Neoschmidia, a new genus of Rutaceae from New Caledonia

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ABSTRACT
The new genus *Neoschmidia* is described and placed next to *Halfordia* in tribe Zanthoxyleae, a new name (*N. pallida*) is established, and a new species (*N. calycina*) is described.

MOTS CLÉS
Rutaceae,
Neoschmidia,
nouveau genre,
Nouvelle-Calédonie.

RÉSUMÉ
Neoschmidia, *un nouveau genre de Rutaceae de Nouvelle-Calédonie*.
Le nouveau genre *Neoschmidia* est décrit et placé à côté de *Halfordia* dans la tribu des Zanthoxyleae, un nouveau nom (*N. pallida*) est établi et une nouvelle espèce (*N. calycina*) est décrite.

During studies on Rutaceae for the *Flore de la Nouvelle-Calédonie* it has become evident that the New Caledonian *Eriostemon pallidus* Schltr. (an illegitimate name, being a later homonym of *E. pallidus* (Benth.) F. Muell.) and a closely related undescribed species constitute a morphologically isolated taxon that has never been formally recognized. The purpose of this paper is to give a taxonomic account of these plants, which are described as a new genus.

Neoschmidia T.G. Hartley, **gen. nov.**

Frutices, trichomatibus simplicibus et compositis (2-5 brachiis radiantibus); foliis alternis, simplicibus, sessilibus vel subsessilibus, saepe confertis et ascendentibus, coriaceis, glanduloso-punctatis, pinnatinervibus, basi cuneatis usque attenuatis, in ramulis decurrentibus, margine integris, revolutis; inflorescentiis cymosis vel ad flores solitarios redactis, bracteatis, axillaribus, saepe inter folia occultis; floribus actinomorphis, bisexualibus, in alabastro pentagone ovoideis; sepalis 5, basi vel usque 1/2 longitudine connatis, in alabastro valvatis, in fructu persistentibus; petalis 5, distinctis, in alabastro anguste imbricatis vel valvatis, crassis et carnosis, 1-nervibus, carinatis, ovato-ellipticis usque lanceolatis, 4-6 mm longis, apice adaxialiter aduncis, in fructu deciduis; staminibus 10, alternatim inaequalibus, staminibus antisepalis longitudine c. 4/5 perianthii partes aequantibus; filamentis distinctis vel basaliter connatis, subulatis, ciliatis, apicem versus saepe glanduloso-papillatis; antheras glabris, ellipsoideis, 0.6-0.8 mm longis, dorsifixis, versatilibus, introrsis, sine appendicibus basalibus, apice obtusis usque mucronulatis; disco intrastaminali, glabro, pulvinato; gynoecio 5-carpellato et 5-loculato, in disco partim incluso, ovariis basaliter connatis et lateraliter a stylo junctis, aliter distinctis, circa 1 mm longis, placentatione axiali,

ovulis in quoque loculo 2, subcollateralibus, stylo glabro, cum stigmate 0.5-1.5 mm longo, stigmate capitato, inconspicue 5-lobato; fructu ex folliculis 1-5 constanti, carpellis abortivis, si ullis, persistentibus, folliculis basaliter connatis, ± asymmetrice ellipsoideis usque obovoideis, 4-6 mm longis, saepe rostro stylari brevi et/vel appendice calcariformi extra-stylari usque 1 mm longa praeditis; epicarpio sicco, subligneo, costato; endocarpio glabro, sub dehiscentia cum semine dimisso; seminibus solitariis (cum ovulo abortivo gemellis), reniformibus, 3-4 mm longis; testa tenui et fragili, granulosa, lustrata, atro-brunnea vel nigra, parte interior nigra, sclerenchymata, apertura chalazali basali, circulari; endospermio copioso; embryone recta, hypocotylo supero, cotyledonibus planis, complanatis, elliptico-oblongis, hypocotylo circa duplo latioribus.

TYPUS. — *Neoschmidia pallida* T.G. Hartley.

Shrubs, trichomes simple and compound (2-5 arms radiating from base). Leaves alternate, simple, sessile or subsessile, often crowded and ascending, coriaceous, glandular-punctate, pinnately veined, base cuneate to attenuate, decurrent on branchlets, margin entire, revolute. Inflorescences cymose or reduced to solitary flowers, bracteate, axillary, often hidden among leaves. Flowers actinomorphic, bisexual, pentagonally ovoid in bud; sepals 5, connate at base or up to 1/2 their length, valvate in bud, persistent in fruit; petals 5, distinct, narrowly imbricate or valvate in bud, thick and fleshy, 1-nerved, keeled, ovate-elliptic to lanceolate, 4-6 mm long, hooked adaxially at apex, deciduous in fruit; stamens 10, alternately unequal, the longer (antisepalous) ones about 4/5 as long as perianth; filaments distinct or basally connate, subulate, ciliate, often glandular-papillate toward apex; anthers glabrous, ellipsoid, 0.6-0.8 mm long, dorsifixed, versatile, introrse, without basal appendages, apex obtuse to mucronulate; disc intrastaminal, glabrous, pulvinate; gynoecium 5-carpelled and 5-loculed, partially embedded in disc, ovaries connate basally and joined laterally in the style, otherwise distinct, c. 1 mm long, placentation axile, ovules 2 per locule, subcollateral, style glabrous, including stigma 0.5-1.5 mm long, stigma capitate, inconspicuously 5-lobed. Fruit of 1-5 follicles, abortive carpels, if any, persistent, follicles basally connate, ± asymmetrically ellipsoid to obovoid, 4-6 mm long, often with short stylar beak and/or extra-stylar spur-like appendage up to 1 mm long; epicarp dry, subwoody, ribbed; endocarp glabrous, the ventral part thinly fleshy, tearing free and persistent on the seed as a transversely elliptic to broadly obovate piece of tissue, remainder of endocarp (the dorsilateral part) cartilaginous, discharged with the seed when fruit dehisces. Seeds solitary (paired with an abortive ovule), reniform, 3-4 mm long; testa thin and brittle, granulose, dark brown to black, lustrous, with inner layer of dense, black sclerenchyma (the sclerotesta), chalazal aperture (observable on the inner surface of testa) basal, circular; endosperm copious; embryo straight, hypocotyl superior, cotyledons plane, flattened, elliptic-oblong, about twice as wide as the hypocotyl.

ANOMALY. — In *Neoschmidia pallida*, occasional flowers are 4-merous (sepals, petals, carpels, and lobes of stigma each 4, stamens 8).

ETYMOLOGY. — The generic name commemorates Maurice SCHMID of IRD (ex ORSTOM), Nouméa, and the Muséum National d'Histoire Naturelle, Paris, authority on the New Caledonian flora and specialist in New Caledonian *Phyllanthus* (Euphorbiaceae).

Neoschmidia is characterized mainly by its alternate, simple leaves, axillary inflorescences, bisexual, 5-merous, diplostemonous flowers, nearly apocarpous ovary and fruit, paired ovules, dry, follicular fruit which at dehiscence discharges the endocarp with the seed, thin, brittle testa which has an inner layer of dense, black sclerenchyma, copious endosperm, and its embryo, which has flattened cotyledons that are considerably wider than the hypocotyl.

Relationships of *Neoschmidia*

Neoschmidia appears to be most closely related to *Halfordia* F. Muell., differing mainly in its axillary (vs. terminal) inflorescences, its 5-carpelled and -loculed (vs. 3 to 5-carpelled and -loculed), nearly apocarpous (vs. completely syncarpous or at apex septicidally fissured) ovary and fruit, its paired (vs. solitary) ovules, and its dry, follicular (vs. fleshy, drupaceous) fruit. As currently construed

(HARTLEY 2001b), *Halfordia* is monospecific and occurs in eastern Australia, New Guinea, New Britain, Vanuatu, and New Caledonia. ENGLER (1931), in the standard major work on Rutaceae, placed *Halfordia* in subfamily Toddalioideae tribe Toddalieae, but it now appears that all Malesian-Australasian plants he placed there are more correctly included in Rutoideae, and that within that subfamily *Halfordia* is best placed in tribe Zanthoxyleae (see HARTLEY 2001b).

It is worthwhile mentioning that *Halfordia* appears to have no other close relatives. The genus *Skimmia* Thunb., which ranges from the Himalayas eastward to Japan and south to Vietnam and the Philippines (TAYLOR 1987), closely resembles it superficially, but differs significantly in having haplostemonous (vs. diplostemonous) flowers, tetracolporate (vs. tricolporate) pollen (HARTLEY 2001a), and a membranaceous testa which lacks sclerotesta (vs. testa thin and brittle, with sclerotesta).

Although *Neoschmidia* appears to be most closely related to *Halfordia*, it is most similar to *Philotheca* Rudge (Rutoideae tribe Boronieae), differing mainly in a single feature: its embryo has flattened, elliptic-oblong cotyledons that are about twice as wide as the hypocotyl, whereas that of *Philotheca* has ± plano-convex, linear cotyledons that are the same width as the hypocotyl. As currently construed (BAYLY 1998; WILSON 1998a), *Philotheca* is endemic to Australia and consists of 46 species, 34 of which were previously assigned to *Eriostemon* Sm. (Boronieae). *Eriostemon* itself, according to WILSON (1998a), who noted that the New Caledonian *E. pallidus* Schltr. is representative of a taxon quite distinct from both *Eriostemon* and *Philotheca*, consists of two species, *E. australasius* Pers. and *E. banksii* A. Cunn. ex Endl., both endemic to Australia.

WILSON (1998a) noted that *Eriostemon pallidus* Schltr. (≡ *Neoschmidia pallida*) differs from *Philotheca* in its very thick (vs. ± papery), induplicate-valvate (vs. imbricate) petals, its lack (vs. possession) of a sclerotesta and a circular chalazal aperture in the seed, and its elliptic (vs. linear, as "terete") cotyledons. He also noted (WILSON 1998a) that a sclerotesta and a circular chalazal aperture are found in the seeds of all Australian and New Zealand members of Boronieae, but have not been observed elsewhere.

My observations on *Philotheca*, the two species herein placed in *Neoschmidia*, and other relevant Rutaceae differ from WILSON's in the following cases. 1) The petals of *Philotheca pungens* (Lindl.) Paul G. Wilson appear to be about as thick as those of *Neoschmidia*. 2) The petals of *Neoschmidia* are narrowly imbricate or valvate in bud, and those of *Philotheca pungens* are valvate in bud. 3) The testa of *Neoschmidia*, viewed in transverse section, has an inner layer of dense, black sclerenchyma that I consider to be the sclerotesta, and examination of the inner surface of the testa reveals a circular chalazal aperture, located at the base of the seed. 4) Seeds of the New Caledonian *Zieria chevalieri* Virot, which clearly belongs in Boronieae, possess both a sclerotesta and a circular chalazal aperture, and in a study of the comparative morphology of 32 genera of Australasian-Malesian Rutaceae which I consider to belong neither to Boronieae nor subfamily Aurantioideae (HARTLEY 2001b), sclerotesta was recorded for the seeds of 23 genera, among which I have subsequently seen a circular chalazal aperture in at least some seeds of *Acronychia* J.R. Forst. & G. Forst., *Boronella* Baill., *Brombya* F. Muell., *Euodia* J.R. Forst. & G. Forst., *Geijera* Schott, *Halfordia*, *Medicosma* Hook.f., *Melicope* J.R. Forst. & G. Forst., *Myrtopsis* Engl., *Sarcomelicope* Engl., and *Zanthoxylum* L.

As construed by HARTLEY (1995), Boronieae occur in Australia, New Caledonia, and New Zealand and comprise 17 genera, to which can now be added *Leionema* (F. Muell.) Paul G. Wilson (WILSON 1998b), which was traditionally treated as a section of *Phebalium*. All of these genera have a linear embryo, which, as proposed by HARTLEY (1995), is a conservative feature that serves to define Boronieae as a natural group separate from all other Rutaceae of the Malesian-Australasian-Pacific region, in which the embryo is non-linear, having cotyledons that are considerably wider than the hypocotyl. (In that study I erroneously implied that the embryo of *Eriostemon pallidus* Schltr. is linear).

Thus, I assume that *Neoschmidia* would be misplaced in tribe Boronieae and propose its placement next to *Halfordia* in tribe Zanthoxyleae.

Key to the species of *Neoschmidia*

1. Leaves sericeous or rarely nearly glabrous or puberulent below, elliptic or narrowly so to obovate, oblanceolate, or sublinear, apex obtuse to acute or rarely rounded; sepals sericeous abaxially, connate at base or up to 1/4 their length, the free portion triangular to lanceolate, (2-)3-5 mm long; petals sericeous abaxially ..... 1. **N. pallida**

1'. Leaves nearly glabrous below, obovate or oblanceolate, apex obtuse or rounded; sepals glabrous to sparsely puberulent abaxially, connate in proximal 1/3-1/2, the free portion broadly triangular, 0.8-1.5 mm long; petals densely appressed-puberulent abaxially ..... 2. **N. calycina**

1. **Neoschmidia pallida** T.G. Hartley, **nom. nov.**

Eriostemon pallidus Schltr., Bot. Jahrb. Syst. 39: 142, "*pallidum*" (1906), *nom. illeg.*, *non* F. Mueller 1869. — Type: *Schlechter 15148*, New Caledonia, Ngoye, 150 m, 30 Nov. 1902, fl. (holo-, B, lost; lecto-, here designated, P!).

Eriostemon pallidus var. *latifolius* Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 27: 470, "*pallidum* var. *latifolium*" (1955). — Type: *MacKee 2204*, New Caledonia, road to Montagne des Sources, 800 m, 13 Mar. 1955 (holo-, P!).

Shrub 0.4-4 m high. Young branchlets glabrous to pubescent or sericeous. Leaves sericeous or rarely nearly glabrous or puberulent below, glabrous above, elliptic or narrowly so to obovate, oblanceolate, or sublinear, 1.5-10 × 0.4-2 cm, apex obtuse (and usually retuse) to acute or rarely rounded and retuse, secondary veins usually obscure. Inflorescences puberulent to sericeous, 1- to several-flowered, 0.8-4.5 cm long; pedicels 1-7 mm long. Sepals sericeous abaxially, glabrous adaxially, connate at base or up to 1/4 their length, the free portion triangular to lanceolate, (2-)3-5 mm long; petals white to mauve, sericeous abaxially, glabrous adaxially; ovaries like the follicles glabrous to pubescent. — Fig. 1.

DISTRIBUTION AND ECOLOGY. — *Neoschmidia pallida* ranges from east-central New Caledonia southward to the southern end of the island; recorded mostly from maquis, also from forests (rain forest, ravine forest, gallery forest), thickets, and open places (stream margins and rocky slopes); 20-1300 m altitude; on ultramafic and schistose terrains.

SELECTED SPECIMENS (97 collections examined). — NEW CALEDONIA: *Balansa 1357*, St. Louis, 21 Dec. 1868, fl. (P); *Balansa 3535*, embouchure du Dothio, Dec. 1871, fl., fr. (P); *Bamps 5984*, Mt. Vulcain - Mt. Humboldt, 1000 m, 14 Dec. 1977, fl. (P); *Hartley 14966*, Montagne des Sources, 300 m, 18 Nov. 1979, fl. (CANB); *Hoff 3583*, fausse Yaté, 10 July 1981, fl., fr. (NOU); *Le Rat 2574*, Mt. Dzumac, 1000 m, Apr. 1905, fl., young fr. (P); *MacKee*, leg. *Cherrier*, *37209*, Thio, Mt. Ningua, 1300 m, 27 Mar. 1979, fl. (P); *MacKee 40032*, vallée de la Ni, 100 m, 3 Dec. 1981, fl. (CANB); *MacKee 44283*, Mt. Dore, 300 m, 21 Apr. 1989, fl., fr. (CANB); *MacKee 46055*, Poro, Kaséoua, 550 m, 17 Dec. 1992, fl. (CANB); *McPherson 2085*, Montagne des Sources, 100 m, 18 Nov. 1979, fl., fr. (CANB, P); *McPherson 2647*, N of Thio toward mine Pauline, 200 m, 14 May 1980, fl. (CANB); *Morat 6364*, forêt de Saille, Mar. 1979, fl. (P); *Schmid 1121*, Dumbéa N, 30 Mar. 1966, fl., fr. (P); *Suprin 2307*, bassin de la Ouinné, 700 m, 5 Oct. 1983, fl., fr. (P).

2. **Neoschmidia calycina** T.G. Hartley, **sp. nov.**

Frutex 0.5-1.5 m alta; ramulis novellis glabris; foliis subtus fere glabris, supra glabris, obovatis vel oblanceolatis, 3.5-6.5 × 0.5-2 cm, apice obtusis vel rotundatis (et retusis), venis secondariis plerumque prominulis; inflorescentiis fere glabris usque puberulis, 1-vel pauciforis, 0.8-1.5 cm longis, pedicellis 1.5-3 mm longis; sepalis abaxialiter glabris usque sparse puberulis, adaxialiter glabris, in 1/3-1/2 proximali connatis, parte libra late triangulari, 0.8-1.5 mm longa; petalis albis, abaxialiter dense appresse puberulis, adaxialiter glabris; ovariis ut folliculis glabris vel fere glabris.

TYPUS. — *MacKee 20419*, New Caledonia, haute Népoui, Oua Péoué, contrefort S du Kopéto, 600 m, 25 Mar. 1969, fl., fr. (holo-, P!).

Shrub 0.5-1.5 m high. Young branchlets glabrous. Leaves nearly glabrous below, glabrous above, obovate or oblanceolate, 3.5-6.5 × 0.5-2 cm, apex obtuse or rounded (and retuse), secondary veins usually prominulous. Inflorescences nearly

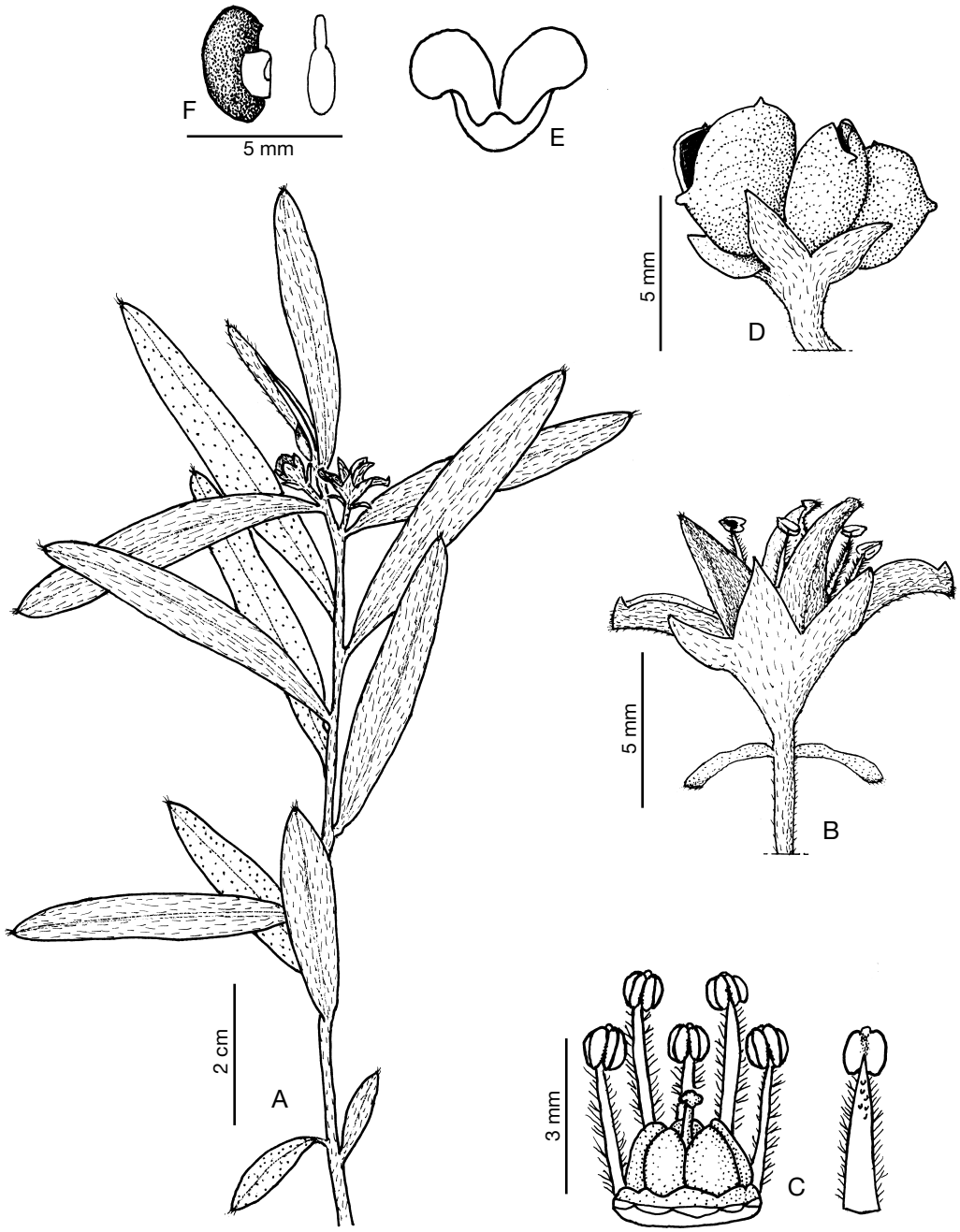

Fig. 1. — ***Neoschmidia pallida*** T.G. Hartley: **A**, flowering branchlet; **B**, flower; **C**, androecium, disc, and gynoecium (rehydrated, five stamens removed, one shown in abaxial view); **D**, fruit; **E**, dorsilateral endocarp; **F**, seed with ventral endocarp and embryo. (A, B, *McPherson 2085*; C, *Hartley 14966*; D-F, *MacKee 44283*).

glabrous to puberulent, 1- or few-flowered, 0.8-1.5 cm long, pedicels 1.5-3 mm long. Sepals glabrous to sparsely puberulent abaxially, glabrous adaxially, connate in proximal 1/3-1/2, the free portion broadly triangular, 0.8-1.5 mm long; petals white, densely appressed-puberulent abaxially, glabrous adaxially; ovaries like the follicles glabrous or nearly so.

DISTRIBUTION AND ECOLOGY. — *Neoschmidia calycina* is known only from west-central New Caledonia; recorded from maquis between 400 and 800 m altitude on ultramafic terrains.

PARATYPES. — NEW CALEDONIA:*Jaffré 2368*, massif du Boulinda, 400 m, 23 Feb. 1978, fl., fr. (NOU, P); *MacKee 19568*, Kopéto, Mt. Tiaoué, 600-800 m, 17 Sep. 1968, fl., fr. (CANB); *MacKee 22201*, Kopéto, crête E du Mt. Vert, 700 m, 8 July 1970, fl., fr. (P).

Neoschmidia calycina differs from *N. pallida* mainly in its sepals, which are connate in their proximal 1/3-1/2 and have a free portion 0.8-1.5 mm long. Also, it lacks the sericeous indumentum seen in *N. pallida*.

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