HOOGLANDIA, A NEWLY DISCOVERED GENUS OF CUNONIACEAE FROM NEW CALEDONIA[1]

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Abstract

Hooglandia McPherson & Lowry (Cunoniaceae) is described from New Caledonia and recognized as distinct from other Cunoniaceae on the basis of its unique unicarpellate (or perhaps pseudomonomerous) gynoecium, and the combination of dioecy and drupaceous fruit, *inter alia*. The single species, *H. ignambiensis*, known only from primary rain forest on the upper slopes of Mt. Ignambi in northeastern New Caledonia, is assigned a provisional threat status of Critically Endangered.

Key words: conservation, Cunoniaceae, *Hooglandia*, New Caledonia.

Résumé

Description de *Hooglandia* McPherson & Lowry, nouveau genre de Cunoniaceae de Nouvelle-Calédonie se distinguant des autres membres de la famille par un gynécée unicarpellé (éventuellement pseudomonomère) et, *inter alia*, l'association de deux autres caractères: dioicie et fruit drupacé. L'unique espèce, *H. ignambiensis*, n'est connue que de la forêt primaire dense humide des pentes supérieures du Mt. Ignambi, au nord est de la Nouvelle-Calédonie; le statut d'espèce en Danger Critique lui est provisoirement attribué.

New Caledonia is widely recognized for its exceptional botanical diversity, with an estimated seed-plant flora of just over 3000 species, nearly 77% of which are endemic (Lowry, 1998; Jaffré et al., 2001; Morat et al., 2001), qualifying it as a global biodiversity hotspot (Myers et al., 2000). The flora is known for its numerous endemic gymnosperms and representatives of many primitive angiosperm families, including the remarkable genus *Amborella* Baill. (see Soltis et al., 2000; Thien et al., 2003; and references therein).

Recently, while collecting on Mt. Ignambi in the northeast of the island, we encountered first a female and then a male individual of a distinctive tree species, one that matched nothing in our experience. At the time we were unable to place the specimens in any family, despite the fact that we had abundant flowering and fruiting material in hand. Subsequent studies in the herbarium, searches of the literature, and discussions with colleagues confirmed our initial impression that our two collections did, in fact, represent an unusual new element of the flora.

Conspicuous features of the new plant—including its opposite, compound, dentate, stipulate leaves; tetramerous, unisexual flowers; imbricate sepals; lack of a corolla; biseriate stamens; disk adnate to the ovary; unicarpellate (or perhaps pseudomonomerous) gynoecium; and drupaceous, bilaterally symmetrical, one-seeded fruit—suggested, in various combinations, members of the Oxalidales (such as the Cunoniaceae or Brunelliaceae) and the Sapindales (such as the Simaroubaceae, Anacardiaceae, Burseraceae, or Sapindaceae). However, it proved impossible to refer the new taxon to any of the currently recognized genera in these families.

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We were able to place our material only after an analysis of molecular sequence data (Sweeney et al., 2004), which clearly showed that the species belongs within the Cunoniaceae. There it comprises the morphologically well-marked new genus that we describe here. Its closest relative may prove to be *Aistopetalum* Schltr., a genus of two species endemic to New Guinea, which resembles our new genus in its large, paniculate inflorescence, apetalous flowers in which the disk is adnate to the ovary, and indehiscent fruit.

Hooglandia McPherson & Lowry, gen. nov. TYPE: *Hooglandia ignambiensis* McPherson & Lowry.

Genus novum, quoad folia opposita imparipinnata, stipulas interpetiolares, inflorescentias paniculatas, flores tetrameros, androecium diplostemonum, discum intrastaminalem, ovarium superum cum multis aliis Cunoniaceis congruens, sed insigniter carpello unico, natura dioecio, fructu drupaceo monospermo divergens et insuper petalis nullis, disco ovarium adnato insolitum.

Hooglandia shares a number of features with many of the 26 other genera of the family (Bradford & Barnes, 2001; Bradford et al., 2004), including opposite, imparipinnately compound leaves, interpetiolar stipules, paniculate inflorescences, tetramerous flowers, a diplostemonous androecium, an intrastaminal disk, and a superior ovary. However, it is unique among Cunoniaceae in combining a unicarpellate (vs. 2(3–5)-carpellate) gynoecium and a bilaterally symmetrical, drupaceous fruit (vs. typically capsules or follicles, or occasionally (in *Davidsonia* F. Muell., *Schizomeria* D. Don, and *Aistopetalum*) radially symmetrical drupes). As well, most Cunoniaceae are hermaphroditic (22 genera) and have petaliferous flowers (15 genera) with disks free from the ovary wall (20 genera) (Bradford et al., 2004), whereas *Hooglandia* uniquely combines dioecy, a condition it shares with *Pancheria* Brongn. & Gris, *Spiraeanthemum* A. Gray, *Vesselowskya* Pamp., and some *Weinmannia* L. spp., with apetalous flowers in which the disk is adnate to the ovary. The phylogenetic implications of the distinctive characters exhibited by *Hooglandia* are discussed by Sweeney et al. (2004).

The new genus joins 104 other seed-plant genera endemic to New Caledonia (Jaffré et al., 2001), bringing the level of generic endemism to 15%.

Etymology. The genus is named in honor of Ruurd Dirk Hoogland (1922–1994), who devoted much of his career to the study of the Cunoniaceae and Dilleniaceae while serving as a member of the CSIRO New Guinea Group and later at the Australian National University, and then after his retirement at the Muséum National d'Histoire Naturelle in Paris (see Morat, 1995). Ru Hoogland was an excellent collector and an expert on the floras of New Guinea, Norfolk Island, and Lord Howe Island.

Hooglandia ignambiensis McPherson & Lowry, sp. nov. TYPE: New Caledonia. Province Nord: Mt. Ignambi, SW of Tchambouenne, 20°27′35″S, 164°35′41″E, 1150 m, 4 May 2002, *P. P. Lowry II, G. McPherson, T. Le Borgne & R. Pouytiela 5767* (holotype, P; isotypes, CANB, G, MO [2 sheets], NOU). Figure 1.

Arbor dioica, 6–8 m alta. Ramuli novelli pubescentes glabrescentes; internodia cava. Folia imparipinnata opposita decussata 26–37 cm longa; foliola (11–)17–19 opposita chartacea oblonga vel subobovata (5.5–)6–10.8 × (2–)2.5–3.3 cm; lamina matura fere glabra, basi obtusa, margine integra vel sparsim dentata, apice acuminata, nervis utroque costae latere 11–14(–16); petioluli 4–6 mm longi pubescentes; petioli 6.5–9.5 cm longi, 2–3.5 mm diametro; stipulae interpetiolares lineares 8–10 mm longae interdum partitae pubescentes caducae, cicatrice ca. 1.5–3 mm lato. Inflorescentiae axillares paniculatae pubescentes, unusquisque axibus primariis 3 ascendentibus vel recurvatis, in plantis femineis (1–)1.5–4.5 cm, in plantis masculis ad 8 cm longis; bracteae triangulatae 1.5–4 mm longae; cymulae flores 4–6 gerentes; bracteolae 0.8–2 mm longae caducae; pedicelli 0.3–1.5 mm longi articulati, in parte inferiore pubescentes, in parte superiore glabri. Flores masculi: sepala 4 discreta alba imbricata 2.5–3.5 mm longa, 2.5–3 mm lata, subincrassata, extus glabra, intus villosa, ciliata; petala nulla; stamina 8(–9) sub anthesi 4 mm longa, filamenta 3 mm longa subcomplanata, antherae 1 mm longae polliniferae dorsifixae versatiles biloculatae dehiscentia longitudinali latrorsa; discus intrastaminalis basim ovarii adnatus annularis; pistillodium (cum stylo) ca. 1.5 mm altum; loculus et ovula vestigiales; stigma minuta. Flores feminei: perianthium ut in floribus masculis; staminodia 8(–9) sub anthesi 1–1.5 mm longa, antherae 0.5–0.75 mm longae quasi non polliniferae; discus intrastaminalis basim ovarii adnatus annularis; gynoecium carpello unico, ovarium superum viride subcomplanatum 1 mm altum, 1 mm latum, uniloculatum glabrum quasi quadratum ambitu, stylus et umbo apicales, stylus albus linearis adpressus geniculatus, ca. 1 mm longus, apex stigmaticus elongatus; ovula 2, apicalia, anatropa. Fructus axillaris infra inflorescentias, in axibus 3.6–6 cm longis, drupaceus, quasi obovatus vel ellipticus, complanatus, 3.8–4.2 cm longus, 2–2.2 cm latus, 0.5 cm crassus, apice rostellato et umbone ca. 5–6 mm diametro, exocarpium carnosum, endocarpium durum. Semen unicum, testa tenuis, endospermium amylaceum, radicula recta, ca. 5 mm longa, cotyledones complanatae virides, ca. 18 mm longae, ca. 11 mm latae.

Dioecious, unarmed, sparsely branched, odorless trees ca. 6–8 m tall. Twigs densely pubescent with short, subappressed trichomes when young, glabrescent, with scattered lenticels, lacking evident exudates; leaf scars cordiform, 5–6(–10) mm long,

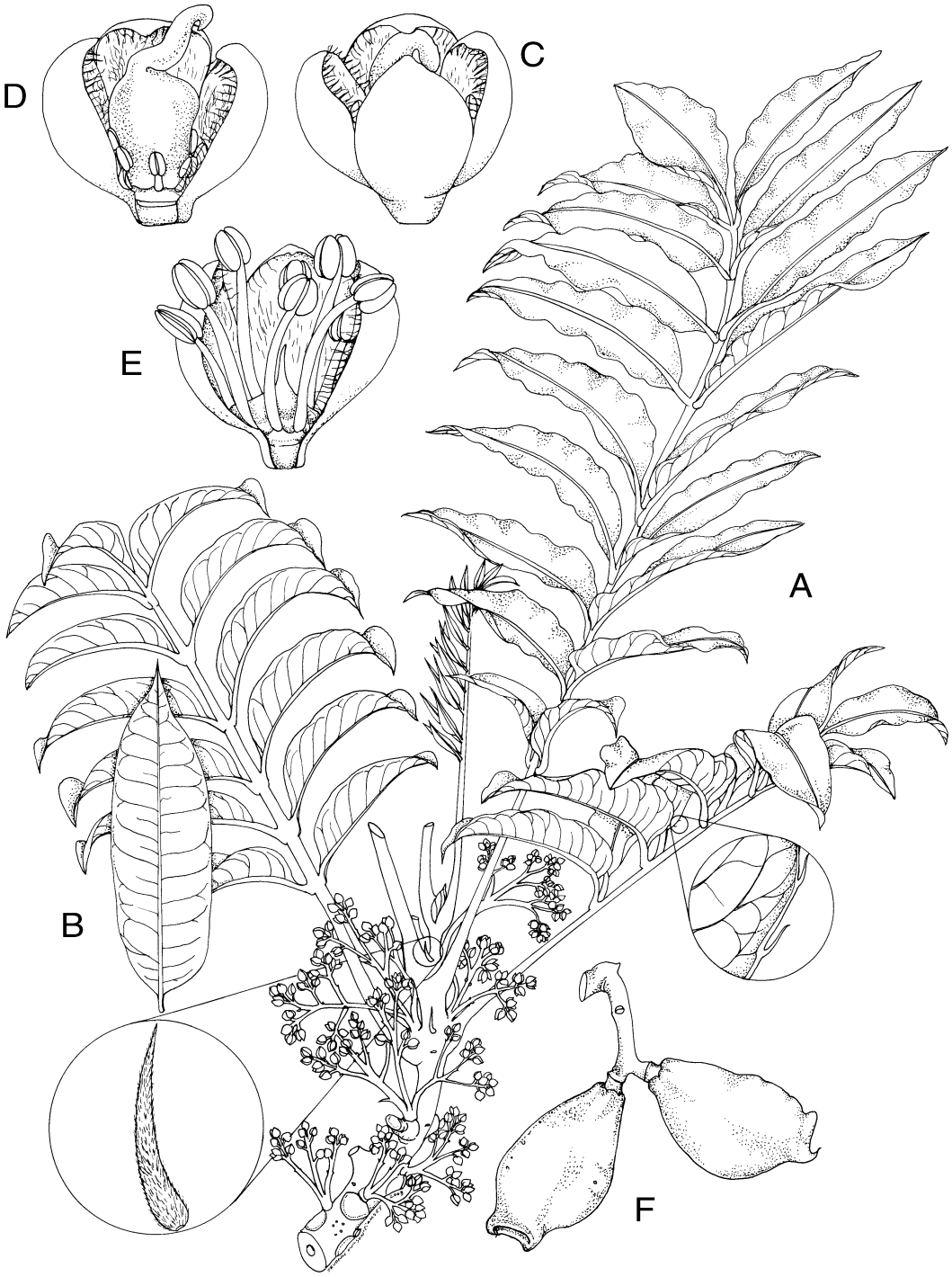

Figure 1. *Hooglandia ignambiensis* McPherson & Lowry. —A. Flowering twig of female material. —B. Abaxial view of a lateral leaflet. —C. Young female flower. —D. Female flower at anthesis, one sepal removed. —E. Male flower at anthesis, one sepal removed. —F. Fruit. (A, B, C, D, and F based on *Lowry et al. 5767,* MO; E based on *Lowry et al. 5770,* MO.)

6–7 mm wide; internodes hollow. *Leaves* imparipinnately compound, opposite, decussate, 26–37 cm long at maturity; leaflets (11 to)17 to 19, opposite, dark green and shiny above, paler beneath, chartaceous, oblong to weakly obovate, (5.5–)6–10.8 × (2–)2.5–3.3 cm, the lower 1(or 2) pairs smaller and often elliptic, occasionally caducous; blade glabrous at maturity except for sparse, short, subappressed hairs on the midvein beneath, the immature leaves sparsely short-subappressed pubescent on both surfaces, more densely so along the midrib; base obtuse, oblique in the lateral leaflets, margins minutely thickened beneath, entire or occasionally with 1 to 3(to rarely 7) very slender, fragile teeth per side, these usually terminating secondary veinlets in the basal third of the blade, or sometimes located instead near the apex, each tooth up to 1 mm long, the slender portion caducous and sometimes leaving behind a small, mucronate remnant; apex acuminate, tapering to a short mucro ca. 1 mm long, venation brochidodromous or semicraspedodromous with 11 to 14(to 16) pairs of opposite to subopposite secondary veins; domatia absent; petiolules 4–6 mm long, tinged reddish purple (in fresh material), short-subappressed pubescent, channeled above; rachis tinged reddish purple, with moderate to dense short, subappressed hairs; petioles 6.5–9.5 cm long, 2–3.5 mm diam., expanded somewhat at the base, flattened in dry material; stipels absent; stipules interpetiolar, linear, subterete, 8–10 mm long, occasionally divided nearly to the base or the two halves completely free from one another and separated by up to 3 mm, densely short-subappressed pubescent, caducous, leaving a small oblate scar ca. 1.5–3 mm wide; colleters absent. *Inflorescences* axillary, flowering sub-synchronous, the terminal flowers opening only slightly before the more basal ones, paniculate, short-subappressed pubescent throughout, borne in the axils of the upper 3 to 7 pairs of leaves, the short basal peduncle (0–)1–5(–6) mm long and bearing 3 ascending to recurved primary axes (1–)1.5–4.5 cm long in female plants, to 8 cm long in male plants, secondary axes (1)2 to 6, subopposite, the lowermost sometimes abortive and leaving an evident scar, each subtended by a caducous, narrowly triangular bract ca. 1.5–4 mm long, terminating in a 4- to 6-flowered cymule, the lowermost secondary axes also bearing 1 or 2 lateral cymules (tertiary axes), flowers subtended by a straight, spreading, narrowly triangular bracteole ca. 0.8–2 mm long, caducous prior to anthesis, leaving an evident scar; pedicels 0.3–1.5 mm long, jointed at or below the midpoint, the proximal portion pubescent, the distal portion glabrous. *Male flowers*: sepals 4, distinct, white, imbricate in bud, 2.5–3.5 mm long, 2.5–3 mm wide, rather thick, spreading at anthesis, glabrous abaxially, villose adaxially, ciliate; petals absent; stamens 8(–9), subequal, 4 mm long at anthesis and slightly exserted beyond the sepals; filaments 3 mm long, somewhat flattened; anthers 1 mm long, polleniferous, dorsifixed above the basal lobes, versatile, bilocular, dehiscence longitudinal and latrorse; pollen spheroidal, 13–16 μm diam., tricolporate, surface visibly psilate, slightly irregular; disk intrastaminal, adnate to base of the pistillode, annular, ca. 1.5 mm diam., slightly lobed around the bases of the filaments; pistillode conical, ca. 1.5 mm high including the erect style/stigma (1 mm long); locule and ovules vestigial; stigmatic portion of style/stigma minute, apparently unreceptive. *Female flowers*: sepals 4(5), distinct, white, in bud the 2 outer imbricate over the 2 inner, 2.5–3 mm long, 2.5–3 mm wide, rather thick, somewhat spreading, glabrous abaxially, villose adaxially, ciliate; petals absent; staminodes 8(–9), 1–1.5 mm long at anthesis, anthers 0.5–0.75 mm long, not or only slightly polleniferous, the pollen grains few, of various sizes, rarely containing cytoplasm; disk intrastaminodial, adnate to the base of the ovary, annular, lobed (sometimes deeply so) around the bases of the staminodes; gynoecium bilaterally symmetrical (excepting the bent style); ovary superior, green, somewhat flattened, 1 mm long, 1 mm wide on the wider face, roughly square in outline, glabrous, unilocular, the style/stigma arising from one distal corner and a faintly bilobed hump occupying the other distal corner, ovules 2, apical, anatropous, both attached at one end of an elongate, shallow trough, micropyle epitropous; style/stigma white, ca. 1 mm long, linear but crooked, not held erect, typically basally appressed to top of ovary and bent about mid-length through 90–180 degrees, the apparently stigmatic portion elongate. *Infructescences* borne in axils of the 2 or 3 pairs of leaves or leaf scars just below the inflorescences, each with 1 to 3 primary axes 3.6–6 cm long and bearing one or two fruit; fruit drupaceous, light green (in nearly mature fresh material), asymmetrically obovate to elliptic in outline, flattened and thus bilaterally symmetrical overall, 3.8–4.2 cm long, 2–2.2 cm wide, 0.5 cm thick, with a narrowly acute, slightly beaked apex ca. 3 mm long and a rounded distal boss ca. 5–6 mm diam., exocarp fleshy, endocarp hard; seed one, the other ovule aborting; testa thin; endosperm starchy, the grains spheroidal, (5–)7(–9) μm diam., oil not detected; radicle straight, ca. 5 mm long; cotyledons flat, green, ca. 18 mm long, ca. 11 mm wide.

Paratypes. NEW CALEDONIA. **Province Nord:** Mt. Ignambi, SW of Tchambouenne, 20°27′35″S, 164°35′41″E, 1150 m, 4 May 2002, *P. P. Lowry II, G. McPherson, T. Le Borgne & R. Pouytiela 5770* (CANB, G, MO, NOU, P).

Although the new species is here interpreted as unicarpellate, and thus unique within the family in this feature, a remnant of a second carpel may be present in the form of the astylous hump visible in both the female flower and the fruit (Fig. 1). However, dissections of the ovary revealed no further evidence that more than one carpel is involved. It may also be worth noting that, although Cronquist (1981) stated that the endosperm in the family is oily or absent, Dickison (1984), Takhtajan (1997), Fortune Hopkins and Hoogland (2002), and Bradford et al. (2004) describe it as starchy, as it is in *Hooglandia*.

Hooglandia ignambiensis is known only from dense, primary rain forest on the upper slopes of Mt. Ignambi in northeastern New Caledonia. The area is part of the Mt. Panié massif, which extends ca. 50 km from north of Mt. Mandjélia southeast to Mt. Panié. The massif has one of the most humid climates in New Caledonia, with recorded annual precipitation levels reaching 4000 mm (Section d'Hydrologie de l'ORSTOM & Service Territorial de la Météorologie, 1981), although rainfall on the upper slopes is certainly even higher (Lowry, 1998). The Mt. Panié massif is characterized by the presence of micaschist and related metamorphic rock types, in contrast to adjacent areas, which are largely dominated by soils derived from other substrates, including the distinctive ultramafic rocks that cover large portions of New Caledonia (Paris, 1981).

The Mt. Panié massif is a center of local endemism, with numerous species recorded only from the comparatively well-collected eastern side of Mt. Panié, and many others restricted to one or a few localities in northeastern New Caledonia. The palm flora of the area is particularly diverse, with 10 species endemic to the massif (Hodel & Pintaud, 1998). This led Pintaud et al. (2001) to recognize the Mt. Panié massif as one of five phytogeographic regions within New Caledonia based on the distribution of palm species. Few plant taxa appear to have been previously known only from Mt. Ignambi, but an endemic new species of gecko was recently described from the peak (Bauer et al., 2000).

Conservation status. Using the data available and applying the IUCN Red Data criteria (IUCN, 2001), we assign *Hooglandia ignambiensis* a provisional threat status of Critically Endangered (CR D) because only two mature individuals are known to exist. The area in which the plant grows, however, does not appear to be under any immediate threat. The single known population occurs well within a sizeable area of pristine forest, where it is protected from the fires that frequently burn in the surrounding secondary grasslands. Although local inhabitants occasionally hunt in the area, we saw no signs suggesting they exploit forest products, and other than the presence of a trail, a long-abandoned road, and a very small clearing on the summit, there was little evidence of human disturbance within the forested area.

A PDF version of this paper, including color images of *Hooglandia ignambiensis,* is available at: http://www.mobot.org/MOBOT/Research/newcaledonia/hooglandia.pdf.

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Figure 2. *Hooglandia ignambiensis* McPherson & Lowry et al. —A. Flowering and fruiting branch. —B. Pistillate inflorescence and fruit. (Based on *Lowry et al. 5767*; photos by P. Lowry).

Figure 3. *Hooglandia ignambiensis* McPherson & Lowry et al. —A. Close-up of pistillate inflorescence. —B. Detail of pistillate flowers. (Based on *Lowry et al. 5767*; photos by P. Lowry).

Figure 4. *Hooglandia ignambiensis* McPherson & Lowry et al. —A. Close-up of staminate flowers. —B. Detail of fruit. (A based on *Lowry 5770*; B based on *Lowry et al. 5767*; photos by P. Lowry).