

A NEW SPECIES OF DIDYMODON (POTTIACEAE, MUSCI) FROM ASIAN RUSSIA
НОВЫЙ ВИД DIDYMODON (POTTIACEAE, MUSCI) ИЗ АЗИАТСКОЙ РОССИИ

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Abstract

Didymodon zanderi sp. n. (Pottiaceae, Musci) is described from Zabaikalsky Territory (former Agin-Byurayt Autonomous District) of Asian Russia. It is related to *D. hedysaryformis* Otnyukova, a species recently described from Tyva Republic, but differs in leaf apices only occasionally fragile, not differentiated into propagulae of definite shape, and in larger laminal cells, bulging and papillose. *Didymodon zanderi* is rather common in Alkhanai National Park, where it grows in abundance on rocks along mountain creeks at ca. 1000-1200 m elev., and also is known from scattered localities in mountain areas of Altai, southern Taimyr, central Yakutia, Buryatia, Primorsky Territory and Kamchatka, from 500 to 2800 m elev.

Резюме

Didymodon zanderi sp. n. (Pottiaceae, Musci) описан из Забайкальского края (бывшего Агинского Бурятского автономного округа). Он близок к недавно описанному из Тывы *D. hedysaryformis* Отнукуова, однако отличается от него лишь иногда обламывающимися верхушками листьев, не дифференцированными в выводковые органы определенной формы, а также более крупными клетками листовой пластинки, мамиллозно выступающими, с низкими разветвленными папиллами. *Didymodon zanderi* является частым и массовым видом на территории Национального парка «Алханай», где растет в изобилии на камнях вдоль горных рек и ручьев на 1000-1200 м над ур. м. Он также известен из нескольких местонахождений в разных горных районах Азиатской России: на Алтае, южном Таймыре, в центральной Якутии, Бурятии, Приморском крае и Камчатке, на высотах от 500 до 2800 м над ур. м.

Several years ago in the course of studies of moss collections from Siberia, the second author found in Altai Mountains peculiar specimens of *Didymodon* which did not fit any known species in that area or in neighboring regions. The species is distinct by the rather small plant size, dense tufts, olivaceous-green and often slightly glaucous above and brown to rusty below, lanceolate leaves with acute or subobtuse apices, costa distally undifferentiated, i.e. composed of homogeneous cells in leaf transverse section, and the large, thin-walled, bulging laminal cells covered by large, low, branched papillae. In habit this species re-

sembles *D. nigrescens*, but the latter plant has smaller and much thicker-walled laminal cells and more intense rusty color of plants. Subsequently this species was found also in herbarium collections from Kamchatka, Buryatia, Yakutia, southern Taimyr, Baikal area, and Primorsky Territory. All these collections lack sporophytes although some have perichaetia.

During a bryofloristic survey in Agin Buryat Autonomous District and Chita Province (Transbaikalia) in 2005-2006, the first author found an unknown *Didymodon* species that occurs abundantly in the area on rocks and boulders nearby moun-

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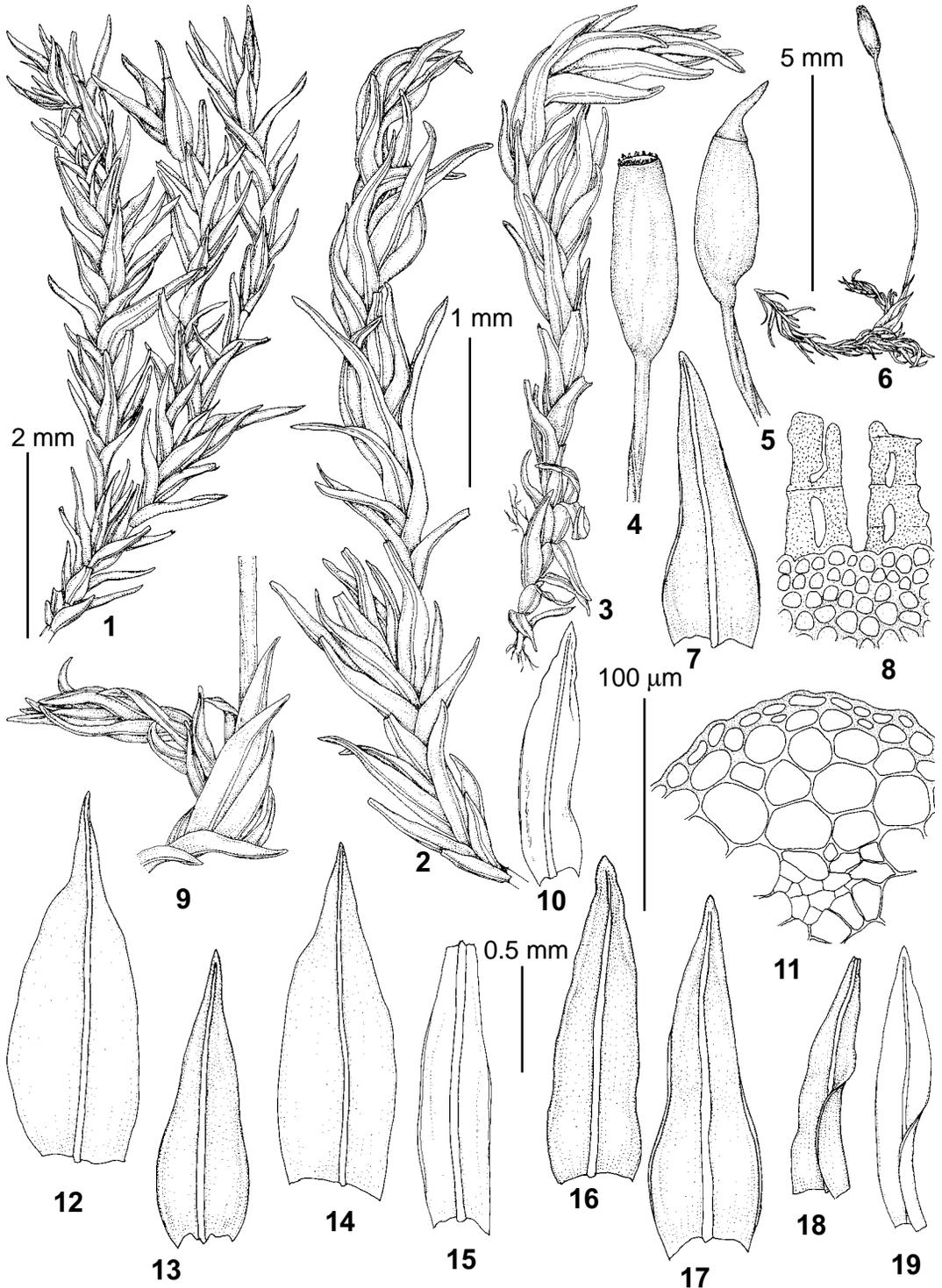


Fig. 1. *Didymodon zanderi* Afonina & Ignatova (from the holotype, Afonina # 3406, LE): 1 – habit, wet; 2-3, 6 – habit, dry; 4-5 – capsules; 7, 10, 15-19 – stem leaves; 8 – peristome teeth; 9 – perichaetium; 11 – stem transverse section; 12-14 – perichaetial leaves. Scale bars: 5 mm for 6; 2 mm for 1; 1 mm for 2-5, 9; 0.5 mm – for 7, 10, 12-19; 100 μm – for 8, 11.

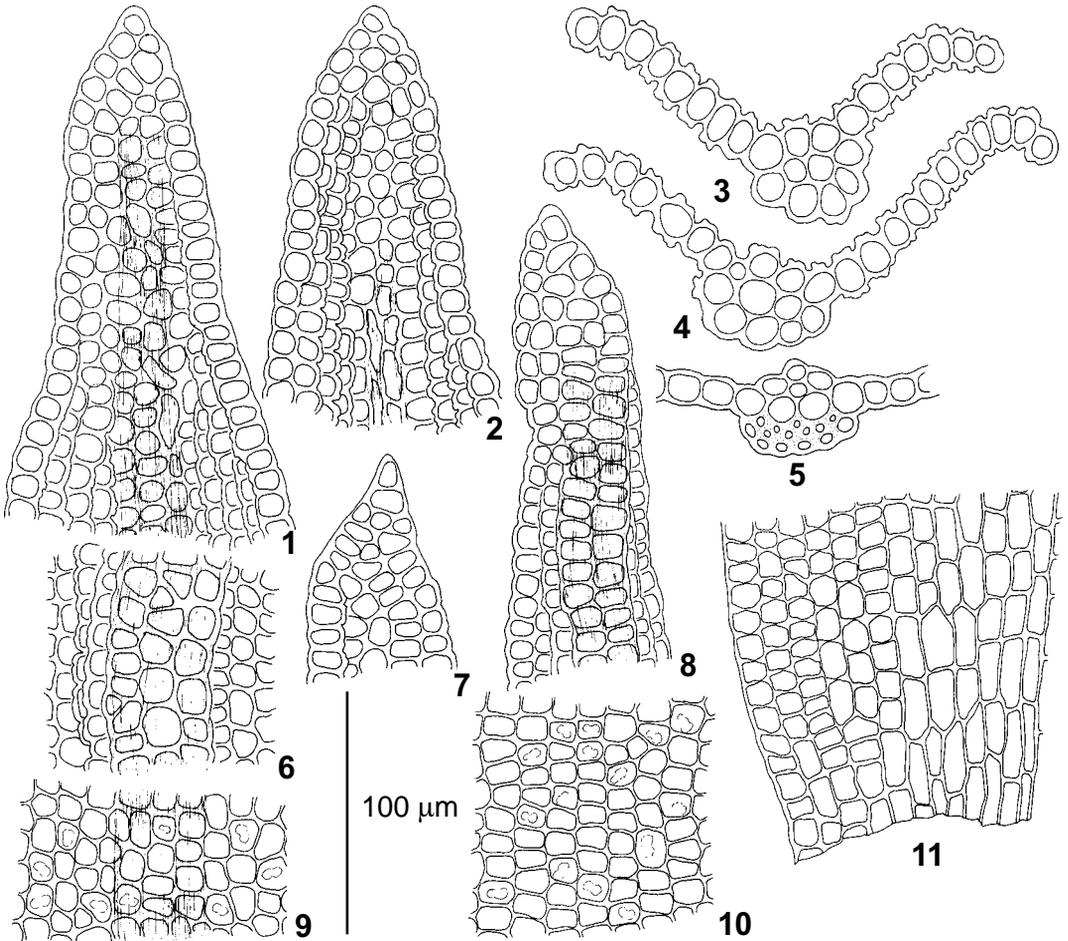


Fig. 2. *Didymodon zanderi* Afonina & Ignatova (from the holotype, Afonina # 3406, LE): 1, 2, 7, 8, 10 – upper leaf cells; 3-5 – leaf transverse sections; 6 – surface cells of costa, dorsal side; 9 – surface cells of costa, ventral side; 11 – basal leaf cells. Scale bars: 100 μm for 1-11.

tain creeks and brooks. Most collections from Transbaikalia were also sterile, but in one specimen a few sporophytes were also found. Comparison with the putative new species recognized by the second author revealed their identity. This species is described below as new for science.

Didymodon zanderi sp. nov. Figs. 1-3

Species haec *Didymodonti hedysarififormi* proxima sed statura majore, caule longiore, 1.5-2.0 cm alto (non 0.8-1.2 cm), structura cellulari laxiore, cellulis laminae distalis plane rotundatis majoribusque 10-14 μm latis (non 6-8 μm), mamilloso-papillois (non levibus), apicibus foliorum laevi-marginatis, solum interdum deciduis, simplicibus, non in propagula distincta formatis.

Typus: Siberia australis. Transbaikalia. Agin-Buryat Districtus autonomus. Viridarium Nation-

alis Alkhanai, zona protectoria, mons Alkhanai, declivum australe, rivulus Arshan, 50°50'N, 113°24'E, alveus rivuli, ad saxa magna, 11.VII.2006, leg. O. Afonina, # 3406 (holotypus LE, isotypi MW, MHA).

Paratypi: 1) in eodem loco, 50°50'N, 113°24'E, ad saxa prope cataracta, 11.VII.2006, leg. O. Afonina, # 3006 (LE, MW); 2) in eodem loco, 50°51'N, 113°23'E, alt. 1171 m, declivum australe-occidentale, ad saxa, 25.VII.2007, leg. O. Afonina, # 08607 (LE, MW, MO).

Close to *Didymodon hedysarififormis* but differs in larger size of plants, longer stems, 1.5-2.0 cm high vs. 0.8-1.2 cm, more lax areolation with upper cells more regularly round and larger, 10-14 μm vs. 6-8(-12) μm , bulging and papillose vs. smooth, leaf apices (apical parts) with smooth

margins, only occasionally deciduous and not differentiated into propagulae of definite shape.

Type: Southern Siberia. Transbaikalia. Agin-Buryat Autonomous District. Protected zone of the National Park Alkhanai, southern macroslope of Alkhanai Mt., Arshan brook, 50°50'N, 113°24'E, on boulders in course of brook, 11.VII.2006, coll. O. Afonina, # 3406 (holotype LE, isotypes MW, MHA).

Paratypes: 1) Southern macroslope of Alkhanai Mt., Arshan brook, 50°50'N, 113°24'E, on rocks under waterfall, 11.VII.2006, # 3006 (LE, MW); 2) Arshan Brook, 50°51'N, 113°23'E, alt. 1171 m, SW-facing slope, on boulders, 25.VII.2007, # 08607 (LE, MW, MO).

The species is named after Richard H. Zander, the monographer of the family Pottiaceae, who also suggested an affinity of the new species with *D. hedysarifformis*.

Plants small to medium-sized for the genus, growing in rather dense and extensive tufts or mats, brownish-green or olivaceous in upper part, often with glaucous tones, brown to rusty in lower part, dull. *Stems* (0.5-)1.5-2.0(-2.5) cm, erect or ascending, usually curved in upper part, irregularly branched; sparsely radiculose at base, with branched brown, smooth rhizoids, round in transverse section, hyalodermis absent, cortical cells in 1-2 layers, with reddish-brown thickened walls; medular cells with moderately thickened yellowish walls, central strand present, small, sometimes indistinct; axillary hairs 3-celled, hyaline, with a longer distal cell. *Leaves* more or less appressed and slightly flexuose when dry, erect to erectopatent when moist; lanceolate or ovate-lanceolate, 1.0-2.0 x 0.35-0.50 mm; slightly concave throughout, from ovate, sheathing base gradually narrowing to the apex; apex acute or subobtuse, rarely almost acuminate; margins narrowly recurved in lower 1/2-3/4, flat distally, crenulate in distal part because of bulging cells, sometimes uneven in upper part at places where fragmentation begins, rarely leaf apices are broken off; *costa* often reddish, narrow, 35-50 µm wide at leaf base, of equal width throughout the leaf or slightly widened at mid-leaf, ending several cells before leaf apex, strongly projecting dorsally, flat or slightly projecting ventrally, undifferentiated in leaf transverse section in upper 1/2 of leaf, with quadrate and papillose surface cells on dorsal and ventral sides, in lower 1/2 with 2-4 guide cells in 1 row,

dorsal stereid band, without dorsal epidermis, in mid-leaf covered by narrow smooth cells dorsally and large papillose cells ventrally, ventral surface cells gradually becoming longer and smooth to the leaf insertion; lamina unistratose; upper laminal cells isodiametric, rounded-quadrate, 10-14 µm, thin-walled or with moderately thickened reddish walls in mature leaves, bulging, covered with low branched papillae 1-2 per cell, papillae often indistinct in front view; median laminal cells rounded-quadrate, ca. 9-11 µm; basal juxtacostal cells elongate rectangular, to 20-40 x 8-12 µm, smooth, yellowish; basal marginal cells quadrate to short-rectangular, smooth. Dioicous, plants with archegonia not rare, male plants very rare, sporophytes found only once. Perichaetia terminal; inner perichaetial leaves 1.1-1.2 mm long; ovate-lanceolate with wide basal part, sheathing in basal 2/3, rather abruptly acuminate. Seta 5-6 mm, yellowish-brown distally, reddish-brown proximally, twisted. Urn ovate to ovate-cylindric, ca. 1.0-1.3 mm long, yellowish-brown; annulus of 3 rows of hexagonal vesiculate cells, deciduous in pieces; operculum conic, with long oblique beak ca. 0.5 mm; peristome teeth 16, rudimentary, irregular in shape, perforated, yellowish, finely papillose, to 75 µm long. Spores ca. 13-15 µm, finely papillose. KOH laminal color reaction red.

DIFFERENTIATION. *Didymodon zanderi* is characterized by relatively broadly acute to somewhat obtuse leaf apex, rather weakly recurved leaf margins, weakly differentiated costa, usually with dorsal stereid band only. Ventral epidermal cells of costa are quadrate and papillose in upper part, elongate and smooth below. Laminal cells are relatively large for the genus, 10-14 µm, thin-walled or with moderately thickened reddish walls in mature leaves, somewhat bulging, covered by low and branched papillae that are usually indistinct in front view.

The occasional slightly sinuous upper leaf, slightly bulging and only slightly papillose laminal cells and short peristome teeth may put *D. zanderi* close to the group of species with caducous leaf apices, especially to *D. hedysarifformis* Otnyukova (Otnyukova, 1998, 2002). However, *D. zanderi* has no caducous leaf apices differentiated into propagulae as in *D. hedysarifformis*, has larger size of plants (stems being 1.5-2.0 cm vs.

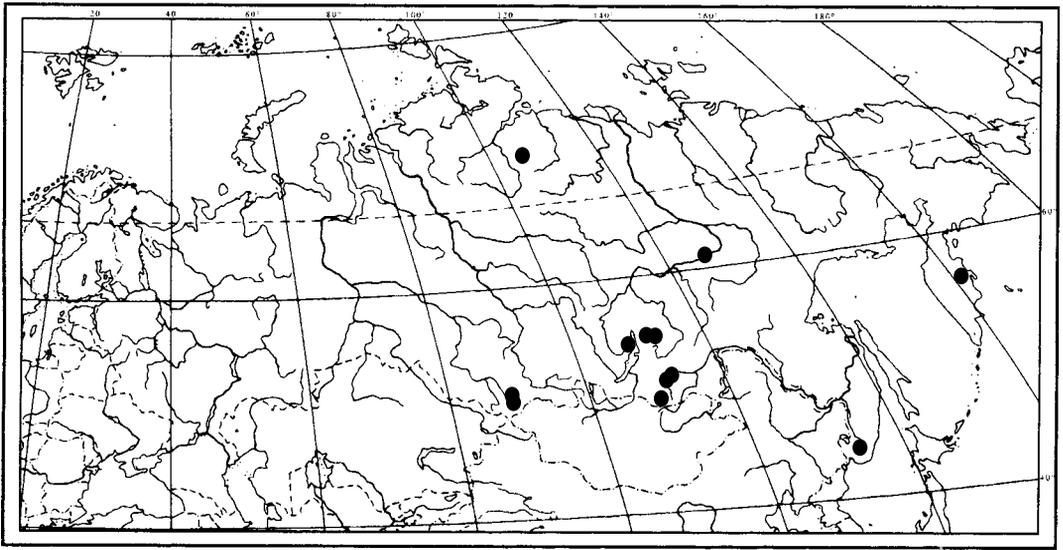


Fig. 3. Distribution of *Didymodon zanderi* Afonina & Ignatova.

0.8–1.2 cm); larger upper laminal cells (10–14 μm vs. 8–10 μm), and larger spore size (13–15 μm vs. 6–8 μm).

Although leaves are usually not fragile in *D. zanderi*, one collection from the alpine belt of Altai Mts. has almost all leaf apices broken off, probably because of severe habitat conditions. It makes the possible relationships with *D. hedyarififormis* more likely.

Didymodon zanderi resembles *D. tophaceus* (Brid.) Liza in leaf shape; both species have acute to subobtuse leaf apices and costa ending several cells before the leaf apex, laminal cells of similar size, covered by low papillae. However, laminal cells are never bulging in the latter species, papillae are simple, ventral epidermal cells of costa are elongate and smooth (papillose in distal 1/2 of leaf in *D. zanderi*). In leaf shape *D. zanderi* is also similar to *D. nigrescens*, but the latter has smaller laminal cells with thicker cell walls and also more intense rusty color of the plants.

OTHER SPECIMENS EXAMINED (all from Russia): **Zabaikalsky Territoty (the former Agin-Buryat Autonomous District)**: National Park “Alkhanai” Protected zone [all coll. by *Afonina*]: Alkhanai Mt., trail to “Vorota” temple, 50°50'N, 113°24'E, lower forest belt, mixed forest, on rocks, 20.VII.2005 # 3505 (LE); southern macro slope of Alkhanai Mt. Arschan brook, 50°50'N, 113°24'E, moist rock with grotto, 11.VII.2006 # 2806 (LE); Arschan brook, 50°50'N, 113°23'E., alt. 1051 m, on rocks along brook, 20.VII.2007 # 06907

(LE); Ubzhogoe Creek, 50°50'N, 113°21'E., alt. 1011 m, aspen-birch fores along creek, on rocks, 21.VII.2007 # 07007 (LE); Ubzhogoe Creek, 50°50'N, 113°21'E., alt. 1011 m, dry course of brook with stone block covered by mosses, 23.VI.2007 # 07307 (LE); Arschan brook, 50°50'N, 113°23'E, alt. 1156 m, stony bed of brook, on rocks and on trunks of dead trees hanging over water, 22.VII.2007 # 07407 (LE); Arschan brook, 50°51'N, 113°23'E., alt. 1171 m, mixed forest on stone slope, on rocks covered by mosses, # 08207 (LE). Ubzhogoe Creek, 50°50'N, 113°22'E., alt. 1048 m, on boulders on slope to creek, 24.VII.2007 # 08507 (LE). **Zabaikalsky Territoty (the former Chita Province)** [all coll. by *Afonina*]: Kyra District, 30 km N of Kyra Settlement, 49°53'N, 112°03'E., alt. 1310 m, rocky course of brook, on rocks, 16.VII.2006 # 11706 (LE). **Altai Republic**: Bogoyash Creek in upper course, 2550 m alt., wet N-facing schist cliffs, aside a stream, 27.VII.1990 *Ignatov s.n.* (MHA); Kobiguayuk Creek, 14.VI.1981 *Ignatov s.n.* (MHA, MO). **Republic of Buryatia**: Kurumkan District, Dzherginsky Nature Reserve: 9 km NNW of Dzhirga River sources, 55°02'N, 111°41'E, 1960 m alt., shrublet-mossy-lichen mountain tundra, 16.VII.2002 *Tubanova # 8(VII)* (UUH, MW); Levyj Biankur Creek upper course, 3.5 km WSW from its sources, 55°01'N, 111°31'E, 1360 m alt., in wet niche under cliff along a stream, in crevice, 11.VII.2003 *Tubanova # Ky-21/03* (UUH, MW); NW shore of Baikal Lake, Kovrizhka Cape, cliffs at lake shore, in small crevices on cliff wall, 27.VIII.1957 *Bardunov s.n.* (SASY, MW). **Kamchatskaya Province**: Klyuchevskie Volcanoes, NW macroslope of Ushkovsky Volcano, Bilichenok Glacier valley, 56°11'N, 160°21'E, 550 m alt., rock outcrops at Bilichenok River bank, on dry

rocks, 22.VII.2003 *Chernyadjeva* #54 ('E, MW). **Pri-morsky Territory:** Maikhe-Daubikhulskoe Plateau, fir-spruce forest with ferns and herbs, middle course of Left Gorbatov Creek, in water near waterfall, 27.VI.1947 *Maximov* #48. (MW). **Taimyrsky Autonomous District:** Khatanga District, Anabar Plateau, Kotujkan River upper course, left bank of Kotujkan River 6 km upstream Vyurbyur Brook, 70°46'15 N, 106°20'4'E, ca. 600 m alt., nival brook bed on NE slope of plateau with 624 m elev., fine soil on gneiss boulder near snow-bed, 22.VII.2007 *Fedosov* #07-63 (MW); same place, 70°50'56 N, 106°16'9'E, ca. 400 m alt., forested rock-field, on wet gneiss ledge, with *Grimmia elatior*, *Fedosov* #07-115 (MW). **Yakutia:** Khangalassky District, Lenskie Stolby National Park, left bank of Labyja Creek, lower part of slope, Larix forest with Alnus, on rocks, 11.VII.2001 *Ivanova s.n.* (SASY, MW).

Habitat and associated species. In the type locality and in nearby places *Didymodon zanderi* grows at 1000-1200 m elev., on rocks and boulders, usually not far from water: in creek and brook beds, on their banks, near waterfalls, rarely on trunks of fallen trees hanging above water. It usually forms extensive pure dark brown or dark green mats both on horizontal and vertical surfaces. Sometimes *Didymodon zanderi* grows in association with *Brachythecium salebrosum* (F.Weber &

D.Mohr) Bruch et al., *Bryoerythrophyllum recurvirostrum* (Hedw.) P.C.Chen, *Hedwigia ciliata* (Hedw.) P.Beauv., *Myuroclada maximowiczii* (G.G.Borshch.) Steere & W.B.Schofield, *Plagiomnium acutum* (Lindb.) T.J.Kop., *Pseudoleskeella rupestris* (Berggr.) Hedenäs, and especially frequently with *Schistidium apocarpum* subsp. *canadense* (Dupert) H.H.Blom. On rocks and boulders along Ubzhogoe Creek and Arschan Brook, *Didymodon zanderi* dominates in moss communities.

In other places *D. zanderi* also grows on rocks near water: along creeks and brooks in mountain areas, near waterfalls and snow-beds, on cliffs at lake shores; it grows on rock surfaces covered with fine soil and in small crevices. Elevations range from ca. 500 m in Taimyr to 2800 m in Altai Mts.

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