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Authors: Luino, Iacopo, Callmander, Martin W., Poncy, Odile, Da-Giau, Simona, and Gautier, Laurent

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# A new *Pararistolochia* Hutch. & Dalziel (Aristolochiaceae) from the Beanka Tsingy (western Madagascar)

Iacopo Luino, Martin W. Callmander, Odile Poncy, Simona Da-Giau & Laurent Gautier

## Abstract

LUINO I., M.W. CALLMANDER, O. PONCY, S. DA-GIAU & L. GAUTIER (2016). A new *Pararistolochia* Hutch. & Dalziel (Aristolochiaceae) from the Beanka tsingy (western Madagascar). *Candollea* 71: 135-141. In English, English and French abstracts. DOI: <http://dx.doi.org/10.15553/c2016v711a16>

*Pararistolochia* Hutch. & Dalziel (Aristolochiaceae) is a genus that comprised about 35 species known until present from continental Africa and Australasia. Two recent inventories carried in the limestone massif of Beanka in western Madagascar have led to the detection of a new species that we describe here as *Pararistolochia enricoi* Luino, L. Gaut. & Callm. This impressive liana is until today the only malagasy representative of the genus. The deciduous habit, together with the two-lobed perianth and the presence of trichomes covering most parts of the plant are exclusive characters that clearly distinguish *Pararistolochia enricoi* within the genus. The new species is provided with a preliminary risk assessment of its conservation status based on the IUCN Red List Categories and Criteria.

## Résumé

LUINO I., M.W. CALLMANDER, O. PONCY, S. DA-GIAU & L. GAUTIER (2016). Une nouvelle *Pararistolochia* Hutch. & Dalziel (Aristolochiaceae) des tsingy de Beanka (ouest de Madagascar). *Candollea* 71: 135-141. En anglais, résumés anglais et français. DOI: <http://dx.doi.org/10.15553/c2016v711a16>

*Pararistolochia* Hutch. & Dalziel (Aristolochiaceae) est un genre qui comprenait jusqu'à présent environ 35 espèces d'Afrique continentale et d'Australasie. Deux récents inventaires effectués dans le massif calcaire de Beanka à Madagascar ont mené à la découverte d'une nouvelle espèce, *Pararistolochia enricoi* Luino, L. Gaut. & Callm. Cette remarquable liane est jusqu'à aujourd'hui le seul représentant malgache du genre. Le feuillage caduc, le périanthe bilobé et la présence de trichomes couvrant quasiment tous les organes de la plante sont des caractères exclusifs qui distinguent clairement *Pararistolochia enricoi* au sein du genre. Une évaluation préliminaire du risque d'extinction basée sur les Catégories et Critères de la Liste Rouge de l'IUCN est proposée.

## Keywords

ARISTOLOCHLACEAE – *Pararistolochia* – Beanka – Taxonomy – New species – Madagascar

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Addresses of the authors:

IL, SDG, LG: Conservatoire et Jardin botaniques de la Ville de Genève and Université de Genève, Laboratoire universitaire Systématique végétale et Biodiversité, C.P. 60, 1292 Chambésy, Switzerland.

MWC: Conservatoire et Jardin botaniques de la Ville de Genève, C.P. 60, 1292 Chambésy, Switzerland.

OP: Institut de Systématique, Evolution et Biodiversité (UMR 7205 – CNRS MNHN UPMC EPHE), Muséum national d'Histoire naturelle, C.P. 39, rue Cuvier 57, 75231 Paris Cedex 05, France.

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## Introduction

As currently circumscribed, *Aristolochiaceae* (including *Hydnoraceae*) is a small family of ca. 500 species in 7–9 genera (STEVENS, 2015). The tribe *Aristolochioideae* is by far the most diverse with ca. 400 species found mainly in the tropics of both old and new world; but considerably less diverse in Africa and Madagascar, with as few as 20 accepted species (PONCY, 1978; DE GROOT et al., 2006).

Until the publication of the first volume of the Flora of West Tropical Africa (HUTCHINSON & DALZIEL, 1927) all tropical African *Aristolochiaceae* species were included in the large pantropical genus *Aristolochia* L. *Pararistolochia* Hutch. & Dalziel was described to accommodate 12 African species, based on their elongated indehiscent lignified fruit and their actinomorphic 3-lobed perianth.

Further publications did not all recognize the generic status of the new genus. Starting with SCHMIDT (1935), the taxonomic level of the separation between *Aristolochia* and *Pararistolochia* (generic or infra-generic) has remained an open question.

The African species of *Pararistolochia* have been revised by PONCY (1978), who defended the separation of the two genera by a thorough analysis of vegetative, floral (including pollen) and fruiting characters. VERDCOURT (1986), in Flora of Tropical East Africa, maintained the two genera separate, whereas JONGKIND (1990), while describing a new species from Gabon with several characters of *Pararistolochia* decided to describe it in *Aristolochia*, arguing that: “At present, the delimitation of *Aristolochia* s.s. versus *Pararistolochia* does not justify the existence of two separate genera.”

HUBER (1985) studied the seed anatomy and provided further support to the “separate-genera” position. He also suggested based upon earlier results (HOU, 1983, 1984) that the genus could possibly extend to Australasia. In preparing a revision of the family for Australia and New Guinea, PARSONS (1996a) defended the separation of the two genera, transferring 11 species of *Aristolochia* to *Pararistolochia* and further describing 12 new species in the genus.

LEAL et al. (2011) recently revised the family for the flore du Gabon and chose to treat the two genera as separate, publishing the combination of the species described by JONGKIND (1990) in *Pararistolochia*. BUCHWALDER (2014) preferred to consider *Pararistolochia* as a subgenus within *Aristolochia*, subsequently making the necessary combinations in *Aristolochia* and listing 35 accepted species in the subgenus *Pararistolochia*.

In the last 15 years, three different phylogenetic analyses of *Aristolochiaceae* were carried out at family or subfamily level. All three have confirmed the monophyly of the *Pararistolochia* clade. In the first one, based on morphological characters of the subfamily *Aristolochioideae*, GONZÁLEZ & STEVENSON (2002) demonstrate that *Aristolochia* in its broad sense is paraphyletic, and that

it includes a monophyletic *Pararistolochia*. They propose a revised classification confirming the generic rank for *Pararistolochia*. The two other studies concern the family *Aristolochiaceae* as a whole and involve molecular techniques. NEINHUIS et al. (2005) confirmed the position of the family within Piperales as well as its subdivision into two subfamilies *Asaroideae* and *Aristolochioideae*. Within the latter, results are mostly in congruence with earlier morphological studies (HUBER, 1985; GONZÁLEZ & STEVENSON, 2002), especially regarding the monophyly of *Pararistolochia*. OHI-TOMA et al. (2006) increased significantly the numbers of species in a molecular phylogeny of *Aristolochia* s.l. and came to the conclusion that it could be divided in two major lineages: the “Isotrematinae clade” (with the genera *Isotrema* Raf. and *Endodeca* Raf.) and the “Aristolochiinae clade”, which is further subdivided into *Aristolochia* s.s. and *Pararistolochia*.

These results make clear that *Pararistolochia* is a valid taxonomic entity. Its rank in the classification will depend on the rearrangement of the taxa within the family, based on phylogenetic patterns at the family level. Pending this taxonomic and nomenclatural statement, we have chosen to describe the new species from Madagascar in *Pararistolochia*, because in our opinion, the morphological and molecular characters that separate the two lineages are clearly sufficient to consider them as separate genera.

During a floristic inventory of the Beanka forest, in western Madagascar (GAUTIER et al., 2013) (Fig. 1) that has already led to the discovery of several new species in various families, e.g. *Anacardiaceae* (RANDRIANASOLO & LOWRY, 2015), *Loranthaceae* (CALLMANDER et al., 2013) and *Pandanaceae* (CALLMANDER et al., 2014), we collected a specimen of *Aristolochiaceae* that we could not match to any described species. The only species of the family so far accepted from Madagascar is *Aristolochia albida* Duch., recorded also widely in continental Africa (Senegal to Southern Sudan, down to Angola and Mozambique), the Comoros and the Mascarenes (DE GROOT et al., 2006). This new species is described below in the genus *Pararistolochia* and represents the first species of the genus in Madagascar. We provide a discussion of its morphological affinities together with colour pictures and line drawings. A preliminary risk assessment following IUCN Red List Categories and Criteria is also provided (IUCN, 2012).

***Pararistolochia enricoi*** Luino, L. Gaut. & Callm., **spec. nova** (Fig. 2, 3).

**Typus :** Madagascar. Prov. Mahajanga : Melaky Reg., Beanka, partie S, 18°07'22"S 44°33'31"E, 300 m, 30.XI.2012, fl., Gautier, Ranirison, Hanitrarivo & Luino 5886 (holo- : G [G00341650]!; iso- : K!, MO!, P [P00853247]!, TEF!).

*Species nova quae a congeneris trichomatibus plantae partes omnes praeter caulem lignosum obtegentibus, perianthio bilobo atque foliis papyraceis deciduis perclare distat.*

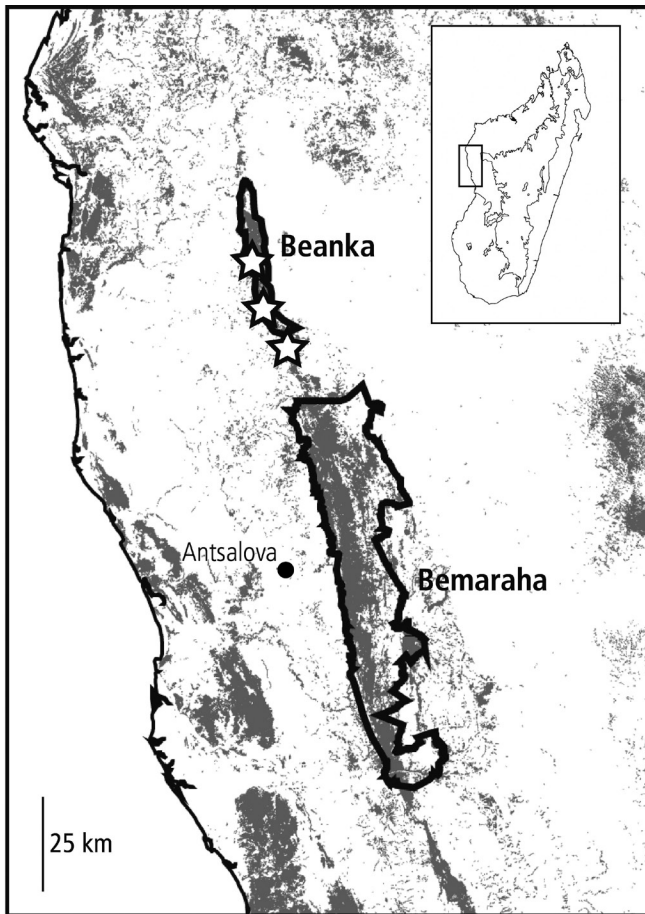


Fig. 1. – Detailed map of western Madagascar showing the distribution of *Pararistolochia enricoi* Luino, L. Gaut. & Callm. (stars) in Beanka, plotted on a map of forest cover in 2000 (grey) following HARPER et al. (2007).

Climbing and ground sprawling, deciduous *vine* or *liana*. *Stems* to 15–25 m high, cross section flattened in the central part resulting in an 8-shape, up to 1.5 cm in width; bark of the oldest stems brown–yellow, corky, verrucate. *Leaves* margins entire; lamina, 4–8 × 3–6 cm, green above, paler below, papery, sparsely pubescent on both surfaces (white indumentum of simple, multicellular trichomes), shape variable, ovate to hastate; base rounded to cordate, auricles well rounded when present, sinus 0.1–1 cm deep or absent; apex rounded to slightly acuminate, sometimes apiculate; primary veins 3–5, prominent beneath, slightly elevated above, pubescent ventrally and dorsally; secondary veins reticulate; petiole slender, 0.9–2.5 cm long, 0.8–1.1 mm wide; young shoots attenuate, densely covered with a golden indumentum. *Inflorescences* arising from the corky stem, sometimes at ground level, solitary or fasciculate by 2–3, consisting of a 5–7 flowered raceme; rachis up to 20 cm long, with irregularly spaced internodes between 1 and 10 cm long; bracts 1–4 mm long, densely pubescent; pedicels 15–30 mm long. *Flowers buds*

densely covered by a golden indumentum, with two bulgings corresponding to the young utricle and perianth lobes. *Mature flowers* up to 48 mm long overall, all the parts covered by a white indumentum; perianth tube S-curved, 15(–18) mm long, funnel-shaped, enlarging throughout and constricted below the throat, flaring from 4 mm in diam. above the utricle to up to 10 mm in diam. in its widest part; throat bright sulphur-yellow, pubescent with white 1.5 mm long setae; lobes 2, triangular to well-rounded, sometimes slightly apiculate, purple, 10 mm long, margins outwardly rolled, dark purple; utricle obovoid, externally white, punctuated with small red spots, purple veined, 11 mm long by 6 mm wide; gynostemium 2.7 mm long by 1.6 mm wide, anthers 6, 1.3 mm long, yellow, each consisting of 4 pollen sacs, stigmatic lobes 6, 1.4 mm long, green, with a short, subconical, sharp apical appendage; ovary cylindrical, 6-ribbed, densely covered by a white indument, 10 to 14 mm long. *Fruits* pendulous, cucumber-like, curved-cylindrical, indehiscent, woody, prominently 6-ribbed, to 5.5 cm long by 2.8 cm wide, yellow and pubescent when immature, brown and sparsely pubescent when mature. *Seeds* stacked in 6 simple rows, heart-shaped convex and rough above, concave and smooth below, 4 mm long by 4 mm wide.

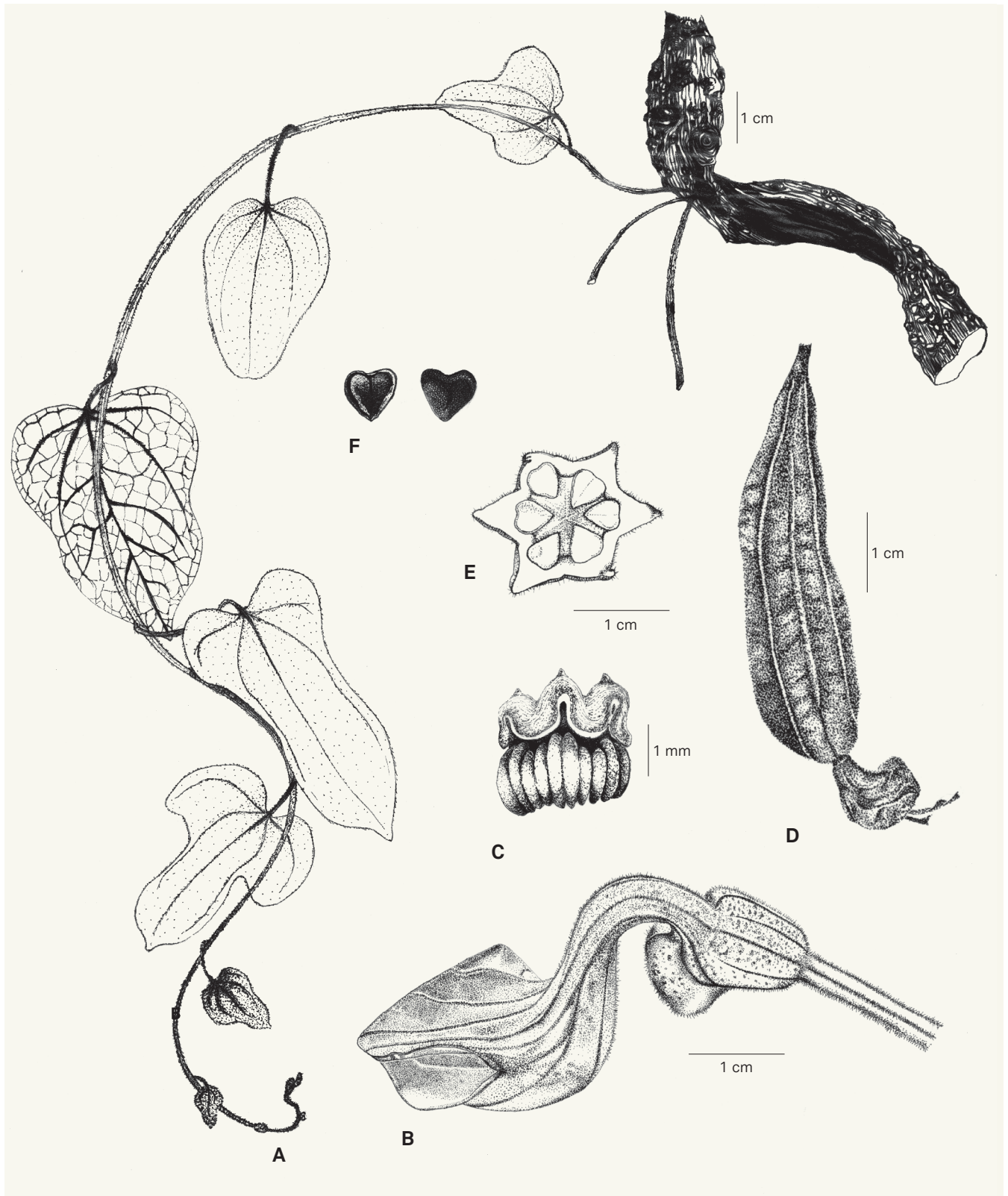
*Etymology.* – The species is named in honour of the first author’s brother Enrico Luino who died in 2003 at the age of 21. Enrico triggered in him the passion for tropical botany.

*Distribution and ecology.* – *Pararistolochia enricoi* is only known from the eroded limestone formations (“Tsingy” in Malagasy) of Beanka in western Madagascar (Fig. 1). Its ecology seems to be strongly related to the climax deciduous forest type, where it grows in shaded conditions. According to the collection period, anthesis takes place in November and fruits ripen between December and January. The plants presenting only young leaves at the moment of the flowering collection, we conclude that, given the papery texture and the thin lamina of the fruiting sample, the species is deciduous and that leaves are absent during the dry season, generally from May to October.

The plant–insect interactions of *Pararistolochia enricoi* are still unknown. In western and southern Madagascar the monospecific butterfly genus *Pharmacophagus antenor* (Drury, 1773) (the only representative of the tribe *Troidini* in Madagascar) is known to be monophagous on *Aristolochia albida* (PARSONS, 1996b). As documented by PARSONS (1996a), the larvae of the troidine papilionid butterflies of the Australasian genus *Ornithoptera* feed primarily on *Pararistolochia* in the Australasian region. Considering the overlapping distributions of *P. enricoi* and *Pharmacophagus antenor* together with the known feeding habits of the latter, one could hypothesize that *P. antenor* larvae also feed on *Pararistolochia enricoi*.



Fig. 2. – *Pararistolochia enricoi* Luino, L. Gaut. & Callm. **A.** Young shoot; **B.** Variable forms of the leaves; **C.** Inflorescence; **D.** Flowers detail; **E.** Longitudinal section of the flower showing gynostemium, utricule, and throat. [Photos: **A-B, E:** I. Luino; **C-D:** L. Gautier]



**Fig. 3.** – *Pararistolochia enricoi* Luino, L. Gaut. & Callm. **A.** Corky stem and leaves; **B.** Flower; **C.** Gynostemium; **D.** Young fruit; **E.** Transversal section of fruit; **F.** Seeds.

[**A-B, F:** Gautier et al. 5886, G; **C:** Luino 116, G; **D-E:** Luino 248, G] [Drawings: **A, C, F:** S. Da-Giau; **B, D-E:** G. Loza]

**Conservation status.** – *Pararistolochia enricoi* is known only from two locations within a proposed protected area with temporary protection (Beanka). The new species is restricted to karstic limestone, an area with no evident human caused damage or alteration. Even if it currently has a very restricted range, the new species is probably under little if any threat, and is here assigned a preliminary status of Least Concern [LC].

**Notes.** – *Pararistolochia enricoi* is the second species within the family *Aristolochiaceae* in Madagascar. It can only be compared with *Aristolochia albida* Duch. but several characters clearly discriminate the new species. *Pararistolochia enricoi* differs from *Aristolochia albida*, also present in Beanka, by its habit (a woody liana up to 16 m long vs. a smaller, non-woody vine), the 8-shaped cross-section of the stem (vs. circular cross-section), the presence of indumentum on most parts (vs. glabrous), the S-shaped perianth tube with two subequal lobes (vs. straight tube with a single lobe) and the indehiscent cucumber-like fruit (vs. dehiscent basket-like fruit) (Fig. 2, 3). Furthermore, *Pararistolochia enricoi* is the only deciduous species of the genus and the first to be recognized in Madagascar. We have discussed in the introduction the reason why we consider *Pararistolochia* as a distinct genus from *Aristolochia*. However, it should be noted that even among *Pararistolochia*, our species has the very striking feature of a bilobed corolla (instead of a tri-lobed corolla in all other species in the genus). Hopefully molecular investigations will further confirm its generic affinities.

**Paratypes.** – **Madagascar. Prov. Mahajanga:** Beanka, partie centrale, 17°56'53"S 44°28'57"E, 190 m, 11.II.2012, fr., Rakotozafy, Bolliger & Hanitrarivo 40 (G, TEF); *ibid. loc.*, 18°01'46"S 44°30'18"E, 260 m, 4.XI.2015, fl., Luino 116 (G, P, MO, K, TEF); *ibid. loc.*, 18°01'46"S 44°30'18"E, 260 m, 15.XI.2015, fl., Luino 247 (G, P, MO, K, TEF); *ibid. loc.*, 2.XII.2015, y. fr., Luino 248 (G, P, MO, K, TEF).

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