

ANDREWSIANTHUS AUSTRALIS VAR. VERRUCOSUS VAR. NOV. (LOPHOZIACEAE,  
MARCHANTIOPHYTA) FROM CHILE

ANDREWSIANTHUS AUSTRALIS VAR. VERRUCOSUS VAR. NOV. (LOPHOZIACEAE,  
MARCHANTIOPHYTA) ИЗ ЧИЛИ

YURIY S. MAMONTOV<sup>1,2</sup>

ЮРИЙ С. МАМОНТОВ<sup>1,2</sup>

Abstract

*Andrewsianthus australis* var. *verrucosus* is described and illustrated based on specimens from the Aysen Region, Chile. The new variety differs from the typical variety mainly by the coarsely verrucose cuticle of leaf cells.

Резюме

По образцам из области Айсен Республики Чили описана новая разновидность *Andrewsianthus australis* var. *verrucosus*. Приводятся описание и фотографии внешнего вида и характерных признаков изученных растений. Новая разновидность отличается от типовой разновидности в основном грубо папиллозной кутикулой клеток листьев, но также особенностями формы роста побегов и характера края листьев.

KEYWORDS: *Andrewsianthus australis*, new variety, verrucose cuticle

INTRODUCTION

In Chile, the genus *Andrewsianthus* R.M.Schust. is represented by three species: *A. australis* J.J.Engel of *A. subg. Andrewsianthus*, also *A. scabrellus* (C.Massal.) R.M.Schust. ex J.J.Engel and *A. sphenoloboides* (R.M.Schust.) R.M.Schust. ex J.J.Engel of *A. subg. Cephalolobus* (R.M.Schust.) R.M.Schust. Of these species, *A. australis* and *A. sphenoloboides* are known only in the Magallanes Region, while *A. scabrellus* is reported also for Los Lagos Region besides Magallanes (Hässel de Menendez & Rubies, 2009). During the study of the liverwort collections from Los Lagos and Aysen regions of Chile, two species of the genus were found. One of them (from Palena Province, Los Lagos Region) with *Cephalozia*-like habit, papillose stem and leaf cells cuticle, leaves as broad or broader than long, entire-margined and 0.3–0.5 bilobed, and lacking *Andrewsianthus*-type branches, has been determined as *A. scabrellus* according to the key in Schuster (2002) and the illustrations in Schiffner (1889: Taf. III: 1–3, as *Cephalozia scabrella* C.Massal.). The second species (from Aysén Province, Aysen Region) with sporadic *Andrewsianthus*-type branches, has been found to be different from the known southern South American species of *A. subg. Andrewsianthus* by the coarsely verrucose leaf surface. Among this subgenus, two species were described to have coarsely verrucose leaf cells, *A. kinabaluensis* N.Kitag. and *A. papillosus* N.Kitag., both from

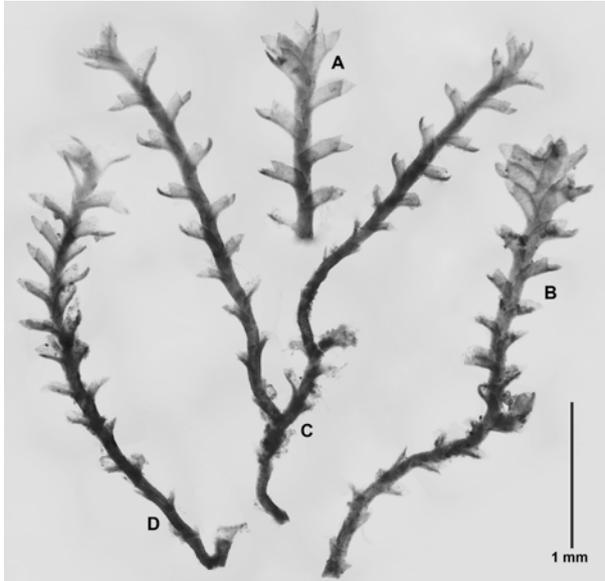
North Borneo (Kitagawa, 1970). Of these species, *A. papillosus* differs from the studied Chilean plants by the distinctly asymmetrical leaves, while *A. kinabaluensis* is distinct by the (1) reddish brown coloration, (2) absence of underleaves, (3) main shoots becoming flagelliform, and (4) shape of leaves, which are broadest in the middle or in upper third. On the basis of the shape of leaves and rudimentary underleaves, as well as the ecology (occurrence on soil over rock), the studied plants from Aysen Region are considered as most closely related to *A. australis* known in Chile from the Magallanes and Ultima Esperanza Provinces of the Magallanes Region (Hässel de Menendez & Rubies, 2009). The studied plants, however, differ from the type description and illustrations of *A. australis* by the verrucose (not striate) leaf surface, and therefore are described here as a new variety of the latter species, *A. australis* var. *verrucosus*. The description of the new variety and photomicrographs of the studied plants are provided below.

MATERIAL AND METHODS

Photomicrographs were obtained with a Leitz Wet-zlar Orthoplan light microscope equipped with a digital camera 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/>).

<sup>1</sup> – Tsitsin Main Botanical Garden, Russian Academy of Sciences, Botanicheskaja 4, Moscow 127276; e-mail: yur-mamontov@yandex.ru, ORCID 0000-0003-3851-0738

<sup>2</sup> – Polar-Alpine Botanical Garden-Institute of, Kola Science Centre of RAS, 184256 Kirovsk, Russia



## TAXONOMY

*Andrewsianthus australis* var. *verrucosus* Mamontov, **var. nov.** Fig. 1, 2.

**Type:** CHILE, Aysén Region, Aysén Province, Cisnes Commune, Parque Nacional Queulat, Salto el Condor Waterfall near Carretera Austral, 44°38'34.3" S,

Fig. 1. *Andrewsianthus australis* var. *verrucosus* (from holotype): A, C, D: sterile shoot fragments (dorsal aspect); B: female shoot fragment (dorsal aspect). Scale bar: 1 mm for A–D.

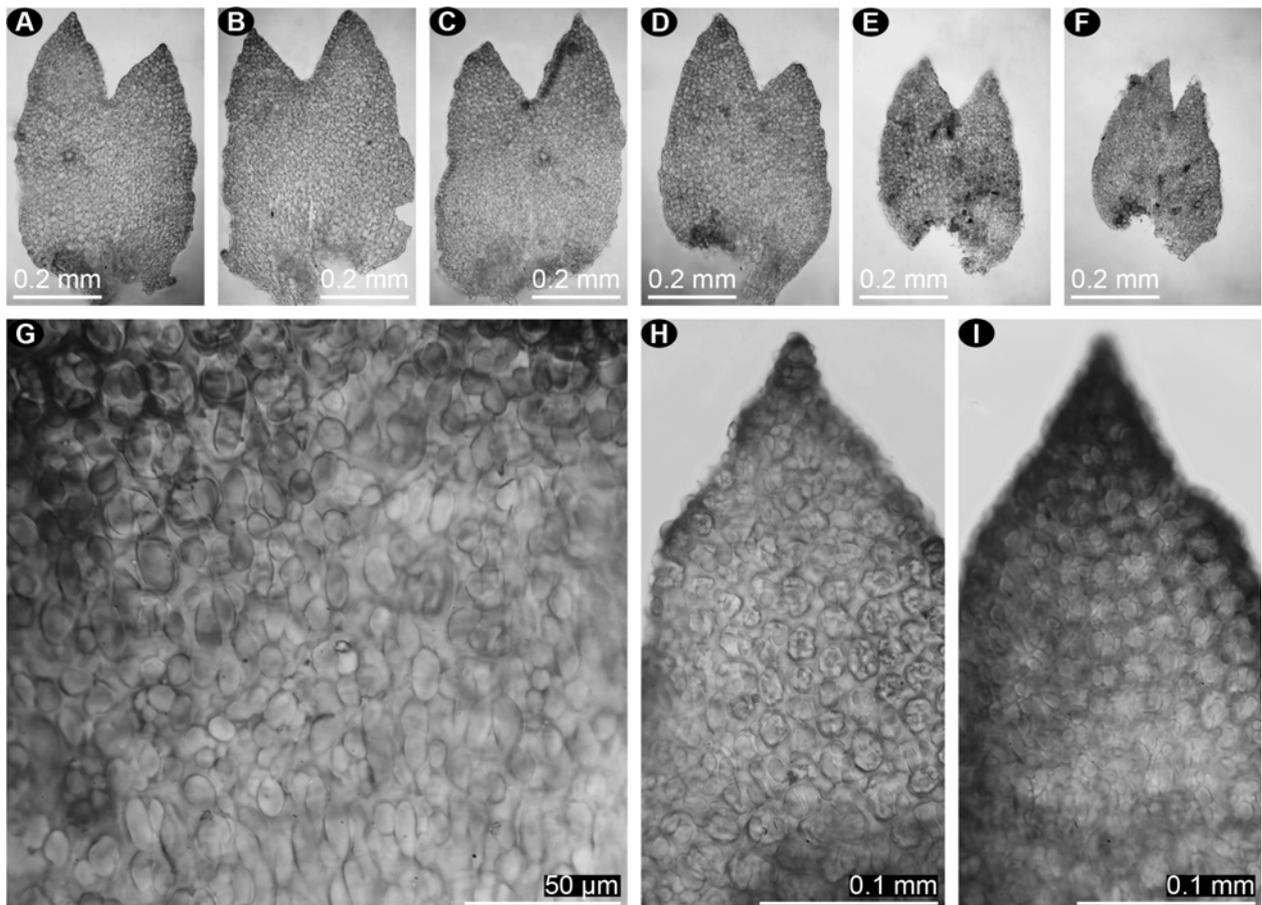
72°26'28.5" W, 326 m a.s.l., 30.XI.2021, Mamontov & Shkurko 934-6-7484 (MHA – holotype).

**Etymology.** The name reflects the coarsely verrucose surface of leaves in the new variety.

**Diagnosis.** Plants golden brown, small, with flagelliform shoots arising mostly from the ultimate branches, with leaves ca. 1.32–1.46× as long as wide, 0.17–0.28 divided into two unequal to subequal lobes, with leaf cells cuticle coarsely verrucose (covered with round to elliptic papillae), with underleaves rudimentary, composed of several cells or 2–3 slime papillae.

**Description.** Plants intermixed with other liverworts, main axes mostly suberect, usually not becoming flagelliform, sterile shoots up to 7 mm long, 0.5–0.7 mm wide, mostly golden brown. Branches sparing, lateral-intercalary, arising from the dorsal end of the leaf axil and of the *Andrewsianthus*-type, occasionally appearing from the leaf axil and thus perceptibly lateral, sometimes initially suberect and then becoming arched, sometimes flagelliform, the flagelliform axes with rhizoids and scale-like leaves, sometimes becoming leafy, rarely pos-

Fig. 2. *Andrewsianthus australis* var. *verrucosus* (from holotype): A–F: leaves; G: leaf cells just below the sinus (showing coarsely verrucose cuticle); H, I: leaf lobes.



itively geotropic. Stems 90–140  $\mu\text{m}$  thick, dark brown when dry, in surface view the cortical cells rounded-quadrate to rectangular, 39–82  $\mu\text{m}$  long, 33–56  $\mu\text{m}$  wide, thin- to thick-walled, cuticle smooth to striate. Rhizoids sparing, mostly grouped in fascicles from stem near ventral base of leaf. Leaves 380–620  $\mu\text{m}$  long, (180–)240–440  $\mu\text{m}$  wide, ca. 1.32–1.46  $\times$  as long as wide, leaves transverse to weakly succubously inserted and oriented, slightly to distinctly decurrent dorsally, obliquely to laterally spreading, only exceptionally with distal " distinctly recurved, more or less distant, plane to deeply concave, elliptic to ovate, dorsal margin sometimes with a tooth of 1–6 cells near the base (Fig. 1A, 2A, B), leaves 0.17–0.28 bilobed, lobes triangular, unequal to subequal in size, apices mostly acute, rarely obtuse, the sinus acute- to almost right-angled, occasionally narrowly rounded at base, the leaf margins plane. Leaf cells rounded-quadrate, rounded-rectangular or rounded-polygonal, wall thin, trigones concave to convex and nodulose, occasionally confluent, median leaf cells 20–33  $\mu\text{m}$  long, 14–24  $\mu\text{m}$  wide, marginal cells somewhat smaller, 15–22  $\mu\text{m}$  long, 12–18  $\mu\text{m}$  wide, cuticle covered with round to elliptic papillae, thus coarsely verrucose (Fig. 2G–I), the papillae 7–21  $\mu\text{m}$  long, 5–11  $\mu\text{m}$  wide. Underleaves rudimentary, composed of several cells or 2–3 slime papillae. Gemmae absent. Plants apparently dioecious (only gynoecia have been found); the unfertilized gynoecia terminal on main axes, with subfloral innovations, the bracts similar in shape to the sterile leaves, but somewhat larger, with entire margins. Bracteole narrowly ovate, entire margined, apex acute.

**Ecology and Distribution.** The new variety is known only from a single locality in Southern Chile, where it was collected in a gorge with a high waterfall at Salto el Condor. The plants of *A. australis* var. *verrucosus* occur on rock outcrops moistened by water drops and spray from the waterfall and were found intermingled in patches of a species of Lejeuneoideae, with an admixture of *Lepicolea ochroleuca* (Spreng.) Spruce, *Hymenophyton pedicellatum* Steph. and *Temnoma quadripartitum* (Hook.) Mitt.

**Studied specimens (paratypes).** CHILE, Aysén Region, Aysén Province, Cisnes Commune, Parque Nacional Queulat, Salto el Condor Waterfall near Carretera Austral, 44°38'34.3" S, 72°26'28.5" W, 326 m a.s.l., 30.XI.2021, Mamontov & Shkurko 934-6-7483, 934-6-7485 (MHA).

#### DISCUSSION

Comparing the new variety with the description and illustrations of *Andrewsianthus australis* in Engel (1972), it can be concluded that the new variety differs from the type one by the following traits: (1) in *A. australis* var. *verrucosus* the flagelliform shoots usually arising from the ultimate branches, whereas in *A. australis* var. *australis* the flagelliform shoots frequently arising from the main axes; (2) in *A. australis* var. *verrucosus* the cortical

stem cells are 39–82  $\mu\text{m}$  long, 33–56  $\mu\text{m}$  wide, whereas in *A. australis* var. *australis* the cortical stem cells are 20–47  $\mu\text{m}$  long, 10–18  $\mu\text{m}$  wide; (3) in *A. australis* var. *verrucosus* the dorsal margin of sterile leaves sometimes bears a tooth of 1–6 cells near the base, whereas in *A. australis* var. *australis* the dorsal margin of sterile leaves bears a sessile or stalked slime papilla near the base; (4) in *A. australis* var. *verrucosus* the leaf margins are plane, whereas in *A. australis* var. *australis* the dorsal leaf margin is slightly to distinctly curved, especially toward the base, and often repand; (5) in *A. australis* var. *verrucosus* the leaf cells have a coarsely verrucose cuticle, the surface covered with rather large, round to elliptic, papillae, whereas in *A. australis* var. *australis* the leaf cells cuticle is smooth to finely to rather coarsely striate.

The studied plants of *A. australis* var. *verrucosus* are somewhat smaller than those described in Engel (1972), i.e., the shoots of *A. australis* var. *verrucosus* are up to 7 mm long (vs. up to 2 cm long in the type variety) and 0.7 mm wide (vs. 1 mm wide in the type variety). However, the sterile leaves in the new variety are of almost the same size as reported for *A. australis* (390–780  $\mu\text{m}$  long, (130–)270–430  $\mu\text{m}$  wide). Therefore, the differences in the morphology of sterile leaves in both taxa can hardly be treated as differences between the stages of the leaf development. The leaf characteristics in *A. australis* var. *verrucosus* are thus considered here as having taxonomic importance. Perianth-bearing shoots have not been found in *A. australis* var. *verrucosus*, so the morphology of their bracts is unknown. In *A. australis* var. *australis*, the dorsal margin of bracts of the perianth-bearing shoots is 1–2 dentate towards the median or basal portion, and the ventral margin with two small teeth near the base (Engel, 1972). In *A. australis* var. *verrucosus*, the bracts of unfertilized gynoecia are entire-margined. *Andrewsianthus australis* was described as occurring on soil over rock or in rock crevices of cliffs or large rock outcrops in dwarf shrub heaths and on soil under cover of sheltered high altitude cliffs, whereas *A. australis* var. *verrucosus* was collected on soil over a cliff, which is continuously moistened with water drops and spray from the nearby high waterfall. Therefore it is possible that *A. australis* var. *verrucosus* prefers more humid habitats than *A. australis* var. *australis*. This assumption can be tested when more gatherings of *A. australis* var. *verrucosus* have accumulated. The listed morphological differences between *A. australis* var. *australis* and *A. australis* var. *verrucosus*, especially the features of leaf cell cuticle, may indicate that the latter taxon represents a separate species, not a variety. To solve this question molecular studies of the *Andrewsianthus* species known in Chile are needed.

The second species, *A. scabrellus*, was reported for the Los Lagos Region of Chile only from the Chiloé Archipelago (Villagran *et al.*, 2005), their ecology and distribution in Palena Province are provided:

CHILE, Los Lagos Region, Palena Province, Chaitén Commune, Sendero Ventisquero Yelcho, 43°16'32.5" S, 72°25'31" W, 155 m a.s.l., evergreen-coniferous-bamboo-fern-moss forest, on rotten log, with *Anastrophyllum crebrifolium* (Taylor & Hook. f.) Steph. and *Cephaloziella serrata* Steph., 29.XI.2021, Mamontov & Shkurko 928-4-7462, 928-4-7466 (MHA); Michimahuida River valley, 42°55'53.8" S, 72°23'39.4" W, 463 m a.s.l., evergreen southern beech-broadleaved-shrub-herb-grass-moss forest, on rotten log, with *Anastrophyllum crebrifolium* and *Cephaloziella serrata*, 29.XI.2021, Mamontov & Shkurko 929-3-7463, 929-3-7464, 929-3-7465, 929-3-7473, 929-3-7474, 929-3-7475, 929-3-7478, 929-3-7479, 929-3-7480 (MHA).

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