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A new species of *Nowellia* Mitt. (Marchantiophyta, Cephaloziaceae) discovered in New Caledonia

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KEY WORDS

Cephaloziaceae,
liverworts,
New Caledonia,
low mountain rainforest,
Pacific region,
new species.

ABSTRACT

Nowellia asperilobula sp. nov., from New Caledonia, is described as a new species of *Nowellia* Mitt. section *Metanowellia*, raising the total number of known species in the genus to eleven. The habitat of the new species and morphological features distinguishing it from the two other New Caledonian species in the genus, *N. langii* Pearson and *N. pusilla* Grolle, are addressed.

RÉSUMÉ

MOTS CLÉS
Cephaloziaceae,
hépatiques,
Nouvelle-Calédonie,
forêt pluviale de basse altitude,
région Pacifique,
espèce nouvelle.

Une nouvelle espèce de *Nowellia* Mitt. (Marchantiophyta, Cephaloziaceae) découverte en Nouvelle-Calédonie. *Nowellia asperilobula* sp. nov., de Nouvelle-Calédonie, est décrite comme nouvelle espèce du genre *Nowellia* Mitt., section *Metanowellia*, en plus des dix espèces déjà connues dans ce genre. Son environnement et les caractères qui la distinguent des autres espèces présentes en Nouvelle-Calédonie, *N. angii* Pearson et *N. pusilla* Grolle, sont présentés.

INTRODUCTION

In his monograph of the liverwort genus *Nowellia* Mitt., Grolle (1968) described seven species, *N. borneensis* (De Not.) Schiffn. (Indonesia, Philippines), *N. curvifolia* (Dicks.) Mitt. (mainly Holarctic region), *N. dominicensis* Steph. (West Indies), *N. evansii* Grolle (Neotropics), *N. langii* Pearson and *N. pusilla* Grolle (Southeast Asia and Australasia), and *N. wrightii* (Gottsche ex Spruce) Steph. (Cuba). Subsequently, Fulford (1968), Robinson (1970) and Mizutani (1994) added, respectively, *N. yunckeri* Fulford from Honduras, *N. reedii* H. Rob. from Costa Rica and *N. aciliata* (P.C. Chen & P.C. Wu) Mizut. from China and Japan. As a result, ten species are currently accepted in the genus (Söderström *et al.* 2016). Among them, two are known in New Caledonia, *N. langii* and *N. pusilla*, the latter being endemic to the region (Thouvenot *et al.* 2011). Both species belong to the section *Metanowellia* (Grolle) R.M. Schust., characterized by relatively thin stems with only 3–6 rows of medullary cells and deeply bifid leaves with a rather low, 4–8 cells high, lamina.

During fieldwork in New Caledonia in 2019 a specimen of *Nowellia* was collected that looked like *N. pusilla* at first glance, but microscopic observations revealed a combination of characters that did not match with any of the known species of the genus. Here the species is described as new to science, constituting the second endemic species of *Nowellia* in New Caledonia and raising the total number of species in the genus to eleven.

TAXONOMIC TREATMENT

Family CEPHALOZIACEAE Mig.
Genus *Nowellia* Mitt.

Nowellia asperilobula Thouvenot, sp. nov.
(Figs. 1, 2)

DIAGNOSIS. — Similar in size and overall aspect to *Nowellia pusilla*, but differing from it by the entire-margined leaves without any tooth-like or ciliate appendage, leaf lobes made of a single row of elongate cells from base to apex, and leaf lamina conduplicate with an ovoid, fully inflated lobule and a rounded keel typically ornamented by strongly protruding mammillose cells, the mammillae rounded to conical in shape.

TYPE. — New Caledonia. South Province, Yaté, Wé Toa, on dead wood in a low wet forest on ultramafic bedrock, interwoven in a mat of various liverwort species, 500 m a.s.l., 166°57'5"E, 22°13'10"S, 8.IX.2019, *Thouvenot NC2953* (holo-, PC[PC0712112], isotype in the author's private herbarium)

DISTRIBUTION. — New Caledonia; only known from the type collection in South Province (Yaté).

HABITAT. — This tiny species is easily overlooked and its ecology and distribution therefore remain little known. The type specimen was collected in a low rainforest characterized by small trees, to 5 m high, with thin trunks when growing on ridge or steep slopes, the trunks becoming larger when growing on flat or hollow spaces. Bryophytes occur mostly near the ground on dead wood, stumps

and lower part of trunks, less than 2 m above ground level. *Nowellia asperilobula* sp. nov. was growing on dead wood, with tiny shoots creeping intermixed among the more robust liverworts *Acromastigum adaptatum* Hürl., *Neolepidozia heterotexta* (Steph.) E.D. Cooper, *Chiloscyphus heteromorphus* (Steph.) J.J. Engel & R.M. Schust., *Tricholepidozia chaetocarpa* (Pearson) E.D. Cooper and *Zoopsis liukiensis* Horik. The rainforest where the species was found occurs near the ridge of the low coastal ranges in the ultramafic southern massif of New Caledonia. These forests stand like islands of moisture within large, drier shrubland areas. *Nowellia asperilobula* sp. nov. is the second endemic species recently described from this locality, together with *Pycnolejeunea apiculata* Thouvenot & Gradst. (Thouvenot & Gradstein 2021).

DESCRIPTION

Dioicous

Habit

Plants light green to almost hyaline, often with red pigmentation, shoots creeping on the substrate or on larger liverworts, remotely branched, branches ventral-intercalary, similar to the main shoots, rhizoids scattered on ventral side, hyaline, smooth, ending in shortly branched tips.

Stems

Translucent stems 62–75 µm thick, cortical cells short rectangular, 35–45 µm long, 25–35 µm wide, in transverse section, seven cortical cells wider than the three medullary ones, external walls slightly thicker than internal ones, firm to thin, without or with small angular thickenings.

Leaves

Distant, alternate, succubous, narrowly inserted, 4(–5) cells at the insertion on the stem, dorsally secund, inflated lobules conspicuous on both lateral sides of the shoots, curved thread-like lobes dorsally exerted; leaves 250–400 µm long, 150–180 µm wide, bifid to half-length or more, the entire basal part inflated, (80–)100(–130) µm long, 150–180 µm wide when fully developed, conduplicate with a saccate dorsal lobule; lamina 4(–5) cells high, ventral margin nearly straight, entire, 3 cells long, sinus rounded and ± plane, (2–)3(–4) cells wide, laminal cells quadrate to rectangular, 12–25(–37) µm long, 10–15 µm wide, thin-walled, walls slightly sinuous; keel rounded, typically with some strongly mammillose cells, the mammillae rounded to conical in shape, but mammillae in some or many leaves low or absent; lobule ovoid, strongly and fully inflated, almost as large as the lamina, the lobule apex usually ending 1–2 cells below the sinus of the lamina, lobule free margin entire, not flattened against the lamina, the lobule apex narrow, 2(–3) cells wide, incurved, forming an obtuse to rounded tooth, lobule cells long rectangular, the median usually 37 µm long, 12 µm wide; leaf lobes filiform from base to apex, made up of a single row of (5–)6(–7) elongate cells, the lobe sometimes gradually narrowed to the tip or little, lobe cells thick-walled, somewhat thickened at the angles, 30–40 µm long, basal cells 20–27 µm wide, median cells 12–15 µm wide, dorsal lobe erect to typically patent and curved in the lower half, ventral lobe erect and nearly straight to curved, rarely 2-celled at the base.

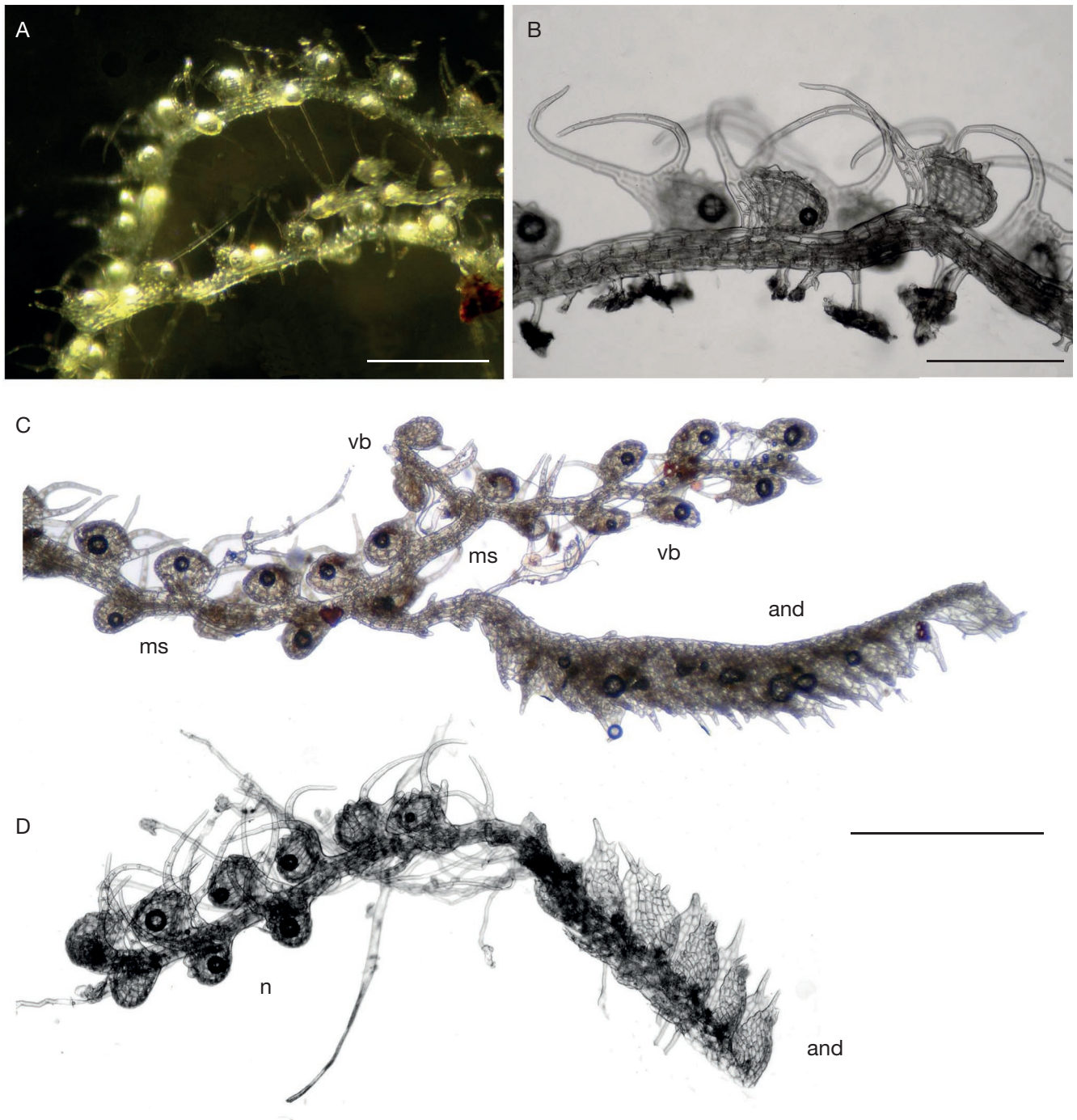


FIG. 1. — *Nowellia asperilobula* Thouvenot, sp. nov.: **A**, vegetative shoots, habit; **B**, vegetative shoot, lateral view; **C**, male shoot; **D**, male shoot with acroscopic innovation. Abbreviations: ms, main shoot; vb, vegetative branch; and, male branch with androecium; and, androecium; n, new vegetative shoot. All from the holotype. Scale bars: A, 500 μ m; B, 200 μ m; C, D, 500 μ m.

Underleaves
Lacking.

Asexual reproduction

1-celled rounded gemmae produced on vestigial leaves made up of a flat, 2-3 cells wide lamina and two very short, 1-2 cells long lobes.

Androecia

Terminal on leading shoots or short ventral-intercalary branches, with frequent acroscopic innovations bearing normal or gemmiferous leaves; 3-9 pairs of male bracts, the bracts dorsally assurgent, oval, concave, 300 μ m long, $\frac{1}{3}$ bifid, apex incurved, sparsely toothed, ventral lobe acuminate in a linear apex 2(-3) cells long, ventral margin entire or with a small, rounded

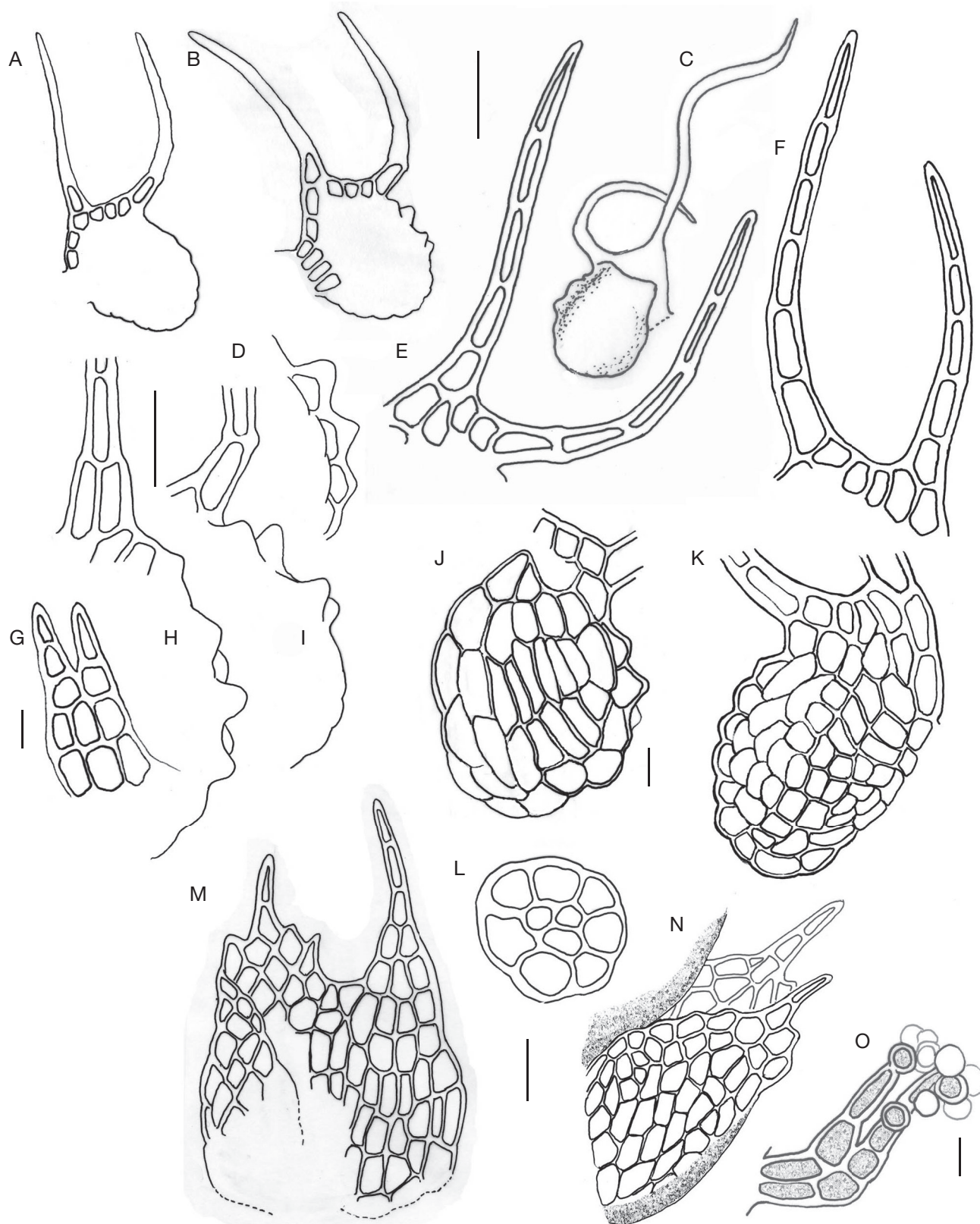


FIG. 2. — *Nowellia asperilobula* Thouvenot, sp. nov.: **A, B**, leaf shapes with marginal cells shown; **C**, leaf, dorsal view; **D**, mammillose cells of the keel in profile view; **E, F**, leaf lobes; **G**, vestigial leaf; **H, I**, keel in profile view with basal cells of dorsal lobe shown; **J**, lobule cells, dorsal view; **K**, lamina cells, ventral view; **L**, stem transverse section; **M**, male bract flattened (dorsal lobe margin folded over); **N**, male bracts in situ, dorsal view; **O**, gemmiferous leaf. All drawn from the holotype. Scale bars: A-C, 100 µm; D, H-I, 50 µm; E-G, J-L, O, 20 µm; M-N, 50 µm.

tooth below the lobe base, dorsal lobe smaller, angular tooth linear 1-2 cells long, dorsal margin crenulate or denticulate.

Gynoecia

Not seen.

DISCUSSION

Nowellia asperilobula sp. nov. is characterized by: 1) leafy shoots very small, pale green and more or less red tinged, creeping; 2) stems with medullar cells in three rows surrounded by seven cortical cell rows; 3) leaves remote, dorsally assurgent, deeply bifid; 4) leaf lamina 4(-5) cells high, strongly saccate, with a fully inflated dorsal lobule almost as large as the lamina; 5) leaf margins entire; 6) leaf lobes filiform, made up of a single row of elongate cells; 7) keel rounded, typically with strongly mammillose cells. The filiform leaf lobes, made up of a single cell row from base to apex, are a unique character of *N. asperilobula* sp. nov. In all other *Nowellia* species with bifid leaves, the lobe bases are more than one cell wide (Grolle 1968). At first glance, *N. asperilobula* sp. nov. resembles the New Caledonia endemic *N. pusilla* but the latter species has several teeth or ciliae on upper leaf margins and lacks mammillose cells. Furthermore, the base of the dorsal lobe in *N. pusilla* is triangular in shape and up to four cells wide. The other *Nowellia* species from New Caledonia, *N. langii*, shares mammillose cells with the new species, but is easily distinguished from *N. asperilobula* sp. nov. by the strongly ciliate leaf margins. Moreover, the stems in *N. langii* have a larger number of medullar cell rows (Grolle 1968).

CONCLUSION

Our knowledge of the liverwort flora of New Caledonia – one of the most famous biodiversity hotspots – seems to rather well advanced as evidenced by the high number of reported species as compared with other Pacific islands (Thouvenot *et al.* 2011). However, many massifs remain

unexplored and the discovery of new species in remote places like the coastal ranges in the ultramafic southern massif (Thouvenot & Gradstein 2021, this paper) demonstrates the need for further surveys.

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