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A New Species of Pandanaceae from Northern Madagascar, *Pandanus ankaranensis*

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Abstract. A new species, *Pandanus ankaranensis* Callm. & Laivao (Pandanaceae), is described from the karst region of Ankarana in northern Madagascar. It resembles *P. grallatus* B. C. Stone, another member of *Pandanus* sect. *Mammillares* H. St. John occurring in the area. The new taxon can be distinguished by its larger and wider leaves that are persistent on the branches, the stipe often lying on the rocks where plants grow, and its larger syncarps. *Pandanus ankaranensis* is classified as Vulnerable based on IUCN Red List criteria.

Résumé. Une nouvelle espèce, *Pandanus ankaranensis* Callm. & Laivao (Pandanaceae), est décrite de la région karstique de l'Ankarana au nord de Madagascar. Elle est proche de *P. grallatus* B. C. Stone, une autre espèce de *Pandanus* sect. *Mammillares* H. St. John qui pousse dans la région, mais s'en distingue par des feuilles plus longues et plus larges qui sont persistantes sur les branches, le stipe souvent couché sur les rochers et par les dimensions de son syncarpe. *Pandanus ankaranensis* est classé Vulnérable selon le Liste Rouge de l'UICN.

Key words: IUCN Red List, Madagascar, Pandanaceae, *Pandanus*.

Madagascar is one of the centers of diversity of the genus *Pandanus* Parkinson, with ca. 90 species, one third of which occur in the northern part of the island (Callmander et al., 2003). This region is one of the most biogeographically complex parts of the island (Battistini, 1965), and it is also one of the least explored. In order to address this gap in botanical knowledge, a coordinated set of inventory projects was conducted in northern Madagascar between 2003 and 2008 under the International Cooperative Biodiversity Group (ICBG) program (see Cao & Kingston, 2009), focusing on the drier parts of the region. A total of ca. 3600 collections were gathered over the course of five years. The specimens resulting from such initiatives have proven to be very helpful when describing new Malagasy species of plants, e.g., *Bathiorhamnus capuronii* Callm., Phillipson & Buerki (Rhamnaceae, Callmander et al., 2008), *Ludia craggiana* Z. S. Rogers, Randrianasolo & J. S. Mill. (Flacourtiaceae, Rogers et al., 2006a), and *Olax antsiranensis* Z. S.

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Rogers, Malécot & Sikes (Olacaceae, Rogers et al., 2006b).

While most *Pandanus* species are known from the humid regions of Madagascar, several previously published members of the genus occur in dry areas in the northern part of the island, including *P. analamerensis* Huynh, *P. coriaceus* Huynh, *P. flagellaris* B. C. Stone, and *P. grallatus* B. C. Stone (Stone, 1975; Huynh, 2000). All of these species have been recorded from around Ambilobe and/or Daraina, and the first two are also known from farther north at Montagne des Français. Two additional species, *P. biceps* B. C. Stone & Guillaumet and *P. pristis* B. C. Stone, are currently known only from the Ankarana massif, a karstic plateau of ca. 150 km² dating from the Jurassic (Rossi, 1980) that is home to many endemic plants, including the new species described here.

Pandanus ankaranensis Callm. & Laivao, sp. nov. TYPE: Madagascar. Prov. Antsiranana: Diana, Ambilobe, Marivorahona, forêt d'Ampondrabe, à 10 km E du village de Mahamasina, Ankarana, forêt sèche, 12°59′52″S, 49°11′16″E, 223 m, 8 Dec. 2007, *R. Randrianaivo*, *R. Rakotondrajaona*, *S. Randrianasolo*, *C. Claude*, *V. Benjara*, *M. Bezara* & *Bezandry 1515* (holotype, MO; isotypes, G, P, TAN). Figures 1, 2.

Haec species inter congeneros madagascarienses *Pandano grallato* B. C. Stone simillima, sed a hoc foliis latioribus longioribusque atque infructescentia drupisque majoribus, ab omnibus habitu arboris caule saepe in saxa incumbente atque foliis mortuis ad ramos erectos persistentibus distinguitur.

Tree to 8 m, stem prickly, 7–10 cm diam., erect or decumbent on rocks, branches few; prop roots abundant. Leaves gradually attenuate in the distal part, those borne apically on the trunk as long as those on lateral branches, (55–)75–95 × (3–)4.5–5.5 cm; old leaves persistent on branch; dry leaves coriaceous, lacking auricles, longitudinal veins visible on both surfaces; marginal prickles borne from 4–8 cm above the blade base to the apex, antrorse, 4–5 mm in the lower 1/3, 6–20 mm apart, strong, ca. 2 mm in the middle 1/3, 4–9 mm apart, to 1 mm in the distal 1/3, 3(–6) mm apart; midrib armed, prickles < 2 mm, randomly disposed (0.8–1.8 cm) and slightly prominent, antrorse in the distal 1/2, then smaller (ca. 1 mm), regularly disposed, spaced 2–8 mm apart and prominent; sheath 4–7 cm, ca. 4.5 cm wide at apex, ca. 5 cm wide at base. Flowers not seen; male flowers unknown. Infructescence terminal, the solitary syncarp erect on a straight peduncle; syncarp 13–14 cm diam., subspherical; peduncle 17–26 cm, 1.4–1.7 cm wide at apex, 0.8–0.9 cm wide at middle, straight, trigonous, veins visible, bracts to as many as 10 on entire peduncle. Drupes 11 or 12, connate in the mature syncarp, 50–60 × 45–50 × 38–46 mm, (4- or) 5-angled; pileus convex, 1/3–1/2 of superior portion free; stigmas 5 to 8, reniform, plane to oblique, gathered in the center of the pileus, 3–6 mm apart, slightly heightened (1–2 mm), apical sinuses 1–5 mm deep, alternating with the stigmas; endocarp 10–12 mm long in the center, ca. 25 mm wide, ca. 20 mm away from the stigmas; seed locule oblong, ca. 11 × 5 mm, superior mesocarp compact; inferior mesocarp fibrous.

Distribution and habitat. *Pandanus ankaranensis* is only known from dry forests on eroded limestone in the Ankarana region of northern Madagascar. Three other *Pandanus* species are known from the karst plateau of Ankarana: two endemic to this locality (*P. biceps* and *P. pristis*) and *P. coriaceus*, which also grows farther north in dry forests on other substrates.

IUCN Red List category. *Pandanus ankaranensis* has an area of occurrence of 118 km², an area of occupancy of 27 km², and comprises three known subpopulations, two of which are located in a protected area (Ankarana). Using the methodology of Callmander et al. (2007) based on IUCN Red List criteria (IUCN, 2001), we assign a preliminary status of Vulnerable (VU D2).

Observations. *Pandanus ankaranensis* is placed in *Pandanus* subg. *Vinsonia* (Warb.) B. C. Stone following the infrageneric classification of Stone (1974)—a system that has "a practical value" and must "remain provisional and flexible" according to Stone (1975: 459). This subgenus certainly has "geographic unity" (Huynh, 1979: 474), and its evolutionary and phylogenetic unity will soon be tested as part of a molecular phylogenetic analysis now being conducted (by M.W.C. and other collaborators). It encompasses nearly all *Pandanus* species from Africa, Madagascar, the Mascarenes, the Comoros, and the Seychelles, with carpels either free or connate into phalanges, and bearing stigmas that vary greatly in form from reniform to spiniform (Stone, 1974). The new species is assigned to section *Mammillares* H. St. John, described to accommodate taxa that bear multiple reniform stigmas that are grouped in the center of the upper part of the drupes (St. John, 1960; Laivao et al., 2006).

Our new species is very distinctive, although in general aspects of the syncarp morphology it resembles *Pandanus grallatus*, which occurs in dry forests of northern Madagascar from north of Ambanja to Ambilobe (Stone, 1975) and Daraina. Both species

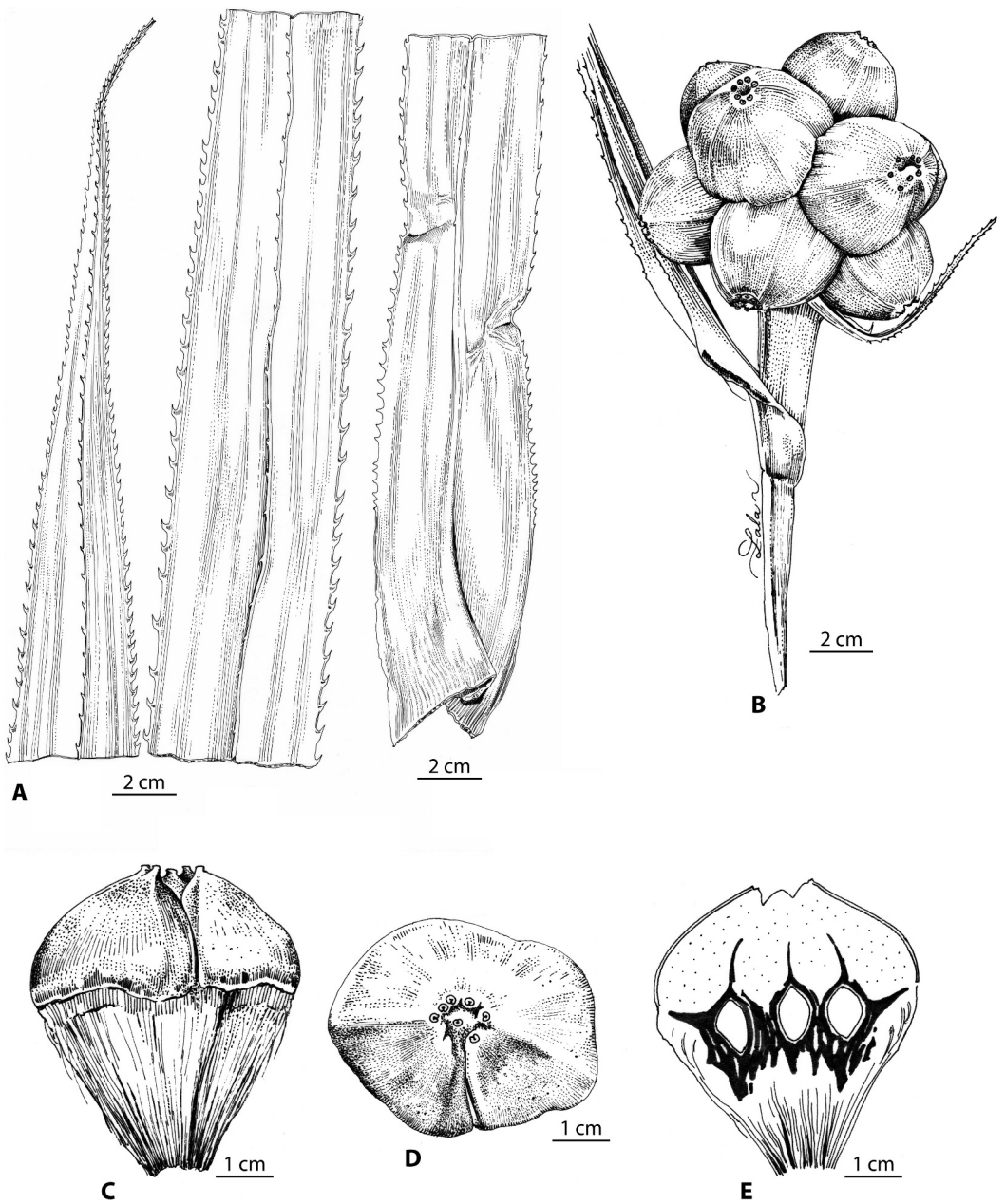

Figure 1. *Pandanus ankaranensis* Callm. & Laivao. —A. Leaf apex, midsection, and base. —B. Syncarp. —C. Lateral view of a drupe. —D. Apical view of a drupe showing the stigmas. —E. Longitudinal section of a drupe. Drawn from the holotype and isotype *Randrianaivo et al. 1515* (MO, TAN) and paratype *Callmander & Toly 49* (TAN).

differ from other members of section *Mammillares* in having sinuses in between the stigmas on the apex of the pileus, but *P. ankaranensis* differs from *P. grallatus* by its wider and longer leaves ([55–]75–95 × [3–]4.5–5.5 cm vs. 50–70 × ca. 2 cm in *P. grallatus*), larger infructescence (13–14 cm vs. ca. 5–5.5 cm diam.), longer peduncles (17–26 cm vs. ca. 10 cm), and larger drupes (5–6 × 4.5–5 × 3.8–4.6 cm vs. 2.2–2.7 × 2–2.6 × 1.8–2 cm). Furthermore, the new species described here can be recognized easily, even when sterile, by its unique habit. It forms a tree with the base of the trunk often prostrate and decumbent on rocks (Fig. 2) and dead leaves that persist on the branches. In contrast, *P. grallatus* is a slender treelet with an erect trunk and numerous ramifications, and leaves that do not persist on the branches.

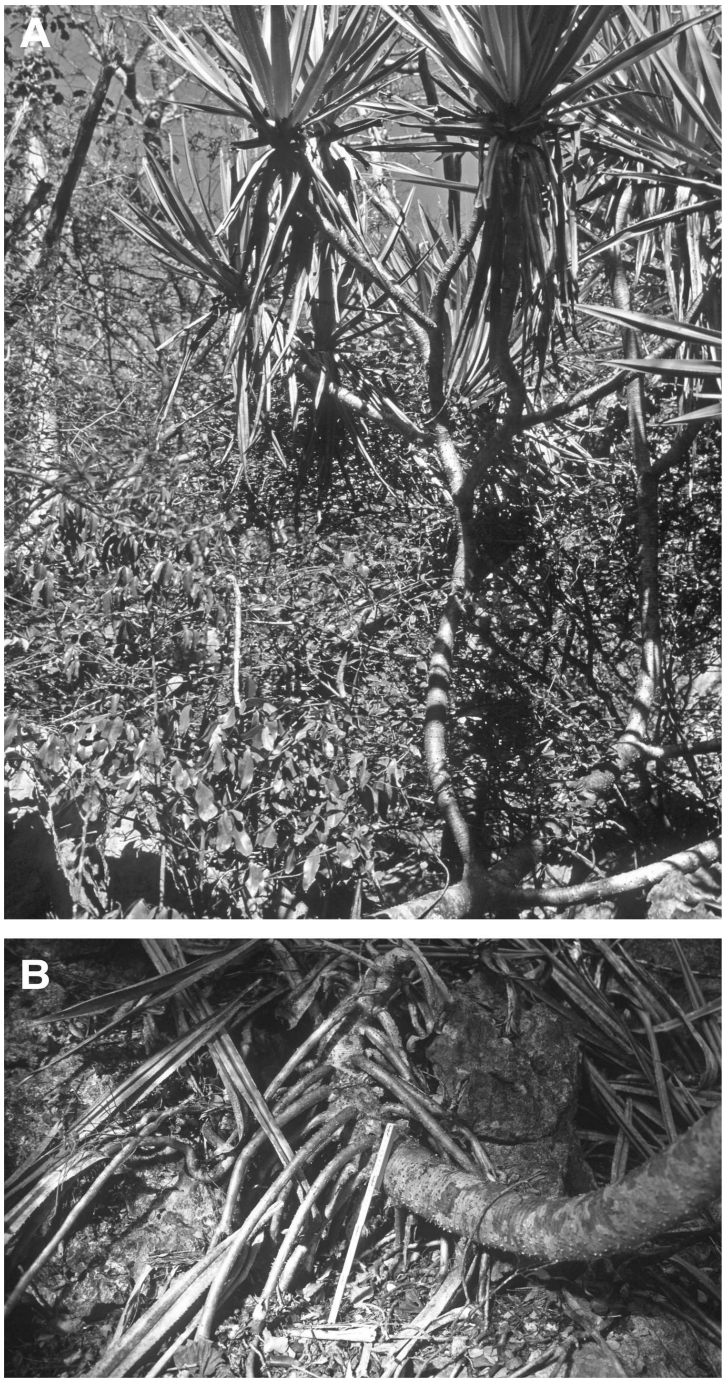

Figure 2. *Pandanus ankaranensis* Callm. & Laivao. —A. Habit showing leaves persistent on the branches. —B. Base of decumbent trunk with prop roots. Photos by M. W. Callmander from the paratype collection *Callmander & Toly 49*.

Paratypes. MADAGASCAR. **Prov. Antsiranana:** Ambilobe, Ankarana, sur les rochers calcaire, 150 m, 12°55′S, 49°06′E, 30 Aug. 1997 (fr.), *M. W. Callmander & A. Toly 49* (G, P, TAN); Ankarana vers la forêt de Mahory (Sud de Diégo-Suarez), [12°49′S, 49°14′E], 14 Aug. 1973 (fr.), *G. Cremers 2466* (KLU, MO, P, PH, TAN).

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