

RARE PLANT COMMUNITIES WITH ABUNDANCE OF *SAUTERIA ALPINA* (NEES) NEES IN THE ARCTIC TUNDRA OF SVALBARD

РЕДКИЕ СООБЩЕСТВА С ПРЕОБЛАДАНИЕМ *SAUTERIA ALPINA* (NEES) NEES В АРКТИЧЕСКОЙ ТУНДРЕ ШПИЦБЕРГЕНА

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Abstract

Rare plant communities with dominance of *Sauteria alpina* in arctic tundra in Svalbard are described and compared with those in the late snow-beds in Scandinavian Mountains. Plant communities occur in similar habitats, have similar appearance, but differ in species composition, alpha diversity and syntaxonomy. Svalbard' communities are related to the community type *Saxifraga oppositifolia*–*Sauteria alpina*, meanwhile Scandinavian calciphytic late snow-bed ones belong to *Sauteria alpina*–var. of the association *Distichio capillacei*–*Saxifragetum oppositifoliae* ass. nov. Both syntaxa belong to the alliance *Saxifrago*–*Ranunculon nivalis* Nordh. 1943 em. Dierßen 1984.

Резюме

Сравнение растительных сообществ арктической тундры на Шпицбергене и в Скандинавских горах, в которых преобладает *Sauteria alpina*, показало различие сообществ в составе сосудистых растений, видовом богатстве и синтаксономической принадлежности, при сходстве в условиях местообитаний и во внешнем облике. Сообщества на Шпицбергене были отнесены к типу сообществ *Saxifraga oppositifolia*–*Sauteria alpina*, а сообщества в Скандинавских горах – к варианту *Sauteria alpina*–var. ассоциации *Distichio capillacei*–*Saxifragetum oppositifoliae* ass. nov. Оба синтаксона в составе союза *Saxifrago*–*Ranunculon nivalis* Nordh. 1943 em. Dierßen 1984.

KEYWORDS: *Saxifrago*–*Ranunculon nivalis*, *Distichio capillacei*–*Saxifragetum oppositifoliae*, *Sauteria alpina*, community *Saxifraga oppositifolia*–*Sauteria alpina*, Svalbard, Scandinavian Mountains

INTRODUCTION

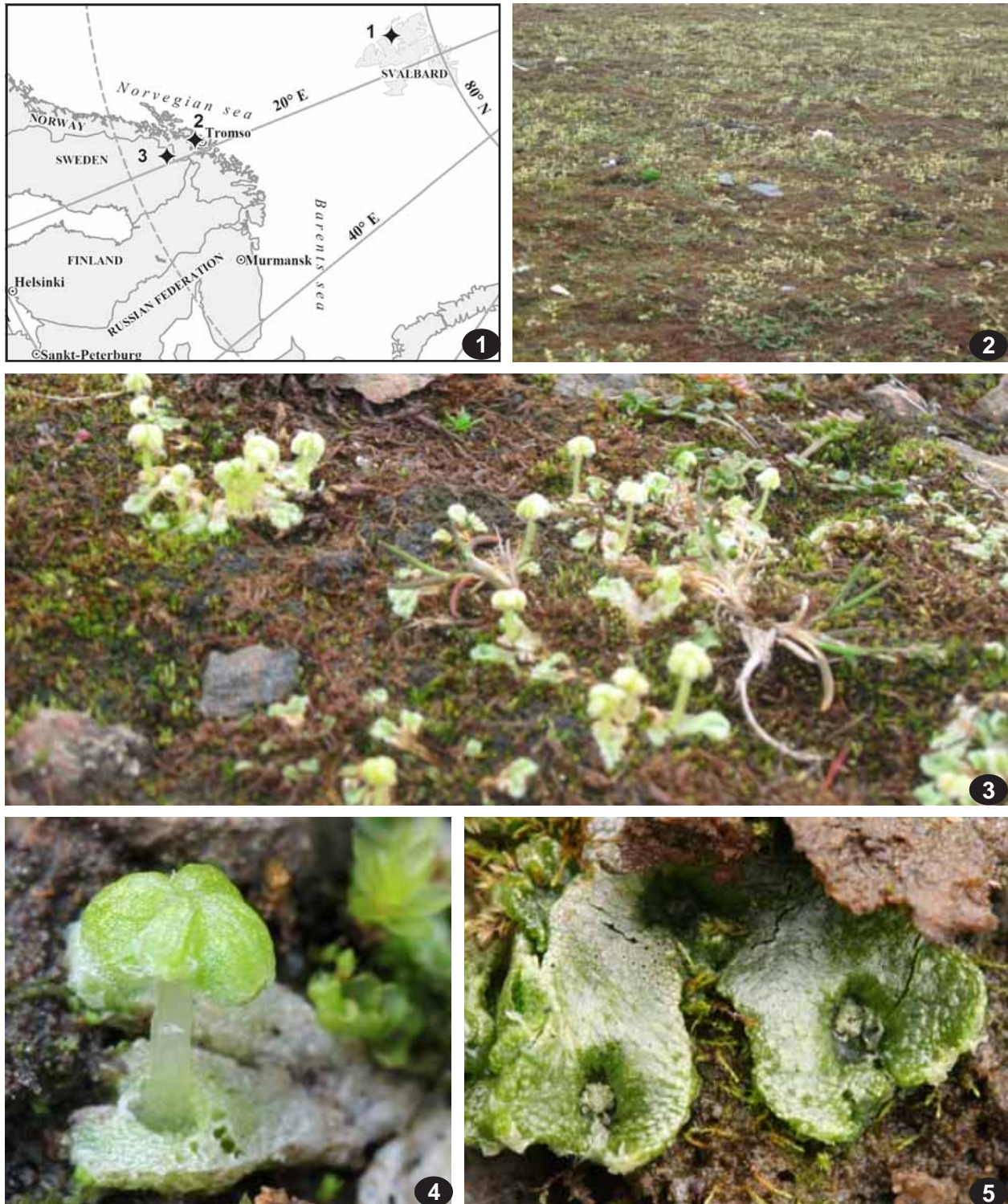
Arctic regions and oroarctic zone of subarctic mountains are known to support extensive plant communities dominated by mosses and liverworts, where flowering plants are not abundant and occur as scattered individuals and tufts on the cover of bryophytes (Longton, 1988). Similarity of these communities in the high Arctic and in high mountains in subarctic areas is due to mainly short growing period caused by long-lying snow cover in mountains and by short summer of polar climate and from cool summer temperature conditions. Liverworts are strikingly abundant in snow-bed communities. *Pleurocladula albescens*, *Anthelia juratzkana*, *Gymnomitrium concinnatum*, *G. corallioides* are referred as diagnostic species of syntaxa, comprising snow-bed communities. These liverwort species are quite common and form extensive closed cover or small patchy communities widely distributed in oroarctic zone and in zonal tundra. Rare snow-bed communities dominated by thallose liverworts were

described on calcium-containing rocks in Northern Scandes (Gjørevoll, 1956) and related to *Saxifraga oppositifolia*–*Sauteria alpina* soziation of association *Oppositifolietum* in alliance *Oppositifolio-Oxyrion* (now regarded as synonym of alliance *Saxifrago*–*Ranunculon nivalis* Nordh. 1943 em. Dierßen 1984), which comprises snow-beds on calcareous and alkaline substrata. The nomenclature of liverworts follows: Konstantinova, Bakalin & al. (2009); mosses: Ignatov et al. (2006); lichens: Santesson et al. (2004); vascular plants: Sekretareva (2004).

Sauteria alpina (Fig. 1) is an arcto-montane circum-polar hepatic, distributed mostly from tundra to the north of taiga zone and in subalpine and alpine zones in the mountains of Eurasia and North America with one possible disjunction in Africa (Borovichev & al., 2012; Borovichev & Bakalin, 2013). The species is characterized as common in Svalbard by Frisvoll & Elvebakk (1996). It grows obligatorily on calcareous substrates

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Figs. 1-5. *Sauteria alpina*-dominated communities. 1: Localities in (1) – Western Svalbard, western shore of the Trygghamna bay; (2) – northern Sweden, Thorne Lappmark; (3) – northern Norway, Tromsø County; 2: General appearance of plant community with dominance of *Sauteria alpina*; 3: Close up view; 4: *S. alpina* with female receptacles; 5: *S. alpina* with developing female receptacles.

and often as solitary thalli among bryophytes or form more or less pure mats often with an admixture of other hepatics, mosses and vascular plants. Such communities with dominance of *Sauteria alpina* are surveyed here.

MATERIALS AND METHODS

Plant communities with dominance of *Sauteria alpina* were described in 2009, on the West Spitsbergen Island, on the western shore of the Trygghamna bay (fig. 2), on wet soil on the first seashore terrace, about 1 km to

the Protektorfjellet Mt., 5 descriptions were collected. Sample plots were 1 m², and generally were square, but when stands were irregular, they were sampled in their entirety. Standardized Braun-Blanquet method was used for vegetation sampling and description. Species were listed and their cover-abundance values were recorded. Quantitative contribution of species to the vegetation was estimated using the Braun-Blanquet cover/abundance scale, where 'r' means single individuals; '+' – a few individuals, <1% of cover; '1' – a few or many individuals, 1–5%; '2a' – 6–15%; '2b' – 16–25%; '3' – 26–50%; '4' – 51–75%; 5 – 76–100%. Altitude, exposition, latitude and longitude were determined using GPS navigator.

To compare *Sauteria alpina*-dominated arctic communities of Svalbard we used descriptions of snow-bed communities of O. Gjærevoll from northern Scandinavian Mountains (Gjærevoll, 1956, table 49, pp. 319–326)¹. Author made five relevés of 1 m² stands for every community, and we used only one average data of five coverage numbers for every species.

RESULTS

Sauteria alpina-dominated plant communities were related to two syntaxa, one variant of association and one type of community.

Association *Distichio capillacei–Saxifragetum oppositifoliae* (Gjærevoll, 1956) stat. nov. hoc loco, *Sauteria alpina*-variant (table 2, type relevé III). Diagnostic taxa (DT) of association are *Saxifraga oppositifolia*, *S. cernua*, *Poa alpina*, *Distichium capillaceum*. Alpha diversity was from 23 to 45 species. DT of variant, thallose liverworts, dominate in plant cover; most conspicuous is *Sauteria alpina*, also present *Preissia quadrata* and *Peltolepis quadrata*. Most abundant is *Anthelia juratzkana*, DT of class *Salicetea herbaceae*. Meso-, hygrophytic mosses *Pohlia drummondii*, *Polytrichastrum alpinum*, *Limprihtia revolvens*, *Encalypta alpina*, *Philonotis tomentella* are constant and dominant species. Vascular plants (DT of alliance and association) are scattered and don't form closed cover, among them *Salix polaris*, *Saxifraga oppositifolia*, *S. cernua* and *Oxyria digyna* are most prominent. Due to light-colored thallus of *Sauteria alpina* communities have very special aspect, especially when liverworts are in 'fructiferous state' (Gjærevoll, 1956).

Communities were described by Gjærevoll (1956) in most calcareous areas of northern part of Scandinavian Mts., at 735–1105 m alt., mainly on north-east exposed slopes, usually as 'pioneer' communities on moist unstable soil, subject to frost boiling, solifluction and sloping

movement. Snow patches were reported to melt in late July-early August. As far as plant communities are regarded as 'pioneer', they can be substituted by the next stage of succession, by dwarf shrubs- and herbs-dominated snow-bed plant communities. That was probably the reason why we haven't found them nearby permanent snow fields on the north-exposed slope of Laktatjakka Mt in August 2010.

Community *Saxifraga oppositifolia–Sauteria alpina* (Fig. 3, 4, tab. 2, type releve 193-01). Alpha diversity was from 15 to 21 species. DT *Cardamine pratensis* ssp. *angustifolia*, *Cochlearia groenlandica*, *Phippsia algida*, *Bryoerythrophyllum recurvirostrum*, *Pseudocalliergon turgescens*, *Drepanocladus polygamus*, *Sauteria alpina*.

Sauteria alpina forms almost closed cover, together with mosses *Distichium capillaceum*, *Bryoerythrophyllum recurvirostrum*, *Pseudocalliergon turgescens*, *Drepanocladus polygamus*, scattered dwarf shrubs (*Saxifraga oppositifolia*) and meso- and hygrophytic forbs and graminoids *Cardamine pratensis* ssp. *angustifolia*, *Phippsia algida*, *Draba alpina* and *Cochlearia groenlandica*. Vascular plants are typical for unstable substrata, some of them prefer rather moist fine earth (*Phippsia algida*), and other are indifferent (*Draba alpina*) and can be met almost everywhere on Svalbard.

Rather rare plant communities occur in calcareous substrata, on unstable and moist fine earth of the seashore terrain of the Trygghamna bay, on the first seaside terrace about 1 km to the Protektorfjellet, Svalbard archipelago, on moving slopes of hills and in peripheral zone of solifluction patches and represent first stage of succession on bare soil.

Prodromus of *Sauteria alpina*-dominated plant communities in Svalbard and Scandinavian Mts.

Class *Salicetea herbaceae* Br.-Bl. in Br.-Bl. et al. 1947

Order *Salicetalia herbaceae* Br.-Bl. ap. Br.-Bl. & Jenyns 1926

Alliance *Saxifrago–Ranunculion nivalis* Nordh. 1943 em. Dierßen 1984

Association *Distichio capillacei–Saxifragetum oppositifoliae* (Gjærevoll 1956) stat. nov.

Community *Saxifraga oppositifolia–Sauteria alpina*

DISCUSSION

In northern European countries *Sauteria alpina* occurs throughout the Scandinavian Mts. from the central part of Norway northwards and is rather rare in the southern parts but in the North it is generally more or less common in subalpine and low alpine, calcareous areas and may be found up to the high-alpine zone (Mertensson, 1955). In Finland *Sauteria alpina* is known from three biogeographical provinces on the north – Kuusamo, Enontekiö Lapland and Inari Lapland (Laaka-Lindberg & al., 2009). Furthermore this species is known in the Fennoscandian regions of Russia: in Murmansk Province – Khibiny Mts., Kutsa area and Salnye Tundry

¹ – Author used a Hult-Sernander scale, which corresponds to the Braun-Blanquet scale as follow:

Hult-Sernander scale	coverage %	Braun-Blanquet scale
1	< 6	1
2	7-12	2a
3	13-25	2b
4	26-50	3
5	51-100	4 and 5

Table 2. Ass. *Distichio capillacei–Saxifragetum oppositifoliae* var. *Sauteria alpina* and community *Saxifraga oppositifolia–Sauteria alpina*

Syntaxa	<i>Distichio capillacei–Saxifragetum oppositifoliae</i> var. <i>Sauteria alpina</i>							community <i>Saxifraga oppositifolia–Sauteria alpina</i>						
Coverage,%	85–90	75–90	90–95	75–90	75–90	50–75	75–90	constancy	95	100	80	95	90	constancy
total				no data	no data				20	15	15	20	10	
dwarf shrubs and herbs				no data	no data			80	90	80	85	90		
mosses								30	30	30	30	40		
Elevation, m	800	800	735	735	1105	960	860							
Exposure	NE	NE	N	N	S	E	N							
Number of taxa	47	45	34	36	23	23	30	17	20	15	18	21		
Releve number, from author	I	II	III	IV	V	VI	VII	193–01	193–3	193–4	193–5	194–1		
from table	1	2	3	4	5	6	7	8	9	10	11	12		
Diagnostic taxa of variant <i>Sauteria alpina</i>														
<i>Sauteria alpina</i>	2a	2a	3	2a	2b	1	–	V	3	2	3	2	2	V
<i>Preissia quadrata</i>	2a	1	1	+	–	2a	1	V	–	–	–	–	–	–
<i>Peltolepis quadrata</i>	1	1	1	2a	–	–	+	IV	–	–	–	–	+	I
Diagnostic taxa of ass. <i>Distichio capillacei–Saxifragetum oppositifolii</i>														
<i>Saxifraga oppositifolia</i>	1	1	1	1	2a	2b	1	V	1	+	1	1	r	V
<i>Distichium capillaceum</i>	1	+	1	2a	2b	1	3	V	+	2	+	+	3	V
<i>Saxifraga cernua</i>	1	1	1	1	1	1	1	V	–	–	–	–	–	–
<i>Poa alpina</i>	2a	2a	2a	2a	1	1	2a	V	–	–	–	–	–	–
Diagnostic taxa of community <i>Saxifraga oppositifolia–Sauteria alpina</i>														
<i>Cardamine pratensis</i> ssp. <i>angustifolia</i>	–	–	–	–	–	–	–	–	1	+	2	2	1	V
<i>Phippsia algida</i>	–	–	–	–	–	–	–	–	+	1	1	1	+	V
<i>Bryoerythrophyllum recurvirostrum</i>	–	–	–	–	–	–	–	–	2	+	2	–	2	IV
<i>Pseudocalliergon turgescens</i>	–	–	–	–	–	–	–	–	–	3	2	+	+	IV
<i>Drepanocladus polygamus</i>	–	–	–	–	–	–	–	–	2	–	2	3	–	III
<i>Cochlearia groenlandica</i>	–	–	–	–	–	–	–	–	+	–	–	r	r	III
Diagnostic taxa of Alliance <i>Saxifraga–Ranunculon nivalis</i>														
<i>Salix polaris</i>	2a	2a	2a	1	1	1	1	V	–	–	–	–	–	–
<i>S. reticulata</i>	+	–	+	+	+	+	+	V	–	–	–	–	–	–
<i>Oxyria digyna</i>	2a	2a	1	2a	+	+	1	V	–	+	–	–	–	I
<i>Ranunculus pygmaeus</i>	+	1	1	+	1	+	+	V	–	+	–	–	+	II
<i>Dichodon cerastoides</i>	1	1	1	+	–	–	1	IV	–	–	–	–	–	–
<i>Ranunculus nivalis</i>	+	+	+	–	–	–	–	III	–	–	–	–	–	–
<i>Cerastium arcticum</i>	–	–	–	+	+	+	–	III	–	–	–	–	–	–
<i>Arabis alpina</i>	1	1	1	+	–	–	–	III	–	–	–	–	–	–
<i>Saxifraga tenuis</i>	1	1	+	–	–	1	–	III	–	–	–	–	–	–
<i>Veronica alpina</i>	–	+	–	+	–	+	1	III	–	–	–	–	–	–
<i>Trisetum spicatum</i>	+	+	+	+	–	–	+	IV	–	–	–	–	–	–
<i>Carex lachenalii</i>	1	1	1	–	1	–	+	IV	–	–	–	–	–	–
Diagnostic taxa of Class <i>Salicetea herbacea</i>														
<i>Anthelia juratzkana</i>	3	3	+	+	–	2a	–	IV	–	–	–	–	–	–
<i>Pohlia drummondii</i>	2a	2a	2a	2a	–	–	+	IV	–	–	–	–	–	–
<i>Sagina saginoides</i>	+	+	–	1	–	1	+	IV	–	–	–	–	–	–
<i>Minuartia biflora</i>	+	–	+	+	–	–	+	III	–	–	–	–	–	–
<i>Omalotheca supina</i>	+	+	–	+	–	+	–	III	–	–	–	–	–	–
<i>Saxifraga rivularis</i>	–	–	–	+	–	–	–	I	r	r	–	–	–	II
other species														
<i>Silene acaulis</i>	+	+	–	+	1	2a	+	V	r	–	–	r	–	II
<i>Bistorta vivipara</i>	+	+	+	+	1	1	+	V	–	–	–	–	–	–
<i>Blepharostoma trichophyllum</i>	+	+	+	–	+	–	+	IV	–	+	+	+	+	IV
<i>Cerastium alpinum</i>	+	+	1	1	–	–	+	IV	–	–	–	–	–	–
<i>Erigeron uniflorus</i>	+	+	+	+	–	–	+	IV	–	–	–	–	–	–
<i>Sagina intermedia</i>	+	+	–	1	1	1	–	IV	–	–	–	–	–	–
<i>Saxifraga aizoides</i>	1	–	1	+	–	–	1	III	–	–	–	–	–	–
<i>Taraxacum croceum</i>	+	+	–	–	–	–	+	III	–	–	–	–	–	–
<i>Juncus biglumis</i>	+	1	+	–	–	–	–	III	–	–	–	–	–	–
<i>Sanionia uncinata</i>	–	+	+	+	–	–	–	III	–	–	–	+	1	II
<i>Bartramia ithyphylla</i>	+	1	+	–	–	–	–	III	–	–	–	–	–	–
<i>Brachythecium turgidum</i>	+	+	+	–	–	–	–	III	–	–	–	–	–	–
<i>Bryum pseudotriquetrum</i>	–	+	+	–	+	–	–	III	–	–	–	–	–	–
<i>Limprichtia revolvens</i>	–	+	+	+	–	–	–	III	–	–	–	–	–	–
<i>Encalypta alpina</i>	1	+	1	3	–	–	1	IV	–	–	–	–	–	–
<i>Philonotis tomentella</i>	+	+	2	–	–	–	+	III	–	–	–	–	–	–
<i>Polytrichastrum alpinum</i>	2a	2a	–	+	–	1	+	IV	–	1	–	–	–	I
<i>Cladonia pyxidata</i>	–	–	–	–	+	+	+	III	–	–	–	–	–	–
<i>Peltigera rufescens</i>	+	–	–	–	+	+	+	III	–	–	–	–	–	–
<i>Solorina saccata</i>	–	–	–	+	+	–	+	III	–	–	–	–	–	–
<i>Stereocaulon rivulorum</i>	–	–	–	–	+	+	+	III	–	–	–	–	–	–
<i>Nostoc</i> spp.	1	1	1	–	–	–	–	III	–	–	–	–	–	–
<i>Bryum</i> sp.	–	–	–	+	–	–	–	I	+	–	+	–	+	III/+
<i>Scapania cuspiduligera</i>	–	–	–	–	–	–	–	–	+	–	r	–	+	III/r–+
<i>Tritomaria scitula</i>	–	–	–	–	–	–	–	–	r	–	–	+	+	III/r–+
<i>Draba alpina</i>	+	–	–	–	–	–	–	–	–	–	r	–	–	–
<i>Orthothecium chryseon</i>	–	+	+	–	–	–	–	II	–	–	–	–	r	I/r
<i>Pohlia cruda</i>	–	+	+	–	–	–	–	II	–	–	–	–	+	I

(Borovichev & al., 2012) and Republic of Karelia – only on anthropogenic habitat (on the soil covering industrial limestone) in Petrozavodsk (Borovichev, 2008). In accordance with all data of literature *Sauteria alpina* doesn't take dominance in communities and occurs in minor proportion in plant cover or as single thalli on bare soil. Plant communities with high dominance of *Sauteria alpina* described in Svalbard and Scandinavian Mts. are among rarest communities for both areas and were not covered earlier. They are characteristic for unstable and moist substrata, and in both areas represent first succession stages. In communities on following succession stages *Sauteria alpina* seems not to compete with latest invaders and 'run away' in rather minor microhabitats (soil cracks and solifluction patches).

Composition and number of vascular plants in *Sauteria alpina*-dominated communities is quite different in both areas (Svalbard and Scandinavian Mts.) with only *Saxifraga oppositifolia* in common (tab. 2), due to location of communities in different natural zones: in the arctic zone on Svalbard and in the boreal zone in Scandes. On the same reason it is not surprising that these communities in Scandinavian Mts. occur in highest points, where plant communities were recorded (at 800–1000 m), near permanent and long-lying snow-fields, and on Svalbard they were described on the seashore terrain, at 30–40 m a. s. l.

Almost all vascular plants in Scandinavian communities have rather narrow ecological niche (as *Ranunculus pygmaeus*, *Saxifraga cernua*, *S. oppositifolia* and are typical for moist fine earth of snow bed habitats, near springs and brooks, on moist screes and solifluction patches mainly in high alpine zone. On Svalbard they are among widespread and commonest species.

Both types of *Sauteria alpina*-dominated communities belong to the class *Salicetea herbaceae*, which includes snow-bed communities on both acidic and calcareous

substrata with dominance of meso-, hygrophytic dwarf shrubs and herbs and abundant mosses and liverworts. Plants distribution patterns reflects variations in time of snow retreat, soil moisture and substrata instability. Diagnostic taxa are *Salix herbacea*, *S. polaris*, *Omalotheca supina* *Harrimanella hypnoides*, *Ranunculus glacialis*, *R. nivalis*, *R. pygmaeus*, *R. sulphureus*, *Saxifraga nivalis*, *S. rivularis*, *Sibbaldia procumbens*, *Minuartia biflora*, *Sagina saginoides*, *Kiaeria starkei*, *Polytrichum sexangulare*, *Racomitrium sudeticum*, *Pohlia drummondii*, *Anthelia juratzkana*, *Pleurocladula albescens*, *Gymnomitrium apiculatum*, *Solorina crocea*.

More or less extensive and closed communities dominated by liverworts *Anthelia juratzkana*, *Pleurocladula albescens*, *Gymnomitrium apiculatum* are rather common in late snow-bed and sometimes in some destroyed moist habitats, on acidic and neutral fine earth, clayey and gravelly substrata, in high Arctic and in mountains of boreal zone. These communities are related to alliance *Cassiopo-Salicion herbaceae* and were described in various, mainly mountainous areas of Europe (Gjaerevoll, 1956; Dierßen, 1996, 2001).

Communities with dominance of *Sauteria alpina* presented in this paper belong to another alliance *Saxifrago-Ranunculion nivalis* (syn. *Saxifrago oppositifolio-Oxyrion digynae* Gjaerevoll 1956, *Salicion polaris* Du Rietz 1942, *Ranunculo-Oxyrion* Nordhagen 1936), which comprises meso-, hygrophytic plant communities in calcareous late snow-bed habitats. DT are *Salix polaris*, *S. reticulata*, *Oxyria digyna*, *Dichodon cerastoides*, *Ranunculus nivalis*, *Cerastium arcticum*, *Arabis alpina*, *Saxifraga tenuis*, *Veronica alpina*, *Trisetum spicatum*, *Carex lachenalii*. Plant communities of this alliance were described in high Arctic and mountainous Scandinavia (Gjaerevoll 1956; Dierßen, 1996; Nilsen & Thannheiser, 2013), but there are almost no data about communities dominated by liverworts.

Notes. Species, which were met in 1–2 relevés with coverage «+», when higher, then marked in brackets: *Arnellia fennica* 193-4; *Asterella lindenberghiana* VII (2); *Barbilophozia hatcheri* II; *Bartsia alpina* III; *Bryum cryophilum* II, III; *Campyllum* sp. 193-3, 193-5; *C. stellatum* 193-01, 194-1; *Cephalozia pleniceps* I; *Ceratodon purpureus* 193-3, 193-5 (r); *Cetraria islandica* VI; *Cladonia bellidiflora* II, *C. coccifera* II; *Cyrtomnium hymenophyllum* 194-1; *Dicranella grevilleana* 193-3 (r); *Dicranoweisia crispula* I, II (1); *Dicranum spadicum* 194-1; *Distichium inclinatum* III, 194-1 (1); *Ditrichum flexicaule* 194-1; *Encalypta* sp. 193-3, 193-4; *Epilobium alpinum* III, VII; *Equisetum arvense* VII; *E. scirpoides* 193-3, 193-5; *Erigeron humilis* V; *Euphrasia frigida* III; *Fissidens viridulus* 193-3, 193-5; *Hylacomium splendens* II; *Isopterygiopsis pulchella* 193-3; *Jungermannia atrovirens* I; *Lecidea* sp. V; *Leiocolea gillmanii* 193-01, 193-3 (1); *Lophozia wenzelii* II; *Lophoziaopsis polaris* 194-1; *Luzula confusa* I; *L. spicata* IV; *Nardia geoscyphus* I; *Oligotrichum hercynicum* V; *Orthocaulis quadrilobus* I; *Peltigera aphthosa* I, II; *P. malacea* IV; *Plectocolea obovata* I; *Pleurocladula albescens* I, II; *Poa alpigena* VII; *Polytrichastrum norvegicum* I, II (2a); *Potentilla pulchella* 193-01, 193-5; *Psoroma hypnorum* I; *Ranunculus acris* VII; *Rhodiola rosea* 194-1 (r); *Saxifraga stellaris* I, II; *S. cespitosa* 194-01, 194-5; *Saccobasis polita* II, *Sagina caespitosa* III; *Salix herbacea* IV; *Scapania irrigua* II, *S. mucronata* I; *Schistochilopsis grandiretis* 193-3; *S. incisa* I, II (1); *Sibbaldia procumbens* V; *Solenostoma sphaerocarpum* I, II (1); *Solorina bispora* I; *Stereocaulon alpinum* IV; *Timmia norvegica* VII; *T. austriaca* I, III (1); *Tortella fragilis* VII; *Tortula hoppeana* II; *Tritomaria quinqueidentata* I, II.

Releve localities: Thorne Lappmark (northern Sweden): **I** and **II** – Mt Vasstjakka, NE slope, late snow-bed, irrigated area. 14.VIII.1947. **III** – Mt Laktatjakka, N slope. 24.VIII.1947. **IV** – Mt Laktatjakka, N slope. 18.VIII.1947. **VII** – Mt Laktatjakka, N slope, bottom of cup-shaped snow-bed. 27.VIII.1947. Bardu, Tromso County (northern Norway): **V** – Mt Melhuskletten, S slope. 5.VIII.1950. **VI** – Mt Veslekletten, steep E slope. 8.VIII.1950. Author of descriptions O. Gjaerevoll (1956)

West Spitsbergen: **193-01, 193-3, 193-4, 193-5, 194-1** – western shore of the Trygghamna bay, on the first seaside terrace about 1 km to the Protektorfjellet Mt.06-07.VII.2009. Author of descriptions E. Borovichev.

Syntaxonomical affiliation of *Sauteria alpina*-dominated plant communities to Alliance *Saxifrago–Ranunculion nivalis* is preliminary, because of their ‘pioneer’ stage and rather spontaneous assemblage of species, which can typify different alliances, characteristic for moist and unstable, calcareous and alkaline substrata (i.e. *Cochleariopsis groenlandicae* Hadač 1989, *Saxifrago–Ranunculion nivalis* and *Puccinellion phryganodis* Hadač 1946). Plant communities of mentioned alliances actually occur in different habitats and environmental conditions. Alliance *Cochleariopsis groenlandicae* includes nitrophytic communities on rich moist soil. Halophytic communities of *Puccinellion phryganodis* occur on seashore. Meso-, hygrophytic communities of *Saxifrago–Ranunculion nivalis* are typical and wide-distributed in snow-beds on terrains and lower mountain slopes. In spite of such a strong ecological differentiation of habitats, on the ‘pioneer’ stages of all these alliances can be composed by the same species which are presented in community *Saxifraga oppositifolia–Sauteria alpina* (i.e. *Phippsia algida*, *Cochlearia groenlandica*, *Draba alpina*) with most abundant *Sauteria alpina*.

ACKNOWLEDGEMENTS

We are very grateful to A.Yu. Likhachev and O.A. Belkina for identifying mosses specimens, to V.E. Fedosov for value comments. A.N. Savchenko is thanked for preparing the map. The work was partially supported by Ministry of economical and social development of Russia and by Trust «Arktikugol» and the Russian Foundation of Basic Research, 12-04-01476 and 14-04-98810.

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