# Two new species of *Prockiopsis* Baill. (Achariaceae) from Madagascar

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**ABSTRACT**
A taxonomic revision of the endemic Malagasy genus *Prockiopsis* Baill. (Achariaceae) is presented. Reevaluation of morphological characters allows us to recognize three species, two of which are described as new. Ecogeographic features of each species in relation to bioclimate and substrate geology are discussed, and a preliminary conservation assessment is calculated according to IUCN Red List criteria. A key to the species is provided in both English and French.

**KEY WORDS**
*Prockiopsis*, Achariaceae, Madagascar, conservation.

**RÉSUMÉ**
*Deux nouvelles espèces de Prockiopsis Baill. (Achariaceae) de Madagascar.*
Une révision taxonomique du genre endémique malgache *Prockiopsis* Baill. (Achariaceae) est présentée. La réévaluation des caractères morphologiques permet de reconnaître trois espèces, dont deux nouvelles décrites ici. Les particularités écogéographiques de chaque espèce par rapport au bioclimat et au substrat géologique sont discutées, et une évaluation préliminaire pour la conservation est réalisée conformément aux critères des Listes Rouges de l'UICN. Une clé de détermination des espèces est présentée en Anglais et en Français.

**MOTS CLÉS**
*Prockiopsis*, Achariaceae, Madagascar, conservation.

## INTRODUCTION

The genus *Prockiopsis* was first described by BAILLON (1886) based upon a HILDEBRANDT collection (*Hildebrandt 3294*) from Nosy Be. PERRIER DE LA BÂTHIE (1946) later accepted the single species, *P. hildebrandtii* Baill., in his treatment of Flacourtiaceae for the *Flore de Madagascar et des Comores*. Citing additional material from western Madagascar, PERRIER DE LA BÂTHIE (p. 21) referred to *P. hildebrandtii* as a "heteromorphic species, somewhat variable in the dimensions of its leaves and bracts, and the length of its peduncles and pedicels, but not polymorphic, all of these variations observable on a single branch" (our translation). CAPURON (1968) published a short note on *P. hildebrandtii* to clarify various aspects of its morphology, and further discussed the variability within the genus. Contrary to PERRIER DE LA BÂTHIE's assertion that the flowers of *Prockiopsis* have 3 imbricate sepals, CAPURON reconfirmed BAILLON's original description of a "gamophyllous" calyx, albeit calyptriform in shape and tearing more or less irregularly. CAPURON also reconfirmed the dehiscent, capsular nature of the fruit described by GILG (1925), which was also contrary to PERRIER DE LA BÂTHIE's assertion that the fruit was indehiscent. CAPURON further stated (p. 366) that "it seems possible to distinguish diverse forms which, if they were better known, might perhaps merit description as sub-species or distinct species" (our translation). He briefly outlined the characters that distinguish three distinct "forms" within the genus, and summarized their geographical distribution within Madagascar. The following taxonomic framework recognizes these three forms as separate species, thus proposing two new species within *Prockiopsis* that correspond to distinct morphological variation, especially in inflorescence structure, and subtending bract structure and number, as well as indument (Figs. 1, 3). Such morphological variation is well correlated with eco-geographic parameters, including bioclimate (CORNET 1974; SCHATZ 2000; see also LOWRY et al. 1997, 1998) and geological substrate (DU PUY & MOAT 1996).

Recent molecular systematic studies based on plastid *rbc*L DNA sequences have resulted in a radical recircumscription of the genera traditionally placed in Flacourtiaceae (CHASE et al. 2002). With the exception of several genera, former Flacourtiaceae fall into two clades that are more closely related to other families within Malpighiales than they are to one another. In Madagascar, with the exception of *Physena* (Physenaceae) and *Aphloia* (Aphloiaceae), all accepted genera treated by PERRIER DE LA BÂTHIE (1946) in the *Flore de Madagascar et des Comores* except *Prockiopsis* are now treated under Salicaceae, as was done recently by SCHATZ (2001). CHASE et al. (2002) place *Prockiopsis* in tribe *Lindackerieae* Zmarty of the family Achariaceae Harms, where its entire, calyptriform calyx is anomalous. SCHATZ (2001) treated *Prockiopsis* under Kiggelariaceae, which, although an older name, is a synonym of the conserved name Achariaceae.

For the "Material examined" cited below under each species, abbreviations are as follows: FC = Forêt Classée, PN = Parc National, RNI = Réserve Naturelle Intégrale, and RS = Réserve Spéciale. A full listing of exsiccatae for each species, with complete localities and latitude/longitude coordinates, is available through W3 TROPICOS (*http://mobot.mobot.org/W3T/Search/vast.html*). Geographic coordinates indicated in square brackets were assigned *post facto* using available information on Malagasy place names and topographic maps, compiled as a gazetteer of botanical collecting localities in Madagascar (*http://www.mobot.org/MOBOT/research/madagascar/gazetteer/*).

### Key to the species of *Prockiopsis*

1. Stems gray puberulous; margins of leaves entire; inflorescences 1-flowered; bracts arranged in 14-15 decussate, tightly imbricate pairs; pedicel golden villous; calyx exterior densely golden sericeous ..... 3. **P. orientalis**
1'. Stems glabrate; margins of leaves serrate to serrulate and often spinose, occasionally entire; inflorescences 2-10-flowered; bracts not distinctly decussate-imbricate; pedicel glabrous to very sparsely puberulous; calyx exterior sparsely sericeous ..... 2

2. Bracts arranged in distinct groups along an elongate rachis, separated by visible internodes, triangular to ovate, densely sericeous in flower; calyx exterior with a distinct tuft of dense, erect, encircling trichomes at the base ..... 1. **P. calcicola**
2'. Bracts densely clustered on a contracted rachis, nearly always obscuring the internodes, acicular to narrowly triangular, sparsely sericeous in flower; calyx exterior lacking a tuft of trichomes at the base ..... 2. **P. hildebrandtii**

**Clé des espèces de *Prockiopsis***

1. Rameaux à pubescence grisâtre ; feuilles à marge entière ; inflorescences uniflores ; bractées, 14-15 paires, décussées et étroitement imbriquées ; pédicelle villeux et doré ; calice densément soyeux-doré à l'extérieur ..... 3. **P. orientalis**
1'. Rameaux devenant glabres ; feuilles à marge serrée à serrulée et souvent épineuse, parfois entière ; inflorescences 4-10 fleurs ; bractées non distinctement décussées-imbriquées ; pédicelle glabre à éparsement pubérulente ; calice éparsement soyeux à l'extérieur ..... 2
2. Bractées disposées en groupes distincts le long d'un rachis allongé, triangulaires à ovées, densément soyeuses à l'anthèse, séparées par des entre-nœuds visibles ; base externe du calice entourée d'une touffe de poils denses et érigés ..... 1. **P. calcicola**
2'. Bractées densément groupées sur un rachis court à entre-nœuds rarement visibles, aciculées à étroitement triangulaires, éparsement soyeuses à l'anthèse ; base externe du calice sans touffes de poils ..... 2. **P. hildebrandtii**

**1. Prockiopsis calcicola** G.E. Schatz & Lowry, **sp. nov.**

*Haec species a* Prockiopsis hildebrandtii Baill. *secus rhachim elongatam dense sericeam unoquoque flore cum bracteis bracteolisque paucis subtendentibus internodio manifesto a ceteris floribus separato atque trichomatum erectorum densorum caespite calycis basim cingente distinguitur.*

TYPUS. — *Leandri & Saboureau 2772*, Madagascar, Prov. Mahajanga, l'Antsingy, vers Ambodiriana (E d'Antsalova), [Bemaraha RNI], [18°40'S, 44°44'E], 100-150 m, 21-27 Jan. 1960, fr. (holo-, P!; iso-, MO!).

Large shrub. Stems initially with sparse, erect, very short, golden puberulous indument, glabrescent. Stipules (1.7-)4.5-6 × 1 mm, narrowly triangular to acicular. Leaves 4.5-11.3 × 2-4 cm, elliptic to narrowly elliptic, subcoriaceous to coriaceous, glabrous above and below, base acute to cuneate, margins entire or with 2-6 serrate teeth in the upper 1/2 to 1/3, apex acute to acuminate or rarely rounded, midrib slightly raised above, raised and glabrous below, venation brochidodromous, 9-10 secondary veins per side, slightly raised above and below; petioles 3-6 mm, very sparsely golden puberulous, glabrescent. Inflorescences axillary, racemose, 2-7-flowered, the peduncle/rachis 3-11 mm, square in cross-section, 1-1.5 mm broad, densely short golden puberulous, the rachis elongating through anthesis and into fruit such that the internodes between flowers and their subtending bracts become distinctly visible, the lowest cluster of bracts not bearing a flower. Pedicels subtended by 2-3 overlapping triangular to ovate-concave, striate bracts, 2-4.5 × 1-3 mm, densely golden puberulous. Pedicels 13-26 mm, expanding to 32 mm in fruit, < 1 mm in diam. at base thickening to > 1mm at apex in fruit, initially sparsely golden puberulous, glabrescent. Calyx 6-8 × 3-4 mm in diam., entire, calyptriform and tearing irregularly, thin and tissue-like, sparsely to moderately densely appressed golden puberulous outside, glabrous inside, with a dense tuft of erect golden hairs encircling the base. Petals 11.2 × 3-5.3 mm, obovate, distinctly clawed, the claw 1-2 mm, tissue-like with visible venation, glabrous, caducous, apex rounded. Stamens c. 20, arranged in two series fused into a single ring at their base; filaments 4 mm long, the basal 1.5 mm glabrous, the central 2 mm covered with sparse curly white indument the apical 0.5 mm glabrous;

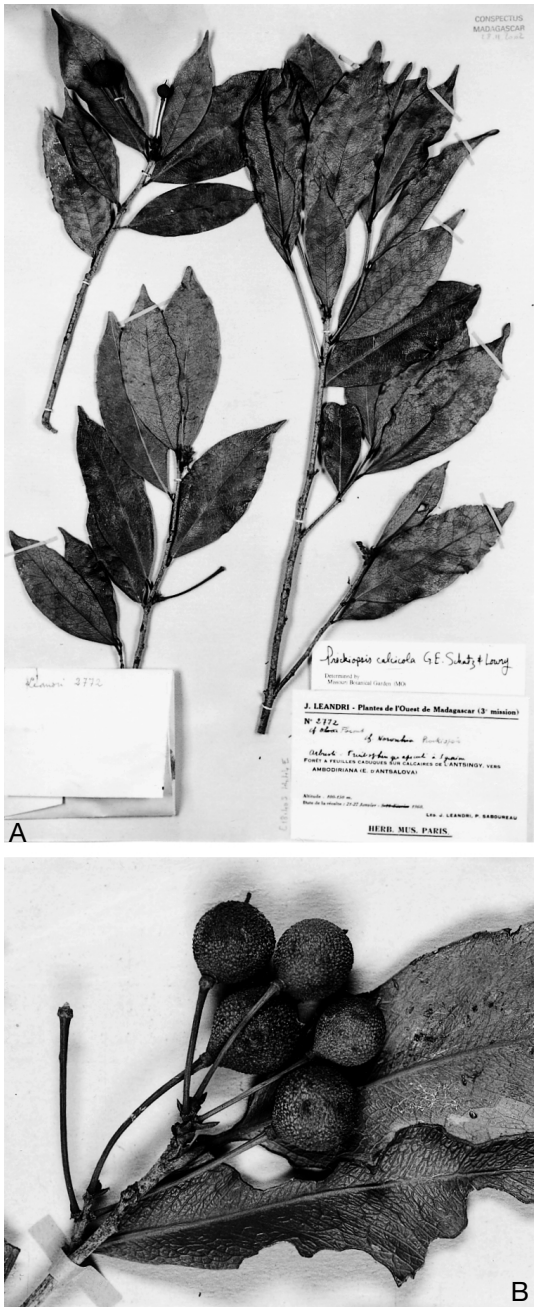


Fig. 1. — ***Prockiopsis calcicola*: A**, holotype (*Leandri & Saboureau 2772*, P); **B**, close-up of infructescence (*Leandri & Saboureau 2963*, P).

anthers 2-2.2 × 0.3 mm. Ovary 3.5 × 2.5 mm, ellipsoid, glabrous; style 3.5-5 mm, slender. Fruit a dehiscent capsule, globose, 7-15 mm in diam., glabrous, verrucose, subtended by a collar 1 mm tall, 2 mm in diam., crowned by the apiculate stylar remnant, 1-4 mm; seed 6 mm in diam., globose. — Fig. 1.

*Prockiopsis calcicola* is known from dry deciduous forest on calcareous substrate in the region of the Tsingy of Bemaraha, Antsely, and Mahajanga (Fig. 2). It can be easily distinguished from *P. hildebrandtii* by its elongate, densely sericeous inflorescence rachis, the individual flowers and their subtending bracts separated by evident internodes, as well as by the dense tuft of encircling trichomes at the base of the calyx.

CONSERVATION STATUS. — With an Area of Occupancy of 300 km$^2$, and three sub-populations, only one of which is within a protected area, *Prockiopsis calcicola* is assigned a preliminary status of Endangered (EN B2ab).

PARATYPES. — MADAGASCAR. ***Prov. Mahajanga***: *Leandri & Saboureau 2963*, l'Antsingy, vers Bevary (E d'Antsalova), environs de l'ancien poste militaire de Bevary, 5-10 km N du village actuel, [Bemaraha RNI], [18°35'S, 44°48'E], 400-600 m, 3 Feb. 1960, fr. (P); *Perrier de la Bâthie 1636*, environs de Majunga, [15°43'S, 46°19'E], Nov. 1903, fl. (P); *Service Forestier 5400*, Antsely, Dist. de Mitsinjo, [16°00'S, 45°54'E], 29 Nov. 1951, fr. (P, TEF); *Service Forestier (Capuron) 18444*, Dunes maritimes, à Ampazony, au NE de Majunga, [15°36'S, 46°23'E], 17 Sep. 1957, fr. (P, TEF).

**2. Prockiopsis hildebrandtii** Baill.

Bull. Mens. Soc. Linn. Paris 1: 573 (1886).

TYPE. — *Hildebrandt 3294*, Madagascar, Prov. Antsiranana, Nossi-Bé (holo-, P!; iso-, P!).

*Prockiopsis hildebrandtii* is a small to medium sized shrub to tree to 4 m tall known from subhumid to dry, evergreen to semi-evergreen forest in the northwest, from Belo sur Tsiribihina (Fide CAPURON 1968) to Vohemar, including the Sambirano region and Nosy Be (Fig. 2). In *P. hildebrandtii*, the acicular bracts subtending each flower are densely clustered on a highly contracted inflorescence rachis, such that the 6-10 flowers appear to originate at more or less the same level.

CONSERVATION STATUS. — With an Extent of Occurrence of over 100,000 km$^2$, an Area of Occupancy of 1,100 km$^2$, and eleven sub-populations, two of which are within protected areas, *Prockiopsis hildebrandtii* is assigned a preliminary status of Least Concern (LC).

MATERIAL EXAMINED. — MADAGASCAR, ***Prov. Antsiranana***: *Birkinshaw 37*, *43*, Lokobe RNI; *Boivin 2122ter*, Nosy Be; *Herb. Jard. Bot. Tananarive 6188*, Andranomazo; *Keraudren 1570bis*, Lokobe RNI; *Morat 1415*, Lokobe RNI; *Ranaivojaona 68*, Ambato; *Réserves Naturelles 2698*, *3024*, *4889*, *5940*, Lokobe RNI; *Service Forestier (Capuron) 23431*, Mahatsinjo, *24866*, Vohemar, *27438*, Andaingo. ***Prov. Mahajanga***: *Decary 1115*, Maromandia; *Perrier de la Bâthie 782*, Firingalava, *1651*, Manongarivo (Ambongo), *6734*, Tsitondroina; *Rakotomalaza 395*, Mangabe; *Réserves Naturelles 1673*, *2042*, Ankarafantsika RNI; *Service Forestier 52*, Ankarafantsika RNI, *8045*, Ampijoroa STF, *18478*, Ankarafantsika RNI, *33697*, *33949*, Ampijoroa STF, *34746*, Ankarafantsika RNI, *35181*, Ampijoroa STF.

### 3. **Prockiopsis orientalis** Capuron ex G.E. Schatz & Lowry, **sp. nov.**

*Haec species a* Prockiopsis hildebrandtii Baill. *caule griseo-puberulo, foliis ellipticis integris, flore solitario bracteis bracteolisque multis ovato-concavis subtento, pedicello parce aureo-tomentoso atque calyce extus dense aureo-puberulo distinguitur.*

TYPUS. — *Réserves Naturelles 11659*, Madagascar, Prov. Toamasina, Betampona RNI, [14°02'S, 48°18'E], 20 Nov. 1960, fl. (holo-, P!; iso-, TEF).

Tree to 8 m tall, 15 cm DBH. Stems gray puberulous. Stipules 3-5.4 × 1 mm, narrowly triangular to acicular. Leaves 2.3-4.2 × 1.1-2 cm, elliptic, chartaceous to subcoriaceous, glabrous above and below, base acute, margins entire, slightly revolute, apex bluntly acuminate with the acumen rounded and often slightly retuse, midrib slightly raised and sparsely puberulous at the base above, raised and glabrous below, venation weakly brochidodromous, 6-8 secondary veins per side, barely visible above, slightly raised below; petioles 2-3 mm, gray puberulous. Inflorescences axillary, reduced to a single flower, sessile, or the peduncle 1-2 mm, < 1 mm in diam.

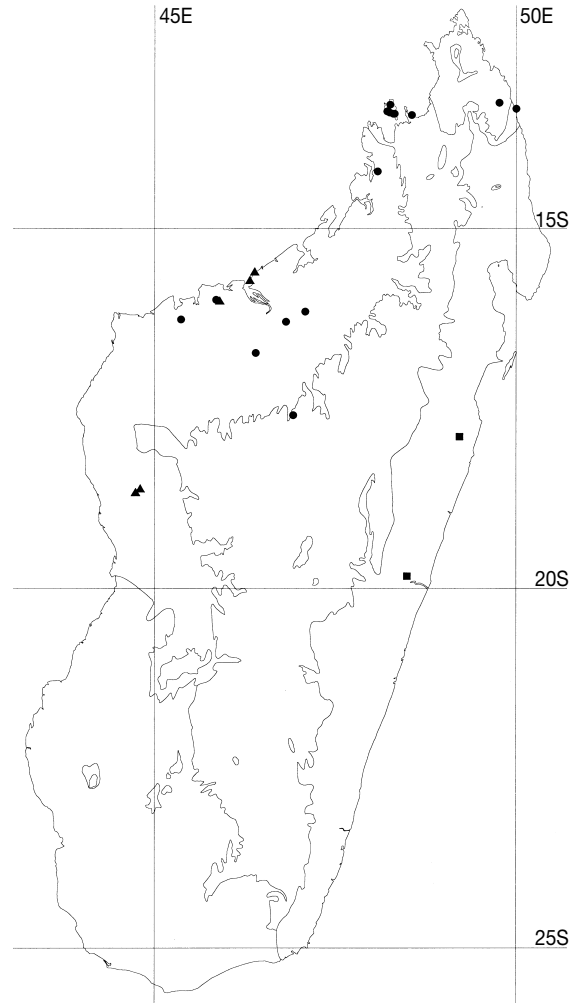


Fig. 2. — Distributions of ***Prockiopsis***, mapped on the bioclimatic zones of Madagascar (after CORNET 1974; see SCHATZ 2000). ***P. calcicola*** (▲), ***P. hildebrandtii*** (●), ***P. orientalis*** (■).

Solitary flower subtended by 14-15 pairs of imbricate-decussate, ovate-concave bracts along a rachis of 5-6 mm, each pair progressively larger, the basal smallest pair 1 × 1 mm, narrowly ovate, the apical largest pair 2.5 × 2.5 mm, broadly ovate, the margins ciliate. Pedicels 8-10 mm, < 1 mm in diam., sparsely golden tomentose. Calyx 10-12 × 5-6 mm in diam., entire, calyptriform and tearing irregularly, thin and tissue-like, densely appressed golden puberulous outside, glabrous inside. Petals 16 × 6 mm, obovate,

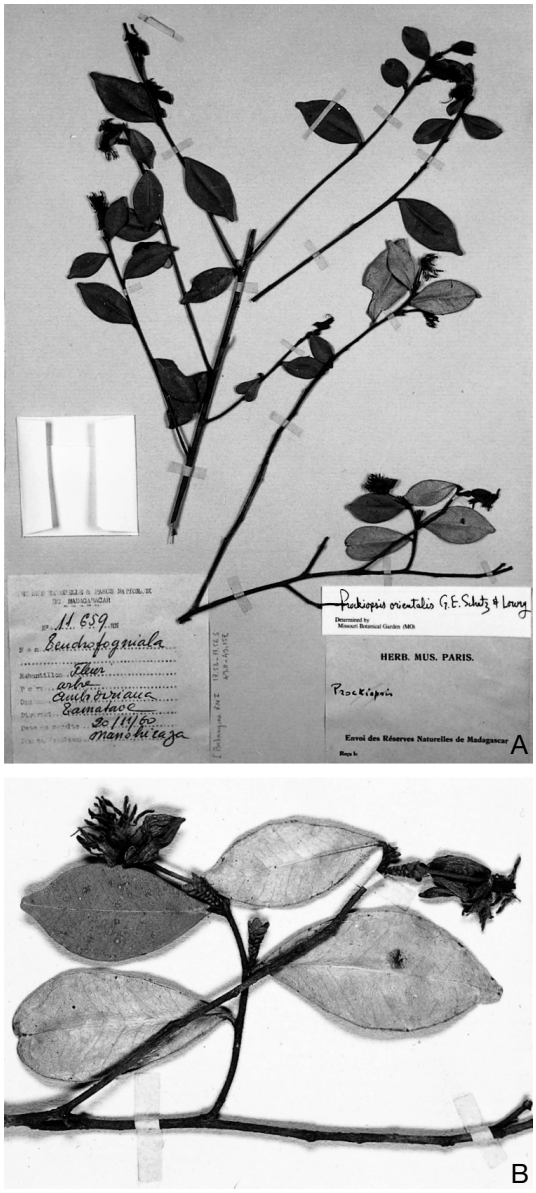


Fig. 3. — ***Prockiopsis orientalis*: A**, holotype; **B**, close-up of inflorescences. (*Réserves Naturelles 11659*, P).

tissue-like with visible venation, glabrous, caducous, apex rounded. Stamens 14-18, arranged in two series fused into a single ring at their base; filaments 6 mm long, the basal 1 mm glabrous, the central 4 mm covered with white wooly indument, the apical 1 mm glabrous; anthers 4-5 × 1 mm. Ovary 3.5 × 2.5 mm, ovoid, glabrous; style 6.7 mm, slender. Fruit unknown. — Fig. 3.

*Prockiopsis orientalis* is known from only two collections made in 1960 from low elevation eastern humid forest (Fig. 2). It can be easily distinguished from *P. hildebrandtii* by its gray puberulous stems, entire, elliptic leaves, solitary flowers, numerous imbricate-decussate, ovate-concave bracts, sparsely golden tomentose pedicels, and densely golden puberulous calyx exterior.

VERNACULAR NAMES. — Maroantrano, Tendrofogniala.

CONSERVATION STATUS. — With an Area of Occupancy of 200 km$^2$, and just 2 sub-populations, only one of which is within a protected area, *Prockiopsis orientalis* is assigned a preliminary status of Endangered (EN B2ab).

PARATYPE. — MADAGASCAR. ***Prov. Toamasina***: *Service Forestier (Bevao) 19661*, Dist. Mahanoro, Canton Ambinanidilina, bord de piste Tratranaingitra, 6 km E de Tratranaingitra, bord de la rivière Manambolo, [19°50'S, 48°29'30"E], 200 m, 13 Mar. 1960, st. (TEF).

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