

ON THE SPOROPHYTE OF *DICRANUM IGNATOVII* (DICRANACEAE, BRYOPHYTA)

О СПОРОФИТЕ *DICRANUM IGNATOVII* (DICRANACEAE, BRYOPHYTA)

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Abstract

Dicranum ignatovii Tubanova & Fedosov was recently described from the southern Russian Far East based on sterile collections. Sporophytes were subsequently found in two herbarium specimens from Kunashir Island (South Kuril Islands), and also dwarf male plants were revealed in one of these specimens, so phylloidioicous sexual condition of this species is confirmed. Here we provide an amended description of the species. A derived peristome structure of *D. ignatovii* is consistent with its epiphytic growth; it is illustrated with SEM images.

Резюме

Dicranum ignatovii Tubanova & Fedosov был недавно описан с юга российского Дальнего Востока по стерильным образцам. Впоследствии спорофиты были обнаружены в двух образцах в гербарных коллекциях с о. Кунашир (Южные Курилы), и в одном из этих образцов были обнаружены карликовые мужские растения, что подтверждает ложнооднодомность этого вида. Мы приводим дополненное описание вида. Модифицированное строение перистома *D. ignatovii* хорошо согласуется с его эпифитным ростом; оно показано на снимках СЭМ.

KEYWORDS: *Dicranum*, sporophyte, sexual condition, peristome structure, Kunashir Island, Far East

INTRODUCTION

Species of the genus *Dicranum* often have phylloidioicous sexual condition (Ireland, 2007; Hedenäs & Bisang, 2015) and sporophyte production in many of them is sporadic or rare. Therefore, species from severe environments are sometimes described without sporophytes, including one which is in the focus of the present paper. *Dicranum ignatovii* Tubanova & Fedosov was recently described from the Kuril Islands in the Russian Far East (Tubanova *et al.*, 2018), based on the results of a molecular phylogenetic analysis. Specimen with unusual combination of gametophytic characters and flagelliform branchlets was found in a clade with *D. scoparium* Hedw., *D. bonjeanii* De Not., *D. bardunovii* Tubanova & Ignatova, *etc.* with high statistical support. However, despite six collections from different regions were available, none of them had sporophytes.

Subsequent studies of herbarium collections allowed us to reveal two specimens of *D. ignatovii* with the sporophytes; both of them were collected in Kunashir Island (Russian Far East): (1) by Leonid Malyshev, 28.IX.1964 (IRK), and (2) by Koroteeva, 13.VIII.2015 (SAK). Below we describe and illustrate sporophytic characters of this species which were previously unknown.

TAXONOMY

Dicranum ignatovii Tubanova & Fedosov, Philipp. J. Syst. Biol. 12(1): 40. 2018. Figs. 1–3

Phylloidioicous. Male plants dwarf, on rhizoidal tomentum of female plants. Inner perigonial leaves 0.6–0.8 mm long and 0.3 mm wide, from ovate base abruptly narrowed into lanceolate acumen; costa ending below leaf apex; margins serrulate distally. Inner perichaetial leaves ca. 4 mm long and 1.2 mm wide, from oblong base abruptly attenuate, acumen narrow, with slightly serrulate upper margins; costa percurrent. Sporophyte single in perichaetium. Seta 6–9 mm long, straight, flexuose when dry, yellow.

Capsules straight, cylindrical to ovate, 1.7–2 mm long and ca. 0.8 mm wide, slightly constricted below mouth, smooth, pale brown, with brown rim; annulus deciduous, consisting of 1–2(–3) cell row. Peristome single, consisting of 16 teeth split distally into 2–3 prongs, with longitudinal perforations in proximal part, orange to red proximally and colorless distally, ca. 200 µm long; outer surface weakly longitudinally striolate to almost smooth below and in the middle, obliquely striolate and weakly papillose in distal part; inner surface with low trabecu-

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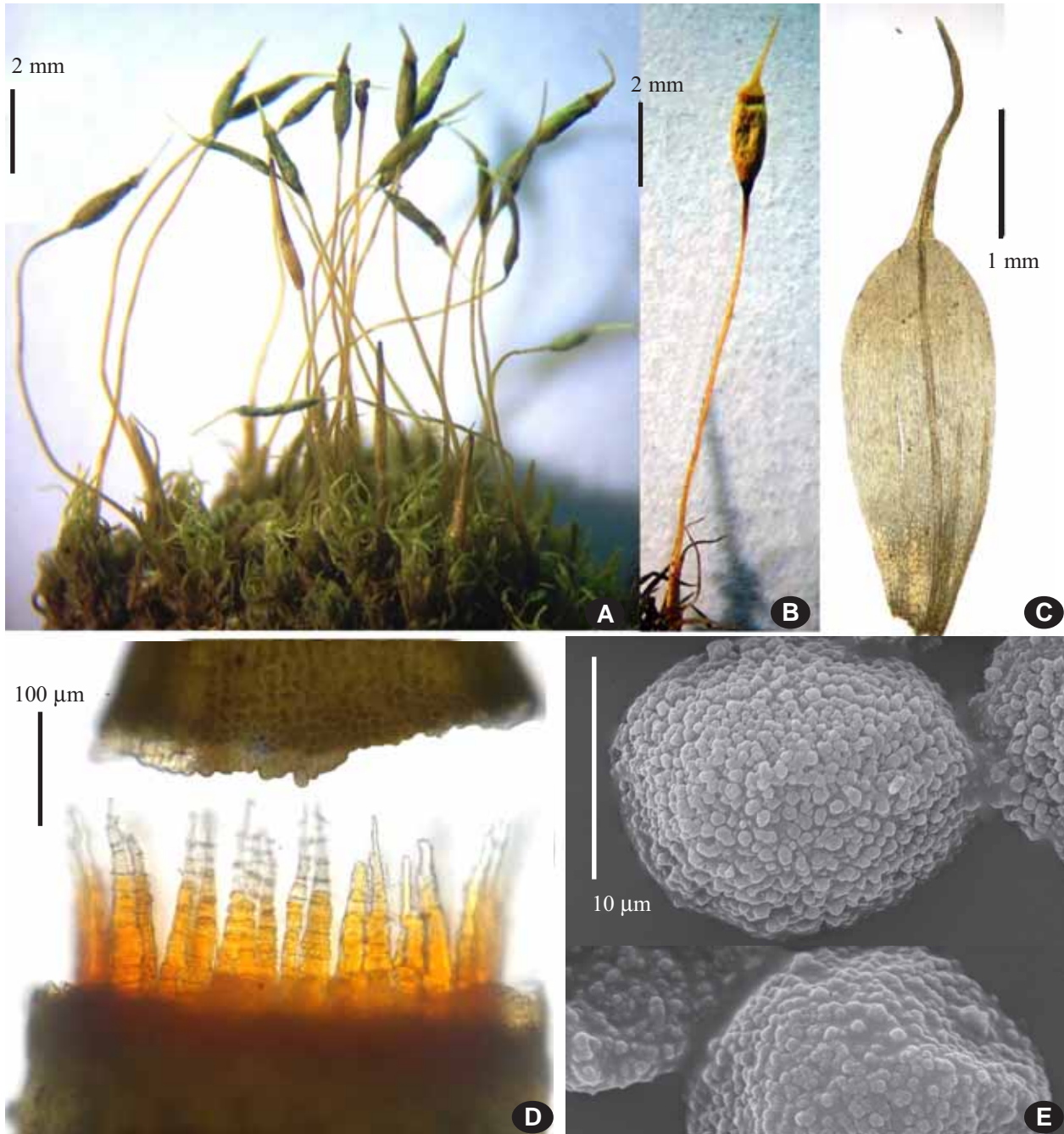


Fig. 1. *Dicranum ignatovii* (A, D, E from: Kunashir Island, *Koroteeva 15-10/13-37*, SAK, UUH, MHA; B–C from: Kunashir Island, 28.IX.1964 *Malyshev s.n.*, IRK, UUH). A: habit of plant with somewhat premature sporophytes; B: almost mature sporophyte with operculum; C: inner perichaetial leaf; D: operculum and capsule mouth with persistent annulus and peristome; E: spores.

lae, sparsely papillose, papillae on trabeculae dense. Operculum conic, with long beak. Spores 14–19 µm, slightly papillose, maturing in the early autumn.

Other studied specimens: RUSSIA, Sakhalinskaya Province, Kunashir Island: “Mendeleevskaya” geothermal power plant (43°59'16"N, 145°46'27"E), western foot of hill 407 (352) m alt., *Picea glehnii* forest with *Sasa* sp., on dead standing tree, 11.VIII.2015 *Koroteeva 15-25/1-3* (SAK, UUH); Mechnikova Mt. (43°58'42"N – 145°46'52"E), 168 m alt., *Picea glehnii* forest with *Sasa* sp., on dead standing tree, 4.VIII.2015 *Koroteeva 15-5/2-12* (SAK, UUH).

Ecology. Label data of the Malyshev collection does not provide any information about substrate; the specimen of Ko-

roteeva was apparently collected on dead wood. In the original description of *D. ignatovii* it was stated that this species grows exclusively on tree trunks; however, later it was also found on trunks of dead standing trees (snags) and, rarely, on fallen trunks.

DISCUSSION

Dicranum ignatovii was described based on an integrative approach, including molecular data and morphology (Tubanova *et al.*, 2018). However, molecular phylogenetic analysis did not reveal any species with similar combination of morphological characters among

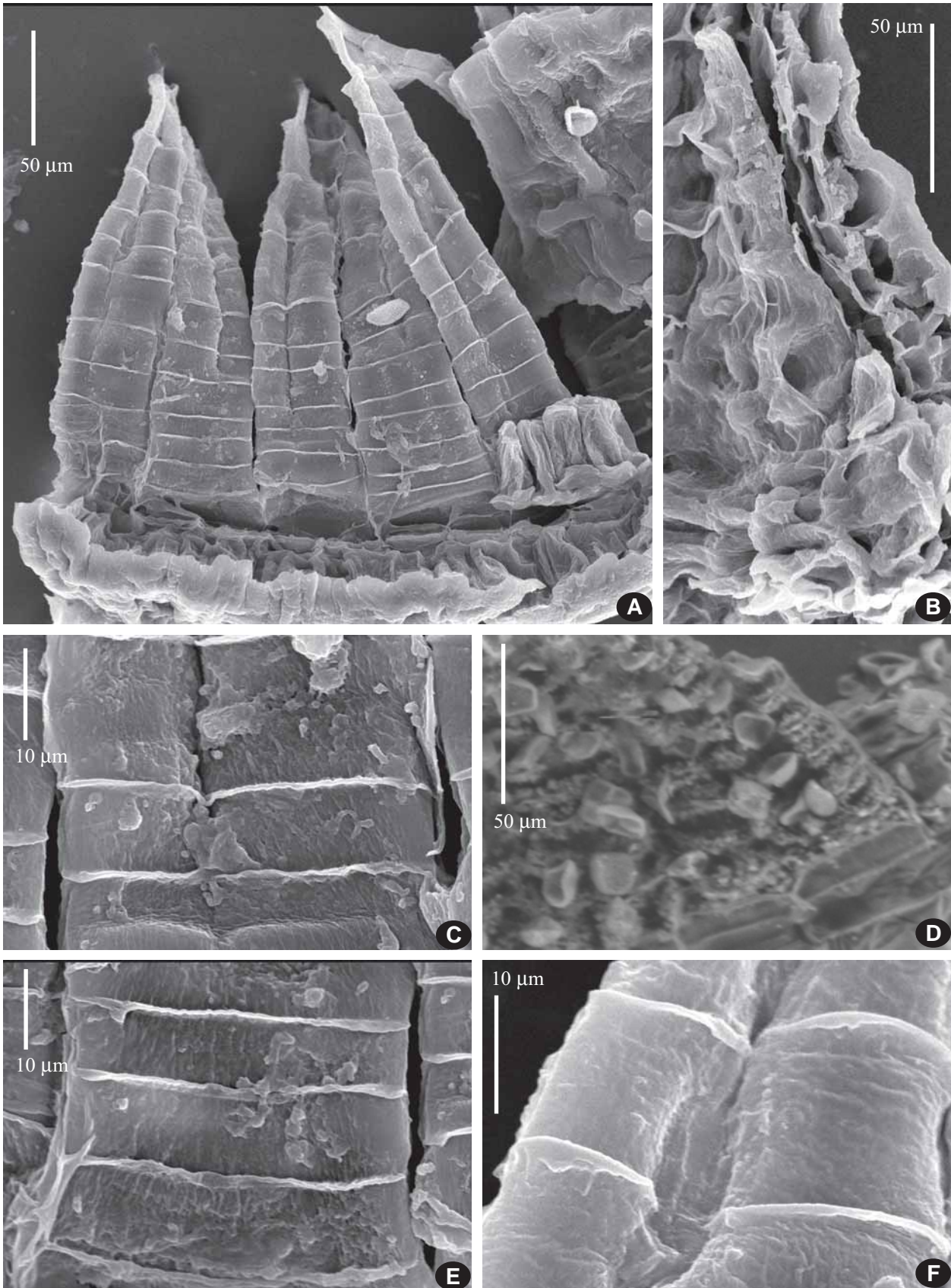


Fig. 2. *Dicranum ignatovii* (from: Kunashir Island, *Koroteeva 15-10/13-37*, SAK, UUH, MHA). A: peristome, general view; B, D: inner surface of peristome tooth; C, E: outer surface of peristome tooth, proximal part; F: outer surface of peristome tooth, median part.

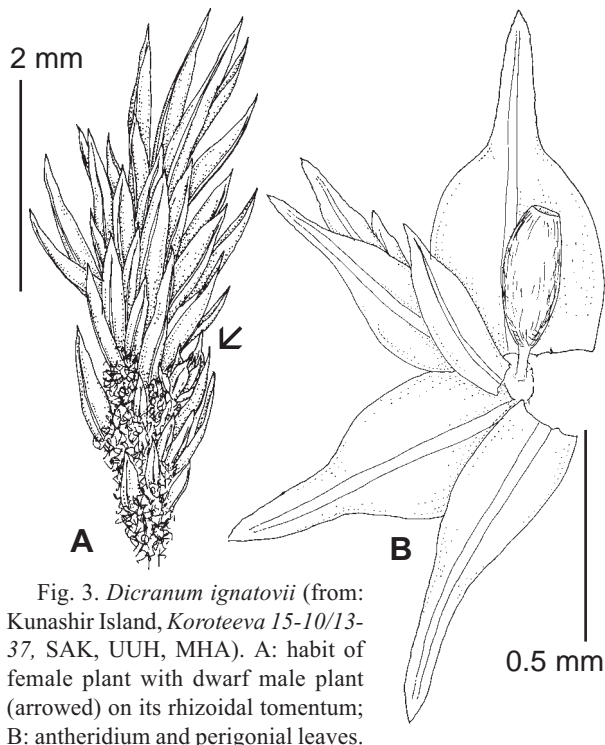


Fig. 3. *Dicranum ignatovii* (from: Kunashir Island, Koroteeva 15-10/13-37, SAK, UUH, MHA). A: habit of female plant with dwarf male plant (arrowed) on its rhizoidal tomentum; B: antheridium and perigonial leaves.

the species closest to *D. ignatovii* by the studied molecular markers. The latter species has a peculiar combination of gametophytic features, *i.e.*, shortly acute, sharply keeled leaves, in upper part with laminae concave from the abaxial view; costa ending several cells below leaf apex, not filling the acumen, roughened at back above; cells in the middle and upper part of lamina short rectangular, quadrate and transversely rectangular; basal laminal cells rectangular, porose, sharply delimited from the middle cells; and flagelliform brood branchlets occasionally present. Some of its sporophytic characters, newly revealed, are also unusual for *Dicranum*. Outer surface of peristome teeth in this genus is described in various Floras as vertically pitted-striolate proximally, papillose above (e.g., Crum & Anderson, 1981; Ireland Jr., 2007; Smith, 2004). This type of peristome surface is illustrated by SEM images in Ignatov & Ignatova (2003). However, in some species with straight, erect capsules this pattern is not represented; e.g., outer surface of peristome teeth of *D. tauricum* Sapjegin is not vertically pitted-striolate but obliquely striolate below (our observations in herbarium material from the Caucasus, MW). Peristomes similar to typical peristome type of *Dicranum* are also known in Leucobryaceae, but only in *Leucobryum*, while other genera, e.g., *Octoblepharum*, are characterized by derived, less regular ornamentation of the peristome (Robinson, 1990). Straight capsules with modified peristomes are characteristic for epiphytic lineages in many moss families (Huttunen *et al.*, 2004; Hedenäs, 2012). Straight capsules, short and weakly ornamented peristome teeth of *Dicranum ignatovii* (Figs. 1–2) are consistent with its epiphytic growth.

In gametophytic characters *Dicranum ignatovii* is likely similar to *D. linzianum* C. Gao, endemic of Xizang, China (Gao *et al.*, 1999). The latter species has leaves of similar shape (ovate-lanceolate, gradually tapered to the short, acute acumen), slender costa ending below apex and occupying small portion of width of leaf acumen, roughened at back above, and short upper laminal cells (oval to rounded rhombic, thick-walled, somewhat porose). However, its description and illustrations are not sufficient for reliable comparison: the transition from mid-leaf to basal cell areolation, as well as shape of leaf transverse section are not shown, and sporophytes are not described (mature sporophytes unknown). This species grows on humic soil in grasslands (Gao *et al.*, 1999), while all collections of *D. ignatovii* are from living or dead trees. The relationship between these two species needs further study, preferably using molecular markers in addition to a detailed morphological comparison.

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