Revised treatment of the genus Lijndenia (Melastomataceae, Olisbeoideae) in Madagascar

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Abstract

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Lijndenia Zoll. & Moritzi *(Melastomataceae, Olisbeoideae)* is a small but widespread paleotropical genus of forest shrubs and small trees. In a previous treatment, Jacques-Félix recognized six endemic species of *Lijndenia* in Madagascar, namely *Lijndenia danguyana* (H. Perrier) Jacq.-Fél., *Lijndenia lutescens* (Naudin) Jacq.-Fél., *Lijndenia melastomoides* (Naudin) Jacq.-Fél., *Lijndenia ramiflora* Jacq.-Fél., *Lijndenia roborea* (Naudin) Jacq.-Fél. and *Lijndenia terminalis* Jacq.-Fél. The present work describes and illustrates three new Madagascan species: *Lijndenia acuminata* R.D. Stone, *Lijndenia darainensis* R.D. Stone and *Lijndenia densiflora* R.D. Stone. The name *Lijndenia lutescens* (Naudin) Jacq.-Fél. is found to be illegitimate, and a new name *Lijndenia memecyloides* R.D. Stone is proposed. With these revisions, the flora of Madagascar now holds nine species of *Lijndenia*, for which a formal taxonomic treatment is provided including a dichotomous key. Lectotypes are designated for *Lijndenia danguyana*, *Lijndenia memecyloides* and *Memecylon meeusei* H. Perrier (treated here as a synonym of *Lijndenia memecyloides*). The conservation status of each species is assessed according to the IUCN Categories and Criteria. Given the extensive anthropogenic deforestation of Madagascar, one must consider the possibility that *Lijndenia acuminata*, *Lijndenia densiflora*, *Lijndenia ramiflora* and *Lijndenia terminalis* are already extinct because these four species have not been recollected within the last 50 years. On the other hand, the recent rediscovery of *Lijndenia melastomoides* is remarkable because this species had not been seen since the year 1954.

Résumé

STONE, R.D. (2017). Révision du genre Lijndenia (Melastomataceae, Olisbeoideae) à Madagascar. *Candollea* 72: 67-86. En anglais, résumés anglais et français. DOI: http://dx.doi.org/10.15553/c2017v721a7

Lijndenia Zoll. & Moritzi *(Melastomataceae, Olisbeoideae)* est un petit genre d'arbustes et de petits arbres à distribution paléotropicale. Dans un traitement précédent, Jacques-Félix avait reconnu six espèces endémiques de ce genre à Madagascar, à savoir *Lijndenia danguyana* (H. Perrier) Jacq.-Fél., *Lijndenia lutescens* (Naudin) Jacq.-Fél., *Lijndenia melastomoides* (Naudin) Jacq.-Fél., *Lijndenia ramiflora* Jacq.-Fél., *Lijndenia roborea* (Naudin) Jacq.-Fél. et *Lijndenia terminalis* Jacq.-Fél. Dans le présent travail, trois nouvelles espèces malgaches sont décrites et illustrées: *Lijndenia acuminata* R.D. Stone, *Lijndenia darainensis* R.D. Stone et *Lijndenia densiflora* R.D. Stone. Le nom *Lijndenia lutescens* (Naudin) Jacq.-Fél. est

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illégitime et un nouveau nom, *Lijndenia memecyloides* R.D. Stone, est proposé. Avec ces révisions, la flore de Madagascar comprend actuellement neuf espèces de *Lijndenia*, pour laquelle un traitement taxonomique est fourni, y compris une clef d'identification. Des lectotypes sont désignés ici pour *Lijndenia danguyana*, *Lijndenia memecyloides* et *Memecylon meeusei* H. Perrier (traité ici comme un synonyme de *Lijndenia memecyloides*). Pour chaque espèce, le statut de conservation est évalué selon les Catégories et les Critères de l'UICN. À cause de la déforestation anthropogène à Madagascar, *Lijndenia acuminata*, *Lijndenia densiflora*, *Lijndenia ramiflora* et *Lijndenia terminalis* pourraient être éteintes, car ces quatre espèces n'ont pas été récoltées depuis 50 ans. De plus, la récente redécouverte de *Lijndenia melastomoides* est remarquable du fait que cette espèce n'avait plus été vue depuis 1954.

Keywords

MELASTOMATACEAE – *Lijndenia* – Madagascar – Plant taxonomy – New species – Plant conservation

Introduction

Lijndenia Zoll. & Moritzi *(Melastomataceae, Olisbeoideae)* is a small but widespread paleotropical genus of forest shrubs and small to medium-sized trees (never reaching higher than the subcanopy). Support for the monophyly of *Lijndenia* and its sister-group relationship with the African-Madagascan genus *Warneckea* Gilg were seen in earlier phylogenetic analyses of nuclear GapC gene sequences (Stone, 2006). Subsequent analyses with denser taxonomic sampling and faster-evolving DNA regions (the ITS and 5' ETS regions of nuclear ribosomal DNA) offer added support for the hypothesis that *Lijndenia* and *Warneckea* are distinct from the paleotropical, species-rich genus *Memecylon* L. (Stone & Andreasen, 2010; Stone, 2014). When *Lijndenia* was first described (Moritzi, 1846), the genus was represented by a single species *L. laurina* Zoll. & Moritzi based on a collection made by Zollinger on the island of Java (Indonesia). The arboreal habit, calyx and anthers were said to be like those of *Memecylon*, whereas the separate sexes (dioecy), inflorescences with a pair of persistent bracteoles fused to form a cupule or "false calyx" immediately subtending each flower, and epigynous chamber (top of ovary) lacking interstaminal partitions were said to be sufficient for establishing a new genus, named in honor of Dutch baron and botanical patron D.W.J.C. van Lynden (1813-1852).

Cogniaux (in Boerlage, 1890) later reduced *Lijndenia* to a monospecific section of *Memecylon*, a treatment that he retained in his *magnum opus* on the *Melastomataceae* (Cogniaux, 1891). This remained the status quo until Bremer (1982) resurrected *Lijndenia* and emended it to include four species, namely *L. laurina* from Malesia and the Philippines; *L. capitellata* (Arn.) K. Bremer and *L. gardneri* (Thwaites) K. Bremer from Sri Lanka; and *L. barteri* (Hook. f.) K. Bremer from western and central Africa. The shared characteristics appearing to indicate a close relationship amongst these species include 3-nerved, brown-drying leaves; ramiform foliar sclereids (Rao & Jacques-Félix, 1978; Rao et al., 1983); a distinctly 4-lobed calyx with calyx lobes imbricate; white flowers; top of ovary lacking interstaminal partitions, the epigynous chamber thus appearing smooth; small anthers lacking a dorsal oil-gland; few ovules; and embryo with rolled cotyledons and a short hypocotyl (Jacques-Félix, 1977, 1978a, 1978b; Bremer, 1981). It was further noted that *L. laurina* is not truly dioecious as reported in Moritzi (1846) but is instead androdioecious (i.e., some trees have male flowers only whilst other trees have hermaphrodite flowers).

Jacques-Félix (1985a, 1985b) further expanded the circumscription of *Lijndenia* by adding six species from Madagascar and one from East Africa. Two of these were new species, i.e. *L. ramiflora* Jacq.-Fél. and *L. terminalis* Jacq.-Fél., while the remaining five were transferred from *Memecylon*, as *L. danguyana* (H. Perrier) Jacq.-Fél., *L. lutescens* (Naudin) Jacq.-Fél., *L. melastomoides* (Naudin) Jacq.-Fél., *L. roborea* (Naudin) Jacq.-Fél. and the Tanzanian *L. brenanii* (A. Fern. & R. Fern.) Jacq.-Fél. This expansion had the effect of weakening the earlier generic diagnosis of Bremer (1982), because most of the Madagascan species have blue flowers borne on long, slender pedicels (versus flowers white and sessile in the remaining species), and the anther-gland is uniformly present (versus gland reduced or absent). Furthermore, in three of the Madagascan species (i.e. *L. lutescens*, *L. roborea* and *L. terminalis*) the leaves are apparently uninervate (obscurely acrodromous), making them rather easily confused with *Memecylon*. However, the Madagascan species of *Lijndenia* can be distinguished from *Memecylon* by their flowers subtended by persistent, cupulate bracteoles and with the style exserted from the corolla in bud (protogyny, a character that *Lijndenia* evidently shares with its sister-genus *Warneckea*).

Borhidi (1993) subsequently transferred six more East African species from *Memecylon* to *Lijndenia*, but these new combinations were made without analysis of taxonomic characters, and only one of them is currently accepted, i.e. *L. procteri* (A. Fern. & R. Fern.) Borhidi from Tanzania. The remaining five of Borhidi's species have since been returned to *Warneckea* (Stone & Andreasen, 2010) or to *Memecylon* (Stone, 2014). Recently, however, a distinctive new Tanzanian species has been described as *L. udzungwarum* R.D. Stone & Q. Luke (Stone & Luke, 2015).

Here I describe three new species of *Lijndenia* from Madagascar, based on recent collections and comparative studies of herbarium material (see the Acknowledgements for a list of the herbaria consulted). In accordance with ICN Art. 53 (McNeill et al., 2012), I also propose a replacement name for *L. lutescens* (Naudin) Jacq.-Fél. since its basionym *Memecylon lutescens* Naudin (Naudin, 1852) is an illegitimate later homonym of *M. lutescens* C. Presl (Presl, 1851). With these revisions the flora of Madagascar now holds nine species of *Lijndenia*, for which I provide a formal taxonomic treatment including a dichotomous key. I also provide a summary of the ecogeographic distribution and distinguishing features of each species (see Table 1). The conservation status of each species is provisionally assessed according to the IUCN Red List Categories and Criteria (IUCN, 2012). All specimens cited have been seen unless otherwise indicated.

Systematics

Lijndenia Zoll. & Moritzi in Moritzi, Syst. Verz.: 9. 1846.

Typus: *Lijndenia laurina* Zoll. & Moritzi

Shrubs or small to medium-sized *trees*, evergreen, glabrous; wood extremely hard; young branchlets terete to distinctly quadrangular (quadrangular-alate in *L. melastomoides*). *Leaves* opposite, petiolate, lacking stipules, subcoriaceous to thickly coriaceous and mostly appearing granular or

Table 1. – Comparison of morphology and ecogeographic distribution amongst the species of Madagascan *Lijndenia* Zoll. & Moritzi

	L. acuminata	*L. danguyana*	*L. darainensis*	*L. densiflora*
Habitat	forest on coastal dunes	montane forest, elev. c. 1000 m	montane forest, elev. 920 m	elev. c. 80-150 m (presumably in lowland humid forest)
Habit	not specified	tree to 20 m	tree 20 m	tree 8-10 m
Nervation of leaves	apparently 1-nerved	3-nerved	apparently 1-nerved	apparently 1-nerved
Leaf blades [cm]	narrowly elliptic, mostly 5.8-6.5 × 1.9-2.4	obovate to oblanceolate or ± elliptic, mostly 5-9.5 × 2.5-4.5	elliptic to obovate, 3-5 × 1.5-3	elliptic, mostly 3.3-5.3 × 1.5-2.5
Leaf apex	distinctly and narrowly acuminate (acumen 5-12 mm)	rounded to retuse	rounded and ± retuse	shortly and obtusely acuminate (acumen mostly 3-6 mm)
Inflorescence position	in fascicles of 1-3 mostly at the leafless nodes of of older branchlets	in fascicles at the leafless nodes of older branchlets	in fascicles of 1-4 at the leafless nodes of older branchlets	in fascicles of 1-6 mostly at the leafless nodes of older branchlets
Peduncles [mm]	7-12(-15)	± absent or to c. 1	± absent or to c. 1	mostly 3-5(-8)
Petal color	not specified	blue to pale bluish-purple	pale violet with white margins	white

papillose-muricate on drying (owing to the presence of ramiform sclereid idioblasts in the mesophyll); leaf-blades ± distinctly 3-nerved (= nervation strongly acrodromous), or in some of the Madagascan spp. apparently uninervate with lateral nerves intramarginal and weaker than the midnerve (= obscurely acrodromous), elliptic (to obovate or oblanceolate in some Madagascan spp.), ± distinctly acuminate at apex. *Cymes* borne in the leaf-axils or in fascicles at the leafless nodes of older branchlets (lower down on the trunk in *L. ramiflora*), ± distinctly pedunculate (the peduncles very short to ± absent in *L. laurina*, *L. danguyana* and *L. memecyloides*), umbelliform to capitellate (or 2-3× branched with secondary inflorescence-axes up to 9 mm in *L. barteri* and *L. brenanii*); bracts ± persistent and with a pair of bracteoles partially fused to form a cupule (false calyx) immediately subtending each individual flower. *Flowers* small, uniformly 4-merous, sessile or borne on long slender pedicels (the latter only in the case of the Madagascan spp.), mostly bisexual (androdioecious in *L. laurina*); calyx margin ± distinctly 4-lobed (not truncate); petals mostly white (blue in most of the Madagascan spp.), spatulate to obovate or suborbicular, unguiculate at base, ± auriculate above the claw in the Madagascan spp.; anthers dolabriform, on long slender filaments; oil-gland on dorsal side of anther connective uniformly present in the Madagascan spp., variably present to reduced or absent in the remaining spp.; style slender, exserted from the corolla in bud (the flowers thus being protogynous); top of ovary lacking interstaminal partitions, the epigynous chamber thus appearing smooth; ovary unilocular, ovules 2-12. *Fruits* berry-like, ± globose, crowned by the persistent calyx; seeds generally solitary (occasionally 2); embryo with a short hypocotyl and leafy cotyledons, the inner cotyledon bent and rolled around the involute edge of the outer cotyledon.

Key to the Lijndenia species of Madagascar

1. Leaves distinctly 3-nerved (the lateral pair of nerves clearly visible at least on the lower surface of the blade)..... 2

1a. Leaves apparently 1-nerved (only the midnerve conspicuous, the lateral pair of nerves intramarginal and faintly visible to ± invisible) 4

2. Young branchlets 4-angled and conspicuously winged .... 5. ***L. melastomoides***

2a. Young branchlets terete.....3

3. Cymes borne below the leaves, in few-flowered fascicles at the defoliated nodes of older branchlets (not lower down on the trunk); peduncles ± absent (the cymes thus subsessile) or very short (up to c. 1 mm); leaf-blades mostly obovate to oblanceolate, 5-9.5(-13) × 2.5-4.5(-6) cm, the apex rounded to retuse or broadly and vaguely obtuse-acuminate..... 2. ***L. danguyana***

3a. Cymes borne in many-flowered fascicles on the trunk; peduncles 5-15 mm; leaf-blades elliptic to elliptic-lanceolate, up to 5.5 × 2 cm, the apex distinctly obtuse-acuminate..... 7. ***L. ramiflora***

L. melastomoides	*L. memecyloides*	*L. ramiflora*	*L. roborea*	*L. terminalis*
swamp forest along the eastern coast (also in other forest types?)	littoral or sublittoral forest on sand, elev. 3-75 m	lateritic soil (presumably in sublittoral forest)	littoral forest on sand	sublittoral forest, on lateritic soil weathered from basalt
tree to 15 m	shrub or tree 4-15 m	shrub or small tree	shrub or small tree 2-6 m	large shrub
3-nerved	apparently 1-nerved	3-nerved	apparently 1-nerved	apparently 1-nerved
lanceolate to oblanceolate, 5-14 × 2-4	narrowly elliptic to oblanceolate or obovate, mostly 3-5 × 1.4-2.2	elliptic to elliptic-lanceolate, up to 5.5 × 2	mostly obovate, 4-7 × 2-4	elliptic-lanceolate, up to 9 × 3.8
short-acuminate	rounded or retuse to vaguely obtuse-acuminate (acumen if present mostly 2-5 mm long)	distinctly acuminate (acumen obtuse and ± apiculate)	rounded to retuse or emarginate	shortly obtuse-acuminate
in fascicles of 1-5 at the leafless nodes and older wood	in fascicles of 1-2(-3) mostly at the leafless nodes of older branchlets	in fascicles of 3-13(-18) at the nodes of the trunk	solitary or in fascicles on the leafy or leafless nodes	terminally on the branchlets or solitary to geminate in the leaf axils
7-15, 4-winged	mostly 1-3 (rarely to 14)	5-15	0.5-3	10-15
pale blue	white	blue	pale blue	unknown

4. Cymes solitary to geminate in the leaf-axils or borne terminally on the branchlets; leaf-blades elliptic-lanceolate, up to 9 × 3.8 cm, the apex shortly and obtusely acuminate ..... 9. ***L. terminalis***

4a. Cymes borne mainly just below the leaves, i.e. fascicled at the defoliated nodes of older branchlets (seldom also in the lower leaf axils); leaf-blades various but not as above 5

5. Petals blue; leaf-blades cuneate-obovate, the apex rounded to retuse or emarginate..... 6

5a. Petals white; leaves elliptic to oblanceolate, the apex obtuse to ± distinctly acuminate.....7

6. Tree 20 m; leaf-blades 3-5 × 1.5-3 cm, subcoriaceous with surface finely granular in dried material; intramarginal nerves faintly visible..... 3. ***L. darainensis***

6a. Shrub or small tree 2-6 m; leaf-blades 4-7(-8.5) × 2-4 (-5.7) cm, thickly coriaceous with surface nearly smooth in dried material; intramarginal nerves invisible or ± faintly visible only toward the base of the blade..... 8. ***L. roborea***

7. Cymes mostly 3-5-flowered, subsessile or on peduncles mostly 1-3 mm (rarely to 14 mm), solitary or in fascicles of 2(-3); leaves narrowly elliptic to oblanceolate or obovate, the apex rounded or retuse to vaguely obtuse-acuminate (the acumen if present mostly 2-5 mm, rarely to 8.5 mm) ..... 6. ***L. memecyloides***

7a. Cymes mostly 5-16-flowered, on peduncles mostly 3-12 (-15) mm, solitary or in fascicles of 2-6; leaf apices distinctly acuminate (never rounded or retuse)..... 8

8. Cymes 1-3 per fascicle, borne on peduncles 7-12(-15) mm; leaf-blades narrowly elliptic, the apex distinctly and narrowly acuminate (the acumen 5-12 mm) .... 1. ***L. acuminata***

8a. Cymes 1-6 per fascicle, borne on peduncles mostly 3-5.5 (-8) mm; leaf-blades elliptic, the apex shortly and obtusely acuminate (the acumen mostly 3-6 mm).... 4. ***L. densiflora***

1. ***Lijndenia acuminata*** R.D. Stone, **spec. nova** (Fig. 1).

Typus : Madagascar. Prov. Fianarantsoa : Farafangana, Ihorombe, Morarano (Tokohandra), 23.X.1952, fl., *Service Forestier 6391* (holo- : P [P00257942]!; iso- : P [P00257943]!, TEF!).

Affinis L. memecyloidi R.D. Stone sed laminis foliorum anguste ellipticis (non oblanceolatis vel obovatis) ad apices distincte angusteque acuminatis (non rotundatis vel retusis vel subacuminatis), pedunculis cymarum 7–15 mm (non 1–3 mm) longis, floribus in quoque cyma numero 7–16 (non 3–5) differt.

Habit not specified, presumably a shrub or small understory tree; young branchlets terete; internodes mostly 1.7-3 cm. *Leaves* apparently 1-nerved (only the midnerve clearly evident, the lateral nerves intramarginal and ± obscure), subcoriaceous, finely granular in dried material, on petioles mostly 3-4 mm; blades narrowly elliptic, (5.3-)5.8-6.5 × 1.9-2.4 cm, the apex distinctly and narrowly acuminate (the acumen 5-12 mm); transverse veins invisible.



Fig. 1. – *Lijndenia acuminata* R.D. Stone. **A.** Flowering branchlet; **B.** Leaf; **C.** Detail of lower leaf surface; **D.** Detail of branchlet showing cymes fascicled at an older, defoliated node; **E.** Cyme (side view); **F.** Open flower (side view); **G.** Petal; **H.** Stamen (side view).
[*Service Forestier 6391*, P] [Drawing: S. Burrows]

Cymes umbelliform and 7-16-flowered, solitary or in fascicles of 2-3 mostly at the leafless nodes of older branchlets, sometimes also solitary or geminate in the leaf axils; peduncles 7-12(-15) mm, compressed, the apex with a pair of persistent, triangular, keeled bracts c. 2 mm, some cymes with an additional axis extending 2-4 mm above the first group of flowers; each flower subtended by a pair of persistent, concrescent bracteoles forming a cupule or involucre from which emerges the pedicel 1-3 mm. *Hypantho-calyx* cupulo-patellate, 1.5 × 2 mm, the margin shallowly 4-sinuate or with calyx lobes slightly triangular; petals 1.5 × 1.5 mm, unguiculate, limb ± sagittate with apex acute, margins convex and base abruptly truncate to shallowly cordate-auriculate above the claw 0.5 mm; staminal filaments c. 3 mm, anthers dolabriform, 1 × 0.5 mm, the anther sacs positioned fronto-ventrally, connective dorsally incurved by an elliptic oil-gland positioned towards the anterior end, prolonged at the posterior end into an acute beak; style filiform, 8 mm. *Fruits* not seen.

Etymology. – The epithet *acuminata* is an adjective referring to the distinctly acuminate leaf apices of this species, this being the main diagnostic feature separating it from the closely related *L. memecyloides* and *L. densiflora*.

Distribution and ecology. – Known only from the type collection made in Fianarantsoa Province, along the south-eastern coast of Madagascar about 30 km south of the city of Farafangana (Fig. 2). The label of the isotype sheet in TEF indicates the habitat as forest on coastal dunes.

Conservation status. – *Lijndenia acuminata* is known from a single location with an area of occupancy (AOO) of 4 km^2 (assuming a 4 km^2 grid cell size). The type locality is very near or adjacent to parcelle 2 of the Réserve spéciale de Manombo, but it appears the reserve boundary has been drawn in a way that excludes the area of dunes behind the immediate coast. Given the severe loss of forested habitats in the Farafangana region and the fact that *L. acuminata* has not been seen in more than 50 years, it is quite possible that the species is already extinct, although more exhaustive surveys would be needed to establish this beyond a reasonable doubt. *Lijndenia acuminata* is thus provisionally assessed as "Critically Endangered" [CR B2ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – *Lijndenia acuminata* is closely related to (and previously confused with) *L. memecyloides*, but distinguished by the combination of leaf blades narrowly elliptic with apex distinctly and narrowly acuminate (versus blades narrowly elliptic to oblanceolate or obovate with apex rounded or retuse to vaguely obtuse-acuminate), cymes borne on peduncles 7-12(-15) mm (versus mostly 1-3 mm), and flowers numbering 7-16 per cyme (versus cymes mostly 3-5-flowered). The type locality of *L. acuminata* is also isolated by a distance of c. 625 km from the nearest known locality of *L. memecyloides* (i.e. near the town of Foulpointe [Mahavelona] in Toamasina province).

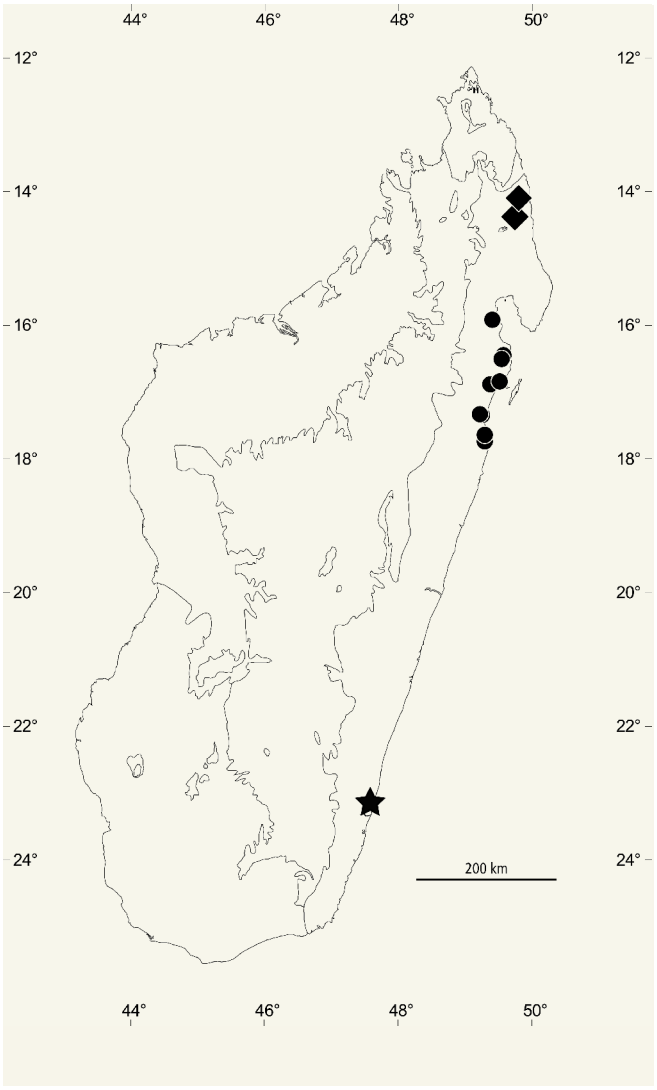


Fig. 2. – Geographic distribution of *Lijndenia acuminata* R.D. Stone (star), *L. densiflora* R.D. Stone (diamonds), and *L. memecyloides* R.D. Stone (circles), mapped on the bioclimatic zones of Madagascar (after Cornet, 1974; see Schatz, 2000).

2. ***Lijndenia danguyana*** (H. Perrier) Jacq.-Fél. in Bull. Mus. Natl. Hist. Nat., B, Adansonia 7 : 38. 1985.

≡ *Memecylon danguyanum* H. Perrier in Mém. Acad. Malgache 12 : 210. 1932.

≡ *Spathandra danguyana* (H. Perrier) Jacq.-Fél. in Adansonia ser. 2, 18 : 228. 1978.

Lectotypus (designated here) : **Madagascar. Prov. Toamasina :** Analamazaotra, XI.1925, fl., *Louvel 5* (P [P00057564]!). **Syntypus : Madagascar. Prov. Toamasina :** Analamazaotra, II.1919, fr., *Thouvenot 123* (P [P00057565, P00257949, P00257950, P05207163, P05207164, P05207165]!, K [K000276111, K000313593]!).

Tree 7 to 20 m; young branchlets terete, blackish; older branchlets whitish and often with fine horizontal fissures (lenticels?). *Leaves* evidently 3-nerved (the midnerve prominent on the lower surface; principal pair of lateral nerves only slightly visible on the lower surface, situated c. 5 mm from the margins at the midpoint of the blade, evanescent toward the apex; an additional, very weak pair of lateral nerves at the revolute margins), coriaceous, granular in dried material, discolored; petiole 5-8 mm; blades mostly obovate to oblanceolate (varying to ± elliptic), 5-9.5(-13) × 2.5-4.5 (-6) cm, attenuate and decurrent on the petiole, rounded to retuse at the apex. *Cymes* subsessile (peduncle ± absent or to c. 1 mm), umbelliform, fascicled at the leafless nodes of older branchlets; each flower subtended by a pair of fleshy bracteoles fused at the base to form a cupule; pedicel 6-10 mm. *Hypanthocalyx* campanulate to cupulo-patellate, 2 × 3 mm, the margin sinuate and minutely 4-toothed; petals blue to pale bluish-purple, orbicular, limb 2-3 mm in diameter, apex rounded to apiculate, base abruptly narrowed and ± auriculate above the claw 0.7 mm; staminal filaments 4.5-6 mm, anthers 2 mm, anther sacs fronto-ventral, connective incurved by the median gland, extremity conical; style slender, 10-12 mm; ovary 10-12-ovuled. *Fruit* globose, 8 mm in diameter, asymmetrical; calycinal crown not prominent.

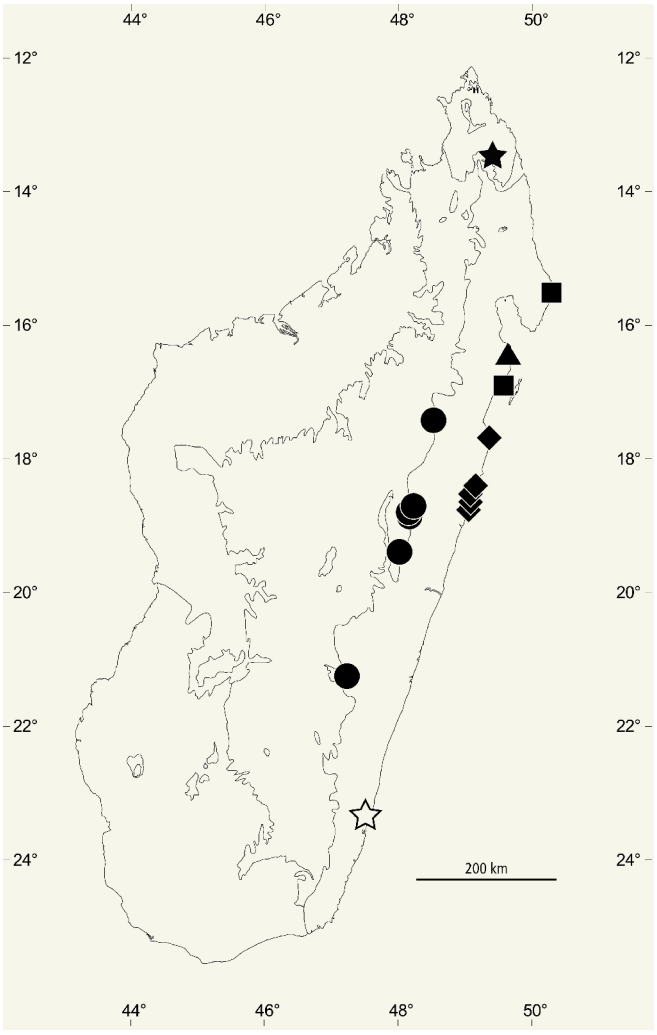


Fig. 3. – Geographic distribution of *Lijndenia danguyana* (H. Perrier) Jacq.-Fél. (circles), *L. darainensis* R.D. Stone (black star), *L. melastomoides* (Naudin) Jacq.-Fél. (squares), *L. ramiflora* Jacq.-Fél. (triangle), *L. roborea* (Naudin) Jacq.-Fél. (diamonds), and *L. terminalis* Jacq.-Fél. (white star), mapped on the bioclimatic zones of Madagascar (after Cornet, 1974; see Schatz, 2000).

Distribution and ecology. – An endemic of montane forest at elevations of about 1000 m along the eastern escarpment bordering Madagascar's central plateau (Fig. 3), in Toamasina province (Moramanga region and to the north near lac Alaotra) and Fianarantsoa province (Ranomafana National Park).

Conservation status. – *Lijndenia danguyana* is known from six locations and has an extent of occurrence (EOO) of 2,390 km^2. Along Madagascar's eastern escarpment there is presently very little forest remaining, and this extraordinary loss of habitat must have produced substantial population declines in many formerly common and widespread forest species, including *L. danguyana* which is an understory tree with very hard wood, a slow growth rate and a projected long generation time. *Lijndenia danguyana* is thus provisionally assessed as "Vulnerable" [VU B1ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012). It should be noted, however, that some occurrences of this species would seem to lie within protected areas, e.g. the Réserve spéciale d'Analamazaotra and the national parks of Andasibe-Mantadia and Ranomafana.

Notes. – In the protologue of *Memecylon danguyanum* (Perrier de la Bâthie, 1932) there were two collections cited, one with flowers *(Louvel 5)* and the other with fruits *(Thouvenot 123)*. The flowering collection has been designated here as the lectotype.

This species was previously illustrated by Perrier de la Bâthie (1951 : fig. 45 : 9-16, as *Memecylon danguyanum*) and by Jacques-Félix (1978b : tab. 2b, as *Spathandra danguyana* ; 1985b : tab. 28 : fig. 6-11).

Jacques-Félix (1985b) described the petals of *L. danguyana* as abruptly narrowed but not auriculate above the claw. A reexamination of the available flowering material indicates that the petals of the lectotype (*Louvel 5*, P) are indeed lacking auricles, but these are present in *Service Forestier 28436* (P) and *Randrianasolo & Rasabotsy 29* (CAS).

Additional material examined. – **Madagascar. Prov. Fianarantsoa :** Ranomafana NP, parcelle 3, S of National Road 25 at 7 km W of Ranomafana, 21°15'30"S 47°25'00"E, 30.XI.1993, fl., *Randrianasolo & Rasabotsy 29* (BR, CAS, G, K, MO, P, TAN, WAG). **Prov. Toamasina :** Périnet, 28.VIII.1952, ster., *Service Forestier 153-B-R-172* (TEF) ; Befody, lac Alaotra, 27.VII.1952, ster., *Service Forestier 503-R-56* (MO, P, TEF) ; Distr. Moramanga, C^ton^ Périnet, Antsampandrano, 17.X.1962, ster., *Service Forestier 21539* (P) ; *ibid. loc.,* 25.X.1962, ster., *Service Forestier 21539-bis* (P [2 sheets]) ; Ankazomanitra, village le Toby, km 45 route Moramanga-Anosibe, 8.XI.1968, fl., *Service Forestier 26815* (P, TEF) ; W d'Antanandava, km 45 route Moramanga-Anosibe, XI.1968, fl., *Service Forestier 28436* (K, MO, P [2 sheets], S, TEF, WAG) ; Moramanga, Andasibe, Réserve faune d'Analamazaotra, 16.I.1984, fr., *Service Forestier 32548* (TEF) ; Andasibe-Mantadia PN, 14 km en voiture au NE de la mine de graphite, 18°53'00"S 48°27'30"E, 13.XI.2001, ster., *Stone et al. 2377* (CAS, P, TAN).

3. ***Lijndenia darainensis*** R.D. Stone, **spec. nova** (Fig. 4A-B, 5).

Typus : Madagascar. Prov. Antsiranana : Daraina region, forêt de Binara, 13°16'19"S, 49°35'59"E, 29.XI.2006, fl., *Gautier & Chatelain 4951* (holo- : G [G00340058]! ; iso- : CAS-1104864!, MO, P, TEF, Herb. Darainense).

Affinis L. danguyanae (H. Perrier) Jacq.-Fél. sed laminis foliorum parvioribus (3-5 × 1.5-3 cm non 5-13 × 2.5-6 cm) ut videtur uninervis (non conspicue trinervis), nervis lateralibus invalidis intramarginalibus differt.

Tree 20 m, the trunk with diameter 40 cm at breast height ; branchlets with whitish gray bark, the youngest compressed and longitudinally grooved on the two faces, with age becoming terete, stout and thickened at the defoliated nodes ; internodes (0.5-)1-2.5(-4) cm. *Leaves* apparently 1-nerved (midnerve clearly visible, finely impressed on the upper surface, somewhat prominent on the lower ; lateral nerves percurrent but only faintly visible, situated 1-2 mm from the revolute margins), subcoriaceous, finely granular in dried material ; petioles 2.5-5 mm ; blades elliptic to obovate, 3-5 × 1.5-3 cm, cuneate at the base, attenuate and decurrent on the petiole, rounded and ± retuse at the apex ; transverse veins scarcely visible, 4-5 pairs spaced 4-6 mm apart, somewhat oblique relative to the midnerve. Cymes umbelliform and 3-7-flowered, in fascicles of 1-4 at the leafless nodes of older branchlets, subsessile or with peduncle c. 1 mm ; bracts not evident ; individual flowers subtended by a pair of persistent, truncate-suborbicular bracteoles c. 0.25 mm forming a cupule or involucre from which emerges the pedicel 4-7.5 mm. *Hypantho-calyx* cupulo-patellate, 3 × 3 mm, the margin shallowly sinuate to truncate and remotely 4-denticulate ; corolla rounded in bud, white, the style long-exserted, pale violet ; petals at anthesis pale violet with white margins, 2 × 2.5 mm, unguiculate-hastate with a pair of rounded to pointed lobes 0.3 mm situated about halfway between the base and the apex, the apex broadly rounded and shallowly cucullate, with a pair of auricles 0.6-0.75 mm at the base of the limb, the claw 0.5 × 0.25 mm ; staminal filaments 3-6 mm (the epipetalous filaments noticeably longer than the episepalous ones), pale violet ; anthers 1.75 mm, thecae fronto-ventral, yellow ; connective white, incurved by the median dorsal oil-gland 0.3 mm, extremity conical-acute ; style slender, 10 mm, pale violet. *Fruits* not seen.

Etymology. – The species epithet refers to the Daraina region of northeastern Madagascar, which in the last two decades has been the subject of much biological research and conservation interest (including extensive plant collecting by Dr. L. Gautier and colleagues of the Conservatoire et Jardin botaniques de la Ville de Genève).

Distribution and ecology. – The type and only known locality of *L. darainensis* is in the Binara forest (Daraina region, Antsiranana Province) at elevation 920 m (Fig. 3). This species and *L. danguyana* are the only two Madagascan Lijndenias inhabiting montane forest, all other species being found at low elevations along or near the eastern coast.

Conservation status. – *Lijndenia darainensis* is known from a single location and has an AOO of 4 km^2. The Binara forest, in spite of its protected-area status within the Station forestière à Usage multiple de Loky-Manambato (gazetted in 2005), is subject to anthropogenic pressures including removal of hardwood timber, slash-and burn-agriculture, and pasturage of zébu cattle (Rakotondravony, 2006). *Lijndenia darainensis* is thus provisionally assessed as "Vulnerable" [VU D2] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – *Lijndenia darainensis* has been previously confused with *L. danguyana*. The leaves of the two species are similar, but in *L. darainensis* the lateral nerves are very weak and situated 1-2 mm from the margins whilst in *L. danguyana* they are more clearly visible and situated c. 5 mm from the margins at the midpoint of the blade. The type locality of *L. darainensis* is also isolated by a distance of c. 450 km from the nearest known locality of *L. danguyana* (i.e. near lac Alaotra in Toamasina province).



Fig. 4. – Living material. **A.** *Lijndenia darainensis* R.D. Stone, flowering branchlets; **B.** *Lijndenia darainensis* R.D. Stone, flowers; **C.** *Lijndenia melastomoides* (Naudin) Jacq.-Fél., flowers. [Photos: **A, B:** L. Gautier; **C:** L. Nikolov]

The blue flowers and apparently 1-nerved, cuneate-obovate leaves of *L. darainensis* also resemble those of *L. roborea*. These two species differ in stature (*L. darainensis* a tree 20 m versus a shrub or tree 2-6 m in *L. roborea*) as well as the texture of the leaves (thinly coriaceous with intramarginal nerves faintly visible versus thickly coriaceous with intramarginal nerves ± invisible). Moreover, *L. darainensis* inhabits montane forest in extreme northeastern Madagascar whilst *L. roborea* is found in littoral forest along the island's east-central coast.

4. ***Lijndenia densiflora*** R.D. Stone, **spec. nova** (Fig. 6).

Typus : Madagascar. Prov. Antsiranana : env. de Lohanantsahabe (haute Antsahabe, affluent rive gauche de la Lokoho), entre Sambava et Andapa, 9.XII.1966, fl., *Service Forestier 27162* (holo- : P [P00257945]! ; iso- : G [G00341693]!, K!, MO-4373720!, S!, TEF!, WAG!).

Affinis L. memecyloidi R.D. Stone sed laminis foliorum ellipticis (non anguste ellipticis vel oblanceolatis) ad apices late obtuseque breviacuminatis (non rotundatis vel retusis vel subacuminatis), cymis in quoque fasciculo numero 1-6 (non 1-2), floribus in quoque cyma numero 5-14 (non 3-5) differt.

Tree to 8-10 m ; branchlets terete ; internodes (0.8-)1.5-2.5(-3.1) cm. *Leaves* apparently 1-nerved (only the midnerve clearly visible, the lateral nerves intramarginal and ± obscure), subcoriaceous, finely granular in dried material, on petioles 3-6 mm ; blades elliptic, 3.3-5.3(-7.7) × 1.5-2.5(-3.2) cm, the apex shortly and obtusely acuminate (the acumen mostly 3-6 mm) ; transverse veins not evident or ± faintly visible in dried material, oriented at an oblique angle relative to the midnerve. *Cymes* umbelliform and mostly 5-9(-14)-flowered, solitary or in fascicles of 2-6 at the leafless nodes of older branchlets, sometimes also in groups of 1-4 in the axils of

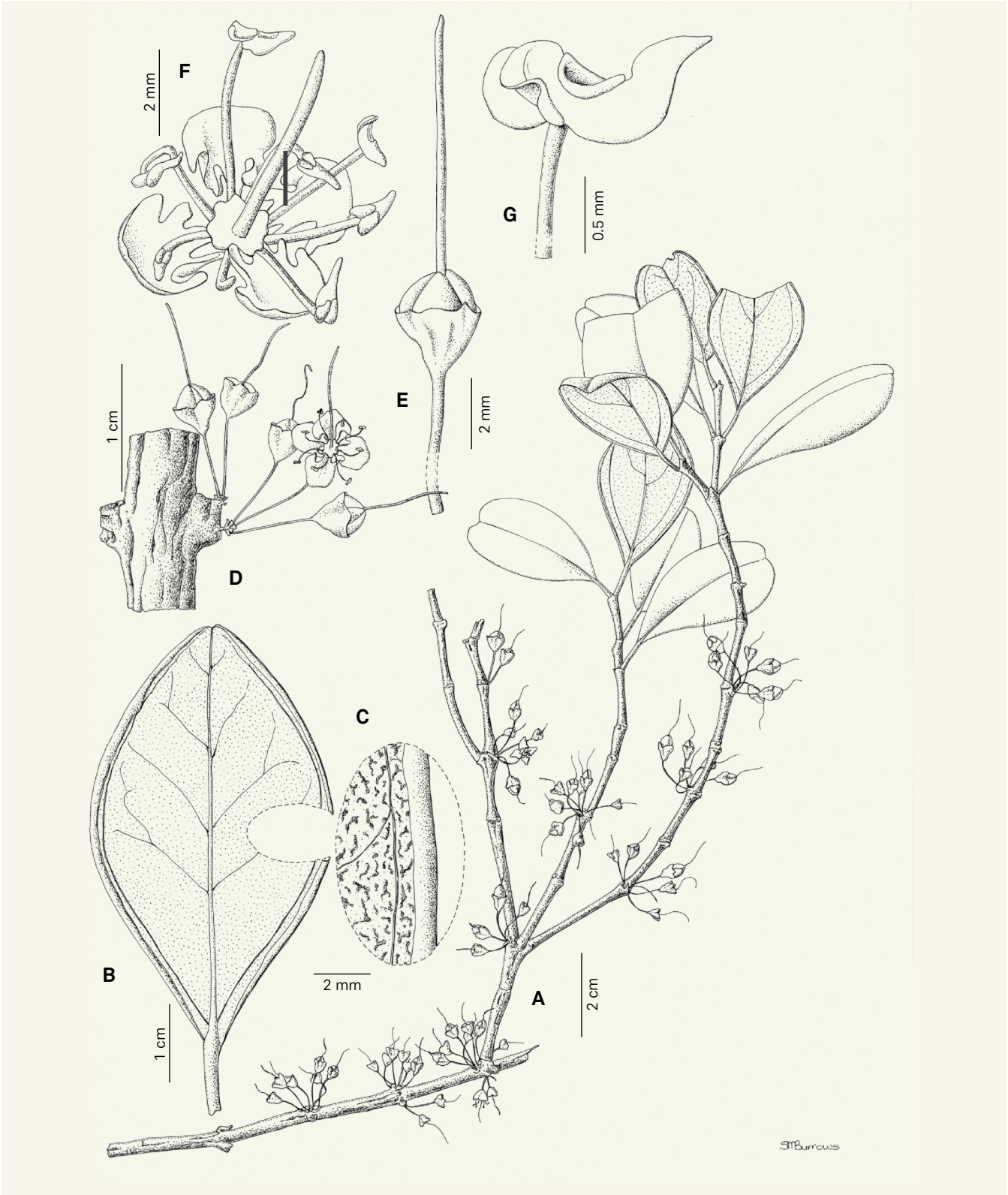


Fig. 5. – *Lijndenia darainensis* R.D. Stone. **A.** Flowering branchlet; **B.** Leaf; **C.** Detail of lower leaf surface; **D.** Inflorescence; **E.** Floral bud (side view); **F.** Open flower (top view); **G.** Stamen (side view).
[*Gautier & Chatelain 4951*, CAS] [Drawing: S. Burrows]

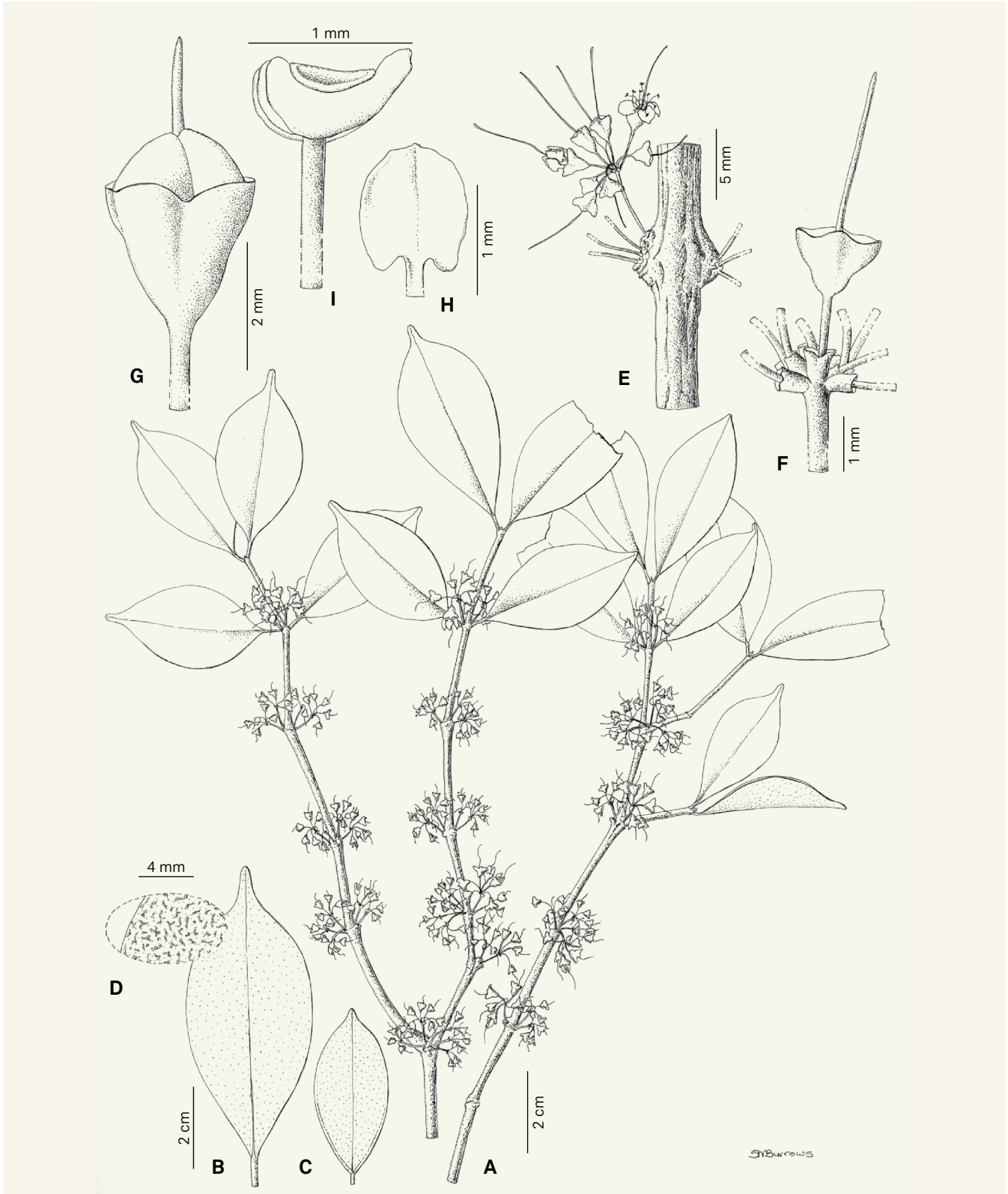


Fig. 6. – *Lijndenia densiflora* R.D. Stone. **A.** Flowering branchlet; **B-C.** Leaves; **D.** Detail of lower leaf surface; **E.** Detail of branchlet showing cymes fascicled at an older, defoliated node; **F.** Cyme (side view); **G.** Floral bud (side view); **H.** Petal; **I.** Stamen (side view).
[*Service Forestier 27162*, P] [Drawing: S. Burrows]

uppermost nodes; peduncles mostly 3-5(-8) mm; each flower subtended by a pair of persistent, concrescent bracteoles forming a cupule or involucre from which emerges the pedicel 1-2 mm. *Hypantho-calyx* cupulo-patellate, 1.25 × 2 mm, the margin shallowly 4-sinuate or with calyx lobes slightly triangular; petals white, reflexed at anthesis, 1.25 × 1 mm, unguiculate, limb orbicular with base abruptly truncate to shallowly cordate-auriculate above the claw 0.25 mm; stamens borne on bluish filaments 1-2.5 mm, anthers dolabriform, 1 × 0.5 mm, the anther sacs positioned at the anterior end, connective dorsally incurved by the medially positioned oil-gland, the posterior end prolonged, extremity obtuse to subacute; style bluish, filiform, 4 mm. *Fruits* not seen.

Etymology. – The species epithet *densiflora* refers to the densely flowered aspect which is perhaps the main characteristic setting this species apart from its closely related congeners *L. memecyloides* and *L. acuminata*. It is caused by the relatively large number of cymes per fascicle, the relatively large number of flowers per cyme (especially in comparison to *L. memecyloides*), and the relatively short pedicels subtending individual flowers, the result being that the individual cymes appear congested with flowers.

Distribution and ecology. – An endemic of northeastern Madagascar (Antsiranana province) in the region to the northwest and southwest of the city of Sambava, the two known localities being approximately 15 to 25 km inland from the coast and about 40 km apart from each other (Fig. 2). Habitat not specified but presumably in lowland humid forest. Elevation estimated as 80 to 150 m above sea level. A concerted effort should be made to relocate *L. densiflora*, particularly in the protected area Makirovana-Tsihomanaomby (gazetted in 2015) which consists of 53 km^2 of low-elevation forest remnants situated to the north of the river Bemarivo and west of the Route nationale no. 5a (between the towns of Sambava and Antsirabe Avaratra).

Conservation status. – *Lijndenia densiflora* is a poorly known species that has not been collected again within the past 50 years. There are just two known locations and an AOO of 8 km^2. The possibility exists that the species is already extinct, but there have been some recent examples of other so-called "forest phantoms" having been rediscovered after not being seen for many years (Schatz et al., 1998; Stone, 2012). At present, *L. densiflora* is provisionally assessed as "Critically Endangered" [CR B2ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – *Lijndenia densiflora* is closely related to (and previously confused with) *L. memecyloides*, but distinguished by the combination of leaf blades elliptic with apex shortly and obtusely acuminate (versus blades narrowly elliptic to oblanceolate or obovate with apex rounded or retuse to vaguely obtuse-acuminate), cymes 1-6 per fascicle (versus cymes mostly 1-2 per fascicle), and flowers numbering 5-9(-14) per cyme (versus cymes mostly 3-5-flowered). The type locality of *L. densiflora* is also isolated by a distance of c. 150 km from the nearest known locality of *L. memecyloides* (i.e. near Rantabé in the Antongil Bay region of Toamasina province).

The species was previously illustrated by Jacques-Félix (1985b: tab. 27: 1-4, as *L. lutescens*).

There is still a lack of precision about the second collecting locality (south of Analamanara between Sambava and Antsirabe Avaratra), but it is evidently close to a remnant forest block called Tsihomanaomby, north of the river Bemarivo and about 3-5 km to the west of the Route nationale 5a (P. Phillipson & J. Razafitsalama, pers. comm.).

Additional material examined. – **Madagascar. Prov. Antsiranana:** env. S d'Analamanara (près de Tsaratanana), entre Sambava et Antsirabe-Nord, XII.1966, fl., *Service Forestier 27175* (BR, G, K, MO, P, TEF, WAG).

5. ***Lijndenia melastomoides*** (Naudin) Jacq.-Fél. in Bull. Mus. Natl. Hist. Nat., B, Adansonia 7: 38. 1985 (Fig. 4C).

≡ *Memecylon melastomoides* Naudin in Ann. Sci. Nat., Bot., ser. 3, 18: 265. 1852.

≡ *Spathandra melastomoides* (Naudin) Jacq.-Fél. in Adansonia ser. 2, 18: 228. 1978.

Typus: Madagascar: *sine loc.*, s.d., fl., *du Petit-Thouars s.n.* (holo-: P [P00057571]!; iso-: BR [BR0000006422448]!).

= *Memecylon cauliflorum* H. Perrier in Mém. Acad-Malgache 12: 209. 1932. **Typus: Madagascar. Prov. Toamasina:** env. de la baie d'Antongil, c. 100 m, X.1912, fl., *Perrier de la Bâthie 2080* (holo-: P [P00057572]!; iso-: P [P00057573]!).

Tree 6-15 m; branchlets 4-winged, the wings greater than 0.5 mm and eventually excoriating, the older branchlets terete and thickened at the nodes. *Leaves* 3-nerved (the midnerve and pair of lateral nerves clearly visible, prominent on the lower surface of the blade), coriaceous, granular on both faces in dried material; petiole 2 mm; blades lanceolate to oblanceolate, 5-14 × 2-4 cm, attenuate at the base and decurrent on the petiole, short-acuminate at apex. *Cymes* umbelliform, solitary or in fascicles of 3-5 at the leafless nodes and the older wood; peduncle 7-15 mm, 4-winged; bracteoles subtending individual flowers very short, truncate, forming a cupule from which emerges the pedicel 2-6 mm. *Hypantho-calyx* cupulo-patellate, 1.5 × 2 mm; calyx limb truncate to sinuate; petals pale blue, mostly elliptical to suborbicular, 1.5 × 2 mm, auriculate above the claw 0.5 mm; staminal filaments 3-4 mm,

anthers 1 × 0.5 mm, the locules fronto-ventral, connective incurved with a well-developed median gland on the dorsal side, the extremity of the connective subacute; style 5 mm; ovary 8-ovuled. *Fruit* unknown.

Distribution and ecology. – An endemic of low-elevation forests along the eastern coast of Madagascar (Fig. 3), in Antsiranana province (south of Antalaha near Ambohitralanana [Cap-Est]) and in Toamasina province (region of Antongil Bay and recently collected at Pointe à Larrée to the north of Soanierana-Ivongo). The habitat in Pointe à Larrée was described by the collector as "swamp forest". New localities for *L. melastomoides* should be sought in the Masoala National Park, particularly the "parcelle détachée d'Andranoanala", a 13-km^2 area of littoral forest, flooded forest and swamps that is close to one of the historical collecting localities near Ambohitralanana.

Conservation status. – *Lijndenia melastomoides* is a poorly known species that had been considered as possibly extinct until its rediscovery at Pointe à Larrée in Nov. 2008. There are just two locations known with any degree of precision, yielding an AOO of 8 km^2. The location near Ambohitralanana (Cap-Est) was formerly protected in the "Réserve naturelle intégrale no. 2", but this area was degazetted in 1964. The other location at Pointe à Larrée includes 51 km^2 of littoral forest and swamp forest and was gazetted as a "Réserve speciale" in 2015. However, the site in recent years has been subjected to threats from logging, wildfires and shifting agriculture, and its status as a protected area is still in the early stages of implementation. *Lijndenia melastomoides* is thus provisionally assessed as "Critically Endangered" [CR B2ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – The conspicuously quadrangular-alate young branchlets of *L. melastomoides* are unique in the genus. The original material of *du Petit-Thouars* was labeled "Madagascar ou Ile Maurice" and was supposed by Perrier de la Bâthie (1932, 1951) to be from Mauritius. This is considered very unlikely, however, because all subsequent collections of *L. melastomoides* are from Madagascar. The species was previously illustrated by Perrier de la Bâthie (1951: fig. 45: 1-8, as *Memecylon cauliflorum*) and Jacques-Félix (1985b: tab. 27: 5-9).

Additional material examined. – **Madagascar. Prov. Antsiranana:** Distr. Antalaha, C^{ton} Ambohitralanana, RN II [Masoala], 10.II.1954, fl., *Réserves Naturelles 6619* (P). **Prov. Toamasina:** Pointe à Larrée, forêt Menagisy, 16°48'51"S 49°42'02"E, XI.2008, fl., *Nikolov 1812* (G, MO).

6. ***Lijndenia memecyloides*** R.D. Stone, **nom. nov.** (Fig. 7).

≡ *Memecylon lutescens* Naudin in Ann. Sci. Nat., Bot., ser. 3, 18: 269. 1852 [nom. illeg.] [non *M. lutescens* C. Presl].

≡ *Spathandra lutescens* (Naudin) Jacq.-Fél. in Adansonia ser. 2, 18: 228. 1978 [nom. illeg.].

≡ *Lijndenia lutescens* (Naudin) Jacq.-Fél. in Bull. Mus. Natl. Hist. Nat., B, Adansonia 7: 44. 1985 [nom. illeg.].

Lectotypus (designated here): **Madagascar:** *sine loc.*, s.d., fl., *du Petit-Thouars s.n.* (P [P00057566]!; isolecto-: P [P00057567]!, BR [BR000000626115] fragment!).

= *Memecylon meeusei* H. Perrier in Not. Syst. (Paris) 12: 106. 1945. **Lectotypus** (designated here): **Madagascar. Prov. Toamasina:** Soanierana-Ambahoabé, 75 m, 3.XII.1938, fl., *Lam & Meeuse 5624* (L [L0009293]!; isolecto-: BR [BR000000626121]!, P [P00057569, P00057570]!, WAG [WAG0002347]!).

Shrub or *tree* to 4-15 m; branchlets terete; internodes (0.6-)1-2.5(-6.8) cm. *Leaves* apparently 1-nerved (only the midnerve clearly visible, the lateral nerves intramarginal and ± obscure), subcoriaceous, finely granular in dried material, on petioles mostly 3-5 mm; blades narrowly elliptic to oblanceolate or obovate, (2.2-)3-5(-6.4) × (1-)1.4-2.2(-2.8) cm, cuneate at base and gradually narrowed to the petiole, the apex rounded or retuse to vaguely obtuse-acuminate (the acumen if present mostly 2-5 mm); transverse veins not evident or ± faintly visible in dried material, oriented at an oblique angle relative to the midnerve. *Cymes* umbelliform and mostly 3-5(-8)-flowered, solitary or in fascicles of 2(-3) mostly at the leafless nodes of older branchlets, sometimes also solitary or geminate in the leaf axils, subsessile or on peduncles mostly 1-3 mm (3.5-14 mm in the type material of *Memecylon meeusei*); each flower subtended by a pair of cymbiform/orbicular, persistent bracteoles fused to form a cupule or involucre from which emerges the pedicel 1-3 mm. *Hypantho-calyx* cupulo-patellate, 1.5-1.75 × 1.75-2 mm, the margin obscurely 4-sinuate or with calyx lobes slightly triangular; petals white, 1.5-2 × 1.5-2 mm, unguiculate, limb suborbicular with base cordate-auriculate above the claw 0.5 mm; stamens white, the anthers dolabriform, 1-1.5 × 0.5 mm, the anther sacs positioned at the anterior end, connective slightly to strongly incurved by the medially positioned, dorsal oil-gland, prolonged at the posterior end into a subacute beak, filaments slender, 3-4 mm; epigynous chamber deep, smooth (lacking interstaminal partitions); style blue, filiform, 5-9 mm; ovary 6-8-ovuled. *Fruits* globose or somewhat asymmetrical, 5-7 mm in diameter, crowned by the persistent calyx c. 1 mm, distinctly 4-toothed or truncate and remotely 4-denticulate.



Fig. 7. – *Lijndenia memecyloides* R.D. Stone. **A.** Flowering branchlet; **B-E.** Leaves; **F.** Detail of lower leaf surface; **G.** Detail of branchlet showing cymes fascicled at an older, defoliated node; **H.** Cyme (side view); **I.** Floral bud (side view); **J.** Petal; **K.** Stamen (side view); **L.** Infructescence (side view). [**A, C, G-K:** *Service Forestier 22086*, P; **B:** *Rabevohitra & Rakotomamonjy 4913*, CAS; **D:** *Evrard 11255-bis*, P; **E-F, L:** *Rabevohitra et al. 4351*, CAS] [Drawing: S. Burrows]

Etymology. – The epithet *memecyloides* refers to the genus *Memecylon* L. with which this species might be confused on account of its apparently uninervate leaves. Sterile specimens of *Lijndenia memecyloides* bear an especially close resemblance to *Memecylon infuscatum* Jacq.-Fél., and the two species occur together in some localities.

Distribution and ecology. – Endemic to Madagascar's eastern coast in Toamasina Province (Fig. 2). Habitat in littoral or sublittoral forest on sand. Elevation from 3 to 75 m above sea level.

Conservation status. – *Lijndenia memecyloides* is known from six locations and has an EOO of 3,650 km^2. At least one of the known sites has now been completely deforested (i.e. Mangalimaso to the west of Foulpointe [Mahavelona]). At another site (near Antanambao-Ambodimanga to the south of Manompana) all of the large trees had been removed a year or two prior to my field-work there in Jan. 2007, leaving the area in the early stages of secondary regrowth. However, some occurrences of this species are found within the protected areas network, e.g. the Réserve de Tampolo near Fénérive [Fenoarivo] and Analalava to the west of Foulpointe [Mahavelona], both of these sites gazetted in 2015. *Lijndenia memecyloides* is thus provisionally assessed as "Vulnerable" [VU B1ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – The name *Lijndenia memecyloides* is here taken up for the species to which the illegitimate name *L. lutescens* was previously applied (Jacques-Félix, 1985b). The present revision also adopts a narrower circumscription of this species in comparison to the earlier treatment of Jacques-Félix (1985b). As presently circumscribed, *L. memecyloides* includes only the populations in Toamasina province, whilst the populations from Antsiranana and Fianarantsoa provinces are described herein as separate species *L. densiflora* R.D. Stone and *L. acuminata* R.D. Stone, respectively. All three of these three species have apparently uninervate leaves and relatively small flowers with white petals. However, *L. memecyloides* can be distinguished by the combination of leaf-blades mostly oblanceolate to obovate with apex rounded to vaguely short-acuminate, inflorescences 1-2(-3) per fascicle, and peduncles mostly 1-3 mm.

Of the original collection by *du Petit-Thouars*, there are two sheets in P, both of which are clearly labeled as *Memecylon lutescens* in Naudin's handwriting. The better of these two sheets has been designated here as the lectotype. In addition there is an "ex herb. Jussieu" sheet [P00057568] that has been labeled as a "Type" but is evidently not part of the original material.

Special mention must be made of the collection *Lam & Meeuse 5624* (type of *Memecylon meeusei*, treated here as a taxonomic synonym of *Lijndenia memecyloides*). The sheet in L has been designated as the lectotype because it bears a determinavit in Perrier de la Bâthie's handwriting and is of better quality in comparison to the duplicates in other herbaria including P. The material is unusual in having leaf-blades narrowly elliptic with a ± distinct but obtuse acumen 3-8.5 mm. The peduncles are also unusually long (mostly 5-11 mm, rarely to 14 mm), but in other features these specimens agree well with *L. memecyloides*, and the collecting locality lies well within the geographic range of this species albeit slightly further inland compared to the other known sites which are more-or-less strictly littoral or sublittoral.

The lectotype sheet of *L. memecyloides* was labeled "Madagascar ou îles Mascareignes," and Wickens (1976) reported that the original material was collected on Réunion. This is considered very unlikely, however, because all subsequent collections of this species are from Madagascar. Wickens (1976) also erroneously treated *Memecylon lutescens* Naudin as a taxonomic synonym of *M. confusum* Blume (an endemic of the island of Réunion). DNA analyses clearly show that the former species is properly placed in *Lijndenia* whilst the latter belongs to *Memecylon* s.s. (Stone, 2014; R.D. Stone, unpublished data).

The line drawings of *Lijndenia lutescens* (≡ *L. memecyloides*) provided by Jacques-Félix (1985b: tab. 27: 1-4) are actually of *L. densiflora* R.D. Stone (q.v.). Because this illustration is of material now considered to be a different species, there are no previously published illustrations of *L. memecyloides*.

Additional material examined. – **Madagascar: Prov. Toamasina:** Réserve forestière de Tampolo (Fénérive), 9.XII.1989, fl., *Evrard 11255-bis* (P); limite N de la forêt d'Analalava, 6 km SW de Foulpointe, 17°41'32"S 49°27'28"E, 1.XII.2004, fl., *Lehavana et al. 219* (K, MO, P); Maroantsetra, Rantabé, 15°43'48"S 49°39'21"E, 19.II.2002, fr., *Rabenantoandro & Rolland 897* (MO, TEF); Soanierana-Ivongo, Manompana, forêt sur sables d'Antanambao-Ambodimanga [forêt classée d'Antsiraka], 16°45'40"S 49°42'35"E, 1.II.2003, fr., *Rabevohitra et al. 4351* (CAS, G, MO, P, TEF); *ibid. loc.,* Tanambaon'Ambodimanga, 16°46'07"S, 49°42'40"E, 30.I.2004, fr., *Rabevohitra 4903* (TEF [the 2nd sheet of this no. in TEF is *Memecylon infuscatum*]); Soanierana-Ivongo, Manompana, forêt de Fandrarazana, 16°45'10"S 49°43'29"E, 30.I.2004, fr., *Rabevohitra & Rakotomamonjy 4913* (CAS, MO, P); env. de PN Mananara-Nord, loc. Ambodihazovola, 27.II.1990, fr., *Raharimalala 331* (P); forêt classée de Tampolo, 17°17'S 49°25'E, IV.1997, fr., *Ralimanana et al. 83-bis* (G, MO); Tamatave, XII.1948, fl., *Service Forestier 1117* (TEF); Tampolo-Tamatave, 27.XI.1951, fl. buds, *Service Forestier 4266* (MO, P, TAN, TEF); Distr. Fénérive, Cton Ampasina, Tampolo (parcelle B.3), 13.I.1956, fl., *Service Forestier 15332* (K, MO, P, TEF); *ibid. loc.,* Jard. Bot. no. 21, 17.XII.1956, fl., *Service Forestier 16476* (MO, P, TEF); forêt de Mangalimaso, W Foulpointe, 23.XI.1962, fl., *Service Forestier 22086* (K, L, MO, P, TEF, WAG); S of Fandrarazana, E side of road to Antanambao-Ambodimanga, 16°45'29"S 49°42'58"E, 19.I.2007, ster., *Stone et al. 2600* (CAS, P [05207162], TAN). **Sine loc.:** *sine loc.*, s.d., fl., *Aublet s.n.* (P).

7. ***Lijndenia ramiflora*** Jacq.-Fél. in Bull. Mus. Natl. Hist. Nat., B, Adansonia 7 : 42. 1985.

Typus : Madagascar. Prov. Toamasina : Antanambé, S de Mananara, XI.1964, fl., *Service Forestier 23755* (holo- : P [P00057574]! ; iso- : G [G00443616]!, K [K000230002]!, MO-4373215!, P [P00057575]!, TEF [TEF000310]!, WAG [WAG0027198]!).

Shrub or small *tree* ; young branchlets terete, flexuous. *Leaves* 3-nerved (principal nerves slightly visible on the upper surface, moderately salient on the lower, the pair of lateral nerves evanescent towards the apex), subcoriaceous, yellowish green and granular on the lower surface in dried material ; petiole 3 mm ; blades elliptic to elliptic-lanceolate, up to 5.5 × 2 cm, cuneate at base, distinctly acuminate at apex (the acumen obtuse and ± apiculate). *Cymes* numbering 3-13(-18) in fascicles at the nodes of the trunk, forming an inflorescence 3-4 cm in diameter and totaling some 60 flowers ; each cyme with a slender peduncle 5-15 mm, directly umbelliform or formed of several umbellules each grouping 6-9 pedicellate flowers ; bracteoles concrescent at their base, the margins free, hyaline, truncate, forming an involucre at the base of the pedicel 5-7.5 mm. *Hypantho-calyx* cupulo-patellate, 2 × 3 mm, the margin membranous, at first 4-lobed in bud, then only sinuate and minutely 4-toothed at anthesis ; epigynous chamber smooth, style 6-7 mm ; petals blue, membranous, semi-ovate, auriculate above the claw, 2.5 × 3 mm ; staminal filaments 5 mm, anthers 2 × 1 mm, anther-sacs fronto-ventral, connective conical, slightly incurved by a median gland 1/3 the length of the connective ; ovary 8-ovuled. *Fruit* unknown.

Distribution and ecology. – The type and only known collection of *L. ramiflora* was made in the coastal region near Antanambé in central Madagascar's Toamasina province (Fig. 3). According to the collector, the site is on lateritic soil and the habitat was presumably in sublittoral forest.

Conservation status. – *Lijndenia ramiflora* is known from a single location with an AOO of 4 km². The coastal forests in the type region have already been destroyed or reduced to small remnants, and *L. ramiflora* was not found during two days of field-work by the present author from Antanambé southward to Manompana (on 17-18 Jan. 2007). Given the extensive loss of habitat and the fact that *L. ramiflora* has not been seen in more than 50 years, it is quite possible that the species is already extinct, although more exhaustive surveys would be needed to establish this beyond a reasonable doubt. *Lijndenia ramiflora* is thus provisionally assessed as "Critically Endangered" [CR B2ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – *Lijndenia ramiflora* is distinctive in producing inflorescences in dense fascicles lower down on the trunk (whilst in the other *Lijndenia* species the inflorescences appear mostly in fascicles at the leafless nodes of older branchlets i.e. just below the leaves). The species was previously illustrated by Jacques-Félix (1985b : tab. 29 : 5-9).

8. ***Lijndenia roborea*** (Naudin) Jacq.-Fél. in Bull. Mus. Natl. Hist. Nat., B, Adansonia 7 : 40. 1985 (Fig. 8).

≡ *Memecylon roboreum* Naudin in Ann. Sci. Nat., Bot., ser. 3, 18 : 268. 1852.

≡ *Spathandra roborea* (Naudin) Jacq.-Fél. in Adansonia ser. 2, 18 : 228. 1978.

Typus : Madagascar : *sine loc.* [env. de Tamatave, fide Perrier de la Bâthie, 1951 : 300], s.d., fl. buds, *Chapelier s.n.* (holo- : P [P00057576]! ; fragment : BR [BR000000626105]!).

= *Memecylon viguierianum* H. Perrier in Mém. Acad. Malgache 12 : 219. 1932. **Typus : Madagascar. Prov. Toamasina :** côte orientale, Tampina, près des lagunes, XI.1920, fl., *Perrier de la Bâthie 13293* (holo- : P [P00057577]! ; iso- : P [P00057578, 00057579]!).

Shrub or small *tree* 2-6 m ; young branchlets terete, stout. *Leaves* apparently 1-nerved (the midnerve visible on the upper surface, thick but not salient on the lower ; the pair of intramarginal nerves obscure but ± visible towards the base on both surfaces), thickly coriaceous, smooth or slightly granular in dried material ; petiole 2-6 mm, thick ; blades mostly obovate, 4-7(-8.5) × 2-4(-5.7) cm, mostly cuneate at base and rounded to retuse or emarginate at apex ; transverse veins salient in the upper part of the leaf, orientated at a somewhat oblique angle relative to the midnerve. *Cymes* solitary or fascicled on the leafy or leafless nodes ; peduncle thick, flattened, 0.5-3 mm ; immediately umbelliform and 7-15-flowered ; bracts fleshy, adherent at their base ; bracteoles 1 mm with free margins, membranous, truncate ; pedicel 3-5 mm. *Hypantho-calyx* cupulo-patellate, 2-2.5 × 2.5-3 mm, calyx lobes triangular, 0.7 × 1 mm ; petals pale blue, unguiculate, limb membranous, ± orbicular, 2.5-3 × 2-3 mm, base cordate to auriculate, claw 1.5 mm, thick, linear or dilated towards the base of the limb ; stamens equal or the epipetalous ones slightly longer (filaments 5-7 mm), anthers 1-1.5 × 0.5 mm, anther sacs frontal, connective incurved with the gland slightly anterior, extremity acute ; style 12 mm. *Fruit* globose, 8 mm in diameter, green turning dark purple at maturity ; calyx lobes persistent.



Fig. 8. – Living material of *Lijndenia roborea* (Naudin) Jacq.-Fél. **A.** Flowers; **B.** Fruiting branchlets; **C.** Leaf; **D.** Fruits. [Photos: **A:** G.E. Schatz; **B:** R.D. Stone; **C-D:** R. Letsara]

Distribution and ecology. – An endemic species of the littoral forest along Madagascar's eastern coast, in Toamasina province from near Ambila-Lemaitso northwards to Foulpointe (Fig. 3).

Conservation status. – *Lijndenia roborea* seems to be a rather common species but with a very limited area of distribution. It is known from four locations (none within a formally protected area) and has an EOO of 420 km^2. One of the known locations (Ambila-Lemaitso) has been recommended for protected status, and another site (Vohibola) where *L. roborea* is expected to occur has been similarly recommended (Consiglio et al., 2006). *Lijndenia roborea* is thus provisionally assessed as "Endangered" [EN B1ab(iii)+B2ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – This species was previously illustrated by Perrier de la Bâthie (1951: fig. 48: 1-4, as *Memecylon viguierianum*) and Jacques-Félix (1985b: tab. 28: 1-5).

Because the leaves of *Lijndenia roborea* are so thickly coriaceous, the ramiform sclereids are not evident as a granular surface texture in dried material (unlike other *Lijndenia* spp. in which this finely granular texture is usually present). The fruits are edible and delicious when ripe.

In the *Flore de Madagascar* (Perrier de la Bâthie, 1951), the name *Memecylon subcuneatum* H. Perrier (1932) was considered to be a taxonomic synonym of *M. roboreum* (≡ *Lijndenia roborea*), but this would seem to be an error as a reexamination of the holotype of *M. subcuneatum* (*Perrier de la Bâthie 6479*, P [P00062708]) indicates it is properly placed in *Memecylon* s.s.

Additional material examined. – **Madagascar. Prov. Toamasina:** near lake S of Ambila-Lemaitso, 19.I.1986, fr., *Dorr et al. 4587* (K, MO, TAN); env. d'Ambila-Lemaitso, 14.XI.1986, fl., *Le Thomas 105* (P); Foulpointe, IV.1986, fr., *Rakotozafy 2048* (MO, TAN); Ambila-Lemaitso, just N of railroad bridge, W of pangalane (canal), 18°51'S 49°08'E, XI.1988, fl., *Schatz et al. 2417* (K, MO, P, TAN); *ibid. loc.,* 28.I.1993, fr., *Schatz et al. 3434* (BR, CAS, MO, P, TAN); Ambila-Lemaitso, 2.II.1951, fr., *Service Forestier 2893* (P, TAN);

ibid. loc., 26.XII.1963, fl. buds, *Service Forestier 22755* (K, MO, P, TEF); *ibid. loc.,* 14.XII.1967, fl., *Service Forestier 28040* (K, MO, P, S, TEF); 7.5 km S d'Ambila-Lemaitso, forêt d'Andavakimena, près du lac d'Andobobe, 18°54'S 49°07'20"E, 14.XI.2001, fl. & immature fr., *Stone et al. 2386* (CAS, P, TAN); N of Ambila-Lemaitso along pangalane, Andrasoabe forest near Ampanotoamaizina, 18°42'03"S 49°12'11"E, 13.II.2008, fr., *Stone et al. 2670* (CAS, G, K, MO, P, TAN).

9. ***Lijndenia terminalis*** Jacq.-Fél. in Bull. Mus. Natl. Hist. Nat., B, Adansonia 7: 42. 1985.

Typus: Madagascar. Prov. Fianarantsoa: entre Farafangana et Manombo, 8.XII.1964, fl. past anthesis & imm. fr., *Service Forestier 23933* (holo-: P [P00057580]!; iso-: P [P00057581]!, TEF!).

Large *shrub*; young branchlets terete. *Leaves* apparently 1-nerved (the midnerve finely impressed on the upper surface, faintly prominent below; intramarginal nerves slightly visible below, evanescent towards the apex), subcoriaceous, yellowish green, dull, granular on both surfaces in dried material; petiole 5-8 mm; blades elliptic-lanceolate, up to 9 × 3.8 cm, cuneate at the base, shortly obtuse-acuminate at the apex. *Cymes* umbelliform, borne terminally on the branchlets or solitary to geminate in the leaf axils; peduncle 10-15 mm; heads subtended by a pair of triangular bracts and with a pair of concrescent, truncate-margined, hyaline bractlets subtending each pedicel 4-5 mm. *Flowers* not seen. *Fruits* hemispheric in early development, 1.5-2 mm in diameter, crowned by the persistent calyx 1 × 2.5-3 mm, the margin sinuate and minutely 4-toothed; mature fruit unknown.

Distribution and ecology. – An endemic of southeastern Madagascar, in Fianarantsoa province south of the coastal town of Farafangana (Fig. 3). The type and only known collection was made in remnants of sublittoral forest, on laterite weathered from basalt.

Conservation status. – *Lijndenia terminalis* is known from a single location and has an AOO of 4 km^2. At the time of the type collection in 1964, the coastal forests in the region of Farafangana had already been severely fragmented by anthropogenic activities. Today, these forests have almost completely disappeared (R. D. Stone, personal observation). Forested habitats on basaltic soils still remain in the Réserve spéciale de Manombo, but *L. terminalis* was not found there despite two days of searching by the present author on 22-23 Nov. 2001. Given the severe loss of habitat and the fact that *L. terminalis* has not been seen in more than 50 years, it is quite possible that the species is already extinct, although more exhaustive surveys would be needed to establish this beyond a reasonable doubt. *Lijndenia terminalis* is thus provisionally assessed as "Critically Endangered" [CR B2ab(iii)] according to the IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. – The cymes borne terminally on the branchlets and at the uppermost leafy nodes are quite distinctive of this species. However, mounted on the Isotype sheet in P [P00057581] there are also two densely fascicled, trunciflorous inflorescences very similar to those of *L. ramiflora* (q.v.). In fact, after a close reexamination I cannot find any differences between the two. Moreover, the axillary and terminal inflorescences of P00057581 have young, developing fruits like those of the Holotype sheet [P00057580] whilst the two trunciflorous inflorescences have flowers ranging from the bud stage to anthesis and past anthesis. These observations indicate that the trunciflorous inflorescences found on the isotype sheet of *L. terminalis* are really from the type collection of *L. ramiflora* (*Service Forestier 23755*) and were placed in error with P00057581. It would thus seem that the original description and illustration of the flowers and floral parts of *L. terminalis* (Jacques-Félix, 1985b: 42 & tab. 29: 1-4) were erroneously based on material taken from *L. ramiflora*.

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