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from New Caledonia

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ABSTRACT
Two endemic species of Cryptocarya R.Br. are described from New Caledonia. Cryptocarya conduplicata Munzinger & McPherson, sp. nov. was previously confused with C. aristata Kosterm., which it resembles in its typically numerous lenticels and oblate fruit, but from which it differs most noticeably in its leaf blades partly folded longitudinally (vs blades flat), and its smaller fruits (13-15 mm long vs 20-30 mm long). Cryptocarya ovoidea Munzinger & McPherson, sp. nov. can be distinguished most easily from C. pluricostata, its sister species according to molecular data, by its indument (hairs sparse, whitish, cream-grey to blackish, quickly falling vs. hairs dense, ferrugineous sublanate and subpersistent in C. pluricostata). As well, the fruit of C. ovoidea, sp. nov. is ovoid and its perianth is caducous, in contrast to the fruit of C. pluricostata, which is ellipsoid and retains its perianth. The two new species are trees occurring in dense humid forest, and are restricted to non-ultramafic substrate. Cryptocarya conduplicata sp. nov. is common, known from three protected areas, and is assigned a preliminarily Least Concern IUCN status, while C. ovoidea sp. nov. is only known from two individuals on Mont Aoupinié, a protected area, where many inventory plots were established without finding any individuals; thus, we assign it a preliminary status of Critically Endangered (CR).
RÉSUMÉ

Novitates neocaledonicae XII: deux espèces nouvelles supplémentaires de Cryptocarya R. Br. de Nouvelle-Caledonie.

Deux espèces endémiques de Cryptocarya R. Br. sont décrites en Nouvelle-Caledonie. Cryptocarya conduplicata Munzinger & McPherson, sp. nov. était auparavant confondue avec C. aristata Kosterm. à laquelle elle ressemble par ses nombreuses lenticelles et ses fruits oblates, mais dont elle diffère surtout par ses limbes partiellement repliés longitudinalement (contre des limbes plats), et ses fruits plus petits (13-15 mm de long contre 20-30 mm de long). Cryptocarya ovoidea Munzinger & McPherson, sp. nov. se distingue plus facilement de C. pluricostata, son espèce soeur selon les données moléculaires, par son indument (poils épar, blancâtres, gris crème à noircâtres, tombant rapidement vs. poils denses, ferrugineux sublaineux et subpersistentes chez C. pluricostata). De même, le fruit de C. ovoidea, sp. nov. est ovoïde et son périanthe est caduc, contrairement au fruit de C. pluricostata, qui est ellipsoïde et conserve son périanthe. Les deux nouvelles espèces sont des arbres présents dans la forêt dense humide, et ne poussent que sur substrat non ultramafique. Cryptocarya conduplicata sp. nov. est commun, connu dans trois aires protégées, et a reçu le statut préliminaire de Préservation de l’UICN, tandis que C. ovoidea sp. nov. n’est connu que de deux individus du Mont Aoupinié, une zone protégée, où de nombreuses parcelles d’inventaire ont été installées sans qu’aucun individu n’ait été trouvé ; nous lui attribuons donc un statut préliminaire en danger critique d’extinction (CR).

MOTS CLÉS
Nouvelle-Caledonie, Lauraceae, conservation, espèces nouvelles.

INTRODUCTION

The Lauraceae of New Caledonia were treated in volume 5 of the Flore de la Nouvelle-Calédonie et Dépendances (Kostermans 1974) and a new species in the genus Litsea Lam. was added 3 years later (Kostermans 1977). Difficulties in identifying some collections of Lauraceae were noted in the 1990s during forest characterization work (Jaffré & Veillon 1990 [publ. 1991], 1995) and led to the suspicion that several morpho-species might represent undescribed taxa. Later, one of us (JM) also encountered difficulties of identification, particularly in the context of setting up the NC-PIPPN plot network (Ibanez et al. 2014), and various forest inventories (Munzinger 2013). We then undertook the revision of the family, within the framework of the Flore de la Nouvelle-Calédonie, in order to publish a new version, because it had become obvious that the first treatment was in need of revision, as are other early volumes of the collection (Munzinger 2015). Results thus far include the description of three new species of Cryptocarya (Munzinger & McPherson 2016) and the discovery that Litsea mackeii Kosterm. is synonymous with a species of Oleaceae (Munzinger & McPherson 2017). Among the other probably new species that had been identified but for which additional material or studies were needed, two are now sufficiently well-delimited that they can be adequately described. Thanks to the nature guards of the Northern Province, we were able to obtain flowers of one of them, and recent field observations and molecular work (the latter not presented here) allow us to validate a second species, previously confused with C. aristata Kosterm. Each species is illustrated, and photographs taken in the field and distribution maps are provided, as well as preliminary conservation evaluations following the IUCN Red List criteria (2012).

MATERIAL AND METHODS

We made use of field observations and photographs, and checked all specimens deposited at MO, MPU, NOU and P (abbreviations follow Thiers 2020); the scanned images of specimens at Z were consulted online at http://www.herbarien.uzh.ch/index_en.html. In addition, we studied the virtual collections of the Global Plants initiative (https://plants.jstor.org/) and used the RECOLNAT infrastructure (https://www.recolnat.org/fr/). Plant terminology follows Harris & Harris (2001). Maps were made using herbarium specimens and occurrences identified by JM in the NC-PIPPN database (Ibanez et al. 2014) and during botanical expeditions (Munzinger 2013; Munzinger et al. 2018). Coordinates not given on original labels of herbarium specimens were added post-facto using MacKee’s gazetteer (available at http://phanero.novcal.free.fr/index-georeference-de-prospection-botanique.html). The year of collection for Lécard’s and Gaillard’s specimens was extrapolated based on Morat (2010). When citing material, any information not available on the original label is given between brackets. We applied the IUCN Red List Categories and Criteria (IUCN 2012; IUCN Standards and Petitions Subcommittee 2019) to assess the risk of extinction of each species. We calculated EOO and AOO (with a 2 × 2 km grid) using the online “geocat” software (http://geocat.kew.org; Bachman et al. 2011). We have indicated vernacular names and uses when information was available.

SYSTEMATICS

Family LAURACEAE Juss.
Genus Cryptocarya R.Br.

Cryptocarya conduplicata
Munzinger & McPherson, sp. nov.
(Figs 1; 2)

From Cryptocarya aristata, which it resembles in its typically numerous lenticels and oblate fruit, C. conduplicata, sp. nov. differs most noticeably in its leaf blades often at least partly folded longitudinally
Two new Cryptocarya R.Br. from New Caledonia

Fig. 1. — Cryptocarya conduplicata Munzinger & McPherson, sp. nov.: A, flowering branch; B, lenticels on young twigs; C, leaf in lateral view; D, abaxial face; E, flower from above; F, flower in lateral view; G, external tepal, adaxial face; H, external tepal, abaxial face (Munzinger et al. 6545); I, stamen of whorl I; J, stamen of whorl III with glands; K, isolated gland; L, staminode, abaxial face; M, staminode, adaxial face; N, gynoecium; O, schematic view of the longitudinal section of the hypanthium and ovary; P, young fruit; Q, ripe fruit in herb.; R, mature fresh fruit; S, fruit in transversal section; T, ripe fruit. Photos: A, from photograph in the field of Munzinger et al. 6491; B, McPherson 19131; C, Veillon 555; D, from photograph in the field of Munzinger et al. 6534; E, from photograph in the field of Munzinger et al. 6545; F-O, Munzinger et al. 6545; P, Munzinger et al. 5874; Q, Veillon 4230; R, after a field photograph not vouchedered; S, T, from photograph in the field of Munzinger et al. 8101. Drawings: Laurence Ramon. Scale bars: A-D, 1 cm; E, F, M, N, 1 mm; G-I, L, O, 0.5 mm; P-T, 1 cm.
Fig. 2. — Field pictures of Cryptocarya conduplicata Munzinger & McPherson, sp. nov.: A, trunk and slash; B, flushing and flowering branch; C, flower; D, branch with young fruits; E, F, branch with nearly mature fruits; G, mature fruit in cross-section; A, D, Munzinger et al. 5874; B, Munzinger et al. 6545; C, Munzinger et al. 6481; E, Butin 87; F, G, Munzinger et al. 8101. Photographs: A-E, P. Lowry; F, G, D. Fleurot.
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[vs blades flat], its lenticels no higher than 0.5 mm (vs 1-3 mm), and its smaller fruits (22-25 mm wide, 13-15 mm high, 10 mm thick vs 25-45 mm wide, 20-30 mm high, 20-30 mm thick); as well, its flowers are slightly smaller (tepals 1.3-1.8 mm vs 1.5-2.0 mm long, and its hypanthium distally is 1.3 mm in diameter vs 1.4-1.8 mm).

**Typus.** — New Caledonia. Province Nord, Haute Tchamba, [c. 500 m], 21°0'23"S, 165°14'35"E, fl, 16.II.2011, J. Munzinger, P. Lowry, S. Buerki, M. Callmander, I. & D. Létocart, C. Davidson & S. Christoph 6545 (holo-, P! [P00819240], iso-, MO! [6642455, 6642456], MPU! [MPU091689], NOU! [NOU052192]).

**Phenology.** — Flowers have been collected in November, December, and February; fruits are known from October to March (black = ripe in November, March). The flowers are noted as very fragrant (MacKee 26524).

**Etymology.** — The specific epithet refers to the often somewhat folded leaves.

**Habitat.** — The species grows in « forêts denses humides de basse et moyenne altitudes sur roches volcano-sédimentaires » sensu Jaffré et al. (2012), at 10-950 m.

**Distribution.** — The species grows on the east side of the main island “Grande Terre”; the southernmost locality is Nakada, and the northernmost is Mandjélia (Fig. 3).

**Conservation Status.** — The plant is known from fourteen subpopulations, three of them in protected areas: “Réserve de nature sauvage du massif de l’Aoupinié” and “Réserve de nature sauvage du mont Panié” in the North Province, and “Parc des Grandes Fougères” in the South Province. The calculated EOO is 3715 km² and the AOO is 68 km². Although some subpopulations may be threatened by bushfires and/or introduced browsers, we assign Cryptocarya conduplicata, sp. nov. a preliminary status of Least Concern (LC).

**Vernacular Name.** — Chêne gris (Sarlin 282).

Fig. 4. — Comparison of general aspect, angle of leaf presentation, and lenticels aspect between C. aristata (to the left in A and B, to the right in C) and C. conduplicata Munzinger & McPherson, sp. nov. (Munzinger et al. 6545, to the right in A and B, to the left C). Photographs: A, J. Munzinger; B, C, P. Lowry.
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**Note**

The species was first collected nearly a century and a half ago (a deapure specime, Lécard 162, dates from 1876/1877) and adequate flowering material has been available since 1965 (Veillon 553). The illust-rate of the treatment in the Flore, R. Fouilloy, who was acknowledged by Kostermans for his “useful additional morphological observations”, apparently noticed that Veillon’s specimen was different from the others, as he made a complete drawing of a dissected flower (see P02006307). However, in 1976 Fouilloy finally identified the specimen as *C. odorata*, even though his drawing reveals some obvious differences when compared to the plate of *C. odorata* provided in the Flore (Kostermans 1974); plate 9, page 49). Specimens of *C. conduplicata*, sp. nov. and *C. aristata* in the herbarium can seem quite similar, and molecular data indicate that the plants are closely related (C. Gemmill pers. comm.), but field observations, in addition to the morphological differences outlined in the diagnosis, confirm that the two entities are distinct. *C. aristata* tending to have uniformly erect leaves, while *C. conduplicata*, sp. nov. typically bears leaves diverging at wider angles. The two species can grow side by side (Fig. 4), but *C. conduplicata*, sp. nov. is restricted to non-ultramafic substrates, while *C. aristata* can be found on both ultramafic and non-ultramafic substrates.

This species was cited as [Cryptocarya sp. “aff. aristata” (Munzinger 5874)] in (Munzinger 2013; Munzinger et al. 2018).

**Cryptocarya ovoidea**

Munzinger & McPherson, sp. nov.

(19811; 157).

From *Cryptocarya pluricostata* Kosterm., its sister species according to molecular data, *C. ovoidea*, sp. nov. differs in its short, sparse, whitish, cream-grey to blackish hairs, pressed toward the apex on bud and young twigs, quickly falling, versus the longer, dense, ferrugineous sublanate and subpersistent indument of *C. pluricostata*. As well, the secondary veins of *C. ovoidea*, sp. nov. remain concolorous on drying and the tertiaries are few, irregular and mostly areolate, whereas the secondaries of *C. pluricostata* turn obviously darker than the blade on drying, and its tertiary veins are numerous, regular and obviously oblique. Furthermore, the fruit of *C. ovoidea*, sp. nov. is ovoid, 22 mm long, 12 mm in diameter, smooth, and the perianth is caducous, in contrast to the fruit of *C. pluricostata*, which is ellipsoid, 18 mm long, 9 mm in diameter, and ribbed, and the perianth is persistent and up to 2 mm long.

**TYPUS** — *New Caledonia*. Aoupinié, 21°11’34.18”S, 165°18’0.91”E, 640 m, 13.X.2008, fr., J. Munzinger, L. Barrabé, F. Rigault, A. Michel, V. Apiaari 5178 (holo.-, NOU[NOU049142]).

**PHENOLOGY.** — Flowers have been collected in December and fruits in October.

**ETYMOLOGY.** — The specific epithet refers to the shape of the fruit.

**HABITAT.** — The species is restricted to the “forêts denses humides de basse et moyenne altitudes sur roches volcano-sédimentaires” sensu Jaffré et al. (2012), from 300 to 540 m.
Fig. 5. — Cryptocara ovoidea Munzinger & McPherson, sp. nov.: A, fruiting branch; B, fruit; C, terminal vegetative bud; D, detail of venation; E, leaf; F, flower; G, longitudinal section of flower; H, exterior tepal and stamen of whorl I; I, interior tepal and stamen of whorl II; J, flower with two tepals removed; K, stamen of whorl III; L, gland; M, staminode, adaxial side; A–E, Munzinger et al. 5178; F–M, Dabome 2. Drawings: Laurence Ramon. Scale bars: A, 2 cm; B, E, 1 cm; C, H, I, K–M 1 mm; D, 5 mm; F, G, J, 2 mm.
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DISTRIBUTION. — This tree is only known from the forests of Aoupinié in the north-east of the main-island (Fig. 4).

CONSERVATION STATUS. — The plant is known from just two trees, both in the protected area "Réserve de nature sauvage du massif de l'Aoupinié", in the North Province. EOO cannot be calculated, while AOO is 8 km². One of us (JM) participated in the establishment of 31 inventory plots (20 × 20 m; DBH≥5 cm) scattered over the Aoupinié massif, from base to summit, within the framework of the NC-PIPPN network (Ibanez et al. 2014). These 31 plots included 4926 trees, of which 284 were Cryptocarya individuals, but none were identified as C. ovoidea, sp. nov. Thus, as there are fewer than 50 known mature individuals, we assign C. ovoidea, sp. nov. a preliminary status of "Critically Endangered" (CR) according to criterion D.

ADDITIONAL MATERIAL EXAMINED. — New Caledonia. Aoupinié, 21°11'34.18"S, 165°18'0.91"E, 640 m [same tree as Munzinger et al. 5178], 27.XII.2017, fl., Dabome 2 (NOU[NOU105563]); Aoupinié, Parcelle Pierec 2, 21°12'42"S, 165°17'14.8"E, 300 m, 8.IV.2014, st., Munzinger & Lowry 7216 (MPU[MPU026705]).
Description
Small tree, up to 8 m tall; diameter unknown; bark unknown; slash unknown. Terminal bud erect, acute, appressed-pubescent, hairs short, whitish, cream-grey to blackish, appressed toward the apex; young stems immediately glabrous, drying dark reddish black, older stems shallowly lenticellate in the lower leafy internodes, more densely lenticellate below the leafy portion of the stem, lenticels evident, up to 4 mm long and 1.5 mm wide, up to 0.5 mm high. Petioles slightly canaliculate (8-)10-11(-16) mm long, up to 25 mm on juvenile (*Munzinger & Lowry 7216), diameter 0.7-1.1 mm., quickly glabrescent. Blades ovate-elliptic to elliptic, 6.5-11.8 × 2.5-4.4 cm, base acute, often slightly attenuate, apex acute, usually slightly acuminate; midrib slightly sunken adaxially, raised abaxially; mature blades discolorous, often lustrous adaxially, matte and somewhat glaucous abaxially; secondary veins (3-)4-5, tertiaries few, irregular, areolated; fine venation reticulate, raised; the secondary and higher order venation concolorous with the blade; young abaxial surfaces sparsely and minutely appressed-pubescent.

Inflorescence axillary but subterminal, appearing while the branch is flushing, 9-30 mm long, axis ca. 1 mm in diameter, minutely appressed-pubescent; bracts caducous. Flowers subsessile (pedicel up to 0.5 mm), yellowish, 3.5-4 mm long, 2.5-3 mm diam.; hypanthium 1.5-2 mm long, 2.5 mm in diameter distally, minutely appressed-pubescent abaxially, glabrous adaxially; tepals subequal, 1.5 mm long, concave, obtuse, pubescent on both surfaces; stamens in 3 whorls, those of whorl I introrse, 1 mm long, filaments 0.5 mm, anthers 0.5 mm long, 0.6 mm wide, pubescent abaxially (more visible on dry), glabrescent adaxially; those of whorl II introrse, slightly shorter, filaments 0.3 mm, anthers 0.5 mm long, 0.6 mm wide, glabrous adaxially and abaxially, those of whorl III extrorse, 1.2 mm long, anthers ovate, 0.7 mm long, 0.5 mm wide, glabrous adaxially and abaxially; glands positioned between whorls II and III, without any apparent attachment to the base of the filaments of whorl III, subglobose, c. 0.5 mm diameter, borne on a pubescent stalk 0.15 mm long; staminodes widely triangular, 0.75 mm long × 0.5 wide, thinly pubescent abaxially, sometimes with a tuft of hairs at summit, glabrous adaxially; gynoecium immersed in the tube, 2.7 mm long, 0.8 mm in diameter, style glabrous, the ovary gradually merging into the style with small discoid stigma. Fruit ovoid, 12 mm wide, 22 mm high, black when ripe (in vivo), calyx caducous, with a few slight longitudinal lines on drying. Cross-section colour unknown.

Note
The species looks quite similar to *Cryptocarya pluricostata* in the field (Fig. 7), and may have been confused with it and thus might be under-collected. After we had found the distinctive fruit of the type collection, we paid close attention to similar trees, and were confident that *Munzinger & Lowry 7216*, even though sterile, was the same new species. This latter collection was then sequenced (C. Gemmill pers. comm.) and confirmed to be the same taxon, with both accessions appearing in a sister position to *C. pluricostata*.

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