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Research Article

Rare and endangered vegetation and vascular plants in canyon "Gorodskaya shchel' (Town Crack)" in southern part of Khibiny Mountains (Murmansk Region, Russia)

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Abstract

Rare and endangered habitat types and vascular plant species were studied in the canyon associated with slope cirque "Gorodskaya shchel' (Town Crack)" in the southern part of Khibiny Mountains (Murmansk Region). Habitat types are interpreted based on a phytosociological approach (Braun-Blanquet classification). Habitat type "D4.2. Basic mountain flushes and streamsides, with a rich arctic-montane flora" of the Emerald Network (partly coincides with type 3220 "Alpine rivers and the herbaceous vegetation along their banks" of Council Directive 92/43/EEC) includes two associations: *Mniobryo–Epilobietum hornemannii* Nordhagen 1943 of alliance *Mniobryo–Epilobion hornemannii* Nordhagen 1943, class *Montio–Cardaminetea* Br.-Bl. et Tx. ex Klika et Hadač 1944, and *Oxyrietum digynae* Gjaerevoll 1956 of alliance *Saxifrago stellaris–Oxyrion digynae* Gjaerevoll 1956, class *Salicetea herbaceae* Br.-Bl. 1948. Habitat type "H2.6 Ultra-basic screes of warm exposures" of the Emerald Network is represented by community type *Racomitrium* spp.–*Ranunculus glacialis* (class *Thlaspietea rotundifolii*). These habitats harbor a number of Red Data Book species: 16 rare vascular plants including two species of the Red Data Book of Russia, four species of Red Data Book of Murmansk Region and ten species which need special attention to their state in the natural environment if the Murmansk Region occurred in the studied canyon, cirque and nearest surroundings. As the area is out of the borders of National Park "Khibiny" and has high conservation value, it is necessary to establish here the botanical nature monument.

Keywords

Braun-Blanquet classification, brook banks, Khibiny Mountains, Murmansk Region, rare and endangered habitats, Red Data Book plants, screes

Introduction

Syntaxonomy and biogeography of valued habitats which are expected to protect rare and endangered flora and fauna are still poorly covered in Russia. The main purpose of this paper is to study the flora and vegetation of such habitats associated with the water courses, stream banks, canyon walls and mountain screes in southern Khibiny Mts near Kirovsk city, Murmansk Region.

In the Habitat Directive for wildlife and nature conservation (Council Directive 1992) these groups of habitats are identified by code 32. "Running water – sections of water courses with natural or semi-natural dynamics (minor, average and major beds) where the water quality shows no significant deterioration" (including type 3220. "Alpine rivers and the herbaceous vegetation along their banks") and code 81. "Scree".

To conserve wild flora and its natural habitats of Europe, the Council of Europe launched the Emerald Network as a network of Areas of Special Conservation Interest in 1989. The list of valued habitat types of the Emerald Network is based on the EUNIS habitat classification (https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification) includes valued habitat types "D4.2. Basic mountain flushes and streamsides, with a rich arctic-montane flora" and "H2.6 Calcareous and ultra-basic screes of warm exposures". These types in European mountainous habitats host many species with an arctic or glacial relict distribution, many of which are included in regional Red Lists of several countries (IMEH 2011).

In Russia there was not an accepted system of rare and endangered habitats as a State legal base for habitat conservation. The Red Data Book of the Russian Federation is recognized as the formal State document to protect rare and endangered species of animals, plants and fungi in their natural habitats. In some regions of former USSR and Russian Federation were created The Green Data Books as regional collection of valued and endangered habitats (Chibilev et al. 1996; Saksonov et al. 2006; GDB 2012; etc.). They provide a solid base for the regional systems of protected territories.

It is the case also in Murmansk Region, where the system of rare and endangered habitats of Murmansk Region was formed when modernizing the regional concept of protected areas (Updating 2014). Habitats of springs and screes in mountains of Murmansk Region were studied to update this system.

Materials and methods

Area of study

Khibiny (Khibinskye) Mts are situated in the central part of Murmansk Region, NW Russia. These low mountains (the highest altitude is 1200 m) are formed by alkaline intrusion. These are among the richest phosphate deposits in the world. Flat surfaces and steep slopes with well-developed moraines are the main features of these mountains shaped by the last glaciation. A remarkable geographical feature of the Khibiny Mountains is the presence of canyons and gorges, which follow tectonic faults. The springs and rivers run along their bottoms.

Khibiny have a gradient from maritime to continental climate, with moderately cold, snowy winters, and short, cool summers. Meteorological data are available from the Handbook of Climate of USSR (Handbook 1965, 1968) for the station Kirovsk (67°34'N, 33°36'E; 350 m above sea level). The mean annual average air temperature is -1.2 °C, for July +12 °C, and for January–February -13 °C. Maximum annual temperatures in mountains are lower than in lowlands. The average growing season is 95 days. Snow cover lasts for about 200 days. Its distribution is strongly affected by wind and topography: the canyons are packed with snow, which melts only in July–August. The annual average precipitation is 712 mm, with highest values in August (60 mm), and lowest in February (20 mm). There exist four vegetation belts or zones in Khibiny – coniferous forests, mountain birch forest, mountain tundra and goltzy deserts.

In the second and third decade of twentieth century, the exploitation of valuable phosphate deposits in the Khibiny started. Near the mountains containing apatite ore mines were built, including concentrating mills, various support units, industrial infrastructure and the Khibinogorsk (since 1934 Kirovsk) town. Now it counts about 26 thousand inhabitants. Mountain slopes near Kirovsk are used by skiers and climbers.

Fig. 1. View on the "Gorodskaya shchel' (Town Crack)" in the south exposed slope of Aikuaivenchorr Mountain. Photo E. Kopeina. The canyon is blanketed by snow till the end of July; the slopes of cirque associated with canyon get partly snow-free in the beginning of June

The bulk of the Khibinsky Mountains is protected today as "Khibiny" National Park. The first proposal to establish a protected area here dates back to the 1920s. In 1917, V. Semenov-Tyan-Shansky (1870–1942), an esteemed Russian geographer, proposed to create a nature conservation park "on the model of the American national parks" in Khibiny. In 1931, the Polar-Alpine Botanical Garden was established in the valley of Bol'shoy Vudjavr Lake, the biggest lake in Khibiny, and now the nature protected area of Botanical Garden (1,670 ha). In 2018, National Park "Khibiny" was founded; its area covered the major part of Khibiny, about 78,400 ha. Four small protected areas (botanical nature monument) were organized in southern and central part of Khibiny, which was not covered by the National Park.

Vegetation studied on south exposed slopes of the Aikuaivenchorr Mt. is outside of the territory of the National Park. This place is popular recreation place. Its un-official name is "Gorodskaya schel' (Town Creek)". The landscape includes two associated units: canyon (Fig. 1) from 380 to 550 m a. s. l. and shallow denudation hollow in the mountain cirque from 550 to 750 m a. s. l. Slopes of cirque are steep in the upper part (about 35°), covered by coarse-grained eluvium, and get flatter in the lower part (up to 5–10°), covered with blocks of deluvium. The width of the canyon bottom varies from 1.5 to 7 m, steep walls are of 6–10 m high, constantly moist due to fractured waters flows. The bottom of the gorge is covered by coarse placers and weathering products of rocks, a stream flows along the bottom. Snow avalanche dam was set across the mountain slope and gorge; the footpath goes up along the stream on the canyon bottom. Mountain birch forests occur in lower part, and tundra zone prevails there.

Methods

Vegetation was described and classified in July and August 2018, in accordance with Braun-Blanquet method (Westhoff and Maarel van den 1973). The size of sample plots was 4 m^2 or in the natural limits of the phytocoenoses. Associations were attributed to higher units in accordance with Mucina et al. (2016). For findings of species from the Red Data Books of Russian Federation and of the Murmansk Region we recorded GPS coordinates, habitats characteristics, size and conditions of local population and herbaria references. Herbarium specimens are deposited at the herbariums of Polar-Alpine Botanical Garden-Institute (KPABG) and Institute of Industrial Ecology of the North (INEP).

Nomenclature

Euro+Med PlantBase (http://www.emplantbase.org/home.html) for vascular plants; Ignatov et al. (2006) for mosses; Konstantinova et al. (2009) for liverworts; Santesson et al. (2004) for lichens. Plants and lichens specimens are stored in the herbariums of Polar-Alpine Botanical Garden-Institute (KPABG) and Institute of Industrial Ecology of the North (INEP), partly are incorporated into the Cryptogamic Russian Information System, CRIS (http://kpabg.ru/cris/?q=node/16) (Melekhin et al 2013). Nomenclature of syntaxa follows to International Code of Phytosociological Nomenclature, ICPN (Weber et al 2000) and Mucina et al. (2016). Descriptions are included into the TURBOVEG database. Authors of syntaxa are given in first mentioning, and in the prodromus.

Results

Prodromus of vegetation in the canyon and mountain cirque on the southern slope of the Aikuaivenchorr Mt.

Class *Montio-Cardaminetea* Br.-Bl. et Tx. ex Klika et Hadač 1944
Order *Montio-Cardaminetalia* Pawłowski et al. 1928
Alliance *Mniobryo–Epilobion hornemannii* Nordhagen 1943
Association *Mniobryo–Epilobietum hornemannii* Nordhagen 1943
Class *Salicetea herbaceae* Br.-Bl. 1948
Order *Salicetalia herbaceae* Br.-Bl. in Br.-Bl. et Jenny 1926
Alliance *Saxifrago stellaris–Oxyrion digynae* Gjaerevoll 1956
Association *Oxyrietum digynae* Gjaerevoll 1956
Class *Thlaspietea rotundifolii* Br.-Bl. 1948
Order *Androsacetalia alpinae* Br.-Bl. in Br.-Bl. et Jenny 1926.
Alliance – ?
Community type *Racomitrium* spp.–*Ranunculus glacialis*

Vegetation units

Class *Montio–Cardaminetea* Br.-Bl. et Tx. ex Klika et Hadač 1944 includes moss-dominated vegetation of brooks and springs of Europe and Greenland (Mucina et al. 2016).

Alliance *Mniobryo–Epilobion hornemannii* Nordhagen 1943. Hygrophytic moss-dominated vegetation in cold oligotrophic springs in the boreal and Arctic zones of Northern Europe and Greenland (Mucina et al., 2016).

Association *Mniobryo–Epilobietum hornemannii* Nordhagen 1943. Luxuriant moss vegetation along flushes margins and on the bottom of springs, with dominant *Pohlia wahlenbergii*, constant presence of *Philonotis fontana*, *Fuscocephaloziopsis albescens*, *Scapania* spp. Single and rare vascular plants are *Epilobium hornemannii*, *Saxifraga stellaris*, *Poa alpina*.

Class *Salicetea herbaceae* Br.-Bl. 1948 comprises snow-bed vegetation in high mountains of Eurasia and moss-dwarf shrubs arctic tundra.

Alliance *Saxifrago stellaris–Oxyrion digynae* Gjaerevoll 1956 includes herb-rich vegetation on acidic to neutral moist substrata in northern mountains and in arctic tundra.

Association *Oxyrietum digynae* Gjaerevoll 1956 comprises low herb vegetation with prevailing mesophytic herbs *Anthoxanthum alpinum*, *Arabis*

alpina, *Bartsia alpina*, *Bistorta vivipara*, *Epilobium anagallidifolium*, *E. alsinifolium*, *E. lactiflorum*, *Oxyria digyna*, *Phleum alpinum*, *Poa alpina*, *Saxifraga stellaris*, *Solidago virgaurea* subsp. *lapponica*, *Taraxacum croceum*, *Veronica alpina*; in moss layer most common are *Pohlia wahlenbergii*, *Polytrichastrum alpinum*, *Diplophyllum taxifolium*, *Aneura pinguis*, *Trilophozia quinquedentata*. Plant communities occur along mountain brooks, on moist rock shelves and in crevices. The association is rather common in Scandinavian Mountains and rare in Murmansk Region, on the north-eastern limit of distribution in Europe.

Class *Thlaspietea rotundifolii* Br.-Bl. 1948.

Order *Androsacetalia alpinae* Br.-Bl. in Br.-Bl. et Jenny 1926.

Class includes vegetation on rocky screes and gravelly alluvia in European mountains and in the Arctic. Order comprises open vegetation of siliceous screes and moraines of Central Europe, the Arctic Ocean islands, Scandinavia and Greenland (Mucina et al. 2016; Valachovič et al. 1997). We still cannot classify scree vegetation in Khibinsky Mountains on the alliance level.

Community type *Racomitrium* spp.– *Ranunculus glacialis* comprises spots of chasmophytic plants *Ranunculus glacialis*, *Papaver lapponicum*, *Juncus trifidus*, *Saxifraga oppositifolia* and mosses *Racomitrium* spp. and was described on the rocky scree along the denudation hollow on steep cirque slopes. These habitats are affected by strong snow and stones gravitation movement, which help to disperse vegetative parts and seeds downslope. Red Data Book species *Ranunculus glacialis* is characteristic species in snow-bed habitats on plateau and summits in Scandinavian mountains; meanwhile In Khibiny and Lovoserskye Mountains occurs mainly on rocky screes.

Rare and value vascular plant species in the area investigated

Species of the Red Data Book of Russia (2008), Red Data Book of Murmansk Region (2014) and of the list of species which need special attention to their state in the natural environment if the Murmansk Region (RDBMu-list) (Red Data Book of Murmansk Region 2014: 62–74), which were found in the studied area, are listed in alphabetical order. Following data are provided: categories of threat to the species, coordinates, height above sea level, habitat type, characteristics of population, date of finding, the herbarium where the specimen is deposited (see Nomenclature), collectors E. Kopeina and N. Koroleva.

Species of Red Data Book of Russia (RDBRu) and Red Data Book of Murmansk Region (RDBMu).

13. *Alchemilla alpina* L.: 67°37’29”–67°37’13”N, 33°42’11”–33°41’49”E, 380–540 m a. s. l.; in the tundra meadows on the lake and brook shore; plentiful; flowering; 21.07.2016. Single finding in Khibiny, gradually spreading along the brook and path. RDBMu: 3 (NT – Near Threatened).
3. *Epilobium alsinifolium* Vill.: 67°37’12”N, 33°42’05”E, 470–520 m a. s. l.; on wet fine earth and rocks along rock walls from the bottom to the upper part of canyon; a few locations with about a dozen plants; flowering; 24.07.2018; INEP. RDBMu: 3 (NT – Near Threatened).
4. *Epilobium lactiflorum* Hausskn. (Fig. 2): 67°37’28”N, 33°42’12”E; 470–520 m a. s. l.; on weathered rocks and along rock walls from the bottom to the upper part of canyon; a few locations with about a dozen plants; flowering; 24.07.2018; INEP. RDBMu: 3 (NT – Near Threatened).
5. *Papaver lapponicum* (A. Tolm.) Nordh. (Fig. 3): 67°37’12”N, 33°42’16”E; 550 m a. s. l.; on rock deluvium on top part of canyon; single individuals; flowering and fruiting; 24.07.2018. RDBMu: 2 (VU – Vulnerable). RDBRu: 3 (NT – Near Threatened).
7. *Ranunculus glacialis* L. (=*Beckwithia glacialis* (L.) A. et D. Löve; *Oxygraphis vulgare* Freyn) (Fig. 4): 67°37’13”N, 33°42’49”E; 550–750 m a. s. l.; on stony and gravely deluvium on cirque slopes and in the head of canyon; several dozens of plants; flowering; 24.08.2018; INEP. RDBMu: 2 (VU-Vulnerable). RDBRu: 3 (NT – Near Threatened).
11. *Woodsia glabella* Richardson: 67°37’12”N, 33°42’09”E; 450–520 m a. s. l.; on wet rocks in the middle part of canyon; single individuals; 24.07.2018. RDBMu: 3 (NT – Near Threatened).

Fig. 2. Epilobium lactiflorum on the canyon shelf. Photo E. Kopeina. This species from the Red Data Book of Murmansk Region (2014) was found in a few localities in Khibiny Mountains. Here milkflower willowherb is on the north-eastern edge of its European area

Fig. 3. Papaver lapponicum on the deluvium debris in the lower part of canyon. Photo E. Kopeina. Lapland poppy is included to the Red Data Books of Russian Federation (2008) and Murmansk Region (2014). It occurs on destroyed habitats in all vegetation zones in Khibiny Mountains

Fig. 4. Ranunculus glacialis on gravely slope of cirque above the canyon. Photo E. Kopeina. The glacier buttercup is included to the Red Data Books of Russian Federation (2008) and Murmansk Region (2014). It occurs on screes and snow bed habitats in tundra zone and cold stony (goltzy) desert

Species of the list of species which need special attention to their state in the natural environment if the Murmansk Region.

1. *Achillea apiculata* Orlova: 67°37'16"N, 33°41'25"E; 470 m a. s. l.; in the meadow on spring bank; a few flowering individuals; 24.07.2018; INEP.
2. *Cassiope hypnoides* (L.) D. Don (=*Harrimanella hypnoides* (L.) Cov.): 67°37'13"N, 33°41'59"E; 470–540 m a. s. l.; on the moist fine earth and rocks in the lower part of the canyon; numerous tufts; flowering; 24.08.2018.
6. *Pyrola norvegica* Knab.: 67°37'11"N, 33°42'20"E; 530 m a. s. l.; on wet rock in the upper part of canyon; a few individuals; flowering; 24.07.2018.
8. *Saxifraga aizoides* L.: 67°37'13"N, 33°41'59"E; 430–460 m a. s. l.; on wet rocks and in the brook in the lower part of canyon; a dozen of plants; flowering; 24.07.2018.
9. *Saxifraga oppositifolia* L.: 67°37'N, 33°42'E; 600 m a. s. l.; on stony and gravely deluvium on cirque slopes; a few tufts; flowering; 24.08.2018.
10. *Silene acaulis* (L.) Jacq.: 600 m a. s. l.; on stony and gravely deluvium on cirque slopes; single tuft; flowering; 24.08.2018.
12. *Dryas octopetala* L.: 67°37'N, 33°42'E, 510–570 m a. s. l.; in the upper part of canyon; plentiful; flowering; 15.06.2018.
14. *Lactuca alpina* (L.) A. Gray (*Cicerbita alpina* (L.) Wallr.): 67°37'N, 33°41'E; 380 m a. s. l.; in the subarctic tall herb birch forest; a few individuals; flowering; 17.07.2018.
15. *Dianthus superbus* L.: 67°37'20N, 33°41'32"E; 400 m a. s. l.; in the subarctic birch forest zone along the path; a few individuals; flowering; 17.07.2018.
16. *Gymnadenia conopsea* (L.) R. Br.: in the RDB-Mu-list; 67°37'17"N, 33°42'37"E; 590 m a. s. l.; in the tundra meadows on the slope, a few individuals; flowering; 17.07.2018.

Discussion

Assessment of valued habitats in a comparable manner is needed for the relevant structure of protected areas network. Cross-reference of units of the EUNIS Habitat Classification and phytosociological definitions of vegetation types provides solid scientific basis for conservation assessment of habitats, their diversity and value. The Braun-Blanquet methodology of vegetation classification (Westhoff and Maarel van der 1973) is based on analysis of species composition and plot records and is the most detailed and comprehensive classification tool across Europe.

As we recognized, the vegetation of habitat type "D4.2. Basic mountain flushes and streamsides, with a rich arctic-montane flora" in Khibiny belongs to two associations: *Mniobryo–Epilobietum hornemannii* and *Oxyrietum digynae*. Surveys of this vegetation were not numerous (Zechmeister, Mucina 1994; Mucina et al. 2016), and vegetation of springs and brooks is still poorly examined on the northern limit, where the number of species and syntaxa is comparatively small.

The alliance *Mniobryo–Epilobion hornemannii*, with distribution in northern Europe and Greenland, was initially reported as the vegetation in cold oligotrophic springs in alpine and subalpine zone in high mountains of Fennoscandia (Nordhagen 1943) with associations *Mniobryo-Archangelicetum*, *Mniobryo–Epilobietum hornemannii* and *Philonoto–Saxifragetum stellaris* and a few units of lower level – sociations. Actually the alliance was not validly published, because no nomenclatural type was defined (ICPN: Art.5). Later the alliance was validated (Zechmeister and Mucina 1994), with association *Mniobryo–Epilobietum hornemannii* Nordhagen 1943 as nomenclatural type.

Among constant vascular plants of alliance and association – *Montia fontana*, *Epilobium alsinifolium*, *E. hornemannii*, *Saxifraga stellaris*, *Cerastium cerastoides*, among mosses – *Pohlia wahlenbergii* and *Philonotis fontana*.

This vegetation in Khibiny is on the north-eastern limit of its European distribution and does not differs essentially in species composition from the cold springs in alpine zone of Fennoscandian mountains due to rather similar major ecological features. But the number of species is small; some species are rarer in Murmansk Region than in Fennoscandia, and are included in the regional Red Data Book of Murmansk Region (2014) – i. e. *Epilobium alsinifolium* and

E. lactiflorum. Vegetation of *Mniobryo–Epilobietum hornemannii* occurs along cold springs under snowfields and is not rare in Murmansk Region, but plant communities are small-sized and vulnerable: for example near the town Kirovsk they are easily destroyed as a result of mining and construction of ski resorts.

The alliance *Saxifrago stellaris–Oxyrion digynae* and association *Oxyrietum digynae* were described by Gjaerevoll (1950) in oligotrophic snow-bed habitats in mountains in northern Sweden. This low-herbs dominated vegetation show ecological and floristic relations to *Mniobryo–Epilobion hornemannii*. Both alliances occur in topographically associated habitats: on moist rocks and stony soils near melting snow and along spring feeding from these snowfields. Conditions of habitats include close presence of brooks with low temperature and high velocity of water, shorter length of the growing season, high humidity of cool air in summer because of the habitat is always in shadow.

Vegetation of both alliances in Khibinsky Mountains shares some characteristic species, such as *Saxifraga stellaris*, *Epilobium alsinifolium*, *Oxyria digyna* and *Arabis alpina*. Low herb communities on moist rocks are rare and also occupy small areas in Khibiny. Due to reduction of permanent snowfields this vegetation seems to be substituted by meadows and grasslands, which are more common and frequent (Koroleva et al. 2019).

Vegetation on screes and rocks of class *Thlaspietea rotundifolii* was analyzed in a few papers and monographs (Rivas-Martínez 1977; Englisch et al. 1993; Valachovič et al. 1997; Mucina et al. 2016, etc.). The eluvium of nepheline syenits in Khibiny is richer of minerals than siliceous rocks, but poor in Calcium. The vegetation on this substratum belongs to order *Androsacetalia alpinae* more characteristic for siliceous rocks. Plant cover is represented mainly by cushion and prostrate dwarf shrubs (*Saxifraga oppositifolia*, *Dryas octopetala*), a few forbs (*Papaver lapponicum*) and graminoids (*Juncus trifidus*, *Festuca ovina*) with patches of mosses (*Bucklandiella microcarpa*, *Racomitrium lanuginosum*) and lichens (*Flavocetraria nivalis*, *Cetraria islandica*).

Red Data Book species *Ranunculus glacialis* was found here on gravely screes and plateau (as in few areas of Khibiny). The glacial buttercup is arctic-alpine plant with contrast ecology: it grows at high altitudes in mountains of Europe – on coarse moraine, rubble and bare rock as well as on freshly soaked and moist, well drained, acidic silicate debris. In Scandinavian Mountains Nordhagen (1943) reported glacial buttercup as characteristic species for herb-and-liverworts dominated vegetation nearby acidic water-saturated solifluction snowfields. In Russia it occurs only in Khibiny and Lovosersky Mountains. Here glacial buttercup grows on coarse grained debris on steep slopes. Based on the company of species (*Papaver lapponicum*, *Juncus trifidus*, *Saxifraga oppositifolia*) we ascribe the community type not to snow bed vegetation but to *Racomitrium* spp.– *Ranunculus glacialis* of order *Androsacetalia alpinae* and class *Thlaspietea rotundifolii*.

Conclusion

Plant cover on the rocks of brook in canyon (type D4.2. "Basic mountain flushes and streamsides, with a rich arctic-montane flora") in Khibiny belongs to the association *Mniobryo–Epilobietum hornemannii* (alliance *Mniobryo–Epilobion hornemannii*) on the north-eastern limit of the area. Meadow-like vegetation on the rock shelves and along the brook belongs to the association *Oxyrietum digynae* (alliance *Saxifrago stellaris–Oxyrion digynae*).

Eluvium of mountain cirque (associated with the canyon, habitat type "H2.6 Calcareous and ultra-basic screes of warm exposures") is occupied by open vegetation of community type *Racomitrium* spp.–*Ranunculus glacialis* of the class *Thlaspietea rotundifolii*. Their syntaxonomy is still not defined on the alliance level.

Species from both regional and federal Red Data Books occur here: two species from the Red Data Book of Russian Federation, four species from the Red Data Book of Murmansk Region and 10 species which need special attention to their state in the natural environment in the Murmansk region.

It is the brooks and streamsides, screes and rocks that harbor a number of Red Data Book spe-

cies and evaluated habitats, thus increasing their importance for biodiversity conservation. In the southern part of Khibiny these habitats are in danger of destruction as a result of mining and recreation, the upper flow of flushes is affected by pollution from mining. As the area is out of the borders of National Park, it is necessary to establish here the conservation area – botanical nature monument. The published data can be used as a preparation for conservation planning and effective protection measures.

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