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Revision of the group previously known as *Panicum* L. (Poaceae: Panicoideae) in Madagascar

Maria S. Vorontsova

Abstract

VORONTSOVA, M.S. (2018). Revision of the group previously known as *Panicum* L. (Poaceae: Panicoideae) in Madagascar. *Candollea* 73: 143–186. In English, English and French abstracts. DOI: <http://dx.doi.org/10.15553/c2018v732a1>

Panicoid grasses are ubiquitous across Madagascar, yet no complete and modern taxonomic framework has so far been attempted. This paper aims to establish and record species boundaries in the group previously recognised as the genus *Panicum* L. (Poaceae, Panicoideae), with simple panicoid spikelets and open panicle-like inflorescences. All specimens held at the K, P, and TAN herbaria were revised in addition to field work throughout the island. Species concepts were reconciled with those in tropical Africa. Recent phylogenetic research in *Panicum* s.l. has been incorporated and several species have been placed in *Adenochloa* Zuloaga, *Trichantheicum* Zuloaga & Morrone, and *Urochloa maxima* (Jacq.) R.D. Webster. Further species outside the *Panicum* s.s. clade will be ultimately transferred to other genera pending further research. A treatment of 32 species is presented, including an identification key, synonymy and typification for all names applied to specimens collected in Madagascar, species descriptions, illustrations, distribution maps, and full specimen citations. Twenty species (63%) are endemic to Madagascar and the nearby islands. Data on natural occurrence in Madagascar are presented but these are still tentative. Nineteen names are placed in synonymy for the first time; 38 lectotypes are designated.

Résumé

VORONTSOVA, M.S. (2018). Révision du groupe d'espèces précédemment compris comme le genre *Panicum* L. (Poaceae: Panicoideae) à Madagascar. *Candollea* 73: 143–186. En anglais, résumés anglais et français. DOI: <http://dx.doi.org/10.15553/c2018v732a1>

Les graminées du groupe *Panicum* L. sont omniprésentes à Madagascar, mais aucune révision taxonomique complète et moderne n'en a été entreprise jusqu'à présent. Cet article a pour but d'établir et documenter la limite des espèces dans un groupe précédemment compris comme le genre *Panicum* L. (Poaceae: Panicoideae), qui était défini par des épillets panicoides simples et des inflorescences ouvertes en forme de panicule. Tous les spécimens conservés dans les herbiers de K, P et TAN ont été révisés et des travaux de terrain ont été menés dans toute l'île. Les concepts d'espèces ont été mis en concordance avec ceux actuellement adoptés en Afrique tropicale. Les récentes recherches phylogénétiques dans le genre *Panicum* s.l. ont été prises en compte et certaines espèces ont été placées dans *Adenochloa* Zuloaga, *Trichantheicum* Zuloaga & Morrone et *Urochloa maxima* (Jacq.) R.D. Webster. Des recherches à venir pourraient encore amener au transfert d'autres espèces qui se retrouveraient en dehors du clade *Panicum* s.s. à d'autres genres. Le traitement de 32 espèces est présenté, comprenant une clé d'identification, la synonymie et la typification de tous les noms utilisés pour les spécimens récoltés à Madagascar, la description des espèces, des illustrations, des cartes de répartition et une citation complète des spécimens. Vingt espèces (63%) sont endémiques de Madagascar et des îles voisines. Les données sur la répartition naturelle à Madagascar sont présentées mais elles restent pour l'heure incomplètes. Dix-neuf noms ont été placés en synonymie pour la première fois; 38 lectotypes sont désignés.

Keywords

POACEAE – Panicoideae – *Adenochloa* – *Panicum* – *Trichantheicum* – *Urochloa* – Madagascar – Taxonomy – Nomenclature

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Introduction

Morphology-based classification systems of the twentieth century defined the genus *Panicum* L. (Poaceae, Panicoideae) as grasses with an open panicle, bearing pedicellate dorsally (or weakly laterally) compressed panicoid spikelets, with an upper palea with margins usually rolled inwards, the spikelets disarticulating as a single unit, and lacking additional distinguishing features such as gibbous shape, lateral compression, paired spikelets, hair tufts, bristles, or awns (thereafter called *Panicum* s.l., CLAYTON & RENVOIZE, 1986; WATSON & DALLWITZ, 1992). This was seen as a “primitive” panicoid morphology likely to have given rise to more “specialised” genera of the Panicoideae (CLAYTON & RENVOIZE, 1986). *Panicum* s.l. comprised a pantropical assemblage of 370–470 superficially similar grasses encompassing variation in chromosome number, photosynthetic system, leaf anatomy, and spikelet morphology detail (CLAYTON & RENVOIZE, 1986; WATSON & DALLWITZ, 1992). Molecular phylogenetic analyses have revealed that *Panicum* s.l. is in fact an artificial grouping of multiple superficially similar lineages in the modern tribes *Paspaleae* and *Paniceae* (KELLOGG, 2015; SORENG et al., 2017). Ongoing work has been carried out especially by Fernando Zuloaga, Osvaldo Morrone and colleagues in realigning the generic classification to reflect these lineages, placing species of *Panicum* s.l. in existing genera (*Acroceras* Stapf, *Coleataenia* Griseb. and *Dichantherium* (Hitc. & Chase) Gould, *Homolepis* Chase and others) and describing new genera: *Adenochloa* Zuloaga, *Apochloa* Zuloaga & Morrone, *Cyphoanthus* Zuloaga & Morrone, *Hopia* Zuloaga & Morrone, *Kellochloa* Lizarazu, Nicola & Scatagliini, *Morronea* Zuloaga & Scatagliini, *Ocellochloa* Zuloaga & Morrone, *Parodiophyllochloa* Zuloaga & Morrone, *Renvoizea* Zuloaga & Morrone, *Rugoloo* Zuloaga, *Stephostachys* Zuloaga & Morrone, and *Trichantheicum* Zuloaga & Morrone (MORRONE et al., 2007, 2008; ZULOAGA et al., 2007, 2010, 2011, 2015; SEDE et al., 2008, 2009). Rearrangement of the generic classification system is not yet complete; a synopsis of all Poaceae genera carried out by KELLOGG (2015) listed a further three clades still lacking generic names: “*Panicum*” sect. *Monticolae* Stapf with sect. *Verrucosa* Hitc. & Chase ex C.C. Hsu and sect. *Ovalifoliae* Stapf, “*Panicum*” *antidotale* Retz., and “*Panicum*” *deustum* Thunb. (KELLOGG, 2015).

Phylogenetic reassessment of the Poaceae has focused on the New World, with a comparatively poor representation of African lineages. Tropical African species of *Panicum* s.l. were first documented in detail by STAPF (1920), with regional floras building on his work to produce *Panicum* treatments for the *Flora of West Tropical Africa* (HUTCHINSON & DALZIEL, 1972), *Flora of Tropical East Africa* (CLAYTON & RENVOIZE, 1982), *Flora Zambesiaca* (CLAYTON, 1989), and *Flora of Ethiopia and Eritrea* (PHILLIPS, 1995). Madagascar’s *Panicum* species were described by Aimée Antoinette Camus (1879–1965) alongside

other grasses from Madagascar, in a series of numerous short papers (CAMUS, 1925a, 1925b, 1930, 1947, 1952a, 1952b, 1956, 1958a, 1958b, 1959). Her work was assembled into a treatment of the High Plateau grasses by BOSSE (1969). Little research on African grasses has taken place since except regional floristic work in South Africa (RUSSELL et al., 1990; FISH et al., 2015) and the Central Africa flora area (SOSEF 2016). This treatment is part of an ongoing project to fully document Madagascar’s grasses (e.g. VORONTSOVA, 2014; VORONTSOVA et al., 2014, 2016).

In Madagascar species of *Panicum* s.l. are found across the whole island, in all habitats, and at all elevations; the species diversity is greatest in mid-elevation mesic forest edge environments. *Urochloa maxima* (Jacq.) R.D. Webster is omnipresent in heavily disturbed areas throughout the island. Many other species are commonly encountered: *Panicum brevifolium* L. forms ground cover in shady disturbed environments, *Adenochloa hymeniocchila* wNees) Zuloaga is often found on the edges of streams, and *Panicum subalbidum* Kunth is a weed of rice paddies. Some species are rare: the endemic *P. capuronii* A. Camus and *P. palackyanum* A. Camus are known from the type only. Most species are habitat specific and restricted to a single ecoregion: *P. mitopus* K. Schum. is limited to wet forests, *P. subhystris* A. Camus is only found at 1200–2300 m elevation, and *P. voeltzkowii* Mez is found only in arid southern and western ecosystems. The question of which species are native and which are introduced is not a simple one in the Poaceae as many grasses are natural pioneers that occupy the “weedy” niche of their native ecosystems. Madagascar’s flora is most closely affiliated with that of tropical Africa (BUERKI et al., 2013), its grass flora composition bears close similarity to that of tropical Africa (VORONTSOVA et al., 2016), so it is reasonable to expect African grasses to occur naturally in Madagascar. Yet African grasses are known to be particularly successful invaders (e.g. PARSONS, 1972) and are likely to have arrived together with the people from the African coast (BURNLEY et al., 2004). Poor levels of grass species recognition and recording in Madagascar means newly arriving species are rarely noted as such. Hence it is not currently possible to ascertain the native status of non-endemic grasses. Based on distribution records and field observations three species have tentatively been assigned as introduced: *Panicum dregeanum* Nees, *P. humile* Nees ex Steud., and *P. trichocladum* K. Schum. *P. mitopus* K. Schum. and *P. pleianthum* Peter occur predominantly on Madagascar with a smaller number of records in East Africa. The majority native non-endemic species are restricted to Africa.

This work aims to establish a basic species inventory for the Poaceae of Madagascar: delimit species, document morphological differences between species, assign specimens to species, and resolve synonymy. This treatment is intended as reference material for specimen identification and as a platform on which to build an understanding of the evolution

of this group. A classification based on monophyly is used as far as possible recognising *Adenochloa* (ZULOAGA et al., 2015) and *Trichanthecium* (ZULOAGA et al., 2011), and placing the species commonly known as *Panicum maximum* Jacq. in its correct placement in the genus *Urochloa* P. Beauv. as *U. maxima* (SALARIATO et al., 2010, 2012). The majority of the Malagasy as well as African species have not yet been analysed in a phylogenetic context and their generic placement remains unconfirmed. BOSSER (1969) documented 19 species of *Panicum*, 16 of which are accepted here: *P. mahafalense* A. Camus and *P. pseudovoeltzkowii* A. Camus are placed in synonymy; *P. umbellatum* Trin. is not treated here due to its racemose inflorescences and placement in the *Brachiaria/Urochloa* group as *Brachiaria umbellata* (Trin.) Clayton (combination in *Urochloa* not yet made). A further 16 species are accepted including two described as new during this project (Appendix 1; VORONTSOVA, 2014). Twenty of 32 species recognised here are endemic to Madagascar and nearby islands.

Methods

All specimens of *Panicum* s.l. at K, P, and TAN herbaria were studied in conjunction with field work throughout Madagascar during the period 2011–2016. Spikelet morphology was recorded with particular care to explore species boundaries. The breadth of known morphological variation within each species was recorded in the descriptions, for all specimens collected in Madagascar but not outside, and illustrated for the particularly variable endemic species *P. spergulifolium* A. Camus and *P. subhystrix*. Names and taxa falling within the species concepts of the accepted species were all designated as new synonyms. All type material and relevant literature was examined. Specimens were recorded in a BRAHMS database. Only names previously applied to Madagascar specimens are treated.

Key to *Panicum* s.l. in Madagascar

1. Most spikelets more than 2 mm long 2
- 1a. Most spikelets less than 2 mm long 18
2. Culms mostly erect, plants in tufts, most leaves basal, growing in dry places and open habitats, not high montane 3
- 2a. Plants prostrate or scrambling or climbing, most leaves positioned on the culms, growing in forest understory, wet habitats, or high montane habitats 9
3. Upper lemma rugose, common invasive plant across Madagascar 32. *U. maxima*
- 3a. Upper lemma smooth 4
4. Lower glume $\frac{1}{4}$ of the spikelet length, 1-veined, culms spongy, common plant of cultivated areas 25. *P. subalbidum*
- 4a. Lower glume $\frac{1}{2}$ – $\frac{3}{4}$ as long as the spikelet, 3–7-veined, culms not spongy 5
5. Spikelets 3–4 mm long and apically obtuse, rare plant from N Madagascar 4. *P. ankareense*
- 5a. Spikelets 2–3 mm long and apically acute or acuminate 6
6. Glumes and the lower lemma apically long-acuminate, turned outwards at maturity 7
- 6a. Glumes and the lower lemma acute to shortly acuminate, not turned outwards at maturity 8
7. Perennial with glabrous stems and nodes 11. *P. dregeanum*
- 7a. Annual with pilose stems and nodes (if glabrous annual cf. *P. humile*) 20. *P. novemnerve*
8. Spikelets almost always subtended by long white cilia, all leaves basal, spikelets acuminate 7. *P. cinctum*
- 8a. Pedicels glabrous, plant usually geniculately ascending, leaves at the base and along the culms, spikelets acute 17. *P. luridum*
9. Lower glume (almost) as long as the spikelet, the spikelets acuminate 10
- 9a. Lower glume shorter than the spikelet, rounded to acute 11
10. Panicle open, spikelets 2–2.5(–2.7) mm long 2. *P. ambositrense*
- 10a. Panicle contracted (linear to narrowly ovate), spikelets 2.5–3(–3.2) mm long 22. *P. perrieri*
11. Gland-tipped hairs on the inflorescence visible with a hand lens, growing close to water 1. *A. hymeniocbila*
- 11a. Inflorescence lacking gland-tipped hairs, not associated with water 12
12. Spikelets oblong, subtended by long white cilia, lower glume with no veins, less than $\frac{1}{3}$ of the spikelet length 27. *P. trichocladum*
- 12a. Spikelets elliptic to ovate, not subtended by cilia, lower glume with 3–5 veins, $\frac{1}{3}$ – $\frac{3}{4}$ as long as the spikelet 13
13. Spikelets asymmetric with the lower glume attached c. 0.5 mm below the upper glume; spikelets brown; plant of lowland forest understory 23. *P. pleianthum*
- 13a. Spikelets symmetric, the lower glume not clearly separated from the rest of the spikelet; spikelets white to purple or brown; plants of mid to high elevations 14
14. Leaves less than 2 mm wide, less than 3 cm long, high elevation plants from Andringitra 15
- 14a. Leaves more than 2 mm wide 16

15. Leaves imbricate, 0.5–3 × 0.5–2 mm, the spikelets terminal, rare and difficult to find, single at branch apices or rarely up to three together 9. *P. cupressifolium*
- 15a. Leaves not imbricate, 4–30 × 1–2 mm, inflorescences terminal, fully exerted on a peduncle 6–20 cm long, 1.5–4(–7) cm long, obovate, few-flowered 24. *P. spergulifolium*
16. Inflorescence branches spreading at maturity 3. *P. andringitrense*
- 16a. Inflorescence branches ascending or appressed 17
17. Spikelets single, the upper lemma without apical crest, common species of the high plateau 17. *P. luridum*
- 17a. Spikelets paired, the upper lemma with an apical crest, rare plant from Andringitra 21. *P. palackyanum*
18. Lower glume as long as the spikelet or slightly longer, spikelets usually with long trichomes 19
- 18a. Lower glume shorter than the spikelet, spikelets usually glabrous 22
19. Leaves rolled, plant caespitose and erect, most leaves at base 30. *T. brazzavillense*
- 19a. Leaves flat or rolled, plant prostrate or scrambling on rocks, significant proportion of the leaves cauline 20
20. Leaves ovate, often cordate at base, upper lemma smooth, common understory plant 5. *P. brevifolium*
- 20a. Leaves linear, elliptic, or lanceolate, not cordate at base, upper lemma with verrucae, endemic of the high plateau 21
21. Upper lemma verrucae elongated, rare annual 6. *P. capuronii*
- 21a. Upper lemma verrucae round, common on the high plateau, vegetatively variable annual or perennial 26. *P. subhystris*
22. Lower glume nerveless or with one vein 23
- 22a. Lower glume with 3–5 veins 28
23. Spikelets drying translucent white, 0.9–1.1(–1.3) mm long 24
- 23a. Spikelets drying pale yellowish to purple, 1.1–1.7 mm long 25
24. Mature leaves with no auricles, upper glume and lower lemma with white bulbous crystal-like prickle hairs 8. *P. crystalinum*
- 24a. Mature leaves with auricles 1–1.5 mm long, upper lemma and lower lemma glabrous or with small prickle hairs 18. *P. manongarivense*
25. Panicles open at maturity, at least some spikelets single 26
- 25a. Panicles or groups of spikelets condensed, with no single spikelets 27
26. Mostly erect plants of drier areas, inflorescence branches and spikelets purple to dark brown 12. *P. flacourtii*
- 26a. Prostrate plants of wet areas, inflorescence branches and spikelets pale 29. *P. vobitrense*
27. Spikelets evenly distributed throughout the panicle 10. *P. danguyi*
- 27a. Spikelets forming a globose head at the apices of panicle branches 19. *P. mitopus*
28. Culms mostly erect, plants in tufts, most leaves basal 29
- 28a. Plants prostrate or scrambling or climbing, most leaves positioned on the culms 32
29. Annual, spikelets acuminate, glumes turning outwards at maturity (spikelets yawning), NW Madagascar (if perennial with acuminate spikelets cf. *P. dregeanum*) 14. *P. humile*
- 29a. Perennial, spikelets rounded to acute, glumes not turning outwards at maturity (spikelets not yawning) 30
30. Spikelets pilose, lower glume rounded on the back, $\frac{3}{4}$ – $\frac{4}{5}$ as long as the spikelet 30. *T. brazzavillense*
- 30a. Spikelets glabrous, lower glume keeled, $\frac{1}{2}$ as long as the spikelet 31
31. Spikelets apically acute, 1.8–2.5 mm long, high plateau 17. *P. luridum*
- 31a. Spikelets apically rounded, 1.3–1.7 mm long, coastal areas 28. *P. voeltzkowii*
32. Leaves more than 1 cm wide, spikelets drying dark brown, forest understory climber with inflorescence branches dehiscent at maturity, North Madagascar 13. *P. humbertii*
- 32a. Leaves less than 1 cm wide, spikelets drying green, purple, or light brown, not a forest understory climber, inflorescence branches not dehiscent 33
33. Leaves glaucous, usually appressed to the stem or retrorse, inflorescence branches spreading on a partly exerted panicle, common creeping plant 31. *T. parvifolium*
- 33a. Leaves not glaucous, usually not appressed or retrorse, panicles usually fully exerted 34
34. Spikelets asymmetric with the lower glume attached c. 0.5 mm below the upper glume; spikelets brown; plant of forest understory 23. *P. pleianthum*
- 34a. Spikelets symmetric, the lower glume not clearly separated from the rest of the spikelet; spikelets white to purple or brown; plants usually of open areas 35
35. Annual, leaf blades elliptic 16. *P. inconspicuum*
- 35a. Perennial, leaf blades linear to lanceolate 36
36. Panicle 10–20 cm long, lower glume rounded on the back, $\frac{3}{4}$ – $\frac{4}{5}$ as long as the spikelet, tapia vegetation 15. *P. ibitense*

- 36a. Panicle 2–7 cm long, lower glume keeled, c. ½ as long as the spikelet, open areas 37
37. Spikelets apically acute, 1.8–2.5 mm long; high plateau 17. *P. luridum*
- 37a. Spikelets apically rounded, 1.3–1.7 mm long; coastal areas 28. *P. voeltzkowii*

Taxonomy

1. *Adenochloa hymeniobila* (Nees) Zuloaga in Pl. Syst. Evol. 301: 1697. 2014 (Fig. 1A).

= *Panicum hymeniobilum* Nees, Fl. Afr. Austral. III.: 46. 1841.

Lectotypus (designated by ZULOAGA, 2014: 1702): **SOUTH AFRICA. Natal:** “in graminosis inter Omsamculo et Omcomas alt 500 ft”, s.d., *Drège 4247* (P [P00444247]); isolecto-: K [K000282468]!).

= *Panicum glanduliferum* K. Schum. in Abh. Naturwiss. Vereine Bremen 9: 401. 1887. **Holotypus:** **MADAGASCAR:** “Im Sümpfen ohne genauere Standort-sangabe”, 8.XI.1877, *C. Rutenberg s.n.* (not found).

– *Panicum adenotrichum* Boivin in Rev. Madagascar 8: 837. 1906 [nom. nud.].

Aquatic rhizomatous prostrate annual *herb*, branching and rooting at nodes, to 2 m long, the culms and nodes glabrous to pilose with simple and clavellate trichomes. *Leaf sheaths* glabrous to pilose with simple and clavellate trichomes. *Ligule* a ciliolate membrane. *Leaf blades* linear-lanceolate, flat, chartaceous, broad at base, 1–10 × 0.1–0.7 cm, drying yellow-green, usually deflexed, sometimes spreading, glabrous to pilose with simple and clavellate trichomes on both sides. *Panicles* terminal, fully exerted on a peduncle 1–10 cm long, 4–10 cm long, ovate, the branches spreading almost at right angles at maturity, with gland-tipped trichomes visible with a hand lens, the secondary branches often contracted and the spikelets appressed to primary panicle branches. *Spikelets* usually paired, oblong, apically obtuse, 2–2.5(–3) mm long, green to purple, never gaping open. *Lower glume* ½–⅔ as long as the spikelet, narrow, chartaceous, apically obtuse to acute, 1-veined, glabrous. *Upper glume* as long as the spikelet, herbaceous, 5–9-veined, glabrous. *Lower floret* barren, with no palea. *Lower lemma* herbaceous, 5–9-veined, glabrous. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – African species common in streams in central and eastern parts of Madagascar at 500–1800 m (Fig. 2A), stems and leaves partly submerged.

Notes. – Recognised by its aquatic habitat, spreading or reflexed inflorescence branches and leaves, and oblong spikelet shape. Characteristic clavellate trichomes on the inflorescence branches are visible with a hand lens.

The name “*Panicum adenotrichum*” appears to originate from a single herbarium specimen (P [P00450266]) and was published without a description.

This species is illustrated in BOSSER (1969: Fig. 120a–e as *P. glanduliferum*) and in ZULOAGA et al. (2015: Fig. 5).

Additional material examined. – **MADAGASCAR. Prov. Antananarivo:** Nanisana, III.1906, *Alleizette 778* (P [P02608876]); parc de Tsimbazaza, 4.VIII.1950, *Benoist 41* (TAN); parc de Tsimbazaza, 22.II.1951, *Benoist 734* (P [P02608865]); Manjakandriana, la Mandraka, 15.IV.1951, *Benoist 1907* (P [P02608866]); La Mandraka, 3.IV.1951, *Benoist 1909* (P [P02608874]); PK 11 rte Tananarive à Antsirabe, 19.VI.1951, *Benoist 1938* (P [P02608873]); PK 11 rte Antsirabe env. de Tananarive, km 11 de la rte d’Antsirabe, 30.III.1951, *Benoist s.n.* (P [P02608862]); parc de Tsimbazaza, IX.1960, *Bosser 14928* (P [P02608853], TAN); Tampoketsa d’Ankazobe, VI.1964, *Bosser 19754* (P [P02608867]); Ranobé, près Sirabé, 1895, *Forsyth-Major s.n.* (G [G00418811]); ferme de Kianjasoa, 20.V.1937, *Herb. Jard. Bot. Tan. 2519* (P [P02608883]); Nanisana, 21.II.1933, *Herb. Jard. Bot. Tan. 32455* (P [P02608877], TAN); Ankazobe tampoketsa au N de Ankazobe, 8.VII.1928, *Humbert & Swingle 4461* (P [P03487889]); Kianjasoa, X.1963, *Morat 154* (TAN); Antsirabe Ville, VI.1913, *Perrier de la Bâthie 15836* (P [P02608869]); E slope of Ankaratra, W of Ambatolampy, 19°22’S 47°17’E, 11.III.1987, *Phillipson 1584* (K [K000805472], P [P02608863], TAN); env. 100 km à l’E de Antananarivo, étang à 5 km à l’W de Moramanga, 18°55’22’S 48°10’48’E, 6.II.2000, *Raynal-Roques & Jérémie 24940* (K [K000805470]); Nanisana, 18.III.1906, *Rotureau s.n.* (P [P02373566]). **Prov. Fianarantsoa:** Fort-Carnot, région Tanala, *Anon. 95* (P [P06795922]); Besorohitra, VII.1951, *Bosser 1548* (TAN); province de Mananjary, III.1909, *Geay 7813* (P [P02608881]); road RN45 15 km from junction with RN7 towards Ranomafana, 21°17’S 47°19’E, 28.X.2011, *Hall et al. 51* (K, TAN); Ambalavao, R.N.5 Sendrisoa, 19.III.1952, *Herb. Inst. Sci. Mada. 8985* (TAN); Itremo, Antanimenaha, 20°31’41’S 46°33’55’E, 20.III.2013, *Nanjarisoa & Andriamampionona 68* (K, TAN); Itremo, Mandimbizaka, juste à coté de la pépinière de la NAP à Mandimbizaka, 20°35’46’S 46°18’51’E, 14.II.2014, *Nanjarisoa et al. 100* (K, TAN); Ambositra, *Perrier de la Bâthie 31* (K [K000805471]); env. d’Ambositra, V.1912, *Perrier de la Bâthie 10852* (P [P02608870]); Sendrisoa, RN 5, district Ambalavao, 19.III.1952, *Réserves Naturelles 3985* (P [P00224763]); Andringitra NP, Belambo camp, 22°08’45’S 46°53’28’E, 26.X.2011, *Vorontsova et al. 602* (K, TAN); Andranovorivato, 35 km before Fianarantsoa, 21°39’30’S 46°59’02’E, 27.X.2011, *Vorontsova et al. 615* (K, TAN); Antsirakambiaty, Itremo Protected Area, 20°35’42’S 46°33’47’E, 12.III.2012, *Vorontsova et al. 727* (K, TAN); Isalo NP, Namaza Riv. bank above Namaza camp, 22°32’20’S 45°22’43’E, 16.XII.2013, *Vorontsova et al. 1297* (TAN); Itremo NAP, Anovitrinimpirahavavy stream, Antsirakambiaty, 20°35’45’S 46°33’47’E, 19.V.2014, *Vorontsova & Nanjarisoa 1534* (K, TAN). **Prov. Mahajanga:** Bealanana: Betainkankana, Ankaizina, V.1952, *Bosser 2827* (TAN); vallée de la Betsiboka: en avant de Maevatanana, près de Mahatsinjo, 5.VII.1928, *Humbert 4461* (P [P02608879]); Firin-galava entre Maevatanana et Andriba, VII.1898, *Perrier de la Bâthie 643* (P [P02608872]). **Prov. Toamasina:** Ste Marie de Madagascar, V.1847, *Boivin 1618* (P [P00450266]); PK 54 rte Moramanga Anosibe, Centre E, IX.1953, *Bosser 6610* (TAN); Lac Alaotra, *Herb. Jard. Bot. Tan. 3392* (P [P02608868]); Manakambahiny, Atsinanana, canton Manakambahiny-Est, district Ambatondrazaka, 24.XII.1962, *Rakotovaio 12354* (P [P02307397]); Ambatondrazaka, Andaingo Gara, Bembaray, Marovoay, îlot au milieu du lac Bembaray, 3.II.2010, *Randriambololomamonjy et al. 476* (P [P06768572]); Tamatave, 13.VIII.1964, *Tateoka 3585* (P [P02608855], TAN); Moramanga, Mantadia PN, Sahanody Riviere, 12 km from Falierana park entrance, 18°48’37’S 48°25’40’E, 8.X.2011,

Vorontsova et al. 323 (K, TAN). **Prov. Toliara:** gorge plateaux et vallées de Isalo, gorges de Sakamarekely et Sambalinieto, 19.X.1924, *Humbert 2870* (K [K000805473], P [P06795923], TAN). **Sine loco:** *Anon. s.n.* (P [P03487890]); s.d., *Cours s.n.* (P [P02608854]); 7.III.1945, *Cours 2717* (K [K000805474], P [P02608861]); *du Petit-Thouars s.n.* (P [P02608882]).

2. *Panicum ambohitrense* A. Camus in Bull. Soc. Bot. France 72: 370. 1925.

Lectotypus (designated here): **MADAGASCAR. Prov. Fianarantsoa:** env. d'Ambositra, 1700 m, V.1912, *Perrier de la Bâthie 10851* (P [P00450276]!; isolecto-: K!). **Syntypus:** **MADAGASCAR. Prov. Antsiranana:** Tsaratanana, IV.1923, *Perrier de la Bâthie 16365* (P [P02251335, P02251348]!).

Prostrate perennial, branched, the long thin culms rooting at nodes, to 2 m long, the culms and nodes glabrous. *Leaf sheaths* glabrous. *Ligule* a glabrous or ciliate membrane. *Leaf blades* linear to linear-lanceolate, flat, chartaceous, 5–13 × 0.3–1 cm, drying yellow-green, glabrous to pubescent on both sides. *Panicles* terminal, partly or fully exserted 10–25 cm long, broadly ovate, diffuse, the branches opening at right angles to the main axis, glabrous, the spikelets clustered at branch apices, the pedicels 3–5 mm long. *Spikelets* lanceolate, apically acuminate, 2–2.5(–2.7) mm long, with prominent veins, green to purple, opening only partly. *Lower glume* equalling the spikelet or almost as long, chartaceous, apically acuminate, 3-veined, glabrous or rarely pubescent. *Upper glume* as long as the spikelet, herbaceous, apically acuminate, 5–7-veined, glabrous or rarely pubescent. *Lower floret* barren, with a reduced palea. Lower lemma herbaceous, 5-veined, glabrous or rarely pubescent. *Upper lemma* somewhat shorter than the lower floret, smooth, shiny, pale.

Distribution and ecology. – Endemic to the central high plateau and high elevation areas in northern Madagascar (Fig. 2A), 1250–2000 m. Wet gallery forest understory, usually beside streams.

Notes. – This common species can be distinguished from the similar and likely related *P. perrieri* A. Camus by its shorter spikelets (2.5–3(–3.2) mm long in *P. perrieri*) and an open panicle (contracted in *P. perrieri*). *Panicum ambohitrense* and *P. perrieri* share long lower glumes and acuminate spikelets and are close to the African *P. aequinerve* Nees which has larger spikelets than *P. ambohitrense* and differs from *P. perrieri* by its open branched panicle. CLAYTON & RENVOIZE (1982) incorrectly cite *P. aequinerve* from Madagascar: this is a record of *P. ambohitrense*.

Perrier de la Bâthie 10851 is chosen to be the lectotype due to the more broad distribution of duplicates than the other syntype collection, *Perrier de la Bâthie 16365* held only at P [P02251348, P02251335].

This species is illustrated in BOSSER (1969: Fig. 122).

Additional material examined. – **MADAGASCAR. Prov. Antananarivo:** Manjakatempo, II.1953, *Bosser 4850* (P [P02251340]); *ibid. loco*, II.1953, *Bosser 4853* (TAN); La Mandraka, II.1953, *Bosser 5008* (TAN); Faratsiho, I.1955, *Bosser 7621* (P [P02307398], TAN); La Mandraka, II.1953, *Bosser 8009* (P [P02251334]); Romainandro, face W de l'Ankaratra, II.1957, *Bosser 10817* (P [P02251241], TAN); Ambatovory-Nandihizana, Ambatovory, IV.1957, *Bosser 11009* (P [P02251345]); Angavokely, III.1959, *Bosser 12730* (TAN); *ibid. loco*, I.1960, *Bosser 13719* (TAN); Ambatolaona, 15.V.1935, *Herb. Jard. Bot. Tan.* 32423 (P [P02251336], TAN); Angavokely, 25.VI.1964, *Tateoka 3519* (P [P02726869], TAN); Manjakatempo, 24.V.1950, *Vaughan s.n.* (K [K000805440]); Manerinerina, Analamaintso forest, 17°57'31" S 47°07'30" E, 13.II.2013, *Vorontsova et al.* 907 (K, TAN). **Prov. Antsiranana:** near summit d'Ambre, 12°35' S 49°09' E, 9.IV.1993, *Andrianantoanina et al.* 49 (K [K000805443], P [P06795995]); montagne d'Ambre, 12°35'47" S 49°09'34" E, 10.XI.2007, *Gautier & Nusbaumer 5188* (G [G00075803]); from Mangindrano up Maromokotro, 11.V.1974, *Gentry 11674* (K [K000805441], P [P02251242]); massif de Marivorahona au SW de Manambato, 18.III.1951, *Humbert & Capuron 25692* (K [K000805552], P [P01914209], TAN). **Prov. Fianarantsoa:** Itremo, Ambatomaneloka, IX.1956, *Bosser 9949* (TAN); Andringitra, IV.1964, *Bosser 19435* (P [P03487900], TAN); 34 km N of Fianarantsoa, 28.I.1975, *Croat 29960* (TAN); Ambohitombo, 1.X.1895, *Forsyth-Major 267* (K [K000805605]); Anjavidilava Est–Andringitra, 11.I.1971, *Guillaumet 3701* (P [P02325400], TAN); Itremo, Antsirakambiaty, 20°35'47" S 46°33'45" E, 18.II.2014, *Nanjariisoa et al.* 138 (K, TAN); Ambohitra, *Perrier de la Bâthie 34* (K [K000805604]); *ibid. loco*, V.1912, *Perrier de la Bâthie 10851* (K, P [P00450276]); Itremo, Antsirakambiaty, 20°35'42" S 46°33'47" E, 12.III.2012, *Vorontsova et al.* 736 (K, TAN). **Prov. Mahajanga:** Bealanana, Ankaizina, V.1962, *Bosser 2536* (TAN). **Prov. Toamasina:** Périnet, II.1955, *Bosser 7775* (P [P02251338]); *ibid. loco*, 25.II.1975, *Croat 32262* (TAN); Analamazaotra, X.1936, *Herb. Jard. Bot. Tan.* 2166 (P [P02251346]); *ibid. loco*, *Perrier de la Bâthie 10922* (K [K000244679], P [P02251343]); *ibid. loco*, *Perrier de la Bâthie 10925* (K [K000805442], P [P02251337], TAN).

3. *Panicum andringitrense* A. Camus in Bull. Soc. Bot. France 72: 369. 1925 (Fig. 1B, 3).

Lectotypus (designated here): **MADAGASCAR. Prov. Fianarantsoa:** massif d'Andringitra, 1600–2200 m, II.1922, *Perrier de la Bâthie 14550* (TAN!; isolecto-: K [K000244686]!, P [P00224760, P02251327]!). **Syntypi:** **MADAGASCAR. Prov. Fianarantsoa:** Andringitra, 1911, *Perrier de la Bâthie 10793* (P [P00224754, P00224757]!); *ibid. loco*, *Perrier de la Bâthie 13625* (P [P00224759, P02251328]!); *ibid. loco*, *Perrier de la Bâthie 14414* (P [P02251339, unmounted]!).

Perennial scrambler, much branched, the main stems woody, 1–3 m long, the culms and nodes glabrous. *Leaf sheaths* glabrous to finely pilose. *Ligule* a minute membrane. *Leaf blades* lanceolate, flat, coriaceous, 2–6 × 0.3–0.7 cm, drying red-brown, spreading, glabrous on both sides, the margins hardened. *Panicles* terminal, partly or fully exserted, 3–10 cm long, ovate, the branches wiry, opening at right angles to the main axis, glabrous. *Spikelets* elliptic, apically obtuse, 2.2–2.7(–3.1) mm long, with poorly visible veins, whitish to purple, opening only partly. *Lower glume* c. ½ as long as the spikelet, chartaceous, apically obtuse, 3-veined, glabrous. *Upper glume* as long as the spikelet or a little shorter at maturity, herbaceous, 3–5-veined, glabrous. *Lower floret* male, with palea.



Fig. 1. – **A.** *Adenochloa hymeniochila* (Nees) Zuloaga; **B.** *Panicum andringitrense* A. Camus; **C.** *Panicum brevifolium* L.; **D.** *Panicum cinctum* Hack. [A: Vorontsova et al. 602; B: Vorontsova et al. 1292; C: Unvouchered photo, Andasibe-Mantadia National Park, Madagascar; D: Rakotoarisoa & Randrianavosoa SNGF 2920] [Photos: A–C: M.S. Vorontsova; D: S. Rakotoarisoa]

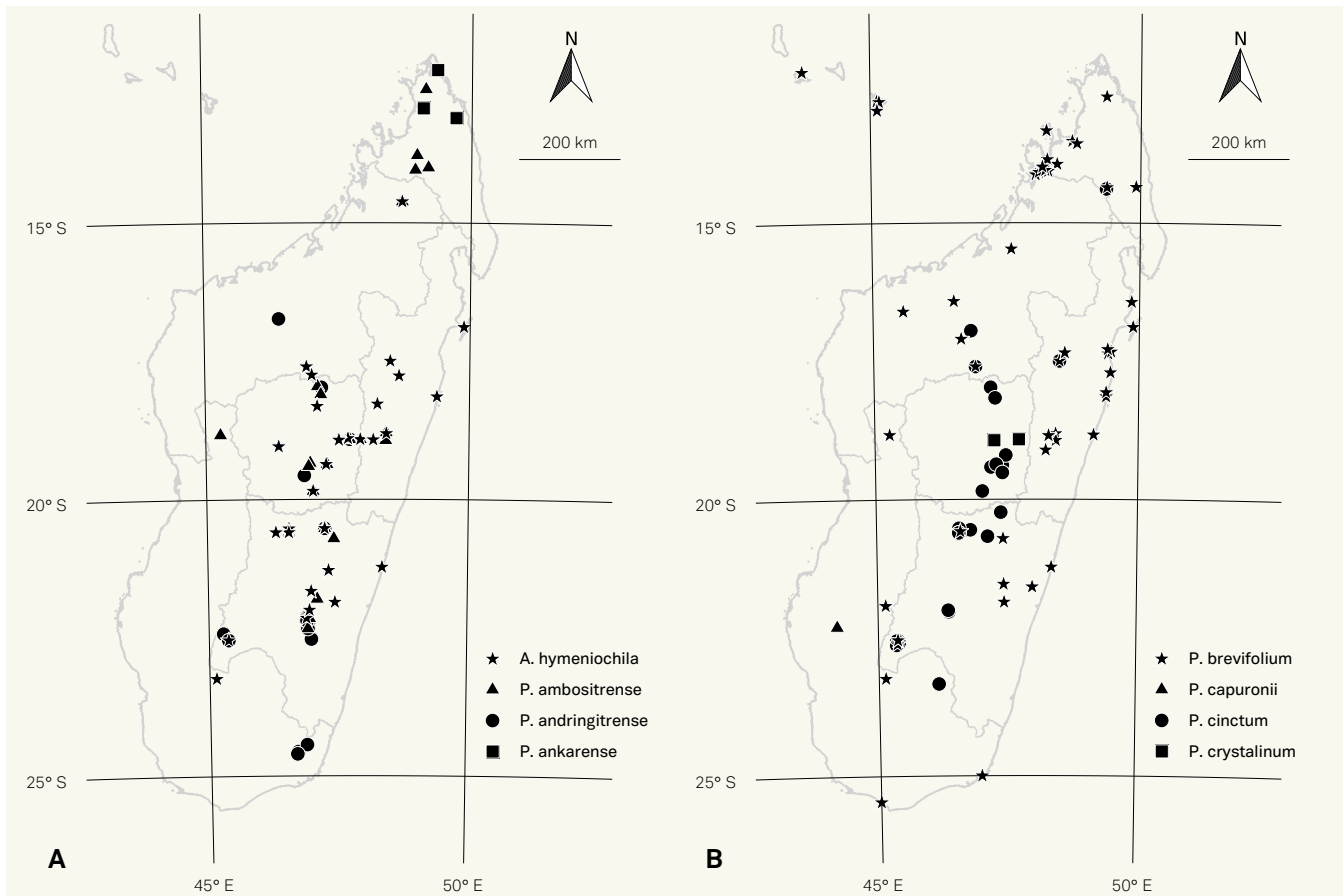


Fig. 2. – Distribution maps. **A.** *Adenochloa hymeniocchila* (Nees) Zuloaga (stars), *Panicum ambositrense* A. Camus (triangles), *P. andringitrense* A. Camus (circles) and *P. ankarense* A. Camus (squares); **B.** *Panicum brevifolium* L. (stars), *P. capuronii* A. Camus (triangle), *P. cinctum* Hack. (circles) and *P. crystalinum* Judz. & Voronts. (squares).

Lower lemma herbaceous, 5-veined, glabrous. *Upper lemma*, smooth, shiny, pale.

Distribution and ecology. – Endemic to the high plateau of central and southern Madagascar, 750–2300 m (Fig. 2A). Exposed ericoid vegetation and rocks, frequently seen climbing in the understory of *Erica* spp.

Notes. – Common species recognised by its long prostrate stems, panicle branches at right angles, and small whitish spikelets.

Populations with longer spikelets have been recorded near Lake Alaotra and these could potentially represent a different species.

The lectotype collection has been chosen due to its broadest distribution of duplicates.

Additional material examined. – **MADAGASCAR. Prov. Antananarivo:** Tampoketsa d'Ankazobe, X.1962, *Bosser* 16555 (P [P02307350], TAN); PK 44 rte de Majunga, III.1963, *Bosser* 17928 (P [P02325448]); Angavokely, I.1971, *Morat* 3753 (TAN); crête des Varavata, 25.XI.1912, *Viguier & Humbert*

1586 (P [P02251509]). **Prov. Fianarantsoa:** Andringitra, near Peak Boby, 22°11'44"S 46°54'01"E, 25.XI.2009, *Couch et al.* 588 (K [K000805444]); Ambo-sitra, 15.XI.1938, *Decary* 13501 (P [P02251350]); Andringitra, 1934, *Heim s.n.* (P [P00224758]); *ibid. loco*, *Homolle* 1219 (P [P02373634]); pic d'Ivohibe, 5.XI.1924, *Humbert* 3312 (G, K [K000805445], P [P00224762]); Andringitra, 27.XI.1924, *Humbert* 3794 (G, K [K000805449], P [P00224761], TAN); *ibid. loco*, *Perrier de la Bâthie* 73, (K [K000805489]); *ibid. loco*, *Perrier de la Bâthie* 11167 (P [P00224753]); *ibid. loco*, *Perrier de la Bâthie* 14550 (K [K000244686], P [P02251327], TAN); Isalo, *Perrier de la Bâthie* 16568 (G, P [P02251519]); Andringitra, near Namoly gate, 22°07'52"S 46°53'32"E, 25.X.2011, *Vorontsova et al.* 591 (K, TAN); Andringitra, 100 m before camp 2, 22°09'09"S 46°53'57"E, 27.XI.2013, *Vorontsova et al.* 1204 (K, TAN); Andringitra, path above camp 3, 22°11'11"S 46°54'03"E, 13.XII.2013, *Vorontsova et al.* 1243 (K, TAN); *ibid. loco*, 13.XII.2013, *Vorontsova et al.* 1247 (TAN); Isalo, Namaza Riv., 22°32'20"S 45°22'43"E, 16.XII.2013, *Vorontsova et al.* 1292 (TAN). **Prov. Mahajanga:** Tsitondroina, 15.V.1941, *Boiteau* 4729 (P [P02251513]). **Prov. Toliara:** Papanga, 3.XI.1928, *Humbert* 6408 (K [K000805450], P [P02251326]); Itrafanaomby, *Humbert* 13513 (P [P02251510]); Andohahela, I.1974, *Morat* 4378 (TAN).

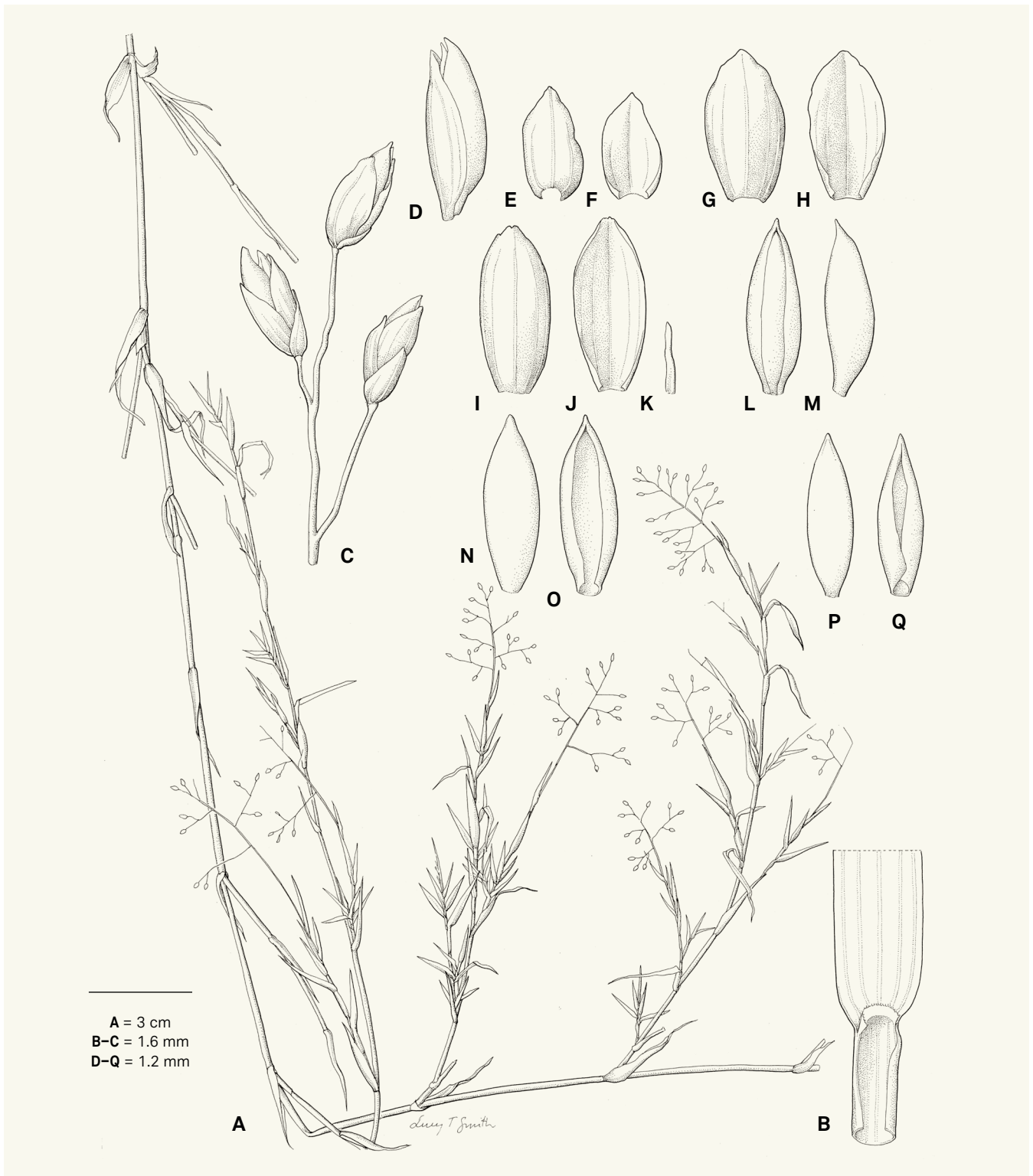


Fig. 3. – *Panicum andringitrense* A. Camus. **A.** Habit; **B.** Ligule; **C.** Panicle branch; **D.** Spikelet with glumes removed; **E.** Lower glume, dorsal view; **F.** Lower glume, ventral view; **G.** Upper glume, dorsal view; **H.** Upper glume, ventral view; **I.** Lower lemma, dorsal view; **J.** Lower lemma, ventral view; **K.** Lower palea; **L.** Upper floret, ventral view; **M.** Upper floret, lateral view; **N.** Upper lemma, dorsal view; **O.** Upper lemma, ventral view; **P.** Upper palea, dorsal view; **Q.** Upper palea, ventral view. [Vorontsova et al. 1204, K] [Drawing: Lucy T. Smith]

4. *Panicum ankarensense* A. Camus in Bull. Soc. Bot. France 92: 50. 1945 (Fig. 4).

Lectotypus (designated here): **MADAGASCAR. Prov. Antsiranana:** Ankarana, entre Ambondromiféhy et Ambilomagodra, 250 m, XI.1937–I.1938, *Humbert 18989* (P [P02251329]!; isolecto-: BR!, E!, EA!, G [G00022461] image seen, K!, L!, MAU!, MO!, P [P02251330, P02251331]!, PRE!, S!, SI!, TAN!, US!). **Syntypus:** **MADAGASCAR. Prov. Antsiranana:** NW de la falaise de l'Ankarana, s.d., *Humbert 18855* (not found).

Erect caespitose perennial, 50–80 cm tall, the culms glabrous, the nodes pubescent. *Leaf sheaths* glabrous to moderately pubescent at the top. *Ligule* a ciliate membrane. *Leaf blades* linear, flat, chartaceous, 15–25 × 0.6–1.5 cm, drying green-brown, cross veins visible when dry, glabrous to moderately pubescent on both sides. *Panicles* terminal, fully exerted on a peduncle 3–10 cm long, 15–20 cm long, diffuse, with c. 20–40 spikelets per panicle, the branches wiry, flexuous, scaberulous, sometimes with gland-tipped cilia, the pedicels 3–12 mm long. *Spikelets* oblong, apically obtuse, 2.8–4 mm long, drying whitish, partly open at maturity. *Lower glume* ½–⅔ as long as the spikelet, chartaceous, apically acute, 5–7-veined, glabrous, separated from the rest of the spikelet by an internode c. 0.5 mm long. *Upper glume* as long as the spikelet or a little shorter, herbaceous, 7-veined, glabrous. *Lower floret male*, with a fully developed palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma*, smooth, shiny, pale, with a small apical crest.

Distribution and ecology. – Narrow endemic restricted to dry forest on limestone in northern Madagascar, 150–250 m (Fig. 2A).

Notes. – Rare species known from five collections only. Appearance of the plant, the long wiry inflorescence branches, and the obtuse oblong spikelets are generally similar to *P. trichocladum* but the spikelets are larger and the lower glume has 5–7 veins.

The second syntype collection *Humbert 18855* was not found; the only known duplicate of *Humbert 18855* is a type of *P. bicuspdatum* A. Camus (= *P. subalbidum* Kunth) from the same locality.

The lectotype sheet was selected due to its best quality reproductive material.

Additional material examined. – **MADAGASCAR. Prov. Antsiranana:** Orangéa, 22.I.1960, *Humbert & Cours 32300* (K [K000805592]); Daraina, forêt d'Ampondrabe, 12°58'16"S 49°42'02"E, 15.II.2005, *Nusbaumer & Ranirison 1471* (G [G00019258]); Daraina, forêt de Solaniampilana-Maroadabo, 13°05'20"S 49°34'43"E, 8.II.2006, *Nusbaumer & Ranirison 2272* (G [G00074508]); Ampandriantsira, W of Irodo village, 12°39'27"S 49°31'43"E, 8.II.2015, *Rakotonasolo et al. 2577* (K [K001036478], TAN); Daraina, Beka-

raoka, 13°06'06"S 49°42'40"E, 15.II.2004, *Ranirison & Nusbaumer 449* (G [G00006817], P [P02726821]).

5. *Panicum brevifolium* L, Sp. Pl.: 59. 1753. (Fig. 1C).

Lectotypus (designated by CLAYTON & RENVOIZE, 1982: 496): **INDIA:** "Habitat in India", s.d., *Herb. Linn. 80.64* (LINN!).

= *Panicum mariae* Steud., Syn. Pl. Glumac. 1: 419. 1854. **Lectotypus** (designated here): **MADAGASCAR. Prov. Toamasina:** Sainte Marie, "à Antharène", III.1847, *Boivin 1620* (P [P02428363]!; isolecto-: G [G00022451, G00022452, G00378073] images seen, P [P00836145, P02251474]!; US [US00074213, US000132970]!), **syn. nov.**

= *Panicum bambusiusculum* Stapf in Bull. Misc. Inform. Kew 1919: 267. 1919. **Holotypus:** **MADAGASCAR. Prov. Toamasina:** Tamatave to Mahambo, 21.VI.1866, *Gerrard 75* (K [K000244689]!), **syn. nov.**

Creeping annual, rooting at lower nodes, to 1 m long, the culms glabrous, the nodes dark. *Leaf sheaths* largely glabrous with ciliate edges. *Ligule* membranous, truncate. *Leaf blades* ovate, flat, membranous, cordate and amplexicaul at base, 2–6 × 0.6–2.5 cm, drying yellow-green, cross veins visible when dry, glabrous to sparsely pubescent on both sides, with bulbous based cilia on the lower part of the margin. *Panicles* terminal, partly or fully exerted on a short peduncle, (2–)3–10(–13) cm long, ovate, the branches divergent at maturity, glabrous or with white cilia. *Spikelets* elliptic, asymmetric, apically apiculate, 1.6–1.8 mm long, with prominent veins, green or purplish, never gaping open. *Lower glume* as long as the spikelet, membranous, acute, 3-veined, glabrous to pubescent, separated from the rest of the spikelet by a swollen internode c. 0.3 mm long. *Upper glume* as long as the spikelet, herbaceous, 5-veined, glabrous to long-pubescent. *Lower floret* barren, with palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny.

Distribution and ecology. – African and Asian species, occurs on La Réunion and Mauritius, introduced to South America. Common across Madagascar except the south west, inhabits shady places in a variety of habitats: wet and dry forest understory and edges, grasslands, and roadsides, 0–1500 m (Fig. 2B).

Notes. – Easily recognised by bulbous-based cilia on the cordate amplexicaul leaf bases, broad ovate leaves, and a long lower glume. Attractive and frequently collected. Trichomes on the upper glume elongate at maturity to enable dispersal.

JARVIS (2007: 720) confirmed the original lectotypification of *Panicum brevifolium* L. by CLAYTON & RENVOIZE (1982: 496) even though VELDKAMP (1996: 189) erroneously cited

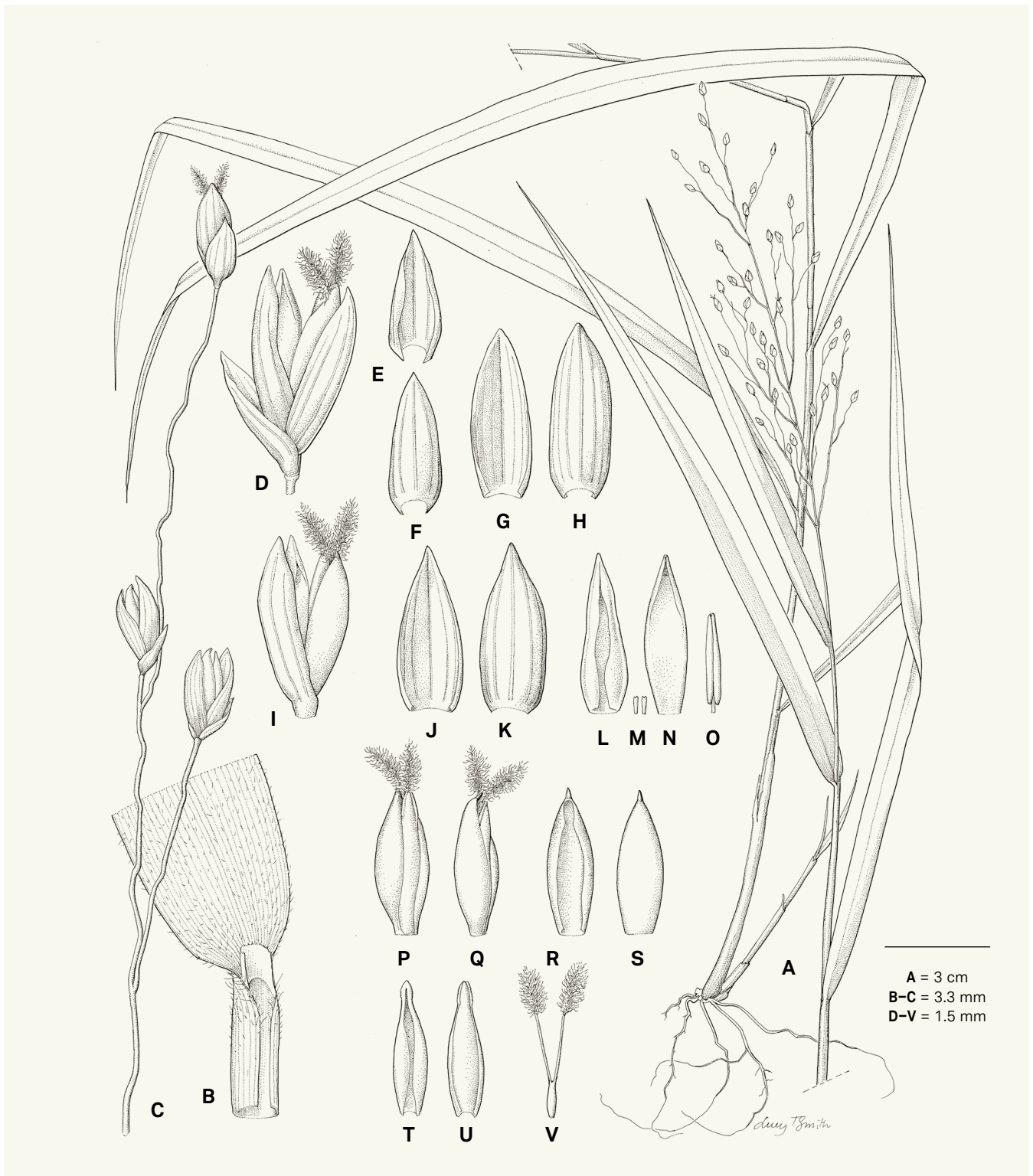


Fig. 4. – *Panicum ankarensense* A. Camus. **A.** Habit; **B.** Ligule; **C.** Panicle branch; **D.** Spikelet; **E.** Lower glume, ventral view; **F.** Lower glume, dorsal view; **G.** Upper glume, ventral view; **H.** Upper glume, dorsal view; **I.** Spikelet with glumes removed; **J.** Lower lemma, ventral view; **K.** Lower lemma, dorsal view; **L.** Lower palea, ventral view; **M.** Lower floret lodicules; **N.** Lower palea, dorsal view; **O.** 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.** Gynoeceum. [Ranirison & Nusbaumer 449, K] [Drawing: Lucy T. Smith]

the same sheet as a holotype. The lectotype sheet of *P. mariae* was chosen due to its most complete label information and two type annotations by Camus; only one collection was cited in the protologue.

This species is illustrated in BOSSER (1969: Fig. 121a–f).

Additional material examined. – MADAGASCAR. **Prov. Antsiranana:** Ambanja, Bandrakorony, 13°45'59"S 47°58'50"E, 23.I.2009, *Bernard et al.* 1333 (G [G00181116]); Nosy Be, Passand, III.1951, *Boivin* 1963 (G, P [P02324471]); Nosy Be, *Boivin* s.n. (P [P02324477]); Andratamarina, 20.IX.1920, *Decary* 20 (P [P02324480]); Besinkara between Ambodisakoana and Ambalafary, 14°04'00"S 48°17'E, 23.VI.1994, *Gautier et al.* 2414b (TAN); Keli-dada, 13°31'S 48°44'E, 11.X.2011, *Hall et al.* 18 (K, TAN); Nosy Be, IV.1879, *Hildebrandt* 2929 (G, K [K000805455], P [P02251495]); vallée de l'Ifasy en aval d'Anaborano, 31.III.1951, *Humbert* 25888 (P [P02251492]); Anivorano, XII.1964, *Morat* 1161 (P [P02307355]); Ampasindava, forêt de Bongomihiravavy, 13°45'36"S 48°06'21"E, 28.XI.2007, *Nusbaumer* 2598 (G [G00180736]); *ibid. loco*, 19.XI.2008, *Nusbaumer et al.* 2904 (G [G00181732]); Nosy Be, 1893, *Perville* s.n. (P [P02251475]); Andranomololo, Andramanalana, 14°21'34"S 49°22'35"E, IV. 2006, *Rakotoavao et al.* 3146 (G, P [P02309320]); Ankijanabe, 1 km E of Antsambalahy, 14°03'05"S 48°13'53"E, 13.V.2014, *Vorontsova et al.* 1475 (K, TAN); Manongarivo, 300 m S of Antsambalahy, 14°03'00"S 48°13'40"E, 13.V.2014, *Vorontsova et al.* 1484 (K, TAN); 32 km S of Ambanja, 13°51'23"S 48°16'00"E, 14.V.2014, *Vorontsova et al.* 1490 (TAN); Manongarivo, Befalafa, 13°56'19"S 48°26'59"E, 3.V.1999, *Wohlhauser et al.* 60094 (G [G00418797], K [K000805452], P [P04430799]). **Prov. Fianarantsoa:** Fort Carnot, 1986, *Beaujard* 98 (P [P06795937]); 34 km N of Fianarantsoa, 31.I.1975, *Croat* 30159 (TAN); Ranomafana, 21°35'S 47°59'E, 29.VI.1987, *Edelman* 117 (TAN); Ambohimitombo, 26.I.1895, *Forsyth-Major* 732 (K [K000805454]); Mananjary, III.1909, *Geay* 7247 (P [P06795941]); *ibid. loco*, III.1909, *Geay* 7465 (P [P06795943]); *ibid. loco*, III.1909, *Geay* 7812 (P [P06795940]); Ikongo, Andrambovato, 24.I.1955, *Humbert* 28470 (P [P02251491]); Itremo, Ihazofotsy, 20°34'45"S 46°36'26"E, 22.II.2014, *Nanjarisoa et al.* 167 (K, TAN); Isalo, 13.IV.1961, *Peltier & Peltier* 3059 (P [P02251494], TAN); Isalo, Namaza Riv., 22°32'20"S 45°22'43"E, 16.XII.2013, *Vorontsova et al.* 1298 (TAN); *ibid. loco*, 18.XII.2013, *Vorontsova et al.* 1324 (TAN). **Prov. Mahajanga:** Maromandia, Ambodirafia, 19.IX.1922, *Decary* 1049 (P [P02251472]); Maromandia, Sandrakoto, 27.XI.1922, *Decary* 1284 (P [P02324481]); Tsaratanakely, V.1958, *Descoings* 3351 (P [P02726858], TAN); S of Sofia, 15°28'S 47°36'E, 10.X.2011, *Hall et al.* 11 (K, TAN); Firingalava entre Maevatanana et Andiba, II.1898, *Perrier de la Bâthie* 892 bis (P [P02324478]); Bemarivo, III.1907, *Perrier de la Bâthie* 11241 (P [P02324475]); Andranomavo in Soalala, 14.VII.1977, *Rakotozafy* 1904 (TAN); Anjojahely, 69 km before Ambanja, 14°05'10"S 48°06'34"E, 9.V.2014, *Vorontsova et al.* 1458 (TAN); 1 km S of Ankaramy Be, 13°59'23"S 48°10'30"E, 14.V.2014, *Vorontsova et al.* 1498 (TAN). **Prov. Toamasina:** Ambatovy, 18°50'49"S 48°17'45"E, 10.III.2005, *Antilabimena et al.* 3694 (P [P06768482]); Ambila, 17.III.1951, *Benoist* 768 (P [P02251493], TAN); Analamazaotra, 3.IX.1951, *Benoist* 1121 (P [P03487899]); Sainte Marie, 1849, *Boivin* 1620 (P [P00836145]); Lavanono Lanambo, Sainte Marie, IV.1851, *Boivin* s.n. (P [P02324479]); Sahamamy Périnet, X.1951, *Bosser* 2132 (TAN); Ambila, 3.V.1928, *Decary* 636 (P [P02324482]); Fenerive Est, 28.IV.1926, *Decary* 3909 (P [P02251490]); Ambila, 4.V.1928, *Decary* 6390 (P [P06795942], TAN); Sandrangato au S de Moramanga, 7.III.1942, *Decary* 17778 (P [P02324483]); between Tamatave and Mahambo, 21.VI.1866, *Gerrard* s.n. (K [K000244689]); Lac Alaotra, *Herb. Jard. Bot. Tan.* 3422 (P [P02324484]); Vohimena près Alaotra, XII.1963, *Morat* 247 (TAN); Foulpointe, I.1964, *Morat* 380 (TAN); baie d'Antongil, VIII.1912, *Perrier de la Bâthie* 12184 (P [P02324474]); Ivoloïna, 1.V.1953, *Portères* s.n. (P [P02373635]); Ambatovy, Ambohivary, 18°51'26"S 48°18'12"E, 18.I.2005, *Ranaivojoana et al.* 1148 (P [P06768486]); Tamatave, 13.VII.1964, *Tateoka* 3574 (P [P06795938], TAN); Tamatave, 27.IX.1912, *Viguier & Humbert* 432 (G, P [P02251476],

TAN); Mantadia, Sahanody Riv., 18°48'48"S 48°25'48"E, 7.X.2011, *Vorontsova et al.* 304 (K, TAN). **Prov. Toliara:** Isalo, gorges de Sakamarekely et Sambalinieto, 19.X.1924, *Humbert* 2883 (K [K000805451], P [P02251478]); Fort Dauphin, 20.IX.1928, *Humbert* 5988 bis (G, P [P01914098]); Beroroha, S de Tanandava, 11.III.1947, *Humbert* 20488 (P [P03487895]). **Sine loco:** VIII.1951, *Bosser* 1564 (TAN); *Decary* 17778 (P [P03487897]); *Geay* s.n. (P [P06795944]); village d'Ampangenenabe, 7.VI.1881, *Lantz* s.n. (P [P02324472]); intérieur, 8.VI.1881, *Lantz* s.n. (P [P02251470]); 7.VI.1881, *Lantz* s.n. (P [P02251480]).

6. *Panicum capuronii* A. Camus in Bull. Soc. Bot. France 103: 613. 1957 (Fig. 5).

Lectotypus (designated here): MADAGASCAR. **Prov. Toliara:** forêt d'Iera à env. 30 km W d'Ankazoabo, IV.1955, *Humbert* 29717 (P [P00450282]); isolecto-: P [P00450283]!).

Delicate annual, erect, 5–15 cm tall, the culms glabrous with some cilia at the nodes. *Leaf sheaths* pilose on the margins. *Ligule* a ciliolate membrane. *Leaf blades* elliptic, flat, membranous, cordate and amplexicaul at base, 2.5–5 × 0.5–0.9 cm, drying yellow-green, glabrous on both sides. *Panicles* terminal, fully exerted, 3–6 cm long, linear, the branches lax, ascending, with glandular patches, glabrous. *Spikelets* ovate, asymmetric, apically obtuse, c. 1.5 mm long, green, opening only partly. *Lower glume* equalling or slightly exceeding the spikelet, membranous, acute, 1–3-veined, glabrous to pubescent, separated from the rest of the spikelet by a short internode. *Upper glume* as long as the spikelet, herbaceous, 5-veined, hirsute with bulbous-based trichomes c. 1 mm long at maturity. *Lower floret* male, with a fully developed palea. *Lower lemma* thinly cartilaginous, 5-veined, sometimes hooded, glabrous. *Upper lemma* with sparse minute elongated verrucae towards the upper half, often dehiscent before the lower floret.

Distribution and ecology. – Endemic to Madagascar. Shade understory of seasonally dry forest, c. 400 m (Fig. 2B).

Notes. – Known from the type collection only.

Close to *P. subhystris* but differs by the shape of the verrucae on its upper lemma which are sparse and elongated, not rounded. *Panicum subhystris* occupies a different environmental niche of higher elevation rocky and savanna habitats on the High Plateau.

Brachiaria capuronii A. Camus has a short lower glume and spikelets arranged along racemes, and is a different species likely not directly related to *Panicum capuronii*. Confusion is possible since *Brachiaria capuronii* has broad membranous leaves somewhat similar to those of *Panicum capuronii* and comes from a similar area of Madagascar.

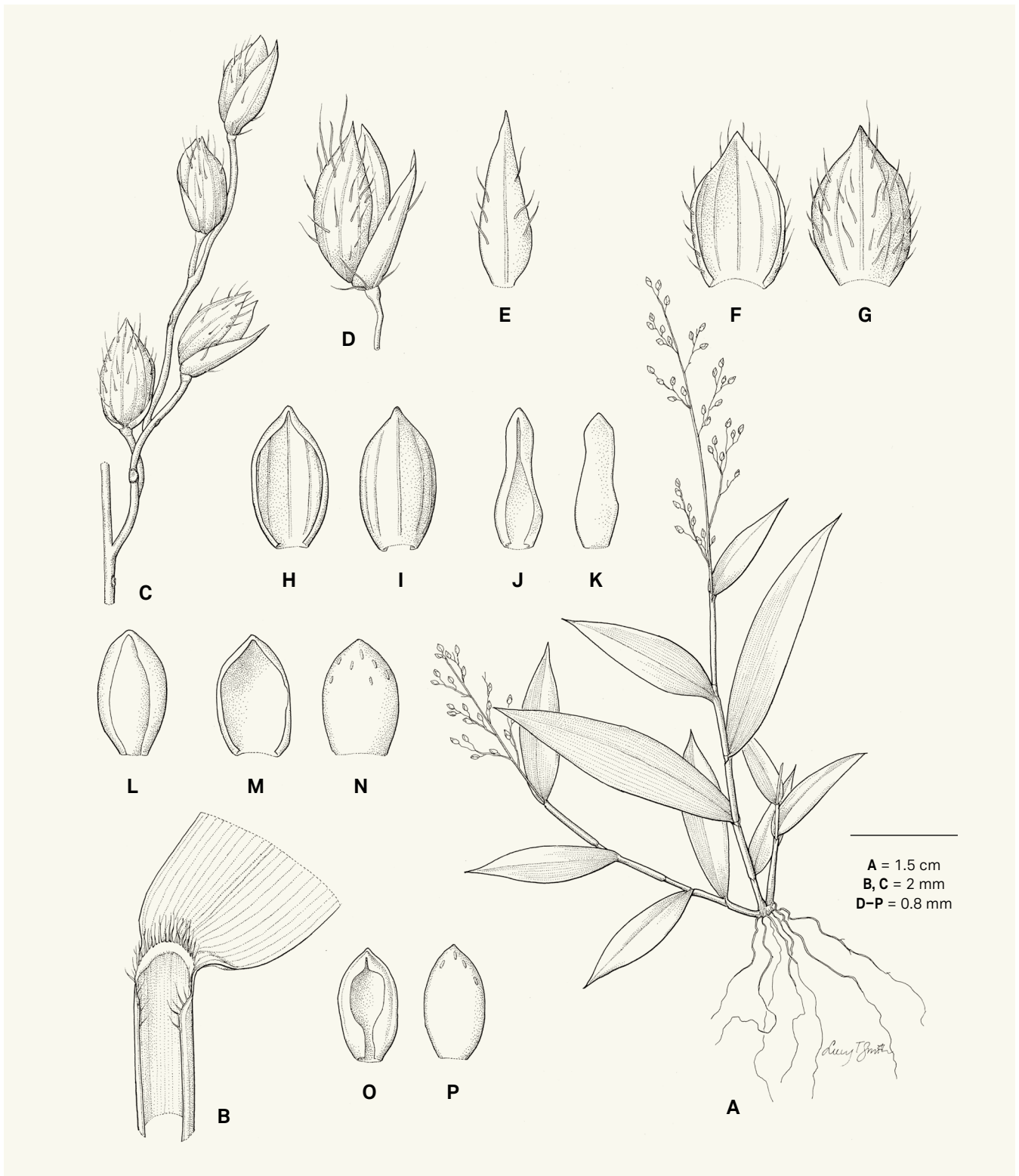


Fig. 5. – *Panicum capuronii* A. Camus. **A.** Habit; **B.** Ligule; **C.** Panicle branch; **D.** Spikelet; **E.** Lower glume, dorsal view; **F.** Upper glume, ventral view; **G.** Upper glume, dorsal view; **H.** Lower lemma, ventral view; **I.** Lower lemma, dorsal view; **J.** Lower palea, ventral view; **K.** Lower palea, dorsal view; **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. [Humbert 29717, P] [Drawing: Lucy T. Smith]

7. *Panicum cinctum* Hack. in Oesterr. Bot. Z. 51: 429. 1901 (Fig. 1D).

Lectotypus (designated here): **MADAGASCAR. Prov. Antananarivo:** Central Madagascar, Betsileo, I.1881, *Hildebrandt 3997* (W [W1916-0024801] image seen; isolecto-: G [G00022444, G00022445] image seen, GOET [GOET006765, GOET006766] image seen, JE [JE00006125] image seen, K [K000244690]!, M [M0103864] image seen, P [P00450284, P00450285, P00450286, P03487894]!, W [W1889-0032444] image seen, US [US00147775, US00147776]!).

= *Panicum ikopense* A. Camus in Bull. Soc. Bot. France 99: 63. 1952. **Lectotypus** (designated here): **MADAGASCAR. Prov. Mahajanga:** Firingalava, chutes de l'Ikopa, à Ikalominty, VII.1899, *Perrier de la Bâthie 893* (P [P00450271]!; isolecto-: P [P00450272, P00450273]!). **Syntypus:** **MADAGASCAR. Prov. Mahajanga:** Macvatanana, III.1900, *Perrier de la Bâthie 1033* (K [K000805602]!, P [P02325394]!), **syn. nov.**

Erect caespitose perennial, with short lignified rhizomes and thickened new shoots, 15–50 cm tall, the culms and nodes glabrous or pilose. *Leaf sheaths* usually long-pilose, sometimes glabrous. *Ligule* a line of hairs. *Leaf blades* linear to lanceolate, flat, firm, 3–20 × 0.15–0.5 cm, drying green-brown, usually clearly long-pilose on both sides, with some bulbous based cilia always present. *Panicles* terminal, fully exerted, 3–18 cm long, ovate, the branches appressed to ascending, with at least some long white cilia subtending the spikelet, rarely glabrous. *Spikelets* ovate, apically acuminate, 2–3 mm long, brown to purple, gaping open at maturity. *Lower glume* c. ½ as long as the spikelet, keeled, apically finely acuminate, 3–5-veined, finely scabrous on the keel. *Upper glume* as long as the spikelet, herbaceous, 5-veined, glabrous. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5–7-veined, glabrous. *Upper lemma* 1.5–1.8 mm long, shorter than the lower floret.

Distribution and ecology. – Endemic to the grassland, savanna and rock outcrops of the High Plateau, 700–2000 m (Fig. 2B).

Notes. – Closely related to two other endemic species: the coastal *P. voeltzkowii* and the mid-elevation *P. luridum* Hack., the distinction with *P. luridum* can be somewhat unclear. Sometimes lacks the white trichomes subtending the inflorescence which were used by BOSSER (1969) to distinguish it from *P. luridum*; the type collection of *P. ikopense* lacks these trichomes. A combination of the following characters can be used to distinguish *P. cinctum* from *P. luridum*: the presence of white cilia subtending the spikelet, more caespitose habit, more thickened underground plant base, broad largely pilose leaves, and larger acuminate spikelets.

The sheet W [W1916-0024801] is from Hackel's own herbarium with Hackel's original handwriting which is why it is has been chosen to be the lectotype of *P. cinctum*. The correct type collection number for *P. ikopense* is *Perrier de la Bâthie 893* as this is the number on all original material annotated by Camus, even though the protologue cites "*Perrier de la Bâthie 593*". The lectotype sheet is chosen for its best flowering material.

This species is illustrated in BOSSER (1969: Fig. 120f-i).

Additional material examined. – **MADAGASCAR. Prov. Antananarivo:** Ambatolampy, II.1953, *Bosser 4753* (P [P02726852], TAN); *ibid. loco*, II.1953, *Bosser 4795* (P [P02251456]); *ibid. loco*, II.1953, *Bosser 4799* (P [P02251446]); Antanifotsy, Ambohimandroso, XII.1955, *Bosser 8884* (TAN); entre Ambatolampy et Faratsiho, II.1957, *Bosser 10794* (P [P02251444]); Ambohitantely, I.1963, *Bosser 17067* (TAN); Manjakatempo, 22.I.1975, *Croat 29043* (TAN); Tampoketsa d'Ankazobe, I.1955, *Gillard s.n.* (TAN); Ambatolampy, Behenjy, 12.II.1938, *Herb. Jard. Bot. Tan. 3162* (P [P02251459]); Belamboany, *Perrier de la Bâthie 1* (K [K000805460]). **Prov. Antsiranana:** forêt d'Andamanalana, 2.V.2006, *Razakamalala et al. 2759* (G, P [P02309319]). **Prov. Fianarantsoa:** Ambatofinandrahana, I.1953, *Bosser 5076* (TAN); Isalo, II.1956, *Bosser 9026* (P [P02251450], TAN); Fandriana, I.1961, *Bosser 14887* (P [P02251465], TAN); Isalo près de Ranohira, II.1963, *Bosser 17412* (P [P02251447]); *ibid. loco*, II.1963, *Bosser 17685* (P [P02251464], TAN); Vohilava to Mananjary, I.1964, *Bosser 19026* (K [K000805596], P [P02222305], TAN); Itremo, I.1964, *Bosser 19050* (P [P02251458]); La Brioche, S du Ambalavao, 10.II.1970, *Bosser 19873* (P [P02307380]); Isalo, 29.I.1955, *Cours 5032* (P [P02324469]); Col de l'Itremo, 27.I.1975, *Croat 29818* (TAN); Isalo, la Piscine, 16.II.1990, *Labat et al. 2142* (K [K000805600], P [P02325432]); PK 500 rte d'Ihosy, II.1967, *Morat 2618* (P [P02307320], TAN); Itremo, Ianasana, 20°34'39"S 46°34'59"E, 15.III.2013, *Nanjarisoa & Andriamampionona 10* (K, TAN); *ibid. loco*, 15.III.2013, *Nanjarisoa & Andriamampionona 11* (K, TAN); Itremo, Soatsihotapaka, 20°31'20"S 46°34'50"E, 20.II.2014, *Nanjarisoa et al. 157* (K, TAN); W Belamboany, V.1912, *Perrier de la Bâthie 10856* (P [P02251453]); Bonnet du Pape, 22.III.2010, *Ramandimbisoa et al. 128* (TAN); Itremo, Soatsihotapaka, 20°30'44"S 46°34'43"E, 26.II.2013, *Vorontsova et al. 1027* (K, TAN); 2 km E of Anjomanakona towards Ivato, 20°40'02"S 47°07'41"E, 27.II.2013, *Vorontsova et al. 1038* (K, TAN); c. 5 km from Ranohira towards Ilakaka, 22°37'36"S 45°20'58"E, 20.IV.2014, *Vorontsova et al. 1367* (TAN). **Prov. Toamasina:** Ambatondrazaka, *Herb. Jard. Bot. Tan. 3409* (P [P02251443]). **Prov. Toliara:** Vondrozo, XII.1963, *Bosser 18765* (P [P02251454]). **Sine loco:** *Cours s.n.* (P [P02251448]); *Cours s.n.* (P [P02251448]); 29.II.1960, *Keraudren 137* (P [P02251461]).

8. *Panicum crystallinum* Judz. & Voronts. in Kew Bull. 69–9511: 4. 2014.

Holotypus: **MADAGASCAR. Prov. Antananarivo:** Antonogona, II.1963, *Bosser 17188* (P [P00524470]!; iso-: P [P02309315, P02309316]!).

Delicate annual, semi-prostrate, to 15 cm tall, the culms glabrous. *Leaf sheaths* glabrous with some cilia at the apex and on the margins. *Ligule* a lacerate ciliolate membrane. *Leaf blades* ovate, flat, membranous, 1.5–2.0 × 0.3–0.45 cm, drying yellow-green, loosely hirsute on both sides. *Panicles* terminal and axillary, partly or fully exerted on a peduncle to 1 cm long, 2–4 cm long, diffuse, the branching distichous or



Fig. 6. – **A.** *Panicum cupressifolium* A. Camus; **B.** *Panicum ibitense* A. Camus; **C.** *Panicum luridum* Hack.; **D.** *Panicum mitopus* K. Schum.
 [A: Nanjarisoa et al. 87; B: Letsara et al. 2047; C: Rakotoarisoa & Randrianavosoa SNGF 2931; D: Vorontsova et al. 2110]
 [Photos: A–B, D: M.S. Vorontsova; C: S. Rakotoarisoa]

in threes, the branches filiform, partly divergent at maturity, glabrous or with a few white cilia, the pedicels 1–6 mm long. *Spikelets* ovate to oblong, apically rounded, 0.9–1.1(–1.3) mm long, almost white, never gaping open. *Lower glume* a nerveless vestige of variable shape. *Upper glume* as long as the spikelet, translucent, 3-veined, with pronounced bulbous pickle hairs between the veins. *Lower floret* barren, without a significant palea. *Lower lemma* translucent, 3–5-veined, with pronounced bulbous pickle hairs between the veins. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to Madagascar, wet forest understory shade and rocky places on the High Plateau near Antananarivo (Fig. 2B).

Notes. – Similar to *P. manongarivense* A. Camus but with translucent, crystal-like, bulbous-based prickly hairs on the upper glume and lower lemma (vs smaller prickly hairs) and without auricles (vs brown membranous auricles 1–1.5 mm long on mature leaves). Also similar to *P. mitopus* but spikelets 0.9–1.1(–1.3) mm long (vs 1.1–1.7 mm long).

This species is illustrated in VORONTSOVA (2014: Fig. 1).

Additional material examined. – MADAGASCAR. Prov. Antananarivo: Angavokely, V.1961, *Bosser 15289* (P [P00524460, P02382370]).

9. *Panicum cupressifolium* A. Camus in Bull. Soc. Bot. France 72: 372. 1925 (Fig. 6A, 7).

Lectotypus (designated here): MADAGASCAR. Prov. Fianarantsoa: Andringitra massif, II.1921, *Perrier de la Bâthie 14548* (P [P00224765]!); isolecto-: E!, EA!, G [G00022443], K [K000244691, K000244692, K000244693, K000244694, K000244695]!, MO!, P [P00224764, P00462677]!, PRE [PRE0031827-0]!, S [S-G-4484] image seen, SI!, TAN!, US [US00147793, US00148388]!). **Syntypus**: Andringitra massif, 2.V.1911, *Perrier de la Bâthie 10833* (K [K000244697]!), P [P00462676, P00224767, P00462675]!), TAN!).

Woody perennial, much branched, the main stems lignified, to 50 cm tall, the culms and nodes glabrous. *Leaf sheaths* glabrous. *Ligule* absent. *Leaf blades* scale-like, ovate, flat, coriaceous, 0.05–0.3 × 0.05–0.2 cm, drying red-brown, imbricate, appressed, glabrous on both sides, often larger on the central stem. *Spikelets* terminal, rare and difficult to find, single at branch apices or rarely up to three together, nodding, elliptic, apically obtuse, c. 2.5 mm long, with poorly visible veins, whitish to purple, opening only partly. *Lower glume* c. ½ as long as the spikelet, chartaceous, apically obtuse, 3-veined, glabrous. *Upper glume* ¾ as long as the spikelet, herbaceous, 3–5-veined, glabrous. *Lower floret* barren, with a reduced palea.

Lower lemma herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to Madagascar, restricted to high elevation and high soil moisture environments in the Andringitra massif, 2400–2700 m (Fig. 8A).

Notes. – Likely the most unusual of Madagascar's grasses, *P. cupressifolium* does resemble a low stature conifer when forming monotypic stands on the plateau of Andringitra National Park. Leaf blades and leaf sheaths are reduced, while inflorescences are not readily visible as they are reduced to a single spikelet (or sometimes a group of up to three spikelets) at the culm apex.

The lectotype sheet has been chosen for its high quality material and an annotation in the author's handwriting.

Additional material examined. – MADAGASCAR. Prov. Fianarantsoa: Andringitra, 27.XI.1924, *Humbert 3888* (G, K [K000244696, K000805462]; *ibid. loco*, VI.1965, *Morat 1298* (P [P00224766]); Andringitra, à 100 m du pic, 22°11'42"S 46°53'31"E, 28.XI.2013, *Nanjarisoa et al. 87* (K, TAN); Andringitra, Peak Boby, 22°11'41"S 46°53'07"E, 25.XI.2009, *Rakotonasolo et al. 1502* (K [K000664083]); Sendrisoa, 18.X.1956, *Rakotovoao 8452* (P [P02251441], TAN); *ibid. loco*, 12.I.1958, *Rakotovoao 9913* (P [P00224773]); Andringitra, below Imarivolanitra, 22°11'42"S 46°53'24"E, 12.XII.2013, *Vorontsova et al. 1233* (TAN); *ibid. loco*, 12.XII.2013, *Vorontsova et al. 1237* (TAN).

10. *Panicum danguyi* A. Camus in Bull. Soc. Bot. France 72: 706. 1925.

Lectotypus (designated here): MADAGASCAR. Prov. Antsiranana: massif de Manongarivo, V.1909, *Perrier de la Bâthie 11072* (P [P00450258]!); isolecto-: P [P00450259]!).

= *Panicum danguyi* var. *mahavavyensis* A. Camus in Bull. Soc. Bot. France 99: 143. 1952. **Lectotypus** (designated here): MADAGASCAR. Prov. Antsiranana: massif de Marivorahona au SW de Manambato, 18.IV.1951, *Humbert & Capuron 25655* (P [P00450261]!); isolecto-: G [G00341774]!, K!, MO!, P [P00450260, P00450262]!, PRE!, SI!, TAN!), **syn. nov.**

= *Panicum tsaratananense* A. Camus in Bull. Soc. Bot. France 77: 638. 1931. **Lectotypus** (designated here): MADAGASCAR. Prov. Antsiranana: Mt Tsaratanana, IV.1924, *Perrier de la Bâthie 16369* (P [P00450236]!); isolecto-: K [K000805597]!, P [P02608161]!), **syn. nov.**

= *Panicum tsaratananense* var. *diffusum* A. Camus in Bull. Soc. Bot. France 105: 246. 1958. **Holotypus**: MADAGASCAR. Prov. Antsiranana: Mt Tsaratanana, IV.1923, *Perrier de la Bâthie 16372* (P [P02608160]!), **syn. nov.**

Ascending wiry annual or perennial, rooting at lower nodes, to 50 cm long, the culms glabrous. *Leaf sheaths* glabrous

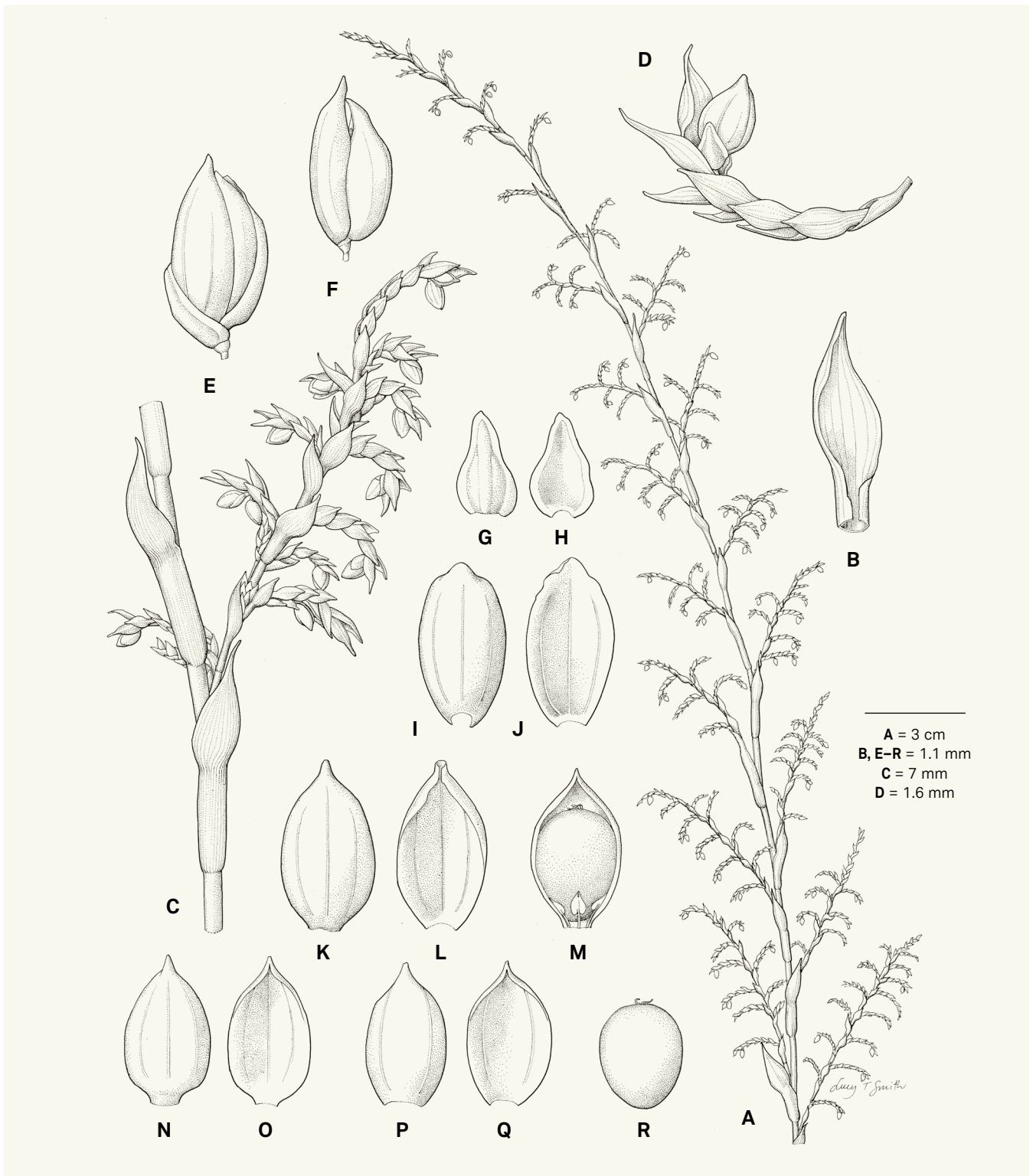


Fig. 7. – *Panicum cupressifolium* A. Camus. **A.** Habit; **B.** Leaf; **C.** Flowering branch; **D.** Apex of flowering branch; **E.** Spikelet; **F.** Spikelet with glumes removed; **G.** Lower glume, dorsal view; **H.** Lower glume, ventral view; **I.** Upper glume, dorsal view; **J.** Upper glume, ventral view; **K.** Lower lemma, dorsal view; **L.** Lower lemma, ventral view; **M.** Upper floret with palea removed; **N.** Upper lemma, dorsal view; **O.** Upper lemma, ventral view; **P.** Upper palea, dorsal view; **Q.** Upper palea, ventral view; **R.** Immature caryopsis. [Nanjarisoa et al. 87, K] [Drawing: Lucy T. Smith]



Fig. 8. – Distribution maps. **A.** *Panicum cupressifolium* A. Camus (stars), *P. danguyi* A. Camus (triangles), *P. dregeanum* Nees (circles) and *P. flacourtii* A. Camus (squares); **B.** *Panicum humbertii* A. Camus (stars), *P. humile* Nees ex Steud. (triangles), *P. ibitense* A. Camus (circles) and *P. inconspicuum* Voronts. (squares).

or with ciliate edges. *Ligule* a lacerate ciliolate membrane. *Leaf blades* ovate to linear-lanceolate, flat or folded, reflexed at maturity, membranous, 1–6.5 × 0.1–0.4 cm, drying yellow-green to red-green, glabrous to pubescent on both sides. *Panicles* terminal, partly or fully exerted on a peduncle to 3 cm long, 3–5 cm long, linear to narrowly elliptic, dense, the branching distichous or in threes, the branches appressed, sometimes with white cilia exceeding the spikelet, the pedicels 0.5–3 mm long. *Spikelets* ovate to oblong, apically rounded to acute, 1.2–1.5 mm long, yellowish or purple, never gaping open. *Lower glume* a nerveless vestige of variable shape. *Upper glume* as long as the spikelet, membranous, 3-veined, with small trichomes between the veins. *Lower floret* barren, without a significant palea. *Lower lemma* translucent, 3–5-veined, with minute trichomes between the veins or towards the apex. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to the mountains of northwestern Madagascar, 1700–2500 m (Fig. 8A).

Notes. – This species is likely a member of a group of closely related wet forest and montane species also including *P. crystalinum*, *P. flacourtii* A. Camus, *P. manongarivense* A. Camus, and *P. vobitrense* A. Camus (Madagasy regional endemics) as well as *P. mitopus* K. Schum. (Madagascar and East Africa). Species boundaries within this group remain unclear. *Panicum danguyi* can be distinguished by its condensed panicles with pale yellowish to purple spikelets evenly distributed throughout the panicle.

The epithet of *P. danguyi* var. *mahavavyensis* is sometimes cited with an alternative spelling ‘mahavavensis’ which is incorrect because the protologue latinized the Malagasy place name ‘Mahavavy’ preserving the final vowel (CAMUS 1952b: 143).

The lectotype sheet of *P. danguyi* is chosen because it has been annotated by Camus. The lectotype sheets of *P. danguyi* var. *mahavavyensis* and *P. tsaratananense* are chosen because of their superior flowering material as well as an annotation by Camus.

Additional material examined. – MADAGASCAR. Prov. Antsiranana: Mt Tsaratanana, V.1926, Perrier de la Bâthie 16371 (P [P03182747]).

11. *Panicum dregeanum* Nees, Fl. Afr. Austral. III. 42. 1841.

Typus: SOUTH AFRICA. Prov. KwaZulu Natal: Port Natal, 100–400' [30–120 m], s.d., *Drège s.n.* (HAL [HAL0063368] image seen, K [K00025535]!, W [W0000283] image seen).

= *Panicum ambongense* A. Camus in Bull. Soc. Bot. France 99: 64. 1952. **Lectotypus** (designated here): MADAGASCAR. Prov. Antsiranana: Manongarivo, Ambongo, XII.1903, *Perrier de la Bâthie 158* (K [K000805608]!), **syn. nov.**

Erect caespitose perennial, in dense compact tufts with a hardened woody base, 0.3–1 m tall, the stems glabrous. *Leaf sheaths* glabrous (although often pubescent in African populations). *Ligule* a ciliolate membrane. *Leaf blades* linear, flat or rolled, chartaceous, 10–20 × 0.2–0.4 cm, drying red-green, glabrous (often pilose in African populations) on both sides. *Panicles* terminal, partly or fully exserted, 10–25 cm long, oblong, a relatively small proportion of the plant, the branches shorter than the main axis of the panicle, appressed or ascending, scabrous. *Spikelets* ovate, apically acuminate, (1.8–)2–2.5 mm long, purplish, gaping open at maturity. *Lower glume* ½–¾ as long as the spikelet, keeled, apically long-acuminate to mucronate, 5-veined, finely scabrous on the keel. *Upper glume* as long as the spikelet, herbaceous, 5–7-veined, glabrous slightly keeled in the upper part. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* c. 1.5 mm long, shorter than the lower floret, smooth, shiny, brown.

Distribution and ecology. – Common across tropical Africa. Apparently less common in Madagascar occurring along the East coast and North-west coast, with two records from the High Plateau; coastal sand, open areas, and savanna, 0–1000 m (Fig. 8A). CAMUS (1952) reports that it forms thick lawns on damp sand near Manongarivo.

This species has not been seen in the field by the author but the distribution suggests it is likely to be an introduction.

Notes. – CAMUS (1952) reports that the spikelets open prior to anthesis. Lateral veins on the lower glume can be difficult to see but there are five visible on at least some spikelets and three are usually clear; these are important for identification. The clear perennial habit with a hard knotty root stock make an easy distinction from *P. novemnerve* and *P. humile* which have similarly long-acuminate glumes and lower lemma. CLAYTON (1982) keys out this species as “basal leaves silky-pubescent”, although some African and all the Malagasy populations have glabrous leaf sheaths.

The full typification of *P. dregeanum* is outside the scope of this work and will be published as part of an ongoing study of African *Panicum* s.l. The protologue of *P. ambongense* cites

“*Perrier de la Bâthie 11208 (168)*” which is likely a transcription error as the only specimen found to match all the protologue data is numbered *Perrier de la Bâthie 158*, where the handwritten number “5” closely resembles a “6”. This specimen is chosen to be the lectotype because it is the only known original material of *P. ambongense*.

This species is illustrated in BOSSER (1969: Fig. 126e-h) and in CLAYTON (1989: tab. 7).

Additional material examined. – MADAGASCAR. Prov. Antananarivo: Ambohimanga, 27.III.1921, *Decary 155* (L [K000805487], P [P02222309]); vallée de la Saonjo, V.1964, *Morat 1093* (TAN). Prov. Fianarantsoa: Nosy Varika, V.1953, *Bosser 5571* (TAN); Farafangana, III.1963, *Bosser 17907* (P [P02608838]); PK 50 avant Mananjary, II.1964, *Bosser 19023* (P [P03487904], TAN); Mananjary–Nosy Varika, I.1964, *Bosser 19027* (P [P02608837], TAN); Mananjary, III.1909, *Geay 7121* (P [P02608835]); Mananjary, III.1909, *Geay 7143* (P [P02608828]); *ibid. loco*, III.1909, *Geay 7151* (P [P02608830]); *ibid. loco*, III.1909, *Geay 7351* (P [P02608829]); *ibid. loco*, III.1909, *Geay 7673* (P [P02608834]); *ibid. loco*, III.1909, *Geay 7762* (P [P02608827]); près de la baie du Namorona, 19.II.1964, *Peltier & Peltier 4709* (P [P02726879]); 33 km S of Irondro, 26.III.1993, *Turk & Beck 366* (P [P02325431], TAN). Prov. Mahajanga: Besalampy, paturage de Beloke, IX.1958, *Herb. Inst. Sci. Mada. s.n.* (P [P02309334]). Prov. Toamasina: Brickaville, I.1964, *Morat 365* (P [P02608839]). **Sine loco:** *Geay 7242* (P [P02608832]).

12. *Panicum flacourtii* A. Camus in Bull. Soc. Bot. France 72: 449. 1925.

Lectotypus (designated here): MADAGASCAR. Prov. Antsiranana: Mt. Tsaratanana, IV.1924, *Perrier de la Bâthie 16163* (P [P00450264]!); isolecto-: P [P00450265]!).

Ascending wiry annual or perennial, rooting at lower nodes, 10–60 cm tall, the culms glabrous. *Leaf sheaths* glabrous or with ciliate edges. *Ligule* a lacerate ciliolate membrane. *Leaf blades* lanceolate, flat, reflexed at maturity, chartaceous, 1–2 × 0.2–0.4 cm, drying red-green, sparsely hirsute on both sides. *Panicles* terminal, fully exserted on a peduncle 5–8 cm long, 3–6 cm long, ovate, diffuse, the branching distichous or in threes, the branches divergent, wiry, with occasional white cilia, the pedicels 1.5–4 mm long. *Spikelets* ovate-elliptic, apically acute, 1.3–1.5 mm long, purple, never gaping open. *Lower glume* a nerveless vestige of variable shape. *Upper glume* as long as the spikelet, membranous, 3-veined, glabrous or with a few small trichomes, dehiscing early. *Lower floret* barren, without a significant palea. *Lower lemma* membranous, 3–5-veined, with minute trichomes between the veins or towards the apex. *Upper lemma* smooth, shiny, pale brown.

Distribution and ecology. – Restricted to Mount Tsaratanana, forest with lichen c. 2000 m (Fig. 8A).

Notes. – This species is likely a member of a group of closely related wet forest and montane species also including *P. crystallinum*, *P. danguyi*, *P. manongarivense*, and *P. vohitrense*

(Malagasy regional endemics) as well as *P. mitopus* (Madagascar and East Africa). Species boundaries within this group remain unclear, particularly for *P. flacourtii* which is only known from two collections. If the open arrangement of the panicle is not a reliable character *P. flacourtii* could be conspecific with *P. danguyi*. *Panicum flacourtii* seems to occur in drier environments than other members of this group and can be distinguished by its open panicles with single spikelets, and purple to dark brown inflorescence branches and spikelets.

The lectotype is chosen for its superior flowering material.

Additional material examined. – MADAGASCAR. Prov. Antsiranana: Mt. Tsaratanana, IV.1924, *Perrier de la Bâthie 16104 bis* (P [P02608821]).

13. *Panicum humbertii* A. Camus in Bull. Soc. Bot. France 72: 620. 1925.

Lectotypus (designated here): MADAGASCAR. Prov. Antsiranana: Massif de Manongarivo, IV.1909, *Perrier de la Bâthie 11088* (P [P00450267]!); isolecto-: P [P00450268]!).

= *Panicum muscicola* A. Camus in Bull. Soc. Bot. France 94: 40. 1947 [as *muscicolium*]. **Lectotypus** (designated here): MADAGASCAR. Prov. Antsiranana: Montagne d'Ambre, VIII.1933, *Perrier de la Bâthie 19300* (P [P00450256]!); isolecto-: P [P02263028]!).

= *Panicum calcicola* A. Camus in Bull. Soc. Bot. France 94: 39. 1947 [as *calcicolium*]. **Lectotypus** (designated here): MADAGASCAR. Prov. Antsiranana: Montagne des Français, V.1923, *Perrier de la Bâthie 16209* (P [P00450281]!); isolecto-: P [P00450279, P00450280]!).

Scandent perennial woody at base, rooting at nodes, to 2 m long, the culms glabrous, the nodes dark and glabrous. *Leaf sheaths* glabrous, with bulbous-based hairs on the margins. *Ligule* membranous, obtuse. *Leaf blades* lanceolate, often asymmetric at base, flat, membranous, 4–15 × 1–2.5 cm, drying green-brown, cross veins visible when dry, glabrous to sparsely pubescent on both sides, sometimes with bulbous based cilia on the lower part of the margin. *Panicles* terminal, partly exserted, (5–)15–20 cm long, effuse, the branches dehiscent, appressed when young and becoming broadly divergent at maturity, usually with a dense cover of bulbous-based white cilia several times longer than the spikelet. *Spikelets* elliptic, apically acute, 1–1.4 mm long, brown, never gaping open. *Lower glume* c. 2/3 as long as the spikelet, membranous, acute, 3-veined, with small prickly hairs. *Upper glume* usually as long as the spikelet, sometimes 2/3–3/4 as long, herbaceous, (3–)5-veined, with small prickly hairs, dehiscent early. *Lower floret* barren, without a significant palea. *Lower lemma* herbaceous, 5-veined, with small prickly hairs. *Upper lemma* smooth, shiny, brown.

Distribution and ecology. – Endemic to northern Madagascar seasonally dry forest on limestone and gneiss, 250–1200 m (Fig. 8B). Seems to be rare; an expedition by the author in 2015 failed to locate this species.

Notes. – This species has dehiscent inflorescence branches, a rare character in grasses. Panicle branches are appressed to the axis on emergence. As the inflorescence ages the upper branches of the inflorescence dehisce, leaving broadly divergent lower inflorescence branches. Hirsute inflorescence branches can form a tangled mass (*Wohlhauser & Andriamalaza 60285*) which may attach itself to passing animals. Spikelets are similar to *Cyrtococcum multinode* (Lam.) Clayton but not dorsally compressed, the spikelets are single, and panicle branches almost always have long white hairs. *Panicum muscicola* is a variant with no trichomes in the inflorescence. Inflorescences of *P. humbertii* are at least 10 cm long; a single collection *Bosser 20382* has inflorescences c. 5 cm long, likely associated with a particularly dry habitat.

The lectotypes of *P. humbertii*, *P. muscicola* and *P. calcicola* are chosen for their superior flowering material.

Additional material examined. – MADAGASCAR. Prov. Antsiranana: Montagne d'Ambre, VII.1953, *Bosser 5342* (P [P02608857], TAN); *ibid. loco*, VII.1953, *Bosser 5379* (P [P02263027]); *ibid. loco*, VII.1953, *Bosser 5543* (K [K000805468], P [P02222308]); montagne des Français, 13.IV.1970, *Bosser 20162* (P [P06795924]); *ibid. loco*, 13.IV.1970, *Bosser 20169* (P [P06795925]); forêt de Sahafary, VI.1970, *Bosser 20382a* (P [P02222320]); NE d'Ambondromifehy, S d'Anivorano-Nord, VI.1970, *Capuron s.n.* (K [K000805469], P [P02222313]); Andrahanjo, c^{on} Ambohimbajo, 16.V.1957, *Christophe 8980* (P [P02608860]); montagne des Français, V.1924, *Perrier de la Bâthie 16211* (P [P02324470]); Manongarivo RS, bassin de l'Ankazomena, 13°56'S 48°27'E, 2.VI.2000, *Wohlhauser & Andriamalaza 60285* (K [K000805467], P [P04430800]).

14. *Panicum humile* Nees ex Steud., Syn. Pl. Glumac. 1: 84. 1854.

Holotypus: SRI LANKA: *sine loco*, s.d., *Thwaites 3243* (P [not found]; iso-: B, BO, BR [BR0000005919376] image seen, K [K000245604]!, PDA, US image seen, W [W18890065031, W18890163787] image seen).

= *Panicum walense* Mez in Bot. Jahrb. Syst. 34: 146. 1904 [as *watense*]. **Holotypus**: SENEGAL: Near Wato [Walo], III.1828, *Leprieur 52* (B [B100168663] image seen; iso-: P [P00442173]!, US [US00140091]!).

Erect annual, in diffuse tufts, 10–40 cm tall, with glabrous stems and nodes. *Leaf sheaths* glabrous. *Ligule* a minute ciliate lacerate membrane. *Leaf blades* linear, flat, chartaceous, 3–15 × 0.3–0.5 cm, drying yellow-green, glabrous on both sides. *Panicles* terminal, partly exserted, 10–15 cm long, ovate, effuse, abundant and prominent on the plant, the branches filiform, scabrous, the pedicels 1.5–7 mm long. *Spikelets* ovate, apically acuminate, 1.7–2(–2.2) mm long, white to purple,

gaping open at maturity. *Lower glume* c. $\frac{3}{4}$ as long as the spikelet, apically long-acuminate, 3-veined, glabrous, separated from the rest of the spikelet by a short internode. *Upper glume* as long as the spikelet, herbaceous, 5-veined, glabrous. *Lower floret* barren, with a reduced palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* c. 1.5 mm long, shorter than the lower floret, smooth, shiny, pale.

Distribution and ecology. – Widespread tropical African and Asian species. Occasional across Madagascar, most commonly recorded from the northwest; near water, below 1000 m (Fig. 8B).

Notes. – The distribution along roads and populated places suggests a non-native origin for this species in Madagascar.

This species is illustrated in BOSSER (1969: Fig. 125f-i as "*Panicum walense*").

Additional material examined. – MADAGASCAR. **Prov. Antsiranana:** Nosy Be, *Bosser 409* (P [P02608187]); PK 70 Ambilobe – Ambanja, 18.IV.1970, *Bosser 20241* (P [P02309343]); Nosy Be, *Gaudichaud 191* (P [P02608178]); *ibid. loco*, *Richard 323* (P [P02608177]); *ibid. loco*, *Richard 642* (P [P02608175]). **Prov. Mahajanga:** Ambalakidy, VI.1953, *Bosser 5482* (P [P02608188]); canton de Belobaka, IV.1963, *Bosser 17612* (P [P02608182]); canton de Mahazoma, V.1958, *Descouings 3408* (P [P02608185]); PK 407 rte Majunga, IV.1967, *Morat 2698* (P [P02726844]); Firingalava, III.1898, *Perrier de la Bâthie 535* (P [P02608190]); bassin du Bemarivo, X.1906, *Perrier de la Bâthie 11129* (P [P02608191]); *ibid. loco*, III.1907, *Perrier de la Bâthie 11141* (P [P02608193]); Majunga, V.1927, *Perrier de la Bâthie 17948* (P [P02608186]). **Prov. Toamasina:** Anororo, W lac Alaotra, VI.1955, *Bosser 8139* (P [P02608184]). **Prov. Toliara:** Manja, 9.IV.1953, *Portères s.n.* (P [P02307376]).

15. *Panicum ibitense* A. Camus in Bull. Soc. Bot. France 72: 371. 1925 (Fig. 6B, 9).

Lectotypus (designated here): MADAGASCAR. **Prov. Antananarivo:** Mont Ibity, I.1914, *Perrier de la Bâthie 10771* (P [P00450269]); isolecto-: K [K000244700]!, P [P00450270]!, TAN [TAN000389]!, US [US00147890]!.

Scandent ascending perennial, with wiry branching stems and an underground bulb 5–8 mm in diameter, to 70 cm long, with glabrous stems and nodes, the nodes enlarged near the base and sometimes finely pilose when young. *Leaf sheaths* glabrous. *Ligule* membranous, truncate. *Leaf blades* linear, flat or rolled, firm, 1–8 × 0.1–0.4 cm, glaucous, dehiscing at the base of the leaf sheaths, scaberulous on both sides. *Panicles* terminal, fully exserted, 10–20 cm long, ovate, the branches wiry, glabrous. *Spikelets* ovate, apically obtuse, 1.5–2 mm long, brown to purple, partly open at maturity. *Lower glume* $\frac{3}{4}$ – $\frac{4}{5}$ as long as the spikelet, truncate to obtuse, with fine cilia at the apex, 3–5-veined, with small prickly hairs on the upper part. *Upper glume* as long as the spikelet or sometimes $\frac{3}{4}$ of the spikelet length, herbaceous, 5-veined, with small prickly hairs on the upper part. *Lower floret* male, with palea. *Lower lemma*

herbaceous, 5-veined, with small prickly hairs on the upper part. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to Madagascar's southern High Plateau (a single collection known from northern Madagascar), common in the frequently burned tapia forest and in open rocky habitats, often on quartz, 800–1800 m (Fig. 8B).

Notes. – This species is unique among Madagascar's grasses in its unusual adaptation to fire: bases of the culms thicken into woody perennial nodule-like storage organs below the ground. The young plant has short flat leaf blades along the culm which dehisce early, leaving only the wiry stems and inflorescences visible for most of the year. Spikelets also dehisce early. The long lower glume, almost as long as the spikelet, is a useful character for identification.

The *Gautier 3011* record from Manongarivo is surprising and seems doubtful. This collection does not have an underground storage organ which could be due young plant age; the late post-flowering stage of the spikelets also decreases reliability.

Other species named after Mount Ibity use the epithet "*ibityense*" but this was published as "*ibitese*" and may not be corrected according to Art. 60.9 (TURLAND et al., 2018).

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

Additional material examined. – MADAGASCAR. **Prov. Antananarivo:** PK 40 rte d'Arivonimamo, V.1960, *Bosser 14450* (P [P02608818], TAN); *ibid. loco*, V.1962, *Bosser 15596* (P [P02325449], TAN); 60 km on rte de Miarinarivo, V.1962, *Bosser 16003* (P [P02608815], TAN); Ambohimanga, 27.III.1921, *Decary 159* (P [P02608848]); *ibid. loco*, 27.III.1921, *Decary 162* (P [P02608808]); *ibid. loco*, 27.III.1921, *Decary 165* (P [P02608847]); Ibity Massif, 15.II.2003, *Schatz et al. 4036* (P [P02309339], TAN); *ibid. loco*, 17.II.2003, *Schatz et al. 4108* (K [K000805609], P [P06795901]). **Prov. Antsiranana:** Manongarivo Reserve, en-dessous d'Ambalafary, 14°04'S 48°17'E, 8.IV.1996, *Gautier 3011* (G, K [K000805463], P [P06795994], TAN). **Prov. Fianarantsoa:** entre Ambatofinandrahana et Itremo, IX.1956, *Bosser 9780* (TAN); 45 km avant Ambositra, XII.1963, *Bosser 18750* (P [P02608814], TAN); Ranohira, Isalo, PK 713, III.1964, *Bosser 19125* (P [P02608816], TAN); Itremo, IV.1964, *Bosser 19562* (P [P02608812], TAN); 54 km E of Ambatofinandrahana, 25.I.1975, *Croat 29644* (TAN); pentes occidentales à Faliarivo, III.1934, *Humbert 14502* (P [P02608809]); plateaux et vallées de l'Isalo, 29.I.1955, *Humbert 29 757* (P [P03487887], TAN); montagnes à l'W d'Itremo, *Humbert 30077* (P [P02608806]); *ibid. loco*, 17.I.1955, *Humbert 30080* (G, P [P02608844], TAN); Itremo, Ambatoantrano, 20°34'11"S 46°34'51"E, 17.III.2013, *Nanjarisoa & Andriamampionona 49* (K, TAN); Itremo, Ampangabe, 20°36'41"S 46°36'34"E, 15.II.2014, *Nanjarisoa et al. 114* (K, TAN); Itremo, Soatsihotapaka, 20°31'33"S 46°34'54"E, 20.II.2014, *Nanjarisoa et al. 153* (K, TAN); Itremo, Ianasana, 20°34'41"S 46°35'05"E, 13.III.2012, *Ratovonirina et al. 171* (K, TAN [K000753861]); *ibid. loco*, 13.III.2012, *Ratovonirina et al. 189a* (K, TAN [K000753879]); Isalo, 1.7 km from Namaza camp on the trail to the Blue and Black Pools, 22°32'15"S 45°22'31"E, 17.XII.2013, *Vorontsova et al. 1315* (TAN); Itremo, Ambatoasira, 20°36'44"S 46°34'26"E, 20.V.2014, *Vorontsova et al. 1582* (TAN); Itremo, IV.1921, *Waterlot 106* (P [P02608846]). **Prov. Toamasina:** près de la gare de Masse, *Bosser 16588* (P [P02608820],

TAN); Ambatovy, I.1972, *Bosser 21115* (P [P06795997]); *ibid. loco*, V.1969, *Morat 3245* (P [P02307366]); Mangoro, II.1925, *Perrier de la Bâthie 16886* (P [P02608845]); Ambatovy, 18°48'48"S 48°19'40"E, 23.II.2005, *Rakotovoao et al. 1362* (K [K000805485], P [P06768481]); Ambatovy, commune rurale Ambohibary, 18°51'14"S 48°18'50"E, 22.II.2005, *Razanatsoa et al. 244* (G, P [P06768480]).

16. *Panicum inconspicuum* Voronts. in Kew Bull. 69–9511: 6. 2014.

Holotypus: MADAGASCAR. Prov. Toliara: Onilahy valley, the seven lakes, III.1960, *Bosser 14595* (TAN!; iso-: P [P02307405]!).

Delicate annual, ascending, rooting at lower nodes, 15–30 cm tall, the culms glabrous. Leaf sheaths large glabrous with ciliate edges. *Ligule* a lacerate membrane. *Leaf blades* elliptic, flat, membranous, 1.5–6 × 0.5–1 cm, drying yellow-green, glabrous or with sparse bulbous-based cilia on both sides. *Panicles* terminal, partly or fully exerted on a peduncle 5–7 cm long, 4–10 cm long, ovate, side branches single, the branches divergent at maturity, scabrous, the spikelets usually paired, the pedicels 0.5–7 mm long. *Spikelets* elliptic, apically rounded, 1.2–1.3 mm long, pale green, never gaping open. *Lower glume* ½–½ as long as the spikelet, obtuse to acute, 3-veined, glabrous becoming pubescent with curved glassy trichomes at maturity. *Upper glume* as long as the spikelet, membranous, 5-veined, glabrous becoming pubescent with curved glassy trichomes at maturity. *Lower floret* barren, without a significant palea. *Lower lemma* translucent, 3–5-veined, glabrous becoming pubescent with curved glassy trichomes at maturity. *Upper lemma*, apically apiculate, smooth, shiny, pale brown.

Distribution and ecology. – Endemic to southwestern Madagascar, understory of dry forest on limestone, 50–350 m elevation (Fig. 8B).

Notes. – Previously overlooked likely due to its superficial resemblance to the common *P. brevifolium*. Differs from *P. brevifolium* by its lower glume ½–½ as long as the spikelet (vs lower glume as long as the spikelet in *P. brevifolium*) and elliptic leaves (vs ovate in *P. brevifolium*).

This species is illustrated in VORONTSOVA (2014: Fig. 2).

Additional material examined. – MADAGASCAR. Prov. Toliara: les 7 lacs, rte Tongobory, 16.V.1951, *Bosser 6 bis* (P [P02307404]); 50 km de Tulear, rte de Sakaraha, III.1960, *Bosser 14065* (P [P02726877]); *ibid. loco*, III.1960, *Bosser 14066b* (P [P02726878]); Beomby, plateau Mahafaly, III.1960, *Bosser 14167* (P [P02726875]); forêt du Zombitsy, III.1964, *Bosser 19362* (P [P06795981]); Fiherenana aux env. de Manera, V.1933, *Perrier de la Bâthie 19215* (P [P02307334]).

17. *Panicum luridum* Hack. in J. Linn. Soc., Bot. 29: 64. 1891 (Fig. 6C).

Lectotypus (designated here): MADAGASCAR. Prov. Antananarivo: Antananarivo (interior), s.d., *Scott Elliot 1745* (W [W1916-0019398] image seen; isolecto-: E [E00200284] image seen, K [K000244704]!, P [P00450228]!, US [US00148261]!).

Stoloniferous perennial, usually geniculately ascending, often with a hardened underground part, to 40 cm tall, the stems and nodes glabrous. *Leaf sheaths* glabrous to pilose. *Ligule* a line of hairs. *Leaf blades* linear to lanecolate, flat, firm, 2–10 × 0.2–0.5 cm, drying yellow-green, glabrous to pilose on both sides sometimes with bulbous based cilia on the lower part of the margin. *Panicles* terminal, fully exerted, 4–7 cm long, ovate, the branches appressed to ascending, glabrous. *Spikelets* broad, apically acute, 1.8–2.5 mm long, pale brown or purplish, gaping open at maturity. *Lower glume* c. ½ as long as the spikelet, keeled, apically finely acuminate, 3-veined, finely scabrous on the keel. *Upper glume* as long as the spikelet, herbaceous, 5-veined, glabrous. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to Madagascar's High Plateau and the env. of Mahajanga, in open grassland, savanna, tapia forest, and disturbed vegetation, often on sand, 0–1600 m (Fig. 10A).

Notes. – This species is not known in coastal regions except for Mahajanga. The species boundaries with both *P. cinctum* and *P. voeltzkowii* are somewhat complex. It has larger spikelets than *P. voeltzkowii*; the spikelets also more acute while being obtuse in the other two.

The sheet W [W1916-0019398] is from Hackel's own herbarium with his original handwriting which is why it is has been chosen to be the lectotype.

This species is illustrated in BOSSER (1969: Fig. 125a–e).

Additional material examined. – MADAGASCAR. Prov. Antananarivo: Nanisana, V.1905, *Alleizette 190* (P [P02207837]); Ibity, 20°04'06"S 47°00'10"E, 26.II.2008, *Andriamahay & Rakotoarisoa 1892* (K [K000805492]); Central Madagascar, Baron 633 (K [K000805488]); Analabe, VI.1951, *Bosser 571* (P [P02726880], TAN); *ibid. loco*, VI.1951, *Bosser 577* (TAN); Manjakandriana, V.1952, *Bosser 646* (P [P02309304], TAN); Antananarivo, V.1951, *Bosser 711* (TAN); Arivonimamo, V.1951, *Bosser 1161* (TAN); env. d'Ambatolampy, II.1953, *Bosser 4797* (P [P02207838]); Analabe, III.1953, *Bosser 5209* (P [P02207835], TAN); PK 50 rte de Majunga, II.1954, *Bosser 7421* (TAN); Ambohimandroso, XII.1955, *Bosser 8885* (P [P02207850]); Andramasina, II.1958, *Descoings 3028* (TAN); Antananarivo, *Herb. Jard. Bot. Tan. 913* (P [P02207829], TAN); Nanisana, bord du chemin d'Anjanahary, 3.II.1933, *Herb. Jard. Bot. Tan. 32457* (P [P02207836], TAN); W de Tsiroanomandidy, XII.1974, *Morat 4783* (P [P02207841], TAN); Central Madagascar, *Parker s.n.* (K [K000805486]); Andranomena, 19°01'03"S 47°13'30"E, 12.III.2011, *Ramahafabariavelo et al. 397* (P [P06795472]); Ambohitantely, Manankazo, 5.II.1948, *Réserves Naturelles*

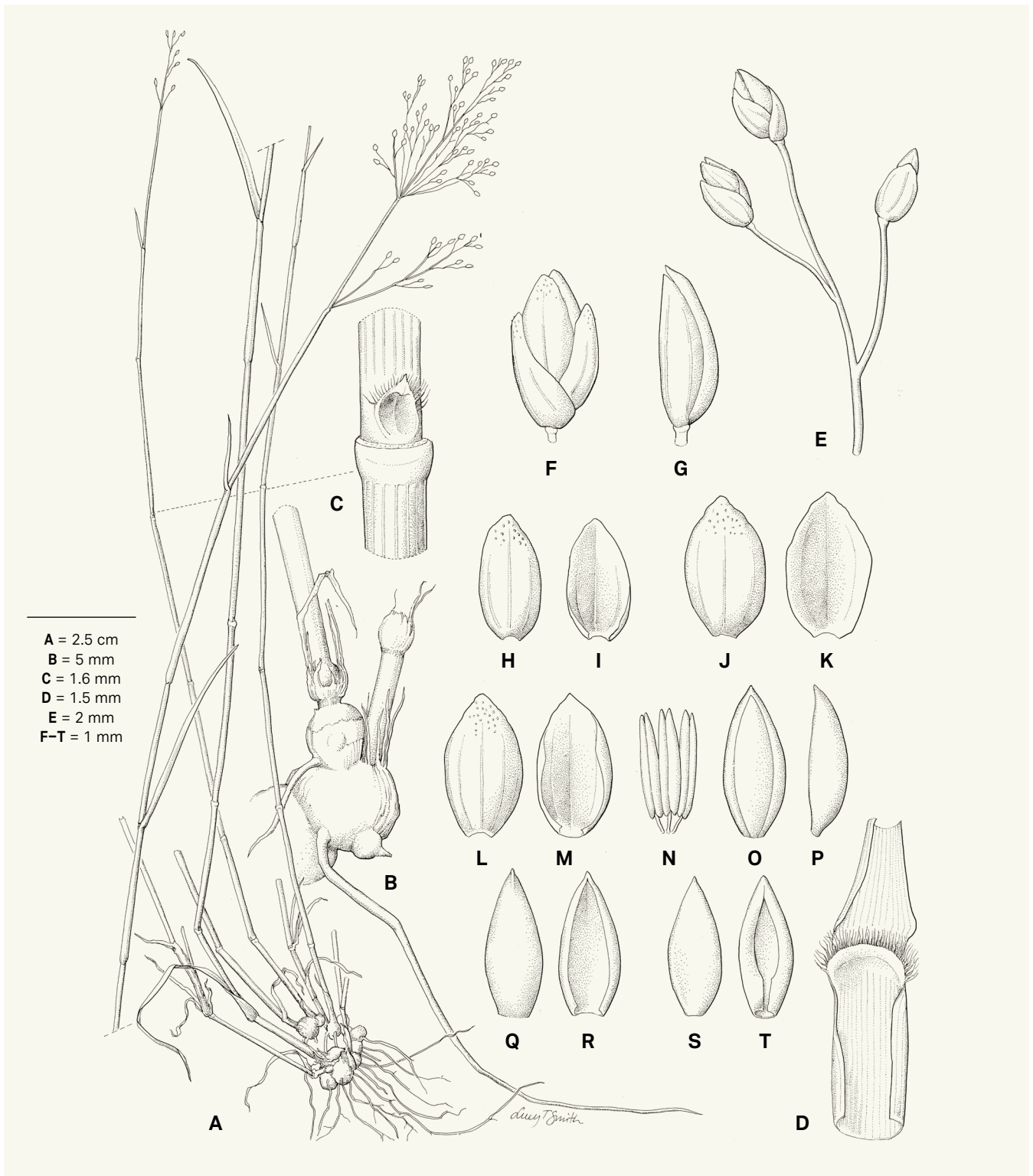


Fig. 9. – *Panicum ibitense* A. Camus. **A.** Habit; **B.** Culm base below ground, enlarged; **C.** Node, enlarged; **D.** Ligule; **E.** Flowering branch; **F.** Spikelet; **G.** Spikelet with glumes removed; **H.** Lower glume, dorsal view; **I.** Lower glume, ventral view; **J.** Upper glume, dorsal view; **K.** Upper glume, ventral view; **L.** Lower lemma, dorsal view; **M.** Lower lemma, ventral view; **N.** Lower floret stamens; **O.** Upper floret, ventral view; **P.** Upper floret, lateral view; **Q.** Upper lemma, dorsal view; **R.** Upper lemma, ventral view; **S.** Upper palea, dorsal view; **T.** Upper palea, ventral view. [Ratovonirina et al. 171, K] [Drawing: Lucy T. Smith]

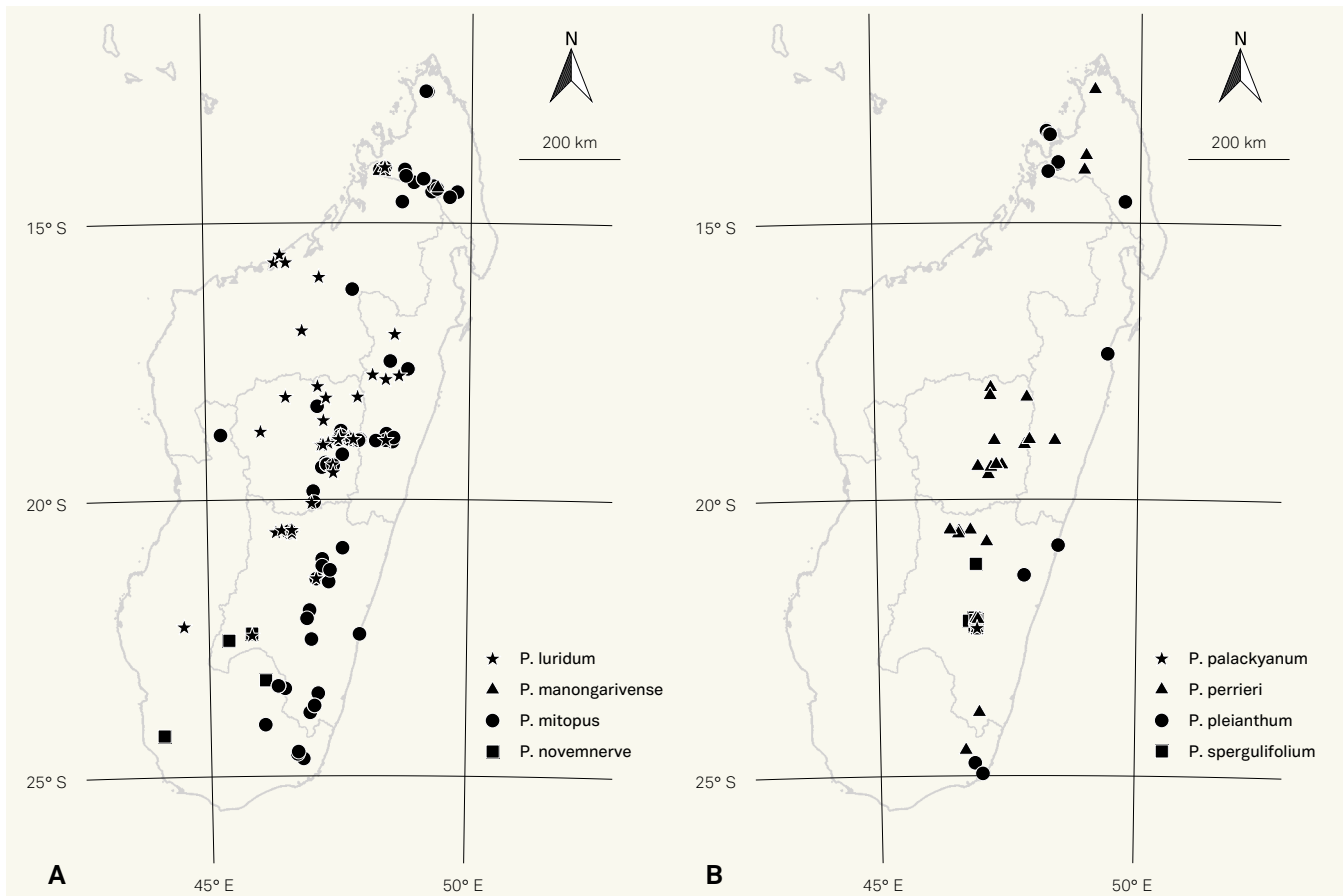


Fig. 10. – Distribution maps. **A.** *Panicum luridum* Hack. (stars), *P. manongarivense* A. Camus (triangles), *P. mitopus* K. Schum. (circles) and *P. novemnerve* Stapf (squares); **B.** *Panicum palackyanum* A. Camus (stars), *P. perrieri* A. Camus (triangles), *P. pleianthum* Peter (circles) and *P. spergulifolium* A. Camus (squares).

1462 (P [P02207834]); Ifaty, 20.VI.1907, *Rotereau s.n.* (P [P02373568]); Antananarivo, 29.III.1950, *Service de l'Agriculture 111* (TAN); Imerintsia-tosika, *Service de l'Agriculture 395* (TAN); Analamaintso forest, 17°57'31"S 47°07'30"E, 13.II.2013, *Vorontsova et al. 909* (K, TAN). **Prov. Antsiranana:** Manongarivo, X.1903, *Perrier de la Bâthie 11101* (P [P02325393]). **Prov. Fianarantsoa:** Ibeoaka, XII.1952, *Bosser 1485* (TAN); Fianarantsoa, XII.1951, *Bosser 1588* (TAN); Horombe, II.1965, *Morat 2021* (TAN); Itremo, Ampangabe, 20°36'53"S 46°37'11"E, 16.III.2013, *Nanjarisoa et al. 24* (K, TAN); Itremo, Mandimbizaka, 20°35'46"S 46°18'51"E, 14.II.2014, *Nanjarisoa et al. 98* (K, TAN); env. de Fianarantsoa, V.1912, *Perrier de la Bâthie 10863* (P [P02325391]); Itremo, Antsirakambiaty, 20°35'42"S 46°33'47"E, 12.III.2012, *Vorontsova et al. 741* (K, TAN). **Prov. Mahajanga:** forêt d'Antsahanitia, 15°34'34"S 46°25'30"E, 23.IV.2009, *Andriamabay & Rakotoarisoa SNGF 2238* (TAN); Beronono, Tsaramandroso, XI.1951, *Bosser 1885* (P [P02207833]); *ibid. loco*, XI.1951, *Bosser 1888* (TAN); entre Ambalakidy et Ambalabe, VI.1953, *Bosser 5473* (TAN); env. de Majunga, VI.1953, *Bosser 5755* (P [P02207847], TAN); Mae-vatanana, 26.XII.1941, *Decary 17031* (P [P02207803]); riv. du Mahajamba, au dessus de Beronono, I.1907, *Perrier de la Bâthie 11143* (P [P02207848]); près de Majunga, III.1927, *Perrier de la Bâthie 17950* (K [K000805490], P [P02207851]). **Prov. Toamasina:** Andilamena, N lac Alaotra, 1952, *Bosser 979* (TAN); Morarano, XII.1954, *Bosser 7467* (TAN); *ibid. loco*, XII.1964, *Bosser 7468* (P [P02207832]); *ibid. loco*, XII.1954, *Bosser 7470* (TAN); *ibid. loco*, XII.1954, *Bosser 7471* (P [P02251455], TAN); Andilamena, V.1953, *Bosser s.n.* (P [P02726868]); Ambatondrazaka, II.1933, *Herb. Jard. Bot. Tan. 324104* (P [P02207830]); *ibid. loco*, III.1932, *Herb. Jard. Bot. Tan. 324129* (TAN);

Ambodivoaro, III.1932, *Herb. Jard. Bot. Tan. 324143* (P [P02207831], TAN); Analamazaotra, *Perrier de la Bâthie 10923* (P [P02207846]); Manakambahiny, 24.XII.1962, *Réserve Naturelles 12361* (P [P06795993]). **Prov. Toliara:** SW de Ankazoabo, 20.II.1970, *Bosser 19946* (K [K000805594], P [P02222319]); piste d'Ankazoabo à Befandriana, II.1968, *Morat 2874* (TAN). *Sine loco:* *Methuen s.n.* (K [K000805496]).

18. *Panicum manongarivense* A. Camus in Bull. Soc. Bot. France 72: 707. 1925 (Fig. 11).

Lectotypus (designated here): **MADAGASCAR. Prov. Antsiranana:** massif de Manongarivo, IV.1909, *Perrier de la Bâthie 11091* (P [P00450232]!; isolecto-: K [K000244705]!, P [P00450233]!, TAN [TAN000390]!).

Delicate prostrate or ascending annual to 50 cm long, the culms glabrous. *Ligule* a lacerate ciliolate membrane, c. 0.7 mm long, with brown membranous auricles 1–1.5 mm long on mature leaves. *Leaf blades* ovate to lanceolate, membranous, 0.5–4.5 × 0.2–0.8 cm, drying glaucous, glabrous to sparsely hirsute on both sides. *Panicles* terminal and axillary, pendent, partly exserted with no clear peduncle, 0.5–7 cm long, diffuse, the branching distichous or in threes, the branches filiform,

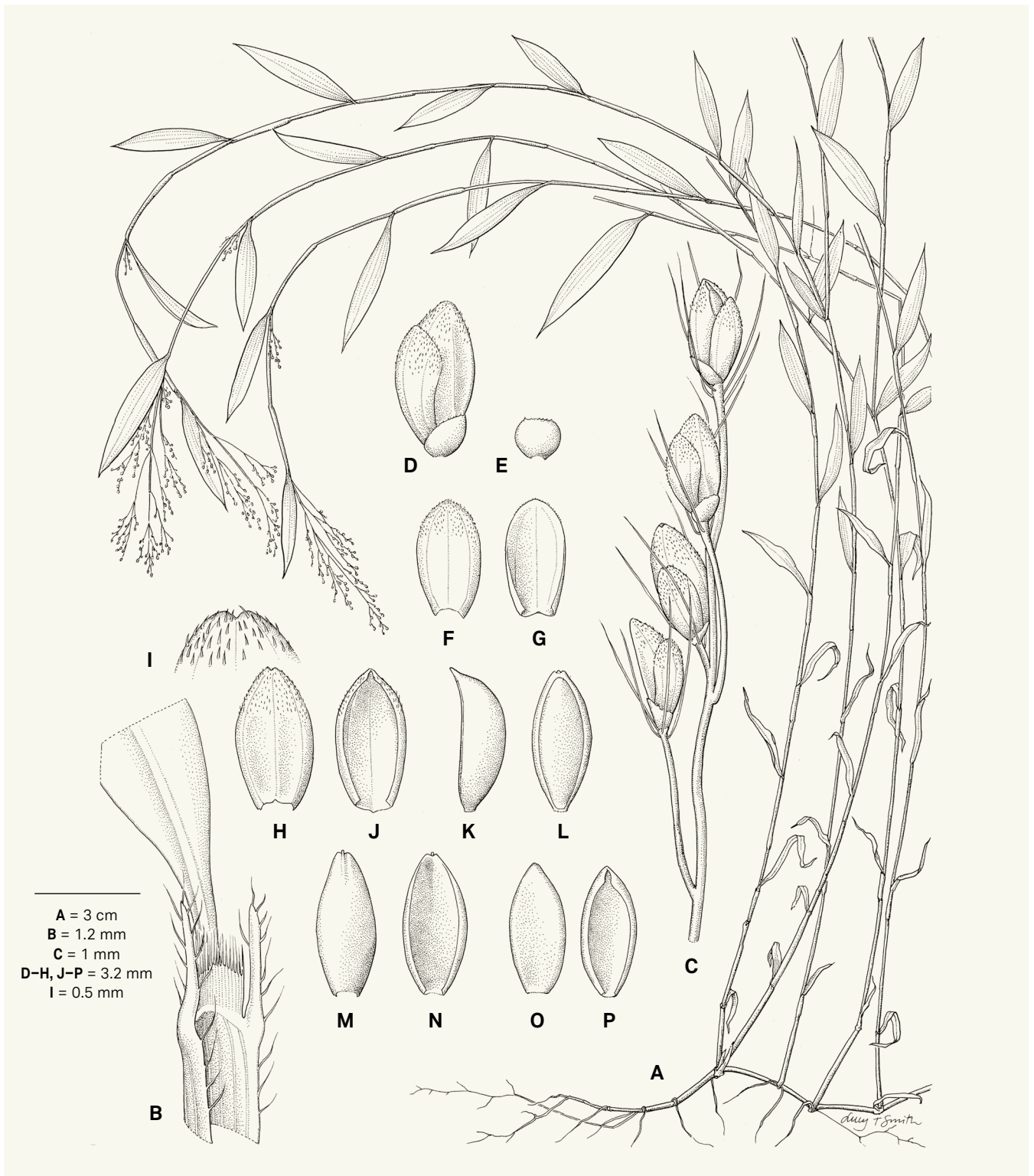


Fig. 11. – *Panicum manongarivense* A. Camus. **A.** Habit; **B.** Ligule area; **C.** Panicle branch; **D.** Spikelet; **E.** Lower glume; **F.** Upper glume, dorsal view; **G.** Upper glume, ventral view; **H.** Lower lemma, dorsal view; **I.** Lower lemma apex, enlarged; **J.** Lower lemma, ventral view; **K.** Upper floret, lateral view; **L.** Upper floret, ventral view; **M.** Upper lemma, dorsal view; **N.** Upper lemma, ventral view; **O.** Upper palea, dorsal view; **P.** Upper palea, ventral view. [Rakotoavao et al. 3178, K] [Drawing: Lucy T. Smith]

partly divergent at maturity, glabrous or with numerous white cilia exceeding the spikelet, the pedicels 1–6 mm long. *Spikelets* ovate to oblong, apically rounded, 0.9–1.1 mm long, almost white, never gaping open. *Lower glume* a nerveless vestige of variable shape. *Upper glume* ½ to as long as the spikelet, translucent, 3-veined, with small trichomes between the veins or towards the apex. *Lower floret* barren, without significant palea. *Lower lemma* translucent, 3–5-veined, with minute trichomes between the veins or towards the apex. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to Manongarivo and nearby; humid mid-elevation habitats, 500–1500 m (Fig. 10A).

Notes. – Close to *P. mitopus* but spikelets smaller and white.

The lectotype has been chosen from two sheets of original material examined by Camus at P and constitutes the higher quality reproductive material.

Additional material examined. – MADAGASCAR. Prov. Antsiranana: Manongarivo, Antsatrotro E of Ankaramy, 14°05'S 48°23'E, 26.III.1993, Malcomber et al. 2310 (K [K000805497], P [P06795304]); Manongarivo, E de Ankaramy-be, Bekolosy, 14°04'S 48°17'E, IV.1993, Rakotomalaza 21 (P [P02373631]); 10 km SW of Andranomololo, 14°21'34"S 49°22'35"E, IV.2006, Rakotovaio et al. 3178 (P [P02309332]).

19. *Panicum mitopus* K. Schum. in Engl., Pflanzenw. Ost-Afrikas, C: 103. 1895 (Fig. 6D).

Holotypus: TANZANIA. Prov. Tanga: Usambara, *Holst 514b* (B [B100673600] image seen).

= *Panicum uvulatum* Stapf in Bull. Misc. Inform. Kew 1919: 265. 1919. **Lectotypus** (designated here): MADAGASCAR: Ivohimanitra, XI.1894, *Forsyth-Major 91* (K [K000244707]!). **Syntypi:** MADAGASCAR. Prov. Antananarivo: Central Madagascar, s.d., *Baron 660* (K [K000244709]!); *ibid. loco*, s.d., *Baron 4099* (K [K000244708]!). Prov. Fianarantsoa: bassin du Matitana, s.d., *Perrier de la Bâthie 68 bis* (K [K000244706, K000244710]!).

= *Panicum neohumbertii* A. Camus in Bull. Soc. Bot. France 74: 633. 1928. **Lectotypus** (designated here): MADAGASCAR. Prov. Toamasina: Beforona, 16.VIII.1924, *Humbert 2255* (P [P00450257]!); isolecto-: B [B 10 0168714] image seen). **Syntypi:** MADAGASCAR. Prov. Antananarivo: Ambohimanga, 27.III.1921, *Decary 168* (TAN!). **Sine loco:** s.d., *Waterlot 103* (P [P02608858]!), **syn. nov.**

Annual or short lived perennial, rooting at lower nodes, prostrate, to 1 m long, the culms glabrous. *Leaf sheaths* glabrous or with ciliate edges. *Ligule* a truncate membrane, sometimes extending into auricles to c. 0.7 mm long. *Leaf blades*

lanceolate, flat membranous to chartaceous, 4–7 × 0.4–1.2 cm, drying glaucous, cross veins visible when dry, usually glabrous, sometimes pubescent on both sides. *Panicles* terminal and axillary, partly or fully exerted on a peduncle to 8 cm long, 4–10 cm long, the branching distichous or in threes, the branches divergent at maturity, glabrous or with white cilia subtending the spikelets, the spikelets clustered at the tips of branches, the pedicels 0.5–2 mm long. *Spikelets* ovate-elliptic, apically rounded to acute, 1.1–1.7 mm long, yellowish, never gaping open. *Lower glume* ⅓–½ as long as the spikelet, obtuse to acute, 0–1-veined. *Upper glume* as long as the spikelet or sometimes ¾ of the spikelet length, membranous, 3-veined, glabrous or with a few small trichomes. *Lower floret* barren, without a significant palea. *Lower lemma* membranous, 3–5-veined, glabrous or with minute trichomes. *Upper lemma* smooth, shiny, yellowish to pale brown.

Distribution and ecology. – Common in wet forest understory across all Madagascar except low elevation coastal regions, 300–2200 m (Fig. 10A). This species is also known in Tanzania but appears to be significantly less common than in Madagascar.

Notes. – Commonly seen, charismatic and frequently collected grass of wet forest understory, *P. mitopus* can be easily recognised by the tight spikelet clusters at the tips of its long and bare dichotomously branched inflorescence.

The lectotype of *P. uvulatum* is selected for its spikelet dissection drawing mounted on the type sheet as well as its high quality original material. The lectotype of *P. neohumbertii* is selected due to its best quality original material seen by the author.

This species is illustrated in BOSSER (1969: Fig. 121g–j as '*Panicum uvulatum*').

Additional material examined. – MADAGASCAR. Prov. Antananarivo: la Mandraka, 4.X.1905, *Alleizette 322* (P [P01973821]); Manjakatampo, 10.XII.1950, *Benoist 414* (P [P01973808]); *ibid. loco*, 19.XII.1950, *Benoist 468* (P [P01973790]); *ibid. loco*, 19.XII.1950, *Benoist 485* (P [P01973813]); *ibid. loco*, 21.XII.1950, *Benoist 535* (P [P01973792]); La Mandraka, 15.IV.1951, *Benoist s.n.* (P [P01973812]); Manjakatampo, 19.XII.1950, *Bosser 468* (P [P03182761]); PK 23 rte de Tamatave, vallée de Soavina, XI.1960, *Bosser 14941* (P [P01973806]); Angavokely, IV.1961, *Bosser 15287* (P [P02022208]); Ambohimanga, 27.III.1921, *Decary 169* (P [P01973816]); au N d'Ankazobe, 11.III.1930, *Decary 7426* (K [K000805536]); près d'Ahitromby, II.1958, *Descouings 3143* (P [P01973791], TAN); Tananarivo, 1840, *Goudot M93* (US); Manjakatampo, 25.III.1937, *Herb. Jard. Bot. Tan. 2439* (P [P01973810]); Ambatolaona, 15.V.1935, *Herb. Jard. Bot. Tan. 32422* (P [P01973825]); la Mandraka, X.1933, *Humbert 11147 bis* (P [P01973818]); Manjakatampo, 27.IV.1955, *Humbert & Capuron 30260* (P [P01973830]); between Tamatave and Antananarivo, VII.1862, *Meller s.n.* (K [K000244711]); Ankaratra, IV.1914, *Perrier de la Bâthie 10739* (P [P01973822]); Andranomangitsy près Antsirabe, VI.1913, *Perrier de la Bâthie 10789* (P [P03182746]); Ankaratra, IV.1914, *Perrier de la Bâthie 12799* (P [P03182750]); Manjakandriana, I.1920, *Perrier de la Bâthie 12968* (P [P03182703]); near Mandraka, 3.IV.1987, *Phillipson 1639* (K [K000805538], P [P02022206], TAN, US); env. de Tananarivo, 20.V.1906, *Rotureau s.n.* (P

[P02325433]); la Mandraka, 31.III.1907, *Rotereau* s.n. (P [P02373567]); Antsirabe, 13.XII.1959, *Schlieben 8152* (K [K000805534], US); Manandona, *Scott-Elliot 2009a* (K [K000805586]); Angavokely, 25.VI.1964, *Tateoka 3516* (TAN). **Prov. Antsiranana:** Marojejy, north of Mandena, 24.XI.1989, *Dransfield 1070* (TAN); *ibid. loco*, 24.XI.1989, *Dransfield 1072* (TAN); jusqu'aux sommets d'Ambohimirahavavy, 19.I.1951, *Humbert & Capuron 25067* (P [P02610015]); *ibid. loco*, 19.I.1951, *Humbert & Capuron 25248* (P [P03183498]); Marojejy, bassin supérieur de l'Antsahaberoka, *Humbert & Saboureau 28890* (P [P03182752]); Bekolosy, 14°02'S 48°18'E, 17.V.1995, *Gautier & Chatelain 2694* (G, K [K000805539], P [P06768789], TAN); trail to the summit of Marojejy Est, 14°26'00"S 49°16'00"E, 12.II.1989, *Miller & Lowry II 4008* (P [P06768790], TAN); Montagne d'Ambre, XII.1964, *Morat 1175* (P [P01973831]); Massif du Tsaratanana, XI.1966, *Morat 2421* (P [P01973794]); forêt d'Analamaitso entre le Bemarivo et l'Anjombona, IV.1902, *Perrier de la Bâthie 11033* (P [P01973785]); Manongarivo, V.1909, *Perrier de la Bâthie 11069* (P [P03182745]); Besanatribe-Ambanja, XII.1963, *Rakotozafy 378* (P [P01973832]); Andranomilolo W of Andranopositra, 14°20'04"S 49°17'50"E, 13.XI.2006, *Ravelonarivo et al. 2082* (P [P02325443]); Andramanalana, 14°23'06"S 49°21'49"E, 2.V.2006, *Razakamalala et al. 2750* (P [P02309333]); Montagne d'Ambre, 12°37'23"S 49°10'47"E, 6.IV.2008, *Trigui et al. 127* (G [G00075808], P [P02625309]); Marojejy NP, camp Simpona, 14°26'20"S 49°44'24"E, 16.X.2011, *Vorontsova et al. 488* (K, TAN). **Prov. Fianarantsoa:** Midongy du Sud, 23°43'33"S 47°02'13"E, 22.VIII.2008, *Bussmann et al. 15087* (TAN); *ibid. loco*, 22.VIII.2008, *Bussmann et al. 15091* (TAN); Behavo Forest, 23°30'11"S 47°06'35"E, 24.VIII.2008, *Bussmann et al. 15154* (TAN); Sendrisoa, 23.II.1975, *Croat 32161* (K [K000805533], P [P01973793], TAN); Ialatsara, 7.II.1942, *Decary 17537* (P [P01973827]); mont Papanga près de Befotaka, 2.XII.1928, *Humbert 6895* (P [P03182751], US); env. de Fianarantsoa, 1955, *Humbert 30206* (P [P02635200]); Itremo, Ambatoantrano, 20°34'07"S 46°34'47"E, 16.II.2014, *Nanjarisoa et al. 127* (K, TAN); Mt Andranomangitsy près Ranomainty, VI.1922, *Perrier de la Bâthie 10789* (P [P01973788]); Matitanana sur la riviere Bainany, VIII.1923, *Perrier de la Bâthie 11172* (P [P03182749], P01973786); Ambalavaokely, 2.IV.1955, *Rakotoavao 174* (P [P06768503]); Itremo, Antsirakambiaty, 20°35'42"S 46°33'47"E, 12.III.2012, *Vorontsova et al. 728* (K, TAN); Andringitra NP camp 2, 22°08'58"S 46°54'01"E, 14.XII.2013, *Vorontsova et al. 1267* (TAN); Itremo, Antsirakambiaty, 20°35'49"S 46°33'43"E, 19.V.2014, *Vorontsova & Nanjarisoa 1557* (TAN). **Prov. Mahajanga:** Mangindrano entre le haut Sambirano et le haut Maivarano, XI.1937, *Humbert 18118* (P [P01973814]); forêt d'Analamahitso entre le Bemarivo et l'Anjobona, VIII.1902, *Perrier de la Bâthie 11036* (P [P01973776]); Ambohimirahavavy, 14°12'36"S 49°07'23"E, 17.XI.2005, *Randrianarivony & Andriamiarinovo 83* (P [P02309323]). **Prov. Toamasina:** Zahamena, 21.III.1941, *Decary 16519* (P [P01973829]); Mantadia NP, Sahanody Riviere, 18°49"S 48°26'E, 7.X.2011, *Hall et al. 1* (K, TAN); Ambatondrazaka, *Herb. Jard. Bot. Tan. 3397* (P [P01973803]); Zahamena, Ambato Zaka, 11.IV.1953, *Réserves Naturelles 6071* (P [P03182762]); Périnet, 3.XI.1915, *Ungemach s.n.* (P [P01973777]); *ibid. loco*, 27.V.1950, *Vaughan s.n.* (K [K000805532]); *ibid. loco*, 27.V.1950, *Vaughan s.n.* (K [K000805531]); entre les gares Rogez et d'Ambatovola, 15.X.1912, *Viguiier & Humbert 726* (P [P01973795]); Mantadia NP, Sahanody riv., 18°48'48"S 48°25'48"E, 7.X.2011, *Vorontsova et al. 306* (K, TAN); *ibid. loco*, 8.X.2011, *Vorontsova et al. 317* (K, TAN). **Prov. Toliara:** pic d'Ivohibe, 5.XI.1924, *Humbert 3314* (G, P [P00224769]); massif de l'Androhahela, 18.X.1928, *Humbert 6104* (P [P03182744]); Mt Kalambatitra, XI.1933, *Humbert 11861* (P [P01973805]); Kalambatitra, Mt Analatsitendrika, XI.1933, *Humbert 11938* (G, K [K000805535], P [P01973820]); Kalambatitra, mont Beanjavidy, XI.1933, *Humbert 12077* (P [P01973801]); NE de Tsivory, XII.1933, *Humbert 12316* (P [P01973802]); mount Itrafanaomby, XII.1933, *Humbert 13509* (P [P01973783]); massif de l'Andohahela, 1.1934, *Humbert 13569* (P [P01973780]); Kalambatrira, forêt de Befarafara, 23°24'44"S 46°27'58"E, 26.V.2005, *Razakamalala & Andrianjafy 2031* (P [P06768704]). **Sine loco:** *Anon. s.n.* (P [P01973799]); *Anon. s.n.* (P [P01973834]); 19.VII.1921, 29.VI.1987, *Edelman 117* (K [K000805537]); *Herb. Stat. Agric. Alaotra 189* (TAN).

20. *Panicum novemnerve* Stapf in Oliv. et al., Fl. Trop. Afr. 9(4): 702. 1920.

Lectotypus (designated here): ZIMBABWE. **Prov. Mashonaland:** Salisbury [Harare], I.1909, *Allen 692* (K [K000282456]!; isolecto-: K [K000282457]!). **Syntypi:** ZIMBABWE. **Prov. Mashonaland:** Harare, I.1909, *Craster 27* (K [K000282454]!); N Mazowe District, 1912, *Mundy s.n.* (K [K000282455]!). **Prov. Bulawayo:** Buluwayo and Matopopo Hills, s.d., *Appleton 6* (K [K000282458]!).

Ascending annual, in diffuse tufts, 30–60 cm tall, with densely pilose stems and nodes. *Leaf sheaths* pilose with bulbous based hairs. *Ligule* a ciliolate membrane. *Leaf blades* linear to linear-lanceolate, flat, chartaceous, 4–20 × 0.4–1.2 cm, drying yellow-green, with bulbous based hairs towards the base on both sides with bulbous based hairs towards the base on both sides, and on the lower parts of the margin. *Panicles* terminal, partly exserted, 10–20 cm long, effuse, the branches ascending, scabrous, the pedicels 1.5–10 mm long. *Spikelets* ovate, apically acuminate, 2–2.5 mm long, brown to purple, gaping open at maturity. *Lower glume* c. ½ as long as the spikelet, apically long-acuminate, 5-veined, glabrous, clasping. *Upper glume* as long as the spikelet, herbaceous, 7–9-veined, glabrous. *Lower floret* barren, with a reduced palea. *Lower lemma* herbaceous, 9-veined, glabrous. *Upper lemma* 1.7–1.8 mm long, shorter than the lower floret, smooth, shiny, pale.

Distribution and ecology. – This Southern African species is known from only a few records in dry southern Madagascar, in clearings and secondary vegetation; elevation not recorded (Fig. 10A).

Notes. – Recognised by its annual habit, 5-veined lower glume, and prominent bulbous-based hairs on the leaf sheaths.

The lectotype collection is chosen for its best original material; sheet K [K000282456] includes original drawings of the spikelet and annotations by Stapf.

This species is illustrated in BOSSER (1969: Fig. 123a-d).

Additional material examined. – MADAGASCAR. **Prov. Fianarantsoa:** Ranohira, II.1956, *Bosser 9024* (TAN); Horombe, XII.1951, *Paulian 10* (TAN). **Prov. Toliara:** Betroka, I.1952, *Bosser 2492* (P [P03123770], TAN); clairières du plateau Mahafaly, 16.III.1962, *Bosser & Viennot 16067* (P [P02307400], TAN); Betroka, 1954, *Paulian s.n.* (TAN); Herb. Stat. Antianidienne Betsioky, 15.II.1962, *Teteftort 12* (P [P03123781]).

21. *Panicum palackyanum* A. Camus in Bull. Soc. Bot. France 77: 638. 1931 (Fig. 12).

Lectotypus (designated here): MADAGASCAR. **Prov. Fianarantsoa:** massif d'Andringitra, IV.1921, *Perrier de la Bâthie 13748* (P [P00450245]!); isolecto-: P [P00224772, P00450246]!).

Scandent perennial, branched, c. 2 m long, the culms and nodes glabrous. *Leaf sheaths* glabrous with a fringe of cilia on the margins. *Ligule* a membrane. *Leaf blades* linear to linear-lanceolate, flat, chartaceous, 5–8 × 0.4–0.6 cm, drying green-brown, imbricate on young shoots, spreading or retrorse, glabrous on both sides. *Panicles* terminal, fully exerted, 11–18 cm long, contracted, with long branches appressed to the axis partly, the branches not whorled, scaberulous, the spikelets paired in most of the panicle, on short pedicels 1.5–3 mm. *Spikelets* elliptic, apically obtuse, 2.5 mm long, whitish to purple, partly open at maturity. *Lower glume* $\frac{1}{3}$ – $\frac{1}{2}$ as long as the spikelet, chartaceous, apically rounded to obtuse, 3–5-veined, glabrous, clasping. *Upper glume* $\frac{3}{4}$ as long as the spikelet, herbaceous, apically truncate, 5–7-veined, glabrous. *Lower floret* male, with a fully developed palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny, pale, with a pronounced apical crest.

Distribution and ecology. – Andringitra forest understory, c. 1600 m (Fig. 10B).

Notes. – This isolated collection seems difficult to place: the crest on its upper lemma could suggest a relationship with *Acroceras*, clustering of the spikelets along primary inflorescence branches could indicate a relationship with *Urochloa/Brachiaria* s.l. (but the panicle is more branched than in *Acroceras* or *Urochloa*), it differs from *Urochloa* by its smooth upper lemma, while poorly visible veins on the spikelet and a short upper glume suggests a relationship with other Andringitra endemics *Panicum andringitrense*, *P. spergulifolium*, and *P. cupressifolium* (although *P. palackyanum* has longer panicles and paired spikelets).

The lectotype sheet is chosen for its best quality original material annotated by Camus.

22. *Panicum perrieri* A. Camus in Bull. Soc. Bot. France 72: 371. 1925.

Lectotypus (designated here): **MADAGASCAR. Prov. Fianarantsoa:** massif d'Andringitra, III.1921, *Perrier de la Bâthie 13694* (P [P00224770]!); isolecto-: K [K000244712]!, P [P00224771]!, TAN!).

Prostrate perennial, with a small rhizome, branched, the long thin culms rooting at nodes, 15–70 cm long, the culms and nodes glabrous. *Leaf sheaths* glabrous. *Ligule* a ciliolate membrane. *Leaf blades* linear, flat, chartaceous, 2–8 × 0.2–0.6 cm, drying yellow-green, often reflexed at maturity, glabrous to pubescent on both sides. *Panicles* terminal, partly or fully exerted, 2–8 cm long, linear to narrowly ovate, a relatively small proportion of the plant, the branches appressed or ascendant, never spreading, glabrous, the spikelets clustered at branch apices, the pedicels 3–5 mm long. *Spikelets*

lanceolate, apically acuminate, 2.5–3(–3.2) mm long, with prominent veins, green to purple, opening only partly. *Lower glume* equalling the spikelet, chartaceous, apically acuminate, 3–5-veined, glabrous or finely pubescent. *Upper glume* as long as the spikelet, herbaceous, apically acuminate, 7-veined, glabrous or finely pubescent. *Lower floret* barren, with a reduced palea. *Lower lemma* herbaceous, 7-veined, glabrous or finely pubescent. *Upper lemma* somewhat shorter than the lower floret, smooth, shiny, pale.

Distribution and ecology. – Endemic to high elevation central Madagascar, open savanna, forest understory, rocky habitats, often on limestone and gneiss, 950–2400 m (Fig. 10B).

Notes. – The leaf shape is somewhat variable. Panicles can open out at maturity. This species is prone to fungal infections which distort the spikelet shape and produce dark coloured globose spikelets.

The lectotype sheet is chosen for its best quality original material annotated by Camus.

This species is illustrated in BOSSER (1969: Fig. 123e–h).

Additional material examined. – **MADAGASCAR. Prov. Antananarivo:** Manjakatampo, 19.XII.1951, *Benoist 1669* (P [P01914221]); la Mandraka, II.1953, *Bosser 4902* (P [P01914229]); *ibid. loco*, II.1953, *Bosser 4904* (TAN); Analabe, III.1953, *Bosser 5152* (P [P02726856], TAN); *ibid. loco*, III.1953, *Bosser 5187* (P [P01914216]); PK 40 rte d'Anjozorobe, II.1954, *Bosser 7255* (P [P02309310]); Faratsiho, I.1955, *Bosser 7619* (P [P01914223]); *ibid. loco*, I.1955, *Bosser 7620* (P [P01914224]); Tampoketsa d'Ankazobe, IV.1955, *Bosser 7864* (TAN); Ankaratra, XI.1955, *Bosser 8669* (P [P01914219]); PK 26 rte Arivonimamo, XII.1955, *Bosser 8902* (TAN); Faratsiho, face W de l'Ankaratra, II.1957, *Bosser 10791* (TAN); au dessus Manjakatampo, II.1957, *Bosser 10802* (P [P01914227]); rte Ambatolampy – Faratsiho, II.1957, *Bosser 10839* (P [P06795983]); *ibid. loco*, II.1957, *Bosser 10841* (P [P00524459]); Antongona, I.1960, *Bosser 13714* (P [P06795917], TAN); la Mandraka, IV.1960, *Bosser 14240* (TAN); PK 28 rte du Sud, XII.1960, *Bosser 14917* (P [P06768560], P06768564); Nanokely, II.1961, *Bosser 15166* (P [P01914228], TAN); au dessus de Manjakatampo, III.1961, *Bosser 15276* (P [P00524469]); Nanokely, V.1962, *Bosser 16360* (P [P06768561], TAN); Lac Mantasoa, 3.III.1970, *Bosser 19991* (K [K000805595], P [P02222317]); Ankaratra, IV.1914, *Perrier de la Bâthie 10742* (P [P01914218]). **Prov. Antsiranana:** montagne d'Ambre, VI.1970, *Bosser 20353* (K [K000805593], P [P02222310]); Massif de Marivorahona, 18.III.1951, *Humbert & Capuron 25654* (P [P02225793]); mount Tsaranana, *Perrier de la Bâthie 16363* (P [P01914225]). **Prov. Fianarantsoa:** Ambatofinandrahana, II.1962, *Bosser 15869* (P [P02251333], TAN); Andringitra, IV.1964, *Bosser 19498* (P [P02307358]); mont Antety près Antsirabe, 10.II.1895, *Forsyth-Major s.n.* (G [G00418812]); Papanga, 2.XII.1928, *Humbert 6952* (P [P01914226]); Andringitra NP, Andohariana, 22°09'24"S 46°53'19"E, 26.XI.2013, *Nanjarisoa et al. 75* (K, TAN); Itremo, Ambatoantrano, 20°34'07"S 46°34'47"E, 16.II.2014, *Nanjarisoa et al. 128* (K, TAN); Itremo, Ambatoantrano, 20°33'51"S 46°34'48"E, 14.III.2012, *Vorontsova et al. 749* (K, TAN); Andringitra NP, at camp 2, 22°09'09"S 46°53'51"E, 14.XII.2013, *Vorontsova et al. 1280* (TAN); Itremo, Ambatoasira, 20°36'44"S 46°34'26"E, 20.V.2014, *Vorontsova et al. 1580* (TAN). **Prov. Toliara:** Massif de l'Andohahela, I.1934, *Humbert 13568* (P [P01914294]).

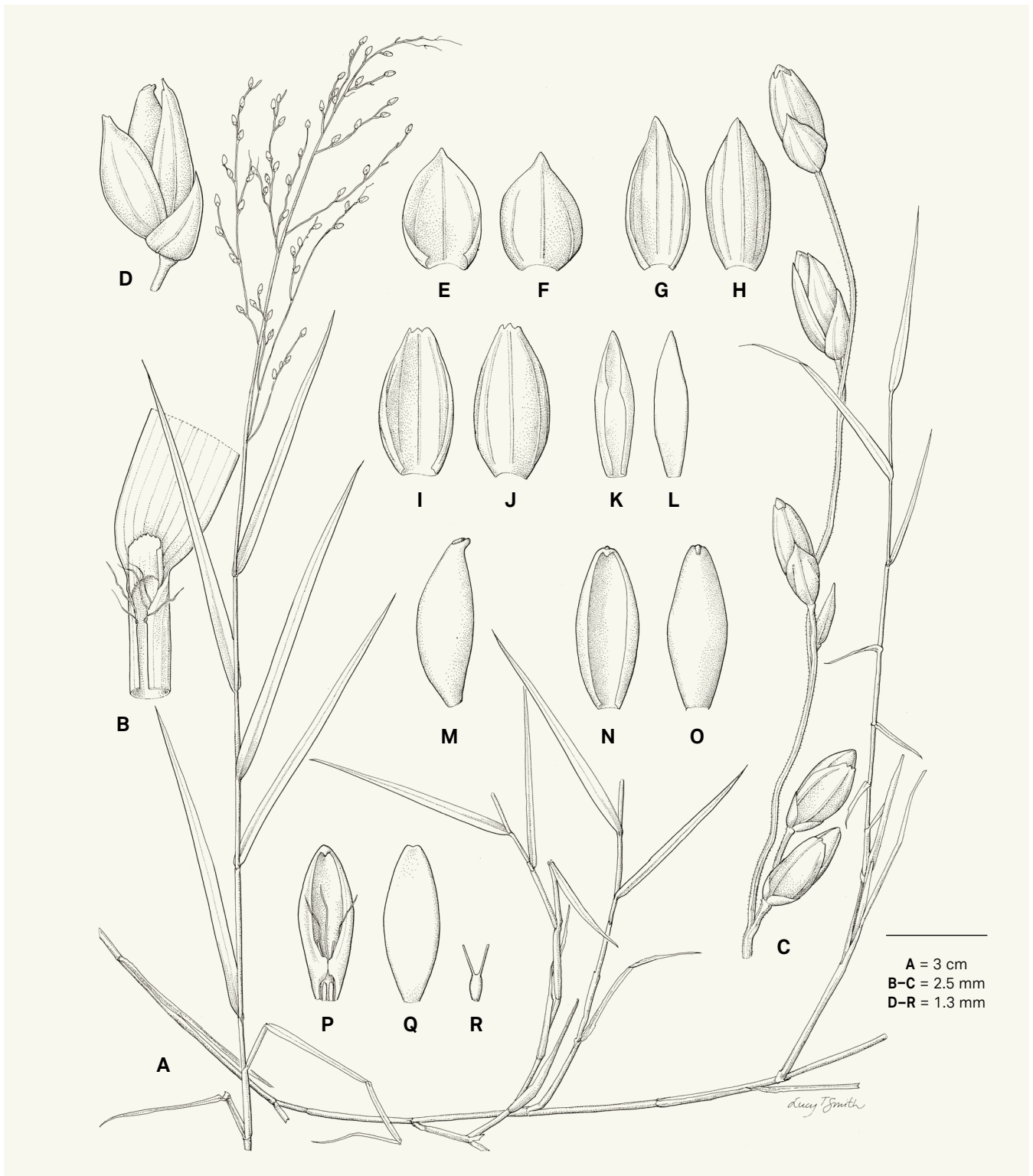


Fig. 12. – *Panicum palackyanum* A. Camus. **A.** Habit; **B.** Ligule area; **C.** Panicle branch; **D.** Spikelet; **E.** Lower glume, ventral view; **F.** Lower glume, dorsal view; **G.** Upper glume, ventral view; **H.** Upper glume, dorsal view; **I.** Lower lemma, ventral view; **J.** Lower lemma, dorsal view; **K.** Lower palea, ventral view; **L.** Lower palea, dorsal view; **M.** Upper floret, lateral view; **N.** Upper lemma, ventral view; **O.** Upper lemma, dorsal view; **P.** Upper floret, the lemma removed; **Q.** Upper palea, dorsal view; **R.** Gynoecium. [Perrier de la Bâthie 13748, K] [Drawing: Lucy T. Smith]

23. *Panicum pleianthum* Peter in Repert. Spec. Nov. Regni Veg. Beih. 40(1, Anhang): 47. 1930.

Lectotypus (designated here): **TANZANIA. Prov. Tanga:** Lushoto District, Mwele to Tanga, Maramba, 9.VI.1917, *Peter 20738* (W [W1960-0020873] image seen; isolecto-: G [G00022437] image seen).

= *Cyrtococcum nossibeense* A. Camus in Bull. Soc. Bot. France 99: 144. 1952. **Lectotypus** (designated here): **MADAGASCAR. Prov. Antsiranana:** Nosy Be, bois de Lomonbe, au dessus de Passandasa, III.1851, *Boivin s.n.* (P [P02263115]!). **Syntypi:** **MADAGASCAR. Prov. Antsiranana:** Nosy Be, s.d., *Boivin s.n.* (P [P02263117]!); *ibid. loco*, III.1847, *Boivin s.n.* (P [P02263116]!), **syn. nov.**

Creeping ascendant perennial, branched, to 60 cm long, the culms and nodes finely pilose. *Leaf sheaths* pilose. *Ligule* a ciliolate membrane. *Leaf blades* lanceolate, flat, chartaceous, 5–10 × 0.6–1 cm, drying yellow-green, distichous, asymmetric at base, pilose on both sides. *Panicles* terminal, fully exerted, 4–20 cm long, narrowly ovate, compact, the branches ascending, glabrous to sparsely pilose. *Spikelets* narrowly ovate, asymmetric, apically acute, 1.7–2.2 mm long, brown even on young plants, never gaping open. *Lower glume* ½ as long as the spikelet, chartaceous, apically obtuse, 3–5-veined, glabrous or finely pilose, clearly separated from the rest of the spikelet by an internode c. 0.5 mm long. *Upper glume* a little shorter than the spikelet exposing the upper lemma at maturity, herbaceous, 5-veined, glabrous or finely pilose. *Lower floret* barren, with a partly developed palea. *Lower lemma* herbaceous, 5-veined, glabrous or finely pilose. *Upper lemma* smooth, shiny, brown.

Distribution and ecology. – Kenya, Tanzania, Mozambique, and Madagascar's coastal forest in eastern and north-western parts of the island, 0–350 m (Fig. 10B).

Notes. – Spikelets of this species appear a little asymmetric and the compression is close to lateral, unlike the symmetric and dorsally compressed spikelets typical of *Panicum* s.l. Malagasy plants were originally described in the genus *Cyrtococcum* Stapf. due to this spikelet morphology and annotated as *C. nossibeense*. This is clearly the same species as the African *Panicum pleianthum*; generic placement will be confirmed following phylogenetic analysis. Inflorescences always appear to be brown and dry, even on freshly collected plants with green culms and leaves. This species is distinct with no close relatives apparent.

The holotype of *P. pleianthum* was confirmed missing from B in October 2016 (Robert Vogt, pers. comm.); of the two known extant duplicates the W sheet has the best material and is selected as the lectotype. P holds three unnumbered collections of this species made by Boivin in Nosy Be and

annotated by Camus as *Cyrtococcum nossibeense*; the sheet P [P02263115] is chosen as the lectotype due to its best material and most extensive original label data.

This species is illustrated in CLAYTON (1989: Tab. 7).

Additional material examined. – **MADAGASCAR. Prov. Antsiranana:** Ampasindava, forêt de Betsitsika, 13°45'44"S 47°59'50"E, 13.I.2009, *Ammann et al. 250* (G [G00180384]); Lokobe, IV.1970, *Bosser 20130* (K [K000805554], P [P02222321]); *ibid. loco*, IV.1970, *Bosser 20136* (P [P02325390]); presqu'île d'Ampasindava, V.1970, *Bosser 20143* (K [K000805553], P [P02222314]); entre Ambodisakoana et Ambalafary, 14°04'S 48°17'E, 23.VI.1994, *Gautier et al. 2414* (G [G00418798], K [K000805555], P [P02325450]); Ampasindava, forêt de Betsitsika, 13°45'27"S 47°58'53"E, 20.I.2009, *Madiomanana et al. 243* (G [G00181509]); PK 90 rte Sambava-Andapa après Andrakata, XI.1967, *Morat 2823* (P [P02307377]); Befalafa, Ambahatra, 13°55'53"S 48°27'15"E, 10.V.1999, *Wohlhauser & Andriamalaza 60118* (G, K [K000805557], P [P04430797]); Manongarivo, Ambahatra, 13°54'00"S 48°28'E, 3.V.2000, *Wohlhauser 60244* (G, K [K000805556], P [P06768575]). **Prov. Fianarantsoa:** Kianjavato, I.1964, *Bosser 18999* (P [P02307330]); Ambahy, Nosy Varika, 20°49'47"S 48°28'58"E, 23.IV.2004, *Razakamalala et al. 1201* (P [P02309324]). **Prov. Toamasina:** Fénérive, rte de Vavatenina, XI.1954, *Bosser & Descouings 84* (P [P02309295]); Ambanivoules, IV.1837, *Goudot s.n.* (G [G00418809]). **Prov. Toliara:** Mandena, IV.1960, *Bosser 14548* (P [P00524465], P [P06795979], TAN); Andohahela NP, 1.8 km N of Fanota, 24°46'S 46°52'E, 1.XI.2011, *Hall et al. 53* (K, TAN).

24. *Panicum spergulifolium* A. Camus in Bull. Soc. Bot. France 72: 619. 1925 (Fig. 13A, 14, 15).

Lectotypus (designated here): **MADAGASCAR. Prov. Fianarantsoa:** Andringitra massif, II.1922, *Perrier de la Bâthie 14551* (P [P02263099]!; isolecto-: G [G00022432] image seen). **Syntypi:** **MADAGASCAR. Prov. Fianarantsoa:** Andringitra massif, I.1922, *Perrier de la Bâthie 14334* (P [P00224783, P02263106]!); Andringitra massif, II.1921, *Perrier de la Bâthie 14413* (G [G00022433], K [K000244714, K000244715]!, P [P00224777, P02263100]!).

Mat-forming perennial, much branched, to 40 cm tall, the culms and nodes glabrous. *Leaf sheaths* glabrous to sparsely ciliate. *Ligule* a ciliolate membrane. *Leaf blades* lanceolate, flat or rolled, coriaceous, 0.4–3(–5) × 0.1–0.2 cm, drying red-brown, imbricate, appressed or ascending, glabrous to sparsely ciliate, sometimes with bulbous based cilia on the lower part of the margin. *Panicles* terminal, fully exerted on a peduncle 6–20 cm long, 1.5–4(–7) cm long, obovate, few-flowered, the branches wiry, contracted or partly open, glabrous. *Spikelets* elliptic, apically obtuse, 2.8–3 mm long, with poorly visible veins, purplish, opening only partly. *Lower glume* ⅓–¾ as long as the spikelet, chartaceous, apically subacute, 3-veined, glabrous. *Upper glume* ¾ as long as the spikelet, herbaceous, 3–5-veined, glabrous. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Unique to high elevation plateau of Andringitra and surrounding area, in damp areas on rocks,



Fig. 13. – **A.** Habitat of *Panicum spergulifolium* A. Camus with *P. spergulifolium* pink at the forefront; **B.** Habitat of *P. voeltzkowii* Mez with the green-brown mat of *P. voeltzkowii* across the forefront; **C.** *Panicum subhystrix* A. Camus; **D.** *Panicum vohitrense* A. Camus.
[A: Vorontsova et al. 1218; **B:** Vorontsova et al. 1391; **C:** Ratovonirina et al. 185; **D:** Vorontsova & Onjalalaina 1466] [Photos: M.S. Vorontsova]

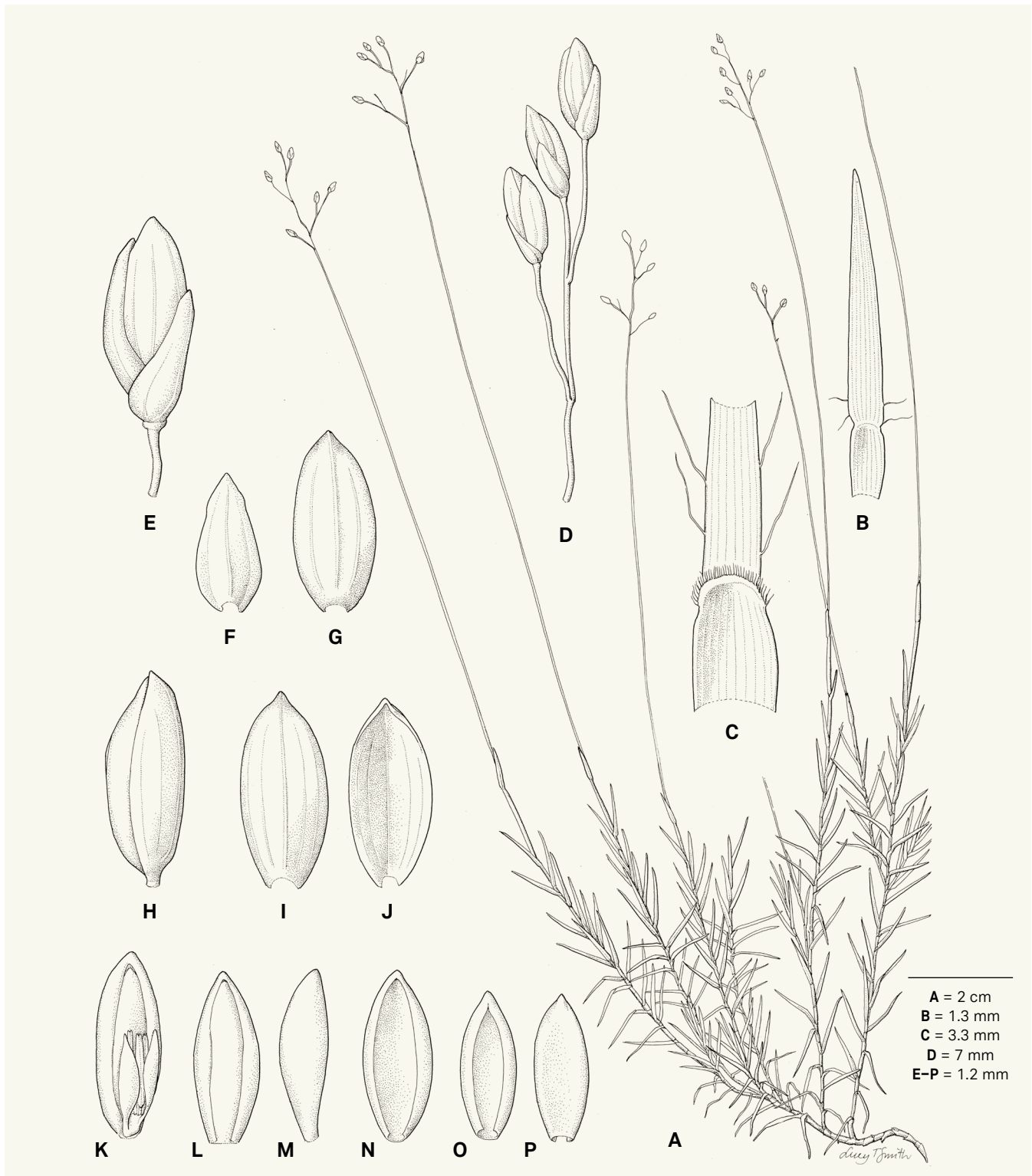


Fig. 14. – *Panicum spergulifolium* A. Camus, low elevation morphotype. **A.** Habit; **B.** Leaf; **C.** Ligule area; **D.** Panicle branch; **E.** Spikelet; **F.** Lower glume; **G.** Upper glume; **H.** Spikelet with glumes removed; **I.** Lower lemma, dorsal view; **J.** Lower lemma, ventral view; **K.** Spikelet with glumes and lower lemma removed; **L.** Upper lemma, ventral view; **M.** Upper floret, lateral view; **N.** Upper lemma, ventral view; **O.** Upper palea, ventral view; **P.** Upper palea, dorsal view. [Nanjarisoa et al. 74, K] [Drawing: Lucy T. Smith]

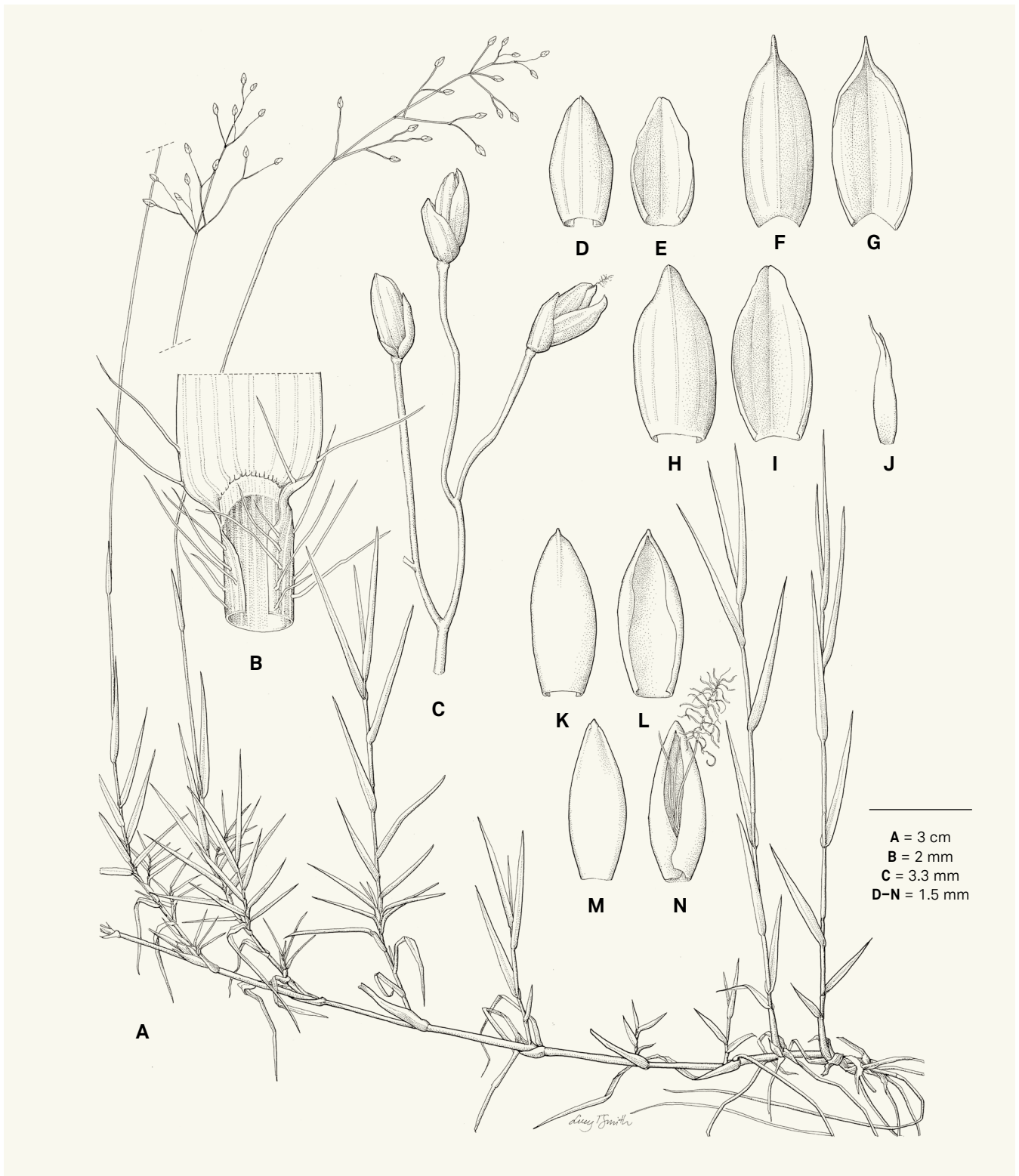


Fig. 15. – *Panicum spergulifolium* A. Camus, high elevation morphotype. **A.** Habit; **B.** Ligule; **C.** Panicle branch; **D.** Lower glume, dorsal view; **E.** Lower glume, ventral view; **F.** Upper glume, dorsal view; **G.** Upper glume, ventral view; **H.** Lower lemma, dorsal view; **I.** Lower lemma, ventral view; **J.** Lower palea; **K.** Upper lemma, dorsal view; **L.** Upper lemma, ventral view; **M.** Upper palea, dorsal view; **N.** Upper floret, the lemma removed. [Vorontsova et al. 1218, K] [Drawing: Lucy T. Smith]

sheltered under rocks, or in open areas with sandy soils, 1700–2600 m (Fig. 10B).

Notes. – This species is dominant across much of the high elevation plateau in Andringitra. There is considerable morphological variability: sheltered populations at higher elevations and with more access to water have longer leaf blades which are more likely to be flat, and larger panicles with open branches. Populations that form ground cover in drier, more open, lower elevation habitats have a denser compact habit with shorter rolled leaf blades, and more condensed panicles with fewer spikelets. Variation appears to be continuous.

The lectotype is chosen for its high quality flowering material and the best distribution of duplicates.

Additional material examined. – MADAGASCAR. Prov. Fianarantsoa: Andringitra NP, 22°10'03"S 46°53'49"E, 25.XI.2009, Couch et al. 590 (K [K000805562]); Manjarivolo, 2.XI.1970, Guillaumet 3501 (P [P06768509]); Andohariana in Andringitra, 13.I.1971, Guillaumet 3731 (P [P06768506]); N des chaînes Anosiennes, 25.XI.1971, Guillaumet 3921 (P [P06768507]); massif de l'Andringitra, 27.XI.1924, Humbert 3879a (K [K000805567]); *ibid. loco*, 27.V.1924, Humbert 3880 (G, K [K000805563]), P [P02263105]; *ibid. loco*, 27.V.1924, Humbert 3881 (G, K [K000805570]), NY, P [P00224782]; *ibid. loco*, 27.XI.1924, Humbert 3882 (P [P02263101]); *ibid. loco*, XII.1924, Humbert 3883 (G, K [K000805568]), NY, P [P00224781]; Andringitra NP, près du campement 2, 22°09'24"S 46°54'19"E, 26.XI.2013, Nanjarisoa et al. 74 (K, TAN); Andringitra NP, Pic Boby, 22°11'42"S 46°53'31"E, 28.XI.2013, Nanjarisoa et al. 86 (K, TAN); Andringitra massif, II.1922, Perrier de la Bâthie 14549 (K [K000244713]), P [P00224784]; Andringitra NP, 22°09'00"S 46°53'57"E, 6.XI.2003, Phillipson et al. 5679 (P [P06768783]); Sendriosa, Ambalavaokely, 5.XII.1954, Rakotoavao 688 (P [P06903358]); Ambalavao, Ramiova, 28.X.1955, Rakotoavao 7632 (P [P06768508]); Andringitra, Diavolana, 6 km from camp 2, 22°08'13"S 46°52'00"E, 29.XI.2013, Vorontsova et al. 1218 (TAN); Andringitra, below Imarivolanitra, 22°11'42"S 46°45'31"E, 12.XII.2013, Vorontsova et al. 1228 (TAN); Andringitra, east of camp 3, 22°11'32"S 46°54'20"E, 13.XII.2013, Vorontsova et al. 1250 (TAN); *ibid. loco*, 13.XII.2013, Vorontsova et al. 1262 (TAN).

25. *Panicum subalbidum* Kunth, Révis. Gramin. 2: 397, tab. 112. 1831.

Holotypus: SENEGAL: Dagana, Walo, IX.1825, Leprieur s.n. (P [P00442196]!).

= *Panicum proliferum* var. *longijubatum* Stapf, Fl. Cap. 7: 406. 1899. ≡ *Panicum longijubatum* (Stapf) Stapf in Oliv. et al., Fl. Trop. Afr. 9: 718. 1920. **Syntype:** SOUTH AFRICA. Coast Reg.: Komgha division, Kei Riv., near Komgha, s.d., Flanagan 953 (K [K000255495]!). **Eastern Reg.:** Natal, near Umzimkulu Riv., 1840, Drège s.n. (K [000255493]!). **Eastern Reg.:** near Umpumulo, s.d., Buchanan 267 (K [K000255494]!); near Durban, Williamson 21 (K [K000255491]!).

= *Panicum bicuspidatum* A. Camus in Bull. Soc. Bot. France 99: 64. 1952. **Holotypus:** MADAGASCAR. Prov. Antsiranana: Ankarana, XII.1937–I.1938, Humbert 18855 (P [P00450278]!), **syn. nov.**

Erect or geniculately ascending perennial, in diffuse tufts, 0.4–1 m tall, the culms spongy, glabrous, the nodes dark. *Leaf sheaths* glabrous. *Ligule* a ciliolate membrane. *Leaf blades* linear, flat, chartaceous, 7–10 × 0.3–1.5 cm, drying yellow-green, glabrous on both sides. *Panicles* terminal, partly or fully exserted, 15–40 cm long, effuse, the branches contracted, the lower branches opening and somewhat reflexed at maturity, scabrous, the spikelets appressed to the branches on pedicels 0.5–3 mm long. *Spikelets* ovate to lanceolate, apically acute, 2.5–3 mm long, with prominent veins, white to yellow, sometimes with purple, almost never gaping open. *Lower glume* c. ¼ as long as the spikelet, membranous, cuff-like, obtuse to finely acute, 1-veined, glabrous. *Upper glume* as long as the spikelet, herbaceous, 7–9-veined, glabrous. *Lower floret* barren, with a reduced palea. *Lower lemma* herbaceous, 7–9-veined, glabrous. *Upper lemma* 2–2.2 mm long, shorter than the lower floret, smooth, shiny, pale.

Distribution and ecology. – Common African grass found across Madagascar except the north of the island, usually near water, on the edges of rice paddies, 0–1500 m (Fig. 16A). Occasionally recorded from La Réunion and Mauritius.

Notes. – This species is recognisable by its pointed spikelets that gape open at maturity, its reduced lower glume, dark nodes, and frequently geniculate growth habit.

The full typification of *Panicum subalbidum* Kunth is outside the scope of this work and will be published as part of an ongoing study of African *Panicum* s.l.

This species is illustrated in BOSSER (1969: Fig. 127e–h).

Additional material examined. – MADAGASCAR. Prov. Antananarivo: parc de Tsimbazaza, 9.XII.1952, Benoist 1925 (P [P03182760]); PK 22 rte d'Arivonimamo, V.1963, Bosser 17064 (P [P02726854]); Antananarivo Ville, aérodrome Ivato, 18.I.1975, Croat 28738 (TAN); Sansoavy, Fenoarivo-Centre, 30.XI.1966, Delhaye 15956 (P [P06768787]); aérodrome Ivato, 7.I.1967, Delhaye & Granier 16816 (P [P02608204]); Nanisana, II.1906, Herb. Jard. Bot. Tan. 772 (P [P02608214]); *ibid. loco*, 31.I.1933, Herb. Jard. Bot. Tan. 32483 (P [P02608216]); parc de Tsimbazaza, 18.VIII.1935, Herb. Jard. Bot. Tan. 324193 (P [P02040429]); central Madagascar, Parker s.n. (K [K000805581]); Antsirabe, I.1924, Perrier de la Bâthie 10757 (P [P02608174]); Lac Itasy, 19°03'45"S 46°44'36"E, 3.II.2000, Raynal-Roques et al. 24919 (K [K000805573]); env. de Antananarivo, 25.IV.1907, Rotureau s.n. (P [P02358113]); *ibid. loco*, 25.VI.1960, Rotureau s.n. (P [P02373565]). **Prov. Fianarantsoa:** station de Belemboaka, Anon. 27397 (P [P02608203]); Vohipeno, X.1990, Beaujard 322 (P [P06768788]); Ranohira, II.1956, Bosser 9023 (P [P02608210]); *ibid. loco*, II.1963, Bosser 17883 (P [P02608171]); Sakaleona, Lac Alaotra, Cours s.n. (P [P02726882]); W of Ambalavao, I.II.1975, Croat 30236 (TAN); Ambohitombo forest, V.1895, Forsyth-Major 248 (G, K [K000805577]); *ibid. loco*, 26.I.1895, Forsyth-Major 734 (K [K000805576]); Betsiléo, II.1881, Hildebrandt 4012 (G, K [K000805575]), P [P02608195]; Isalo, haute vallée de la Mama, 29.I.1955, Humbert 28779 (P [P02608198]); PK 40 on RN27, 21.XII.1965, Peltier & Peltier 5568 (P [P02726870]); 4 km from Vangaindrano towards Taolagnaro, 23°21'17"S 47°36'40"E, 30.X.2011, Vorontsova et al. 637 (K, TAN); RN25 from Iroandro to Ambolotara, 21°23'12"S 47°56'19"E, 4.XI.2011, Vorontsova et al. 708 (K, TAN). **Prov. Mahajanga:** Marovoay, 13.VI.1912, Afzelius G46 (K [K000805578]); *ibid. loco*, 13.VI.1912, Afzelius s.n.

(K [K000805574]); Befandriana, Angodrogodro-baiba, 17.XII.1942, *Herb. Jard. Bot. Tan.* 5552 (P [P02608209]); haute vallée de la Sofia vers Antsakabary, XI.1937, *Humbert 18075* (G, P [P02608207]); rte Majunga, Marovay, IV.1967, *Morat 2713* (P [P02608164]); env. de Maevatanana, VII.1900, *Perrier de la Bâthie 895 bis* (P [P02608196]); Iabohazo riv., affluent de gauche du Betsiboka, VII.1902, *Perrier de la Bâthie 11106* (P [P02263079]); Andranomavo, Soalala, 24.II.1953, *Réserves Naturelles 5100* (P [P02608200]); *ibid. loco*, 8.II.1955, *Réserves Naturelles 7098* (P [P02608166]); Antanimbary, near Maevatanana, 17°11'S 46°51'E, 13.II.2013, *Vorontsova et al. 913* (K, TAN); Majunga, VII.1922, *Waterlot 549* (P [P02608212]). **Prov. Toamasina:** Sainte Marie, 1847, *Boivin 1622* (K [K000805572], US); *ibid. loco*, 1850, *Boivin s.n.* (K [K000805584]); Mahanoro, Anosivolo, 20°00'33"S 48°17'49"E, 11.II.2010 *Faranirina et al. 173* (P [P06768784]); lac Alaotra, *Herb. Jard. Bot. Tan.* 3393 (P [P02608173]); Ambatondrazaka, 8.III.1932, *Herb. Jard. Bot. Tan.* 324149 (P [P02608172]); *ibid. loco*, III.1932, *Herb. Jard. Bot. Tan.* 324162 (P [P02608211]); Ivoloina, VII.1930, *Martine G14* (P [P02608202]); Mahanoro, rivière alimentée Mangoro, 20°00'32"S 48°17'47"E, 8.II.2010, *Rakotoavao et al. 5176* (P [P06768525]). **Prov. Toliara:** Beloha – Tsihombe, II.1962, *Bosser 15657* (P [P02608163], TAN); banks of Onilahy riv., near Tongobory, 14.II.1975, *Croat 31199* (TAN); Andohahela NP, Fanota, 24°46'31"S 46°51'53"E, 2.XI.2011, *Hall et al. 63* (K, TAN); massif de l'Ivakoany, XI.1933, *Humbert 12257* (US); forêt d'Analavelona au N du Fiherenana, III.1934, *Humbert 14266* (P [P02608199]); vallée de l'Onilahy en aval de Tongobory, 8.XI.1960, *Leandri & Chauvet 3733* (P [P02608222]); *ibid. loco*, 8.XI.1960, *Leandri & Chauvet 3748* (P [P02608197]); Morondava, X.1963, *Morat 152* (P [P02608220]); bords du Manambolo, X.1904, *Morat 737* (P [P02608218]); piste de Sakaraha à Ankazoabo après Laborano, II.1968, *Morat 2882* (P [P02608219]). **Sine loco:** *Anon. 23* (P [P02608213]); Masobisilay, *Anon. 31* (P [P02608167]); *Cours s.n.* (P [P02329564]); 1956, *Dequaire 27397* (P [P06795991]).

26. *Panicum subhystrix* A. Camus in Bull. Soc. Bot. France 72: 708. 1925 (Fig. 13C, 17).

Lectotypus (designated here): **MADAGASCAR. Prov. Fianarantsoa:** Andringitra massif, II.1922, *Perrier de la Bâthie 14545* (TAN [TAN000388]!; isolecto-: B [B 10 0168672] image seen, K [K000805589]!, P [P00224774, P00224776]!).

= *Isachne perrieri* A. Camus in Bull. Soc. Bot. France 72: 306. 1925. = *Panicum betafoense* A. Camus in Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 1: 111. 1949.

Lectotypus (designated here): **MADAGASCAR. Prov. Antananarivo:** W de Betafo, V.1920, *Perrier de la Bâthie 13183* (P [P00450277]!; isolecto-: P [P02241484]!), **syn. nov.**

= *Isachne hirtissima* A. Camus in Bull. Soc. Bot. France 73: 916. 1927. = *Panicum betafoense* subsp. *midongyense* A. Camus in Bull. Soc. Bot. France 107: 210. 1960.

Lectotypus (designated here): **MADAGASCAR. Prov. Fianarantsoa:** env. de Midongy, III.1919, *Perrier de la Bâthie 12523* (P [P00450255]!; isolecto-: K [K000244643]!, P [P00450254, unmounted]!), **syn. nov.**

Annual or perennial, creeping or ascending, stems often branched at the base to form a dense mat, to 1 m long, the culms glabrous to pilose with bulbous-based cilia. *Leaf sheaths* glabrous to pilose with bulbous-based cilia. *Ligule* a glabrous

or ciliolate membrane. *Leaf blades* lanceolate to filiform, flat or rolled, chartaceous, amplexicaul when broad, 3–7 × 0.1–1 cm, drying yellow-green, glabrous to pubescent on both sides. *Panicles* terminal, fully exerted, 3–10 cm long, elliptic, the branches lax, ascending, with glandular patches, glabrous or pubescent, the pedicels filiform and flexuous. *Spikelets* broadly ovate, asymmetric, apically obtuse, 1.5–2 mm long, yellowish or purple, gaping open at maturity. *Lower glume* equalling or slightly exceeding the spikelet, membranous, acute, 1–3-veined, glabrous to pubescent, separated from the rest of the spikelet by a short internode. *Upper glume* as long as the spikelet, herbaceous, 5-veined, hirsute with bulbous-based trichomes at maturity. *Lower floret* male, with palea. *Lower lemma* thinly cartilaginous, 5–7-veined, sometimes hooded, glabrous. *Upper lemma* shorter than the lower floret, the whole surface with a dense covering of fine verrucae, often dehiscent before the lower floret.

Distribution and ecology. – Endemic to the Central Plateau high elevation grassland, woodland, tapia forest, in damp areas and frequently sheltered by rocks, common on gneiss and quartzite, 1200–2300 m (Fig. 16A).

Notes. – This species is extraordinarily variable in its vegetative growth pattern, with leaves from filiform rolled to lanceolate 1 cm wide. This variability is often seen within a single population, while the spikelet morphology is constant. The scandent habit and long lower glume of *Panicum subhystrix* can be similar to the sympatric *P. perrieri* which has longer spikelets and the lower glume not offset from the rest of the spikelet. *Panicum subhystrix* is often seen in the vegetative state with a distinct juvenile morphology which is difficult to recognise.

The lectotype of *P. subhystrix* is chosen for its good quality material, and to improve the availability of type material in Madagascar; the B duplicate is not annotated with a collector number but the note by the species author implies this is a fragment of *Perrier de la Bâthie 14545*. The lectotype of *Isachne perrieri* is chosen for its best quality material. The lectotype of *I. hirtissima* is chosen because it is the only duplicate at the species author's place of work annotated by the author.

Panicum betafoense was published as a replacement name for *Isachne perrieri* since *Panicum perrieri* was already a name in use for another species since 1925. *Panicum betafoense* was published by means of an indirect reference (TURLAND et al. 2018: Art. 41.3).

Additional material examined. – **MADAGASCAR. Prov. Antananarivo:** Analandraisoa, IV.1963, *Bosser 17614* (P [P02307346]); env. Ibity, 6.V.1970, *Bosser 20259* (P [P06795929]); *ibid. loco*, 6.V.1970, *Bosser 20261* (P [P06795932]); Ibity massif, V.1969, *Morat 3185* (P [P02307393]); *ibid. loco*, II.1914, *Perrier de la Bâthie 10269* (P [P02251485]); Andranomongitsy près Banomointy, VI.1912, *Perrier de la Bâthie 10290* (P [P02251496]); Betafo, VI.1912, *Perrier de la Bâthie*

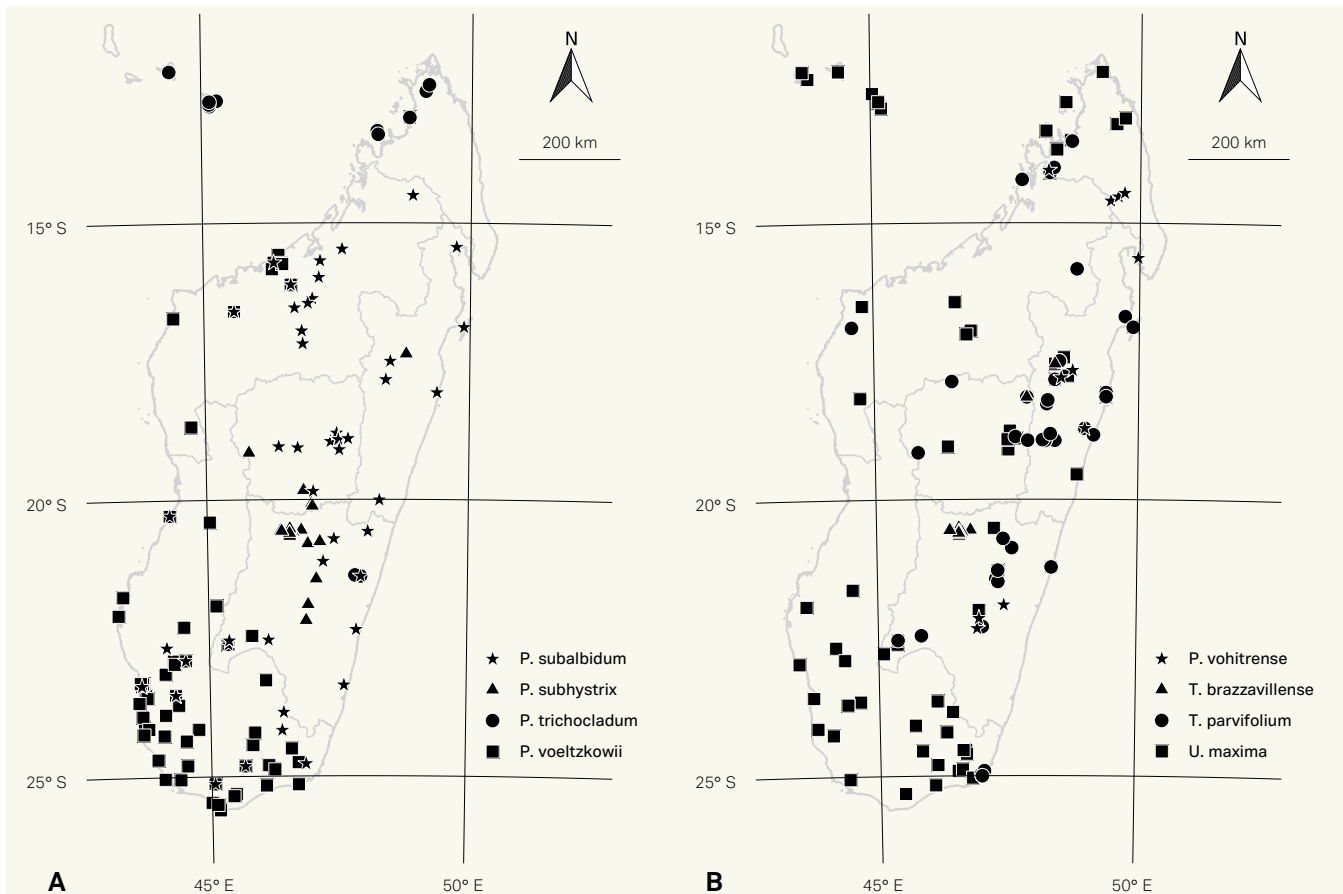


Fig. 16. – Distribution maps. **A.** *Panicum subalbidum* Kunth (stars), *P. subhystrix* A. Camus (triangles), *P. trichocladum* K. Schum. (circles) and *P. voeltzkowii* Mez (squares); **B.** *Panicum vohitrense* A. Camus (stars), *Trichanthecium brazzavillense* (Franch.) Zuloaga & Morrone (triangles), *T. parvifolium* (Lam.) Zuloaga & Morrone (circles) and *Urochloa maxima* (Jacq.) R.D. Webster (squares).

10296 (P [P06768765]); Mt Ibity, *Perrier de la Bâthie* 10769 (P [P02251489, P02251507]); Andranomongitsy près Banomointy, VI.1912, *Perrier de la Bâthie* 10790 (P [P02251488]); Betafo, VI.1912, *Perrier de la Bâthie* 10796 (P [P06768764]); NW de Betafo, V.1962, *Bosser* 16375 (P [P06795931]); 2–3 km E of Ibity cement factory, Beampombo, 20°04'14"S 47°00'11"E, 28.IV.2004, *Rogers et al.* 346 (P [P02373632]). **Prov. Fianarantsoa:** Itremo, IX.1956, *Bosser* 9838 (P [P06795930]); Fianarantsoa, IV.1964, *Bosser* 19534 (P [P02324486], TAN); Ambatofinandrahana, IV.1964, *Bosser* 19556 (P [P02251487], TAN); Itremo, IV.1964, *Bosser* 19564 (P [P02251486]); Itremo, Ambatomenaloha, IV.1964, *Bosser* 19663 (P [P02324485], TAN); Ambalavao, 20.X.1940, *Decary* 15914 (P [P06795968]); Itremo, X.1954, *Morat* 752 (P [P02307321]); Ambalavao, IV.1972, *Morat* 3919 (P [P02325447], TAN); à l'W d'Itremo, 17.I.1955, *Humbert* 30070 (P [P02251502, P02251501]); *ibid. loco.*, 17.I.1955, *Humbert* 30079 (P [P02251504]); *ibid. loco.*, 17.I.1955, *Humbert* 30081 (P [P02251505]); *ibid. loco.*, 17.I.1955, *Humbert* 30082 (P [P02251497]); *ibid. loco.*, 17.I.1955, *Humbert* 30083 (P [P02251503]); *ibid. loco.*, 17.I.1955, *Humbert* 30084 (P [P02251501]); Itremo, Ianasana, 20°34'39"S 46°34'54"E, 15.III.2013, *Nanjarisoa & Andriamampionona* 14 (K, TAN); Itremo, Andohatanimena, 20°31'15"S 46°33'59"E, 19.II.2014, *Nanjarisoa et al.* 145 (K, TAN); Itremo, Soatsihotapaka, 20°31'35"S 46°34'52"E, 20.II.2014, *Nanjarisoa et al.* 152 (K, TAN); *ibid. loco.*, 20.II.2014, *Nanjarisoa et al.* 154 (K, TAN); Itremo, Ankevo, 20°39'36"S 46°34'46"E, 13.III.2012, *Ratovonirina et al.* 185 (K, TAN [K000753875]); Itremo, Ianasana, 20°34'41"S 46°35'05"E, 13.III.2012, *Ratovonirina et al.* 189b (K, TAN); Itremo, Ambat-oantrano, 20°33'51"S 46°34'48"E, 14.III.2012, *Vorontsova et al.* 748 (K, TAN); Itremo, Soatsihotapaka, 20°30'44"S 46°34'43"E, 26.II.2013, *Vorontsova et al.*

1022 (K, TAN); Itremo, Ianasana, 20°34'46"S 46°35'18"E, 20.V.2014, *Vorontsova* 1586 (TAN); *ibid. loco.*, 20.V.2014, *Vorontsova & Nanjarisoa* 1597 (TAN). **Prov. Toamasina:** Maningory, chutes de Ambato, 14.XII.1944, *Homolle* 1833 (P [P02251500]).

27. *Panicum trichocladum* K. Schum. in Engl., Pflanzenw. Ost-Afrikas, C: 103. 1895.

Lectotypus (designated here): **TANZANIA:** Kilimanjaro, s.d., *H. Meyer* 140 (B [B100715462] image seen; isolecto-: US [US00140067] image seen). **Syntypus:** **TANZANIA:** Usambara, s.d., *Volkens* 69 (B†, US [US00140067] image seen, BR [BR0000008766779] image seen).

Scrambling ascending perennial, rhizomatous, 1.5–2 m tall, the culms branching, glabrous or sometimes pubescent on the nodes. *Leaf sheaths* glabrous to finely pubescent. *Ligule* a ciliolate membrane. *Leaf blades* linear to lanceolate, flat, chartaceous, 3–15 × 0.5–1.5 cm, drying green-brown, rounded at the base and acuminate at the tip, glabrous to finely pubescent on both sides. *Panicles* terminal, partly or fully exserted, 5–15 cm long, ovate, diffuse, the branches filiform, flexuous, with long

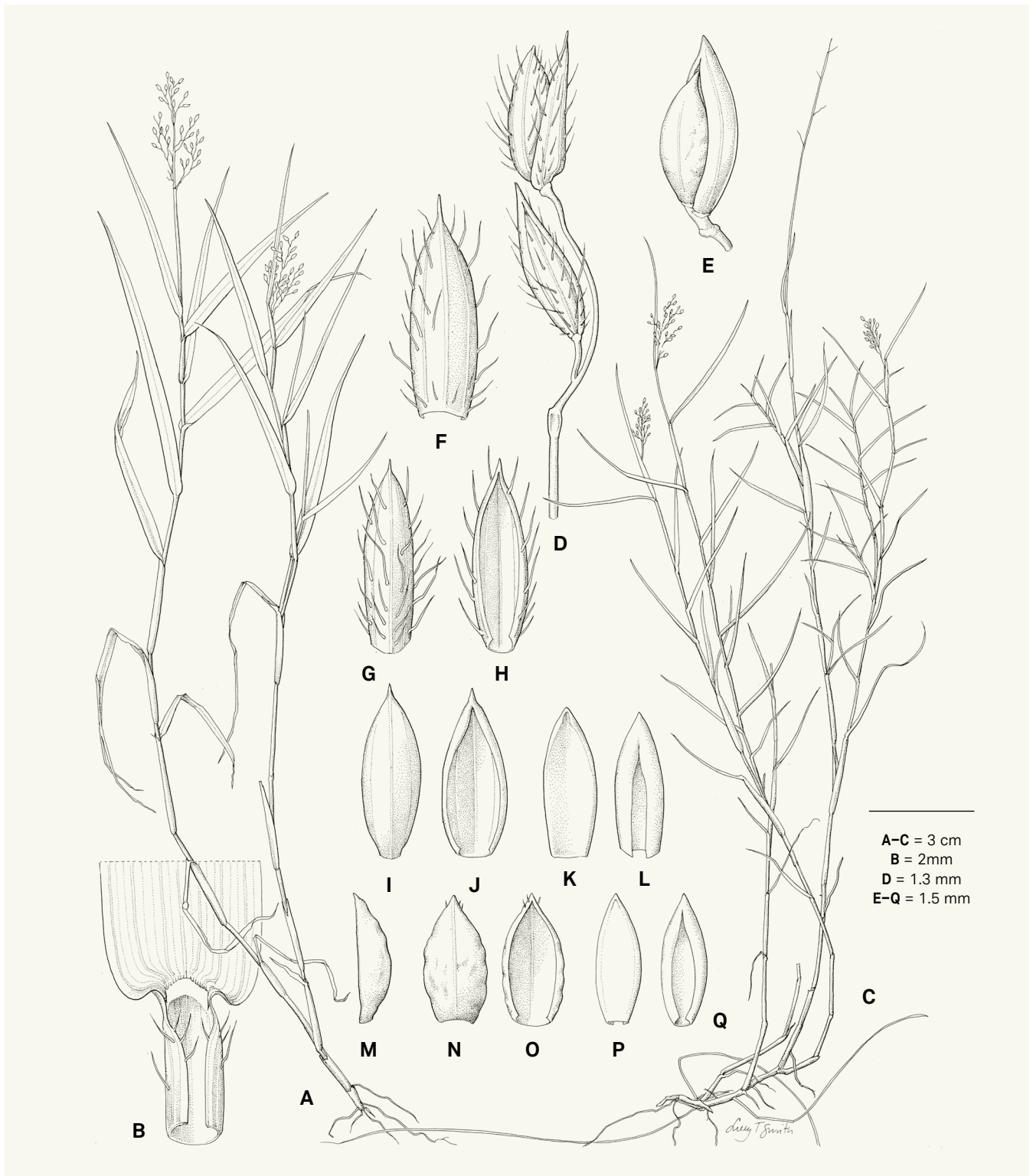


Fig. 17. – *Panicum subhystrix* A. Camus. **A.** Habit, wet environment; **B.** Ligule; **C.** Habit, dry environment; **D.** Panicle branch; **E.** Spikelet with glumes removed; **F.** Lower glume, dorsal view; **G.** Upper glume, dorsal view; **H.** Upper glume, ventral view; **I.** Lower lemma, dorsal view; **J.** Lower lemma, ventral view; **K.** Lower palea, dorsal view; **L.** Lower palea, ventral view; **M.** Upper floret, lateral view; **N.** Upper lemma, dorsal view; **O.** Upper lemma, ventral view; **P.** Upper palea, dorsal view; **Q.** Upper palea, ventral view. [Vorontsova et al. 748, K] [Drawing: Lucy T. Smith]

white cilia subtending the spikelet, the pedicels 3–10 mm long. *Spikelets* oblong, apically rounded to acute, c. 3 mm long, with poorly visible veins, green to purple, partly open at maturity. *Lower glume* $\frac{1}{6}$ – $\frac{1}{4}$ as long as the spikelet, membranous, with no veins, glabrous. *Upper glume* as long as the spikelet, herbaceous, 5-veined, glabrous. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Tropical African species introduced to South America and Asia, and common on the Comoros. Sometimes collected in northern Madagascar, with a single weedy record from Fianarantsoa. Humid disturbed areas, often near human habitation, 50–1000 m (Fig. 16A).

Notes. – This species can be recognised by its wiry flexuous inflorescence branches, and by long white trichomes usually subtending the spikelet. It seems likely that this species is introduced in Madagascar.

This species is illustrated in BOSSER (1969: Fig. 127a–d).

Additional material examined. – MADAGASCAR. Prov. Antsiranana: Nosy Be, VII.1850, *Boivin 1962bis* (P [P02608269]); montagne d'Ambre, Joffreville, VII.1953, *Bosser 5448* (P [P02608274]); Nosy Be, Ambatoloaka, VIII.1959, *Bosser 13220* (P [P02608268]); camp d'Ambre, IV.1933, *Perrier de la Bâthie 19303* (P [P02608270]); Nosy Be, Passandana, 18.VII.1840, *Perville 299* (K [K000805601], P [P02608266]); Nosy Be, Hellville, 11.IX.1912, *Viguiier & Humbert 124* (P [P02608273]). Prov. Fianarantsoa: RN25 from Irontro to Ambolotara, 21°23'12"S 47°56'19"E, 4.XI.2011, *Vorontsova et al. 705* (K, TAN).

28. *Panicum voeltzkowii* Mez in Bot. Jahrb. Syst. 57: 187. 1921 (Fig. 13B).

Lectotypus (designated here): MADAGASCAR. Prov. Antsiranana: Baie de Rigny, X.1848, *Boivin 2266* (P [P00450240]!; isolecto-: K [K000805591]!, G [G00378071, G00378072] images seen, P [P03367593]!, US, W [W18890147243] image seen). **Syntypus**: MADAGASCAR: *sine loco*, *Voeltzkow 321* (not found).

= *Panicum mandrareense* A. Camus in Bull. Soc. Bot. France 99: 63. 1952. **Lectotypus** (designated here): MADAGASCAR. Prov. Toliara: montagnes entre l'Andohahela et l'Elakelaka, entre Ampahiso et Mahamavo, I.1934, *Humbert 13783* (P [P00450230]!; isolecto-: P [P00450231, P02207804]!, US). **Syntypus**: MADAGASCAR. Prov. Toliara: Mandrare valley, Anadabolava, *Humbert 12549* (not found), **syn. nov.**

= *Panicum pseudovoeltzkowii* A. Camus in Bull. Soc. Bot. France 105: 248. 1958. **Lectotypus** (designated here): MADAGASCAR. Prov. Toliara: Manampetsotsa au Delta de la Linta, 17.VIII.1928, *Humbert & Swingle 5345* (P [P00450248]!; isolecto-: NY, P [P00450249, P02608146]!, TAN!, US [3 sheets]!). **Syntypus**: MADAGASCAR. Prov. Toliara: Manampetsotsa au delta

de la Linta, 17.VIII.1928, *Humbert & Swingle 5302* (P [P02608148]!), **syn. nov.**

= *Panicum pseudovoeltzkowii* var. *latifolium* A. Camus in Bull. Soc. Bot. France 105: 248. 1958. **Lectotypus** (designated here): MADAGASCAR. Prov. Toliara: du Lac Manampetsa près d'Itampolo, 17.VIII.1928–24.VIII.1928, *Humbert & Swingle 5388bis* (P [P00450250]!). **Syntypus**: MADAGASCAR. Prov. Mahajanga: env. de Marovoay, XII.1903, *Perrier de la Bâthie 11100* (P [P02207800]!), **syn. nov.**

= *Panicum morombense* A. Camus in Notul. Syst. (Paris) 15: 412. 1959. **Holotypus**: MADAGASCAR. Prov. Toliara: Morombe, 24.II.1943, *Decary 18765* (P [P00450234]!), **syn. nov.**

Caespitose perennial, forming stolons and rooting at nodes, the plant tufted or geniculate ascending or creeping, 10–40 cm tall, the culms glabrous. *Leaf sheaths* glabrous. *Ligule* a line of hairs. *Leaf blades* linear to lanecolate, flat or rolled, chartaceous, 3–9 × 0.15–0.7 cm, drying yellow-green, glabrous to sparsely pubescent on both sides, often with bulbous based cilia on the lower part of the margin. *Panicles* terminal, fully exerted, 2.5–6 cm long, ovate, the branches lax, ascending, glabrous. *Spikelets* ovate to subglobose, apically obtuse, 1.3–1.7 mm long, pale brown or purplish, gaping open at maturity. *Lower glume* c. $\frac{1}{2}$ as long as the spikelet, keeled, apically finely acuminate, 3-veined, finely scabrous on the keel. *Upper glume* as long as the spikelet, herbaceous, 5-veined, glabrous. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to Madagascar and nearby islands. Southern and western areas of Madagascar, especially on the coast and at low elevations on sand, common along roadsides, pastures, secondary vegetation, grasslands, dunes, and spiny forest, 0–500 m (Fig. 16A). Common on the coast of La Réunion.

Notes. – *Panicum voeltzkowii* commonly forms ground cover in arid southern Madagascar. Clearly a relative of *P. luridum*, this species occupies a more arid habitat niche; the spikelets are smaller than *P. luridum* and apically rounded. The long-standing distinction between *P. voeltzkowii* (tufted with no stolons, salt tolerant) and *P. pseudovoeltzkowii* (stoloniferous, not salt tolerant) is not possible to differentiate on herbarium specimens; both morphologies have been observed in a single population in the field.

Of the two syntype collections, only *Boivin 2266* was successfully located. The lectotype sheet is selected because it represents the top set of Boivin's collections held at P, with an original handwritten label. The lectotype of *P. mandrareense* is selected for its best quality original material annotated by

the author. The epithet of *P. pseudowoeltzkowii* has sometimes been spelled as '*Panicum pseudowoeltzkowii*', a variation in transliteration that does not constitute a correctable error. The protologue of *P. pseudowoeltzkowii* indicates two syntypes from the southwestern coast: *Humbert & Swingle* 5302, and 5345; the lectotype is chosen because the collection *Humbert & Swingle* 5345 has better global distribution of duplicates and the lectotype sheet bears the best material annotated by the author. The chosen lectotype sheet of *P. pseudowoeltzkowii* var. *latifolium* is the only sheet annotated by A. Camus of the two syntype collections indicated in the protologue: *Perrier de la Bâthie* 11100 and *Humbert & Swingle* 5388bis. The type collection of *P. morombense* is cited in the protologue as "Decary 8765", almost certainly an erroneous citation of *Decary* 18765.

This species is illustrated in *BOSSER* (1969: Fig. 126a-d as '*Panicum pseudowoeltzkowii*').

Additional material examined. – **MADAGASCAR.** **Prov. Antsiranana:** Fot-simavo, Ambilobe, XII.1964, *Morat* 1281 (P [P01914239]). **Prov. Mahajanga:** Majunga, 4.III.1924, *Decary* 2420 (P [P02207805]); plage de Marofototra, X.1904, *Morat* 746 (P [P02309297]); E d'Antsalova, I.1975, *Morat* 4885 (TAN); baie de Bombetoka, V.1907, *Perrier de la Bâthie* 11040 (P [P02608152]); près d'Andranomavo, X.1903, *Perrier de la Bâthie* 11103 (P [P01914247]); Station Forestière Antsianitia, 15°34'42"S 46°24'55"E, 15.II.2013, *Vorontsova et al.* 937 (K, TAN); *ibid. loco*, 15.II.2013, *Vorontsova et al.* 945 (K, TAN); between Station Forestière Marohogo and Andradia, 15°43'13"S 46°28'39"E, 19.II.2013, *Vorontsova et al.* 969 (K, TAN). **Prov. Toliara:** Manasoà, Mahafaly, 29.I.1913, *Afzelius* G45 (K [K000805607]); Toliara Ville, jardin Griton, V.1930, *Basse s.n.* (P [P02608158]); entre Efoetsy et Itampolo, V.1951, *Bosser* 166 (P [P01914252], P06795573), TAN); Ampanihy-Beloha, V.1951, *Bosser* 308 (P [P02726818], TAN); Androka, Ranomasy, V.1951, *Bosser* 319 (TAN); W d'Ejeda, V.1951, *Bosser* 407 (P [P01914154], TAN); Efoetsy, V.1951, *Bosser* 460 (P [P01914253], TAN); Ifotaka, Mandrare, XI.1952, *Bosser* 4203 (P [P02207811], TAN); Imanombo, XI.1952, *Bosser* 4298 (P [P02608153, P02726855], TAN); Ankilizato, Mahabo, I.1953, *Bosser* 4526b (P [P01914251], TAN); Sakaraha, II.1956, *Bosser* 9025 (P [P01914248], TAN); env. de Morondava, IX.1956, *Bosser* 10033 (P [P01914249]); entre Ampanihy et Ejeda, XI.1956, *Bosser* 10537 (P [P01914255]); vallée du Fihierenana, III.1960, *Bosser* 14023 (P [P01914158], TAN); Vohitany, bords de la Linta, II.1962, *Bosser* 15739 (P [P01914153], TAN); Beheloka, 17.III.1962, *Bosser & Viennot* 16073 (P [P01914157]); Tan-andava, Mangoky, III.1962, *Bosser & Viennot* 16103 (P [P02207809]); PK 20 rte de Ianakafy, près de Betroka, II.1963, *Bosser* 17210 (P [P02307384]); env. d'Ankazoabo, II.1963, *Bosser* 17478 (P [P01914155]); Ampanihy-Beloha, S d'Ampanihy, III.1964, *Bosser* 19218 (P [P02726823]); entre Ampanihy et Tranoroa, III.1964, *Bosser* 19334 (P [P02726817]); île de Nosy-Ve, au large d'Anakao, II.1964, *Bosser* 19337 (P [P02608155]); Andavadoaka, III.1964, *Chabonis s.n.* (P [P01914236]); between Tongobory and Betsioky, 23°31'30"S 44°19'30"E, 14.II.1975, *Croat* 31210 (TAN); Lavanono, 17.II.1975, *Croat* 31562 (K [K000805560], P [P01914254]); vicinity of Tsihombe, 18.II.1975, *Croat* 31619 (TAN); Ambovombe, 19.IV.1924, *Decary* 2561 (P [P01914233]); Antanimora, près du Fort-Dauphin, 12.VII.1926, *Decary* 4218 (P [P02207799]); Amboasary, 22.I.1932, *Decary* 9572 (P [P03487909], TAN, US); station Behemboka, *Dequaire* 27585 (P [P02726887]); S Ambovombé, 1956, *Descoings* 1635 (P [P02726850], TAN); *ibid. loco*, 1956, *Descoings* 1657 (P [P02307354], TAN); Itampolo, IV.1969, *Guillaumet* 2444 (P [P01914250]); Soaranano, 20.I.1938, *Herb. Jard. Bot. Tan.* 3122 (P [P01914235]); entre Beloha et Ambovombe, VII.1930, *Herb. Jard. Bot. Tan.* 261952 (P [P01914232]); delta du Fihierenana, 14.IX.1924, *Humbert & Perrier de la Bâthie* 2450 (K [K000805590]); plateau Mahafaly, 27.IX.1924, *Humbert* 2668 (P [P02726884]); delta de

la Linta, 24.VIII.1928, *Humbert & Swingle* 5456 (US); env. de Tsihombe, 8.IX.1928, *Humbert & Swingle* 5564 (P [P00450253]); vallée de la Manambolo, XII.1933, *Humbert* 12779 (P [P02207821]); entre Ampahiso et Mahamavo, I.1934, *Humbert* 13713 (P [P01914238]); env. de Manera, III.1934, *Humbert* 14419 (P [P02207806]); env. de Manombo, 29.I.1947, *Humbert* 20062 (P [P01914240]); env. d'Antanimoro, 30–35 km N vers Ambia, 6.II.1955, *Humbert & Capuron* 28831 (P [P03487885, P03487907]); baie des Galions, 18.II.1955, *Humbert & Capuron* 29014a (P [P02222306], TAN); *ibid. loco*, 18.II.1955, *Humbert* 29033 (P [P01914241]); *ibid. loco*, 18.II.1955, *Humbert & Capuron* 29034 (P [P02222307]); cap Sainte-Marie, 5.III.1955, *Humbert & Capuron* 29249 (P [P01914244]); lac Tsimanampetsa, 25.XI.1960, *Leandri* 4056 (P [P02309294]); Sarodrano, II.1967, *Morat* 2637 (P [P01914237]); Toliary rural, II.1968, *Morat* 2872 (TAN); Sakaraha, II.1968, *Morat* 2886 (TAN); Ankaboka – Bemandraty, Ankazoabo, VIII.1967, *Morat* 2900 (TAN); Sakaraha, IV.1967, *Morat* 2927 (TAN); lac Tsimanampetsotsa, 15.IV.1961, *Peltier & Peltier* 3124 (P [P02307319]); entre Tulear et St Augustine, 31.III.1966, *Peltier & Peltier* 5841 (P [P01914151]); Mahafaly Plateau, *Perrier de la Bâthie* 114 (K [K000805494]); *ibid. loco*, *Perrier de la Bâthie* 119 (K [K000805493]); dunes de la côte Mahafaly, *Perrier de la Bâthie* 139 (K [K000805558]); plateau Mahafaly, VI.1910, *Perrier de la Bâthie* 11205 (P [P01914149]); *ibid. loco*, VI.1910, *Perrier de la Bâthie* 11206 (P [P01914150]); Antaka, de la côte Mahafaly, *Perrier de la Bâthie* 11184 (P [P01914243]); dunes des Befanamy, 15.II.1921, *Poisson* 141 (P [P02207810]); terrain d'aviation, Morondava, 9.III.1953, *Portères s.n.* (P [P06795577]); SW, V.1953, *Portères s.n.* (P [P02373633]); Betsioky-Ejeda road, 23°52'34"S 44°07'15"E, 20.III.1993, *Prendergast* 583 (K [K000805559]); Betsioky, May, *Réserves Naturelles* 3923 (P [P03183557]); 25 km N of Itampolo, 24°13'22"S 43°41'09"E, 25.IV.2014, *Vorontsova et al.* 1391 (TAN); from delta of the Linta to Ampanihy, 25°02'57"S 44°23'27"E, 25.IV.2014, *Vorontsova et al.* 1400 (TAN); c. 3 km from Cape Ste Marie towards the ANGAP office, Bevozoa, 25°35'02"S 45°08'32"E, 27.IV.2014, *Vorontsova et al.* 1418 (TAN); Vavaony beach, 25°36'18"S 45°09'46"E, 28.IV.2014, *Vorontsova et al.* 1425 (TAN); Ambalanosy, 25°30'22"S 45°06'57"E, 28.IV.2014, *Vorontsova et al.* 1438 (TAN); Ambaliandro, 25°21'11"S 45°26'13"E, 29.IV.2014, *Vorontsova et al.* 1448 (TAN). **Sine loco:** *Herb. Stat. Agric. Alaotra* 27239 (P [P02307348], TAN); IV.1967, *Morat* 2937 (TAN).

29. *Panicum vobitrense* A. Camus in Bull. Soc. Bot. France 92: 51. 1945 (Fig. 13D).

Lectotypus (designated here): **MADAGASCAR.** **Prov. Toamasina:** sur le Vohitra, 300 m, IX.1921, *Perrier de la Bâthie* 14014 (P [P00450243]); isolecto-: [P00450241, P00450242]!).

Annual or short lived perennial, rooting at lower nodes; prostrate, to 1 m long, the culms glabrous. *Leaf sheaths* glabrous or with ciliate edges. *Ligule* a lacerate ciliate membrane. *Leaf blades* lanceolate, flat, membranous, 1.5–5 × 0.3–1.1 cm, drying glaucous to yellow-green, cross veins visible when dry, glabrous on both sides, with a few cilia around the ligule and on sheath margins. *Panicles* terminal and axillary, partly or fully exerted on a peduncle to 5 cm long, 4–13 cm long, diffuse, the branching distichous or in threes, the branches divergent at maturity, glabrous, the spikelets not clustered at the tips of branches, the pedicels 2.5–8 mm long. *Spikelets* ovate-elliptic, apically rounded to acute, 1.3–1.7 mm long, yellowish, never gaping open. *Lower glume* up to ½ as long as the spikelet, obtuse to acute, 0–1-veined, glabrous. *Upper glume* as long as the spikelet, membranous, 3-veined, glabrous or with a few small trichomes.

Lower floret barren, without a significant palea. *Lower lemma* membranous, 3–5-veined, glabrous or with minute trichomes. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Endemic to the east coast and northern wet forests of Madagascar. Humid forest understory, often by the sides of a stream, often on laterite or gneiss, 450–1800 m (Fig. 16B).

Notes. – This species is distinguished from *P. mitopus* by its single long pedicels, divergent from the rest of the synflorescence branches. It is unclear whether this character is genetic in origin or a reflection of humid environment so it is possible this species may prove to be conspecific with *P. mitopus*.

The lectotype sheet is selected for its best quality material annotated by the species author.

Additional material examined. – MADAGASCAR. Prov. Antsiranana: massif du Marojejy, 9.XI.1959, *Humbert & Saboureau 140* (P [P03182743]); *ibid. loco*, 28.XI.1948, *Humbert & Capuron 22135* (P [P02608141]); entre la Haute Andramonta et la Majaika, 3.I.1951, *Humbert & Capuron 24843* (P [P02608144]); Reserve Speciale Manongarivo, Bekolosy, 14°02'50"S 48°17'46"E, 12.V.2014, *Vorontsova & Onjalalaina 1466* (K, P, TAN). Prov. Fianarantsoa: Andringitra, IV.1964, *Bosser 19484* (P [P02309317]); Pic Ivo-hibe, 21.IX.1926, *Decary 5410* (P [P01973817]); Ikongo, 17.X.1926, *Decary 5756* (P [P01973835]). Prov. Toamasina: mont Ankaroka, *Humbert & Cours 17532* (P [P01973797]); massif de l'Andrangovalu X.1937, *Humbert & Cours 17883* (P [P01973796]); NE of Ambanizana, 15°38'00"S 49°58'E, 20.X.1986, *Lowry et al. 4210* (P [P02661726]).

30. *Trichanthecium brazzavillense* (Franch.) Zuloaga & Morrone in Syst. Bot. Monogr. 94: 21. 2011.

= *Panicum brazzavillense* Franch. in Mem. Soc. Hist. Nat. Autun 8: 341. 1895.

Holotypus: DEMOCRATIC REPUBLIC OF THE CONGO: env. de Brazzaville, IX.1887, *Thollon 876* (P [P00057688]!); iso-: K [K000255588]!, P [P00057689]!.

= *Panicum fredericii* Rendle, Cat. Afr. Pl. (Hiern) 2: 180. 1899. **Lectotypus** (designated by ZULOAGA et al., 2011: 21): ANGOLA: Pungo Andongo, s.d., *Welwitsch 2872* (K [K000282489]!; isolecto-: BM [BM000923104] image seen, LISU [LISU226248, LISU226246, LISU226247] images seen).

= *Panicum decaryanum* A. Camus in Bull. Soc. Bot. France 99: 65. 1952. **Holotypus:** MADAGASCAR. Prov. Fianarantsoa: env. d'Ambatofinandrahana, 17.II.1938, *Decary 13013* (P [P00450263]!), **syn. nov.**

Erect caespitose perennial, 20–70 cm tall, the culms glabrous or sparsely pubescent on nodes. *Leaf sheaths* glabrous. *Ligule* membranous, truncate. *Leaf blades* filiform, rolled, firm, 5–15 × 0.1–0.2 cm, drying green-brown, basally sparsely pilose above. *Panicles* terminal, fully exserted, 5–10 cm long, ovate, the

branches wiry, appressed to spreading, glabrous, the pedicels filiform and undulating, 2–10 mm long. *Spikelets* subglobose to ovate, apically acute, 1.5–1.8 mm long, usually purple or brown, gaping open at maturity. *Lower glume* $\frac{3}{4}$ – $\frac{4}{5}$ as long as the spikelet, obtuse to acute, with hyaline edges, 3–5-veined, pilose separated from the rest of the spikelet by an internode of c. 0.3 mm. *Upper glume* as long as the spikelet, herbaceous, 5-veined, pilose. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* shorter than the lower floret dull, finely verruculose, the small verrucae difficult to see without a microscope.

Distribution and ecology. – Tropical African species; distribution in Madagascar limited to open seasonally flooded and grazed grassland and tapia forest on the High Plateau, 800–1800 m (Fig. 16B).

Notes. – Recognisable by its filiform leaves, pilose spikelets, and a lower glume almost as long as the spikelet. The panicle resembles the sympatric *Panicum ibitense* and can be distinguished from that species by its erect tufted habit, basal leaves, and a lack of swollen underground storage organs.

This species is illustrated by BOSSER (1969: Fig. 119a–d as *Panicum decaryanum*) and by ZULOAGA et al. (2011: Fig. 8).

Additional material examined. – MADAGASCAR. Prov. Antananarivo: Analabe, III.1953, *Bosser 5140* (P [P02608840]); *ibid. loco*, III.1953, *Bosser 5144* (K [K000805464], P [P02608843], TAN). Prov. Fianarantsoa: Itremo, I.1964, *Bosser 18946* (P [P02608823]); *ibid. loco*, I.1964, *Bosser 18946bis* (P [P02608825]); *ibid. loco*, I.1964, *Bosser 18952* (P [P02608842], TAN); *ibid. loco*, I.1964, *Bosser 18952bis* (P [P02608826]); *ibid. loco*, IV.1964, *Bosser 19540* (K, P [P02608822]); Col de Itremo, 27.I.1975, *Croat 29817* (TAN); Itremo, Ianasana, 20°34'39"S 46°34'59"E, 15.III.2013, *Nanjarisoa & Andriamampionona 9* (K, TAN); Itremo, Ampangabe, 20°37'02"S 46°36'49"E, 15.II.2014, *Nanjarisoa et al. 115* (K, TAN); Itremo, Ambatoantrano, 20°34'77"S 46°34'50"E, 16.II.2014, *Nanjarisoa et al. 126* (K, TAN); Itremo, Ankevo, 20°39'35"S 46°34'46"E, 13.III.2012, *Ratovonirina et al. 193* (K [K000753883], TAN). Prov. Toamasina: Mahatsinjo, XII.1954, *Bosser 7475* (P [P02307362]); lac Alaotra, VI.1959, *Bosser 13043* (P [P02608824], TAN).

31. *Trichanthecium parvifolium* (Lam.) Zuloaga & Morrone in Syst. Bot. Monogr. 94: 59. 2011.

= *Panicum parvifolium* Lam., Tabl. Encycl. 1: 173. 1791.

Holotypus: SOUTH AMERICA: "Ex America merid.", s.d., *Richard s.n.* (P-LA image seen; iso-: US [US00139840] image seen).

Creeping stoloniferous perennial, branching and rooting at nodes, to 1 m long, the culms and nodes glabrous. *Leaf sheaths* glabrous. *Ligule* a membrane. *Leaf blades* lanceolate to narrowly ovate, flat, chartaceous, broad and amplexicaul at base, 1.5–3 × 0.2–0.7 cm, glaucous, drying yellow-green, mostly appressed to the stem, often becoming reflexed at maturity, glabrous on both sides, or with a few long cilia near the ligule.

Panicles terminal, the uppermost leaf blade usually partly covering the panicle, or shortly exserted, 1–3 cm long, ovate, the branches spreading or slightly reflexed, glabrous. *Spikelets* ovate to elliptic, apically obtuse, 1–2 mm long, green, never gaping open. *Lower glume* $\frac{1}{2}$ – $\frac{2}{3}$ as long as the spikelet, chartaceous, apically obtuse, 3–5-veined, glabrous. *Upper glume* as long as the spikelet, herbaceous, 5-veined, glabrous. *Lower floret* barren, with a fully developed palea. *Lower lemma* herbaceous, 5-veined, glabrous. *Upper lemma* smooth, shiny, pale.

Distribution and ecology. – Common across Africa and South America. In damp shaded locations across most of Madagascar, absent from the southwest, 0–1500 m (Fig. 16B).

Notes. – Common understory plant. Can be recognised by the characteristic shape of the plant: short appressed leaves on the apical part of the culms partly covering the spreading panicle branches.

This species is illustrated by BOSSER (1969: Fig. 124f-j) and by ZULOAGA et al. (2011: Fig. 26).

Additional material examined. – MADAGASCAR. **Prov. Antananarivo:** près Ambatolaona, 19.XI.1950, *Benoist 313* (P [P01914195], TAN); Analabe, 1951, *Bosser 597* (TAN); PK 13 rte Majunga, IX.1957, *Bosser 12282* (TAN); rte Moramanga – lac Alaotra, VI.1959, *Bosser 13056* (P [P01914198], TAN); *ibid. loco*, VI.1959, *Bosser 13057* (P [P01914188]); vallée de Soavina, XI.1960, *Bosser 14820* (P [P01914199], TAN); vallée de la Saonjo, Beboho, V.1964, *Morat 1087* (P [P01914180]); Ambatovy, 18°48'47"S 48°19'40"E, 23.II.2005, *Rakotovoao et al. 1356* (K [K000805544], P [P06795471]); Ambohitavato, *Service de l'Agriculture 338* (TAN). **Prov. Antsiranana:** Kelidada, 13°31'S 48°44'E, 11.X.2011, *Hall et al. 16* (K, TAN); vallée de l'Antsahabe, 10.III.1949, *Humbert 23333* (P [P03182740], TAN); Mananjeba, VII.1913, *Perrier de la Bâthie 10720* (K [K000805550], P [P03182758]); Manongarivo, XII.1903, *Perrier de la Bâthie 11099* (P [P03182732], TAN). **Prov. Fianarantsoa:** Ampamaherana, Fianarantsoa, XII.1951, *Bosser 1445* (TAN); plateau de l'Horombe, 11.II.1970, *Bosser 19879* (K [K000805540], P [P0222322]); Ambohimombo forest, Aanala, 23.XI.1894, *Forsyth-Major 424* (K [K000805547]); Mananjary, III.1909, *Geay 7025* (P [P01914190]); *ibid. loco*, III.1909, *Geay 7474* (P [P01914170]); near Ranomafana, 29.XII.1967, *Haine 46* (K [K000805542]); aviations de Sahambava, 17.IV.1941, *Herb. Jard. Bot. Tan. 4876* (P [P01914183]); Horombe, III.1970, *Morat 3465* (TAN); Ambohimanga du Sud, 8.XI.1963, *Rakotozafy 172* (TAN); Isalo NP, above Namaza camp, 22°32'20"S 45°22'43"E, 16.XII.2013, *Vorontsova et al. 1302* (TAN). **Prov. Mahajanga:** entre Mandritsara et Andilamena, XI.1937, *Humbert 17988* (P [P01914185]); Maningoza riv., VI.1911, *Perrier de la Bâthie 10836* (P [P03487903]); Analalava, 17.VIII.1921, *Waterlot 224* (P [P01914174]). **Prov. Toamasina:** Sainte Marie, 1849, *Boivin s.n.* (K [K000805548]); E, XI.1954, *Bosser & Descoings 84b* (P [P01914187]); c. 30 km N of Tamatave, 27.II.1975, *Croat 32474* (TAN); Vohibinany au S du Tamatave, 10.V.1928, *Decary 6523* (P [P01914159]); Ambohimena, Amparihy, 18°12'17"S 48°16'46"E, 2.II.2010, *Frasier et al. 62* (P [P06768556]); lac Alaotra, *Herb. Jard. Bot. Tan. 3408* (P [P01914167]); Manompana, I.1964, *Morat 373* (TAN); Foulpointe, I.1964, *Morat 381* (TAN); *ibid. loco*, I.1964, *Morat 403* (TAN); lac Alaotra, VIII.1912, *Perrier de la Bâthie 10785* (G, P [P03182759]); forêt d'Analamazaoatra, XII, *Perrier de la Bâthie 10920* (P [P03182729]); Ivoloïna, V.1953, *Portères s.n.* (P [P02307378]); village Bembari, Marovoay, 18°16'22"S 48°15'40"E, 3.II.2010, *Rakotovoao & Razanatsoa 5148* (G, P [P06768589]); Manaka E, 19.XI.1960, *Rakotovoao 11297* (P [P01914194]); lac Alaotra, 15.VI.1995, *Ranarijaona 50* (P [P02373627]); 5 km W of Moramanga, 18°55'22"S 48°10'48"E, 6.II.2000, *Raynal-Roques & Jérémie 24943*

(K [K000805543], P [P02309325]); Tamatave, 13.XI.1964, *Tateoka 3572* (P [P01914200], TAN); Vohitra près de Brickaville, 4.X.1912, *Viguiet & Humbert 475* (P [P02726814]). **Prov. Toliara:** Ste Marie, 1847, *Boivin s.n.* (P [P01914177]); *ibid. loco*, 1849, *Boivin s.n.* (P [P01914179]); *ibid. loco*, IV.1851, *Boivin s.n.* (P [P01914181]); Fort Dauphin, *Decary 9806* (K [K000805541], P [P01914171]); côte SW, *Grandidier s.n.* (P [P01914166]); vallée de l'Antara, bassin du Manampatra, 16.XI.1924, *Humbert 3417* (G, P [P01914162], TAN); env. de Fort Dauphin, près de Nampohana, 20.IX.1928, *Humbert 5753* (K [K000805551], P [P01914193, P03182730]); Fort Dauphin, *Keraudren-Aymonin & Aymonin 24883* (P [P01914196]); Mandromodromotra, 23.XI.1959, *Peltier & Peltier 1498* (P [P01914192], TAN). **Sine loco:** 1847, *Boivin s.n.* (P); *Boivin s.n.* (P [P01914191]); *Boivin s.n.* (K [K000805546]); Maromandia, 12.XI.1922, *Decary 1230* (P [P01914160]); Maromandia, Sandralosoto, 27.XI.1922, *Decary 1270* (P [P01914161]); *Perville s.n.* (P); *Rouquette 3* (P [P01914165]).

32. *Urochloa maxima* (Jacq.) R.D. Webster, Austral. Paniceae (Poaceae): 241. 1987.

= *Panicum maximum* Jacq., Icon. Pl. Rar. [Jacquin] 1: 2, tab. 13. 1781.

= *Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs in Austrobaileya 6: 572. 2003.

Holotypus: FRANCE. Guadeloupe: *sine loco*, *Jacquin s.n.* (W [W0011326] image seen; iso-: BM image seen).

= *Panicum mananarense* A. Camus in Notul. Syst. (Paris) 15: 412. 1959. **Lectotypus** (designated here): MADAGASCAR. **Prov. Toliara:** basse vallée de la Mananara, affluent du Mandrare, 50–150 m, 1–2.III.1955, *Humbert & Capuron 29160* (P [P00450288]); isolecto-: P [P00450287, P00450289]!, **syn. nov.**

= *Panicum maximum* var. *effusum* A. Camus in Notul. Syst. (Paris) 15: 413. 1959. **Lectotypus** (designated here): MADAGASCAR. **Prov. Toliara:** env. d'Antanimoro, 30–35 km au N vers Ambia, 200–500 m, 6–9.II.1955, *Humbert & Capuron 28804* (P [P00450292]); isolecto-: K [K001096176]!, P [P00450290, P00450291]!, **syn. nov.**

= *Panicum mahafalense* A. Camus in Bull. Soc. Bot. France 72: 620. 1925. **Holotypus:** MADAGASCAR. **Prov. Toliara:** dunes de Tsimanampetsotsa, côte Mahafaly, VI.1910, *Perrier de la Bâthie 11181* (P [P00450235]!), **syn. nov.**

Erect tufted perennial, the habit variable, 0.5–2 m tall, the culms and nodes glabrous to pilose. *Leaf sheaths* glabrous to pilose. *Ligule* a ciliolate membrane. *Leaf blades* linear-lanceolate, flat, chartaceous, 15–100 × 10–35 cm, drying yellow-green, glabrous to pilose on both sides. *Panicles* terminal, fully exserted 15–70 cm long, oblong or pyramidal, the branches ascending to spreading, glabrous or sometimes sparsely pilose, the lowermost branches arranged in a whorl. *Spikelets* oblong, apically obtuse, 3–4.5 mm long, green to olive or purple, never gaping open. *Lower glume* $\frac{1}{4}$ – $\frac{1}{3}$ as long as the spikelet, membranous, obtuse to acute, 3-veined, glabrous or finely pubescent. *Upper glume*

as long as the spikelet, herbaceous, 5-veined, glabrous or finely pubescent. *Lower floret* male, with palea. *Lower lemma* herbaceous, 5-veined, glabrous or finely pubescent. *Upper lemma* with a pronounced rugose surface visible with a hand lens.

Distribution and ecology. – A pantropical weed of global importance including La Réunion, Mauritius, and Rodrigues. Common throughout Madagascar usually in severely disturbed habitats, 0–1500 m (Fig. 16B).

Notes. – Likely the most common and the most abundant grass in Madagascar, *Urochloa maxima* is commonly seen by the roadside and in secondary vegetation formations throughout the island. It is also found in ecosystems that are otherwise natural. The limited herbarium collections cited here do not begin to represent the real distribution of *Urochloa maxima* across Madagascar. The common assumption that this plant is a weedy introduction from tropical Africa may not be true: its distribution and variability suggests it could be part of the island's natural pioneer flora.

This is Madagascar's only species of *Panicum* s.l. with a rugose upper floret. BOSSER (1969) considered *P. mahafalense*, also with a rugose upper floret, to be an endemic species different from *Urochloa maxima* by its pubescent spikelets and a smaller habit. *Panicum mahafalense* is here placed in synonymy under *Urochloa maxima*. Pubescent spikelets are in fact a common variant of the reputedly variable *U. maxima* worldwide (CLAYTON & RENVOIZE, 1982) and no difference could be confirmed in plant size.

The type collection of *Panicum mananarensis* is cited as “Humbert & Capuron 29168” in the protologue, which is almost certainly an error for Humbert & Capuron 29160; the lectotype sheet is chosen for its superior flowering material annotated by A. Camus. The lectotype sheet of *P. maximum* var. *effusum* is also chosen for its superior flowering material annotated by A. Camus. The holotype number of *P. mahafalense* A. Camus is cited as 11101 in the protologue, an error for 11181.

This species is illustrated in BOSSER (1969: Fig. 118).

Additional material examined. – MADAGASCAR. **Prov. Antananarivo:** central Madagascar, X.1881, *Baron 525* (K [K000805511]); *ibid. loco*, X.1882, *Baron 1996* (K [K000805513], P [P02394631]); Imerina, 1881, *Cowan s.n.* (P [P02394616]); Antananarivo, 15.I.1975, *Croat 28463* (K [K000805502], P [P02394663]); *ibid. loco*, 24.IV.1921, *Decary 215* (P [P02394635]); *ibid. loco*, 3.V.1943, *Decary 19379* (K [K000805507], P [P02394653]); Tsimbazaza, 20.II.1984, *Dorr 2819* (K [K000805500], P [P02394660]); région de Tananarive, 15.XII.1966, *Granier & Delbays 16989* (P [P02394676]); Tsimbazaza, V.1935, *Herb. Jard. Bot. Tan. 3248* (P [P02394460]); ferme vétérinaire de Kianjasoa, *Herb. Jard. Bot. Tan. 32436* (P [P02394632]); *ibid. loco*, *Herb. Jard. Bot. Tan. 32439* (P [P02394462]); Nanisana, 21.III.1933, *Herb. Jard. Bot. Tan. 32486* (P [P02394633]); *ibid. loco*, 10.IV.1933, *Herb. Jard. Bot. Tan. 32493* (P [P02394461]); Ambalavao, 14.X.1970, *Keraudren-Aymonin & Aymonin 24622* (P [P02394674]); cour des subsistences militaires à Analakely, 25.IV.1907, *Rotereau s.n.* (P [P02726810]); Ambohimanga, *Waterlot 113* (P [P02394617]); Antananarivo, *Waterlot s.n.* (P [P02394618]). **Prov. Antsiranana:** Ambanja station I.F.C.C., 18.VI.1962,

Anon. 54 (P [P02394647]); env. de Diego-Suarez, April, *Bernier 18* (G, P [P02726865]); Nosy Be, VI.1847, *Boivin 1964* (P [P02394638]); Port Leven, III.1849, *Boivin 2268* (P [P02394637]); Nosy Be, *Boivin s.n.* (P [P02394636]); *ibid. loco*, *Fournier s.n.* (P [P02394610]); Ankarana, XII.1937, *Humbert 18854* (P [P02394641]); vallée de l'Antsahabe, 10.III.1949, *Humbert 23317* (G, P [P03182733]); Daraina, forêt de Bekaraoka, 13°06'23"S 49°42'49"E, 9.I.2005, *Nusbaumer & Ranirison 1379* (G [G00019420], P [P02309331]); Daraina, forêt d'Antsahabe, 13°12'38"S 49°33'29"E, 29.X.2005, *Rakotondrafara et al. 331* (G [G00096371], P [P02373639]). **Prov. Fianarantsoa:** Ranomafana, 18.V.1951, *Bosser 353* (P [P06768705]); Mananjary, III.1909, *Geay 7149* (P [P02394643]); *ibid. loco*, III.1909, *Geay 7253* (P [P02394646]); *ibid. loco*, III.1909, *Geay 7609* (P [P02394627]); Isalo, haute vallée de la Mania, 29.I.1955, *Humbert 28777* (G, K [K000805498], P [P03182700]); Isalo NP, Namaza, 22°32'23"S 45°22'53"E, 18.XII.2013, *Vorontsova et al. 1331* (TAN). **Prov. Mahajanga:** Beanka, 17°52'36"S 044°28'35"E, 27.I.2012, *Bolliger et al. 153* (G [G00340170]); Bevendro mountain, 25.XI.1932, *Leandri 634* (P [P02394614]); Maevatanana, Ikopa, VI.1898, *Perrier de la Bâthie 224a* (P [P02394648]); “Suberbieville”, V.1897, *Perrier de la Bâthie 224b* (P [P02394658]); Ambongo, 1932, *Perrier de la Bâthie 11142* (P [P02394656]); env. de Madirovalo, IV.1910, *Perrier de la Bâthie 11232* (P [P02394655]). **Prov. Toamasina:** Tamatave, VII.1903, *Bernard s.n.* (P [P02394453]); Sainte Marie island, V.1947, *Boivin 1621* (P [P02394642]); Ilaka-Est, XII.1962, *Bosser 16873* (P [P02394630]); Imerimandroso, 3.VII.1921, *Decary 184* (P [P02394615]); Ivoloïna, *Dequaire 27643* (P [P02394673]); lac Alaotra, *Herb. Jard. Bot. Tan. 3496* (P [P02394649]); Ambatondrazaka, 7.III.1932, *Herb. Jard. Bot. Tan. 324128* (P [P02394457]); *ibid. loco*, 30.IX.1932, *Herb. Jard. Bot. Tan. 324133* (P [P02394458]); Tamatave, III.1932, *Herb. Jard. Bot. Tan. 324170* (P [P02394459]); Ambatondrazaka, III.1932, *Herb. Jard. Bot. Tan. 324154* (P [P02394455]); massif de l'Ivakoany, XI.1933, *Humbert 12257 [a]* (P [P02394634]); Manakambahiny Est, 24.XII.1962, *Rakotovoao 12369* (P [P02394659]); côtes de l'Ivoloïna, 20.IX.1912, *Viguiier & Humbert 204* (P [P02394609]). **Prov. Toliara:** Sakamalio valley, 17.I.1913, *Afzelius s.n.* (NY); Ambovombe, XI.1956, *Bosser 10132* (TAN); Ifotaka, III.1960, *Bosser 14606* (P [P02726845]); 23–28 km W of Manambara, 21.II.1975, *Croat 31983* (P [P02394664]); Ambovombe, 8.IV.1924, *Decary 2595* (P [P02394624]); Mahabo, 1952, *Dequaire 27120* (P [P02394668]); bas Mangoky, V.1955, *Descoings 356* (P [P02726857]); *ibid. loco*, III.1955, *Descoings 396* (P [P02394665]); delta de la Linta, 24.VIII.1928, *Humbert & Swingle 5443* (P [P02394626]); vallée moyenne du Mandrare près d'Anadabolava, XII.1933, *Humbert 12412* (P [P02394666]); *ibid. loco*, XII.1933, *Humbert 12542* (P [P02394654]); Mt Morahariva, XII.1933, *Humbert 13093* (P [P02394640, P02394651]); entre l'Andohahela et l'Elakelaka, I.1934, *Humbert 13960* (P [P02394620]); col d'Ambato et pentes orientales du Vohipaly, II.1934, *Humbert 14151* (K [K000805506], P [P02394639]); forêt d'Analavelona, III.1934, *Humbert 14261* (P [P02394670]); env. de Manombo, forêt d'Isonoto 28.I.1947, *Humbert s.n.* (P [P03182756]); *ibid. loco*, 28.I.1947, *Humbert s.n.* (P [P02394623]); Mahaboboka, 27.II.1964, *Peltier & Peltier 4970 bis* (P [P02309298]); Beza Mahafaly, 23°39'S 44°38'E, 31.IV.1987, *Phillipson 1749* (K [K000805501], P [P02309307]); Ranobe forest, 23°00'22"S 23°00'22"E, 13.III.2006, *Phillipson et al. 5849* (G, P [P02625311]); région Ihotry, 28.IV.1995, *Ranarijaona 72* (P [P02373638]); Soalary, 21.III.1953, *Ravelonahay 4947* (P [P03182696]); Ampandrandava, XI.1942, *Seyrig 351* (P [P02394657]); Belamoty, 25°02'57"S 44°23'27"E, 25.IV.2014, *Vorontsova et al. 1406* (TAN). **Sine loco:** 8.III.1945, *Cours 2724* (P [P03182697]); *Cours s.n.* (P [P02394672]); *Cours s.n.* (P [P02394671]); *Herb. Jard. Bot. Tan. 892* (P [P02394628]); *Herb. Jard. Bot. Tan. 893* (P [P02394625]); 1896, *Husnot s.n.* (P [P03183500]); 1896, *Husnot s.n.* (P [P03183501], P02394454); 1887, *Myre de Villers s.n.* (P [P02394661]); I.1934, *Perrier de la Bâthie s.n.* (P [P02394677]).

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References

- ACOSTA, J., M.A. SCATAGLINI, R. REINHEIMER & F.O. ZULOAGA (2014). A phylogenetic study of subtribe Otachyriinae (Poaceae, Panicoideae, Paspaleae). *Pl. Syst. Evol.* 300: 2155–2166.
- BOSSER, J. (1969). *Graminées des pâturages et des cultures à Madagascar*. Orstom.
- BUERKI, S., D.S. DEVEY, M.W. CALLMANDER, P.B. PHILLIPSON & F. FOREST (2013). Spatio-temporal history of the endemic genera of Madagascar. *Bot. J. Linn. Soc.* 171: 304–329.
- BURNEY, D.A., L.P. BURNEY, L.R. GODFREY, W.L. JUNGERS, S.M. GOODMAN, H.T. WRIGHT & A.T. JULL (2004). A chronology for late prehistoric Madagascar. *J. Human Evol.* 47: 25–63.
- CAMUS, A. (1925a). Sacciolepis, Panicum, Brachiaria et Boivinella nouveaux de Madagascar et des Comores. *Bull. Soc. Bot. France* 72: 618–623.
- CAMUS, A. (1925b). Paspalidium et Panicum nouveaux de Madagascar. *Bull. Soc. Bot. France* 72: 706–708.
- CAMUS, A. (1930). Graminées nouvelles de Madagascar. *Bull. Soc. Bot. France* 77: 638–641.
- CAMUS, A. (1947). Graminées nouvelles de Madagascar. *Bull. Soc. Bot. France* 94: 40–42.
- CAMUS, A. (1952a). Panicum nouveaux de Madagascar. *Bull. Soc. Bot. France* 99: 63–65.
- CAMUS, A. (1952b). Graminées nouvelles de Madagascar et de la Réunion. *Bull. Soc. Bot. France* 99: 142–144.
- CAMUS, A. (1956). Sections et espèces nouvelles du genre Panicum. *Bull. Soc. Bot. France* 103: 612–614.
- CAMUS, A. (1958a). Espèces, sous-espèces et variétés nouvelles de Graminées malgaches. *Bull. Soc. Bot. France* 105: 244–246.
- CAMUS, A. (1958b). Sur quelques Panicoideae de Madagascar. *Bull. Soc. Bot. France* 105: 247–249.
- CAMUS, A. (1959). Schizachyrium, Poecilostachys et Panicum de Madagascar. *Notul. Syst. (Paris)* 15: 410–415.
- CLAYTON, W.D. (1989). Gramineae. In: LAUNERT, E. & G.V. POPE (ed.), *Fl. Zambesiaca* 10(3). Royal Botanic Gardens, Kew.
- CLAYTON, W.D. & S. A. RENVOIZE (1982). Gramineae. *Fl. Trop. E. Africa* 3.
- CLAYTON, W.D. & S. A. RENVOIZE (1986). *Genera Graminum: grasses of the World*. H.M.S.O., London.
- FISH, L., A.C. MASHAU, M.J. MOEAHA & M.T. NEMBUDANI (2015). Identification guide to the southern African grasses. An identification manual with keys, descriptions and distributions. *Strelitzia* 36.
- HUTCHINSON, J. & J.M. DALZIEL (1972). Juncaceae, Gramineae. *Fl. W. Trop. Africa* 3(2).
- JARVIS, C. (2007). *Order out of chaos: Linnaean plant names and their types*. Linnean Society of London.
- KELLOGG, E.A. (2015). Flowering Plants. Monocots: Poaceae. In: KUBITZKI, K. (ed.), *The families and genera of vascular plants*. Vol. 13. Springer.
- MORRONE, O., S.S. DENHAM, S.S. ALISCIONI & F.O. ZULOAGA (2008). Parodiophyllochloa, a new genus segregated from Panicum (Paniceae, Poaceae) based on morphological and molecular data. *Syst. Bot.* 33: 66–76.
- MORRONE, O., M.A. SCATAGLINI & F.O. ZULOAGA (2007). Cyphonanthus, a new genus segregated from Panicum (Poaceae: Panicoideae: Paniceae) based on morphological, anatomical and molecular data. *Taxon*: 521–532.
- PARSONS, J.J. (1972). Spread of African pasture grasses to the American Tropics. *J. Range Managem.* 25: 12–17.
- PHILLIPS, S. (1995). Poaceae. In: HEDBERG, I. & S. EDWARDS (ed.), *Fl. Ethiopia & Eritrea* 7. The National herbarium, Addis Ababa University and the Department of Systematic Botany, Uppsala University.
- RUSSELL, G.G., L. WATSON, M. KOEKEMOER, L. SMOOK, N.P. BARKER, H.M. ANDERSON & M.J. DALLWITZ (1990). Grasses of southern Africa. *Mem. Bot. Surv. South Africa* 58.
- SALARIATO, D.L., O. MORRONE & F.O. ZULOAGA (2012). Mayariochloa, a new monotypic genus segregated from Scutachne (Poaceae, Panicoideae, Paniceae). *Syst. Bot.* 37: 105–116.
- SALARIATO, D.L., F.O. ZULOAGA, L. GIUSSANI & O. MORRONE (2010). Molecular phylogeny of the subtribe Melinidinae (Poaceae: Panicoideae: Paniceae) and evolutionary trends in the homogenization of inflorescences. *Mol. Phylog. Evol.* 56: 355–369.
- SEDE, S.M., O. MORRONE, L.M. GIUSSANI & F.O. ZULOAGA (2008). Phylogenetic studies in the Paniceae (Poaceae): a realignment of section Lorea of Panicum. *Syst. Bot.* 33: 284–300.

- SEDE, S.M., F.O. ZULOAGA & O. MORRONE (2009). Phylogenetic studies in the Paniceae (Poaceae-Panicoideae): *Ocellochloa*, a new genus from the New World. *Syst. Bot.* 34: 684–692.
- SORENG, R.J., P.M. PETERSON, K. ROMASCHENKO, G. DAVIDSE, J.K. TEISHER, L.G. CLARK, P. BARBERÁ, L.J. GILLESPIE & F.O. ZULOAGA (2017). A worldwide phylogenetic classification of the Poaceae (Gramineae) II: An update and a comparison of two 2015 classifications. *J. Syst. Evol.* 55: 259–290.
- SOSEF, M.S. (2016). Taxonomic novelties in Central African grasses (Poaceae), Paniceae 1. *Pl. Ecol. Evol.* 149: 356–365.
- STAPP, O. (1920). *Panicum*. In: PRAIN, D. (ed.), *Fl. Trop. Africa* 9: 638–738.
- TURLAND, N.J., J.H. WIERSEMA, F.R. BARRIE, W.GREUTER, D.L. HAWKSWORTH, P.S. HERENDEEN, S. KNAPP, W.-H. KUSBER, D.-Z. LI, K. MARHOLD, T.W. MAY, J. MCNEILL, A.M. MONRO, J. PRADO, M.J. PRICE & G.F. SMITH (2018). International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. *Regnum Veg.* 159.
- VELDKAMP, J.F. (1996). Revision of *Panicum* and *Whiteochloa* in Malesia (Gramineae-Paniceae). *Blumea* 41: 181–216.
- VORONTSOVA, M.S. (2014). Two new species of *Panicum* sensu lato (Poaceae: Panicoideae) from Madagascar. *Kew Bull.* 69: 9511: 1–7.
- VORONTSOVA, M.S., G. BESNARD, F. FOREST, P. MALAKASI, J. MOAT, W.D. CLAYTON, S. FICINSKI, G.M. SAVVA, O.P. NANJARISOA, J. RAZANATSOA, F.O. RANDRIATSARA, J.M. KIMEU, W.R.Q. LUKE, C. KAYOMBO & H.P. LINDER (2016). Madagascar's grasses and grasslands: anthropogenic or natural? *Proc. Roy. Soc. Biol. Sci. Ser. B.* 283: 2015–2262.
- VORONTSOVA, M.S., O.P. NANJARISOA & G. BESNARD (2014). Three new grass records for Madagascar. *Candollea* 69: 85–87.
- WATSON, L. & M.J. DALLWITZ (1992). *The grass genera of the world*. CAB international.
- ZULOAGA, F.O., L.M. GIUSSANI & O. MORRONE (2007). *Hopia*, a new monotypic genus segregated from *Panicum* (Poaceae). *Taxon* 56: 145–156.
- ZULOAGA, F.O., O. MORRONE & M.A. SCATAGLINI (2011). Monograph of *Trichanthecium* (Poaceae, Paniceae). *Syst. Bot. Monogr.* 94.
- ZULOAGA, F.O., L. SALOMÓN & M.A. SCATAGLINI (2015). Phylogeny of sections *Clavelligerae* and *Pectinatae* of *Panicum* (Poaceae, Panicoideae, Paniceae): establishment of the new subtribe *Dichantheliinae* and the genus *Adenochloa*. *Pl. Syst. Evol.* 301: 1693–1711.
- ZULOAGA, F.O., M.A. SCATAGLINI & O. MORRONE (2010). A phylogenetic evaluation of *Panicum* sects. *Agrostoidae*, *Megista*, *Prionitia* and *Tenera* (Panicoideae, Poaceae): two new genera, *Stephostachys* and *Sorengia*. *Taxon* 59: 1535–1546.

Appendix I.

Thirty two species of the group previously known as *Panicum* L. in Madagascar. [E] indicates endemic, and includes species which occur in the Mascarenes and the Comores as well as Madagascar. [I] indicates likely introduced species.

- Adenochloa hymeniocbila* (Nees) Zuloaga
Panicum ambositrense A. Camus [E]
Panicum andringitrense A. Camus [E]
Panicum ankareense A. Camus [E]
Panicum brevifolium L.
Panicum capuronii A. Camus [E]
Panicum cinctum Hack. [E]
Panicum crystalinum Judz. & Voronts. [E]
Panicum cupressifolium A. Camus [E]
Panicum danguyi A. Camus [E]
Panicum dregeanum Nees [I]
Panicum flacourtii A. Camus [E]
Panicum humbertii A. Camus [E]
Panicum humile Nees ex Steud. [I]
Panicum ibitense A. Camus [E]
Panicum inconspicuum Voronts. [E]
Panicum luridum Hack. [E]
Panicum manongarivense A. Camus [E]
Panicum mitopus K. Schum.
Panicum novemnerve Stapf
Panicum palackyanum A. Camus [E]
Panicum perrieri A. Camus [E]
Panicum pleianthum Peter
Panicum spergulifolium A. Camus [E]
Panicum subalbidum Kunth
Panicum subhystrix A. Camus [E]
Panicum trichocladum K. Schum. [I]
Panicum woeltzkowii Mez [E]
Panicum wobitrense A. Camus [E]
Trichanthecium brazzavillense (Franch.) Zuloaga & Morrone
Trichanthecium parvifolium (Lam.) Zuloaga & Morrone
Urochloa maxima (Jacq.) R.D. Webster