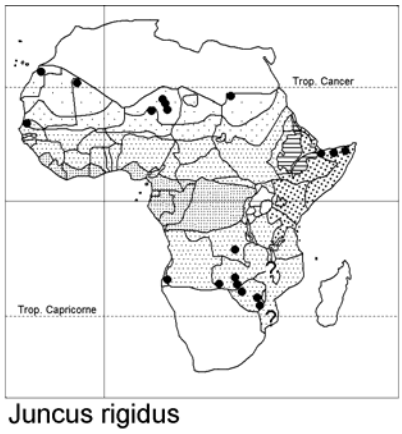
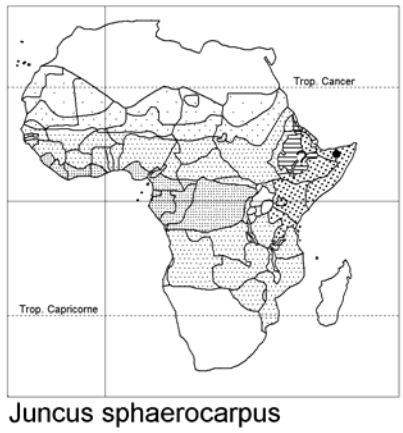
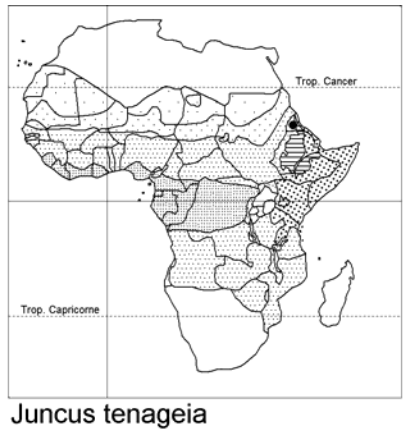


Juncus rigidus



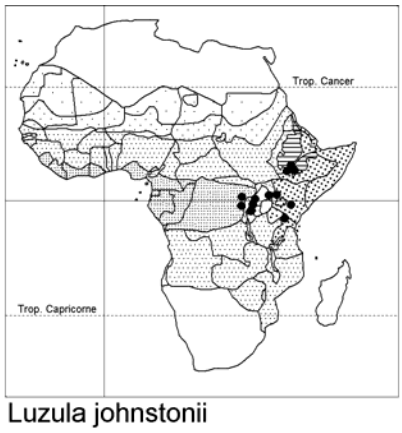
Juncus sphaerocarpus



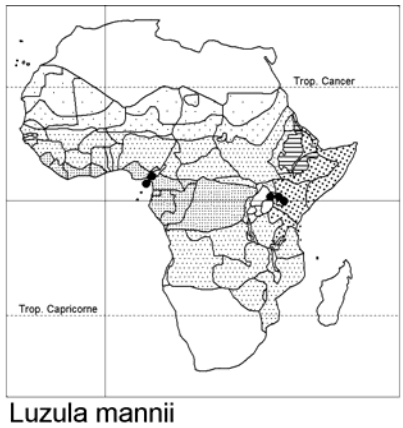
Juncus tenageia

Luzula abyssinica

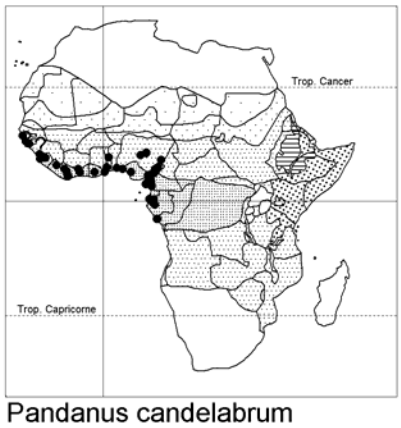
Luzula atlantica subsp. tibestica



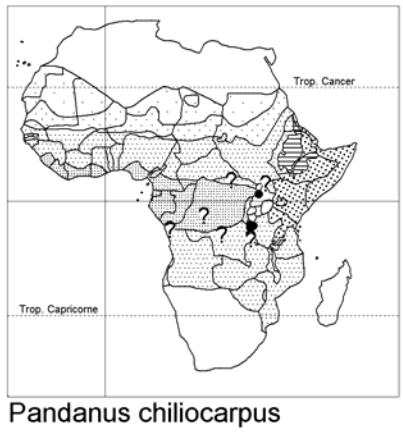
Luzula johnstonii



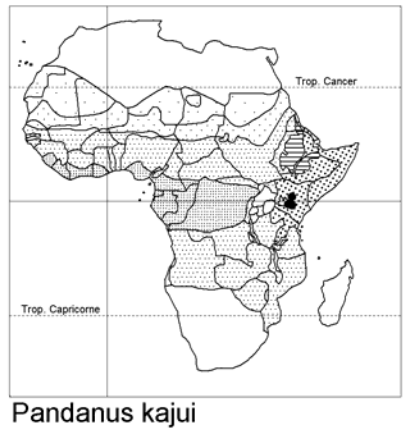
Luzula mannii



Pandanus candelabrum



Pandanus chiliocarpus



Pandanus kajui

LUZULA ABYSSINICA

inflorescence consisting of 2-3 erect branches to 6 cm long, bearing to 10 subsessile contiguous spicate heads, each of 10-20 flowers, giving the appearance of *a single*, *lobed spike*; if the heads are separated then the branches are all erect *(not in an umbel).*

Swamps and damp places in rain-forest and grassland; moor and moor grassland, sheltered or in the open among rocks; wet soil and paths; wet, grassy clearings in rain-forest; *Senecio* and *Ericaceae* forest; 2000-4550 m alt.

Variable species, in height, size of leaves, hairiness.

L. atlantica Braun-Blanq. subsp. **tibestica** Quézel; Dobignard & Chatelain, Index synon. fl. Afr. N. 1: 168, 2010. – Icon.: Maire, Fl. Afr. N. 4: 308, 1957 (subsp. **atlantica**).

syn.: *L. tibestica* (Quézel) Zahran ex Romo & Boratyński

Near *L. atlantica* typical but: basal leaves 7,1-7,9 mm wide (not 8-9,5) and 8-10 cm long (not 10-13); glomerule of flowers with only 2-4 flowers (not 2-7), outer sepals more lengthily acuminate with a black awn (not reddish-brown), capsule 1,5-1,2 mm (not 2 × 1,15), seed 0,6-0,7 × 0,6 (not 0,8-1 × 0,8 mm).

Bottoms of dark gorges in seepage areas with *Cystopteris fragilis*, in volcanic lappiaz of crater; 3100 m alt. (see Collect. Bot. Barcelona 30: 55-56, 2011).

L. atlantica subsp. **atlantica** occurs in Morocco [Kirschner & al., 2002: 37-38, 195 (map)].

The names of plants cited by Romo & Boratyński were revised by J.-P. Lebrun in Bothalia 14: 512-513, 1983, who gave the correct names; later *Helictotrichon tibesticum = H. elongatum*, and *Spergularia tibestica = S. microsperma,* were added to the list.

L. johnstonii Buchenau; Kirschner & al. (2002): 166, 224 (map); Fl. Trop. E. Afr., Juncaceae: 7-8, 1996. – Icon.: Robyns, Fl. spermat. Parc Natl. Albert 3: 345, 1955; Fl. Afr. C., Juncaceae: 9, 1973; Fl. Eth. & Eritrea 6: 390, 1997.

Herb perennial, with stolons 2-20 cm long and somewhat distant stems; stems 15-60 × 0,05-0,2 cm, angular; leaves many near base, fewer above; blades 5-25 × 0,3-0,9 cm, with scattered long white hairs; inflorescence *lax*, many-branched, with 1- and 2-sided cymes; major inflorescence-branches 1-8 cm long, each carrying *1 sessile* and *1-6 stalked* flowers.

Damp places, usually in shade of rain-forest; open parts of woodland; moor; swampy soil in bamboo or *Senecio* and *Ericaceae* forests; wet soil in swamps, near streams and paths; sometimes very common locally; 2200-4200 m alt.

L. mannii (Buchenau) Kirschner & Cheek; Cable & Cheek, Pl. Mt Cameroon: 167, 1998 (under *L. campestris*); Onana & Cheek, Red Data Book flow. pl. Cameroon: 382, 559 (map), 2011. – Icon.: Fl. Trop. E. Afr., Juncaceae: 9, 1966 (as *L. campestris* var. *gracilis*); Kew Bull. 55: 902, 2000 (subsp. **mannii**); Kirschner & al. (2002): 120-121, 212 (maps).

bas.: *L. campestris* (L.) DC. var. *mannii* Buchenau

syn.: *L. campestris* subsp. *mannii* (Buchenau) Weim.

Herb perennial, 10-65 cm tall; rhizome horizontal or ascending, stolons short; stem rigid, erect, c. 1,7 mm Ø; basal leaves 7-13 cm × 4-8 mm, cauline leaves 2-3, 3,5-7 cm × 2,5-4,5 mm, densely hairy, margins densely serrulate; inflorescence dense, of 3-4 sessile and 2-7 pedunculate clusters, peduncles with secondary branches and 1-3 sessile *clusters* on each branch; peduncles 2-11 cm long, 0,3-0,5 mm Ø; clusters *echinate*, globular, 0,6-1,2 cm Ø, of more than 13 flowers.

LUZULA MANNII

On young, volcanic soils; wet places and by streams in grassland and moor; 2700-c. 4000 m alt.

Bioko /Fernando Poo.

Comprises 2 subspp.: – subsp. **mannii**, with straight, rigid peduncles and blackish tepals, in Cameroon, Bioko/Fernando Poo; – subsp. **gracilis** (S. Carter) Kirschner & Cheek [bas.: *L. campestris* (L.) DC. var. *gracilis* S. Carter], with flexuose to arcuate peduncles and pale brown tepals, in Kenya/Uganda border area (Mt Elgon).

SYNONYMS:

Luzula campestris (L.) DC. var. *gracilis* S. Carter = **Luzula mannii** subsp. **gracilis**

var. *mannii* Buchenau = **L. mannii** subsp. **mannii**

var. *mannii* sensu Robyns 1955, quoad specim. Humbert 8598 = **L. abyssinica**

subsp. *mannii* (Buchenau) Weim. = **L. mannii**

macrotricha Steud. = **L. abyssinica**

spicata (L.) DC. var. *erecta* E. Mey. and var. *simensis* Hochst. = **L. abyssinica**

tibestica (Quézel) Zahran ex Romo & Boratyński = **L. atlantica** subsp. **tibestica**

volkensii Buchenau = **L. abyssinica**

(TENAGEIA)

Tenageia vaillantii (Thuill.) Rchb. = **Juncus tenageia** subsp. **tenageia**

PANDANACEAE / *1* g. / *11* native spp.

By Henk Beentje (1) and Martin W. Callmander (2)

(1) Herbarium, Library, Art & Archives, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3DS, United Kingdom

(2) Missouri Botanical Garden, P.O. Box 299, St. Louis, MO, 63166-0299, U.S.A. and Conservatoire et Jardin botaniques de la Ville de Genève, Ch. Impératrice 1, CP 60, 1292 Chambésy, Switzerland

The authors are grateful to Chiara Nepi (Museo di Storia Naturale dell'Università degli Studi di Firenze, Sezione di Botanica), Thomas Haevermans (Museum national d'Histoire naturelle de Paris), Adélaïde Stork and Cyrille Chatelain (Conservatoire et Jardin botaniques de la Ville de Genève) and Tariq Stévart (Missouri Botanical Garden, St. Louis & National Botanic Garden of Belgium) for their support, advice and help in this study. Ben Stone was very helpful to HB when he embarked on East African pandanology in the early 1990s. Financial support to MWC was provided by an EDIT Integration Research Grant.

In the order *Pandanales* the paleotropical family *Pandanaceae* is close to the neotropical *Cyclanthaceae*, based on morphological (Cox & al., 1995) and molecular (Chase & al., 1995) evidence. The family countains c. 700 species assigned to five genera (in decreasing order of species richness): *Pandanus* Parkinson (c. 450 spp.), *Freycinetia* Gaudich. (c. 200 spp.), *Benstonea* Callm. & Buerki (c. 50 spp.), *Martellidendron* (Pic. Serm.) Callm. & Chassot (6 spp.) and *Sararanga* Hemsl. (2 spp.). *Pandanaceae* can be readily recognized by their leaves: coriaceous, M-shaped in transverse section, generally with prickles on margins (except some *Pandanus* cultivars and most *Freycinetia* species where prickles are subtle). They are root climbers *(Freycinetia),* trees and shrubs *(Benstonea, Martellidendron, Pandanus),* trees

PANDANACEAE

(Sararanga) or epiphytes (*Benstonea*). The center of family diversity is in New Guinea where four out of the five genera are present (except *Martellidendron*) with c. 150 sp., many of which are still to be described). In Continental Africa, the specific diversity is small compared to the offshore microcontinent of Madagascar (c. 85 spp. of *Pandanus* and five *Martellidendron* spp.) or the Mascarenes archipelago (25 *Pandanus* spp.): only the genus *Pandanus* occurs, in which we recognize 12 African species. The systematics of this family have puzzled generations of botanists due to the apparent convergence/homology of key morphological characters (especially in its largest genus *Pandanus*). Molecular analysis based on plastid data greatly contributed to infer the evolution of this family and provided evidence of the five lineages currently recognized at generic level (see Buerki & al. 2012; Callmander & al., 2003; Callmander & al., 2012).

Several pandans are economically important throughout the family's distribution range. Species such as *P. conoideus* Lam. (New Guinea) and *P. tectorius* Parkinson (Pacific Islands) are edible and the fruit pulp is an important source of protein for indigenous people. *Pandanus amaryllifolius* Roxb. is widely cultivated from India to South East Asia for the fragrance of its leaves and is used as spice in cooking. In Africa, several species are widely cultivated: *Pandanus utilis* Bory is cultivated in Senegal and Mozambique and its leaves are also used for basketry and thatching. *Pandanus odoratissimus* L. f. is also cultivated (see below). Other Pandanus species are planted and cultivated as garden trees, especially cultivars of *P. tectorius* s.l., e.g. *Walters 2150* (MO) from Libreville, Gabon.

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PANDANUS / *11*

About 450 species in the tropics and subtropics of the Old World. To accommodate the wide morphological variability found within the genus and to simplify identification, an elaborate infra-generic classification system has been developed (see Stone, 1974). Seven subgenera and 81 sections are currently recognized. All but one of the African species belongs to *Pandanus* subg. *Vinsonia*, with the only exception, *P. kirkii*, belonging to *Pandanus* subg. *Pandanus*. The African pandans have generally a clear morphological affinity with Madagascar and the nearby western Indian Ocean Islands (Seychelles, Mascarenes and the Comores). Except *P. kirkii* which belongs to the sea-dispersed species of *Pandanus* sect. *Pandanus* (see Stone, 1973 and under the species), all African species seems to be monophyletic and cluster together in a strictly African clade (see Buerki & al., 2012).

The first African *Pandanus* was published by Palisot de Beauvois in 1804, *P. candelabrum*, on very poor and fragmented material (see Huynh, 1989 and above); several taxa were published piecemeal after. Rendle (1894) was the first to attempt a complete revision of the genus recognizing eight species. In his monograph of *Pandanaceae*, Warburg (1900) included 16 species of which eight were new. When Stone (1973) published the first modern synopsis of the African species of *Pandanus*, he

recognized 17 species native to the continent. Between 1984 and 1997, Huynh described c. 30 new species from Africa leading to c. 50 *Pandanus* species for the continent. With the publication of Pandanaceae for the *Flora of Tropical East Africa* and *Flora Zambesiaca* by Beentje (1993, 2009), the taxonomy of the genus is in good order in these regions. On the contrary, species of Western and Central Africa, which represent three-quarters of those found on the continent, are poorly known: *"The taxonomy of the family is difficult, not least of all African species, because of the wretched state of many specimens"* (Beentje, 1993: 1). This difficulty is mainly linked with the fact that all the systematics of the family is based on (often) fragmentary fruiting and leaf material (especially true for Africa where very few and complete collections are available; for a guide to collecting of Pandans, see Stone in Ann. Missouri Bot. Gard. 70: 137-145, 1983). This exemplifies the impossibility of understanding the variation in one species from a single individual: foliage and fruiting differences between juveniles and adults, the impact of ecological factors or even drying artefacts on herbarium sheets. Furthermore, taxonomists such as Prof. H. St John and Dr. K.-L. Huynh frequently and almost automatically regarded new collections as representing new species. Successive collections from the same population might become types of new species. This narrow species concept frequently led to serious problems and to a very large number of binomials. None of the species described by Huynh from western Africa had been critically reviewed yet and many are therefore here reduced to synonymy in this critical checklist. Several species are imperfectly known and their taxonomic status is not clear. We provide this overview of African pandans to serve as a first attempt to improve our understanding of a poorly known family in Continental Africa, to encourage new and more complete collections (including ecological data, digital pictures, silica-gel DNA samples). This is the only way to increase our knowledge of the African screwpines.

Dioecious trees or shrubs; often with stilt roots or aerial roots from lower stem, and sometimes from the branches. Stem growth conspicuously sympodial (appearing dichotomous). Leaves tristichous, alternate and appearing spiral (through torsion of stem), crowded towards the apex of the branch, simple, medium-sized to large, sessile, sheathing, lanceolate or linear, coriaceous, keeled and often 3-plicate, usually with small prickles on the midrib beneath, on the margins, and rarely on the distal ventral pleats as well. Inflorescences terminal or terminating lateral shoots, enclosed at first by spathaceous and often coloured bracts. Flowers unisexual and small. Pistillate flowers without perianth, with 1 to several ovaries; ovary 1-locular, free or almost joined with adjacent ovaries of the same flower, but always with separate stigmas corresponding to the number of locules; style absent or vestigial; stigma appressed or erect, often V- to kidney-shaped; ovules anatropous, solitary. Fruiting heads [syncarp] globose to oblong, solitary or several in a spiciform arrangement, composed of many fruits joined together but with distinct apices: fruits a drupe or cluster of partly fused drupes; pericarp thin; mesocarp fibrous with spongy pith, fleshy; endocarp fibrous, enclosing the locules in an integral structure. Seeds inseparable from the endocarp; testa membranous; endosperm white, homogenous, with subbasal embryo. Staminate inflorescence, a raceme of spikes, pending; flowers without perianth, rarely vestigial perianth; stamens few to numerous, in umbellate groups, the filaments generally connate in a *stemonophore*, rarely free, the anthers erect and basifix, 2-thecous, opening lengthwise by slits; ovary absent, rarely vestigial.

Key to African taxa

1 Leaves with long flagella/cauda prolonging the apex; fruiting heads usually solitary; carpels/drupes united into phalanges with distinct apices divided by shallow grooves; stamens racemose with a distinct axi .... 2 (subgenus *Pandanus* section *Pandanus*)

– Leaves without or only very short prolongation at apex; fruiting heads solitary or in groups; carpels/drupes free (or if connate with individual heads almost indistinguishable, not separated by grooves); stamens crowded at the apex of a column ..... 3 (subgenus *Vinsonia*)

2 Most marginal leaf prickles less than 5 mm long, greenish or brown-tipped; phalanges with short or no shoulders; seashore in Kenya and Tanzania ..... **P. kirkii**

– Most marginal leaf prickles more than 5 mm long, white; ripe phalanges with distinct fleshy shoulders; cultivated but surviving as an escape in Mozambique, in swamp .... **P. odoratissimus**

3 Sheathing leaf bases with marginal lobes [*P. rabaiensis*] or without [*P. thomensis*]; carpels connate into phalanges with (2-)4-14 apices ..... 4 (sect. *Dauphinensia,* sect. *Vinsonia*)

– Sheathing leaf bases without marginal lobes; carpels free, sometimes with a few 2-3-locular phalanges intermixed..... ..... 5 (sect. *Heterostigma*)

4 Syncarps 2-7, each 7-20 × 5-12 cm; drupes 15-30 mm long; anthers 1.8-2 mm long; East Africa ..... **P. rabaiensis**

– Syncarps solitary, 22 × 15 cm; drupes 75 mm long; anthers 3 mm long; São Tomé ..... **P. thomensis**

5 Adult leaves less than 4 cm wide 6

– Adult leaves over 4 cm wide 8

6 West Africa, West of 3° W and N of 10° N; drupes < 350 per syncarp, 27-45 mm long ..... **P. senegalensis**

– South of 8° S 7

7 West Africa; West of 16° E; drupes per syncarp probably < 350, 15-29 mm long ..... **P. welwitschii**

– East Africa; East of 25° E; drupes per syncarp > 400, 18-34 mm long..... **P. livingstonianus**

8 Syncarps usually several per peduncle..... 9

– Syncarps usually solitary..... 10

9 Drupes per syncarp probably < 350; West and coastal Central Africa..... **P. candelabrum**

– Drupes per syncarp > 300, 20-25 mm long; Kenya..... ..... **P. kajui**

10 Drupes per syncarp probably < 350, 50-53 mm long; coastal Gabon to N Angola..... **P. gossweileri**
Drupes per syncarp > 400, 18-40 mm long; East of 25° E 11

11 Leaves 130-270 × 4-8 cm; syncarp 19-38 × 8-20 cm; East DRCongo to Uganda and Tanzania ..... **P. chiliocarpus**

– Leaves 30-150 × 1.5-5 cm; syncarp 6-15 × 6-10 cm; Zambia to Mozambique ..... **P. livingstonianus**

Pandanus utilis and *P. tectorius*, often cultivated in gardens are omitted from the key.

Pandanus candelabrum P. Beauv.; Fl. Senegal: 187, 1967; Fl. anal. Togo: 683, 1984; Fl. Gabon 28: 17, 1986; Cable & Cheek, Pl. Mt Cameroon: 180, 1998 (sub. nom. *P. satabiei)*; Chapman & Chapman, Forests Taraba & Adamawa States, Nigeria: c52, 2001; Sosef & al., Checklist Gabonese vascular plant: 322, 2006; Lisowski, Fl. de la Répu. Guinée: 442, 2009; Onana, Vascular plants of Cameroun 176-177, 2011; Chatelain & al., Boissiera 64: 244-245, 2011. – Icon: Rendle in J. Bot. 32: Tab. 347, 5-6, 1894; Fl. West Tr. Afr.: 171, 1968; Hawthorne & Jongkind, Woody pl. west. Afr. for.: 865, 2006; Beentje & Bandeira, Field guide of the Mangrove trees of Afr. & Madag.: 42-43, 2007; Piatek & Mossebo in Polish Bot. J. 53: 140, 2008.

Typus. – Nigeria. Fleuve Formose [fleuve Niger], s.d., *Palisot de Beauvois s.n.* (lecto-: G [G00004217]; isolecto-: G [G00340894], P [P00459587]) (lectotypified by Huynh, 1984: 340).

syn.: *Heterostigma heudelotianum* Gaudich.; *Pandanus heudelotianus* (Gaudich.) Balf. f. Typus. – Nigeria. Senegambia in upper Guinea, s.d., *Heudelot 381* (holo-: P [P00459597, P00758114 carpo.]; iso-: FI).

P. abbiwii Huynh. Typus. – Ghana. Pokuase, 15.III.1985, *Abbiw* s.n. (holo-: P [P00836314 carpo.]; iso-: G [G00369739], GC, K [K000781586]).

P. akeassii Huynh. Typus. – Ivory Coast. Tai-Tabou road, between Sakré & Djiroutou near Para, 16.V.1985, *Aké Assi 16847* (holo-: P [P00836312 carpo.]; iso-: G [G00369736], K [K000781587], UCJ).

P. akeassii Huynh var. *limitaneus* Huynh. Typus. – Ivory Coast. Between Tai & Grabo, near Sakré, VII.1975, *Aké Assi* s.n. (holo-: P [P00836311 carpo.]; iso-: G [G00369738], K [K000781808], UCJ).

P. barterianus Rendle. Typus. – Equatorial Guinea [Bioko]. Fernando Po, s.d., *Barter s.n.* (holo-: K [K000781809]).

?P. chevalieri Huynh. Typus. – Guinea. Fouta Djalon, Collengui, III.1905, *Chevalier 13539A-a* (holo-: P [P00459590]).

?P. columellatus Huynh. Typus. – Senegal. Casamance, Samandeniéry, en face de Sedhiou, I.1900, *Chevalier s.n.* (holo-: BR [BR0000008815804]; iso-: BR [BR000000 8815811]; P [P00459591, P00459592]).

?P. crassicollis Huynh. Typus. – Togo. Atakpamé, 26.III.1908, *Von Doering 315* (holo-: B [B100167999]; iso-: B [B100167998).

P. crassilix Huynh. Typus. – Cameroon. Island in Marimba Creek, 1.II.1883, *Krause* 3364 (holo-: B [B100167996]; iso-: FI [FI000960]).

?P. denudatus Huynh. Typus. – Togo. Entre Pangalam et Koumoniadé, 10 km N Sokodé, 26.IV.1978, *Hakki & al. 430* (holo-: B [B100167995]).

?*P. djalonensis* Huynh. Typus. – Guinea. Plateaux ferrugineux du Fouta Djalon, c. 1000-1300 m, IX.1930, *Chevalier s.n.* (holo-: FI [FI000980]).

P. freetownensis Huynh. Typus. – Sierra Leone. Near Freetown, Heddle's farm, s.d., *Lane-Poole* s.n. (holo-: FI [FI000977]).

P. gabonensis Huynh. Typus. – Gabon. Bords Komo, près Mbel, 12.I.1968, *Hallé & Villiers 4332* (holo-: P [P00459593]; iso-: P [P00757838]).

P. parvicentralis Huynh. Typus. – Gabon. Libreville, p.k. 18, 10.III.1969, *I.N.E.F s.n.* (holo-: P [P00459595]).

P. guineabissauensis Huynh. Typus. – Guinea-Bissau. Fulacunda, entre Bolola e Buba, 1.VIII.1945, *Espirito Santo 2156* (holo-: LISC [LISC003422]; iso-: COI).

P. kamerunensis Warb. Typus. – Cameroon. Sine loc., s.d., *Schran s.n.* (holo-: B†; iso-: FI [FI000998]).

P. kerstingii Warb. Typus. – Togo. Basari, 1902, *Kersting 693* (holo-: B [B100176655, B100176656, B100176657]; iso-: FI [FI000996]).

P. lachaisei Huynh. Typus. – Ivory Coast. Bandama River bank near Tiassalé, VIII.1958, *Aké Assi s.n.* (holo-: P [P00836313 carpo.]; iso-: G [G00369737], K [K000781805]).

P. latiloculatus Huynh. Typus. – Cameroon. 17 km N Kribi, 8.III.1969, *Bos 4101* (holo-: WAG [WAG0002617, WAG000 2618]; iso-: K [K000781580], M [M0106838], P [P00459596], PRE [PRE07264500], YA [YA0031879]).

P. liberiensis Huynh. Typus. – Liberia. Ganta, 16.II.1936, *Harley* 834 (holo-: K [K000435967]).

P. oblongicapitellatus Huynh. Typus. – Sierra Leone. Sasseni, 1892, *Scott Elliot 4504* (holo-: K [K000697932]; iso-: FI [FI001013]).

?P. parachevalieri Huynh. Typus. – Guinea. Fouta Djalon, Collengui, III.1905, *Chevalier 13539A-c* (holo-: P [P00459588]).

P. problematicus Huynh. Typus. – Sierra Leone. Near Freetown, Heddle's farm, 1914, *Lane-Poole s.n.* (holo-: FI [FI001049, 2 sheets]).

?P. pseudochevalieri Huynh. Typus. – Guinea. Fouta Djalon, Collengui, III.1905, *Chevalier 13539A-b p.p.* (holo-: P [P00459589]).

P. satabiei Huynh. Typus. – Cameroon, 30 km W of Edea along Ndonga stream, 20.XII.1973, *Letouzey 12472* (holo-: YA; iso-: P [P00459594], YA).

P. sierraleonensis Huynh. Typus. – Sierra Leone. N°2 river, 1.III.1965, *Morton 1748* (holo-: K [K000435965]; iso-: K [K000435964, K000781801], WAG [WAG000 2618, WAG0002620, WAG0002621, WAG0002622]).

P. tenuimarginatus Huynh. Typus. – Cameroun. Sine loc, s.d., 1888, *Coll. Illegib.* (holo-: FI [FI001068]).

P. teuszii Warb. Typus. – Gabon. Sine loc., s.d., *Teusz s.n.* (holo-: B†; iso-: FI [FI003584]).

P. tiassaleensis Huynh. Typus. – Ivory Coast. Tiassalé region, Amani-Ménou, 19.III.1985, *Aké Assi* 16813 (holo-: P [P00836320 carpo.]; K [K000781807]).

P. togoensis Warb. Typus. – Togo. Misahöhe, 20.IV.1894, *Baumann 223* (holo-: B [B100168000, B100176654]).

P. triangularis Huynh. Typus. – Sierra Leone. Near Njala, II.1933, *Deighton 2625* (holo-: K [K000781585]; iso- K [K000781812]).

P. umbellatus Martelli. Typus. – Ivory Coast. Sine loc., 1896, *Jolly 32* (holo-: FI [FI003588]).

P. unwinii Martelli. Typus. – Nigeria, S., near Benin, 16.IX.1907 *Unwin s.n.* (holo-: FI [FI001064]).

?P. leonensis Lodd. ex H. Wendl., *nom nud.*; *P. nigeriensis* Huynh, *nom. nud*.

Tuckeya candelabrum (P. Beauv.) Gaudich.

Tree 3-20 m high, branched in upper part and candelabra-shaped; stem to 25 cm in diam.; proroots to 3 m high, 7-8 cm in diam. Leaves (0.7-)1-2.5(-4) m long, (2-)4-6.5(-11.5) cm wide, attenuate or caudate to 5-10 cm; marginal teeth 1.1-5.3 mm long, 2-50 mm apart, antrorse (or retrorse near base), rarely bifurcate. Pistillate inflorescence at anthesis 3.3-8 × 2.4-3.7 cm, all ovaries separate; stigma reniform. Infructescence a compound

PANDANUS CANDELABRUM

spike or a solitary syncarp. Bracts 8-13, 10-112 × 3.5-10 cm. Syncarps (1-)3-6, dark green ripening light yellow, pleasant smell, ovoid, (6-)10.5-31 × (5.5-)7-17 cm, triquetrous, basal ones smaller than terminal, each with 200-300 drupes; peduncle slightly curved, (26-)33-75 × 0.7-2.8 cm; drupes (2.5-)3-5(-7) × 0.8-2.4 × 0.5-1.6 cm, 5-6(-9)-angular, 1-3(-5)-locular; pileus conical, 5-12 mm high, sometimes with spinules below stigma; stigmas 1-3(-5), horizontal to sub-vertical, reniform; endocarp (0.6-)1-2.5 cm long, mesocarp spongy, fibrous. Staminate inflorescence 29-32 cm long, peduncle 1-4 cm, with 9-10 spikes of 14-35 × 2.2-3.5 cm each, strongly scented; bracts to 93 × 4 cm; stamens subumbellate, 6-12 fused in many fasciculate bundles *('stemonophore')* 4-12 mm long; filament 0.6-7 mm, anther 1-2.4 × 0.4-0.5 mm, acuminate and often curved.

River-banks in forest or open, swamps (in water up to 1.2 m deep), mangrove edges, in small groups or solitary; sea level-1300 m.

West Africa (Benin, Cameroon, Equatorial Guinea [incl. Bioko], Gabon, Gambia, Ghana, Guinea, Guinea-Buissau, Liberia, Nigeria, Ivory Coast, Senegal, Sierra Leone, Togo).

The lack of good recent fertile collections from *Pandanus* in western Africa coupled with the very incomplete type material of *P. candelabrum* are both reponsible of the longlasting uncertainty around this species. The choice of Huynh to segregate each collection as a new species based on strict biometry (leaning on collections obviously at different maturation stages and drying artefacts) or on unreliable characters, i.e. place of the center of the seed locule in a drupe (infra/supramedian), is certainly not defendable. We have tried in this critical checklist to take an objective view of the collections in western Africa. It is clear that one species seems to be widespread in the whole region along river-banks, mangroves edges and swamps. It is also possible that more than one species is involved in the « Pandanus candelabrum complex » (see also comments under *P. senegalensis* for the Fouta Djalon Guinean collections). To solve this question, reliable collections are much needed including digital pictures and field observations on the variability of each *Pandanus* population in the region. Some monitoring of *Pandanus* population has been done in Gabon recently showing that this species seems not to be fruiting every year (Stévart, pers. comm.) which will render the task to solve the taxonomy of this species even more laborious. The two species described by Huynh (1986) in the *Flore du Gabon* (*P. gabonensis* and *P. parvicentralis*) agree with normal variation of *P. candelabrum*. However it is likely that more than one species occurs as native to Gabon (Stévart, pers. comm.) and more collections and careful field study are much needed to solve the taxonomy of the widespread and morphologically variable *P. candelabrum*.

P. chiliocarpus Stapf; Robyns & Tournay, Fl. des Spermat. Parc Natl. Albert: 11, 1955; Lovett & al., Field guide moist for. trees Tanzania: 292, 2006; Kalema & Beentje, Conservation checklist of the trees of Uganda: 191, 2012. – Icon.: Eggeling & Dale, Indigenous trees Uganda, ed. 2: 294, 1952; Fl. Trop. E. Afr., Pand.: 6, 3, 1993.

Typus. – Uganda. Toro Distr.: by Nsonge and Dura riv., s.d., *Dawe 523* (holo-: K; iso-: FI).

syn.: *P. hemiacanthus* Peter. Typus. – Tanzania. Buha Distr.: Mkalinzin-Kwa Bikare, s.d., *Peter 38846* (holo-: B†).

P. africanus H. St. John, *nom. nud.*; *P. kasaiensis* H. St. John, *nom. nud.; P. kigomaensis* H. St. John, *nom. nud.*; *P. rotundus* H. St. John, *nom. nud.; P. ugandaensis* H. St. John, *nom. nud. et inval.* in Hamilton, Uganda Forest trees: 76. 1981; *P. welwitschii* sensu Peter, Fl. Deusch Ost-Afrika 1: 111. 1930 [non Rendle 1894].

PANDANUS CHILIOCARPUS

Tree 7-15 m high, stem c. 10-20 cm in diam.; proproots many, to 0.5-1 m high, 5-7 cm across. Leaves (smaller on side branches, larger in terminal tuft) 1.3-2.7 m long, 4-8 cm wide; marginal spines 3-5 mm long, 6-16(-30) mm apart. Syncarps (presumably solitary) 13-38 × 7.5-20 cm, somewhat trigonous, with c. 1800 drupes; peduncle 25-35 cm long with scars of 8 bracts, these to 65 × 3.4 cm; drupes 33-60 × 10-16 × 7-10 mm, 5-6-angular, 1(-2)-locular; pileus sub-conical, 4-6 mm high; stigmas 1(-3), horizontal to sub-vertical, reniform; endocarp 12-15 mm long, mesocarp fibrous. Staminate inflorescence 14-26 cm long, with 4-6 spathes each 7-11 cm long, 1.4-2 cm across ; lower bract 10.5 × 3.1 cm, upper bract 4.5 × 0.6 cm, spiny on midrib and margins; stamens subumbellate with 6-8 stamens per umbel, *stemonophore* (3-)5-8 mm long, filaments (0.6-)1.5-5.3 mm, anthers 1.8-2.8 × 0.7-0.8 mm, base equal to slightly unequal, apiculate.

Swamps and stream-beds in forest, riverine forest, gregarious; 750-1200 m.

Uganda, Tanzania, possibly Democratic Republic of the Congo (specimens resemble *P. chiliocarpus*, e.g. *Robyns* 2245 (K) from Moba, just across Lake Tanganyika, but also *Liben 3721* (BR [BR0000008815941]) from Malungu, *Evrard 4419* (BR [BR0000008897244]) from Central Congo), *Wagemans 180* (BR [BR0000008815996]) from lower Congo near the coast.), possibly also in South Sudan (*Myers 6503,* K; *Schweinfurth 3263,* K).

There are clear relationships with *P. candelabrum* and *P. welwitschii*, especially for the collections from Democratic Republic of the Congo that are associated with *P. chiliocarpus* tentatively.

(**P. gossweileri** Huynh); Figueiredo & Smith, Pl. Angola: 194, 2008.

Typus. – Angola. Cabinda, Buco Zau, 400 m, 1916, *Gossweiler 7174* (holo-: K [K000435960]; iso-: LISJC, LISU).

syn.: *P. bilobatus* Huynh. Typus. – Angola, Cuanza Sul, Ucua (Dembos), 15.IX.1932, *Gossweiler* 9644 (holo-: COI [COI00077127]; iso-: LISC).

Tree to 8-10 m, branched. Leaves to 2 m long, 4.8(-9.5) cm wide in the middle; marginal prickles up to 4.7 mm long and 19-28 mm apart. Syncarp solitary, ovoid, dimensions unknown, number of drupes presumed in low hundreds; drupes 5-5.3 × 0.7-1 × 0.4-0.6 cm; pileus conical, 5-6-angular, 6-12 mm high; stigmas 1-2, reniform, horizontal; endocarp c. 10-18 mm long; mesocarp fibrous. Staminate inflorescence 14 cm long with 8 spikes; lower spikes 8.5-11 × 1.6-2.1 cm, upper 3.2-3.8 × 0.8-1.1 cm; stamens in groups of 4-13 on a *stemonophore* to 5.4 mm long, subumbellate; filaments 2.4 mm; anthers oblong, 1.2-1.6 × 0.4 mm, apex often curved.

Along riverine forests; 0-400 m.

Angola.

Very near to *P. candelabrum* and *P. welwitschii*. A doubtful taxon based on very fragmented material. – Not mapped.

P. kajui Beentje. – Icon.: Fl. Trop. E. Afr., Pand.: 3, 1993.

Typus. – Kenya. Embu Distr.: 25 km E Embu, Ena riv. Bridge, 19.X.1961, *St. John 26589* (holo-: EA [EA000002755, EA000002756]; iso-: B [B100167994], BISH [BISH1011539], BR [BR0000008816078], K [K000435962], L [L0050506], MO, P [P02087140, P00836322 carpo.]).

syn.: *P. embuensis* H. St John, *nom. nud.*; *P. murira* Beentje in Utafiti 1: 96. 1988, *nom. nud.*

Tree 9-15 m high, sparsely branched, stem c. 20 cm in diam.; stilt roots 1-2 m high, to 9 cm across, with sharp conic spines in longitudinal rows. Leaves 0.4-2.3 m long, 3-13 cm wide; marginal teeth 3-5 mm long, 2-13 mm apart. Syncarps (1-)5 together, peduncle not quite pendent, trigonous, 35 cm long. Syncarp broadly ovoid, slightly trigonous, 7-11 × 6-10 cm, with 300-700 drupes; drupes 1(-3)-locular, the lower one 20-25 mm long; pileus pyramidal, 4-7 mm high, 7-16 mm across; stigma reniform-rounded; endocarp c. 10 mm long in young fruit, mesocarp fibrous. Staminate inflorescences with 5-6 spikes, each 4.5-6 × 2-3 cm ; bracts similar to leaves, lowermost 32 × 6 cm, uppermost 4 × 2 cm; stamens in subumbellate groups of 5-6 on a *stemonophore*, filaments 2.5-4 mm long, anthers 2.2-3 × 1 mm.

Riverine fringe; 750-1200 m.

Kenya.

P. kirkii Rendle; Sauer in Ann. Missouri Bot. Gard. 52: 439, 1965. – Icon.: Stone in Ann. Missouri Bot. Gard. 60: 261, 1973; Fl. Trop. E. Afr., Pand.: 5, 1993; Thulin, Fl. Somalia 4: 274, 1995; Lovett & al., Field guide moist for. trees Tanzania: 292, 2006.

Typus. – Tanzania. Mainland opposite Zanzibar, 1867, *Kirk s.n.* (holo-: K [K000435961]).

syn.: *P. heddei* Warb. Typus. – Tanzania. Dar es Salaam, 1900, *Hedde 31* (holo-: B†).

P. usaramensis Martelli. Typus. – Tanzania. Dar es Salaam, 1905, *Stuhlmann s.n.* (holo-: FI [FI000992, FI000993]).

P. platycarpus Warb. Typus. – Tanzania. Sine loc., s.d., *Krauss s.n.* (holo-: B†; iso-: FI [FI001052]).

P. warburgii Martelli. Typus. – East Africa. Sine loc., s.d., *Holz s.n.* (holo-: B†).

P. cuneatus H. St. John, *nom. nud.* [non Huynh 1999]; *P. inframedius* H. St. John, *nom. nud.; P. mkadi* H. St. John, *nom. nud.*; *P. mombasaensis* H. St. John, *nom. nud.*; *P. pembaensis* H. St. John, *nom. nud.*; *P. profundus* H. St. John, *nom. nud.; P. radians* H. St. John, *nom. nud.*; *P. rimosus* H. St. John, *nom. nud.*; *Pandanus sessilis* Bojer, *nom. inval.*; *P. zanzibarensis* H. St. John, *nom. nud.*

Tree, 4-15 m; stilt-roots from lower part of stem, with small sharp spines in longitudinal rows. Leaves 0.9-1.5(-3) m long, 4.7-6.6 cm wide, attenuate into a long flagella at the apex; marginal prickles 1.3-4 mm long, 2-13 mm apart. Syncarp solitary, almost round, 8-18 × 5-16 cm; peduncle 15-40 cm long; drupes 4-6 × (3-)4-5(-6) × (2-)3-4 cm, 4-5-angular, 5-11(-14)-locular, incompletely fused into c. 38 phalanges; pileus composed of 5-11(-14) domes with distinct apices separated by grooves, yellow-brown to orange when ripe; stigma reniform, often sub-vertical; endocarp c. 1 cm cm long, mesocarp fibrous. Staminate inflorescences with 9-12 spikes, to 10 × 2.5 cm; bracts green to cream in color, lowermost 50 × 5 cm, diminishing in size to the uppermost 5 × 2 cm; stamens racemose, each raceme c. 1 cm long, filaments 0.3-1.8 mm long, anthers 2-4.5 × c. 1 mm, apiculate.

Coastal, above the high tide mark on sandy beaches, and on coral near the sea; 0-10 m.

Kenya, Somalia, Tanzania.

This species has the most western distribution of the seashores and oceanic dispersal group of species of *Pandanus* sect. *Pandanus*. *Pandanus kirkii* and its relatives: *P. maximus* Martelli (Grande Comore) and *P. balfourii* Martelli (Seychelles), which may be synonymous (see Stone, 1973), are replaced by *P. odoratissums* L. f. from India to Borneo and the Philippines and further East by *P. tectorius* Parkinson in the remaining part of Melanesia to the Pacific Islands (incl. Hawaii) (see maps in Stone, *Compt. Rend. Soc. Biogéogr. Séance* 458, 1975: 80). A collection of a staminate plant in Nosy Be (small island in the northwestern coast of Madagascar), *Bernardi 11895* (G) has been determined by Stone as *P. kirkii*. This collection is from near the ex-ORSTOM center and may likely be a cultivated tree of either *P. kirkii* or *P. odoratissimus*.

P. livingstonianus Rendle; Gomes e Sousa, Dendrol. Moçamb.: 177-178, 1966. –Icon.: Huynh in Bot. Helvetica 107: 92, 1997; Coates Palgrave, Trees of Southern Afr., 3rd ed.: 96, 2002 (map); Beentje & Bandeira, Field Guide to the mangrove trees of Afr. & Madag.: 81, 2006; Fl. Zambesiaca 12/2: 150, 2009.

Typus. – Mozambique. Luabo, Zambesi, XII.1859, *Kirk s.n.* (holo-: K [KEBC00000056]; iso-: FI [FI001033]).

syn.: *P. gasicus* Huynh. Typus. – Mozambique. Gaza, Macia, Tuane, Rio Uagunumbo, 10.III.1970, *Balsinhas 1620* (holo-: LMU).

P. globulatus Huynh. Typus. – Mozambique. Zambézia, Pebane, c. 43 km, estrada para Mualama, c. 30 m, 15.I.1968, *Torre & Correia 17139* (holo-: LISC [LISC003403]).

P. mosambicus Huynh. Typus. – Mozambique. Manica, Mts Chimanimani, E side of Musapa gap, 31.I.1962, *St. John 26630* (holo-: BISH; iso-: A, BR [BR0000008815972], EA [EA000002765], K [K000435959, K000781833], LISC [LISC003404], LMA, US [US0057329]).

P. petersii Warb. Typus. – Mozambique. *Peters s.n.* (holo-: K [KEBC00000056]; iso-: FI [FI001032]).

P. serrimarginalis Huynh. Typus. – Mozambique. Gaza, Macia, praia de S. Matinho do Bilene, 14.XII.1961, *Lemos & Balsinhas 309* (holo-: LMA [2 sheets]; iso-: BISH).

P. trilateralis Huynh, *nom. nud.*

Tree 3-20 m high, solitary or clumped; crown narrowly pyramidal or columnar in the open to more ovoid underneath other trees, with a terminal tuft of large leaves on the stem, and lateral branches ending in tufts of smaller leaves. Stem 10-25 cm in diameter; stilt-roots to 3 m high. Leaves 0.3-1.1 m long, 1.5-3 cm wide, on young vigorous trees 0.5-1.5 m long and 2.5-5 cm wide, rigid; prickles on leaf margin 0.6-3.3 mm long. head at anthesis 4.3-6 cm long, 2-4.5 cm across, erect, the ovaries all separate; styles reniform. Syncarp solitary, ovoid with pointed apex, (6-)11-15 cm long, 6-10 cm wide, with 450-600 drupes. Peduncle 16-31 cm long; bracts to 36(-57) × 3 cm; drupes 18-34 × 5-12 × 5-18 mm, (4-)5-6-angled, 1(-3)-locular; pileus 2.5-5 mm long, 5-18 mm across, slightly raised; stigma 1(-3), reniform to horseshoe-shaped; endocarp 7-11 mm long, mesocarp fibrous. Staminate flowers in densely branched spiciform inflorescences; peduncle ± 12 cm long; axis of inflorescence 10-30 cm long with 6-10 branches, each subtended by conspicuous large off-white or cream bracts to 31(-89) × 5 cm; inflorescence branches cylindrical, 3-17 × 1-3 cm, densely packed with many flattened

stemonophores 2-7.5(-11) mm long, each bearing at its apex (2-)4-7(-11) stamens; filaments (0.6-)1.1-3.7 mm long, slightly flattened; anthers 1-2.8 mm long, ellipsoid, apex rounded with a small apiculum, creamy white.

Along river-banks, in freshwater swamps, often gregarious; 0-1200 m.

Democratic Republic of the Congo, Mozambique, Zambia.

Gomes e Sousa (1966) says that the species is fast diminishing in numbers, as river-banks are being cleared.

[**P. odoratissimus** L. f.]; St. John in Taxon 12: 201-204, 1963; Stone in Gard. Bull. Singapore 22: 231-257, 1967. – Icon.: Stone in Nat. Hist. Bull. Siam Soc. 24: 14, 1971; Stone in Fl. Camb. Laos Vietnam 20: 22, 1983.

Typus. – Sri Lanka. Sine loc., 1777/78, *Thunberg s.n.* (holo-: LINN).

Tree to 10 m, erect or rarely decumbent, with candelabra-like branching, or less often a much-branched clump-forming shrub 3-4.5 m; stem to 20 cm in diam. Leaves linear, subcoriaceous, (7-)10-48 × 3.5-11 cm, olive green and slightly glaucous above, paler green below; margins whitish or pale green and with (occasionally red-brown tipped) white prickles 3–6(–10) mm long and 7-45 mm apart, smaller and less spaced higher up; midrib with reflexed prickles 3–6 mm long and 4-45 mm apart. Pistillate inflorescence with terminal arching to pendulous solitary syncarp; peduncle 9-40 × 0.8-2 cm, 3-sided, the lower bracts leaf-like, the upper bracts yellowish-white and gradually shorter, the uppermost bracts linear-lanceolate. Syncarp ellipsoid or globose, (9-)15-23(-30) × (9-)12-20 cm, composed of many (26-143) phalanges; phalanges free but tightly crowded, orange-red to red, soft and fleshy when ripe, oblong-ellipsoid or obovoid, 30-80 × 22-45 mm, composed of 4-10 fused carpels or fewer near cephalium apex or more at cephalium base; each carpel ending in a U- or V-shaped stigma 2-4 × 2-4 mm, these arranged concentrically on the rather flattened or low-pyramidal phalange apex, sometimes greenish; phalange sides ± smooth; abrupt fleshy dark red 'shoulders' 3-6 mm wide of the mature phalanges are typical, but do not last upon drying, as both colour and structure disappear, endocarp 15-30 mm long, bony, walls 1.5-4 mm thick; seeds ellipsoid, 8–18 × 3.5–5 mm; basal mesocarp fibrous and fleshy, extensive. Staminate inflorescence terminal arcuate and pendent, creamy white, a 30-60 cm long raceme of spikes (usually 5, 7, 9 or 11); peduncle fleshy and soon desintegrating, the creamy white bracts similar to those on the pistillate inflorescence, lowest floral bract 48 × 2.2 cm, at base with marginal prickles, at apex long-subulate, the median bract 19 × 2.6 cm, unarmed except near apex; spikes dense, cylindric, 2.5-4(-7.5) × 1.5-2 cm, with many staminate flowers; each spike of a fleshy central axis with *stemonophore* 13 mm long each bearing 19-24 stamens; stamens with filament 0.5–2 mm long, anthers 2-3.6 × 0.5-0.9 mm, of which the apiculus 0.3-0.7 mm, often contorted when dry. Inflorescence decaying quickly after maturing.

Occurs naturally on the indo-malesian coasts from Sri Lanka to Micronesia and the Philippines but also at low altitude along streams and marshes.

Cultivated on Pemba (*St. John 26611*, EAH, K) and in Mozambique for the fragrant staminate inflorescences (also persists as semi-wild in a swamp in this country).

Pandanus odoratissimus belongs to a group of sea-dispersed species of *Pandanus* sect. *Pandanus*. This group includes *P. kirkii* (naturally occurring on the East coasts of Africa, see above), *P. maximus*

Martelli (Grande Comore), *P. balfourii* Martelli (granitic Seychelles Islands) and *P. tectorius* (replacing *P. odoratissums* further East from eastern Borneo to the South Pacific Islands) (Stone, 1974). It can be distingued from the native African *P. kirkii* by its much longer and very white margin prickles and by its ripe fruit with strongly developed shoulders (see Stone, 1967).

P. rabaiensis Rendle; Fl. Mascareignes, Pand. 190: 13, 2003. – Icon.: Stone in Ann. Missouri Bot. Gard. 60: 267, 1973; Lounibos in Cah. ORSTOM., sér. Ent. méd. et Parasitol., 17: 27, 1979; Fl. Trop. E. Afr., Pand.: 3, 1993; Lovett & al., Field guide moist for. trees Tanzania: 292, 2006.

Typus. – Kenya. Kilifi Distr.: Rabai Hills, I.1886, *Taylor s.n.* (holo-: BM [BM000922194] pro parte [Pistillate only]).

syn.: *P. engleri* Warb. Typus. – Tanzania. Lushoto Distr.: below Sakare, s.d., *Engler 981* (holo-: B [B100167990]).

P. goetzei Warb. Typus. – Tanzania. Iringa Distr.: Lofia river, 6.I.1899, *Goetze 437* (holo-: B [B100167991, B100167992]; iso-: FI [FI003587]).

P. hahnii Warb. Typus. – Martinique. In cultivation, from "East African Islands" (?), *Hahn s.n.* (holo-: B†; iso-: FI [icono.]).

P. stuhlmannii Warb. Typus. – Tanzania. Uzaramo Distr.: Dar es Salaam, 7.I.1894, *Stuhlmann 6072* (holo-: B [B100167989]; iso-: FI [FI003586]).

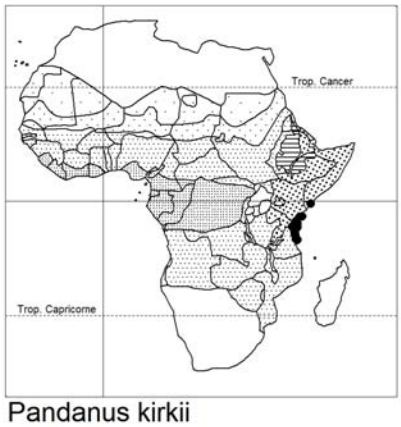
P. bicarpelatus H. St. John, *nom. nud.*; *P. cidaris* H. St. John, *nom. nud.; P. diminuens* H. St. John, *nom. nud.*; *P. mafiaensis* H. St. John, *nom. nud.; P. makuti* H. St. John, *nom. nud.; P. petraeus* H. St. John, *nom. nud.; P. usambaraensis* H. St. John, *nom. nud.; P. kambicalcicola* H. St. John, *nom. nud.*

Tree 3-20 m tall, to 25 cm in diam., with sharp conic spines 2-7 mm; stilt roots to 2 m high in swampy sites, much less on solid ground. Leaves 1.2-4 m long, (1.3-)5-16 cm wide; marginal prickles 2-5 mm long, 5-13(-33) mm apart. Infrutescence not quite pendent, plurisyncarpic with 2-7 heads. Syncarp red, 7-20 × 5-12.5 cm, ellipsoid; peduncle to 75 × 2.5 cm; drupes 15-30 × 22-28 × 15-23 mm, (2-)4-6-locular; pileus 5-20 mm high, 15-35 mm across; stigmas 4-6, reniform; endocarp 16-19 mm high, mesocarp (slightly) spongy and fibrous. Staminate inflorescences white, 12-30 cm long; individual spadices 5-6 in number, to 14 × c. 3.5 cm; lowermost bracts whitish, the proximal to 67 × 5.5 cm, the distal 11 × 1.7 cm; stamens subumbellate, often with two tiers of umbels. *Stemonophore* 5-10.5 mm long, each bearing 5-8 stamens; filaments 0.5-1 mm; anthers linear, 1.8-2 mm long, rounded at apex, spirally contorted after anthesis.

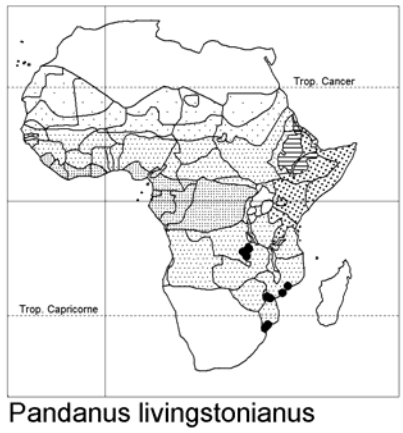
On the coast in swampy sites and on limestone, on white sand with giant heath, more inland in riverine forest or along streams in evergreen forest; 0-1400 m.

Kenya, Tanzania; not known elsewhere.

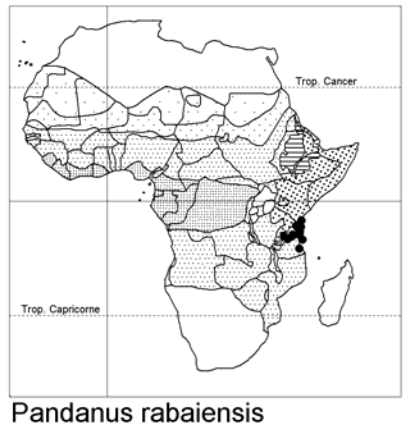
Pandanus rabaiensis is the only known taxon of *Pandanus* sect. *Dauphinensia* H. St. John occurring outside Madagascar (see Callmander & Laivao, 2002a).



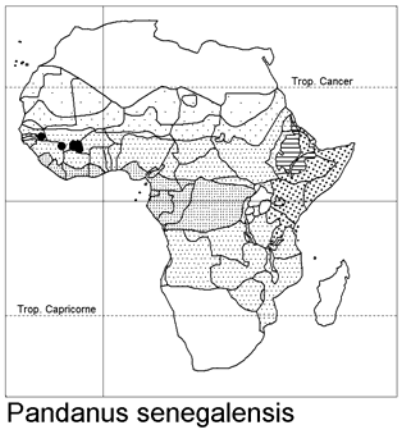
Pandanus kirkii



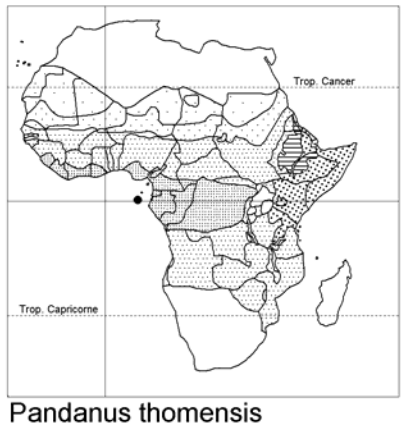
Pandanus livingstonianus



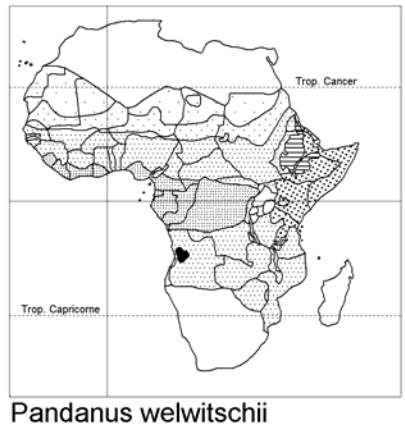
Pandanus rabaiensis



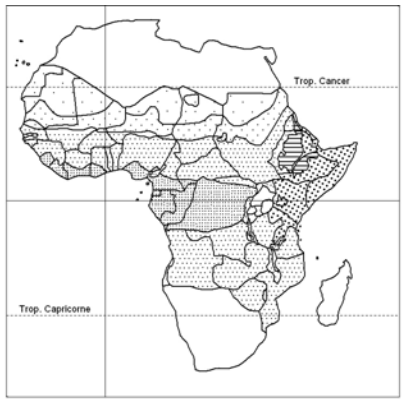
Pandanus senegalensis

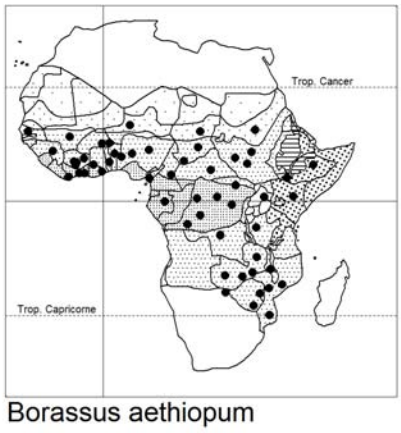


Pandanus thomensis

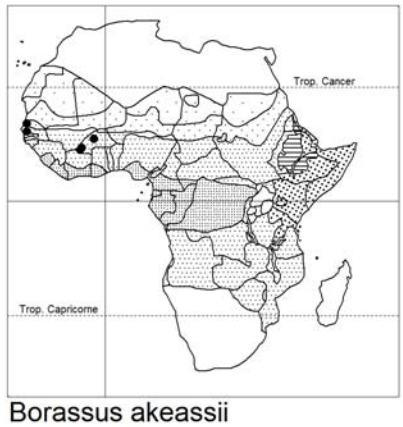


Pandanus welwitschii

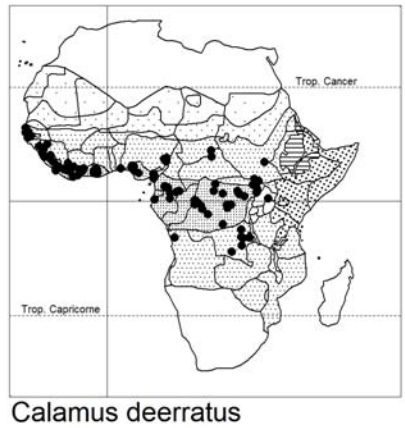




Borassus aethiopum



Borassus akeassii



Calamus deerratus

PANDANUS

P. senegalensis Huynh. – Icon.: Huynh in Candollea 42: 137, 138, 1987.

Typus. – Senegal. Banharé, piste de Niokolo-Koba, 2 km au N du carrefour Poko, 28.XII.1960, *Raynal & Raynal 6966* (holo-: P [P00459602, P00836274 carpo.]; iso-: P [P00459603]).

syn.: *Pandanus brevifrugalis* Huynh. Typus. – Burkina Faso. Banfora, Comoe falls, 27.V.1955, *ABI 2995* (holo-: ABI).

P. cissei Huynh. Typus. – Mali. Près du point de croisement entre la route Sikasso-Finkolo-Koloko et la riv. Farako, 12.I.1989, *Malgras et al. 13* (holo-: P [P00836318 carpo.]; iso-: G [G00369732]).

P. echinops Huynh. Typus. – Mali. Point de croisement entre la route Sikasso-Finkolo-Farako et la riv. Farako de Mendéla, 11.V.1988, *Malgras et al. 16* (holo-: P [P0083 6319 carpo.]; iso-: G [G00369733]).

P. farakoensis Huynh. Typus. – Mali. Près du point de croisement entre la route Sikasso-Finkolo-Farako et la riv. Farako de Mendéla, 8.VI.1988, *Malgras et al. 22* (holo-: P [P00836315 carpo.]; iso-: G [G00369735]).

P. laferrerei Huynh. Typus. – Mali. Farako, région de Sikasso, near Ngolokounadougou, 10.III.1968, *Laferrère 29* (holo-: K [K000781816 carpo.]; iso-: K [K000 435966]).

P. malgrasii Huynh. Typus. – Mali. Finkolo, 22.I.1988, *Malgras 1* (holo-: P [P00836321 carpo.]; K [K00078 1806]).

P. muralis Huynh. Typus. – Mali. Ngolokounadougou, 11°12’32’’N 5°26’10’’W, 13.IV.1989, *Malgras et al. 41 (lég. Cissé)* (holo-: P [P00836317 carpo.]; iso-: G [G003 69731]).

P. raynalii Huynh. Typus. – Mali. Ngolokounadougou, forêt classée du Farako, chutes Farako, 14.XII.1978, *Raynal 21010* (holo-: P [P00459600]).

P. sikassoensis Huynh. Typus. – Mali. Près du point de croisement entre la route Sikasso-Finkolo-Koloko et la riv. Farako, 11.V.1988, *Malgras et al. 14* (holo-: P [P0083 6316 carpo.]; iso-: G [G00369730]).

P. malensis Huynh, *nom. nud*.

Tree 2-6 m tall. Leaves 0.8-1.3 m long, 2.5-4 cm wide; marginal prickles 0.5-5 mm long, 5-28 mm apart. Syncarp solitary (sometimes plurisyncarpic), pendulous at maturity, slightly ovoid to oblong-ovoid, 8.5-14(-18) cm long, 6.5-12 cm wide, with number of drupes in low hundreds (< 400); peduncle 20-27 cm long, 0.7-1 cm thick at apex; bracts foliaceous, to 38 × 2.5 cm; drupes 2.7-4.5 × 0.5-2(-3.3) × 0.5-1.2(-1.6) cm, 5-6-angular, 1(-3-9)-locular; pileus 2-6 mm long, somewhat flat to broadly pyramidal; stigma 1(-3), reniform; endocarp 0.7-2 cm long, mesocarp fibrous. Staminate inflorescence unknown.

Gallery forest, waterfalls; 100-500 m.

Burkina Faso, Mali, Senegal.

Huynh (1988) described *P. raynalii* stating it was close to *P. senegalensis*; the differences were held to be in the length of the germinating tube, the siting of the apex of the mesocarp, and the shape of the upper endocarp (attenuate rather than thick). We believe that these two taxa are the same, as the characters of leaves, syncarp, drupes, endocarp and mesocarp are all very similar. Another species, *P. brevifrugalis*, described by Huynh (1988) also falls into this taxon, with its typical short and flat pileus. The Fouta Djalon Guinean collections from *Chevalier* (types of *P. chevalieri, P. djalonensis, P. parachevalieri* and *P. pseudochevalieri*) are close to *P. senegalensis* and may be better placed here. More collections are needed to understand the taxonomy of this species.

PANDANUS SENEGALENSIS

Huynh (1988, 1995, 1996) placed several species that we have placed in synonymy with *P. senegalensis* under *Pandanus* sect. *Souleyetia*; except for *P. muralis* which he placed in a newly described section: *Pandanus* sect. *Pseudophalanx* (Huynh 1995: 38). *Pandanus* sect. *Souleyetia* is endemic to Madagascar and Mauritius, and *P. senegalensis* and its synonyms should be placed in sect. *Heterostigma*. *Pandanus* sect. *Pseudophalanx* is clearly a synonym of *Pandanus* sect. *Heterostigma*. The incompletely fused carpel character mentioned by Huynh to describe sect. *Pseudophalanx* is obviously a drying artefact.

P. thomensis Henriq.; Stone in Ann. Missouri Bot. Gard. 60: 270, 1973; Figueiredo & al. in Bothalia 41: 66, 2011. – Icon.: Henriques in Bol. Soc. Brot. 5: 206, 1887.

Lectotypus (here designated). – São Tomé. Rodia, regione inferiore, c. 500 m, XII. 1885, *Quintas 113* (lecto.-: COI [COI000 05915, excluding staminate flowers]; iso-: B [B10016 7988]; FI [FI003589], K [K000527234]). Paralectotypus. – Sao Thomé. Ins. Rolas, c. 500 m, V.1885, *Moller s.n.* (paralecto-: COI [COI00 005915, staminate flower; isoparalecto-: FI [FI003590]).

Tree 8-15 m tall, branched. Leaves 1.6 m long, 9 cm wide in mid-leaf; marginal teeth dense, retrorse. Syncarp solitary, terminal, erect at first, then pendulous on long peduncle, ovoid, 22 × 15 cm; bract 5 × 4 cm; drupes obconic, rather convex above, 7.5-8.4 × 3.7-5.6 × 3-3.8 cm, 10-14-locular; pileus sulcate and tuberculate; stigmas sessile, rather thick, irregularly radiating; mesocarp spongy and fibrous above. Staminate inflorescences terminal leafy spicate panicle; spathes increasing in size upwards, keeled, with sparse teeth on midrib, rather shorter than spadix branches; rachis fleshy, compressed; stamens irregularly umbellate on stalk 6 × 1 mm; filaments thick, conical, ± connate; anthers 3 mm long, shortly apiculate.

Presumably in streamside forest ; about 500 m.

São Tomé.

Henriques (1887: 207) cited two collections as types: *Quintas s.n. [Quintas 113]* and *Moller s.n.*). There is confusion about which of these two collections represents a pistillate and a staminate plant; both were collected in 1885. Henriques specifically noted that the plant fructified in December which is the *Quintas* collection, and the later is here designated as the lectotype. The collection in B is considered as an isolectotype even if it is annoted «leg. Moller».

P. welwitschii Rendle; Stone in Ann. Missouri Bot. Gard. 60: 271, 1973; Figueiredo & Smith, Pl. Angola: 194, 2008; Fl. Zambesiaca 12/2: 152, 2009.

Typus. – Angola. Pungo Andongo, Candumba, Ilha Calemba, Condo, III.1857, *Welwitsch 5770* (holo-: BM [BM000922195, BM000922196]; iso-: FI [FI003583]).

syn.: *P. angolensis* Huynh. Typus. – Angola. Distr. Cuanza Sul: près de Lussusso, 75 km de Donodo vers Quibala, 200 m, 20.III. 1974, *Dechamps, Murta & Silva 1585* (holo-: LISC [LISC003402]; iso-: BR [BR0000008815903]).

P. angolensis fo. *cacondensis* Huynh. Typus. – Angola. Distr. Cuanza Sul: près de la ville de Caconda, Benguela, 1907, *Gossweiler s. n.* (holo-: LISC [LISC003402]; iso-: BR [BR0000008815903], FI [FI000976]).

Tree 3-6 m tall, stem c. 30 cm in diam.; lower branches with smaller leaves, apical tufts of leaves very large. Leaves 1.2-1.5 m long and 3.7-4 cm wide; marginal prickles 1.1-5.3 mm long, 10-25 mm apart, retrorse and antrorse. Syncarp solitary, ovoid, 15 × 7.5 cm, number of drupes unknown; drupes 1.5-2.9 × 0.5-1 × 0.5-0.8 cm, 5-6-angular, 1(-2)-locular; pileus 4-5.7 mm long,

broadly pyramidal or table-shaped; stigma reniform; endocarp 12-13 mm long, mesocarp fibrous. Staminate inflorescence unknown.

Streamsides, in water; 200-1700 m.

Angola.

Possibly the same as *P. livingstonianus* (and published at the same time, see Beentje, 2009). The protologue specifically states the tree lacks stilt roots (which are always present in *P. livingstonianus*, as well as in all other African pandans).

DOUBTFUL SPECIES:

Pandanus butayei De Wild. Syntypus. – Democratic Republic of the Congo. Sine loc., s.d., *Gillet 2247.* (holo-: BR [BR0000008815828]). – Congo. N'Lenfu s.d., *Butaye s.n.* (holo-: BR [BR0000008815835, BR0000008815842, BR0000008815859]).

This species was considered as *nom. subnudum* by Stone (1973: 272). The two syntypes at BR represent only leaves and very old drupes. The description is very succinct and not helpful. It is probably related to *Pandanus chiliocarpus*.

Pandanus insolitus Huynh. Typus. – Democratic Republic of the Congo. Sine loc., s.d., *Agesmit s.n.* (holo-: FI [FI001000]).

This species is only known by old separate drupes. It is obviously not a species originating from Africa. Looking at the morphology of the drupes, this collection is probably associated with SE Asia and either represent a cultivated species or a label error. We would be inclined to assume the latter option because no species with this kind of morphology has been recorded in Africa.

SYNONYMS:

Heterostigma heudelotianum Gaud. = **Pandanus candelabrum**

Pandanus abbiwii Huynh = **Pandanus candelabrum**

akeassii Huynh = **P. candelabrum**

akeassii var. *limitaneus* Huynh = **P. candelabrum**

angolensis Huynh = **P. welwitschii**

angolensis fa. *cacondensis* Huynh = **P. welwitschii**

barterianus Rendle = **P. candelabrum**

bicarpelatus H. St. John, *nom. nud.* = **P. rabaiensis**

bilobatus Huynh = **P. welwitschii**

brevifrugalis Huynh = **P. senegalensis**

butayei De Wildeman = **see doubtful species**

chevalieri Huynh = **P. candelabrum**

cidaris H. St. John, *nom. nud.* = **P. rabaiensis**

columellatus Huynh = **P. candelabrum**

crassilix Huynh = **P. senegalensis**

diminuens H. St. John, *nom. nud.* = **P. rabaiensis**

djalonensis Huynh = **P. candelabrum**

echinops Huynh = **P. senegalensis**

embuensis H. St. John, *nom. nud.* = **P. kajui**

engleri Warb. = **P. rabaiensis**

freetownensis Huynh = **P. candelabrun**

gasicus Huynh = **P. livingstonianus**

globulatus Huynh = **P. livingstonianus**

goetzei Warb. = **P. rabaiensis**

gossweileri Huynh = **P. welwitschii**

guineabissauensis Huynh = **P. candelabrum**

hahnii Warb. = **P. rabaiensis**

heddei Warb. = **P. kirkii**

hemiacanthus Peter = **P. chiliocarpus**

heudelotianus (Gaud.) Balf. f. = **P. candelabrum**

insolitus Huynh = **see doubtful species**

kambicalcicola H. St. John, *nom. nud.* = **P. rabaiensis**

kamerunensis Warb. = **P. candelabrum**

kigomaensis H. St. John, *nom. nud.* = **P. chiliocarpus**

kerstingii Warb. = **P. candelabrum**

lachaisei Huynh = **P. candelabrum**

laferrerei Huynh = **P. candelabrum**

latiloculatus Huynh = **P. candelabrum**

leonensis Wendl., *nom. nud.* = **P. candelabrum**

liberiensis Huynh = **P. candelabrum**

mafiaensis H. St. John, *nom. nud.* = **P. rabaiensis**

makuti H. St. John, *nom. nud.* = **P. rabaiensis**

malensis Huynh *nom. nud.* = **P. senegalensis**

malgrasii Huynh = **P. senegalensis**

mosambicus Huynh = **P. livingstonianus**

muralis Huynh = **P. senegalensis**

murira Beentje, *nom. nud.* = **P. kajui**

nigeriensis Huynh, *nom. nud.* = **P. candelabrum**

oblongicapitellatus Huynh = **P. candelabrum**

parachevalieri Huynh = **P. candelabrum**

pembaensis H. St. John, *nom. nud.* = **P. kirkii**

parvicentralis Huynh = **P. candelabrum**

petersii Warb. = **P. livingstonianus**

profundus H. St. John, *nom. nud.* = **P. kirkii**

problematicus Huynh = **P. candelabrum**

pseudochevalieri Huynh = **P. candelabrum**

petraeus H. St. John, *nom. nud.* = **P. rabaiensis**

radians H. St. John, *nom. nud.* = **P. kirkii**

raynalii Huynh = **P. senegalensis**

rotundus H. St. John, *nom. nud.* = **P. chiliocarpus**

satabiei Huynh = **P. candelabrum**

serrimarginalis Huynh = **P. livingstonianus**

sessilis Bojer, *nom. nud.* = **P. kirkii**

sierraleonensis Huynh = **P. candelabrum**

stuhlmannii Warb. = **P. rabaiensis**

tenuimarginatus Huynh = **P. candelabrum**

teuszii Warb. = **P. candelabrum**

tiassaleensis Huynh = **P. senegalensis**

togoensis Warb. = **P. candelabrum**

triangularis Huynh = **P. candelabrum**

ugandaensis H. St. John, *nom. nud. et inval.* = **P. chiliocarpus**

usambaraensis H. St. John, *nom. nud.* = **P. rabaiensis**

umbellatus Martelli = **P. candelabrum**

unwinii Martelli = **P. candelabrum**

usaramensis Martelli = **P. kirkii**

warburgii Martelli = **P. kirkii**

Tuckeya candelabrum (P. Beauv.) Gaud. = **Pandanus candelabrum**