

# Endemic families of Madagascar. V. A synoptic revision of *Eremolaena*, *Pentachlaena* and *Perrierodendron* (Sarcolaenaceae)

## **Porter P. LOWRY II**

Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166-0299, U.S.A.

lowry@mobot.org

Laboratoire de Phanérogamie, Muséum national d'Histoire naturelle,  
16 rue Buffon, 75005 Paris, France.

lowry@mnhn.fr

## **Thomas HAEVERMANS**

Laboratoire de Phanérogamie, Muséum national d'Histoire naturelle,  
16 rue Buffon, 75005 Paris, France.

haever@mnhn.fr

## **Jean-Noël LABAT**

Laboratoire de Phanérogamie, Muséum national d'Histoire naturelle,  
16 rue Buffon, 75005 Paris, France.

labat@mnhn.fr

## **George E. SCHATZ**

Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166-0299, U.S.A.

schatz@mobot.org

## **Jean-François LEROY<sup>†</sup>**

Laboratoire de Phanérogamie, Muséum national d'Histoire naturelle,  
16 rue Buffon, 75005 Paris, France.

## **Anne-Elizabeth WOLF**

Laboratoire de Phanérogamie, Muséum national d'Histoire naturelle,  
16 rue Buffon, 75005 Paris, France.

aewolf@mnhn.fr

## ABSTRACT

As part of an assessment of the vascular plant families endemic to Madagascar and the Comoro Islands, a synoptic revision is presented of three genera of Sarcolaenaceae: *Eremolaena* Baill. (2 spp.), *Pentachlaena* H. Perrier (3 spp.), and *Perrierodendron* Cavaco (5 spp.). Molecular sequence data place Sarcolaenaceae as the sister group of Dipterocarpaceae within an expanded Malvales. The three genera studied appear to be closely related and probably form a monophyletic assemblage, sharing several diagnostic features (e.g., free stipules and inflorescence bracts, an involucre reduced at anthesis but expanding somewhat in fruit in certain species, and seeds with little or no endosperm and a smooth integument); features separating the genera include sepal size, the number of carpels, and fruit dehiscence. Five species are described as new, including one *Pentachlaena* (*P. betamponensis*) and four *Perrierodendron* (*P. capuronii*, *P. occidentalis*, *P. quartzitorum* and *P. rodoense*). Keys to the genera and species are provided in English and French.

## KEY WORDS

Sarcolaenaceae,  
*Eremolaena*,  
*Pentachlaena*,  
*Perrierodendron*,  
Madagascar,  
endemism.

## RÉSUMÉ

*Familles endémiques de Madagascar. V. Révision synoptique des genres Eremolaena, Pentachlaena, et Perrierodendron (Sarcolaenaceae).*

Dans le cadre de l'évaluation des familles de plantes vasculaires endémiques de Madagascar et des Comores, la révision synoptique de trois genres appartenant aux Sarcolaenaceae est présentée : *Eremolaena* Baill. (2 spp.), *Pentachlaena* H. Perrier (3 spp.), et *Perrierodendron* Cavaco (5 spp.). Des analyses moléculaires montrent que les Sarcolaenaceae sont le groupe frère des Dipterocarpaceae, au sein des Malvales élargies. Les trois genres étudiés semblent être étroitement apparentés entre eux et forment vraisemblablement un groupe monophylétique, partageant plusieurs caractères diagnostiques (ex. : des stipules libres ainsi que les bractées inflorescentielles ; un involucre réduit à l'anthèse mais se développant quelque peu lors de la fructification chez certaines espèces, des graines avec peu ou pas d'endosperme et un tégument lisse) ; les caractères distinctifs des genres sont, entre autres, la taille des sépales, le nombre de carpelles et la déhiscence du fruit. Cinq espèces nouvelles sont décrites, un *Pentachlaena* (*P. betamponensis*) et quatre *Perrierodendron* (*P. capuronii*, *P. occidentalis*, *P. quartzitorum* et *P. rodoense*). Des clés de détermination des genres et des espèces sont établies en anglais et en français.

## MOTS CLÉS

Sarcolaenaceae,  
*Eremolaena*,  
*Pentachlaena*,  
*Perrierodendron*,  
Madagascar,  
endémisme.

## INTRODUCTION

This is the fifth in our series of synoptic revisions of genera belonging to Madagascar's eight endemic plant families, each of which is being prepared to provide a modern framework for compiling a Red Data Book in which the conser-

vation status of the approximately 100 species concerned will be assessed (SCHATZ et al. 1998, 1999a,b, in press; LOWRY et al. 1999). We have examined all the available material of three closely related genera of Sarcolaenaceae (*Eremolaena* Baill., *Pentachlaena* H. Perrier, and *Perrierodendron* Cavaco) at the major herbaria

with important holdings of Malagasy plants (K, MO, P, TAN and TEF), and have reviewed the circumscription of species and infraspecific taxa, as presented by CAVACO (1951, 1952a,b) and updated by CAPURON (1973).

CAVACO, in his treatment of Chlaenaceae (= Sarcolaenaceae) for the Flore de Madagascar (1952b; see also 1952a), recognized two species of *Eremolaena* and a single species each of *Pentachlaena* and *Perrierodendron*. Two decades later, CAPURON (1973) described a second species of *Pentachlaena*. Shortly thereafter, J.-F. LEROY began drafting a paper describing four new species of *Perrierodendron*, which unfortunately remained unpublished at the time of his death early last year. A careful study of the herbarium material of this genus has confirmed that all four taxa are sufficiently distinct to warrant recognition at the species level. Analysis of the specimens of *Pentachlaena* has also revealed a third undescribed species in that genus.

Based on recent molecular sequence data, Sarcolaenaceae and Dipterocarpaceae comprise sister taxa in a group that also includes Cistaceae and *Muntingia* L. within an expanded Malvales (ALVERSON et al. 1998; BAYER et al. 1999). Fossil pollen recorded from the Miocene of South Africa clearly belongs to Sarcolaenaceae (COETZEE & MÜLLER 1984), indicating that the family was more widespread in the past, and that its current status as a Malagasy endemic is a result of extinction elsewhere.

Within Sarcolaenaceae, *Eremolaena*, *Pentachlaena* and *Perrierodendron* appear to form a related and probably monophyletic group. As indicated by CAPURON (1970), they share a number of diagnostic features, including free stipules and inflorescence bracts, an involucre that is reduced at anthesis (but which in certain species expands somewhat in fruit), and seeds with little or no endosperm and a smooth integument. Moreover, members of all three genera share a striking vegetative resemblance and are often difficult to distinguish when sterile. Based on these and other characters (especially of the pollen), CAPURON (1970) placed *Eremolaena*, *Pentachlaena* and *Perrierodendron* in one of the informal groups he recognized within Sarcolaenaceae, an interpretation supported by a preliminary

cladistic analysis of the family using morphological features (HAEVERMANS 1999). A recent study of pollen morphology among Sarcolaenaceae (NILSSON & RANDRIANASOLO 1999) indicates that the tetrads of all but one species in these three genera are similar in structure, with prominent apertural ridges comprising disk-like lumps or claw-like elements, a finding that is consistent with their hypothesized close relationship. However, the pollen of the single sample of *E. rotundifolia* studied is distinctly different, comprising single grains with a reticuloid-rugulate, columellar exine – an observation that would be worth confirming in additional material. Notwithstanding this possible palynological anomaly, however, the three genera appear to be closely related, and can be separated from one another using several features, including sepal size, the number of carpels, and fruit dehiscence.

Examination of the available material of *Eremolaena*, *Pentachlaena*, and *Perrierodendron* has led us to propose the following revised taxonomy, in which ten species are recognized, five of which are described as new. The epithets chosen for two of the new species (*Perrierodendron quartzitorum* and *P. rodoense*) were taken from annotations made by CAPURON and LEROY, respectively, in the Paris herbarium. For the “Material examined” cited below under each species, abbreviations are as follows: PN = Parc National; RNI = Réserve Naturelle Intégrale; RS = Réserve Spéciale; STF = Station Forestière. A full listing of exsiccatae for each species, with complete localities and latitude/longitude coordinates, has been compiled for the Madagascar Conspectus Project (SCHATZ et al. 1996), and is available on the World Wide Web through W3 TROPICOS (<http://mobot.mobot.org/Pick/Search/pick.html>). Specimen data and images can also be accessed through the SONNERAT database at (<http://www.mnhn.fr/base/sonnerat.html>). Additional images are available on the Web at (<http://mobot.mobot.org/MOBOT/Madagascar/sarco.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.

## TAXONOMIC TREATMENT

### Key to the genera

1. Fruit indehiscent, subtended by an accrescent, entire involucre; ovary 2-carpellate ..... **Perrierodendron**
- 1'. Fruit dehiscent, the involucre accrescent or not, lobed; ovary 3-5-carpellate ..... 2
2. Sepals strongly unequal, the outer 2 much smaller; petals strongly contorted in bud; ovary 3-carpellate; ovules 2 per carpel ..... **Eremolaena**
- 2'. Sepals more or less equal in size; petals slightly contorted in bud; ovary 5-carpellate; ovules 4-6 per locule ..... **Pentachlaena**

In order to facilitate identification in Madagascar, the keys to the genera and species are also given in French.

### Clé des genres

1. Fruit indéhiscent, entouré d'un involucre entier et accrescent ; ovaire à 2 carpelles ..... **Perrierodendron**
- 1'. Fruit déhiscent, l'involucre accrescent ou non, lobé ; ovaire à 3-5 carpelles ..... 2
2. Sépales très inégaux, les deux extérieurs plus petits ; pétales nettement contortés dans le bouton floral ; ovaire à 3 carpelles ; 2 ovules par loge ..... **Eremolaena**
- 2'. Sépales plus ou moins égaux ; pétales légèrement contortés dans le bouton floral ; ovaire à 5 carpelles ; 4-6 ovules par loge ..... **Pentachlaena**

### EREMOLAENA Baill.

Bull. Mens. Soc. Linn. Paris 1: 413 (1884).

TYPE. — *Eremolaena humblotiana* Baill.

The genus *Eremolaena* comprises two species, both of which have been recognized for many decades. Vegetatively they closely resemble several species in the two putatively related genera,

including *Pentachlaena orientalis*, *Perrierodendron capuronii*, and *P. occidentalis*, and can sometimes be difficult to recognize without flowers and/or fruits. Distinctive features of the genus include strongly unequal sepals (the outer two being much smaller), an ovary with 3 carpels (vs. 2 in *Perrierodendron* and 5 in *Pentachlaena*), and a dehiscent fruit (also present in *Pentachlaena*) containing only 2 seeds in each locule.

### Key to the species of *Eremolaena*

1. Leaves subcoriaceous, largest blades at least 9 cm long, secondary and tertiary venation distinctly raised on abaxial surface; sepals 15-19 mm long at anthesis; flowers borne in pairs, subtended by 5 small, scale-like involucral lobes; humid and subhumid forest on laterite, Betampona RNI, Lac Alaotra region, and Brickaville to Vatomandry ..... 1. ***E. humblotiana***
- 1'. Leaves chartaceous, largest blade not exceeding 5(-6) cm long, secondary and tertiary venation weakly raised on abaxial surface; sepals 9-12 mm long at anthesis; flowers borne singly, subtended by a very small, 3-lobed collar; littoral forest on sand, Masoala PN to Ft. Dauphin area ..... 2. ***E. rotundifolia***

### Clé des espèces d'*Eremolaena*

1. Feuilles subcoriaces, limbes les plus grands mesurant au moins 9 cm de long, nervation secondaire et tertiaire distinctement proéminente sur la face abaxiale ; fleurs géminées, portées par un involucre de 5 petits lobes en forme d'écailles ; sépales de 15-19 mm de longueur à l'anthèse ; forêt humide et subhumide sur latérite, RNI de Betampona, région du Lac Alaotra, et de Brickaville à Vatomandry ..... 1. ***E. humblotiana***
- 1'. Feuilles chartacées, limbes les plus grands ne dépassant pas 5(-6) cm de long, nervation secondaire et tertiaire faiblement proéminente sur la face abaxiale ; sépales de 9-12 mm de long à l'anthèse ; fleurs solitaires, portées par une très petite collerette 3-lobée ; forêt littorale sur sable, du PN de Masoala à la région de Ft. Dauphin ..... 2. ***E. rotundifolia***

## 1. *Eremolaena humblotiana* Baill.

Bull. Mens. Soc. Linn. Paris 1: 413 (1884). — Type: *Humblot 245*, Madagascar, Prov. Toamasina, Manahar [= Manahara?], NE du Lac Alaotra, 13 May 1882 (holo-, P!; iso-, K!, MO!, P [2 sheets!]).

*Eremolaena humblotiana* is restricted to humid and subhumid evergreen forest at low and middle altitude, up to 1200(-1500) m, from the Brickaville to Vatomandry area, Betampona RNI, Zahamena RNI, and the area around Lac Alaotra (Fig. 1). It can be recognized by its large, subcoriaceous leaves with the venation distinctly raised on the lower surface, and its comparatively large flowers with sepals 15-19 mm long. With the exception of a recent collection from Zahamena RNI made in 1994, *E. humblotiana* has not been recorded from elsewhere in its range since 1957.

VERNACULAR NAMES. — Amaninombilahy, Hamaninaombilahy, Fotona.

MATERIAL EXAMINED. — *Cours 1185*, Sahalampy, 2447, Ampitanonoka; *Homolle 2447*, Ampitanonoka; *Humblot 245*, Manahar; *Perrier de la Bâthie 14156*, Vatomandry, 14739, Andriantantely; *Randrianjanaka & Zafy 242*, Zahamena RNI; *Réserves Naturelles 2225*, 9133, Betampona RNI; *Service Forestier 10034*, 16882, Andriantantely, 18091, Betampona RNI.

## 2. *Eremolaena rotundifolia* (F. Gérard) Danguy

Bull. Mus. Natl. Hist. Nat. 21: 202 (1915). — *Rhodolaena rotundifolia* F. Gérard, Compt. Rend. Hebd. Séances Acad. Sci. 58: 1704 (1914). — Type: *Perrier de la Bâthie 3015*, Madagascar, Prov. Fianarantsoa, dunes littorales du bas Faraony (SE), [21°47'S, 48°10'E], Oct. 1911 (holo-, P!; iso-, P!).

*Eremolaena rotundifolia* is restricted to littoral forests on sand from Masoala PN to the Ft. Dauphin area (Fig. 1). It can be distinguished by its small, chartaceous leaves with the venation weakly raised on the lower surface, and its small flowers with the sepals 9-12 mm long. This species had been collected recently at Masoala PN and in the Ft. Dauphin area, but has not been recorded from elsewhere for over 30 years.

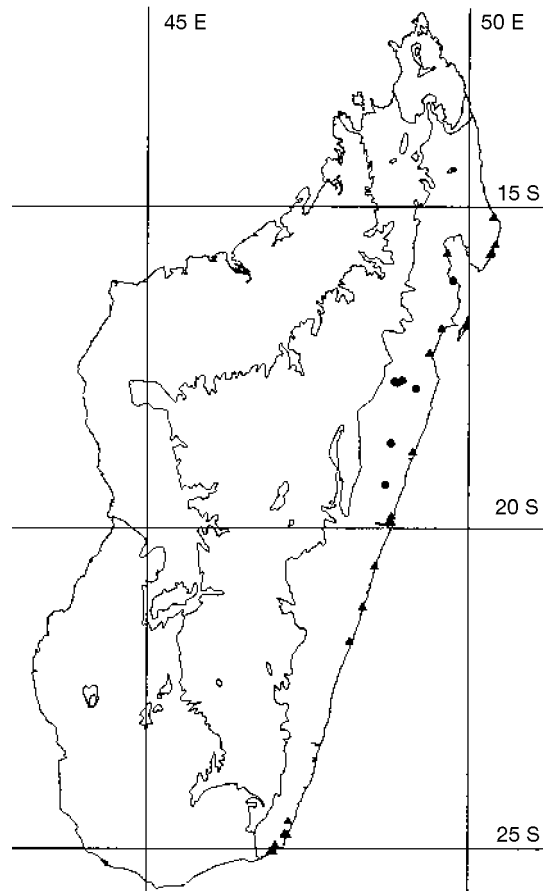


Fig. 1. — Distributions of *Eremolaena*, mapped on the simplified bioclimatic zones of Madagascar (SCHATZ in press, after CORNET 1974). *E. humblotiana* (●), *E. rotundifolia* (▲).

VERNACULAR NAMES. — Amaninombilahy fotsy, Anjananjana, Fotona, Fotonala, Fotonalahy, Menahy lahy, Takodizahana lahy, Voantalanina.

MATERIAL EXAMINED. — *Baron 6101*, without precise locality; *Bernard 254*, 294, Masoala PN; *D'Arcy 15391*, 15405, Fort Dauphin; *Dorr 4050*, Fort Dauphin; *Geay 7533*, 8113, 8114, Mananjary; *Guillaumet 2534bis*, Soanierana-Ivongo; *Louvel 66*, without precise locality; *Perrier de la Bâthie 3015*, Faraony, 18119 Mahanoro; *Rabevohitra 1942*, Ste. Luce; *Rakotozafy 599*, Mahanoro, 2054, Mandena STF; *Réserves Naturelles 9536*, Masoala PN; *Service Forestier 2114*, Faraony, 2854, 3362, Mandena STF, 4586, Mahanoro, 4907, Ambilabe, 7256, Ambila-Lemaitso STF, 7493, Lanihiry, 9169, Tenina, 9192,

Tampolo STF, 9696, Ste. Luce, 11763, Ambinanibe, 11786, Bemangidy, 13095, 13325, Tampolo STF, 14662, Faraony, 16893, Tampolo STF, 19623, Miakara, 27750, Ambalabe, 28653, Ste. Luce, 28868, Ambohidena.

## PENTACHLAENA H. Perrier

Bull. Mus. Natl. Hist. Nat. 26: 669 (1920).

TYPE. — *Pentachlaena latifolia* H. Perrier.

The genus *Pentachlaena* was originally described with a single species (*P. latifolia*), which is restricted to the Col des Tapias, the Ibity mas-

sif, and the area immediately to the south. CAPURON (1970) mentioned a second member of the genus growing at low elevations in the east, which he later described (CAPURON 1973) as *P. orientalis*. Here we describe a third species, known only from the type collection in flower, made at Betampona RNI over 40 years ago, but which could very well still occur in the wild, considering how many other rare species characteristic of low elevation humid evergreen forest have been rediscovered there within the last several years. *Pentachlaena* can be distinguished from its presumed relatives by its dehiscent, 5-locular fruit with a particularly thick, almost woody exocarp, in which each locule contains 4-6 seeds.

### Key to the species of *Pentachlaena*

1. Inflorescences terminal, branched, with ca. 10 flowers; leaves obovate, with 5-6 pairs of secondary veins, apex distinctly emarginate; Betampona RNI ..... 1. ***P. betamponensis***
- 1'. Inflorescences axillary and occasionally terminal, with 2 flowers; leaves elliptic to orbicular, with (7-)-8-12 pairs of secondary veins, apex rounded to truncate, rarely somewhat emarginate ..... 2
2. Leaves elliptic, strongly discolorous, largest blade 9.5-18 × 7-12 cm; peduncles at least 15 mm long; bracts subtending flowers 10-15 mm long, deeply lacinate; seeds pubescent; sublittoral forest on sand overlaying laterite, Tampolo STF, Analalava, Betampona RNI ..... 2. ***P. orientalis***
- 2'. Leaves broadly elliptic to orbicular, weakly discolorous, largest blade 5-9 × (3.5-)-4-7 cm; peduncles less than 8 mm long or flowers subsessile; bracts subtending flowers to 5-7 mm long, entire or slightly dentate; seeds glabrous; Tapia woodland on outcrops of quartzite and perhaps other substrates, Col des Tapias, Ibity and area immediately S ..... 3. ***P. latifolia***

### Clé des espèces de *Pentachlaena*

1. Inflorescences terminales, ramifiées, à 10 fleurs environ; feuilles obovées, à 5-6 paires de nervures secondaires, apex nettement émarginé; Betampona RNI ..... 1. ***P. betamponensis***
- 1'. Inflorescences axillaires et parfois terminales, à 2 fleurs; feuilles elliptiques à orbiculaires, à (7-)-8-12 paires de nervures secondaires, apex arrondi à tronqué, rarement légèrement émarginé ..... 2
2. Feuilles elliptiques, fortement discolores, limbes les plus grands 9.5-18 × 7-12 cm; pédoncules mesurant au moins 15 cm de long; bractées florales de 10-15 mm de long, profondément laciniées; graines pubescentes; forêt sublittorale sur sable superposé sur latérite, Tampolo STF, Analalava, Betampona RNI ..... 2. ***P. orientalis***
- 2'. Feuilles largement elliptiques à orbiculaires, faiblement discolores, limbes les plus grands 5-9 × (3.5-)-4-7 cm; pédoncule mesurant moins de 8 mm de long ou fleurs subsessiles; bractées florales mesurant jusqu'à 5-7 mm de long, entières ou légèrement dentées; graines glabres; bois de Tapia sur rochers de quartzites et peut-être d'autres substrats, Col des Tapias, Ibity et environs immédiatement au S ..... 3. ***P. latifolia***

#### 1. *Pentachlaena betamponensis* Lowry, Haevermans, Labat & G.E. Schatz, **sp. nov.**

*Arbor, altitudine ignota. Folia petiolo 0.8-1.2 cm longo; lamina obovata, coriacea, 4-5 × ca. 3 cm, apice emarginata, margine integra, basi truncata, nervis secundariis 5- vel 6-jugatis. Inflorescentia terminalis, ramosa, ex floribus ca. 10 constans; axe primario 4-5 cm longo,*

*parce stellato-strigoso; pedunculis 5-6 mm longis, dense stellato-strigosis; bracteis 4-5 × ca. 1 mm, anguste oblongis; involucri sub anthesi leviter undulato, margine dentato, 3-4 mm in diam., dense papilloso-strigoso, flores duos sessiles quemque ca. 3 cm in diam. includente. Flos sepalis 5 imbricatis coriaceis, leviter laciniatis, ca. 1 × 1 cm; petalis 5 obovatis, glabris, ca. 1.5 × 0.8-1 cm, apice rotundatis*

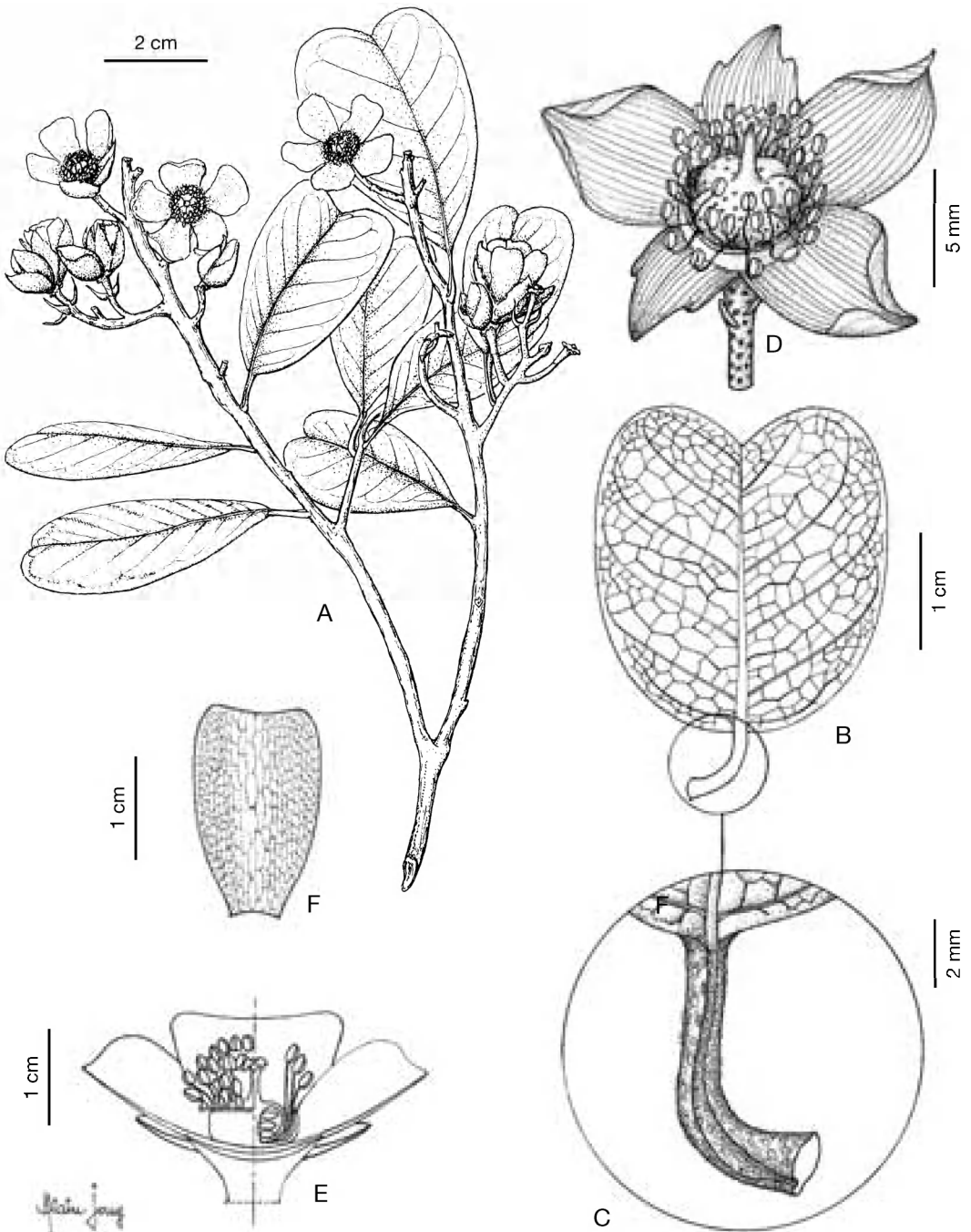


Fig. 2. — *Pentachlaena betamponensis*: **A**, flowering branch; **B**, leaf (abaxial surface); **C**, petiole; **D**, flower at anthesis; **E**, flower (schematic transverse section); **F**, petal. (Service Forestier 9158). — Drawn by A. JOUY and A. BERTHELOT.

*leviter emarginatis, basi breviter unguiculatis; staminibus 150 ad 200 vel plus; ovario 5-loculari subgloboso in alabastro elobato, sub anthesi lobulos celeriter evolvente, dense stellato-strigoso, ca.  $3.5 \times 1.5$  mm; stylo ca. 3 mm longo, ca. 0.5 mm in diam., basi stellato-strigoso. Fructus ignotus.*

**TYPUS.** — Réserves Naturelles (Razanaparany) 9158, Madagascar, Prov. Toamasina, Betampona RNI, [17°55'S, 49°13'E], 12 Nov. 1957, fl. (holo-, P!; iso-, TEF).

Trees (height unknown). Twigs covered with stellate indumentum. Leaves obovate, brown above, greenish-brown below (in dry material), coriaceous,  $4.5 \times 3$  cm, with scattered papillate stellate indumentum with curly branches on abaxial surface, later becoming glabrous to subglabrous, apex emarginate, margin entire, base truncate, venation brochidodromous, with 5-6 pairs of secondary veins, midrib weakly channeled above, raised below; petiole 0.8-1.2 cm long, with sparse stellate indumentum, adaxially canaliculate; stipules unknown, caducous, scars inconspicuous. Inflorescences terminal, branched, with ca. 10 flowers, primary axes 4-5 cm long, sparsely stellate-strigose, peduncles 5-6 mm long, densely stellate-strigose; bracts  $4.5 \times 1$  mm, narrowly oblong; involucre in flower weakly undulate, margin toothed, 3-4 mm in diam., densely papillate strigose, enclosing 2 sessile flowers each ca. 3 cm in diam.; sepals 5, imbricate, coriaceous, margin slightly laciniate, ca.  $1 \times 1$  cm, glabrous and papyraceous where covered by adjacent sepals, densely stellate strigose where exposed; petals 5, contorted in opposite direction from sepals, obovate, glabrous,  $1.5 \times 0.8$ -1 cm, apex rounded, slightly notched, claw short; extrastaminal disc 1 mm high, with an irregular margin; stamens ca. 150-200 or more, filaments ca. 5 mm long, anthers  $1 \times 1$  mm, basifixed; ovary subglobose, not lobed in bud, but becoming so at anthesis, densely stellate-strigose,  $3.5 \times 1.5$  mm, locules 5, number of ovules unknown; style 3 mm long, 0.5 mm in diam., stellate-strigose at base, stigma crateriform with a distinctly undulate margin. Fruits unknown. — Fig. 2.

This species, known only by the type specimen collected at Betampona RNI (Fig. 3), is easily dis-

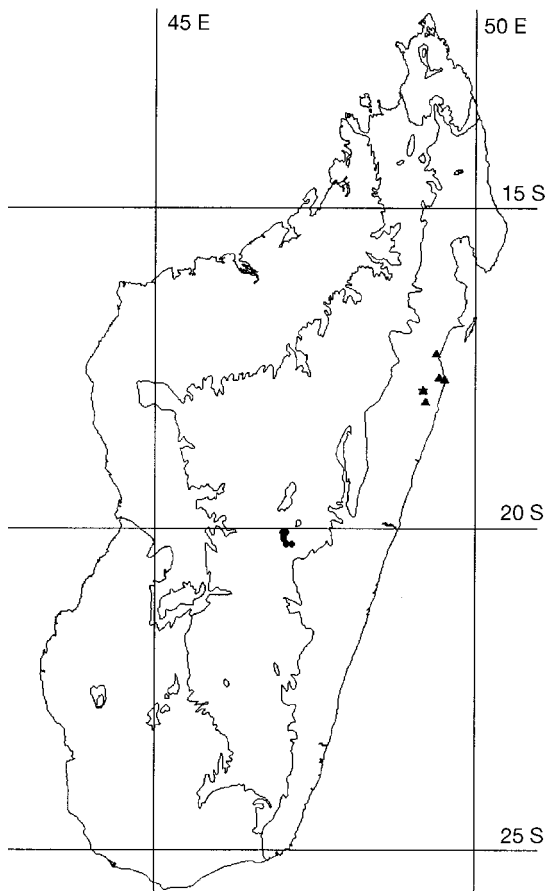


Fig. 3. — Distributions of *Pentachlaena*, mapped on the simplified bioclimatic zones of Madagascar (SCHATZ in press, after CORNET 1974). *P. betamponensis* (★), *P. latifolia* (●), *P. orientalis* (▲).

tinguished by its comparatively small, obovate leaves and branched, 10-flowered inflorescence. It also differs from the other humid forest member of the genus, *P. orientalis*, by its smaller flowers and entire rather than distinctly laciniate bracts.

**VERNACULAR NAME.** — Amaninombilahy.

## 2. *Pentachlaena latifolia* H. Perrier

Bull. Mus. Nat. Hist. Nat. 26: 669 (1920). — Type: *Perrier de la Bathie* 13096, Madagascar, Prov. Antananarivo, rocaïlles, quartzite, Mt. Ibity, 1500 m, [20°07'S, 47°01'E], Apr. 1920 (holo-, P!; iso-, K!, MO!, P!).

*Pentachlaena latifolia* is restricted to quartzite substrates in the Ibity and Analabe massifs (Fig. 3), forming shrubs to small trees (5–6 m tall) that can be distinguished by their broadly elliptic to orbicular leaves, and flowers that are subsessile or borne on short peduncles less than 8 mm long, and subtended by short, entire to slightly dentate bracts. This species appears to be able to tolerate fires by forming new shoots from the base after burning. *Pentachlaena latifolia* has been collected recently at Ibity, but has never been recorded in any of Madagascar's protected areas.

MATERIAL EXAMINED. — *Bernardi* 11591, Col des Tapias; *Dorr* 4524, Ibity; *Lowry & Schatz* 4818, Ibity; *Morat* 3194, Ibity; *Perrier de la Bâthie* 1998, Ibity; 2112, Bois des Tapias, 13096, 17903, 18499, Ibity; *Rakotozafy* 435, Ibity; *Service Forestier* 22668, Ambohimanjaka-Fierenantsoa, 23490, Analabe-Ampanadianambilapa, 27393, Analabe; *Viguié* 1496, Ambohiponana.

### 3. *Pentachlaena orientalis* Capuron

*Adansonia*, sér. 2, 13: 289 (1973). — Type: *Service Forestier* (Capuron) 8628, Madagascar, Prov. Toamasina, forêt sublittorale sur sable, à Tampolo [STF], au N de Fénérive, [17°17'S, 49°23'E], Nov. 1953 (holo-, P!; iso-, G!, K!, MO!, P [3 sheets]!, TEF).

*Pentachlaena orientalis* occurs in humid forest on sand and laterite, and is known only from Tampolo STF, Analalava W of Foulpointe, and Betampona RNI (Fig. 3). This large tree can reach 25–30 m in height and 80–90 cm dbh (CAPURON 1973), and is easily recognized by its large, elliptic and strongly discolorous leaves, and flowers that are borne on peduncles at least 15 mm long and subtended by distinctly lacinate bracts. *Pentachlaena orientalis* is

known from only seven collections, the most recent of which was made in 1963.

VERNACULAR NAMES. — Ampody, Tainenaka.

MATERIAL EXAMINED. — *Réserves Naturelles* 5917, Betampona RNI; *Service Forestier* 8628, 12580, Tampolo STF, 19920, Antsaravy, 22108, Mangalimaso, 22778, Analalava.

### PERRIERODENDRON Cavaco

*Bull. Mus. Natl. Hist. Nat.*, sér. 2, 23: 138 (1951).

TYPE. — *Perrierodendron boinense* (H. Perrier) Cavaco.

Cavaco (1951) described *Perrierodendron* based on a species originally assigned to *Eremolaena* by PERRIER DE LA BÂTHIE (1925), but which was clearly distinct from that genus on the basis of several features, especially the presence of an indehiscent, 2-locular fruit subtended by an accrescent, entire involucre. CAPURON (1970) mentioned two additional species, but declined to describe them for lack of sufficient material. J.-F. LEROY began preparing a manuscript describing these and two additional new species shortly after CAPURON's death in 1971, but it remained unpublished at the time he passed away in early 1999. A careful re-evaluation of his work and comparison of the material of *Perrierodendron* now available shows that five well delimited species can indeed be recognized, four of which are newly described here. Two of these taxa are represented by several collections in flower and fruit, and although the other two are known from very limited material, they appear to be amply distinct to justify describing them at this time.

### Key to the species of *Perrierodendron*

1. Leaves and petioles pubescent even when mature, indumentum totally covering the abaxial surface; lateral branches with leaf scars almost as wide as the stem, internodes 1.5–3(–4) mm long, giving the stem an evident “zig-zag” appearance; involucre in fruit forming a minute cupule, apex of fruit tapering into a prominent rostrum ca. 1/2 the length of the fruit body; Tapia woodland on quartzite, Itremo. 4. **P. quartzitorum**
- 1'. Leaves and petioles sparsely pubescent to glabrescent; lateral branches with leaf scars less than 1/2 as wide as the stem, internodes at least (3–)6–12 mm long, branches not distinctly “zig-zag”; involucre in fruit forming an evident cupule, apex of fruit rounded or with a short rostrum not exceeding 1/4 the length of the fruit body ..... 2
2. Flowers borne individually at the apex of an unbranched peduncle (5–)9–14 mm long, each peduncle borne singly in the axil of a highly reduced leaf (resembling a bracteole) on a short, naked branchlet; dry forest on sand, lower Rodo (= Irodo) basin ..... 5. **P. rodoense**

2. Flowers sessile or subsessile, solitary or several borne along a distinct inflorescence axis (some flowers abortive but leaving an evident scar) ..... 3
3. Leaves shiny above, with scattered stellate indumentum mostly on the primary and secondary veins; inflorescence axes usually 2-5 cm long; fruit obovoid, weakly bi-lobed toward the apex, 2-seeded, covered with very short stellate indumentum, stamens not persistent; involucre reflexed, margin undulate ..... 2. **P. capuronii**
- 3'. Leaves dull above, covered with dense stellate indumentum throughout (nearly glabrescent in some old leaves); inflorescence axes less than 1.5 cm long or flowers solitary and subsessile; fruit ovoid, unlobed, 1-seeded, evidently woolly hirsute with stellate hairs comprising short and much elongated branches, base surrounded by the persistent stamens; involucre appressed to the fruit, forming a distinct cupule, sometimes asymmetrically accrescent ..... 4
4. Fruit exocarp distinctly ribbed on outer and inner surfaces, apex acute, with a short, blunt protuberance, endocarp thick, almost bony; sepals ca. 8-9 mm long; petals ca. (10-)11-13 mm long; dry forest, Analalava, Bongolava, Ankarafantsika RNI ..... 1. **P. boinense**
- 4'. Fruit exocarp smooth (unribbed) on outer and inner surfaces, apex extended into a short, conic rostrum, endocarp thin, crustaceous; sepals ca. 5-6 mm long; petals ca. 8-9(-10) mm long; dry forest, Ambasy, Ingaro, Isalo PN, Sakaraha ..... 3. **P. occidentalis**

### Clé des espèces de *Perrierodendron*

1. Feuilles et pétioles pubescents même à maturité, indument couvrant entièrement la face abaxiale ; cicatrices foliaires sur les rameaux latéraux à peu près aussi larges que le rameau, entre-nœuds long de 1,5-3 (-4) mm, donnant aux rameaux une apparence évidente en « zig-zag » ; fruit à involucre en cupule minuscule, apex du fruit atténué en un rostre proéminent ca. 1/2 de la longueur du corps de fruit ; bois de Tapia sur quartzite, Itremo ..... 4. **P. quartzitorum**
- 1'. Feuilles et pétioles éparsement pubescents à glabrescents ; rameaux latéraux avec des cicatrices foliaires couvrant moins de la moitié de la largeur des rameaux, entre-nœuds (3-)6-12 mm de long, rameaux n'ayant pas une apparence en « zig-zag » ; fruit à involucre en cupule évidente, apex du fruit arrondi ou avec un rostre court ne dépassant pas 1/4 de la longueur du corps du fruit ..... 2
2. Fleurs naissant individuellement au sommet d'un pédoncule non ramifié long de (5-)9-14 mm, les pédoncules solitaires à l'aisselle d'une feuille extrêmement réduite (ressemblant à une bractéole) sur un petit rameau nu ; forêt sèche sur sable, bassin inférieur de la Rodo (= l'Irodo) ..... 5. **P. rodoense**
- 2'. Fleurs sessiles ou subsessiles, solitaires ou regroupées sur un axe inflorescentiel distinct (quelques fleurs peuvent avorter en laissant une cicatrice bien visible) ..... 3
3. Feuilles brillantes dessus, portant un indument étoilé épars surtout sur les nervures primaires et secondaires ; axes inflorescentiels habituellement de 2-5 cm de longueur ; fruit obovoïde, faiblement bilobé vers le sommet, 2-séminé, couvert d'un indument étoilé très court, étamines non persistantes ; involucre réfléchi, marge ondulée ..... 2. **P. capuronii**
- 3'. Feuilles mates dessus, entièrement couvertes d'un dense indument étoilé (quelques vieilles feuilles presque glabrescentes) ; axe inflorescentiel de moins de 1,5 cm de longueur ou fleurs solitaires et sessiles ; fruit ovoïde, non lobé, 1-séminé, couvert d'un indument hirsute laineux composé de poils étoilés formés de branches courtes et plus longues, base entourée par les étamines persistantes ; involucre appliqué sur le fruit, formant une véritable cupule, parfois asymétriquement accrescent ..... 4
4. Exocarpe du fruit distinctement côtelé sur les surfaces externes et internes, apex aigu, avec une protuberance courte peu visible, endocarpe épais, presque osseux ; sépales d'environ 8-9 mm de longueur ; pétales d'environ (10-)11-13 mm de longueur ; forêt sèche, Analalava, Bongolava, RNI d'Ankarafantsika ..... 1. **P. boinense**
- 4'. Exocarpe du fruit lisse sur les deux faces, apex étendu en un rostre conique court, endocarpe mince, caracté ; sépales d'environ 5-6 mm de longueur ; pétales d'environ 8-9(-10) mm de longueur ; forêt sèche, Ambasy, Ingaro, PN d'Isalo, Sakaraha ..... 3. **P. occidentalis**

### 1. *Perrierodendron boinense* (H. Perrier) Cavaco

Bull. Mus. Natl. Hist. Nat., sér. 2, 23: 138 (1951). — *Eremolaena boinensis* H. Perrier, Bull. Soc. Bot. France 72: 311 (1925). — Lectotype (here designated): *Perrier de la Bâthie 3031*, Madagascar, Prov. Mahajanga, Bongolava, [15°46'S, 47°23'E], Nov. 1906 (P!; islecto-, K!, P!, TAN).

*Perrierodendron boinense* is distributed in dry, deciduous forest from Analalava to Bongolava and Ankarafantsika RNI (Fig. 4), apparently on sandy substrates. It resembles and is probably closely related to *P. occidentalis*. Diagnostic characters include its distinctly ribbed fruit with a blunt protuberance at the apex and a thick,

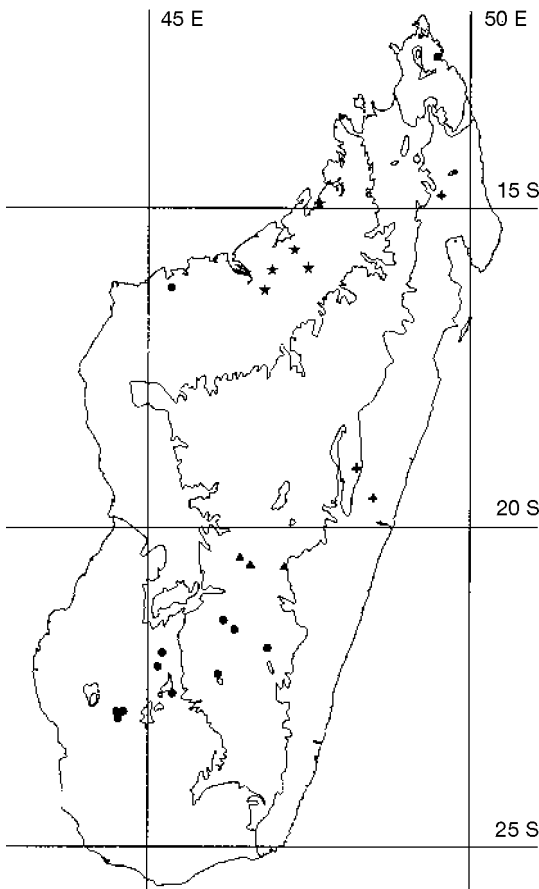


Fig. 4. — Distributions of *Perrierodendron*, mapped on the simplified bioclimatic zones of Madagascar (SCHATZ in press, after CORNET 1974). *P. boinense* (★), *P. capuronii* (+), *P. occidentalis* (●), *P. quartzitorum* (▲), *P. rodoense* (■).

almost bony endocarp, and sepals that are ca. 8-9 mm long and petals ca. (10-)11-13 mm long. *Perrierodendron boinense*, known from ten gatherings, has been collected several times within the last decade, including twice at Ankarafantsika RNI.

PERRIER DE LA BÂTHIE (1925) cited two of his own collections when he described *Eremolaena boinensis*, one of which (3031) has immature fruits and is here selected as the lectotype; the other material (1644) is assigned to *Perrierodendron occidentalis*.

**MATERIAL EXAMINED.** — *Perrier de la Bâthie* 3031, Bongolava; *Réserves Naturelles* 1055, 4741, Ankarafantsika RNI; *Service Forestier* 3-R-215,

Ampijoroa STF, 67, without precise locality, 18794, Ambarijebay Atsimo, 19251, Betaramahamay, 34400, Ampijoroa STF, 34759, 34825, Ankarafantsika RNI.

## 2. *Perrierodendron capuronii* J.-F. Leroy, Lowry, Haevermans, Labat & G.E. Schatz, **sp. nov.**

*Arbor* ca. 20 m alta. *Folia* petiolo 0.7-1. cm longo, parce stellato-pubescente; lamina obovata, chartacea subcoriaceave, (2.5-)5-9 × (2.5-)4-6.5 cm, utrinque indumento stellato praesertim secus nervos primarios secundariosque parce induta, apice rotundata vel leviter emarginata, margine irregulariter subundulata, basi truncata subcordata, nervis secundariis 7- ad 9-jugatis. Inflorescentia axillaris ex floribus 1 ad 7 constans, interdum in axilla inter ramulum et axin florem solitarium gerens; axe primario 1-5 cm longo, parce stellato-strigoso; pedunculis 1-3 mm longis, indumento stellato dense obtectis; involucri sub anthesi undulato, 1.5-2. mm in diam., dense papilloso-strigoso, flores sessiles unum duosve quemque ca. 2.5 cm in diam. includente. Flos sepalis 5, imbricatis, coriaceis, integris, asymmetricis, duobus externis ca. 1.5 × 1.5 mm, tribus internis ca. 8 × 6-9 mm; petalis 5, obovatis, ca. 15 × 8 mm, ut videtur glabris sed sub lente utrinque trichomatibus papillosis dispersis indutis visis, apice rotundatis emarginatis; staminibus 45 ad 50; ovario imperfecte biloculari in quoque loculo ovula duo gerente, breviter conico, a basi usque ad styli basin dense piloso, ca. 2 × 3 mm; stylo glabro, ca. 5 mm longo, ca. 1 mm in diam. Fructus obovoideus, apicem rotundatum versus leviter bilobus, 0.8-1.3 × 0.8-1.2 × 0.7-1 cm, laevis (eporcat); exocarpio tenui dense breviter stellato-strigoso; involucri sub fructu reflexo, maturitate 0.6-1 cm in diam., irregulariter undulato; seminibus in quoque loculo uno duobusve.

**TYPUS.** — *Service Forestier* 9279, Madagascar, Prov. Antsiranana, Amponaomby, Andapa, [14°48'S, 49°33'E], 3 Dec. 1953, fl. (holo-, P!; iso-, P!, TEF).

Trees 20 meters tall, bole to 8 m, bark with slight cracks. Young twigs with dense stellate indumentum toward apex. Leaves obovate, brown above, greenish-brown below (in dry material), chartaceous to subcoriaceous, (2.5-)5-9 × (2.5-)4-6.5 cm, with sparse stellate indumentum mostly on the primary and secondary veins of both surfaces, apex rounded to slightly emarginate, margin irregularly and weakly undulate, base truncate to subcordate, venation brochidodromous, with 7-9 pairs of alternate to subopposite secondary veins, midrib weakly channeled above, raised below; petiole 0.7-1 cm long,

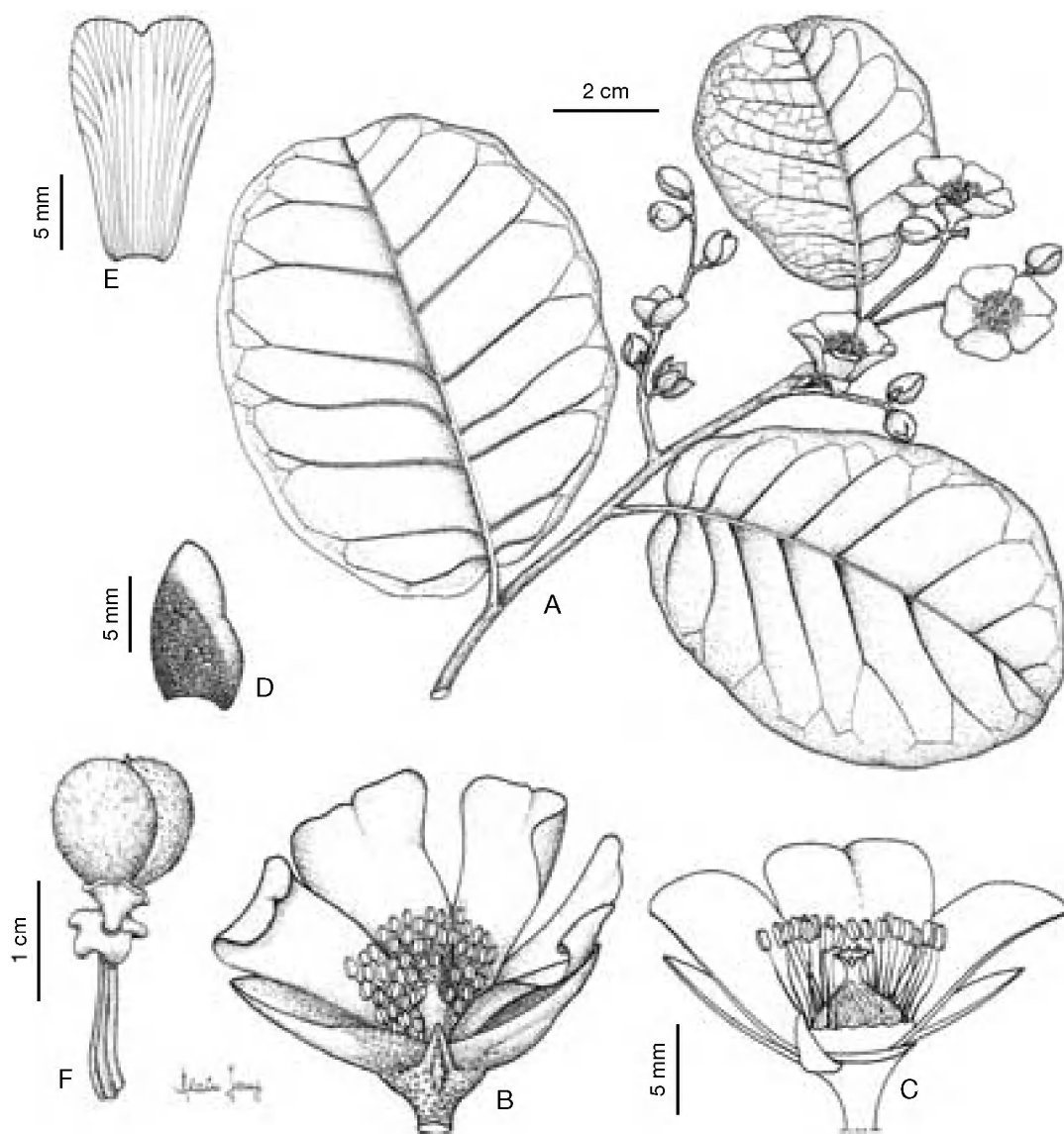


Fig. 5. — *Perrierodendron capuronii*: **A**, flowering branch; **B**, flower at anthesis; **C**, flower (schematic transverse section); **D**, sepal; **E**, petal; **F**, fruit. (A-E, Service Forestier 9279; F, Service Forestier 26658).

sparsely stellate, adaxially canaliculate; stipules unknown, caducous, scars inconspicuous. Inflorescences axillary, with 1-7 flowers, primary axis 1-5 cm long, sparsely stellate-strigose, sometimes also with a single axillary flower borne between the stem and the inflorescence axis; bracts not seen; peduncles 1-3 mm long, densely covered with stellate indumentum, involucre in

flower undulate, 1.5-2 mm in diam., densely papillate-strigose, containing 1 or 2 sessile flowers each ca. 2.5 cm in diam.; sepals 5, imbricate, coriaceous, entire, asymmetrical, the 2 small external ones  $1.5 \times 1.5$  mm, deltoid, the 3 internal ones  $8 \times 6-9$  mm, glabrous and papyraceous where covered by the adjacent sepal, densely stellate-strigose below where exposed; petals 5, con-

torted in opposite direction from sepals, obovate, 15 × 8 mm, appearing glabrous but with scattered papillose hairs on both surfaces, apex rounded, notched; extrastaminal disc cupuliform, 1 mm high, with an irregular margin; stamens ca. 45-50, not persistent in fruit, filaments ca. 1 cm long, glabrous, anthers 1 × 1 mm, basifixed; ovary shortly conical, densely pilose (glabrous at the base of the style), 2 × 3 mm, with 2 incomplete locules each containing 2 ovules; style glabrous, ca. 5 mm long, 1 mm in diam., stigma 1-1.5 mm long, crateriform, margin distinctly undulate. Fruits obovoid, weakly bi-lobed toward the rounded apex, 0.8-1.3 × 0.8-1.2 × 0.7-1 cm, smooth (without ridges), exocarp thin, densely short stellate-strigose, endocarp thin, involucre reflexed, 0.6-1 cm in diam. at maturity, irregularly undulate; seeds 1-2 per locule, spherical to hemispherical (depending on the number), 5-6 mm long, brown, endosperm lacking, cotyledons contorted, radicle included, ca. 5 mm long. — Fig. 5.

*Perrierodendron capuronii* is known from only three collections, the type gathering, which is in flower, and two paratypes, one with numerous fruits and only a few partially damaged, detached leaves, and another from the same area with a few very young fruits and numerous well preserved leaves that closely match those of the holotype. We associate the holotype with the other collections based primarily on similarities in their inflorescence structure and leaf color, texture and venation, as well as the fact that the blade is distinctly shiny on its adaxial surface. The sites at which the paratype collections were made near Moramanga are over 400 km to the SSW of the type locality (Fig. 4), and may be situated closer to sea level. However, until additional material at other stages of development becomes available from either or both areas, it seems best to treat them as belonging to a single species.

*Perrierodendron capuronii* can be distinguished from other members of the genus by its leaves with a shiny adaxial surface, its obovoid and weakly bi-lobed, 2-seeded fruit covered with very short stellate indumentum, and its reflexed involucre with an undulate margin.

ETYMOLOGY. — The specific epithet honors the renowned forest botanist René CAPURON, who contributed so much to our understanding of the Malagasy flora, and who took a special interest in the taxonomy and morphology of the island's endemic plant families.

VERNACULAR NAMES. — Ampaliala, Tanantanampotsy.

PARATYPES. — MADAGASCAR, *Prov. Toamasina*: SF 25523, Anosibe an'Ala, Ambatoafo, Fiadanana, [19°32'S, 48°30'E], 18 Feb. 1965, ster. (K, MO, P, TEF); SF 26658, Moramanga, Toby-Andasimanara, [19°04'S, 48°14'E], 900 m, 6 Feb. 1968, fr. (P[2 sheets], TEF).

### 3. *Perrierodendron occidentale* J.-F. Leroy, Lowry, Haevermans, Labat & G.E. Schatz, **sp. nov.**

*Arbor 3-20 m alta. Folia petiolo (0.3-)0.5-1(-1.5) longo, indumento stellato obecto; lamina obovata usque elliptica, chartacea, 3-6.5(-8) × 2-5 cm, utrinque indumento stellato parce induta, apice truncata retusa obtusave, margine integra vel irregulariter subundulata, basi truncata obtusa emarginatave, nervis secundariis 5-ad 10-jugatis. Inflorescentia axillaris ex floribus 1 ad 5 constans, aliquando in axilla inter ramulum et axin florem solitarium gerens; axe primario 0.5-2 cm longo, parce stellato-strigoso; pedunculis 1-5 mm longis, indumento stellato dense obectis; involucre sub anthesi ca. 2 mm in diam., dense papilloso-strigoso, florem sessilem solitarium ca. 2.5 cm in diam. includente. Flos sepalis 5, imbricatis, coriaceis, asymmetricis, duobus externis ca. 3 × 1 mm, tribus internis 5-6 × ca. 4 mm; petalis 5, obovatis, 8-9(-10) × ca. 6 mm, glabris, apice rotundatis emarginatis, basi breviter unguiculatis; staminibus 50 ad 55 in fructu persistentibus; ovario imperfecte biloculari in quoque loculo ovula duo gerente, breviter conico, a basi usque ad styli basin dense piloso, ca. 3.5 × 3 mm; stylo glabro, ca. 3.5 mm longo, ca. 1 mm in diam. Fructus late obovoideus, apice in rostrum brevem conicum productus, 1.2-1.5 × 0.7-0.9 cm, exocarpio tenui, crustaceo, utrinque laevi (eporcato), trichomatibus stellato-strigosis ramulos 1-2 mm longos gerentibus vestito; involucre maturitate ca. 0.7 cm in diam. cum staminum reliquiis persistentibus cupulam sub fructu formante; seminibus in quoque fructu uno duobusve.*

TYPUS. — *Service Forestier (Capuron) 20603*, Madagascar, *Prov. Toliara*, forêt d'Analamarina (Hazoroa) au sud-est de Sakaraha, [23°00'S, 44°33'E], 500-600 m, 28 Dec. 1961, fr. (holo-, P!, iso-, P!, TEF).

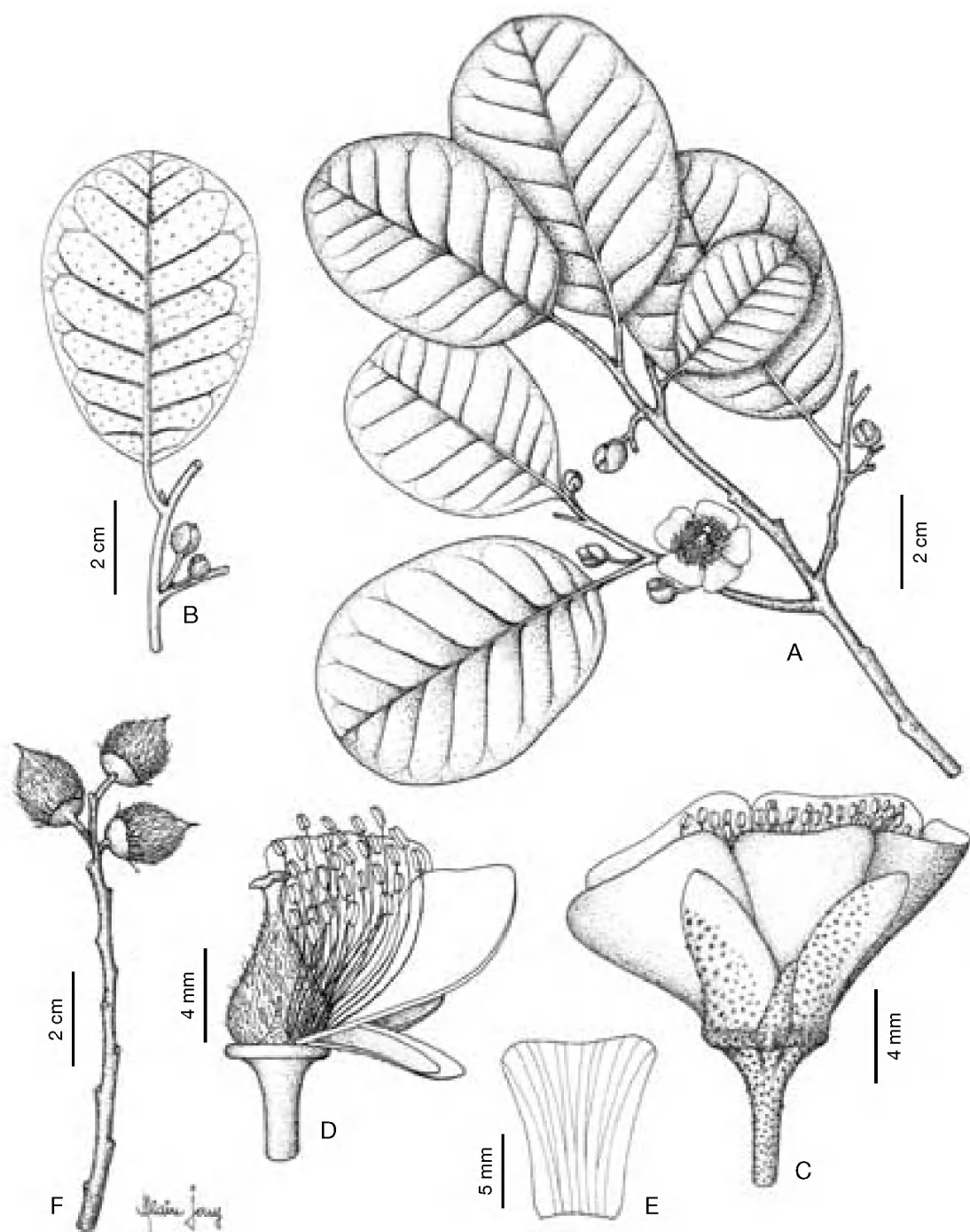


Fig. 6. — *Perrierodendron occidentale*: **A**, flowering branch; **B**, leaf (abaxial surface) and flower buds; **C**, flower at anthesis; **D**, flower (some parts removed to show gynoeceum); **E**, petal; **F**, fruits. (A-E, *Perrier de la Bâthie* 1644; F, *Service Forestier* 20603).

Trees 3-20 m tall. Young twigs with stellate indumentum. Leaves obovate to elliptical, dull brown above, dull green below (in dry material), chartaceous, 3-6.5(-8) × 2-5 cm, with scattered stellate indumentum on both surfaces, apex truncate or retuse to obtuse, margin subentire, slightly undulate, base truncate to obtuse or emarginate, venation brochidodromous, with ca. 5-10 pairs of alternate to subopposite secondary veins, midrib weakly channeled above, raised below; petiole (0.3-)0.5-1(-1.5) long, adaxially canaliculate, covered with stellate indumentum; stipules linear, caducous, 1.5-2 mm long. Inflorescences axillary, with 1-5 flowers, primary axis 0.5-2 cm long, sparsely stellate-strigose, occasionally with an axillary flower borne between the stem and the inflorescence axis; peduncles 1-5 mm long, densely covered with stellate indumentum; bracts minute (?), caducous; involucre in flower ca. 2 mm in diam., densely papillate-strigose, containing a single sessile flower ca. 2.5 cm in diam.; sepals 5, imbricate, coriaceous, asymmetrical, the 2 small external ones 3 × 1 mm, narrowly triangular, the 3 larger internal ones ca. 5-6 × 4 mm, glabrous and papyraceous where covered by the adjacent sepals, densely stellate strigose below where exposed; petals 5, contorted in opposite direction from sepals, obovate, ca. 8-9(-10) × 6 mm, glabrous, apex rounded, notched, claw short; disc cupuliform, 0.5 mm high, margin entire; stamens ca. 50-55, persistent in fruit, filament 5 mm long, anthers 1 × 1 mm, basifixed; ovary shortly conical, densely pilose (glabrous at the base of the style), 3.5 × 3 mm, with 2 incomplete locules each containing 2 ovules; style glabrous, 3.5 mm long, 1 mm in diam., stigma 1 mm long, crateriform, margin distinctly undulate. Fruits broadly obovoid, 1.2-1.5 × 0.7-0.9 cm, apex extended into a short conical rostrum, exocarp thin, crustaceous, smooth on outer and inner surfaces, without ridges, branches of stellate-strigose indumentum 1-2 mm long, transparent yellow with a reddish core, endocarp thin, crustaceous; involucre forming a cup with persistent remains of the stamens, 0.7 cm in diam. at maturity; seeds 1-2 per fruit, spherical or hemispherical, 6-9 mm in diam., brown, cotyledons very contorted, radicle included, 3-4 mm long. — Fig. 6.

*Perrierodendron occidentale* is widely distributed in western Madagascar, extending from Isalo

PN to Ambalabe and Analamary in the S, with an outlying population at Manongarivo SSE of Soalala in the NW (Fig. 4). It occurs on sandy substrates in seasonally dry, deciduous forests. With the exception of one collection made in 1973 and another last year, *P. occidentalis* has not been recorded since the early 1960s. This species closely resembles *P. boinense*, but can be distinguished from it by having smooth (unribbed) fruit with the apex extended into a short, conic rostrum, a thin, crustaceous endocarp, and sepals ca. 5-6 mm long and petals ca. 8-9(-10) mm long.

VERNACULAR NAMES. — Fotona, Nato, Tsian-dala, Tsitaka.

PARATYPES. — MADAGASCAR, *Prov. Fianarantsoa*: *Cremers* 3584, Ambasy, ouest Ambalavao, [21°28'S, 46°12'E], 900-1000 m, 9 Dec. 1974, fl. (P[2 sheets], TAN); *Decary* 16384, Isalo PN, [22°08'-22°40'S, 45°10'-45°24'E], 2 Nov. 1940, fl. (P); *Humbert* 19511, Isalo PN, sud de Sahanafa, [22°20'S, 45°18'E], 1000 m, 28 Nov.-4 Dec. 1946, fl. (P[2 sheets]); *SF* 4-R-258, Lalanandro, [22°18'S, 46°06'E], 29 Jan. 1925, ster. (P); *SF* 59-R-141, Ambondrona, [21°54'S, 46°52'E], 9 June 1954, ster. (P); *SF* 74-R-47, Lalanandro, [22°18'S, 46°06'E], 1 June 1952, ster. (P); *SF* 239-R-239, Isalo PN, [22°08'-22°40'S, 45°10'-45°24'E], 23 July 1955, ster. (P); *SF* 13761, Massif d'Ingaro, Ambalavao, [21°36'S, 46°22'E], 13 Feb. 1955, fr. (P, TEF), *SF* 13878, Isalo PN, [22°11'-22°43'S, 45°10'-45°21'E], 22 Jul. 1955, ster. (P, TEF). *Prov. Mahajanga*: *Perrier de la Bâthie* 1644, Manongarivo (Ambongo), [16°16'S, 45°22'E], Nov. 1903, fl. (P). *Prov. Toliara*: *Humbert* 19395, bassin de la Malio (affluent de Mangoky), près d'Ambalabe, [21°58'S, 45°15'E], 400-450 m, 23-27 Nov. 1946, fl. (P[2 sheets]); *Randrianaivo et al.* 315, Zombitse PN, 12 km E of Sakaraha, 1 km N of Andranomaitso, 23°53'07"S, 44°38'42"E, 600-800m, 4 Feb. 1999, fr. (G, K, MO, P, TAN); *SF* 5-R-350, Sakaraha STF, [22°53'S, 44°32'E], 24 Feb. 1956, ster. (P); *SF* (Capuron) 20599, Analamary, forêt d'Analamarina (Hazoroa), au sud-est de Sakaraha, [23°00'S, 44°33'E], 28 Dec. 1961, bud (P).

#### 4. *Perrierodendron quartzitorum* J.-F. Leroy, Lowry, Haevermans, Labat & G.E. Schatz, **sp. nov.**

*Frutex arbusculave 3-6 m alta. Folia petiolo 0.2-0.5 cm longo, indumento fusco stellato-strigoso dense oblecto; lamina obovata usque elliptica, chartacea subcoriaceave,*

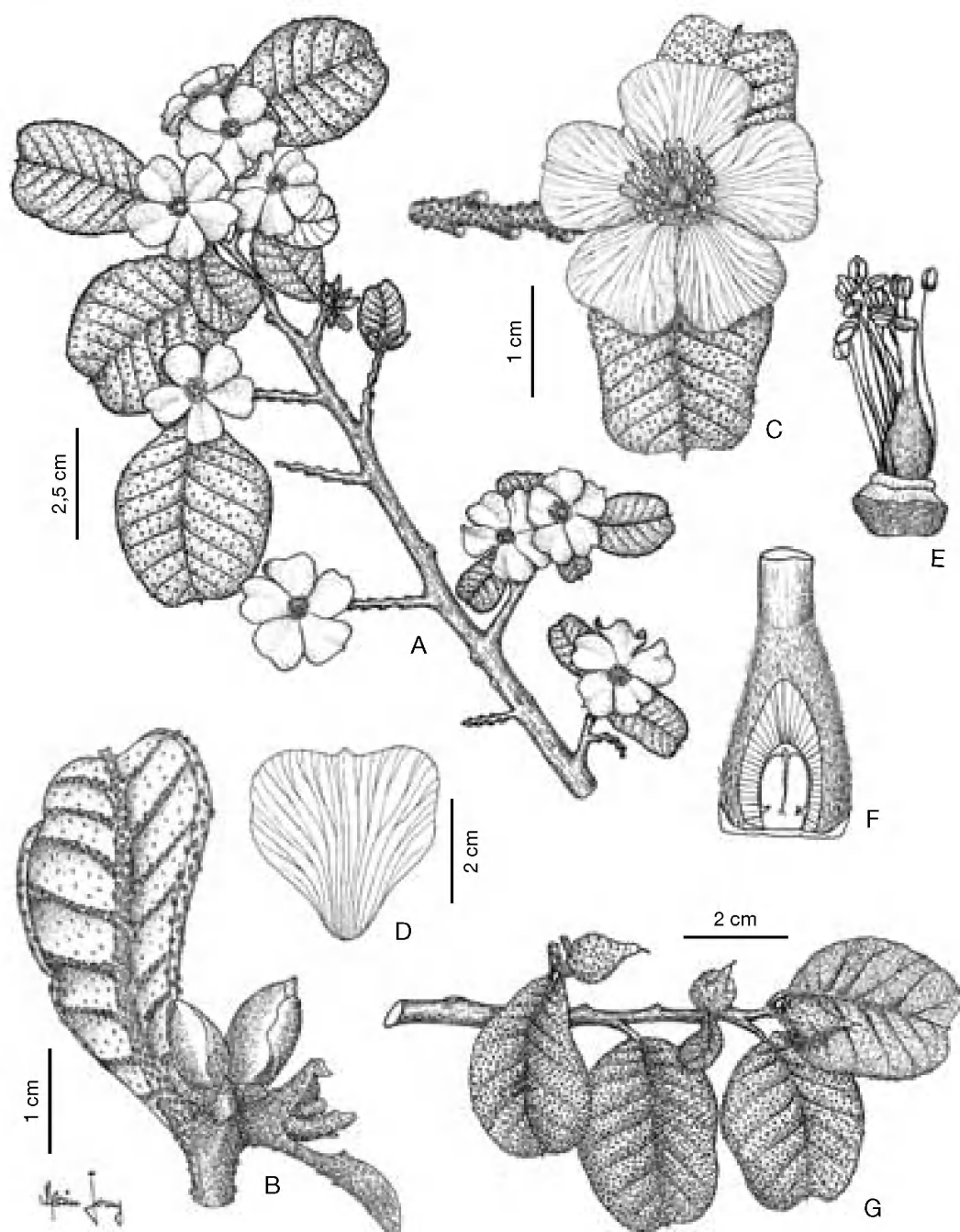


Fig. 7. — *Perrierodendron quartzitorum*: **A**, flowering branch; **B**, young leaf and buds; **C**, flower at anthesis; **D**, petal; **E**, androecium and gynoecium; **F**, gynoecium (portion of wall removed to show ovules); **G**, fruiting branch. (A-G, *Labat et al.* 3035).



Fig. 8. — Photographs of *Perrierodendron quartzitorum*: **A**, habit; **B**, mature fruit; **C**, flowering branch; **D**, flower. (A, B, D, Labat et al. 3035; C, Du Puy et al. M636). — Photos J.-N. LABAT.

2.5-4(-5) × 2-3.5(-4) cm, utrinque indumento fusco stellato dense induta, apice rotundata vel leviter emarginata, mucronata, margine integra, basi truncata usque obtusa, nervis secundariis 7- ad 10- (ad 13-) jugatis. Inflorescentia axillaris, contracta, plerumque ex floribus 1 ad 3 constans; axe primario 3-6 cm longo, dense stellato-strigoso; pedunculis longitudine 1 mm non attingentibus, dense papilloso-strigosis; involucri sub anthesi perparvo vel absente, si adest flores sessiles quemque ca. 3.5 cm in diam. includente. Flos sepalis 5, imbricatis, coriaceis, integris, asymmetricis, duobus externis 2-3 × ca. 1 mm, tribus internis 10-11 × 5-6 mm, unoquoque in partibus sepalo vicino tectis glabro papyraceoque, in partibus expositis dense stellato-strigoso; petalis 5, obovatis, 15-17 × ca. 14 mm, glabris, apice rotundatis emarginatis, mucronatis; staminibus ca. 20, caducis; ovario imperfecte biloculari in quoque loculo ovula duo gerente, conico, a basi usque ad styli basin dense piloso, ca. 3 × 3 mm; stylo glabro, ca. 2 mm longo, ca. 1 mm in diam. Fructus conicus, apice acutus, 1.9-2.5 × 0.9-1.1 cm, indumento papilloso stellato dense oblecto; endocarpio crustaceo; involucri in fructu parvo vel absente; semine in quoque fructu uno (vel rare seminibus duobus).

TYPUS. — Labat, Haevermans, Rabenantoandro & Cook 3035, Madagascar, Prov. Fianarantsoa, Ambatofinandrahana, Itremo, forêt claire sclerophylle à *Perrierodendron* et *Leptolaena* sur sol sableux sur schiste, 20°35'31"S, 46°35'43"E, 1560 m, 26 Mar. 1999, fl., fr. (holo-, P!; iso-, G!, K!, MO!, P [2 sheets]!, TAN!).

Shrubs to small trees 3-6 m. Twigs with stellate indumentum, internodes 1.5-3(-4) mm long, giving the stems an evident "zigzag" appearance. Leaves elliptical to obovate, dark green above, pale green below (in dry material), chartaceous to subcoriaceous, 2.5-4(-5) × 2-3.5(-4) cm, with dense stellate brown indumentum on both surfaces, apex rounded to slightly emarginate, mucronate, margin entire, base truncate to obtuse, venation eucamptodromous, with 7-10 (-13) pairs of alternate to subopposite secondary veins, midrib and secondary veins weakly chan-

neled above, raised below; petiole 0.2-0.5 cm long, densely brown stellate-strigose, adaxially canaliculate; stipules not seen. Inflorescences axillary, contracted, generally with 1-3 flowers, primary axis 3-6 cm long, densely stellate-strigose; peduncles very short, less than 1 mm long, densely papillate strigose; involucre in flower very small to absent, containing 2 sessile flowers each ca. 3.5 cm in diam.; sepals 5, imbricate, coriaceous, entire, asymmetrical, the 2 small external ones, 2-3 × 1 mm, narrowly triangular, the 3 internal ones 10-11 × 5-6 mm, glabrous and papyraceous where covered by the adjacent sepal, densely stellate strigose where exposed; petals 5, contorted in opposite direction from sepals, obovate, 15-17 × 14 mm, glabrous, apex rounded, notched, mucronate, claw short; extrastaminal disc cupuliform, 1 mm high; stamens ca. 20, not persistent in fruit, filaments 4-5 mm long, anthers 1 × 1 mm, basifixed; ovary conical, densely pilose (glabrous from the base of the style), 3 × 3 mm, with two incomplete locules each containing 2 ovules; style ca. 2 mm long, 1 mm in diam., forming an extension of the conical ovary, stigma 1 mm long, crateriform, margin distinctly undulate. Fruits conical, apex acute, 1.9-2.5 × 0.9-1.1 cm, with dense papillate stellate indumentum; endocarp crustaceous, involucre small to absent; seeds 1(-2), spherical to hemispherical, ca. 0.8 cm in diam., light brown (in spirit material), aborted ovules 3, persistent, embryos 1-2 per seed, cotyledons very contorted, radicle included, 1 mm long. — Figs. 7, 8.

*Perrierodendron quartzitorum* is restricted to the Itremo massif (Fig. 4), where it has been collected several times recently. This species is easily recognized by the dense, stellate indumentum that covers the abaxial surface of its leaves, its short internodes that give an evident “zig-zag” appearance to the stems, and its fruit whose apex tapers into a prominent rostrum about half the length of the fruit body.

VERNACULAR NAMES. — Kitoto, Kitotovavy.

PARATYPES. — MADAGASCAR, *Prov. Fianarantsoa: Du Puy, Labat & Andriantiana M636*, W of Ambositra, Itremo, 20°35'28"S, 46°35'40"E, 1500 m, 21 Nov. 1993, fl. (K, MO, P, TAN, TEF); *Humbert*

30023, montagnes à l'Ouest d'Itremo, [20°28'-20°49'S, 46°26'-46°41'E], 1500-1700 m, 17-22 Jan. & 18-22 Apr. 1955, fl. (P); *Service Forestier (Capuron) 11567*, Monts Ambatomenaloha, ouest d'Itremo, audessus d'Antanimena, [20°32'S, 46°33'E], 20 Jan. 1955, y. fr. (K, MO, P[2 sheets], TEF), *SF (Capuron) 28902*, environs du col de l'Itremo, ouest d'Ambatofinandrahana, [20°35'S, 46°35'E], 1600-1700 m, 27 Nov. 1969, fl. (P, TEF), *SF (Capuron) 29045*, montée du col de l'Itremo, Ambatofinandrahana, rive droite de l'Ambatorangotana, [20°35'S, 46°35'E], 1650-1700 m, 21 Feb. 1970, fr. (B, BR, G, K, MO, P[2 sheets], WAG).

### 5. *Perrierodendron rodoense* J.-F. Leroy, Lowry, Haevermans, Labat & G.E. Schatz, **sp. nov.**

*Arbor 10-12 m alta, usque ad 50 cm in diam. Folia petiolo 0.5-0.8(-1) cm longo, indumento stellato parce induto; lamina obovata, chartacea subcoriacea, (2.6-) 3.2-4(-5.3) × 2.9-3.1(-5) cm, utrinque pubescentia stellata parce induta, apice obtusa rotundatave, margine integra vel subundulata, basi emarginata, nervis secundariis 6- ad 10-jugatis. Inflorescentia axillaris ex flore solitario pedunculo eramoso (0.5-)0.9-1.4 cm longo bracteola 2-3 mm longa in ramulo nudo 0.5-1.7 cm longo portata subtento insidente constans; involucre sub anthesi undulato, 4-5 mm in diam., dense papilloso-strigoso, florem solitarium ca. 2 cm in diam. includente. Flos sepalis 5, imbricatis, coriaceis, asymmetricis, ovatis usque suborbiculatis, duobus externis ca. 2 × 5 mm, tribus internis 10-12 × 8-10 mm; petalis 5, obovatis, 10-11 × 8-10 mm, glabris, albidis, apice obtusis; staminibus 80 ad 85, caducis; ovario imperfecte biloculari in quoque loculo ovula duo vel tria gerente, subcylindrico, apice acuto, a basi usque ad styli basin dense piloso, ca. 2 × 3 mm; stylo glabro, ca. 2 mm longo. Fructus ignotus.*

TYPUS. — *Service Forestier (Capuron) 23095*, Madagascar, Prov. Antsiranana, forêt d'Analafondro, sur sables, au pied sud-est du plateau Sahafary (bassin inférieur du Rodo), [12°37'S, 49°29'E], 27 Dec. 1963, fl. (holo-, P!; iso-, K!, MO!, P!).

Trees 10-12 m high, to 50 cm dbh. Young twigs with very dense stellate indumentum. Leaves obovate, dark brown above, light brown below (in dry material), chartaceous to subcoriaceous, (2.6-)3.2-4(-5.3) × 2.9-3.1(-5) cm, with sparse stellate pubescence on both surfaces, apex obtuse to rounded, margins entire, slightly undulate, base emarginate, venation brochidodromous, with 6-10 pairs of alternate to subopposite secondary veins, midrib weakly channeled above, raised below; petiole 0.5-0.8(-1) cm long, with

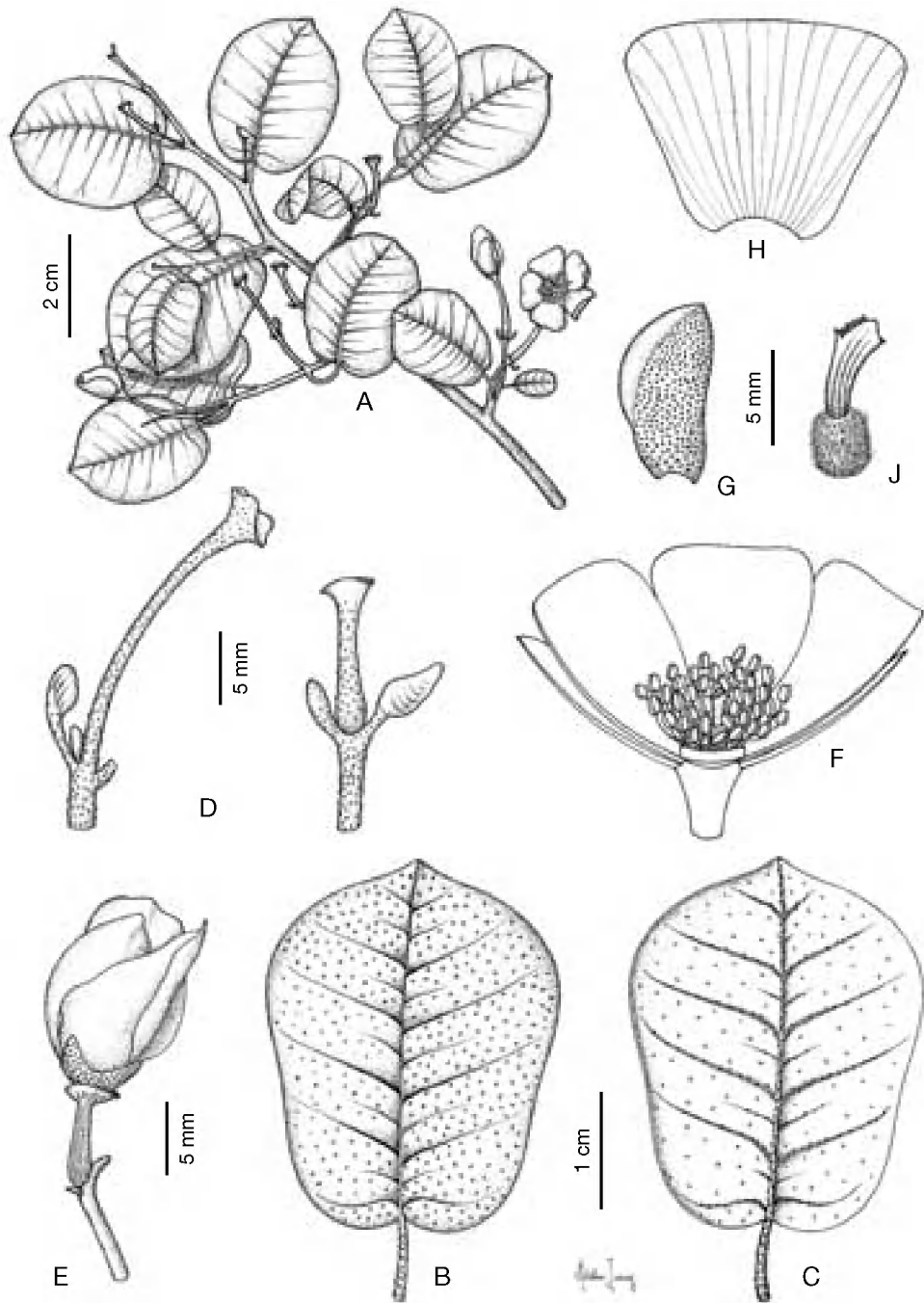


Fig. 9. — *Perrierodendron rodoense*: **A**, flowering branch; **B**, leaf (adaxial surface); **C**, leaf (abaxial surface); **D**, detail of flowering pedicel; **E**, flower bud; **F**, flowers (schematic section); **G**, sepal; **H**, petal; **J**, gynoecium. (A–J, *Service Forestier 23095*).

sparse stellate indumentum, adaxially canaliculate; stipules unknown, caducous, scars inconspicuous. Inflorescences axillary, flowers borne singly at the apex of an unbranched peduncle (0.5-)0.9-1.4 cm long, with a slightly swollen base, subtended by a highly reduced leaf (bracteole) 2-3 mm long borne on a naked branchlet 0.5-1(-1.7) cm long, involucre in flower undulate, 4-5 mm in diam., densely papillate-strigose, containing a single flower ca. 2 cm in diam.; sepals 5, imbricate, coriaceous, asymmetrical, ovate to suborbicular, the 2 small external ones  $2 \times 5$  mm, deltoid, the 3 larger ones  $10-12 \times 8-10$  mm, glabrous and papyraceous where covered by the adjacent sepal, densely stellate-strigose below where exposed; petals 5, contorted in opposite direction from sepals, obovate,  $10-11 \times 8-10$  mm, glabrous, whitish, apex obtuse; extrastaminal disc cupuliform, 1 mm high, margin entire; stamens ca. 80-85, filaments ca. 5 mm long, anthers ca.  $1(-1.5) \times 0.5$  mm, oblong, basifixed; ovary subcylindrical, densely pilose (glabrous from the base of the style), ca.  $2 \times 3$  mm, apex truncate, with 2 incomplete locules each containing 2-3 ovules; style glabrous, ca. 2 mm. long, stigma 2.5-3 mm long, crateriform, margin distinctly undulate. Fruits unknown. — Fig. 9.

This species is known only from the type material, collected in the lower Rodo (= Irodo) basin (Fig. 4). It can be recognized by having flowers that are borne individually at the apex of an unbranched peduncle  $(5-9) \times 14$  mm long and subtended by a highly reduced leaf (bracteole) on a short, naked branchlet.

### Acknowledgements

We are grateful to C. BIRKINSHAW, K. SIKES, S. ANDRIAMBOLOLONERA, J. RAHARIMAMPIONONA and L. ANDRIAMAHEFARIVO for specimen and data management; A. JOUY and A. BERTHELOT for the fine illustrations; R. GEREAU for help with the Latin descriptions; J. RABENANTOANDRO and E. RANDRIANJOAHNY for assistance in the field; S. RAZANAKA for administrative support; Ph. MORAT and his staff for courtesies provided at the Laboratoire de Phanérogamie in Paris, and two anonymous reviewers for valuable comments and suggestions. Field work by PPL and GES was conducted under collaborative agreements between the Missouri

Botanical Garden and the Parc Botanique et Zoologique de Tsimbazaza and the Direction de la Recherche Forestière et Piscicole, FOFIFA, Antananarivo, Madagascar. Work in Madagascar by TH and JNL was carried out under an agreement between the Muséum National d'Histoire Naturelle, Paris and the Centre National de Recherche sur l'Environnement, Antananarivo. We gratefully acknowledge courtesies extended by the Government of Madagascar (Direction Générale de la Gestion des Ressources Forestières) and by the Association Nationale pour la Gestion des Aires Protégées. Participation by PPL, GES and AEW was supported by grants from the U.S. National Science Foundation (DEB-9024749 and DEB-9627072) and from the John D. and Catherine T. MACARTHUR Foundation, the Liz CLAIBORNE and Art ORTENBERG Foundation, and the National Geographic Society.

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*Manuscript received 22 December 1999;  
revised version accepted 3 March 2000.*