Novelties from the Northern Mountains Complex of Madagascar V: A new threatened Pandanus (Pandanaceae) from the Kalobinono massif

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Abstract

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A new species of *Pandanus* Parkinson *(Pandanaceae)* endemic to Madagascar is described as *Pandanus kalobinonensis* Callm., Razakamal. & Luino and illustrations are provided. The new species is restricted to the north-western lowland moist evergreen forests of the Kalobinono massif. *Pandanus kalobinonensis* can easily be morphologically distinguished from other members of the genus by its small solitary globose syncarp borne on a short peduncle, monocarpellate drupes, and single spiniform stigma with an adaxial stigmatic groove. Despite the occurrence of both collections within limits of the newly designated Galoko-Kalobonino Protected Area, the new species is preliminary assessed as "Endangered" [EN] using the IUCN Red List Criteria.

Résumé

CALLMANDER, M.W., R. RAZAKAMALALA, I. LUINO, R.L. ANDRIAMARISOA & S. BUERKI (2020). Nouveautés du Complexe des Montagnes du Nord de Madagascar V: Un nouveau Pandanus (Pandanaceae) menacé du massif du Kalobinono. *Candollea* 75: 99–105. En anglais, résumés anglais et français. DOI: http://dx.doi.org/10.15553/c2020v751a10

Une nouvelle espèce de *Pandanus* Parkinson *(Pandanaceae)* endémique de Madagascar est décrite comme *Pandanus kalobinonensis* Callm., Razakamal. & Luino et des illustrations sont fournies. La nouvelle espèce a une aire de distribution restreinte dans les forêts denses humides sempervirentes de basse altitude du massif du Kalobinono dans le nord-ouest de Madagascar. La nouvelle espèce se distingue facilement des autres membres du genre par son petit syncarpe globuleux solitaire, porté par un pédoncule court, ses drupes monocarpellées surmontées d'un stigmate spiniforme portant la zone stigmatique sur la face adaxiale. Malgré le fait que les deux récoltes se trouvent dans les limites de la nouvelle aire protégée du Galoko-Kalobonino, la nouvelle espèce est préalablement évaluée comme «En danger» [EN] en utilisant les critères de la Liste Rouge de l'UICN.

Key-words

PANDANACEAE – *Pandanus* – Madagascar – Galoko-Kalobinono – New species – IUCN Red List

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Introduction

The Galoko mountain range is located at the northern edge of the Sambirano Region (Gachet, 1958), which consists of the Isalo Sandstone (Besairie, 1936) comprising two main summits: the Galoko (1,148 m) and the Kalobinono (1,028 m) (Fig. 1). This mountain chain has been botanically poorly studied since the 21th century. The botanical inventory of the Galoko-Kalobinono region began with Henri Perrier de la Bâthie (1873–1958) who visited the area twice between 1908 and 1923. Later, botanists from the "Service Forestier" conducted fieldwork in this region; however less than 50 collections were made during the 20th century. Starting in 2004, intensive botanical inventories have generated a total of 1412 collections for this region (Callmander et al., 2018). This collection effort has revealed several new species in families such as *Anacardiaceae* (Randrianasolo & Lowry, 2009), *Annonaceae* (Callmander et al. 2009a; Johnson & Murray, 2020), *Araliaceae* (Callmander et al., 2009a), *Burseraceae* (Daly et al., 2015), *Malvaceae* and *Meliaceae* (Callmander et al., 2009a), *Oleaceae* (Callmander et al. 2009a; Hong-Wa, 2016), *Pandanaceae* (Callmander et al., 2008), *Rubiaceae* (De Block, 2014), *Sapindaceae* (Schatz et al., 2017) and *Violaceae* (Wahlert, 2016). Overall, a total of 14 species are currently endemic to the Galoko-Kalobinono massifs (Callmander et al., 2018).

These botanical discoveries have shed light on the unique biodiversity of the Galoko-Kalobinono region, which is facing high human pressure as demonstrated by a deforestation rate in the Galoko of 158,36 ha/year (Ranirison et al., 2014). A multidisciplinary biodiversity inventory has been published by a consortium of Malagasy NGOs (the Missouri Botanical Garden-Madagascar, the Vahatra association, and the Bibikely Biodiversity Institute from the California Academy of Sciences). This biodiversity inventory was prepared in the context of the "Protected Areas of Managed Resources" (MRPA) program, which aimed at expanding the protected areas network of Madagascar within representative ecoregions, while considering regional population growth (see Ranirison et al., 2014). Following this effort, a new protected area of 74,205 ha was designated for this region in 2015 (MEEF, 2015), the "Paysage Harmonieux Protégé de Galoko-Kalobinono". This protected area includes 11,739 ha of strict conservation ("noyau dur"). The Missouri Botanical Garden has been managing the protected area between 2013 to 2017 and the Famelona association has taken over management duties since 2018 [www.famelona.mg].

Pandanaceae of the Galoko-Kalobinono region have been well studied and currently comprises five species distributed into two genera. *Martellidendron cruciatum* (Pic. Serm.) Callm. & Chassot, *Pandanus boivinii* Solms, *P. grallatus* B.C Stone, *P. sambiranensis* Martelli, and *P. mammillaris* Martelli & Pic. Serm. have been recorded from the Protected Area. Those latter five species are not endemic to the region and occur in several neighboring forests (see Madagascar Catalogue, 2020). *Martellidendron cruciatum* has a widespread distribution in Malagasy moist forests, whereas the other species are mostly endemic to the Sambirano Domain, a region well known for its high level of endemism (see Gautier, 2002). Currently, *P. sermollianus* Callm. & Buerki is the only endemic species of the Galoko-Kalobinono region. This species was discovered in 2005 during the first intensive botanical inventory of this region (Callmander et al., 2008).

During the MRPA program, an unidentified collection of *Pandanus* Parkinson was collected at low elevation in the Kalobinono massif in 2013 by RR (*Razakamalala et al. 7586*). Another collection tentatively assigned to the same taxon was made by RR and IL in 2015 (*Luino & Razakamalala 106*) on the first author initiative. These two collections confirmed a further new species endemic to the Galoko-Kalobinono region, which is formally described and illustrated in this publication: *Pandanus kalobinonensis* Callm., Razakamal. & Luino. The new species description is accompanied by notes on its morphological affinities, its preliminary risk of extinction assessment following IUCN Red List Categories and Criteria (IUCN, 2012), a field photograph and a line drawing.

Taxonomy

Pandanus kalobinonensis Callm., Razakamal. & Luino, **sp. nov.** (Fig. 2, 3).

Holotypus: Madagascar. Reg. DIANA [Prov. Antsiranana]: Fkt. Anketrabe-Belinta, massif du Kalobinono, 13°38'42"S 48°40'29"E, 740 m, 16.X.2015, fr., *Luino & Razakamalala 106* (G [G00341880]!; iso-: TAN!).

Haec species ab omnibus congeneris syncarpio parvo globoso solitario brevipedunculato atque drupis monocarpellatis in stigma spiniforme adaxialiter sulcatum desinentibus differt.

Treelet to 3–4 m tall; stem prickly, up to 5 cm dbh. *Leaves* 125–160 cm long, 2–3 cm wide in the middle, 3 cm wide near the sheath, gradually attenuate in the upper third, and tapering to a flagellate apex in the distal 5 cm, coriaceous; longitudinal and transverse veins visible on both surfaces; prickles white *in vivo*; marginal prickles beginning at (4–)5–6 cm above the base and extending to the apex, antrorse, 2–4 mm and placed 2–8 mm apart in the lower third, to 2 mm and 5–10 mm apart in the middle third; to < 1 mm and 2–4 mm apart in the distal third; midrib armed below in the upper ⅔, prickles small (< 1 mm), irregularly disposed (5–10 mm); sheath 5 cm long, c. 3.5 cm wide at apex c. 4–4.5 cm large at base. *Infrutescence* terminal, a solitary syncarp subtended by naviculate bracts, borne on a straight short peduncle; syncarp 50 × 60–70 mm, globose to ovoïd; peduncle straight, short, 65 mm long, c. 9 mm in diam at apex, trigonous, 3–4 remaining bracts, c. 5–7.5 cm long, positioned near the base of the syncarp, boat-shaped at base and becoming flagellate in the distal part.

Fig. 1. – The Galoko mountain range with the Galoko summit on the left, the distinctly shaped domes of the Kalobinono on the right and rice plantations in the foothills.
[Photo: S. Wohlhauser]

Drupes c. 65–140 per syncarp, (15–)20(–25) mm high, 5–7 mm wide, (3–)4–6 mm thick, 4–6 angled; carpel 1, free in the upper fourth, tapering to the base; pileus pyramidal, somewhat rounded at apex. *Stigma* 1, erect or curved, spiniform, on the centre of the apical face of the pileus, brown *in vivo*, 3–5 mm in length, stigmatic groove abaxial, covering c. ⅔ of the length of the stigma. *Endocarp* 10–13 mm long in the centre, < 1 mm wide, 4–6 mm away from stigma base; seed locule oblong, 10–12 × 3–5 mm, superior and inferior mesocarp fibrous. *Staminate* plant unknown.

Etymology. – The species epithet refers to the Kalobinono massif and its eroded landscape of Isalo Sandstone dominated by a pair of distinctly shaped domes (fig. 1). The literal translation from the Sakalava dialect means "princess with large breasts". Similarly, the name Galoko refers to a local king. The two summits are sacred for the local Sakalava. According to the legend, the queen embodied in the Kalobinono massif gave birth to the nearby Manongarivo massif, fathered by the king at Galoko (Solo et al., 2008).

Distribution and ecology. – *Pandanus kalobinonensis* is currently only known from the lowland moist evergreen forest in the Kalobinono massif (northwestern Madagascar) between 420 to 740 m elevation.

Conservation status. – *Pandanus kalobinonensis* is known from 2 locations from the Galoko-Kalobinono Protected Area collected at a distance of c. 1 km in lowland moist evergreen forests. The holotype collection is located well within the intact forest at 740 m, but the paratype is located at 425 m and was made only a hundred meters from recently cleared forest. This latter location could be projected to disappear in a relatively near future. Lowland moist evergreen forests were highly threatened in the

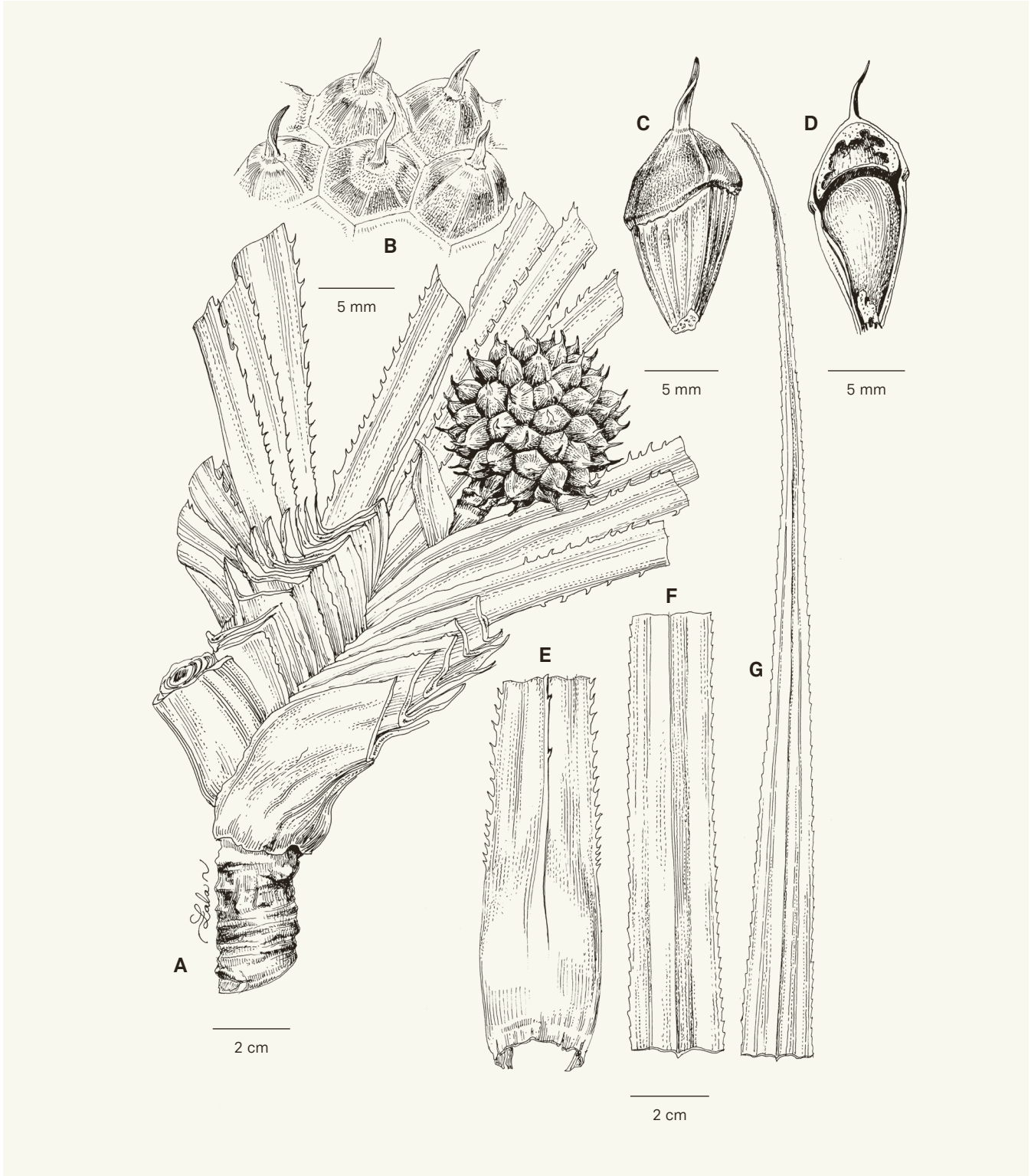

Fig. 2. – *Pandanus kalobinonensis* Callm., Razakamal. & Luino. **A.** Fruiting branch; **B.** Detail of the syncarp; **C.** Drupe; **D.** Cross section of a drupe; **E.** Basal section of a leaf; **F.** Mid section of a leaf; **G.** Apex section of a leaf.
[**A–D:** *Razakamalala et al. 7586*, TAN; **E–G:** *Luino & Razakamalala 106*, TAN] [Drawing: R.L. Andriamiarisoa]

Fig. 3. – Photograph of *Pandanus kalobinonensis* Callm., Razakamal. & Luino. [*Luino & Razakamalala et al. 106*] [Photo: I. Luino]

massifs where Tsimihety immigrants have established settlements for several decades and are practicing slash and burn agriculture (Solo et al., 2008) (Fig. 1). The loss of moist evergreen forest area between 2006 to 2016 has reached 1408 ha, which represents 15% of the total cover of the PA (Rabenandrasana et al., 2018). Since mid 2018, slash and burn agriculture is restricted within the strict conservation zone, but the risk of uncontrolled pasture fire is still a threat (P. Ranirison, pers. comm.). With an area of occupancy (AOO) of 4 km^2, and despite that both collections ocur within limits of the protected area, *P. kalobinonensis* is therefore assigned a preliminary conservation status of "Endangered" [EN B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v)] using IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – *Pandanus kalobinonensis* is morphologically distinct among Malagasy species of *Pandanus*. Its small globose solitary syncarp bearing monocarpellate drupes topped by a spiniform stigma (Fig. 2, 3) resembles several Southeast Asian *Pandanus* species. Several species in Madagascar were hypothesized to have morphological Indo-Malaysian affinities (Stone 1974; Callmander & Laivao, 2003). *Pandanus platyphyllus* Martelli was for example placed by Stone (1974) in the Malaysian *Pandanus* subgenus *Rykia* (Vrise) B.C. Stone before staminate plants were studied by Huynh (1977) and confirmed to belong to the Afro-Malagasy subgenus *Vinsonia* (Warb.) B.C. Stone. Phylogenetic analyses further demonstrated that those latter morphological affinities were most likely the result of convergent evolution since all Malagasy species of *Pandanus* subgenus *Vinsonia* formed a monophyletic clade (Buerki et al., 2012). In this context, *Pandanus kalobinonensis* is therefore classified in *Pandanus* subgenus *Vinsonia*. The sectional placement of this species remains to be established, like other recently discovered morphologically isolated species in Madagascar (see Callmander et al., 2008, 2009b, 2013).

Paratypus. – **Madagascar. Reg. DIANA [Prov. Antsiranana]:** Beramanja, Anketrabe Belinta, massif du Kalobinono, 13°38'16"S 48°40'21"E, 425 m, 29.IX.2013, fr., *Razakamalala et al. 7586* (TAN).

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