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# Cyphostemma darainense Wahlert & Phillipson (Vitaceae), a new species from northeastern Madagascar

Gregory A. Wahlert, Peter B. Phillipson, Louis Nusbaumer & Laurent Gautier

## Abstract

WAHLERT, G. A., P. B. PHILLIPSON, L. NUSBAUMER & L. GAUTIER (2012). *Cyphostemma darainense* Wahlert & Phillipson (Vitaceae), a new species from northeastern Madagascar. *Candollea* 67: 277-283. In English, English and French abstracts.

*Cyphostemma darainense* Wahlert & Phillipson (Vitaceae), a new species from northeastern Madagascar, is described and illustrated. Recent floristic inventories in the Loky-Manambato region of northeastern Madagascar have highlighted the area as an important area of local endemism for plants. The new species was identified after survey of the collections for this genus in the Geneva herbarium and latter confirmed during the preparation of the treatment of *Vitaceae* for the "Catalogue of the Vascular Plants of Madagascar". Observations about its ecology are also provided, its potential range is modeled using the statistical package "BIOMOD", and its preliminary IUCN conservation status is given.

## Key-words

VITACEAE – *Cyphostemma* – Madagascar – Daraina forest complex – IUCN conservation

## Résumé

WAHLERT, G. A., P. B. PHILLIPSON, L. NUSBAUMER & L. GAUTIER (2012). *Cyphostemma darainense* Wahlert & Phillipson (Vitaceae), une nouvelle espèce du nord-est de Madagascar. *Candollea* 67: 277-283. En anglais, résumés anglais et français.

*Cyphostemma darainense* Wahlert & Phillipson (Vitaceae), une nouvelle espèce du nord-est de Madagascar, est décrite et illustrée. Des inventaires floristiques menés récemment dans la région de Loky-Manambato au nord-est de Madagascar ont mis en évidence l'importance de cette région en tant que centre d'endémisme local. Cette nouvelle espèce a été identifiée suite à l'examen des collections du genre dans l'herbier de Genève et ensuite confirmé au cours de la préparation du traitement des *Vitaceae* pour le «Catalogue des Plantes Vasculaires de Madagascar». Des données relatives à son écologie sont aussi présentées, sa distribution potentielle est prédite à l'aide de modèles statistiques du logiciel «BIOMOD» et le statut de conservation IUCN est fourni.

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## Introduction

The genera and species of *Vitaceae* of Madagascar were last treated by DESCOINGS (1967). A recent taxonomic treatment of the *Vitaceae* for MADAGASCAR CATALOGUE (2011) has shown northern Madagascar to be a center of diversity for the family, with 26 of the 53 native species occurring within the Antsiranana Province. While evaluating the species diversity of *Cyphostemma* (Planch.) Alston for this project, several specimens from the Daraina region were examined that did not fit the description of any of the known species from Madagascar.

Over the course of several years, intensive botanical exploration and vegetation studies of the patchwork of forests in the Daraina region, notably by the Conservatoire et Jardin botaniques de la Ville de Genève, in partnership with DBEV, Antananarivo University and Fanamby NGO, have resulted in the discovery of many new plant species in diverse families, (see list in NUSBAUMER & al., 2010, and additional descriptions in RAKOTOARINIVO & DRANSFIELD, 2010; SKEMA & DORR, 2010; CALLMANDER & PHILLIPSON, 2011; CALLMANDER & al., 2011; JONGKIND & GAUTIER, 2011). The Daraina region was recently protected with a provisional and official status of Loky-Manambato Multiple Usage Forest Station (Station Forestière à usages Multiples = SFUM).

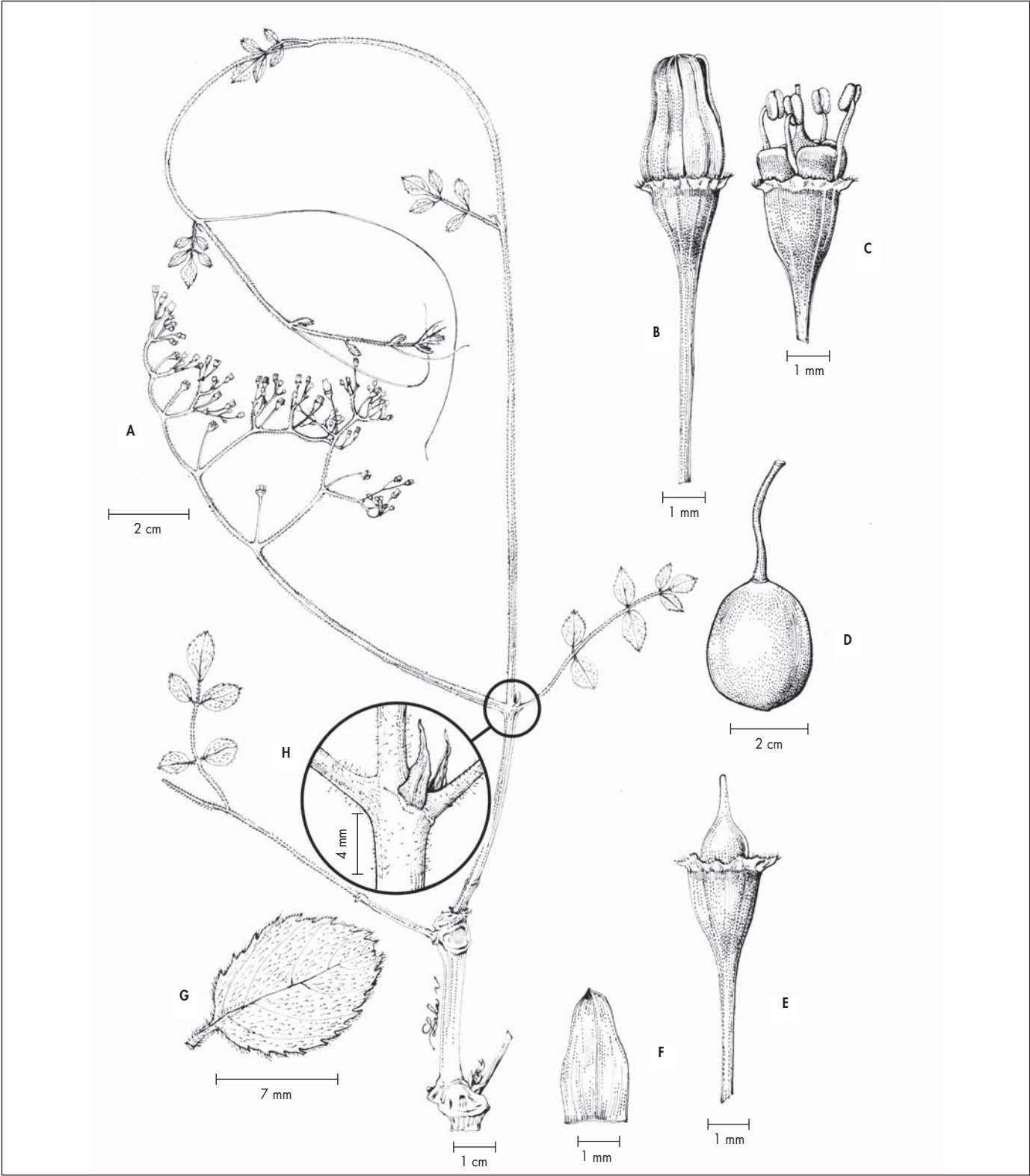
In addition to the taxonomic novelties resulting from botanical inventories, vegetation and ecological studies conducted in the Loky-Manambato region has provided a dataset enabling to predict species distribution. In particular, the potential distribution and environmental optimum of the new species described here was modeled using the “BIOMOD” statistical package (THULLER, 2003; THULLER & al., 2009). “BIOMOD” is a conservation management and climate change measurement tool which is largely used for predicting species distributions at a local to continental scale (GUISAN & THULLER, 2005; LOBO & al., 2010; KEENAN & al., 2011; MCMAHON & al., 2011). “BIOMOD” allows the use of different statistical models resulting in a consensus prediction of distribution, potential niche, and the probability of presence of the species on a delimited surface (THULLER & al., 2009). Data were obtained by recording plant occurrences along transects with measurements taken every 10 m across the ten main forest blocks of the Loky-Manambato region. In addition to recording the taxa, satellite images and a digital elevation model were used to compute the following environmental variables at a small scale: annual mean temperature, potential solar radiation, cloud cover during the dry season (April–November) and the wet season (December–March), slope, curvature, and distance to rivers. These data and the “BIOMOD” platform were used to generate predicted distribution and to evaluate the most important environmental variables influencing the distribution of a species in the area.

*Cyphostemma darainense* Wahlert & Phillipson, **spec. nova** (Fig. 1–4).

**Typus:** MADAGASCAR. **Prov. Antsiranana:** Vohemar, Daraina, forêt d’Andranotsimaty, à 10 km au Nord-est de Daraina, 13°11’04”S 049°42’24”E, 182 m, 14.XI.2005, fr., *Randrianaivo & al.* 1308 (holo-: P; iso-: CNARP, MO [6028348], TAN).

*Cyphostemma darainense* Wahlert & Phillipson is similar to *C. echinocarpa* Desc., but differs by the acute apex of the stipule, the obovate leaflets with rounded or mucronate apices, and the shorter peduncle.

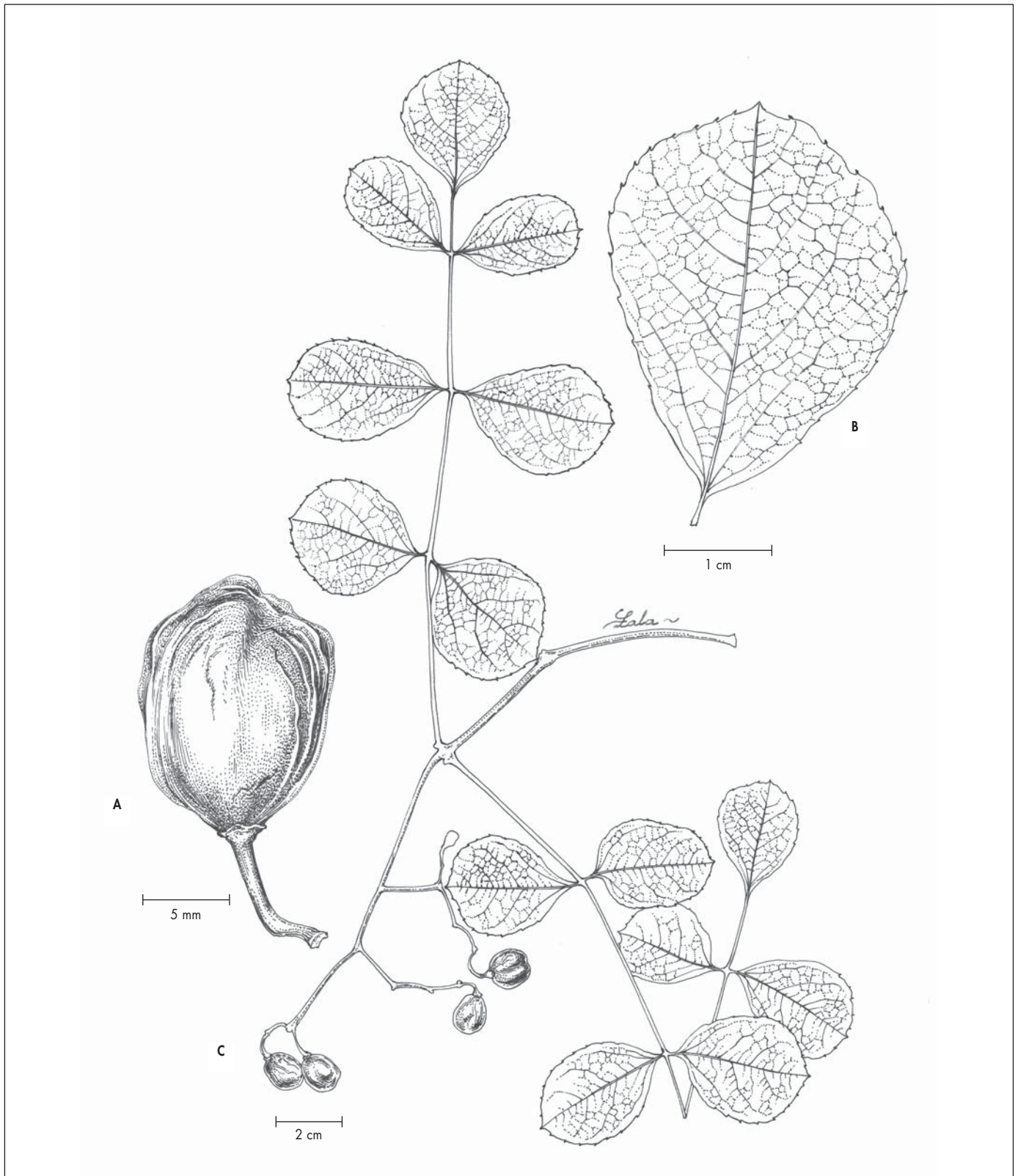
*Plant* a pachycaul, with a swollen, semi-succulent, bottle-shaped trunk up to 2 m tall, with 1–few lianescent stems growing from the apex of the trunk. *Stems* up to 6 m long, subwoody, young stems sparsely pubescent; nodes slightly swollen, pubescent; stipules caducous, narrowly triangular, 3.5–5 × 0.7–1.1 mm, pubescent, margin ciliate, apex acute; young tendrils sparsely pubescent, apex bifid, subpersistent; mature tendrils becoming glabrous. *Leaf* compound, imparipinnate with (2–)3 pairs of lateral leaflets, 13–25 cm long (including petiole), 7–11 cm wide; rachis pubescent when young, becoming sparsely pubescent, extending 2–3 cm beyond the upper pair of lateral leaflets; petiole 4.5–8 cm long; lateral and terminal leaflets similar, obovate or rarely ovate or suborbicular, 3–5.8 cm long, 2.2–4.2 cm wide, base cuneate, rounded, or truncate, apex rounded or obtuse, mucronate, mucro 1–3 mm long, margin finely denticulate, ciliate, young leaves densely pubescent, becoming sparsely pubescent or glabrous; petiolules 1–4 mm long, pubescent; primary vein visible on both surfaces, sparsely pubescent on lower surface, minutely pubescent on upper surface towards the base; secondary veins visible on lower surface, not clearly visible on upper surface, sparsely pubescent on lower surface, tertiary venation reticulate. *Inflorescence* a leaf-opposed, compound dichasial cyme, open, flat-topped, c. 7–10 cm wide, rachis sparsely pubescent, peduncle 3.5–7.5 cm long, bracteoles ovate to broadly triangular, c. 0.3 × 0.3 mm, margin ciliate. *Flower* bud cylindrical and slightly constricted near the middle, 1.8–2.5 mm long, 1.4–2 mm wide at the base, glabrous; pedicel 4–12 mm long, thickened near the calyx, sparsely pubescent to glabrous. *Calyx* a fused membranous flange, 0.4–0.6 mm tall, ciliate at the summit. *Corolla* pale yellow, petals four, linguiform, glabrous, 3–3.5 mm long, 1–1.5 mm wide at the base, 0.8–1, apex rounded, ± hooded, margin entire, with 6–10 parallel veins. *Stamens* four, oppositipetalous, 1.8–3.8 mm long, filament 1.7–2.1 mm long, anther dorsifixed, oblate, 0.5–0.7 × 0.5–0.7 mm; nectary glands four, alternipetalous, square to rectangular, 0.6–0.8 × 0.7–1.1 mm, fused to the base of the ovary. *Ovary* ovoid, 0.8–0.9 × 0.7–0.8 mm, glabrous, style cylindrical, glabrous, c. 0.6 mm long. *Fruit* a berry, subspheroid, green, c. 2 × 1.5 cm, glabrous. *Seed* reniform-obovoid, beaked, with a raphe, c. 13 × 7 mm.



**Fig. 1.** – *Cyphostemma darainense* Wahlert & Phillipson. **A.** Inflorescence; **B.** Flower showing corolla and fused, flange-like calyx; **C.** Stamen and nectary glands; **D.** Fruit; **E.** Ovary; **F.** Petal; **G.** Immature leaflet; **H.** Node and stipules.

[Ratovoson & al. 1060, MO] [Drawn by R. L. Andriamiarisoa]





**Fig. 2.** – *Cyphostemma darainense* Wahlert & Phillipson. **A.** Dried fruit; **B.** Leaflet; **C.** Infructescence.

[Be & al. 292, CNARP] [Drawn by R. L. Andriamiarisoa]



**Fig. 3.** – Field photograph showing fresh leaves and mature fruits of *Cyphostemma darainense* Wahlert & Phillipson.

[Ranirison & Nusbaumer 1037, G] [Photo: L. Nussbaumer]

**Etymology.** – The specific epithet refers to the locality of Daraina in the central part of the Loky-Manambato region which is the only known region of occurrence for the new species.

**Distribution.** – The species is only known from the forests of Loky-Manambato. Fifty-eight individuals were observed among more than 54,000 plant occurrences identified during a vegetation study of the region. It is frequent in several forests subareas of this region, including: Ampondrabe, Bekaraoka, and Solianampilana, and less frequently in Ankaramy, Bobankora, and Antsahabe.

**Habitat and ecology.** – *Cyphostemma darainense* grows primarily in dry forests or in ripicolous vegetation within dry forests, and uncommonly to rarely in mesophyllous, arbustive saxicolous, or sclerophyllous forest types. It occurs on thin substrates, generally among stones or on rocky outcrops. The species was observed at low elevations, between 100 and 550 m, on level ground or slopes, but never on ridge crests. The species does not grow in sites that do not provide stability for the swollen, semi-succulent trunk. The absence of the species from crests and steep slopes may indicate that it is susceptible to windthrow. *Cyphostemma darainense* grows in forests with canopies reaching 8 to 10 m, with emergent trees reaching 10 to 14(-18) m, with a sparse arbustive strata 2 to 4.5 m high, and a sparse suffrutescent strata less than 1 m high.



**Fig. 4.** – Field photograph showing pachycaulous habit of the trunk of *Cyphostemma darainense* Wahlert & Phillipson.

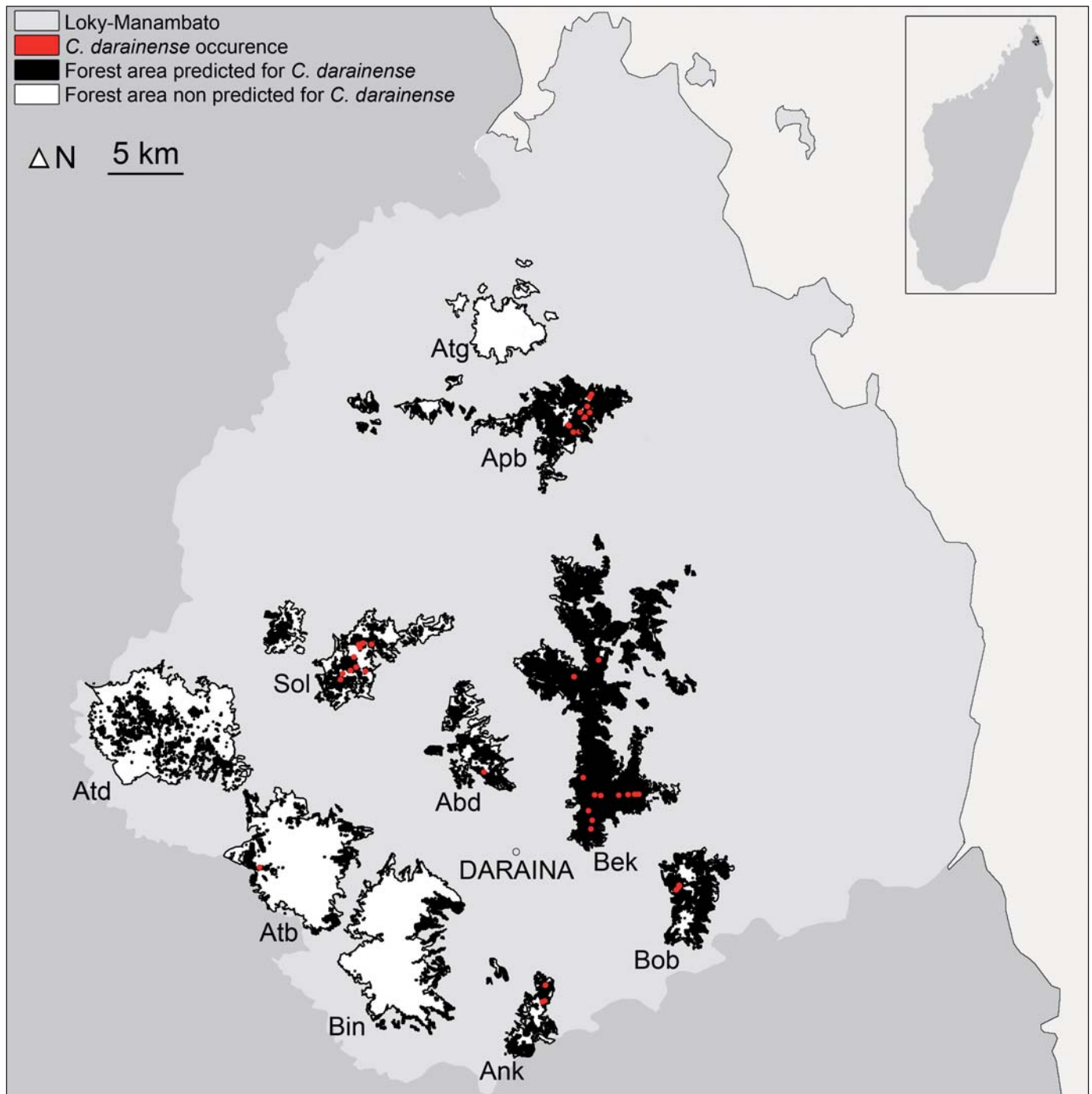
[Ranirison & Nusbaumer 1037, G] [Photo: L. Nussbaumer]

The most frequent species recorded together with *C. darainense* in vegetation surveys are, in decreasing abundance: *Drypetes perrieri* Leandri, *Cynometra commersoniana* Baill., *Dialium occidentale* subsp. *septentrionale* Du Puy & R. Rabev., *Grevea madagascariensis* Baill., *Dracaena reflexa* Lam., *Strychnos decussata* (Pappe) Gilg, *Ehretia cymosa* Thonn., *Baudouinia sollyaeformis* Baill., *Dracaena xiphophylla* Baker, *Droceloncia rigidifolia* (Baill.) J. Léonard, *Mallotus oppositifolius* (Geiseler) Müll. Arg., and *Gyrocarpus americanus* subsp. *tomentosus* Kubitzki.

**Potential distribution.** – Results from modeling the potential distribution of *Cyphostemma darainense* show the species to have an affinity with the environmental conditions present in the eastern forests of Loky-Manambato (Fig. 5). The three most important environmental variables that appear to delimit its distribution are: a) annual mean temperature less than 19°C, b) slopes greater than 28° (at higher temperatures), and c) cloud cover less than 20% during the dry season.

**Conservation status.** – With an “Extent Of Occurrence” (EOO) of 551 km<sup>2</sup>, an “Area Of Occupancy” (AOO) of 76 km<sup>2</sup>, and 8 subpopulations, 5 of which are in the Loky-Manambato protected area, *C. darainense* is assigned a preliminary status of “Endangered” (EN) following IUCN (2001) (calculation following MOAT, 2007, and CALLMANDER & al., 2007).





**Fig. 5.** – Map of Loky-Manambato area showing actual distribution of *Cyphostemma darainense* Wahlert & Phillipson (red dots), potential distribution (black shading), and area not predicted for its distribution (white). [Forest acronyms: Abd: Ambilondamba, Ank: Ankaramy, Apb: Ampondrabe, Atb: Antsahabe, Atd: Ambohitsitondroina, Atg: Antsaharaingy, Bek: Bekaraoka, Bin: Binara, Sol: Solaniampilana].

**Table 1.** – Main differences between *Cyphostemma darainense* Wahlert & Phillipson and *C. echinocarpa* Desc.

	<i>C. darainense</i>	<i>C. echinocarpa</i>
Stipule apex	acute	obtuse
Leaflet shape	usually obovate	usually oval-ovate
Leaflet apex	rounded or mucronate	cuspidate or acuminate
Peduncle length [cm]	3.5-7.5	10-15
Fused calyx margin	ciliate	entire or weakly lobed
Filament length [mm]	1.7-2.1	2-4

*Paratypes.* – **Madagascar:** Antsiranana Province, Vohemar District, Daraina, Mahatsara, Ambilondambo (Ambilondamba) à 8 km au Nord de Daraina, 13°09'45"S 049°38'49"E, 326 m, 17.XI.2005, fr., *Be & al.* 292 (CNARP, G, MO, P[2 sheets], TAN); Ampisikina, Tsaratanana, forêt d'Ampondrabe, à 1 km au Nord ouest du village d'Ambaribe, 12°58'18"S 049°41'57"E, 200 m, 4.XI.2005, fr., *Rakotonandrasana & al.* 968 (CNARP, MO, P, TAN); Daraina, Befarafara, forêt de Solanampilana, Ankoakala, à 2 km au Sud de Befarafara, 13°05'26"S 049°34' 32"E, 100 m, 15.XI.2005, fr., *Rakotonandrasana & al.* 987 (CNARP, G, MO, P, TAN); Ampisikina (Ampisikinana) Soatanana, Ambarilao, forêt d'Ampondrabe, 12°57'39"S 049°42' 31"E, 175 m, 5.XI.2005, fl., *Ratovoson & al.* 1060 (MO, P, TAN); Daraina, forêt d'Ankaramy, à 1330 m du point côté 215, au 123°, 13°17'30"S 49°40'47"E, 330 m, 21.XII.2005, fr., *Ranirison & Nusbaumer* 1037 (G, K, MO, P, TEF).

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