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# The genera of Lauraceae in Madagascar with nomenclatural novelties in Cryptocarya

Henk van der Werff

### **Abstract**

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Two identification keys to the genera of *Lauraceae* in Madagascar based on or fruiting specimens are provided. For each genus diagnostic characters, estimates of species numbers, recent literature and additional notes are included. Eight species of *Ravensara* Sonn. are transferred to *Cryptocarya* R. Br., resulting in five new combinations and three new names. A lectotype is designated for *Ravensara affinis* Kosterm. (= *Cryptocarya petiolata* van der Werff).

### Résumé

VAN DER WERFF, H. (2017). Les genres de Lauraceae à Madagascar, avec des nouveautés nomenclaturales dans le genre Cryptocarya. *Candollea* 72: 323-328. En anglais, résumés anglais et français. DOI: http://dx.doi.org/10.15553/c2017v722a8

Deux clés d'identification des genres de *Lauraceae* à Madagascar basées sur des spécimens en fleur ou en fruit sont fournies. Pour chaque genre, les caractères diagnostiques, l'estimation de son nombre d'espèces, la littérature récente le concernant et des notes supplémentaires sont fournies. Huit espèces de *Ravensara* Sonn. sont transférées à *Cryptocarya* R. Br., par cinq nouvelles combinaisons et trois noms nouveaux. Un lectotype est désigné pour *Ravensara affinis* Kosterm. (= *Cryptocarya petiolata* van der Werff).

### **Keywords**

LAURACEAE - Cryptocarya - Ravensara - Madagascar - identification key - new combinations - new names

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### Introduction

Lauraceae form a sizeable family of trees and shrubs best represented in tropical America and tropical Asia. Africa is relatively poor in species, but Madagascar is about as rich in species as the entire African mainland. Lauraceae occur predominantly in wet forests and their species numbers diminish rapidly in seasonal dry forests. Our knowledge of Lauraceae from Madagascar started with the description of a few isolated species, especially those species used by the Malagasy people. The first species described from Madagascar was Ravensara aromatica Sonn. (= Cryptocarya agathophylla van der Werff), the leaves of which were widely used as a condiment and for their medicinal properties. The first treatment of Lauraceae from Madagascar was published in 1939 (Kostermans, 1939) in which the following genera were recognized: Apollonias Nees, Cassytha Osbeck, Cryptocarya R. Br., Ocotea Aubl., Potameia Thouars and Ravensara Sonn. Potameia and Ravensara were considered to be endemic to Madagascar. With minor changes this treatment was reissued in 1950 as a fascicle of the Flore de Madagascar et des Comores (Kostermans, 1950). The main change was the transfer of the species previously placed in Apollonias to Beilschmiedia. In 1957 and 1958 Kostermans published a series of articles with the descriptions of new species of Beilschmiedia (Kostermans, 1957a), Cryptocarya (Kostermans, 1957b), Ocotea (Kostermans, 1957c), Potameia (Kostermans, 1957d) and Ravensara (Kostermans, 1958) and thereby greatly increased the number of known species of Lauraceae from Madagascar. Unfortunately, no keys to the species were included and identification of Lauraceae remained difficult. The genera Cryptocarya and Ravensara differed in only one character of the fruit (cotyledons ruminate by septa developing from the exocarp in Ravensara or without septa in Cryptocarya). Because species of Cryptocarya with ruminate cotyledons were also reported from Australia (HYLAND, 1989), VAN DER WERFF (1992) proposed to merge Cryptocarya and Ravensara. With Ravensara being the older name, he also proposed to conserve Cryptocarya over Ravensara (VAN DER WERFF, 1992), a proposal that was accepted by the Nomenclature Section of the International Association for Plant Taxonomy (Brummit, 1994). Rohwer & Richter (1987) established a new Malagasy endemic genus, Aspidostemon Rohwer & H.G. Richt., for a number of species previously placed in Cryptocarya. Aspidostemon differs from Cryptocarya in having 3 or 6 stamens (vs 9 stamens in Cryptocarya), opposite leaves (vs alternate in Cryptocarya) and in characters of the wood and bark.

The floral parts of a typical *Lauraceae* flower are arranged in whorls of three. From the outside toward the center there are two whorls of three tepals each, however the six tepals appear in most species as one whorl with the tepals equal in size and shape. The stamens are arranged in four whorls with Whorl I the outermost and Whorl IV the innermost. Whorl I

is opposite the outer tepals, Whorl II opposite the inner tepals, Whorl III again opposite the outer tepals, Whorl IV opposite the inner tepals. Stamens of whorl IV are nearly always staminodial or lacking. The anthers are generally bi- or quadrilocular, and display valvate dehiscence, each locule formed from a single locellus opening by a valve or flap attached apically. The pistil has a single ovary with one ovule and the fruit is a one-seeded drupe. In a few genera the floral parts are arranged in whorls of two instead of three; flowers of those species have four tepals and six stamens arranged in three whorls of two. Reductions of flower parts occur; sometimes stamens of Whorl III or II become staminodial or their anthers may be unilocular due to the fusion of adjacent locelli. There is also variation in the development of fruits. In some genera the tepals fall off in old flowers and the fruit sits fully exposed on the pedicel. In others the fruit is seated in a shallow or deep cup. Finally, in some genera the fruit is fully enclosed in the accrescent floral tube, which carries small scars of fallen tepals on the tips.

### **Taxonomy**

We provide below two keys for identifications of Malagasy genera of *Lauraceae*, based respectively on flowering and fruiting material. However, a few unusual vegetative characters states are of great help to identify these genera:

- Opposite leaves: while alternate leaves predominate in Lauraceae, all species of *Aspidostemon* have opposite leaves and a few species of *Beilschmiedia* and *Ocotea* also have opposite leaves.
- Presence of domatia: All known species with domatia from Madagascar belong to Ocotea.
- Presence of dense, brown, reddish or dark brown pubescence on young leaves and twigs: All known species with this type of pubescence belong to *Cryptocarya*.

### Key to genera based on flowering specimens

<ol> <li>Herbaceous, parasitic vine without leaves</li> <li>Trees or shrubs with regular leaves</li> </ol>	-
Stamens 4-locular  2a. Stamens 2-locular, rarely 1-locular	
<ul><li>3. Flowers with 4 tepals</li><li>3a. Flowers with 6 tepals</li></ul>	
4. Leaves alternate	
5. Stamens 3 or 6; leaves opposite	f opposite,

6. Receptacle tube deep, the ovary enclosed in the tube
Cryptocarya
6a. Receptacle tube very short, the ovary fully exposed in
the flower
Key based on fruiting specimens
1. Herbaceous parasitic vine without leaves Cassytha

### 

base; leaves alternate or opposite ...... Beilschmiedia

5a. Fruits with 6 small tepals or 6 scars of fallen tepals at the

### Aspidostemon Rohwer & H.G. Richt.

Typus: Aspidostemon perrieri (Danguy) Rohwer

Diagnostic characters. – Opposite leaves, trimerous flowers with 3 or 6 two-locular stamens, staminodia of whorl III enlarged and conspicuous. Fruits enclosed in receptacle with scars of fallen tepals on top.

Distribution. - Endemic to Madagascar.

Number of species. – 28.

Recent literature. – Rohwer & Richter (1987), van der Werff (2006).

Notes. – Aspidostemon can be recognized in the field by its opposite leaves frequently with acuminate tips and inconspicuous, immersed or slightly raised venation. The bark of Aspidostemon is distinctive and has been referred to as platanoid (VAN DER WERFF, 2006), it was described by René Capuron on the labels of several of his collections "rhytidome caduc par plaques [exfoliating in large plates]". Opposite leaves occur also in a few species of Beilschmiedia and Ocotea; see the discussion under those genera. Sterile specimens cannot be identified with confidence except for one or two vegetatively distinct species.

### Beilschmiedia Nees

**Typus:** Beilschmiedia roxburghiana Nees

Diagnostic characters. – Flowers trimerous with nine bilocular stamens (rarely with dimerous flowers; see notes) and fruits seated on the pedicel, the tepals deciduous or persisting as small bracts at the base of the fruits.

Distribution. - Pantropical.

Number of species in Madagascar. - 9 (all endemic).

Recent literature. - VAN DER WERFF (2003).

Notes. – The Beilschmiedia species in Madagascar can be divided in three groups on vegetative and floral characters. The first group has alternate leaves and small flowers with erect tepals; the second one has alternate leaves and larger flowers with spreading tepals and the third group has opposite leaves and flowers with erect tepals. Some specimens have the vegetative characters of the third group but dimerous flowers (with 4 tepals and 6 stamens instead of 6 tepals and 9 stamens) characteristic of Potameia and thus combine characters of Beilschmiedia and Potameia. An analysis of cuticular features (NISHIDA & VAN DER WERFF, 2007) has shown that these specimens all have cuticles characteristic of the third group of Beilschmiedia and therefore they are placed in Beilschmiedia.

### Cassytha Osbeck

**Typus:** Cassytha filiformis L.

Diagnostic characters. – Herbaceous, parasitic vine without leaves.

Distribution. - Pantropical.

*Number of species in Madagascar.* – 1 (native, non-endemic).

Recent literature. – Weber (1981).

Notes. – All species of Cassytha are leafless, herbaceous and parasitic vines. Largely because of their habit they have been placed in a separate family, Cassythaceae but phylogenetic studies (Rohwer, 2000; Chanderbali et al. 2001) have shown that Cassytha is nested within Lauraceae.

### Cryptocarya R. Br.

Typus: Cryptocarya glaucescens R. Br.

= Ravensara Sonn. **Typus:** Ravensara aromatica Sonn. (= Cryptocarya agathophylla van der Werff).

Diagnostic characters. – Flowers with nine bilocular stamens, ovary included inside a deep receptacle, fruits enclosed by the receptacle with scars of the fallen tepals on top; leaves alternate.

Distribution. - Pantropical.

*Number of species in Madagascar.* – c. 40 (c. 39 endemic, one shared with the Comoro Islands)

Recent literature. - VAN DER WERFF (2008, 2013a).

Notes. - Cryptocarya is readily recognized by its flowers, with the ovary included in, but not attached to, the receptacle and its fruits, entirely enclosed in the accrescent receptacle. Species previously placed in Cryptocarya with a similar receptacle, but with 3 or 6 stamens and opposite leaves are now recognized as Aspidostemon. The genus Ravensara, formerly treated as endemic to Madagascar, and differing from Cryptocarya only in one fruit character: the presence of septa growing from the receptacle wall in to the fruits and making the fruits appear 6-lobed. Because this character also appeared sparingly in Cryptocarya species outside Madagascar, Ravensara and Cryptocarya are now considered synonyms (VAN DER WERFF, 1992) and Cryptocarya, although nomenclaturally younger, is conserved over Ravensara (VAN DER WERFF, 1992; BRUMMIT, 1994). Several species of Cryptocarya have a dense indument consisting of erect, curly hairs entirely covering the lower leaf surface and young twigs. The color of this pubescence varies from brown, reddish brown or dark brown and it wears off on older leaves and twigs. This pubescence seems to be restricted to Cryptocarya in Madagascar. Most species of Lauraceae in Madagascar have elliptic leaves, but among Cryptocarya species oblong leaves are not uncommon. Cryptocarya is in need of a complete taxonomic revision.

Since *Ravensara* was sunk in synonymy of *Cryptocarya*, several *Ravensara* species have been transferred to *Cryptocarya* (VAN DER WERFF, 2008, 2013a). Eight species recognized by Kostermans are still in need of a name in *Cryptocarya* and the necessary nomenclatural changes (five new combinations and three new names) are presented below. A lectotype is designated for *Ravensara affinis* Kosterm. (= *Cryptocarya petiolata* van der Werff).

### Transfers of Malagasy Ravensara species to Cryptocarya Cryptocarya canaliculata van der Werff, nom. nov.

= Ravensara impressa Kosterm. in Not. Syst. (Paris) 8: 109. 1939 [non Cryptocarya impressa Miq.].

**Typus:** MADAGASCAR. **Prov. Toliara:** Morondava, bois près de la riv. Anove, 200 m, Aug. 1912, *Perrier de la Bâthie 10134* (holo-: P [P00853277]!; iso-: P [P00540975] image seen).

### Cryptocarya coriacea (Kosterm.) van der Werff, comb. nov.

= *Ravensara coriacea* Kosterm. in Bull. Jard. Bot. Etat Bruxelles 28: 177. 1958.

**Typus:** MADAGASCAR. **Prov. Toamasina:** Menagisy, Brickaville, 8.XII.1950, fl., *Service Forestier 12356* (holo: P [P00853276]!; iso-: BO, P [P00540979] image seen).

### Cryptocarya flavescens (Kosterm.) van der Werff, comb. nov.

= Ravensara flavescens Kosterm. in Not. Syst. (Paris) 8: 108.1939.

**Typus:** MADAGASCAR. **Prov. Toamasina**: forêts montagneuses de l'Est, fl., *Louvel 233* (holo-: P [P00853278]!).

### Cryptocarya montana (Kosterm.) van der Werff, comb. nov.

= *Ravensara montana* Kosterm. in Bull. Jard. Bot. Etat Bruxelles 28: 183. 1958.

**Typus:** MADAGASCAR. Prov. Antsiranana: Massif du Marivorahona, 1900 m, 25.III.1951, fr., Service Forestier 3061 (holo-: P [P00540969] image seen, iso-: BR [BR0000006251659] image seen, K!, L [L0036893] image seen, [P00853275, P00540970, P00540971] images seen, TEF [TEF000295] image seen).

### Cryptocarya multiflora van der Werff, nom. nov.

Ravensara floribunda Baillon in Adansonia 9: 304. 1870 [non Cryptocarya floribunda Nees].

**Typus:** MADAGASCAR: *sine loc.*, fl., *Chapelier s.n.* (holo-: P [P00540976] image seen; iso-: P [P00853273]!).

### Cryptocarya oreophila van der Werff, nom. nov.

= Ravensara macrophylla Kosterm. in Not. Syst. (Paris) 8: 111. 1939 [non *Cryptocarya macrophylla* Gamble].

**Typus:** MADAGASCAR. Prov. Antsiranana: Tsaratanana, 2000 m, IV.1924, fr., *Perrier de la Bâthie 16071* (holo-: P [P00853272]!; iso-: P [P00540972] image seen).

### Cryptocarya perareolata (Kosterm.) van der Werff, comb. nov.

= *Ravensara perareolata* Kosterm. in Bull. Jard. Bot. Etat Bruxelles 28: 185. 1958.

**Typus:** MADAGASCAR. Prov. Fianarantsoa: Andrambovato-Fologoina-Fort Carnot, 27.I.1953, fl., *Service Forestier* 7076 (holo-: P [P00540960]!; iso-: BO, P [P00853274]!, TEF [TEF000293] image seen).

### Cryptocarya petiolata van der Werff, nom. nov.

= *Ravensara affinis* Kosterm. in Not. Syst. (Paris) 8: 104. 1939 [non *Cryptocarya affinis* Merr.].

**Lectotypus** (designated here): MADAGASCAR. **Prov. Antananarivo:** bois des pentes occidentale, près d'Anjanabonoina bassin inférieur de l'Andrantsay, W. de Betafo, c. 1400 m, [19°57'02»S 46°28'36»E], IX.1921, fl., *Perrier de la Bâthie 13952* (P [P01991357]!; isolecto-: P [P01991355, P01991356, P01991358] images seen).

Note. – Kostermans (1939: 104) cited two collections under Ravensara affinis: Perrier de la Bâthie 13952 was listed as the type in the protologue, but specimens of Perrier de la Bâthie 10144 cited by Kostermans were annotated as the type in P. I follow the type indication from the protologue and accept Perrier de la Bâthie 13952 as the type collection of Cryptocarya petiolata with the sheet P01991357 designated here as the lectotype. Perrier de la Bâthie 10144 is no more than a paratype.

### Ocotea Aubl.

**Typus:** Ocotea guianensis Aubl.

*Diagnostic characters.* – Flowers with 9 four-locular stamens and fruit seated in a shallow or deep cupule.

Distribution. – Mostly neotropical, but with a smaller number of species in Madagascar and Africa.

Number of species in Madagascar. - 35 (all endemic)

Recent literature. - VAN DER WERFF (2013b).

Notes. – Ocotea is easily recognized in Madagascar. It is the only genus which has flowers with quadrilocular stamens and fruits seated in a cupule. Some of its species have domatia, tufts of hairs or pits in the axils of some of the secondary veins. Domatia do not occur in species of the other genera in Madagascar and sterile specimens with domatia can be assigned with confidence to Ocotea. Most species have alternate leaves, but a few have opposite or subopposite leaves.

### Potameia Thouars

Typus: Potameia thouarsii Roem. & Schult.

*Diagnostic characters.* – The combination of dimerous flowers (flowers with 4 tepals and 6 or fewer stamens) and alternate leaves.

Distribution. - Endemic to Madagascar (but see notes).

Number of species. – Estimated at 25 (all endemic)

Recent literature. - VAN DER WERFF (1991, 1996).

Notes. - Potameia is closely related to Beilschmiedia and differs from that genus by its dimerous flowers. Both genera have fruits seated on the pedicel with remnants of the tepals at the base, four in *Potameia* and six in *Beilschmiedia*. One species of Beilschmiedia (B. pedicellata van der Werff) may have dimerous flowers, but differs from *Potameia* in its opposite leaves (all species of *Potameia* have alternate leaves). Most species of Potameia have flowers with six bilocular stamens. In a few species the adjacent locelli become fused so the stamens are unilocular. The number of stamens can also be reduced; the extreme is P. micrantha van der Werff, a species with flowers with two stamens, each unilocular. Most herbarium specimens of *Potameia* have a light colored, grey bark. While such a bark color may also occur outside *Potameia*, its presence strongly suggests Potameia. Several Asian species, mostly from southern China, have been placed in *Potameia* but are now considered to belong to Syndiclis Hook.f.. The single Indian species placed in Potameia, P. tirunelvelica (Manickam, Murugan, Jothi & Sundaresan) M. Gangop., was originally placed in Beilschmiedia; the description stated that it has opposite leaves and dimerous flowers. Because the combination of opposite leaves and dimerous flowers also occurs in a Beilschmiedia and not in Potameia, I consider the Indian species as a Beilschmiedia and Potameia as a genus endemic to Madagascar. Potameia is in need of taxonomic revision.

#### Introduced taxa

Four species belonging to three genera have been introduced to Madagascar, but are not known to have become naturalized. These are: *Cinnamomum*, with two species. *Cinnamomum* has bisexual flowers with nine 4-locular stamens. *Cinnamomum camphora* (L.) Sieb. has alternate, tripliveined leaves with domatia; *C. verum* J.Presl has opposite, tri-veined leaves without domatia. *Cinnamomum camphora* is the source of camphor; the bark of *C. verum* yields cinnamon.

Litsea, with one species, L. glutinosa (Lour.) C.B. Rob. It is dioecious, with its unisexual flowers arranged in an umbel and is the only Lauraceae known from Madagascar with unisexual flowers arranged in this way. Litsea glutinosa is native to tropical Asia and Australia. In addition to Madagascar, it is also introduced in Africa and South America.

*Persea*, with one species, *Persea americana* Mill. It has flowers with nine 4-locular stamens and long filaments. Leaves are pinnately veined and lack domatia. It is cultivated for its fruits, the avocado.

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