

A NEW SPECIES OF *CEPHALOZIELLA* (CEPHALOZIELLACEAE, MARCHANTIOPHYTA)
FROM CHILE

НОВЫЙ ВИД *CEPHALOZIELLA* (CEPHALOZIELLACEAE, MARCHANTIOPHYTA) ИЗ ЧИЛИ

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Abstract

A new species of the genus *Cephaloziella* (Spruce) Schiffn. is discovered in the collections from the Aysén Region, Chile. The new species differs from all the known species of the genus by the unique multicellular (of 4–6 cells), papillate gemmae.

Резюме

Новый вид рода *Cephaloziella* (Spruce) Schiffn. выявлен в сборах из области Айсен Республики Чили. Данный вид отличается от других видов этого рода наличием крупных выводковых почек из 4–6 клеток, а также папиллообразно выпяченными угловыми утолщениями клеток стебля, листьев и выводковых почек.

KEYWORDS: *Cephaloziella*, Chile, multicellular gemmae, cell wall protuberances.

INTRODUCTION

In the course of the study of the liverwort collections from the Exploradores River valley (Aysén Region, Chile), an enigmatic species similar to the smallest representatives of the genus *Cephaloziella* (Spruce) Schiffn. has been found. The studied shoots have stem surface, leaf margins and abaxial leaf faces crenulate and mamillate respectively, with dome-shaped protuberances above cell walls intersections. The plants are sterile, however the combination of morphological characteristics, including reddish coloration, rhizoids scattered along the ventral surface of stem, rather well-developed and sometimes bilobed underleaves, the almost transverse insertion and shape of leaves (obovate, bilobed to 1/2 of the length, with triangular lobes 2–4 cells wide at base), as well as papillate gemmae fall within the genus *Cephaloziella*. A few differences include: (1) the presence of dome-shaped cell wall protuberances on stem surface, leaf margins and abaxial leaf faces, and (2) presence of multicellular gemmae. These traits are not known in any other species of this genus. By the presence of cell wall protuberances, in combination with the plant size and the shape and insertion of leaves and underleaves, the studied plants are similar to a representative of monospecific genus *Pigafettoa* C.Massal. of the family Lophocoleaceae. The species of this genus, *P. crenulata* C.Massal., is an endemic of southern South America and ‘has a facies much like that of a *Cephaloziella*’ (Engel & Schuster, 1973). In Engel & Schuster (1973) and Engel (1990), *P. crenulata* is characterized to be reproducing by fragmentation of leaves and underleaves, to lack of specialized structures of asexual

reproduction, and to occur on rocks in Patagonian Channels and in the Falkland Islands. By contrast, the plants here studied from the Aysén Region, in Chile, were collected on bark of trees and bear masses of characteristic gemmae. The presence of red pigments and the rhizoids scattered on the ventral surface of the stem in the studied plant contradict to that is known for Lophocoleaceae, to which *P. crenulata* belongs. Therefore the discovered species from Aysén is classified here within *Cephaloziella*. Since the gemmae in *Cephaloziella* are 1–2-celled, the gemmae of the Aysén plant are a unique element in that genus (and perhaps in Jungermanniales as a whole) and led, along with the presence of cell wall protuberances, to the need to describe this species as a new one, *C. grossigemma*. The description and photomicrographs of this species are provided below.

MATERIAL AND METHODS

Photomicrographs were obtained with a Leitz Wet-zlar Orthoplan light microscope and an Olympus MVX10 stereomicroscope equipped with digital cameras Nikon D90. In order to better illustrate the three-dimensional objects, photomicrographs were combined from several optical sections using the stacking software Helicon Focus 8 (<https://www.heliconsoft.com/heliconsoft-products/helicon-focus/>).

TAXONOMY

Cephaloziella grossigemma Mamontov, sp. nov.
Figs. 1, 2.

Type: CHILE, Aysén Region, Aysén Province, Aysén Commune, Exploradores River valley, Parque Explorad-

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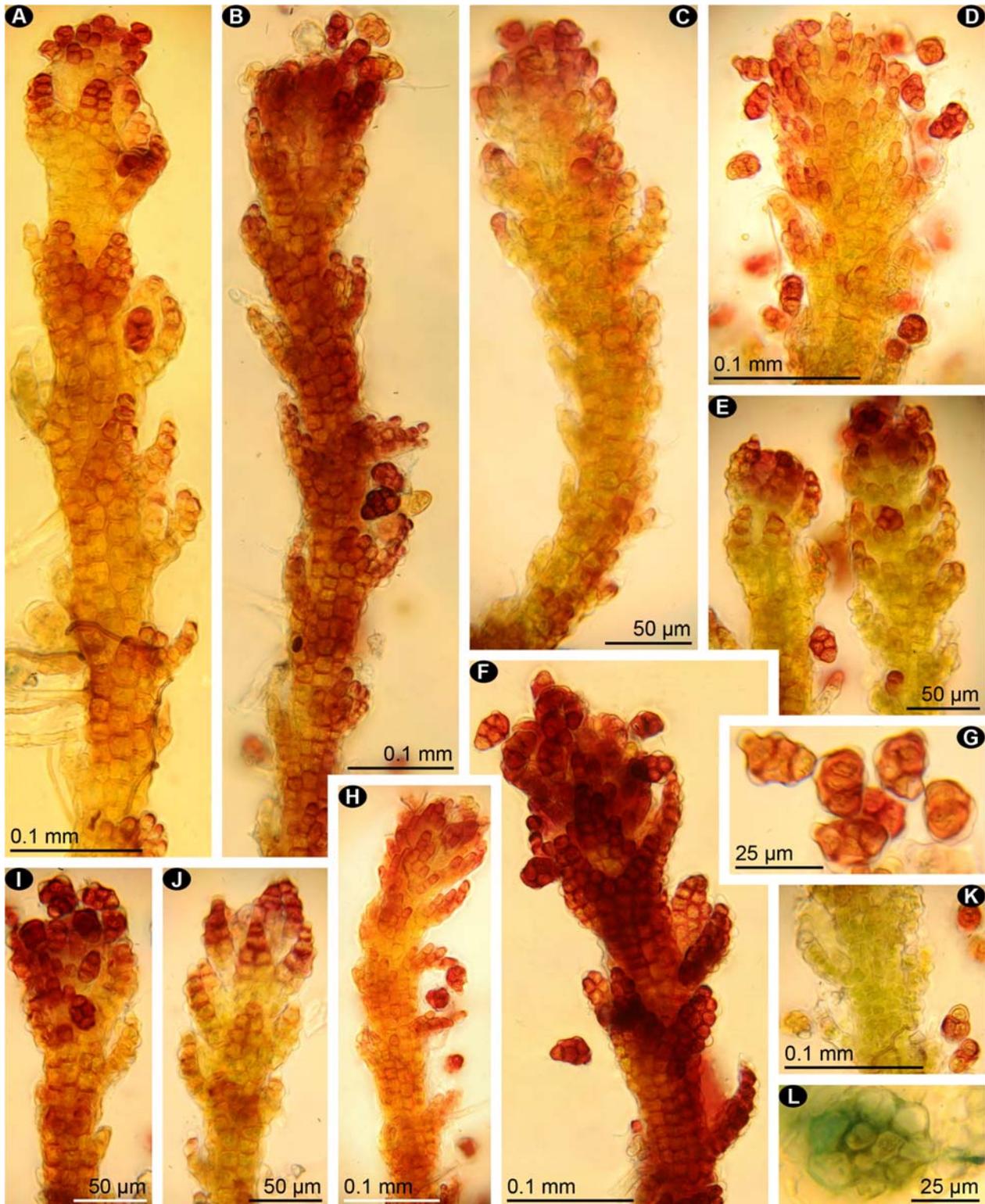


Fig. 1. *Cephaloziella grossigemma* (from holotype): A–F, H–K: shoots fragments; G: gemmae; L: stem cross section.

ores, near camino a Bahía Exploradores, 46°29'53.2" S, 73°09'12.1" W, 226 m a.s.l., 6.XII.2021, *Mamontov & Shkurko* 957-1-7472 (MHA – holotype).

Etymology. The name reflects the presence of relatively large, multicellular gemmae, the characteristic feature of the new species.

Diagnosis. Plants golden to reddish or reddish brown, shoots very small, simple or sparingly branched, capitate to even clavate due to the masses of gemmae in the upper part of shoot, with leaves ca. 0.98–1.26 times as long as wide, 0.35–0.52 divided into two subequal lobes, often with tumid, protuberant septa over the stem and leaf cell wall in-

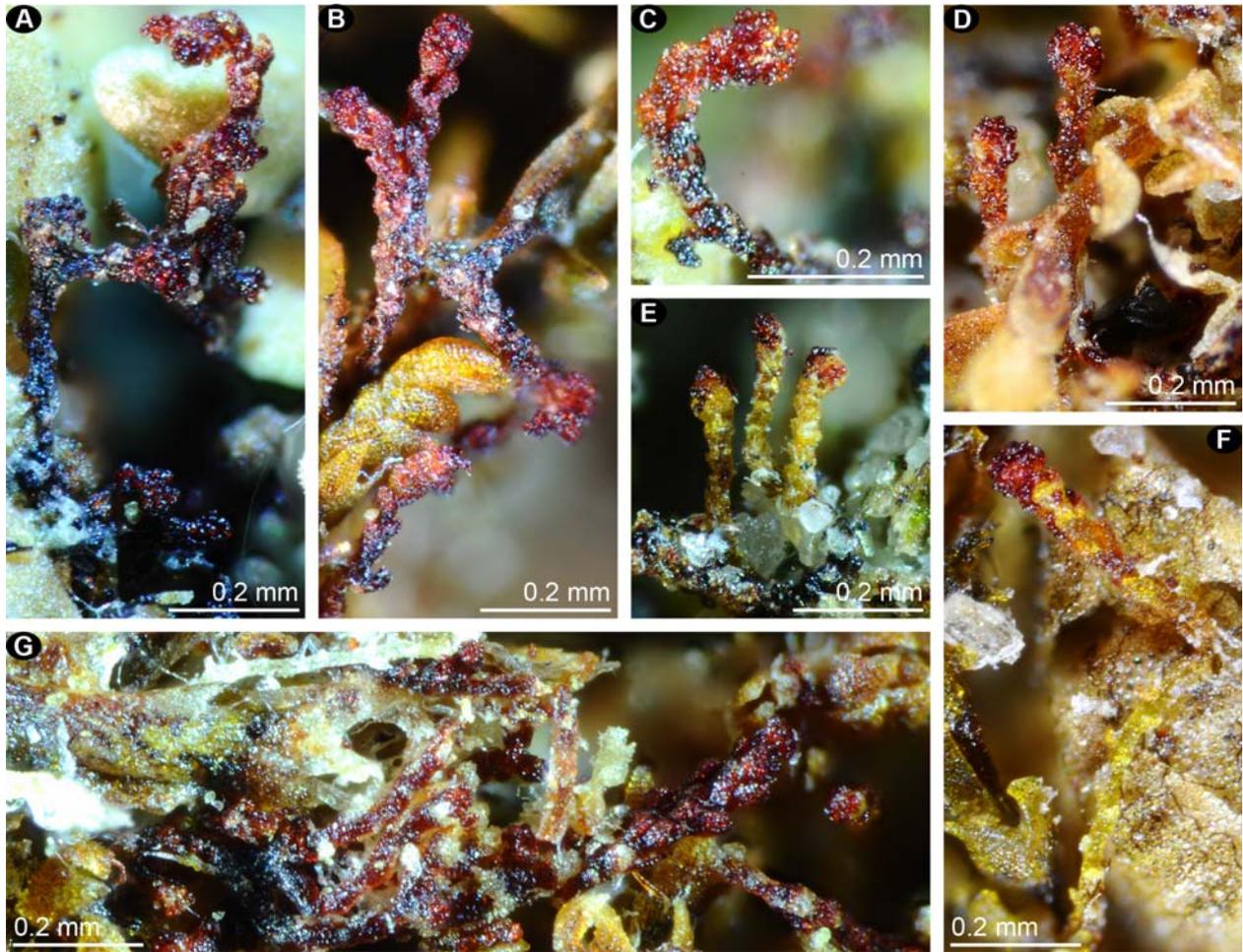


Fig. 2. *Cephaloziella grossigemma* (from holotype): A–G: dry habit.

tersections, and thus with crenulate appearance, with underleaves up to 0.53–0.87 the length of adjacent leaves, with reddish to reddish brown, multicellular, papillate gemmae.

Description. Plants golden to reddish or reddish brown, capitate to even clavate due to the masses of gemmae in the upper part of shoots, procumbent or ascending, usually simple (only isolated branches seen), very minute, leafy shoots 0.5–1.5 mm long, 70–130 μm wide. Branching of the *Frullania*-type (associated halfleaf unlobed); stolons or flagella lacking, but some shoots rather microphyllous (Fig. 1D, H). Stems 38–63 μm in diameter, in surface view cortical cells thin- to rather thick-walled (Fig. 1A), rounded-quadrate to rounded-hexagonal, 14.5–30.5 μm long, 13.3–25.3 μm wide, the cell walls intersections sometimes tending to be externally produced so that the surfaces, in profile, are seen to be covered with low, thickened, dome-like projections; stems in cross section of 7–8 cortical cells and 3 medullary cells (Fig. 1L), the cortical cells thin-walled, 9–20 μm in diameter, the medullary cells 11–14 μm in diameter. Rhizoids short and infrequent, whitish, scattered on the ventral side of stems. Leaves 66–93 μm long, 52–84 μm wide, 0.98–1.26 \times as long as wide, alternate, transversely to slightly succubously inserted, obliquely spreading to suberect, remote to subcontiguous, oblong or

ovate or obovate in outline, almost plane to distinctly concave, 0.35–0.52 bifid; lobes plane to incurved, triangular, 2–4 cells wide at base, entire-margined when unmodified, the cell walls intersections often with dome-like projections similar to those seen on stem surface, so the lobe margins are typically crenulate; sinus mostly sharp, rarely semilunate; margins of leaves and underleaves modified with gemma formation bear finger-like processes of one to several cells long. Underleaves small to rather large, in upper parts of shoots ca. 0.53–0.87 the length of adjacent lateral leaves, transversely inserted, spreading or erect or appressed, entire or 0.3–0.4 bifid. Leaf cells rounded-quadrate to rounded-hexagonal, thin- to thick-walled, the laminal cells 13–17 μm long, 12–14 μm wide, the cells at base of leaf lobes 9.2–18.6 μm long, 9.2–17.5 μm wide, intramarginal cells also often with thickened dome-like projections above the walls intersections. Asexual reproduction via reddish to reddish brown (like the shoot tips) gemmae; the gemmae 21–49 μm long, 16–30 μm wide, multicellular (of 4 to 6 cells), with thickened dome-like projections similar to those in the stem and leaf cells. Sexuality and sporophyte unknown.

Ecology-Distribution. *Cephaloziella grossigemma* is known only from a single locality in Southern Chile,

where it was collected from bark of living dwarf (stem diameter of ca. 5 cm) *Nothofagus* sp. trees in southern beeches-fern-moss brush. The plants are found among lichen thalli, also on shoots of other liverworts and on decaying bark pieces within patches of *Anastrophyllum crebrifolium* (Taylor & Hook. f.) Steph., where an admixture of *Cephaloziella serrata* Steph., *Frullania fertilis* De Not. and *F. patagonica* Steph. occur.

Studied specimens (paratypes). CHILE, Aysén Region, Aysén Province, Aysén Commune, Exploradores River valley, Parque Exploradores, near camino a Bahía Exploradores, 46°29'53.2" S, 73°09'12.1" W, 226 m a.s.l., 6.XII.2021, Mamontov & Shkurko 957-1-7471, 957-1-7477 (MHA).

DISCUSSION

The plants of *Cephaloziella grossigemina* have a characteristic morphology, and thus can be confused with *Pigafettoa crenulata*. The species described here is distinctly smaller than *P. crenulata*, that is reflected in the following differences: (1) in *C. grossigemina* the leafy shoots are 70–130 µm wide, whereas in *P. crenulata* the leafy shoots are 170–325 µm wide; (2) in *C. grossigemina* the stems are 38–63 µm in diameter, in cross section with only 3 rows of thin-walled medullary cells, whereas in *P. crenulata* the stems are 65–85 µm in diameter, with medulla of ca. 15–16 rows of very thick-walled cells; (3) in *C. grossigemina* the stem leaves are 66–93 µm long, whereas in *P. crenulata* the stem leaves are 140–225 µm long. As it was noted in the Introduction section, the shoots of *C. grossigemina* have red pigments and the rhizoids scattered among the ventral stem surface. In *P. crenulata* (as well as in other Lophocoleaceae), the red pigments absent and the rhizoids are typically present at the base of the underleaf lamina. Moreover, by contrast to *P. crenulata*, the shoots of *C. grossigemina* show no traces of the fragmentation of leaves and underleaves, while the plants bear rather large (perhaps the largest within the Jungermanniales) characteristic gemmae (Fig. 1G). The leaves and underleaves in *C. grossigemina* are often strongly modified by gemma formation, so they are reduced in size and bear finger-like processes at margins. Sometimes the leaves and underleaves near shoot apex are completely reduced to finger-like processes, so the shoots apices have a characteristic brush-like habit (Fig. 1D, H).

In Chile, there are two species of *Cephaloziella*, *C. gemmata* J.J.Engel and *C. serrata* Steph., which occur in similar or the same (case of *C. serrata*) habitats as *C. grossigemina* and thus can be confused with the latter species. However, *C. gemmata* differs from *C. grossigemina* by 1–2-celled gemmae, which are typical of *C. subg. Cephaloziella* sensu Schuster (2002). Moreover, in both *C. gemmata* and *C. serrata* the margins of leaf disk and lobes with one to several (occasionally numerous), thick-walled 1(–2)-celled spinelike teeth (Engel, 1973; Fulford, 1976). The papillate gemmae similar to those of *C. grossigemina*, are known in species of *C. subg. Evansia* Müll. Frib. sensu Schuster (2002: 137, Fig. 262: 7, 8) and *C. subg. Prionolobus* sensu Schuster (2002: 141, Fig.

264: 15). However, the species of *C. subg. Evansia* and *C. subg. Prionolobus* are characterized by serrulate to sharply toothed (or edentate in *C. grisea* R.M.Schust. and *C. granatensis* (J.B.Jack ex Steph.) Fulford) leaf margins (Schuster, 2002), while the gemmae are 2-celled. By contrast, in *C. grossigemina* the margins of leaf disk and lobes are entire or crenulate due to cell wall protuberances or bear thin-walled 1(–2)-celled processes due to gemma formation, while the gemmae are 4–6-celled.

Taking into account the differences between *C. grossigemina* and other *Cephaloziella*, the placement in that genus remains arguable since perianths were not discovered and DNA data are unavailable. Unfortunately, the tiny plant size of the species as well as its scarce presence in the studied specimens, make it questionable whether DNA extraction is successful using available options. Therefore, until the perianths are discovered and DNA data are available due to obtaining more material of this species or better options of DNA extraction, the possible assignment of *C. grossigemina* to a genus other than *Cephaloziella*, or even to its own separate genus, has remained an open question. Nowadays, *C. grossigemina* is a strict endemic which is known only from Exploradores River valley. However, this species is among the smallest liverworts known, so it can easily be overlooked in the previous collections. It is possible that this species has wider distribution and can be found in further studies of liverworts in Patagonia.

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