Exacum Alberti-Grimaldii Wohlh. & Callm. (Gentianaceae), a New Species Endemic to Northern Madagascar

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Exacum alberti-grimaldii Wohlh. & Callm. (Gentianaceae), a new species endemic to northern Madagascar

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Abstract

WOHLHAUSER, S. & M. W. CALLMANDER (2012). Exacum alberti-grimaldii Wohlh. & Callm. (Gentianaceae), a new species endemic to northern Madagascar. *Candollea* 67: 373-378. In English, English and French abstracts.

Exacum alberti-grimaldii Wohlh. & Callm. *(Gentianaceae)*, a new species endemic to northern Madagascar, is described and illustrated. It resembles morphologically two other species: *Exacum dolichantherum* Klack. and *Exacum nossibense* Klack., also endemic to Madagascar. The three species have in common verticillated upper leaves and umbella-shape inflorescence. The new species can, however, be easily recognized by its smaller discrete petals and by the absence of wings on the sepals. It is known only from the Ampantsona river watershed in the Andrafiamena region in semi-decidous or sclerophyllous forests.

Key-words

GENTIANACEAE – *Exacum* – Andrafiamena – Madagascar – Taxonomy – Conservation

Résumé

WOHLHAUSER, S. & M. W. CALLMANDER (2012). Exacum alberti-grimaldii Wohlh. & Callm. (Gentianaceae), une nouvelle espèce endémique du nord de Madagascar. *Candollea* 67: 373-378. En anglais, résumés anglais et français.

Exacum alberti-grimaldii Wohlh. & Callm. *(Gentianaceae)*, une nouvelle espèce du nord de Madagascar, est décrite et illustrée. Elle ressemble morphologiquement à deux autres espèces endémique de Madagascar: *Exacum dolichantherum* Klack. et *Exacum nossibense* Klack. Les trois espèces ont en commun des feuilles supérieures verticillées et une inflorescence en ombelle. La nouvelle espèce peut cependant facilement être reconnue à ses petits pétales discrets et l'absence d'aile sur les sépales. Elle n'est connue que du bassin-versant de la rivière Ampantsona dans la région d'Andrafiamena dans les forêts semi-décidues et sclérophylles.

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Introduction

The paleotropical genus *Exacum* L. currently includes 70 species with a distribution that ranges from Africa to Australia with three main centres of diversity: Madagascar (39 spp.) (Wohlhauser & al., 2005), India-Sri-Lanka (18 spp.) and Arabian Peninsula (5 spp.). Since Klackenberg (1985) published the *Exacum* monography, eight species have been added to the genus. Following a molecular phylogeny (Yuan & al., 2003), four *Cotylanthera* Blume species from the Indian subcontinent were transferred to *Exacum* (Klackenberg, 2006). In addition, four new species have been described: *E. decapterum* Klack. from Madagascar (Klackenberg, 1990); *E. arabicum* Thulin from Yemen and Oman (Thulin, 2001); *E. klackenbergii* Gopalan from India (Gopalan, 2002), and *E. darae* Hul from Vietnam (Hul, 2010).

The genus *Exacum* consists of both annual and perennial species. The highest diversity is encountered in annual species and most perennial species are known from Madagascar and the Indian subcontinent. Perennial species are mostly encountered in natural forests and rocky outcrops; annual species inhabit seasonally humid places, usually in low vegetation and open areas, from sandy river beaches to swampy coastal areas or muddy pastures from sea-level to mid-elevation (Wohlhauser & al., 2005). Several annual species have restricted distribution in Madagascar: *E. appendiculatum* Klack. is endemic from the sandstone of Isalo in the south-western of Madagascar and *E. conglomeratum* Klack. is restricted to the rocky area of the Andringitra massif in the southern part of highlands (Klackenberg, 1990).

The Andrafiamena ridge in northern Madagascar is a transitional dry area showing a gradient of different forests types on diverse substrates (limestone-sandstone). This region is home to the Critically Endangered Perrier's Sifaka *(Propithecus perrieri)* (Ranaivoarisoa & al., 2006; Banks & al., 2007) and therefore of high conservation concern (Burivalova, 2011). Thanks to the establishment of monitoring facilities for the management of the Andrafiamen-Andavakoera Protected Area, currently under creation by Fanamby NGO, botanical inventories have been completed in this region. Among the recent collections issued from these inventories, one specimen was directly recognized as a yet unknown species of *Exacum* considering its small size and morphological characters.

In the present article, we describe a new species *E. alberti-grimaldii* Wohlh. & Callm., endemic from the Andrafiamena-Andavakoera region in northern Madagascar (Fig. 1). The new species is provided with preliminary risk assessments based on the IUCN Red List Categories and Criteria (IUCN, 2001). Calculations of the Area of Occupancy (AOO), Extent of Occurrence (EOO) and number of subpopulations were based on the methods presented in Callmander & al. (2007). A discussion of its morphological affinities is provided.

Exacum alberti-grimaldii Wohlh. & Callm., **spec. nova** (Fig. 2-4).

Typus: Madagascar. Prov. Antsiranana: Fkt. Andrafiabe, chaîne d'Andrafiamena, bassin-versant d'Ampantsona, falaises gréseuses en forêt de transition, 12°55'10"S 49°21'13"E, 650 m, 1.V.2007, fl. & fr., *Wohlhauser & Bongary 803* (holo-G [G0036900]!; iso-, K!, MO!, P [P00722549]!, TAN!).

Haec species quoad folia superiora verticillata etiam inflorescentiam umbraculiformem Exaco dolichanthero et E. nossibensi similis, sed a hoc sepalis exalatis, ab illo petalis discretis minoribus (2-3 × 1-1.5 vs 3-7 × 2-4 mm) facile distinguitur.

Annual erect *herb*, unbranched, 3-13 cm. *Stem* quadrangular, with inconspicuous membranous wings, without nodes (exceptionally 1 node), often with 2 cotyledons at base. Any parts of the plants may be reddish due to the presence of anthocyanin in shadow habitats. *Leaves* not amplexicaulous, (2-)3 pairs, opposite-decussate, with generally sub-verticillate aspect, shape variable depending on plant size and position of leaves; proximal pair of leaves sometimes on a lower node on the stem or absent, broadly ovate, narrowly attenuate at base, obtuse (sometimes rhomboid, orbicular or obcordate), (5-)10(-15) × (2-)5(-7) mm, lamina herbaceous, with 1-3 nerves diverging from base; medium pair of leaves generally large, subsessile, cordate, (4-)15(-25) × (3-)10(-15) mm, lamina herbaceous, with 3-5(-7) nerves diverging from base; distal pair of leaves generally reduced, very variable in size, shape and color (reddish), ovate to lanceolate, (5-)20(-37) × (3-)10(-28) mm, lamina herbaceous to membranaceous, with 1(-3) nerves diverging from base. *Flowers* (1-)5(-14) in umbel-shaped,

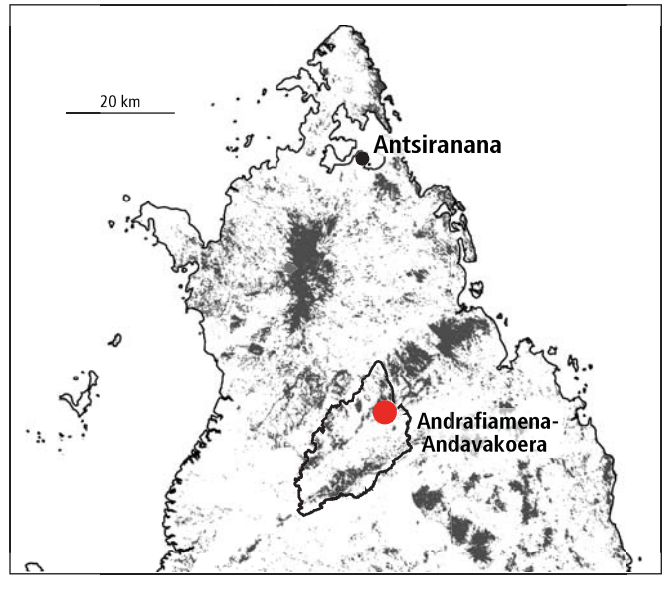

Fig. 1. – Map of Northern Madagascar with the locality of the type collection (star) within the proposed boundary of the Andrafiamena-Andavakoera protected area (Grey shadow, corresponding to remaining primary forest).

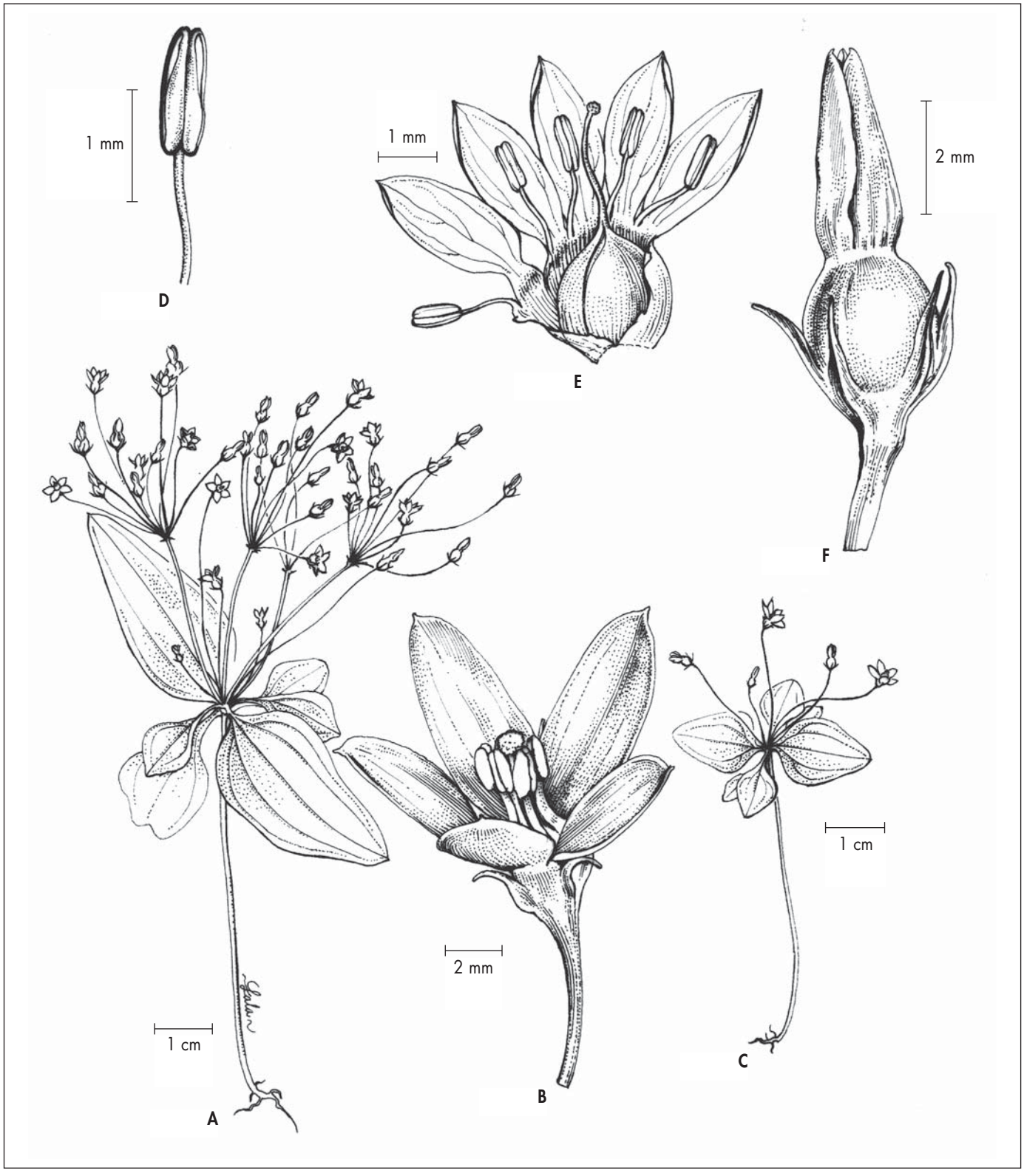

Fig. 2. – *Exacum alberti-grimaldii* Wohlh. & Callm. **A.** Habitus of a multi-umbellated individual; **B.** Flower; **C.** Habitus of an individual with single umbel; **D.** Stamen; **E.** Flower with calyx removed; **F.** Detail of an autogamous flower.

[*Wohlhauser & Bongary 803*, G, TAN] [Drawing: Roger Lala Andriamiarisoa]

Fig. 3. – Flowering plant of *Exacum alberti-grimaldii* Wohlh. & Callm. with detail of a flower (framed). [*Wohlhauser & Bongary 803*] [Photo: S. Wohlhauser]

Fig. 4. – An autogamous flower of *Exacum alberti-grimaldii* Wohlh. & Callm. showing the unwinged sepals. [*Wohlhauser & Bongary 803*] [Photo: S. Wohlhauser]

generally simple condensed cymes inflorescences, if composed 7-15 flowers per umbellule; pedicels (15-)25(-36) mm, erect at maturity, possibly cleistogamous (then reflected below the leaves). *Calyx* 5-lobed, the lobes shortly fused at base (< 1/5 of the length), 1.5-2.5 mm, linear, not winged, acuminate, accrescent in fruit. *Corolla* 5-lobed, light blue, white in throat, fused in the lower fourth, 2-3 × 1-1.5 mm, obovate, obtuse, acuminate, when withered with lobes forming a cone at the top of the capsule, accresent. *Stamens* 2-3 mm long; anthers c. 1 mm, yellow, rectangular, curved and slightly narrowing towards the apex, without papilla near the apex, opening by pores that later widen to slits along up to $^1/_2$ of the anther length. *Styles* as long as the stamens. *Fruit* a sub-spherical capsule, 1.5-2 mm in diam., coriaceous, with accresent sepals appressed to the distal part of withered corolla, septicidally 2-valved with the partial septum.

Etymology. – The species is named in honour of Albert II de Monaco, Albert Alexandre Louis Pierre Grimaldi, Prince of Monaco, in recognition of his tireless support to the NGO Fanamby for their conservation activities in Northern Madagascar, especially in the Andrafiamena region where the species seems to be endemic.

Distribution and ecology. – *Exacum alberti-grimaldii* is only known from the Ampantsona river watershed occurring on seeping sandstone outcrops or on temporary humid river banks in semi-deciduous or sclerophyllous forest. It is an annual species completing its life-cycle in less than two and half months between March and May.

Conservation status. – *Exacum alberti-grimaldii* has been observed only three times in the Ampantsona valley and collected only once. With only one collection and three known

subpopulations, an AOO of > 9 km² within the Protected Area under creation of Andrafiamena-Andavakoera and according to its annual life-cycle and rarity of proper habitats, *E. alberti-grimaldii* is assigned a preliminary status of Vulnerable (VU D2) following IUCN Categories and Criteria (IUCN, 2001).

Notes. – Only two other species are characterized by verticillated upper leaves and umbella-shape inflorescence: *E. dolichantherum* Klack. and *E. nossibense* Klack. (KLACKENBERG, 1985: 94; Fig. 69, 96, 71). *Exacum alberti-grimaldii* can be easily distinguished from *E. dolichantherum* by its smaller discrete petals (2-3 × 1.0-1.5 mm vs 3-7 × 2-4 mm for *E. dolichantherum*) and from *E. nossibensee* by the absence of wings on the sepals (Fig. 2-4). The new species grows in a dry transition area on diverse substrates (limestone-sandstone) whereas *E. dolichantherum* grows in open areas on sand along the littoral of the east coast and *E. nossibensee* is endemic from the Sambirano Domain *sensu* HUMBERT (1955) on diverse substrates.

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