lawn grass to several localities in southern Africa (Clayton & Renvoize, 1982), and known as "coconut lawn", "gazon cocotier" in Mayotte [P00290436]. Considerable variability across the range becomes visible when examined under a binocular microscope: occasionally the lower glume is absent altogether, fine trichomes can appear on the spikelet, and the upper lemma can be either shiny or finely rugulose.

Boivin's Nosy Be collections of *Brachiaria umbellata* are numerous and it is not possible to verify which ones may have originally constituted a single gathering, or which exact sheet Steudel (1854) may have been referring to as "Boivin legit in Ins. Nossibé", not citing a collection number. The more comprehensive and fully labelled sheets of these collections bear the number *1962* and a collection date of June 1847, while others only bear the printed date range 1847–1852. The lectotype selected here is the best quality and most extensively annotated sheet of Boivin's herbarium.

Selected specimens examined. – Madagascar. **Reg. Amoron'i Mania [Prov. Fianarantsoa]:** Ambatofinandrahana, Itremo, pepinière de la NAP à Ihazofotsy, 21.II.2014, *Nanjarisoa et al. 164* (K, TAN). **Reg. Analamanga [Prov. Antananarivo]:** Manjakandriana, 4.IV.1951, *Bosser 647* (P); Antananarivo, Tsimbazaza, IV.1961, *Bosser 15353* (P, TAN); Beronono, c. 4 km from Ankazobe to Ankafobe, 8.V.2017, *Solofondranohatra & Razanatsoa 1020* (K, P, TAN). **Reg. Analanjirofo [Prov. Toamasina]:** Soanierana Ivongo, Mananknany, 25.X.1986, *Pettersson & Nilsson 38* (P). **Reg. Anosy [Prov. Toliara]:** Vinanibe près du Fort-Dauphin, 14.VIII.1932, *Decary 10292* (P); Taolagnaro, Mandromodromotra, I.1959, *Peltier & Peltier 1497* (P, TAN); Sainte-Luce, Ambandrika, 29.II.2012, *Ramananjanahary et al. 558* (P). **Reg. Atsinanana [Prov. Toamasina]:** Ilaka-Est, XII.1962, *Bosser 16882* (K, P, TAN); Tamatave, III.1932, *Jard. Bot. Tananarive 324186* (P, TAN). **Reg. Boeny [Prov. Mahajanga]:** Ankarafantsika NP office, 14.II.2017, *Vorontsova & Duncan-Rice 2092* (K, P, TAN). **Reg. DIANA [Prov. Antsiranana]:** Nosy-Be, Ambatoloaka, VIII.1959, *Bosser 13230* (P, TAN); Sahafary Forêt, VI.1970, *Bosser 20382[b]* (K); Manongarivo, Besinkara, Ambalafary, 13.V.1995, *Gautier & Chatelain 2644* (G, K, P, TAN). **Reg. Ihorombe [Prov. Fianarantsoa]:** près de Ranotsara, XII.1963, *Bosser 18728* (P, TAN). **Reg. Melaky [Prov. Mahajanga]:** marais d'Antsalova, X.1963, *Morat 163* (TAN). **Reg. Sofia [Prov. Mahajanga]:** sur le Mahajamba à Beronono, I.1907, *Perrier de la Bâthie 11144[a]* (P). **Reg. Vatovavy [Prov. Fianarantsoa]:** env. d'Ambila, 18.III.1951, *Benoist 829* (P, TAN).

12. ***Echinochloa hubbardii*** (A. Camus) Voronts., **comb. nov.** (Fig. 11B–C).

≡ *Brachiaria hubbardii* A. Camus in Bull. Soc. Bot. France 94: 40. 1947. ≡ *Acroceras hubbardii* (A. Camus) Clayton in Kew Bull. 34: 557. 1980. ≡ *Panicum hubbardii* (A. Camus) Renvoize in Hautrey et al., Fl. Mascareignes 203: 123. 2018.

Lectotypus (designated here): **Madagascar. Reg. DIANA [Prov. Antsiranana]:** Nosy Be, V.1879, *Hildebrandt 2985* (P [P02233603]!; isolecto-: GOET [GOET005565] image!, K [K000244701, K000244702]!, P [P02233606, P02233612]!, US!). **Syntypi: Comoros. Anjouan:** Tsantsany, XII.1921, *Decary 810* (P [P00216311]!); ibid. loco, VIII.1923, *Waterlot 918* (P [P00216314]!). **Grande Comore:** Vouni, V.1850, *Boivin s.n.* (P [P00216307]!). **Madagascar. Reg. Analanjirofo [Prov. Toamasina]:** Sainte Marie, V.1852, *Boivin s.n.* (P [P02233596]!). **Mayotte:** Majimbini forest, V.1884, *Humblot 1092* (P [P00216308, P00216309, P00216310]!); ibid. loco, s.d., *Boivin s.n.* (K [K000805482]!).

Fig. 11. – A. *Brachiaria umbellata* (Trin.) Clayton; **B, C.** *Echinochloa hubbardii* (A. Camus) Voronts.; **D–F.** *Urochloa brizantha* (Hochst. ex A. Rich.) R.D. Webster. [**A:** Tzimbazaza 24.II.2022; **B:** *Vorontsova et al. 2115*; **C:** *Vorontsova et al. 2124*; **D:** *Vorontsova et al. 2396*; **E:** *Vorontsova et al. 2398*; **F:** *Randriatsara et al. 3*] [Photos: Maria S. Vorontsova]

Tanzania. **Zanzibar:** XI.1873, *Hildebrandt 1100* (GOET [GOET005564] image!, P [P00442051]!).

= *Brachiaria hubbardii* var. *halophila* A. Camus in Bull. Soc. Bot. France 101: 395. 1954. **Holotypus: Madagascar. Reg. Boeny [Prov. Mahajanga]:** Anjiajia, VIII.1952, *Bosser 3500* (P [P02233608]!; iso-: K [K000244703]!).

= *Brachiaria nodosa* Renvoize & Bosser in Hautrey et al., Fl. Mascareignes 203: 139. 2018, **syn. nov. Holotypus: Mauritius:** Serpent Island, XII.1971, *Vinson s.n.* (MAU [MAU15188] image!).

Stoloniferous mat-forming perennial, prostrate with ascending flowering culms, to 20 cm high, culms much branched, rooting at nodes, glabrous, nodes bearded. *Leaf sheath* glabrous to pubescent. *Ligule* absent. *Leaf blade* linear, membranous, 1–4 × 0.1–0.2 cm, glabrous to pubescent on both sides. *Inflorescence* capitate, 0.5–1.5 cm long, with 5–15(–30) spikelets. *Racemes* 1–4, 0–0.3 cm long, barely separable within capitate inflorescence, on a common axis 0–1 cm long, with no secondary branching, rhachis narrow, glabrous, spikelets overlapping with adjacent spikelets, single, subsessile. *Spikelets* elliptic, apically acute, 2–2.3 mm long, white to pale green. *Lower glume* ½–⅔ as long as spikelet, membranous, acute, 3–5-veined, glabrous or sometimes apically pubescent, orientation relative to rhachis variable. *Upper glume* as long as spikelet or a little shorter, membranous, pinched at apex, 5–7-veined, glabrous or sometimes apically pubescent. *Lower floret* male, palea as long as lemma, anthers 3, c. 1.2 mm long. *Lower lemma* membranous, pinched at apex, 5–7-veined, glabrous or sometimes apically pubescent. *Upper lemma* acute, smooth, shiny, white becoming pale brown, with an apical green crest.

Distribution and ecology. – Sea shores, associated with puddles and temporary water bodies. Readily forms short dense grazing lawns and turf. Frequently associated with human activity and commonly seen on pavements, between paving slabs, and within local pastures and sports turf. Not recorded in Tanzania since *Hildebrandt 1100*, the single syntype collection made in 1873 (Fig. 9).

Notes. – *Echinochloa hubbardii* (A. Camus) Voronts. is recognised by its long-exserted capitate inflorescences, short soft leaf blades, and diminutive mat-forming habit. The complete absence of a ligule is consistent with the Hackel et al. (2018) phylogenetic placement of this species in *Echinochloa,* a genus commonly lacking a ligule.

Echinochloa hubbardii is sympatric with the closely related miniature trailing Mascarene species *E. serpens* (Kunth) Voronts. (comb. nov., see below), which is also occasionally present in Madagascar and has similar globose inflorescences and lacks of ligule but sessile inflorescences with fewer spikelets, and with glumes and lower lemma which are always pilose. From the overall appearance of the plants it is quite clear that *E. hubbardii* and *E. serpens* are closely related, and different from all the other species in *Acroceras, Brachiaria, Echinochloa, Panicum* s.l., and *Urochloa*. This relationship between *Echinochloa hubbardii* and *E. serpens* was previously obscured by the traditional generic concepts and thus confusingly variable generic placements of these species in *Brachiaria* [*B. hubbardii* A. Camus in Bosser, 1969], *Acroceras* [*A. hubbardii* (A. Camus) Clayton in Clayton & Renvoize, 1982], and *Panicum* as well as *Brachiaria* [*Panicum hubbardii* (A. Camus) Renvoize, *Brachiaria serpens* (Kunth) C.E. Hubb., and *B. nodosa* Renvoize & Bosser in Bosser & Renvoize, 2018].

Brachiaria nodosa is morphologically consistent with *Echinochloa hubbardii* but with more indumentum on the distal parts of its spikelets than average, thus similar to *E. serpens* but with exserted inflorescences and longer spikelets. The type of *Brachiaria hubbardii* var. *halophila* A. Camus displays densely hirsute leaf sheaths and leaf blades and thus a paler specimen colour, but no other differences are observed.

Many of the older specimens of both *Echinochloa hubbardii* and *E. serpens* are annotated as "Panicum conglomeratum L." and a specimen of *E. hubbardii* is present in the Linnaean herbarium: *Herb. Linn. 80.29* [http://linnean-online.org/1261]. Due to confusion with the sympatric and superficially similar *Sacciolepis indica* (L.) Chase, the name *Panicum conglomeratum* L. is illegitimate and referrable to *Sacciolepis indica* (Hubbard & Vaughan, 1940; Cafferty et al., 2000; Jarvis, 2007). The lectotype of *Brachiaria hubbardii* is designated here for its superior quality material and also to maintain continuity with Bosser & Renvoize (2018) who cited *Hildebrandt 2985* at P as the holotype.

Selected specimens examined. – Madagascar. **Reg. Betsiboka [Prov. Mahajanga]:** massif causses du Kelifely, XI.1974, *Morat 4671* (P). **Reg. Boeny [Prov. Mahajanga]:** Anjiajia, VIII.1952, *Bosser 3500* (K, P); Madirovalo, VI.1901, *Perrier de la Bâthie 168[a]* (K). **Reg. DIANA [Prov. Antsiranana]:** vallée de l'Ifasy en aval d'Anaborano, 31.III.1951, *Humbert & Capuron 25864* (P); Nosy Be, dans la rue de Helville, VIII.1933, *Perrier de la Bâthie s.n.* (P, TAN); Ambilobe, roadside opposite Jovenna petrol station, 11.X.2011, *Vorontsova et al. 347* (K, TAN). **Reg. Menabe [Prov. Toliara]:** environs de Morondava, IX.1956, *Bosser 9918* (P).

13. ***Echinochloa leandriana*** (Bosser) Voronts., **comb. nov.**

≡ *Brachiaria leandriana* Bosser in Adansonia, sér. 2, 6: 111. 1966.

Holotypus: Madagascar. **Reg. Atsimo-Andrefana [Prov. Toliara]:** plateau Mahafaly, W de Ejeda, III.1960, *Bosser 14538* (P [P00450182]!; iso-: [P00450183, P00450184]!, TAN!).

Loosely tufted mat-forming stoloniferous perennial, ascending to erect, to 30 cm high, culms thickened and knotty at base, glabrous, nodes bearded. *Leaf sheath* pubescent, silky at base. *Ligule* absent. *Leaf blade* narrow-lanceolate, chartaceous, 4–8 × 0.3–0.7 cm, pubescent on both sides. *Inflorescence* racemose, thick, contracted or subcapitate, 3–6 cm long. *Racemes* 4–7, 0.6–2.5 cm long, decreasing in length upwards, on a common axis 1–4 cm long, with no secondary branching, rhachis triquetrous, finely pubescent, spikelets overlapping untidily with adjacent spikelets, paired, subsessile, in 4 untidy rows. *Spikelets* ovate, apically apiculate, 2–2.2 mm long, whiteish. *Lower glume* ⅔–¾ as long as spikelet, herbaceous, apiculate, 3–5-veined, hirsute, orientation relative to rhachis variable. *Upper glume* as long as spikelet, herbaceous, apiculate, 7–9-veined, veins pronounced, hirsute. *Lower floret* male, palea as long as lemma. *Lower lemma* herbaceous, 5–7-veined, hirsute. *Upper lemma* apiculate, smooth, shiny, pale.

Distribution and ecology. – Endemic to the Mahafaly plateau in arid inland southwestern Madagascar, forming spreading mats in open canopy secondary vegetation on limestone (Fig. 12).

Notes. – This species is known from only three collections by Jean Bosser and has not been seen since 1963. It is not clear why Bosser (1966) described this material in the genus *Brachiaria* given its striking resemblance to *Echinochloa*, including the lack of ligule characteristic of *Echinochloa* illustrated in Bosser (1966). Compared to *Brachiaria* and *Urochloa* s.l., this is a distinctive species with dense whiteish inflorescences and bearded nodes. Unpublished DNA sequences place it firmly in *Echinochloa* in the subtribe *Boivinellinae* (*Bosser 16110*, P02233533, G. Besnard & J. Hackel, pers. comm.). A full revision of *Echinochloa* in Madagascar is beyond the scope of this work; the species is here transferred to *Echinochloa* pending a more detailed assessment of species boundaries.

Additional specimens examined. – **Madagascar. Reg. Atsimo-Andrefana [Prov. Toliara]:** Ankalirano (Ankadirano), plateau Mahafaly, III.1962, *Bosser & Viennot 16110* (P); Betioky, Ekinaty, III.1963, *Bosser 19687* (P).

14. ***Echinochloa serpens*** (Kunth) Voronts., **comb. nov.**

≡ *Panicum serpens* Kunth, Rev. Gram. 1: 38. 1829 [nom. nov.]. ≡ *Panicum parvifolium* var. *serpens* (Kunth) Baker, Fl. Mauritius: 438. 1877. ≡ *Brachiaria serpens* (Kunth) C.E. Hubb. in Kew Bull. 1939: 654. 1939.

≡ *Panicum repens* Nees, Fl. Bras. Enum. Pl. 2(1): 171. 1829 [nom. illeg., non *P. repens* L., 1762].

Holotypus: Mauritius: sine loco, *Bory de St Vincent. No. 40* (B-W [BW18793010] image!).

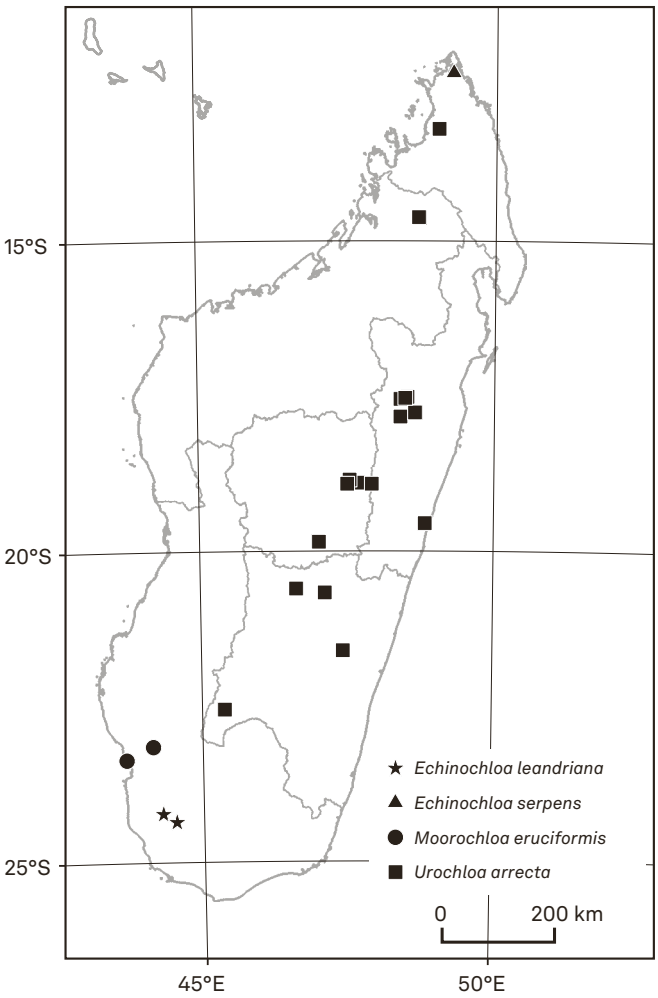

Fig. 12. – Distribution maps. *Echinochloa leandriana* (Bosser) Voronts. (stars), *E. serpens* (Kunth) Voronts. (triangles), *Moorochloa eruciformis* (Sm.) Veldkamp (circles), and *Urochloa arrecta* (Hack. ex T. Durand & Schinz) Morrone & Zuloaga (squares).

= *Brachiaria lateritica* A. Camus in Bull. Soc. Bot. France 93: 89. 1946, **syn. nov. Holotypus: Madagascar. Reg. DIANA [Prov. Antsiranana]:** env. de Diégo-Suarez, VIII.1933, *Perrier de la Bâthie 19296* (P [P02233536]!).

Stoloniferous mat-forming perennial, forming dense cushions, not rising more than c. 2 cm above ground, culms much branched, rooting at nodes, glabrous, nodes bearded. *Leaf sheath* pubescent. *Ligule* absent. *Leaf blade* narrow-lanceolate, membranous, 0.7–1.5(–1.8) × 0.08–0.12(–0.15) cm, sparsely to densely pubescent on both sides. *Inflorescence* capitate, not fully exserted, 0.3–0.5(–0.8) cm long, with 3–5(–8) spikelets, with no secondary branching, rhachis narrow, glabrous to pubescent, spikelets overlapping with adjacent spikelets, single, subsessile. *Spikelets* elliptic, apically acute, 1–1.5(–2) mm long, white to pale green. *Lower glume* ½–⅔ as long as spikelet, membranous, acute, 3-veined, glabrous to apically pubescent, orienta-

tion relative to rhachis variable. *Upper glume* as long as spikelet or slightly shorter, membranous, pinched at apex, 5–7-veined, pubescent, often with bulbous-based hairs. *Lower floret* male, palea as long as lemma. *Lower lemma* membranous, pinched at apex, 5–7-veined, pubescent, often with bulbous-based hairs. *Upper lemma* acute, smooth, shiny, white becoming pale brown, with an apical green crest.

Distribution and ecology. – The only collection known from Madagascar is the type of *Brachiaria lateritica* A. Camus (Fig. 12).

Notes. – Details of the species boundary between *Echinochloa hubbardii* and *E. serpens* are not altogether clear and require field work. These species seem to be sympatric, forming ground cover at low elevations on the islands. Herbarium specimens of *E. serpens* consistently differ from *E. hubbardii* by their more compact habit, uniform short leaf blades and short peduncles, and pubescence on leaf blades and spikelets. These two species are maintained here as separate taxa in agreement with Hubbard and the Kew collections as documented by Camus (1947), and also in agreement with Bosser & Renvoize (2018). For discussion of the relationship between *E. hubbardii* and *E. serpens* and their generic placement see the notes under *E. hubbardii*.

This species has historically been refereed to as "Panicum conglomeratum"; see notes under *Echinochloa hubbardii*. The protologue of *Panicum repens* Nees (Nees von Esenbeck, 1829) cites "in insula Mauritii (Sieb. Herb. n. 34)" and this number is also cited by Baker (1877) in his description of *Panicum parvifolium* var. *serpens* (Kunth) Baker. Unfortunately, Baker conflates this species with the superficially similar *P. umbellatum* Trin. (= *Brachiaria umbellata* in this treatment). The collection *Sieber Hb. Maur. II. No. 34* is the type of *Panicum umbellatum*, and all the sheets examined clearly belong to *Brachiaria umbellata,* not *Echinochloa serpens*.

15. ***Moorochloa eruciformis*** (Sm.) Veldkamp in Reinwardtia 12: 139. 2004.

    ≡ *Panicum eruciforme* Sm. in Sibthorp, Fl. Graec. Prodr.: 40. 1806. ≡ *Brachiaria eruciformis* (Sm.) Griseb., Fl. Ross. (Ledeb.) 4: 469. 1853. ≡ *Urochloa eruciformis* (Sm.) C. Nelson & Fern. Casas in Fontqueria 51: 4 .1998.

    Holotypus: Greece: sine loco, s.d., *Sibthorp s.n.* (OXF).

Loosely tufted annual, ascending to erect, 0.1–0.6 m high, culms not branched, glabrous, nodes bearded. *Leaf sheath* glabrous to sparsely pubescent. *Ligule* a line of hairs. *Leaf blade* linear, chartaceous, 2–15 × 0.2–0.6 cm, glabrous to pubescent on both sides, retrorse at maturity. *Inflorescence* racemose, slender, contracted, 2–10 cm long. *Racemes* 3–14, 0.5–2.5 cm long, roughly even in length, appressed, on a common axis 1–8 cm long, with no secondary branching, rhachis triquetrous, pubescent, spikelets imbricate, single, subsessile, in 2 tidy rows. *Spikelets* elliptic, apically acute, 1.7–2.7 mm long, whiteish. *Lower glume* up to ⅕ as long as spikelet, membranous, truncate to acute, 1-veined, glabrous to pubescent, turned towards rhachis. *Upper glume* as long as spikelet, membranous, 5-veined, pubescent (rarely glabrous). *Lower floret* infertile or male, palea c. ⅔ to as long as lemma, anthers 3, 0.5–1 mm long. *Lower lemma* membranous, 5-veined, pubescent (rarely glabrous). *Upper lemma* obtuse, smooth, shiny, yellow to pale brown.

Distribution and ecology. – It seems relatively uncommon in Madagascar and restricted to the arid south (Fig. 12).

Notes. – Arrangement of spikelets on the racemes appears remarkably tidy and compact, rendering this species easy to recognise. Occurs over much of Africa and Asia, naturalised in Australia and Latin America, but a comparatively small number of collections are known from Madagascar. For the history of the generic name see Veldkamp (2004).

Additional specimens examined. – **Madagascar. Reg. Atsimo-Andrefana [Prov. Toliara]:** env. de Tulear, XI.1956, *Bosser 10549* (P); Andranovory, 19.X.1960, *Peltier & Peltier 2517* (P).

16. ***Urochloa arrecta*** (Hack. ex T. Durand & Schinz) Morrone & Zuloaga in Darwiniana 31: 69. 1992.

    ≡ *Panicum arrectum* Hack. ex T. Durand & Schinz, Consp. Fl. Afr. 5: 741. 1894. ≡ *Brachiaria arrecta* (Hack. ex T. Durand & Schinz) Stent in Bothalia 1: 26. 1924.

    Lectotypus (designated by Sosef 2016: 358): **South Africa. Eastern Cape:** Komgha Division, near Kei River, s.d., *Drège s.n.* (K [K000282184]!).

    = *Brachiaria arrecta* var. *madecassa* A. Camus in Bull. Soc. Bot. France 101: 395. 1954. **Holotypus: Madagascar. Reg. Vakinankaratra [Prov. Antananarivo]:** near Antsirabe, I.1914, *Perrier de la Bâthie 10756* (P [P00450159]!; iso-: P [P02040480]!).

Loosely tufted stoloniferous perennial, ascending to erect, 0.5–1.3 m high, culms sparsely branched, rooting at lower nodes, glabrous. *Leaf sheath* glabrous, sometimes pubescent at base of plant. *Ligule* a line of hairs. *Leaf blade* linear to narrow-lanceolate, thickly chartaceous, 4–20 × 0.3–1.2 cm, glabrous on both sides. *Inflorescence* racemose, slender, open, 5–30 cm long. *Racemes* 2–5, 2–10 cm long, roughly even in length, on a common axis 5–25 cm long, with no secondary branching, rhachis narrowly winged, 0.5–1.5 mm wide, margins scabrid or with cilia up to 0.5 mm long, spikelets imbricate, single, subsessile, in 2 rows, pedicels often pubescent. *Spikelets* elliptic, apiculate, 3.5–4 mm long, yellowish, often with a purple tinge. *Lower glume* c. ½ as long as spikelet, membranous, obtuse,

3-veined, glabrous, turned towards rhachis. *Upper glume* as long as spikelet, membranous, 5–7-veined, glabrous. *Lower floret* male, palea as long as lemma, anthers 3, c. 2.2 mm long. *Lower lemma* membranous, 5–7-veined, glabrous. *Upper lemma* obtuse, rugulose.

Distribution and ecology. – Common element of pastures, grazing lawns, open savannas, stream banks, roadsides, rice paddies, and swamps in central and eastern Madagascar, at elevations of 1000–1700 m (Fig. 12).

Notes. – Common native African forage grass. Much larger plant than *Urochloa distachyos* (L.) T.Q. Nguyen or *U. nana* (Stapf) Voronts. (comb. nov., see below); its mainly erect habit is a useful recognition feature. Distinguished from *U. brizantha, U. eminii*, and *U. jubata* (Fig. & De Not.) Sosef by the absence of long cilia on the edges of its rhachis, with cilia only up to 0.5 mm long (1.5–3 mm long in *U. brizantha*). The lower part of the plant is often underwater. Provides good quality forage in the dry season (Bosser, 1969).

Selected specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** Morarano, W du Lac Alaotra, XII.1954, *Bosser 7465* (P); Ambatondrazaka, Manakambahiny Est, 24.XII.1962, *Rakotovao 12358* (P). **Reg. Amoron'i Mania [Prov. Fianarantsoa]:** Ambositra, riviere de Fatihita, 25.I.2015, *Manjato et al. 620* (MO, P); 2 km E of Anjomanakona towards Ivato, 27.II.2013, *Vorontsova et al. 1036* (K, TAN). **Reg. Analamanga [Prov. Antananarivo]:** Ilafy, VI.1905, *Alleizette 162a* (P); Antananarivo-Sud, Ampitatafika, PK 10 rte. d'Arivonimamo, II.1961, *Bosser 15154* (P, TAN). **Reg. Atsinanana [Prov. Toamasina]:** Ilaka-Est, station d'essai "Caroline", XII.1962, *Bosser 16827* (P). **Reg. DIANA [Prov. Antsiranana]:** rte. d'Ambilobe à Ambanja, XII.1964, *Morat 1208* (P). **Reg. Sofia [Prov. Mahajanga]:** Bealanana, Betainkankana, Ankaizina, V.1952, *Bosser 2748* (P). **Reg. Vakinankaratra [Prov. Antananarivo]:** Ambohimandroso, Analamahitsy village, 26.IV.2017, *Solofondranohatra et al. 883* (K, P, TAN). **Reg. Vatovavy [Prov. Fianarantsoa]:** Vohitranivo, XI.1952, *Bosser 3976* (P).

17. ***Urochloa brizantha*** (Hochst. ex A. Rich.) R.D. Webster, Austral. Paniceae (Poaceae) 233. 1987 (Fig. 11D–F).

≡ *Panicum brizanthum* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 363. 1850. ≡ *Brachiaria brizantha* (Hochst. ex A. Rich.) Stapf in Oliv., Fl. Trop. Afr. 9: 531. 1919.

Lectotypus (designated by Veldkamp, 1996: 417): **Ethiopia. Tigray:** Mt. Scholoda (Selleuda), X.1837, *Schimper 89* (P [P00442084]!; isolecto-: BM [BM000923191]!, BR [BR0000008645142, BR0000008366955] images!, G [G00015881, G00015882, G00015883, G00015884] images!, GOET [GOET006080] image!, K [K000282126, K000282127, K000282128]!, L [L0043836, L0043837] images!, LG [LG0000090036057, LG0000090036200] images!, M [M0103976, M0103977] images!, MO [MO-1742002] image!, MPU [MPU024477, MPU024478] images!, P [P00442082, P00442083, P00731455, P02284802, P02284803]!, PRE [PRE0664145-0] image!).

Tufted perennial, firmly rooted and almost woody near base of mature stand, ascending to erect, 0.3–2 m high, culms not branched, glabrous to sparsely hirsute. *Leaf sheath* glabrous to sparsely pilose. *Ligule* a ciliate membrane. *Leaf blade* broadly linear, chartaceous, 10–100 × 0.3–2 cm, glabrous to sparsely pilose on both sides. *Inflorescence* racemose, stout, erect, 5–25 cm long. *Racemes* 2–16, 4–20 cm long, usually gently curved, on a common axis 3–20 cm long, with no secondary branching, rhachis herbaceous, curved, 1–1.5 mm wide, margin ciliate with trichomes 1.5–3 mm long, spikelets imbricate, single, subsessile, in a single row. *Spikelets* plump elliptic to obovate, apically subacute, 4–6 mm long, white-yellowish, often with a purple tinge. *Lower glume* c. ⅓ as long as spikelet, membranous, clasping, acute or obtuse, 5-veined, glabrous, separated from rest of spikelet by a short internode, turned towards rhachis. *Upper glume* almost as long as spikelet, cartilaginous, dully shining, 5–7-veined, glabrous or pubescent. *Lower floret* male, palea as long as lemma. *Lower lemma* somewhat concave, cartilaginous, dully shining, 5–7-veined, glabrous or pubescent. *Upper lemma* acute, smooth to rugulose.

Distribution and ecology. – Recorded occurrences appear to reflect past forage plantings along roadsides, as well as agricultural stations. Open roadside grazing lawns, at elevations of 800–1600 m (Fig. 13).

Notes. – African forage species bred as a forage crop, introduced to Madagascar in the twentieth century, and now grown as a successful forage crop in the highlands (Bosser, 1969). Agricultural literature in Madagascar frequently refers to "brachiaria", which appears to indicate this species rather than any of the others.

In spite of the comparatively low number of herbarium records, *Urochloa brizantha* is commonly seen naturalised on the roadsides, for example in Ankafobe and near Moramanga. Usually seen forming a dense monotypic sward of firmly-rooted erect plants with woody culm bases (Fig. 11D–F). Diagnostic characters of *U. brizantha* include shiny cartilaginous upper glume and lower lemma (herbaceous in *U. eminii,* including the previously distinct species *Brachiaria ruziziensis* R. Germ. & C.M. Evrard), narrow rhachis (wide in *U. eminii*), and tufted habit (stoloniferous in *U. eminii*), although all of these intergrade into *U. eminii*.

Additional specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** Alaotra Agricultural Station, IX.1953, *Bosser 7103* (TAN); Alaotra, XII.1963, *Morat 251* (TAN); Moramanga, road from Andasibe to Vakona, turnoff towards Ambatovy mine, 22.II.2019, *Vorontsova et al. 2396* (K, TAN). **Reg. Analamanga [Prov. Antananarivo]:** Manjakandriana, Sohisika Association office at entrance to Ankafobe PA, 1.III.2019, *Vorontsova et al.*

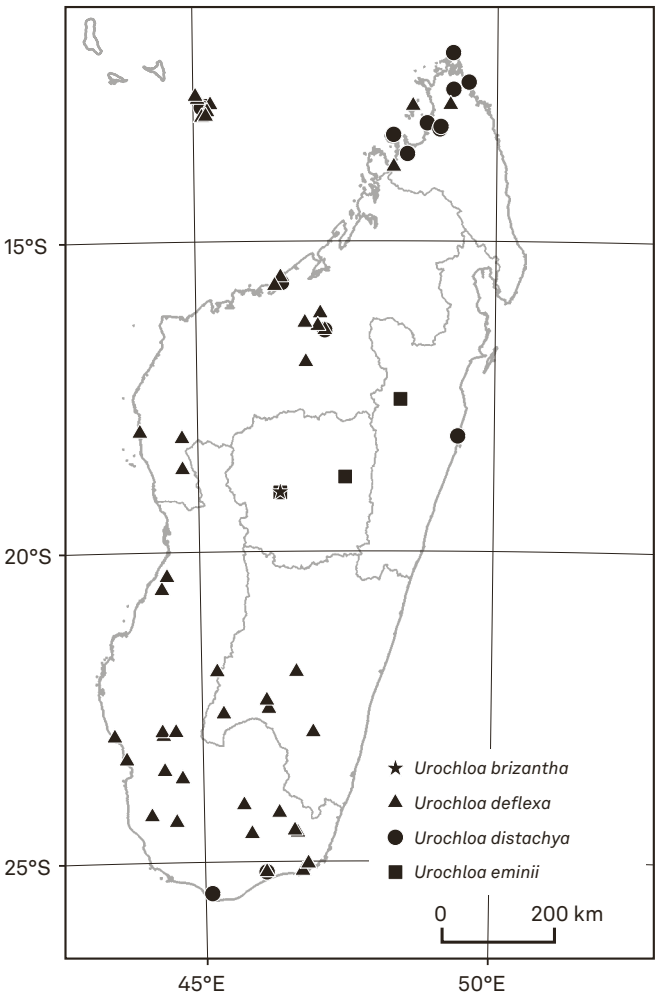

Fig. 13. – Distribution maps. *Urochloa brizantha* (Hochst. ex A. Rich.) R.D. Webster (stars), *U. deflexa* (Schumach.) H. Scholz (triangles), *U. distachyos* (L.) T.Q. Nguyen (circles), and *U. eminii* (Mez) Davidse (squares).

2398 (K, TAN). **Reg. Bongolava [Prov. Antananarivo]:** Kianjasoa, 15.IV.1962, *Boudet 1157* (P [P02520029]).

18. ***Urochloa deflexa*** (Schumach.) H. Scholz in Bull. Mus. Natl. Hist. Nat., B, Adansonia 11: 443. 1989 (Fig. 14A, B).

≡ *Panicum deflexum* Schumach., Beskr. Guin. Pl.: 63. 1827. ≡ *Panicum ramosum* var. *deflexum* (Schumach.) Peter in Repert. Spec. Nov. Regni Veg. Beih. 40: 177. 1930. ≡ *Brachiaria deflexa* (Schumach.) C.E. Hubb. ex Robyns in Bull. Jard. Bot. État Bruxelles 9: 181. 1932.

Holotypus: Ghana: southern part of the country, s.d., *Thonning 390* (C [C10004257] image!; iso-: C [C10004258, C10004259] image!, K [K000282165]!).

Loosely tufted annual, largely erect, to 0.7 m high, culms weakly branched, glabrous. *Leaf sheath* glabrous to sparsely pubescent towards top. *Ligule* a line of hairs. *Leaf blade* lanceolate, chartaceous, 8–17 × 0.4–1.2 cm, glabrous to sparsely pubescent on both sides. *Inflorescence* racemose, effuse, open, 5–15 cm long. *Racemes* 6–15, 2–8 cm long, flexuous, decreasing in length upwards, on a common axis 3–12 cm long, sometimes with small secondary branches, rhachis triquetrous, ciliate, spikelets not overlapping with adjacent spikelets, paired, sessile and shortly pedicelled in each pair, at least some pedicels longer than spikelets. *Spikelets* broadly elliptic, plump, apically apiculate, 3–3.3 mm long, whiteish. *Lower glume* c. ½ as long as spikelet, membranous, clasping, acute, 3–5-veined, glabrous to hirsute, separated from rest of spikelet by an internode c. 0.5 mm long, orientation relative to rhachis variable. *Upper glume* as long as spikelet, herbaceous, apiculate, 7-veined, veins pronounced, hirsute. *Lower floret* infertile, palea ⅔–¾ as long as lemma. *Lower lemma* herbaceous, 5-veined, cross veins sometimes visible, hirsute. *Upper lemma* acute, rugose.

Distribution and ecology. – Likely native, adventitious African and south Asian grass common in drier western and especially southern parts of Madagascar. Roadsides, dry forest and spiny forest understory, savanna, cultivation, on sand, laterite, and a variety of substrates, at elevations of 0–1300m (Fig. 13).

Notes. – A key character for *Urochloa deflexa* (Schumach.) H. Scholz is the presence of at least some pedicels which are longer than the spikelet (Fig. 14A, B). On smaller individuals the inflorescence is often larger than the rest of the plant. Clayton & Renvoize (1982) noted continuous variation between *U. deflexa* and *U. ramosa* (L.) T.Q. Nguyen but these seem to be distinct in Madagascar. The inflorescences of *U. deflexa* can appear to be paniculate rather than racemose, and it is therefore regularly mistaken for *Panicum*.

Urochloa deflexa is a weed of a broad range of arid lower elevation localities. It forms the ground cover in many disturbed areas, such as the Ankarafantsika National Park visitor centre. Unlike other parts of Africa, there is no evidence of the grain being eaten by people in Madagascar.

Selected specimens examined. – **Madagascar. Reg. Anosy [Prov. Toliara]:** 23–28 km W of Manambaro, 21.II.1975, *Croat 31978* (K, MO, TAN); Tolagnaro, Amboasary-Sud, Somangy, 8 km from Amboasary to Berenty, 15.III.2019, *Rakotomalala et al. 274* (K, TAN). **Reg. Boeny [Prov. Mahajanga]:** Ambondromamy, 13.II.2013, *Vorontsova et al. 914* (K, TAN). **Reg. DIANA [Prov. Antsiranana]:** Mailaka, II.1892, *Douillot s.n.* (P); forêt d'Analamahitso au Sud d'Anivorano-Nord, XII.1937, *Humbert 19069* (P); Ambilobe, falaise de l'Ankarana, I.1969, *Morat 3087* (P). **Reg. Ihorombe [Prov. Fianarantsoa]:** bassin de la Malio, près d'Ambalabe, 23.XI.1946, *Humbert 19468* (P); près d'Ambalabe, 23.XI.1946, *Humbert 20060[b]* (K, P, TAN); Ivohibe, haute vallée de la Menarahaka a l'E d'Ihosy, 28.I.1955, *Humbert 28615* (P); plateaux et vallées de l'Isalo à l'W de Ranohira, 29.I.1955, *Humbert 29845* (P). **Reg. Melaky [Prov. Mahajanga]:** Mt Bevendro, Tsingy du Bemaraha, 25.XI.1932, *Leandri 636* (P); près d'Ambodiriana, entre Antsalova et Tsiandro, Ouest Antsingy forêt, 21.I.1960, *Leandri 2672* (P).

Fig. 14. – A, B. *Urochloa deflexa* (Schumach.) H. Scholz; **C, D.** *Urochloa distachyos* (L.) T.Q. Nguyen; **E, F.** *Urochloa reptans* (L.) Stapf. [**A, B:** Ankarafantsika NP 17.II.2018; **C:** *Vorontsova et al.* 1774; **D:** *Vorontsova et al. 2117;* **E, F:** *Vorontsova et al. 2120*] [Photos: Maria S. Vorontsova]

19. ***Urochloa distachyos*** (L.) T.Q. Nguyen in Novosti Sist. Vyssh. Rast. 1966: 13. 1966 (Fig. 14C–D).

≡ *Panicum distachyon* L., Mant. Pl.: 183. 1767. ≡ *Brachiaria distachyos* (L.) Stapf in Oliv., Fl. Trop. Afr. 9: 565. 1919.

Lectotypus (designated by Henrard 1950: 191): **India:** "Habitat in India orientali. Koenig.", s.d., *Herb. Linn. No. 80.41* (LINN-HL80-41 image!).

= *Panicum subquadriparum* Trin., Gram. Panic.: 145. 1826. ≡ *Brachiaria subquadripara* (Trin.) Hitchc. in Lingnan Sci. J. 7: 214. 1931. ≡ *Urochloa subquadripara* (Trin.) R.D. Webster, Austral. Paniceae (Poaceae) 252. 1987. **Lectotypus** (designated by Sosef, 2016: 360): **Guam:** sine loco, s.d., *Chamisso in Herb. Trinius 0974.01* (LE).

= *Panicum miliiforme* J. Presl in C.B. Presl, Reliq. Haenk. 1: 300. 1830. ≡ *Brachiaria miliiformis* (J. Presl) Chase in Contr. U.S. Natl. Herb. 22: 35. 1920. ≡ *Brachiaria subquadripara* var. *miliiformis* (J. Presl) S.L. Chen & Y.X. Jin in Acta Phytotax. Sin. 22: 472. 1984. **Holotypus: Philippines**. **Luzon:** sine loco, s.d., *Haenke s.n.* (PR; iso-: B [B 10 0367348] image!, HAL [HAL0063364] image!, W [W18890237977, W0006077, W0006079] images!).

Stoloniferous mat-forming perennial, prostrate with ascending flowering culms, ascending to c. 0.5 m high, culms branched, rooting at lower nodes, often with a knotty rootstock, glabrous. *Leaf sheath* glabrous or sparsely pubescent with ciliate margins. *Ligule* a ciliate membrane. *Leaf blade* linear to narrow-lanceolate, chartaceous, 2–20 × 0.3–1 cm, glabrous to sparsely pubescent on both sides. *Inflorescence* racemose, slender, open, 3.5–15 cm long, peduncle glabrous to pubescent. *Racemes* 2–5, 1–6 cm long, gently curved, roughly even in length, on a common axis 0.5–10 cm long, with no secondary branching, rhachis narrowly winged, 0.7–1 mm wide, scaberulous, spikelets imbricate, single, subsessile, in 2 rows. *Spikelets* plump elliptic to obovate, apically subacute to acute, 2.5–3.7 mm long, whiteish, sometimes tinged with purple. *Lower glume* ⅓–½ as long as spikelet, membranous, clasping, obtuse, 5–7-veined, glabrous, separated from rest of spikelet by an internode c. 0.5 mm long, turned towards rhachis. *Upper glume* as long or almost as long as spikelet, membranous, 5–7-veined, glabrous. *Lower floret* infertile, palea ⅔ as long to almost as long as lemma. *Lower lemma* membranous, 5-veined, glabrous. *Upper lemma* subobtuse to acute, rugulose.

Distribution and ecology. – Paleotropical forage and adventitious grass common in the warmer lowland parts of Madagascar, and especially common the far north of Madagascar and on Nosy Be. Roadsides, rice paddies and fields of maize and sugarcane, savannas, costal habitats especially on sand, at elevations of 0–600 m (Fig. 13).

Notes. – *Urochloa distachyos* is a known invasive tropical lawn and pasture weed with creeping stolons, typically invading rice paddies and pastures at lower elevations. It seems to be related to *U. arrecta* (Hackel et al., 2018), which is abundant across the highlands.

This treatment follows Sosef (2016) and Morrone & Zuloaga (1992) in treating *Urochloa distachyos* as conspecific with *U. subquadripara* (Trin.) R.D. Webster, as part of a possible polyploid complex. Bosser (1969) considered the northern populations previously assigned to *Brachiaria subquadripara* (Trin.) Hitchc. [*B. miliiformis* (J. Presl) Chase in Bosser (1969)] with longer spikelets to be recent introductions, making no statement on the origin of the *B. distachyos* with shorter spikelets in southern and western Madagascar.

Selected specimens examined. – **Madagascar**. **Reg. Androy [Prov. Toliara]:** Ambovombe Sud, I.1956, *Descoings 1577* (P); Andasaria, 20 km before Tsihombe village on the RN 13, 18.III.2019, *Rakotomalala et al. 307* (K, TAN). **Reg. Atsinanana [Prov. Toamasina]:** Tamatave, 13.VII.1964, *Tateoka 3587* (P). **Reg. Boeny [Prov. Mahajanga]:** Bealoy, VI.1953, *Bosser 5468* (P); 5–10 km before Ambondromamy, before Kamoro bridge, 13.II.2013, *Vorontsova et al. 915* (K, TAN). **Reg. DIANA [Prov. Antsiranana]:** Ambavahibe, Montagne d'Ambre, VII.1953, *Bosser 5515* (K, P); Nosy-Be, Ambatoloaka, VIII.1959, *Bosser 13222* (P); Ambilobe, Sosumav, XII.1964, *Morat 1284* (P); from Cape Ste Marie ANGAP office on the road to Soamanitra, 28.IV.2014, *Vorontsova et al. 1432* (P, TAN).

20. ***Urochloa eminii*** (Mez) Davidse in Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1258. 1993.

≡ *Panicum eminii* Mez in Bot. Jahrb. Syst. 34: 135. 1904.≡ *Brachiaria eminii* (Mez) Robyns in Bull. Jard. Bot. État Bruxelles 9: 176. 1932.

Lectotypus (designated by Robyns,1932: 177): **Tanzania. Mwanza Reg.:** Muansa, V.1892, *Stuhlmann 4663* (B; isolecto-: BR [BR0000008756312] image!, K [K000282133]!).

= *Brachiaria decumbens* Stapf in Oliv., Fl. Trop. Afr. 9: 528.1919. ≡ *Urochloa decumbens* (Stapf) R.D. Webster, Austral. Paniceae: 234. 1987. **Lectotypus** (designated by Sosef, 2016: 360): **Uganda. Kampala:** Mengo Distr., Mpumu, X.1914, *Dümmer 1070* (K [K000282130]!; isolecto-: BM [BM000923187]!, BOL [BOL139359] image!, BR [BR0000008639684] image!, PRE [PRE0664142-0] image!).

= *Brachiaria ruziziensis* R. Germ. & C.M. Evrard in Bull. Jard. Bot. État Bruxelles 23: 373. 1953. ≡ *Urochloa ruziziensis* (R. Germ. & C.M. Evrard) Crins in J. Arnold Arbor., Suppl. Ser. 1: 269. 1991. **Holotypus: Democratic Republic of the Congo:** plaine de la Ruzizi, Tsimuka, II.1950, *Germain 6214* (BR [BR0000008756558] image!; iso-: EA [EA000000400] image!, YBI [YBI143266063] image!).

Stoloniferous perennial, largely erect, to 0.3–2 m high, culms weakly branched, rooting at lower nodes, glabrous to sparsely hirsute. *Leaf sheath* glabrous to pilose. *Ligule* a ciliate membrane. *Leaf blade* broadly linear to narrow-lanceolate, chartaceous, 5–20 × 0.7–1.5 cm, pilose on both sides. *Inflorescence* racemose, stout, open, 5–20 cm long. *Racemes* 2–7, 1–5 cm long, often curved, roughly even in length, on a common axis 1–8 cm long, with no secondary branching, rhachis subfoliaceous, 2–3.5 mm wide, margin ciliate with trichomes 1.5–3 mm long, spikelets imbricate, single, subsessile, usually in 2 rows. *Spikelets* plump elliptic to obovate, apically subacute, 4–5 mm long, white-yellowish, often with a purple tinge. *Lower glume* ⅓–½ as long as spikelet, membranous, clasping, acute or obtuse, 5-veined, glabrous, separated from rest of spikelet by a short internode, turned towards rhachis. *Upper glume* almost as long as spikelet, membranous, not shining, 5–7-veined, pubescent. *Lower floret* male, palea as long as lemma. *Lower lemma* membranous, not shining, 5–7-veined, pubescent. *Upper lemma* acute, smooth to finely rugulose, with a minute apical crest.

Distribution and ecology. – Introduced trial forage which does not seem to have gained widespread use or become naturalised; all known collections cite its introduced origin. Included here for completeness (Fig. 13).

Notes. – We follow Sosef (2016) and accept *Urochloa eminii*, *U. decumbens* (Stapf) R.D. Webster, and *U. ruziziensis* (R. Germ. & C.M. Evrard) Crins as representing a single species; all records known from Madagascar were previously placed in *U. ruziziensis*. Diagnostic characters of the known Malagasy specimens of *U. eminii* include herbaceous upper glume and lower lemma (shiny cartilaginous upper glume and lower lemma in *U. brizantha*), wide rhachis (narrow rhachis in *U. brizantha*), and stoloniferous habit (tufted habit in *U. brizantha*), although all of these intergrade into *U. brizantha*.

Additional specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** introduit du Cogo Belge, Station Agricole Lac Alaotra, VI.1955, *Bosser 8146* (P). **Reg. Analamanga [Prov. Antananarivo]:** Antananarivo Ville, Ivato, 16.IX.2000, *Allorge 2531* (P). **Reg. Bongolava [Prov. Antananarivo]:** Kianjasoa, introduit, pasturage, 19.IV.1962, *Boudet 1156* (P).

21. ***Urochloa glumaris*** (Trin.) Veldkamp in Blumea 41: 420. 1996.

≡ *Panicum glumare* Trin., Gram. Panic. 143. 1826.

Holotypus: Country unknown: sine loco, s.d., *Herb. Lindley in herb. Trinius 0727.01* (LE; iso-: CGE).

= *Urochloa paspaloides* J. Presl in C.B. Presl, Reliq. Haenk. 1: 318. 1830. ≡ *Brachiaria paspaloides* (J. Presl) C.E. Hubb., Hooker's Icon. Pl. 34: tab. 3363. 1938. **Holotypus: Philippines:** hab. in Luzonia ad Sorgozon, 1792, *Haenke s.n.* (PR; iso-: MO [MO-157629] image!, W [W0006080, W18890235852] image!).

Loosely tufted stoloniferous perennial, ascending to erect, 0.15–0.5 m high, culms sometimes branched at base, glabrous or pilose above, nodes bearded when young. *Leaf sheath* glabrous or sparsely pubescent towards apex, with ciliate margins. *Ligule* a ciliate membrane. *Leaf blade* linear, chartaceous, 5–20 × 0.3–0.8 cm, with tubercle-based hairs on both sides. *Inflorescence* racemose, slender, 5–10 cm long. *Racemes* 2–4, 2.5–6 cm long, roughly even in length, on a common axis 2–4 cm long, with no secondary branching, rhachis triquetrous, 0.5–0.8 mm wide becoming more narrow towards apex, finely pilose, spikelets overlapping untidily with adjacent spikelets, paired, sessile and shortly pedicelled in each pair. *Spikelets* elliptic, apically apiculate, 3.5–4.5 mm long, yellowish, often with a purple tinge. *Lower glume* ¾ to almost as long as spikelet, chartaceous, long-acuminate to mucronate, 5-veined, veins green, prominent, glabrous or scaberulous towards apex, turned away from rhachis. *Upper glume* as long as spikelet, somewhat concave, cartilaginous, long-acuminate, 7-veined, veins green, prominent, glabrous or scaberulous towards apex. *Lower floret* infertile, palea absent or minute. *Lower lemma* somewhat concave, cartilaginous, 5-veined, glabrous. *Upper lemma* rounded, rugulose, with a scabrous mucro 0.5 mm long.

Distribution and ecology. – Asian species long common in Mauritius, with only a single collection known from Madagascar: a historic Boivin collection from the Nosy Be island (and only a single collection known from La Reunion) (Fig. 15).

Notes. – *Urochloa glumaris* (Trin.) Veldkamp has acuminate to mucronate glumes, with the spikelet strongly dorsally compressed and a somewhat concave upper glume and lower lemma. Veldkamp (1996), Clayton et al. (2022), and Bosser & Renvoize (2018) record this species as annual but specimens suggest this is in fact a stoloniferous perennial sometimes branching at lower nodes.

For discussion of the typification see Veldkamp (1996).

Additional specimens examined. – Madagascar. **Reg. DIANA [Prov. Antsiranana]:** Nosy Be, s.d., *Boivin 1978bis* (P).

22. ***Urochloa humbertiana*** (A. Camus) Voronts., **comb. nov.**

≡ *Brachiaria humbertiana* A. Camus in Bull. Soc. Bot. France 79: 844. 1933.

Lectotypus (designated here): **Madagascar. Reg. Atsimo-Andrefana [Prov. Toliara]:** E du delta de la Linta, Beharahaka, VIII.1928, *Humbert & Swingle 5487* (P [P00450180]!; isolecto-: P [P00450181]!). **Syntypi: Madagascar. Reg. Androy [Prov. Toliara]:** Ambovombe, II.1931, *Decary 8466* (P [P02210586]!); Ambovombe,

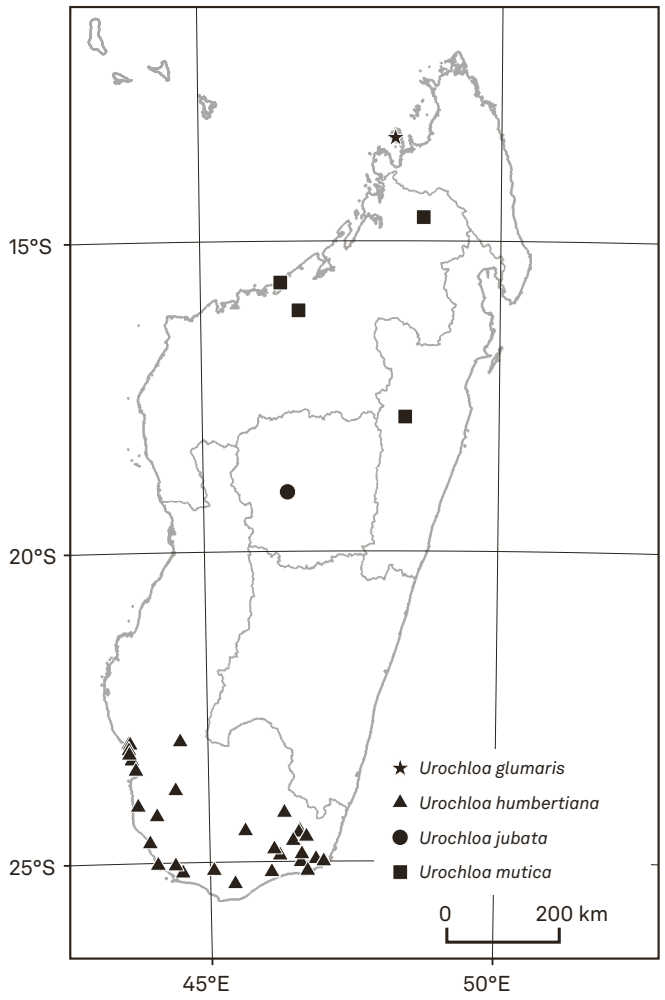

Fig. 15. – Distribution maps. *Urochloa glumaris* (Trin.) Veldkamp (stars), *U. humbertiana* (A. Camus) Voronts. (triangles), *U. jubata* (Fig. & De Not.) Sosef (circles), and *U. mutica* (Forssk.) T.Q. Nguyen (squares).

II.1931, *Decary 8546* (K [K000805655]!; P [P02233594]!). **Reg. Anosy [Prov. Toliara]:** vallée du Mandrare à Amboasary, I.1932, *Decary 9564* (P [P02210587]!). **Reg. Atsimo-Andrefana [Prov. Toliara]:** dunes de Tulear, V.1910, *Perrier de la Bâthie 11188* (P [P02210588, P02233560]!).

Loosely tufted perennial, with short knotty rhizomes, ascending to erect, to 0.5 m high, culms branched at base, rooting at lower nodes, glabrous to shortly pilose. *Leaf sheath* glabrous or sometimes pilose. *Ligule* a lacerate ciliolate membrane. *Leaf blade* linear, sometimes narrow-lanceolate, chartaceous, 2.5–10 × 0.1–0.5 cm, glabrous to pubescent on both sides. *Inflorescence* racemose, slender, open or contracted, 5–10 cm long. *Racemes* 3–7, 1–5 cm long, flexuous, decreasing in length upwards, lowermost raceme roughly equal to inflorescence axis in length, on a common axis 2–6 cm long, with no secondary branching, rhachis narrow, scabrous, spikelets not overlapping with adjacent spikelets, single, on pedicels of uneven length. *Spikelets* oblong to somewhat obovate, apically subacute, 2–3 mm long, whiteish. *Lower glume* c. ⅓ as long as spikelet, membranous, obtuse, 1–3-veined, glabrous or sometimes pilose, separated from rest of spikelet by an internode c. 0.5 mm long, orientation relative to rhachis variable. *Upper glume* as long as spikelet, herbaceous, 5-veined, veins dark green, glabrous or sometimes pilose. *Lower floret* infertile or male, palea c. ⅔ to as long as lemma, anthers 3, c. 2 mm long. *Lower lemma* herbaceous, 5-veined, glabrous or sometimes pilose. *Upper lemma* subacute, finely rugose to almost smooth.

Distribution and ecology. – Endemic to southern Madagascar and abundant in southern spiny forest, in both primary and secondary vegetation, at elevations of 0–750 m. Frequently found on dunes by the sea (Fig. 15).

Notes. – *Urochloa humbertiana* (A. Camus) Voronts. can usually be recognised by its unusually narrow linear leaf blades 1–3 mm wide; these sometimes become lanceolate up to 5 mm wide. Its lower glume is translucent with almost invisible veins, while the 5 veins on upper glume and the lower lemma are a clearly visible dark green colour. The species *U. humbertiana* encompasses considerable variability in leaf width (usually narrow and linear, sometimes broader and narrow-lanceolate), indumentum (leaf blades and spikelets usually glabrous but sometimes pilose), and fertility of the lower floret (usually sterile with palea c. ⅔ as long as the lower lemma, sometimes male with 3 anthers and palea as long as the lemma). Individuals with broad leaf blades, indumentum, and fertile lower florets (e.g. *Bosser 14626* and *Nanjarisoa et al. 192*) are substantially different in appearance but do not seem to justify the description of a new species.

The lectotype is chosen for its superior quality material and annotation by the author.

Selected specimens examined. – Madagascar. **Reg. Androy [Prov. Toliara]:** Beloha, III.1960, *Bosser 14149* (P). **Reg. Anosy [Prov. Toliara]:** vallée de la Manambolo au NW de Maroaomby, XII.1933, *Humbert 12771* (K, P, TAN). **Reg. Atsimo-Andrefana [Prov. Toliara]:** 32 km au N de Tuléar, Madiorano, forêt de M. Domergue, 31.I.1990, *Labat & Du Puy 2037* (K, P); plateau Mahafaly, s.d., *Perrier de la Bâthie 115* (K); Berenty, 10 km from Amboasary west, 16.III.2019, *Rakotomalala et al. 289* (K, TAN).

23. ***Urochloa jubata*** (Fig. & De Not.) Sosef, Fl. Gabon 5bis: 64. 1999.

≡ *Panicum jubatum* Fig. & De Not. in Agrost. Aegypt. Fragm. 2: 15. 1853. ≡ *Brachiaria jubata* (Fig. & De Not.) Stapf in Oliv., Fl. Trop. Afr. 9: 563. 1919.

Holotypus: Sudan: Cordofan, s.d., *Figari s.n.* (FI).

Tufted perennial, erect, 0.25–1.2 m high, culms not branched, glabrous. *Leaf sheath* glabrous. *Ligule* a ciliate membrane. *Leaf*

blade broadly linear, chartaceous, 5–30 × 0.3–1.7 cm, glabrous on both sides, with bulbous based trichomes on margins at base. *Inflorescence* racemose, slender, contracted, 5–25 cm long. *Racemes* 5–10, 1–6 cm long, often curved, on a common axis 3–20 cm long, with no secondary branching, rhachis winged, 1–2 mm wide, margin ciliate with yellow tubercle-based trichomes 2–6 mm long, spikelets imbricate, single, subsessile, in 2 rows. *Spikelets* elliptic, apically subacute, 2.5–3.8 mm long, yellowish, often with a purple tinge. *Lower glume* ⅔–¾ as long as spikelet, membranous, apically rounded, 7–11-veined, glabrous, turned towards rhachis. *Upper glume* as long as spikelet, membranous, 5–7-veined, pubescent. *Lower floret* male, palea as long as lemma, anthers 3, c. 1.5 mm long. *Lower lemma* membranous, 5-veined, with a few cross veins, pubescent. *Upper lemma* subacute, rugulose, shiny, with a minute apical crest.

Distribution and ecology. – This African species seems to be an isolated experimental forage introduction to Madagascar. It has not been seen since the only known collection (Fig. 15).

Notes. – *Urochloa jubata* can be readily recognised by the yellow cilia on the edges of the rhachis, and long rounded lower glume with 7–11 veins.

Additional specimens examined. – Madagascar. **Reg. Itasy [Prov. Antananarivo]:** vallée de l'Isaonjo, 10–15 km W d'Ambohitrombo, V.1964, *Groene s.n.* (TAN, P).

24. ***Urochloa mutica*** (Forssk.) T.Q. Nguyen in Novosti Sist. Vyssh. Rast. 1966: 13. 1966.

≡ *Panicum muticum* Forssk., Fl. Aegypt.-Arab. 20. 1775. ≡ *Brachiaria mutica* (Forssk.) Stapf in Oliv., Fl. Trop. Afr. 9: 526. 1919.

Holotypus: Egypt. Beheira: Rashid, XI.1761, *Forsskål 86* (C [C10002726] image!; iso-: BM).

Stoloniferous perennial, ascending to erect, 0.25–1.25 m high, culms weakly branched, rooting at lower nodes, glabrous, nodes prominently bearded. *Leaf sheath* glabrous to pubescent. *Ligule* a line of hairs. *Leaf blade* linear, thickly chartaceous, 6–30 × 0.3–1.5 cm, glabrous to pubescent on both sides. *Inflorescence* racemose, pyramidal, open, 10–30 cm long. *Racemes* 5–20, 2–10 cm long, decreasing in length upwards, on a common axis 7–20 cm long, with short secondary branches on lower racemes, rhachis narrowly winged, 0.5–1 mm wide, scabrid, spikelets overlapping with adjacent spikelets, paired near base and single towards apex of racemes, subsessile, in several untidy rows, subtended by a few cilia. *Spikelets* elliptic, apically acute to acuminate, 2.5–3.5 mm long, yellowish to purple. *Lower glume* ¼–⅓ as long as spikelet, membranous, acute, 1–3-veined, glabrous, orientation relative to rhachis variable. *Upper glume* as long as spikelet, membranous, 5–7-veined, glabrous. *Lower floret* male, palea as long as lemma, anthers 3, c. 1.8 mm long. *Lower lemma* membranous, 5-veined, glabrous. *Upper lemma* obtuse, rugulose, minutely mucronate.

Distribution and ecology. – The origin of this easily recognisable pantropical forage is not fully clear. At least some of the known localities are introductions; Boivin recorded it as "naturalised" on Mauritius in 1851 [P06769193]. Damp habitats in fields and secondary vegetation (Fig. 15).

Notes. – *Urochloa mutica* is recognised by its tall stature and its pyramidal inflorescences with an untidy arrangement of spikelets on the racemes.

Selected specimens examined. – Madagascar. **Reg. Sofia [Prov. Mahajanga]:** Bealanana, Betainkankana, Ankaizina, V.1952, *Bosser 2557* (P). **Reg. Boeny [Prov. Mahajanga]:** Mahajanga Ville, Amborovy, 8.V.1962, *Boudet 1277* (P); Marovoay, IMVPT 890, 9.V.1962, *Boudet 4283* (P). **Reg. Alaotra-Mangoro [Prov. Toamasina]:** Ambatondrazaka, introduced, 7.III.1932, *Jard. Bot. Tananarive 324119* (P).

25. ***Urochloa nana*** (Stapf) Voronts., **comb. nov.**

≡ *Brachiaria nana* Stapf in Bull. Misc. Inform. Kew 1919: 264. 1919.

Holotypus: Madagascar. Reg. Atsimo-Andrefana [Prov. Toliara]: Onilahy, near Sakomdy river, VI.1910, *Perrier de la Bâthie 117* ["*107*"] or *11202* (K [K000244719]!; iso-: P [P00450185, P00450186]!).

Loosely tufted stoloniferous perennial, ascending to erect, to 20 cm high, culms much branched, rooting at lower nodes, culms glabrous or pubescent, nodes finely hirsute. *Leaf sheath* glabrous or sparsely pubescent with ciliate margins. *Ligule* a line of hairs. *Leaf blade* ovate, basally cordate, thickly chartaceous, 1–4 × 0.4–1 cm, glabrous to sparsely hirsute on both sides, sometimes with bulbous-based trichomes near base. *Inflorescence* racemose, contracted or sometimes open, rarely fully exserted, 3–5 cm long. *Racemes* 3–5, 2–3 cm long, roughly even in length, often appressed, frequently bare towards apex on a common axis 0.5–1.5 cm long, with no secondary branching, rhachis triquetrous to narrowly winged, 0.6–0.8 mm wide, scaberulous, spikelets overlapping untidily with adjacent spikelets, paired, subsessile, in 2 untidy rows. *Spikelets* elliptic, apically apiculate, 2.7–3 mm long, whiteish. *Lower glume* ¼–⅓ as long as spikelet, membranous, obtuse to acute, 1–3-veined, glabrous, orientation relative to rhachis variable. *Upper glume* as long as spikelet, membranous, 5–7-veined, with cross veins towards apex, glabrous. *Lower floret* infertile, palea absent or ⅓–½ as long as lemma. *Lower lemma* membranous, 5–7-veined, with cross veins towards apex, glabrous. *Upper lemma* obtuse, rugulose.

Distribution and ecology. – Endemic to the northern, western, and southern parts of Madagascar. Dry forest and spiny forest and savanna, roadsides, cultivation, often on limestone, at elevations of 0–800 m (Fig. 16).

Notes. – *Urochloa nana* can be recognised by its visibly thick leaf blades, and frequently bare apices of racemes. It is somewhat similar to *U. ramosa* but its spikelets are smaller, upper lemma less rugose, lower glume more membranous, and its leaf blades thicker. *Urochloa nana* also resembles *U. reptans* (L.) Stapf with its leaf blades and racemes crowded at the apex of the culms and slightly curved upwards; *U. nana* can be distinguished from *U. reptans* by its larger spikelets, a 3-veined lower glume, and the absence of a mucro on the upper lemma. *Urochloa nana* seems to be related to *U. distachyos* as its chloroplast DNA sequences were identical (Hackel et al., 2018).

The collection series of *Perrier de la Bâthie* are labelled with five-digit numbers at P, with duplicates of the same series marked with three-digit numbers at K. It is sometimes possible to establish a correspondence between these two series when both numbers are cross-referenced on a sheet at P, such as the isotype sheet P00450185. Thus, the type collection is marked with two alternative numbers: *Perrier de la Bâthie 117* and *11202*. It seems clear the number *107* in the protologue is an error, because the holotype sheet is numbered *117*, annotated by Oto Stapf, and is the only historic collection of this species held at K.

Selected specimens examined. – Madagascar. **Reg. Atsimo-Andrefana [Prov. Toliara]:** Sakaraha, II.1956, *Bosser 9000* (P); Sakaraha, forêt de Zombitsy, III.1955, *Humbert et al. 29663* (P); Morondava Airport, 9.III.1953, *Porteres s.n.* (P). **Reg. DIANA [Prov. Antsiranana]:** Ambilobe, Sosumav, XII.1964, *Morat 1271* (P); Andrafiabe, Ankarana, I.1969, *Morat 3111* (P). **Reg. Melaky [Prov. Mahajanga]:** lisière de la R.N. 9, Antsalova, I.1975, *Morat 4851* (P). **Reg. SAVA [Prov. Antsiranana]:** Sambava, Marojejy NP office, 14.X.2011, *Hall et al. 28* (K, TAN).

26. ***Urochloa panicoides*** P. Beauv., Ess. Agrostogr.: 52, tab. 11. 1812.

≡ *Panicum panicoides* (P. Beauv.) Hitchc. in J. Washington Acad. Sci. 9: 551. 1919.

Lectotypus (designated by Veldkamp, 1996: 433): [icon] (Beauvois, Ess. Agrostogr.: 52, tab. 11. 1812).

Loosely tufted annual, ascending to erect, 0.1–1 m high, culms not branched, rooting at lower nodes, glabrous. *Leaf sheath* glabrous or sparsely pilose, with ciliate margins. *Ligule* a ciliate membrane. *Leaf blade* broadly linear to narrow-lanceolate, chartaceous, 2–25 × 0.5–1.8 cm, glabrous or sparsely pilose on both sides, with bulbous based trichomes on margins at base. *Inflorescence* racemose, thick, 5–10 cm long. *Racemes* 2–7, 1–7 cm long, roughly even in length, on a common axis 1–9 cm long, with no secondary branching, rhachis narrowly winged, 0.8–1.3 mm wide, smooth with pilose margins, spikelets imbricate, single or paired, subsessile, subtended by a few long cilia. *Spikelets* elliptic, apically acute, 3.5–4.5 mm long, drying yellow-green. *Lower glume* ¼–⅓ as long as spikelet, membranous, ovate, obtuse to subacute, 3–5-veined, glabrous or pubescent, turned away from rhachis. *Upper glume* as long as spikelet, somewhat concave, membranous, acute, 7-veined, veins green, prominent, with cross veins sometimes visible, glabrous or pubescent. *Lower floret* infertile, palea absent. *Lower lemma* somewhat concave, membranous, 7-veined, with cross veins sometimes visible, glabrous or pubescent, sometimes with a setose fringe. *Upper lemma* rounded, rugulose, with a mucro 0.3–1 mm long.

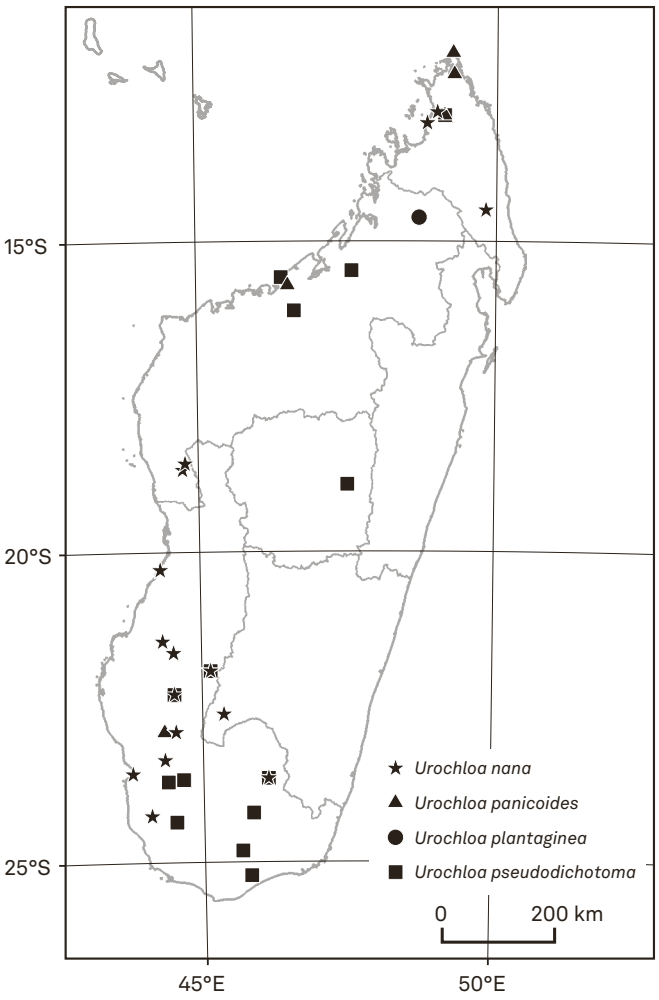

Fig. 16. – Distribution maps. *Urochloa nana* (Stapf) Voronts. (stars), *U. panicoides* P. Beauv. (triangles), *U. plantaginea* (Link) R.D. Webster (circles), and *U. pseudodichotoma* (Bosser) Voronts. (squares).

Distribution and ecology. – Until 2012 this paleotropical forage and invasive savanna grass common in the Mascarenes was only known in Madagascar from a single collection; it is not clear whether it has previously been overlooked or whether it is undergoing a period of spread. According to recent observations, it is often locally common. Open secondary vegetation

on sand, beaches and roadsides, spiny forest understory, at elevations of 0–150 m (Fig. 16).

Notes. – The spikelets of *Urochloa panicoides* P. Beauv. can be either glabrous or pubescent. Its somewhat concave upper glume and lower lemma are similar to *U. glumaris*.

Additional specimens examined. – Madagascar. **Reg. Atsimo-Andrefana [Prov. Toliara]:** Sakaraha, 3 km S du village de Mahaboboka, 20.IV.2014, *Nanjarisoa et al. 176* (K, TAN). **Reg. Boeny [Prov. Mahajanga]:** Ambalakida, c. 5 km before Andradia on the track from Majunga-Ankarafantsika road towards Anjohibe cave, 16.II.2013, *Vorontsova et al. 955* (K, TAN). **Reg. DIANA [Prov. Antsiranana]:** extremitè nord du Cap d'Ambre, VIII.1955, *Gillard s.n.* (P); Ankarana MNP office, 28.II.2015, *Vorontsova et al. 1829* (K, TAN); Antsiranana city, 2.III.2015, *Vorontsova et al. 1833* (K, TAN).

27. ***Urochloa plantaginea*** (Link) R.D. Webster in Syst. Bot. 13: 607. 1988.

≡ *Panicum plantagineum* Link, Hort. Berol. 1: 206. 1827 [non *P. plantagineum* Schumach., 1827] [nom. illeg.]. ≡ *Brachiaria plantaginea* (Link) Hitchc. in Contr. U.S. Natl. Herb. 12: 212. 1909. **Holotypus: [Brazil]:** cultivated in the Berlin Botanical Gardens, *Anon. s.n.* (B [B 10 0367300] image!; iso-: HAL [HAL0082173] image!, US [US00139874 fragm.]!).

Loosely tufted stoloniferous perennial, ascending to erect, 0.4–1 m high, culms weakly branched, rooting at lower nodes, glabrous. *Leaf sheath* glabrous. *Ligule* a line of hairs. *Leaf blade* lanceolate, chartaceous, 4–21 × 0.6–1.3 cm, glabrous to pubescent on both sides. *Inflorescence* racemose, stout, open, 10–30 cm long. *Racemes* 2–8, 2–11 cm long, gently curved, roughly even in length, on a common axis 10–20 cm long, with no secondary branching, rhachis winged, 1–2 mm wide, scaberulous, spikelets imbricate, single, subsessile, in 2 rows. *Spikelets* elliptic, apically acute, 4–5.5 mm long, yellowish. *Lower glume* ¼–⅓ as long as spikelet, membranous, clasping, obtuse to acute, 3–5-veined, glabrous, separated from rest of spikelet by an internode c. 0.5 mm long, turned towards rhachis. *Upper glume* as long as spikelet, membranous, 5–7-veined, glabrous. *Lower floret* infertile or male, palea ⅔ to as long as lemma. *Lower lemma* membranous, 5-veined, glabrous. *Upper lemma* subacute, rugulose, sometimes with a minute mucro.

Distribution and ecology. – This highly competitive weedy grass from South America has been introduced to North America and to West Africa. A single collection is known from Madagascar (Fig. 16).

Notes. – *Urochloa plantaginea* (Link) R.D. Webster appears similar to *U. arrecta* but has a significantly larger spikelet.

The illegitimate homonym *Panicum plantagineum* Schumach. is a synonym of the easy to distinguish *P. brevifolium* L.

Additional specimen examined. – Madagascar. **Reg. Sofia [Prov. Mahajanga]:** Bealanana, Betainkankana, Ankaizina, V.1952, *Bosser 2803* (P).

28. ***Urochloa pseudodichotoma*** (Bosser) Voronts., **comb. nov.**

≡ *Brachiaria pseudodichotoma* Bosser in Adansonia, sér. 2, 6: 109. 1966.

Holotypus: Madagascar. Reg. Atsimo-Andrefana [Prov. Toliara]: Anavoha, secteur de Fotadrevo poste d'Ejeda, 17.II.1960, *Dauban s.n.* (P [P00450189]!).

Mat-forming annual to short-lived stoloniferous perennial, prostrate with ascending flowering culms, to 10 cm high, culms branching at every node, rooting at lower nodes, glabrous, nodes finely hirsute. *Leaf sheath* glabrous or sparsely pubescent with ciliate margins. *Ligule* a line of hairs. *Leaf blade* ovate, flat or sometimes folded, chartaceous, 1–2 × 0.05–0.4 cm, drying somewhat glaucous, glabrous on both sides. *Inflorescence* racemose, slender, contracted, partly exserted, 1–2 cm long. *Racemes* 1–2, 0.8–1.5 cm long, roughly even in length, with no secondary branching, rhachis narrowly winged, 0.5–0.8 mm wide, scaberulous, spikelets imbricate, single, subsessile, in 2 tidy rows. *Spikelets* elliptic, apically apiculate, 2–2.5 mm long, whiteish. *Lower glume* c. ¼ as long as spikelet, membranous, usually obtuse, 1–3-veined, glabrous, overlapping on opposite side of spikelet, turned towards rhachis. *Upper glume* as long as spikelet, membranous, 5–7-veined, with cross veins towards apex, glabrous. *Lower floret* infertile, palea absent. *Lower lemma* membranous, 5–7-veined, with cross veins towards apex, glabrous. *Upper lemma* obtuse, rugulose.

Distribution and ecology. – Endemic to western and southern Madagascar, with a single record from Antananarivo (*Perrier 10886* locality is questioned in a note by Bosser). Open savanna and secondary vegetation on sand, spiny forest understory, disturbed areas, at elevations of 0–200m (1200 m if the Antananarivo record is correct) (Fig. 16).

Notes. – *Urochloa pseudodichotoma* (Bosser) Voronts. forms visually appealing spreading mats. The unusual feature of this species is dichotomous branching at each culm node, so all leaf blades are on secondary branches.

Selected specimens examined. – Madagascar. **Reg. Analamanga [Prov. Antananarivo]:** Antananarivo-ville, I.1915, *Perrier de la Bâthie 10886* (P). **Reg. Anosy [Prov. Toliara]:** Atsimo-Andrefana, entre Ampanihy et Ejeda, XI.1956, *Bosser 10109* (P); Amboasary-Sud, Somangy, c. 8 km from Amboasary to Berenty, 15.III.2019, *Rakotomalala et al. 268* (K, TAN). **Reg. Atsimo-Andrefana [Prov. Toliara]:** near Beza Mahafaly Reserve, Ambinda stream, 15.I.1989, *Phillipson & Rabesihanaka 3180* (K, P). **Reg. Boeny [Prov. Mahajanga]:** près de Marovoay, V.1927, *Perrier de la Bâthie 17964* (P); Station Forestière Antsianitia, 15.II.2013, *Vorontsova et al. 942* (K, TAN). **Reg. DIANA [Prov. Antsiranana]:** Mahomasina, bungalows near MNP Ankarana office, 26.II.2015, *Vorontsova et al. 1814* (K, P, TAN). **Reg. Sofia [Prov. Mahajanga]:** nord du Bongolava, sud de Port Berge, IV.1967, *Morat 2718* (P).

29. ***Urochloa ramosa*** (L.) T.Q. Nguyen in Novosti Sist. Vyssh. Rast. 1966: 13. 1966.

≡ *Panicum ramosum* L., Mant. Pl. 1: 29. 1767. ≡ *Brachiaria ramosa* (L.) Stapf in Oliv., Fl. Trop. Afr. 9: 542. 1919.

Lectotypus (designated by Cope in Nasir & Ali, 1982: 207): **[India]:** cultivated in Uppsala (Sweden), *Anon. s.n.* (LINN-HL nº 80–44 image!).

Loosely tufted annual, ascending to erect, 0.1–0.7 m high, culms weakly branched, glabrous. *Leaf sheath* glabrous to pubescent. *Ligule* a line of hairs. *Leaf blade* lanceolate, chartaceous, 2–25 × 0.4–1.4 cm, glabrous to pubescent on both sides. *Inflorescence* racemose, open, 6–15 cm long. *Racemes* 3–15, 1–8 cm long, flexuous, decreasing in length upwards, on a common axis 3–10 cm long, sometimes with small secondary branches at base, rhachis triquetrous, scaberulous, spikelets mostly not overlapping with adjacent spikelets, single, on pedicels of uneven length, pedicels shorter than spikelets, subtended by white cilia. *Spikelets* broadly elliptic, plump, apiculate, 2.5–3.5 mm long, yellowish. *Lower glume* ⅓–½ as long as spikelet, membranous, clasping, obtuse to acute, 5–7-veined, cross veins visible, glabrous, sometimes separated from rest of spikelet by an internode c. 0.5 mm long, orientation relative to rhachis variable. *Upper glume* almost as long as spikelet, membranous, 5–7-veined, cross veins visible, glabrous or sometimes pubescent. *Lower floret* infertile, palea ⅔–¾ as long as lemma. *Lower lemma* membranous or somerimes coriaceous, 5-veined, cross veins sometimes visible, glabrous or sometimes pubescent. *Upper lemma* subacute to acute, rugose.

Distribution and ecology. – The origin of this African and Asian grass in Madagascar remains unknown. In Madagascar it occurs largely in the west; open grassland, cultivation, roadsides, and seashores, at low elevations (Fig. 17).

Notes. – *Urochloa ramosa* can be recognised by its plump spikelets. Its racemes appear to have a "messy-looking" arrangement due to paired spikelets with pedicels of different lengths partly overlapping: this is similar to the "messy" racemes of *U. nana, U. reptans*, and *U. mutica* but unlike the more "tidy-looking" racemes of *U. distachyos* and *U. arrecta* where pedicels are uniform. According to Clayton & Renvoize (1982) and Clayton (1989), *U. ramosa* is doubtfully distinct from *U. deflexa;* the two indeed look similar, but *U. ramosa* can be distinguished by its shorter pedicels.

According to the Linnean typification project [https://www.nhm.ac.uk/our-science/data/linnaean-typification]: "The typification of this name is attributable to Cope (June 1982), who published it some months ahead of Clayton & Renvoize (in Polhill, Fl. Trop. E. Africa, Gramineae 3: 599. 5 November 1982)."

Selected specimens examined. – Madagascar. **Reg. Alaotra-Mangoro [Prov. Toamasina]:** Ambatovy forest, Analamay, 1.III.2005, *Antilahimena & Razafindasy 3511* (P); Alaotra Lake, *Herbier de la Station Agricole de l' Alaotra 27014* (P). **Reg. Androy [Prov. Toliara]:** Ambovombe-Androy, Talaky centre, c. 3 km from Ambovombe town to southeast, 17.III.2019, *Rakotomalala et al. 302* (K, TAN). **Reg. Atsimo-Andrefana [Prov. Toliara]:** Tulear, *Perrier de la Bâthie 131* (K). **Reg. Boeny [Prov. Mahajanga]:** Mahajanga ville, Pointe du Caïman, 12.I.1929, *Humbert 7155* (P). **Reg. DIANA [Prov. Antsiranana]:** extrême nord du Cap d'Ambre, VIII.1955, *Gillard s.n.* (P); chemins près d'Antsirane, 13.IX.1912, *Viguier & Humbert 140* (P). **Reg. Sofia [Prov. Mahajanga]:** Mampikony to Ambanja, Analamisakana area, 21.II.2015, *Vorontsova et al. 1764* (K, TAN).

30. ***Urochloa reptans*** (L.) Stapf in Oliv., Fl. Trop. Afr. 9: 601. 1920 (Fig. 14E–F).

≡ *Panicum reptans* L., Syst. Nat. ed. 10, 2: 870. 1759. ≡ *Brachiaria reptans* (L.) C.A. Gardner & C.E. Hubb., Hooker's Icon. Pl. 34: tab. 3363. 1938.

Lectotypus (first step designated by Hitchcock & Chase, 1910: 36; second step designated by Veldkamp, 1996: 427): **Country unknown:** sine loco, *Browne s.n., Herb. Linn. No. 80.52,* upper specimen (LINN-HL80-52 image!).

Annual to short-lived stoloniferous perennial, ascending to erect, to 0.6 m high, culms weakly branched, rooting at lower nodes, glabrous or pubescent, nodes finely hirsute. *Leaf sheath* glabrous or sparsely pubescent with ciliate margins. *Ligule* a line of hairs. *Leaf blade* ovate to lanceolate, basally cordate, chartaceous, 1–6 × 0.3–1.2 cm, glabrous to sparsely hirsute on both sides, sometimes with bulbous-based trichomes near base. *Inflorescence* racemose, slender, open or contracted, 3–5 cm long. *Racemes* 4–15, 1–3.5 cm long, decreasing in length upwards on a common axis 1–3 cm long, sometimes with secondary branchlets, rhachis triquetrous, less than 0.5 mm wide, scaberulous to pubescent, spikelets overlapping untidily with adjacent spikelets, single, on pedicels of uneven length, subtended by white cilia. *Spikelets* ovate, apically acute, 1.7–2 mm long, yellow-brown to purpleish. *Lower glume* c. ¼ as long as spikelet, membranous, truncate, with no veins, glabrous, orientation relative to rhachis variable. *Upper glume* as long as spikelet, membranous, 5–7-veined, glabrous. *Lower floret* infertile, palea as long as lemma. *Lower lemma* membranous, 5–7-veined, glabrous. *Upper lemma* rounded, rugulose, mucronate.

Distribution and ecology. – Pantropical known weed with Malagasy populations of unknown origin. West Madagascar, especially abundant in north Madagascar where it often forms a dominant contribution to grazing lawn turf. Coastal grasslands and grazing lawns, secondary vegetation and roadsides, dry forest understory, often on sand, at elevations of 0–300 m (Fig. 17).

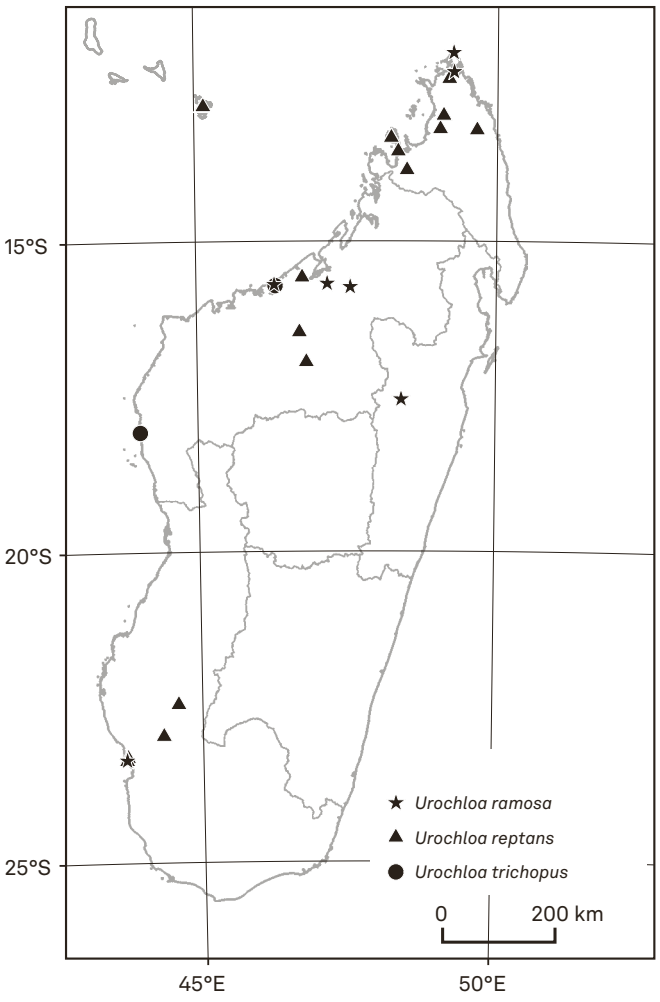

Fig. 17. – Distribution maps. *Urochloa ramosa* (L.) T.Q. Nguyen (stars), *U. reptans* (L.) Stapf (triangles), and *U. trichopus* (Hochst.) Stapf (circles).

Notes. – The young inflorescences of *Urochloa reptans* are frequently purple in a way not usually seen in other species. *Urochloa reptans* displays a remarkable range of sizes, with smaller plants that appear reproductively immature still capable of producing clearly separated and reproductively functional spikelets on apical racemes. The mucro on the upper lemma appears to be sometimes absent.

According to the Linnean typification project [https://www.nhm.ac.uk/our-science/data/linnaean-typification]: "Veldkamp (in Blumea 41: 429. 1996) followed Hitchcock (in Contr. U. S. Natl. Herb. 12: 119. 1908) in regarding this and *P. reptans* L. (1759) as homotypic. However, the first clear type choice dates from Hitchcock & Chase (in Contr. U. S. Natl. Herb. 15: 36. 1910), later restricted to the upper specimen on the sheet by Veldkamp".

Selected specimens examined. – Madagascar. **Reg. Atsimo-Andrefana [Prov. Toliara]:** vallée du Fiherenana, III.1960, *Bosser 14019* (P); Ankazoabo-Sud, Fotivolo, II.1963, *Bosser 17952* (P). **Reg. Boeny [Prov. Mahajanga]:** Ambato Boeny, XI.1951, *Bosser 2012* (K, P); Androhibe, I.1967, *Granier & Delhaye 112* (P); Basalle - Antanimena plateu, I.1924, *Perrier de la Bâthie 15919* (P). **Reg. Diana [Prov. Antsiranana]:** Nosy Be, IV.1879, *Hildebrandt 2928* (K, P); commune Antsahampano, fokontany Antongombato, Antamotamo, 3.III.2015, *Vorontsova et al. 1840* (TAN). **Reg. SAVA [Prov. Antsiranana]:** Vohemar, Daraina Protected Area office grounds, 12.X.2011, *Vorontsova et al. 352* (K, TAN); outside Montagne d'Ambre Parcelle 1. **Reg. Sofia [Prov. Mahajanga]:** Moramandia, Andranosamantana, 28.II.1923, *Decary 1468* (P).

31. ***Urochloa trichopus*** (Hochst.) Stapf in Oliv., Fl. Trop. Afr. 9: 589. 1920.

≡ *Panicum trichopus* Hochst. in Flora 27: 254. 1844.

Holotypus: [Sudan]: cultivated in Cordofan, 1837, *Kotschy 74* (TUB ([TUB006436] image!); iso-: BM ([BM000923215, BM000923216]!), G ([G00022708] image!), K [K000281979, K000281980]!, MO [MO-1660898] image!, S [S05-8793] image!, US [US-1125963]!, W [W0030715, W0030714, W18890243303, W19160023511] image!).

= *Urochloa mosambicensis* (Hack.) Dandy in J. Bot. 69: 54. 1931. ≡ *Panicum mosambicense* Hack. in Bol. Soc. Brot. 6: 140. 1888. **Holotypus: Mozambique:** continente fronteiro, 1884, *de Carvalho 19* (W [W19160023605] image!; iso-: COI, K [K000281991]!).

Loosely tufted stoloniferous perennial, ascending to erect, to 0.2–1.5 m high, culms not branched, glabrous, nodes bearded, basal sheaths silky pubescent. *Leaf sheath* glabrous or sparsely pubescent towards apex, with ciliate margins. *Ligule* a line of hairs. *Leaf blade* broadly linear to narrow-lanceolate, chartaceous, 2–30 × 0.3–2 cm, sparsely to densely pilose on both sides. *Inflorescence* racemose, thick, 7–20 cm long. *Racemes* 3–15, 2–8 cm long, roughly even in length, on a common axis 3–12 cm long, with no secondary branching, rhachis narrowly winged, 0.8–1 mm wide, scaberulous to finely pilose, spikelets imbricate, single or paired, subsessile, subtended by a few long cilia. *Spikelets* ovate, plump, apically acuminate, 3–5 mm long, drying yellowish with silky-white hairs. *Lower glume* ⅔–¾ as long as spikelet, membranous, obtuse, 3(–5)-veined, side veins joining midvein near apex, often with a tuft of hairs from middle of back, turned away from rhachis. *Upper glume* as long as spikelet, membranous, long-acuminate, 7-veined, glabrous or pubescent. *Lower floret* male, palea as long as lemma, anthers 3, 1.5–2 mm long. *Lower lemma* membranous, long-acuminate with central nerve developing into a mucro, 5-veined, with cross veins towards apex, usually with a setose fringe. *Upper lemma* rounded, rugulose, with a mucro 0.5–1.2 mm long.

Distribution and ecology. – African species not present in the Mascarenes; only two localities are currently known from the western coast but it is likely the true distribution is more widespread. Not clear whether this species is native to

Madagascar. Open secondary vegetation on sand, roadsides, at low elevations (Fig. 17).

Notes. – Distinctive by its odd obtuse lower glume with tuft of trichomes in the middle. Appears to be polyphyletic in Hackel et al. (2018). The accession *Vorontsova et al. 916* yielded three chloroplast regions which place it as sister to the African and Asian clade containing *Urochloa reptans, U. glumaris, U. ramosa, U. praetervisa* (Domin) Hughes, *U. echinolaenoides* Stapf, and *U. setigera* (Retz.) Stapf. Only one of these regions, *ndhF*, was available for the second accession from Kruger National Park, South Africa (YBK350 from Bouchenak-Khelladi et al., 2014) and the species was recovered as part of an African clade with *U. rudis* Stapf and *U. panicoides*. Good forage (Bosser, 1969).

Additional specimens examined. – Madagascar. **Reg. Boeny [Prov. Mahajanga]:** La Corniche, Kanto Hotel grounds, 14.II.2013, *Vorontsova et al. 916* (K, TAN). **Reg. Melaky [Prov. Mahajanga]:** env. de Maintirano, II.1957, *Service Veterinaire s.n.* (P); ibid. loco, X.1964, *Morat 732* (P, TAN).

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Appendix – Placements of the 31 accepted species from chloroplast phylogenetic reconstruction by HACKEL et al. (2018) except those inferred from morphology [*].

Species	Subtribe	HACKEL et al. (2018) clade strictly endemic to the Madagascar region	Generic placement fide BOSSER (1969)
Brachiaria antsirabensis A. Camus	Boivinellinae	Clade 34: *Brachiaria antsirabensis, B. dimorpha*	*Brachiaria*
Brachiaria bemarivensis A. Camus	Boivinellinae	Clade 41: *Brachiaria fragrans, Panicum ibitense, P. spergulifolium, P. cupressifolium, P. andringitrense, B. bemarivensis*	*Brachiaria*
Brachiaria comorensis (Mez) A. Camus	Boivinellinae		-
Brachiaria dimorpha A. Camus	Boivinellinae	Clades 34 and 35: *Brachiaria antsirabensis, B. dimorpha, Panicum lycopodioides, B. epacridifolia, B. dimorpha*	-
Brachiaria epacridifolia (Stapf) A. Camus	Boivinellinae	Clade 35: *Panicum lycopodioides, Brachiaria epacridifolia, B. dimorpha*	*Brachiaria*
Brachiaria fragrans A. Camus	Boivinellinae	Clade 41: *Brachiaria fragrans, Panicum ibitense, P. spergulifolium, P. cupressifolium, P. andringitrense, B. bemarivensis*	-
Brachiaria fruticulosa A. Camus	unknown		-
Brachiaria perrieri A. Camus	Melinidinae*		*Brachiaria*
Brachiaria subrostrata A. Camus	Melinidinae	Clade 48: *Brachiaria subrostrata*	*Brachiaria*
Brachiaria tsiafajavonensis A. Camus	Boivinellinae	Clade 40: *Brachiaria tsiafajavonensis*	-
Brachiaria umbellata (Trin.) Clayton	Melinidinae		*Panicum*
Echinochloa hubbardii (A. Camus) Voronts.	Boivinellinae		*Brachiaria*
Echinochloa leandriana (Bosser) Voronts.	Boivinellinae [unpubl. data]		-
Echinochloa serpens (Kunth) Voronts.	Boivinellinae*		
Moorochloa eruciformis (Sm.) Veldkamp	Melinidinae		*Brachiaria*
Urochloa arrecta (Hack. ex T. Durand & Schinz) Morrone & Zuloaga	Melinidinae		*Brachiaria*
Urochloa brizantha (Hochst. ex A. Rich.) R.D. Webster	Melinidinae		*Brachiaria*
Urochloa deflexa (Schumach.) H. Scholz	Melinidinae		*Brachiaria*
Urochloa distachyos (L.) T.Q. Nguyen	Melinidinae		*Brachiaria*
Urochloa eminii (Mez) Davidse	Melinidinae		*Brachiaria*
Urochloa glumaris (Trin.) Veldkamp	Melinidinae*		-
Urochloa humbertiana (A. Camus) Voronts.	Melinidinae	Clade 57: *Brachiaria humbertiana*	*Brachiaria*
Urochloa jubata (Fig. & De Not.) Sosef	Melinidinae		-
Urochloa mutica (Forssk.) T.Q. Nguyen	Melinidinae		*Brachiaria*
Urochloa nana (Stapf) Voronts.	Melinidinae		*Brachiaria*
Urochloa panicoides P. Beauv.	Melinidinae		-
Urochloa plantaginea (Link) R.D. Webster	Melinidinae		-
Urochloa pseudodichotoma (Bosser) Voronts.	Melinidinae	Clade 54: *Brachiaria pseudodichotoma*	*Brachiaria*
Urochloa ramosa (L.) T.Q. Nguyen	Melinidinae		-
Urochloa reptans (L.) Stapf	Melinidinae		*Brachiaria*
Urochloa trichopus (Hochst.) Stapf	Melinidinae		*Urochloa*