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SYNTAXONOMY OF VEGETATION OF THE SVYATOI NOS PENINSULA, LAKE BAIKAL
2. FORESTS AND KRUMMHOLZ IN COMPARISON WITH OTHER REGIONS OF NORTHERN BURYATIA

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Abstract: Using the Braun-Blanquet approach, 7 plant communities of forests and 3 communities of krummholz were distinguished on the Svyatoi Nos Peninsula on the eastern coast of Lake Baikal. Dominant species of these communities are *Abies sibirica*, *Larix sibirica*, *Pinus sibirica*, *P. sylvestris*, *P. pumila* and *Betula divaricata*. The data from Svyatoi Nos were combined with all the available data from the northern part of the Republic of Buryatia (289 relevés) and classified into 23 communities. These have been assigned to the following alliances: *Aconito rubicundi-Abietion sibiricae* – floodplain forests with tall forbs and the relict occurrence of a few nemoral species, *Pino sibiricae-Laricion sibiricae* – mesic forests with (sub-Atlantic-)boreal species and abundant mosses, *Vaccinio-Pinion pumilae* – krummholz communities of NE Asian distribution, *Cladonio stellaris-Laricion gmelinii* – *Larix gmelinii* dominated open forests on permafrosts with NE Asian distribution, and *Hieracio umbellati-Pinion sylvestris* – xeric forests with southern Siberian species. Phytogeographical affinities of these alliances are discussed and a system of high-ranked syntaxa (orders, classes) is proposed for the northern Buryatian forests and krummholz.

INTRODUCTION

The first part of the vegetation survey of the Svyatoi Nos Peninsula (CHYTRÝ et al. 1993) focused on the natural and semi-natural non-forest vegetation. Since then, we have extended our phytosociological research into other parts of the northern Transbaikal area, which resulted in several regional vegetation surveys (ANENKHONOV 1995, CHYTRÝ et al. 1995, DANIHELKA & CHYTRÝ 1995) and the further accumulation of data, collected partly in co-operation with A. Ünal, M. Valachovič, I. Hodálová, J. Danihelka and P. Pešout. The availability of these data and current attempts to work out a large-scale classification of southern Siberian forests (ERMAKOV 1995a,b, 1997, ERMAKOV et al. 1991) make it possible to analyse forest and krummholz plant communities of the Svyatoi Nos Peninsula from a broader geographical perspective. The objectives of this paper are twofold: (1) to provide a regional classification of forest and krummholz vegetation of the Svyatoi Nos Peninsula; (2) to synthesize all the available relevé data from these vegetation types in northern Buryatia in order to produce a framework for understanding regional vegetation patterns in the study area.

STUDY AREA

The Svyatoi Nos Peninsula is situated on the eastern coast of Lake Baikal (Eastern Siberia). Its main part is formed of a mountain range extending from an altitude of 455 m on the Baikal coast up to 1877 m. The predominant parent materials of this range are ancient siliceous rocks. Rainfall is under striking geomorphological control with contrasting wetter NW- and drier SE-facing slopes. The range is mainly forested. Above the timberline at 1100–1300 m, a krummholz belt with dominating *Pinus pumila* is developed and the summits are covered with an alpine tundra. The other part of the peninsula is the isthmus formed of sandy deposits. The isthmus is largely covered with mires and shallow lakes, with forests being of rather localized distribution on consolidated sand dunes. For a detailed description of the environment of the peninsula see CHYTRÝ et al. (1993).

The other regions used for comparison are situated in the northern part of the Republic of Buryatia (Fig. 1). All of them possess ancient siliceous bedrock, namely granite and gneiss. They are as follows:

(1,2) Bol'shoi Chivyrkui and Bol'shaya Cheremshana are valleys of the rivers draining the west-facing slopes of the Barguzinskii Range into Lake Baikal. The valleys are 22–28 km long, arising in glacial cirques at about 1500–1900 m and turning into deep V-shaped valleys downstream. Due to the lakeward aspect of the valleys, the climate is comparatively less continental with higher precipitation and a lower annual temperature range. Detailed descriptions of the environment are found in CHYTRÝ et al. (1995) and DANIHELKA & CHYTRÝ (1995), respectively.

(3,4) Gremyachaya and Nesterikha are valleys of the rivers draining the opposite east-facing slopes of the Barguzinskii Range at altitudes of about 500–1800 m. In their upper parts, particularly in the glacial cirques, the valleys are wide, becoming narrow downstream where they cross a lateral ridge. They are situated in the lee of the winds from Baikal; consequently they receive a lower precipitation compared to the west-facing valleys. Even so the climate shares fewer continental features with the climates of Svyatoi Nos and the localities (1) and (2).

(5) Umkhei is situated in the Barguzin river valley above its opening into the Barguzinskaya depression. The river forms a comparatively narrow valley of 1–3 km in width, with well-developed terraces, at altitudes of 600–1000 m. This locality is remote from Lake Baikal and is located near the intermontane Barguzinskaya depression with a dry and summer-warm climate. Consequently, the climate in Umkhei is warmer and drier than at Baikal.

(6) Dzelinda includes terraces and slopes in the middle part of Verkhneangarskaya depression which is a part of the Verkhnyaya Angara river valley. The altitude ranges from 600 to 1400 m. As the valley stretches in approximately an E-W direction, it is influenced by westerly winds that prevent the development of ultracontinental climatic features. In terms of precipitation, the climate is relatively wet, similarly to the localities (1–2), but it is cooler than in localities (1–5), due to northerly location.

The remaining localities are situated in the ultracontinental region where the permafrost is widely distributed and there are only a few rather small permafrost-free areas.

(7,8) Dzhirga and Balan-Tomur are situated in the upper part of the Barguzin river basin on the boundary between the Ikatskii and Yuzhno-Muiskii Ranges. The investigations focused on glacial cirques with numerous moraines and adjacent mountain slopes. The climate is more continental and cooler but the rainfall is comparatively high due to the high-altitude location (1200–1700 m).

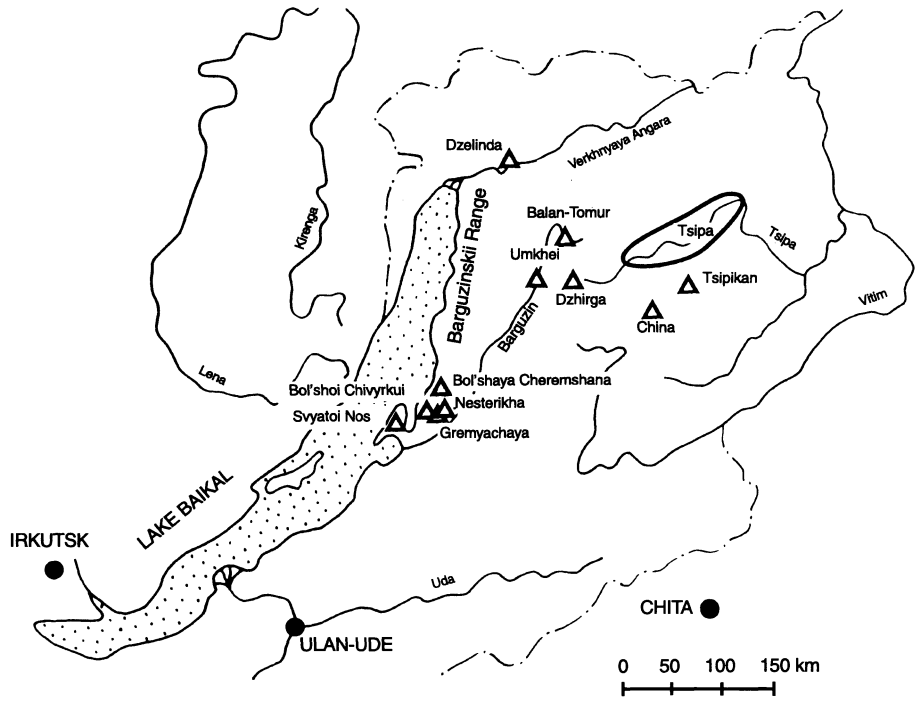

Fig. 1. Map of northern Buryatia with the study sites.

(9) Tsipa area includes the Bauntovskaya depression situated in the Tsipa river valley which is approximately 160 km long and up to 35 km wide. The comparatively flat bottom of the depression is situated at 1050–1200 m a.s.l. with rather gentle slopes of the surrounding mountains that reach altitudes of 2000–2500 m. The timberline lies approximately at 1400–1700 m. The climate of the depression is ultracontinental with a mean annual temperature about -6 °C and rainfall about 350 mm.

(10,11) China and Tsipikan are situated in the northern part of the Vitimskoe mountain plateau. The landscape is dominated by flat landforms and gentle slopes at altitudes of 700–1300 m. The climate is similar to that of Tsipa.

METHODS

The Braun-Blanquet approach with the 7- or 9-grade cover/abundance scale (r, +, 1, 2, 3, 4, 5 or r, +, 1, 2m, 2a, 2b, 3, 4, 5) was used to classify vegetation (WESTHOFF & VAN DER MAAREL 1978). The 1991–92 data from Svyatoi Nos and 1988–96 data from the other localities were stored in TURBO(VEG) database (HENNEKENS 1996). All the relevés from forests and *Pinus pumila*- and *Betula divaricata*-dominated krummholz were selected, except the relevés of post-fire stands and forested bogs. The resulting dataset of 289 relevés was classified by the program TWINSPAN (HILL 1979). Several TWINSPAN runs were performed with different data subsets to compare similar vegetation types separately. The final classification of the relevés into vegetation types was made subjectively, taking into account the results of numerical classification.

The classification for Svyatoi Nos is presented in a table of individual relevés (Tab. 1) and the classification for the whole of northern Buryatia is summarized in a constancy table (Tab. 2). In these tables, blocks of preferential species of communities and of the groups of communities are indicated. The validity of these blocks is limited to the particular tables: if some columns are removed or some new columns added, the structure of the blocks would be changed to some extent. Consequently, as Tabs. 1 and 2 represent different views of the same vegetation pattern (local vs. broader in geographical terms, respectively), the species in corresponding blocks need not always match perfectly. To give more objective lists of diagnostic species for the newly described alliances (see Appendix) unaffected by the limited validity of the tables, we made a literature comparison with similar vegetation units from Siberia and the Far East. As a result, we designated as diagnostic only those species that appear to have a more general validity for the delimitation of the particular alliance against the other alliances within the order or class (character or differential species). To visualise a simplified pattern of the constancy table, an ordination of the $\log_2$-transformed percentage matrix was performed using the correspondence analysis from the SYN-TAX 5.1 package (PODANI 1993).

Syntaxonomical interpretation of the classification was elaborated by comparison with the available literature from Siberia and Mongolia, based on the Braun-Blanquet approach. The names of syntaxa were checked for correctness in terms of the 2nd edition of the Code (BARKMAN et al. 1986). Ineffectively or invalidly published names and the preliminarily proposed names of other authors that will be published elsewhere are indicated by "*ad interim*" in the syntaxonomical synopsis. Plant names follow CZEREPANOV (1995) for vascular plants, IGNATOV & AFONINA (1992) for mosses, KONSTANTINOVA et al. (1992) for hepatics and SANTESSON (1993) for lichens.

RESULTS

Forest and krummholz communities of the Svyatoi Nos Peninsula

The forests of Svyatoi Nos are classified into 7 associations (Tab. 1; see Appendix pp. 52–57). They are formed by 6 tree species. *Pinus sylvestris* is the most widespread, constituting the dominant or co-dominant in four associations. Another tree species frequently found in the peninsula is *Larix sibirica*, which, like *Pinus sylvestris*, is termed a light taiga tree due to the high permeability of its canopy to light. Dark taiga trees are represented by *Pinus sibirica* and *Abies sibirica.* They are rather rare, being confined to the habitats with higher moisture status such as riverine sites or slopes exposed to the moist winds from the lake. Small-leaved trees *Betula pendula* s.l. and *Populus tremula* form an admixture in the sub-canopy of coniferous forests. They only attain dominance in the successional post-fire and clearing communities. Krummholz is represented by *Pinus pumila* and *Betula divaricata* stands.

Cardamino macrophyllae-Abietetum sibiricae

This is an *Abies sibirica* or *Betula pendula* s.l. dominated forest, forming strips along the creeks on the bottoms of narrow valleys. The habitat is wet but well-drained, periodically flooded for short periods. One kind of stand is found in the mountains near the timberline where *Abies sibirica* galleries ascend along the streams to the subalpine belt which is otherwise dominated by *Pinus pumila.* At lower altitudes of the forest belt the other kind is encountered

with a predominance of *Betula pendula* s.l. The shrub layer is formed from species with high demands on the abundant soil moisture (*Lonicera pallasii*, *Duschekia fruticosa*), and the same environmental affinities are displayed by the field layer which is dominated by tall forbs of the *Trollio-Crepidion sibiricae*. Bryophytes are rare and lichens are absent.

Carici cinereae-Pinetum sylvestris

Fringes of mires in slacks of coastal sand deposits of Lake Baikal with the ground water table close to the soil surface support this open forest dominated by *Pinus sylvestris*. As the water level in Baikal oscillates in both annual and long-term cycles, some trees may periodically decline due to the decreasing oxygen status of the soil. In canopy gaps, *Betula pendula* s.l. may develop a sub-canopy layer. Poorly-drained soil on siliceous sand is indicated by the vigorous cover of such species as *Carex cinerea*, *Calamagrostis neglecta*, and *Vaccinium uliginosum*.

Calamagrostio obtusatae-Laricetum sibiricae

These mixed forests of *Larix sibirica* and *Pinus sylvestris* are typical of mesic habitats with deep and fertile soils on flat land or gentle slopes. They occur on the Baikal terraces and the foothills of the mountain range at altitudes up to 500 (–550) m. *Rhododendron dauricum*, *Duschekia fruticosa* and *Betula pendula* s.l. predominate in a vigorous undergrowth. The field layer consists of a mixture of the species of southern Siberian herb-rich light taiga such as *Calamagrostis obtusata*, *Galium boreale*, *Carex pediformis* s.l., and the *Vaccinio-Piceetea* species such as *Ledum palustre*, *Linnaea borealis* and *Trientalis europaea*. Abundant mosses in the ground layer with *Pleurozium schreberi* being a dominant indicate affinities to the *Vaccinio-Piceetea*.

Maianthemo bifolii-Pinetum sibiricae

This community is developed on the coastal sand deposits of Lake Baikal in the northern part of the Svyatoi Nos Peninsula. The habitat is influenced by strong and cool winds from the lake which bring moisture, but the soils are well-drained and become rather dry particularly when the lake is calm. Because of this, stress-tolerant species such as *Pinus sibirica* and *P. pumila* dominate the tree and shrub layer respectively, with a species-poor field layer dominated by *Vaccinium vitis-idaea*, *Ledum palustre* s.l. and *Empetrum sibiricum* s.l. *Pleurozium schreberi* forms vigorous moss carpets.

Festuco ovinae-Pinetum pumilae

Extensive stands of *Pinus pumila* form the subalpine belt (in Russian "*podgol'tsy*") of the Svyatoi Nos mountain range. From this belt *Pinus pumila* descends to lower altitudes as an understorey species of pine and larch forests. In the absence of competition of trees, e. g. on talus slopes, pure krummholz stands may be still rather vigorous in the forest belt at altitudes as low as 900 m. However, in contrast to some other regions of NW Baikal, they are hardly developed on the sand dunes of the cool Baikal coast, although *Pinus pumila* is typical of bogs on the Svyatoi Nos isthmus (*Chamaedaphno-Pinetum pumilae* – see CHYTRÝ et al. 1993).

The *Festuco ovinae-Pinetum pumilae* is a comparatively thermophilous krummholz type, being confined to south-facing slopes or to altitudes near the timberline. Such habitats are warmer in summer and the vegetation season is longer due to earlier snow melt. This is reflected in the occurrence of small-leaved woody plants such as *Betula pendula* s.l. and

Duschekia fruticosa admixed in the *Pinus pumila* canopy. In addition the field layer is characterized by some species lacking in the high-altitudinal krummholz such as *Festuca ovina* s.l., *Rosa acicularis* and *Chamaenerion angustifolium.*

Pleurozio schreberi-Pinetum pumilae

The krummholz community of this type is confined to higher altitudes or north-facing slopes where the snow-free period lasts for 3–4 months/yr. In the Svyatoi Nos mountain range, it is widespread at altitudes above 1400 m except on the summit plateau where strong winds prevent *Pinus pumila* to form more extensive stands, thus giving space to the alpine tundra communities dominated by *Betula exilis*, dwarf shrubs, grasses, lichens and mosses. The *Pleurozio schreberi-Pinetum pumilae* is an extremely species-poor community with *Vaccinium vitis-idaea*, *Ledum palustre*, *Bergenia crassifolia* and *Empetrum sibiricum* s.l. often being the only field-layer species. A striking feature is the frequent occurrence of the lichens *Cladonia stellaris* and *C. rangiferina* and mosses such as *Pleurozium schreberi.*

Pleurozio schreberi-Betuletum divaricatae

Subalpine shrubby birch stands of approximately the same height as *Pinus pumila* stands (i.e. 1–3 m) are rather rare in the Svyatoi Nos mountain range. Our observations from some other regions of northern Buryatia indicate that *Betula divaricata* is largely confined to flatland or gentle slopes, possibly with deeper and longer snow cover than on steeper slopes where *Pinus pumila* prevails. On the Svyatoi Nos Peninsula, gently undulating terrain at high altitudes is only found on the summit plateau of the mountain range, however, it is obvious that apart from a few sites in the lee, there is only moderate snowpack and long-lasting snowbeds are rare due to the strong wind action. Possibly this is the reason why *Betula divaricata* stands are rather rare in Svyatoi Nos. The undergrowth of *Betula divaricata* scrub is poor in species, with a composition similar to that of *Pinus pumila* communities.

Calamagrostio epigei-Pinetum sylvestris

This light taiga forest dominated by *Pinus sylvestris* is typical of coastal sand deposits on the Svyatoi Nos isthmus. In the vegetation zonation it is found between the *Padus asiatica-Pinus sibirica* community in the wind-exposed coastal habitats and the *Carici cinereae-Pinetum sylvestris* in the dune slacks influenced by ground water. Vigorous shrub undergrowth is mainly formed of *Rhododendron dauricum.* The field layer is dominated by low shrubs such as *Vaccinium vitis-idaea*, *Empetrum sibiricum* s.l. and *Arctostaphylos uva-ursi*, with *Calamagrostis epigeios* having its primary habitat on sand dunes. Dry soils are indicated by the high cover of lichens of the genus *Cladonia*, forming patchy mosaics with *Pleurozium schreberi* and other mosses.

Vicio nervatae-Pinetum sylvestris

Dry south-facing slopes in the middle altitudes of the Svyatoi Nos mountain range, particularly on the leeward eastern hillsides, are occupied by this kind of light forest dominated by *Pinus sylvestris.* As usual, such slopes are rather steep and consequently the soils are shallow rankers with abundant rock outcrops. At lower altitudes near the Baikal coast these forests are almost absent even in similar topographical situations, possibly due to frequent fogs. Steep south-facing slopes at middle altitudes are obviously warm in summer, but winters may be rather cold there due to the higher altitude and strong winds. The snow cover is presumably rather low. Harsh climatic conditions are reflected in the constant occurrence of

dwarf cedar pine *Pinus pumila* in the undergrowth, which descends from the subalpine belt. Besides predominant *Vaccinium vitis-idaea*, the field layer is formed of heliophilous continental species such as *Pulsatilla patens* s.l., *Vicia nervata* and *Dendranthema zawadskii*. The ground layer is poorly developed. In the canopy gaps on some rock outcrops, small patches of vegetation related to mountain steppes are encountered (*Saxifrago bronchialis-Phlojodicarpetum baicalensis* – see CHYTRÝ et al. 1993).

Padus asiatica-Pinus sibirica community

This community is formed from small groups of *Pinus sibirica* trees surrounded by a dense scrub of *Padus asiatica*, *Sorbus sibirica* and *Cotoneaster melanocarpus* on the coastal dunes of the Svyatoi Nos isthmus. Patches of this vegetation are the first stage of forest succession on the dunes and, as a result, a number of species of open sand dunes of the *Oxytropidion lanatae* are represented in the field layer. *Pinus sibirica* seems to be better adapted than *P. sylvestris* for tolerating the influence of strong and cool winds from the lake, as well as the cooling effect of fog. *P. sylvestris* largely avoids extreme coastal habitats. However, once a wind-breaking barrier of *P. sibirica* patches is created, *P. sylvestris* gradually invades the dunes closer to the coast and a shift into the *Calamagrostio epigei-Pinetum sylvestris* takes place. Compared to the *Maianthemo bifolii-Pinetum sibiricae*, which was found in similar habitats in the northern part of the Svyatoi Nos Peninsula, the site is warmer due to its location in the lee of the Svyatoi Nos mountain range and because it is open to the south.

Forests and krummholz of northern Buryatia compared with Svyatoi Nos

With our present knowledge, forests and krummholz of northern Buryatia may be classified into 23 communities (three of them with two sub-communities). These may be clustered into five groups (Tab. 2; see Appendix pp. 58–75). All but one of these groups are represented in the Svyatoi Nos Peninsula by at least one community. The exception is the group of open *Larix gmelinii* forests on permafrosts in areas with an ultracontinental climate. In addition to these five groups, two communities of *incertae sedis* were distinguished and both of them occur in Svyatoi Nos (*Carici cinereae-Pinetum sylvestris* and *Padus asiatica-Pinus sibirica* community). In total, the number of communities in Svyatoi Nos is 10.

The diversity of vegetation types in Svyatoi Nos is relatively high, because none of the reference localities in northern Buryatia posseses a higher number of forest or krummholz communities. As both Svyatoi Nos and the reference localities were surveyed with approximately the same amount of effort, this observation is not a consequence of more detailed investigations carried out in Svyatoi Nos. It may be presumably attributed to (1) a lower degree of continentality in the proximity of the lake; (2) environmental heterogeneity with an altitudinal range of more than 1400 m, the presence of both wet lakeward and dry leeward slopes, differences between flat sand deposits on the isthmus and steep slopes over hard rocks. In terms of geomorphological control of vegetation diversity, Svyatoi Nos may be thus considered a small-scale model of the Barguzinskii Range.

Syntaxonomically, the five groups distinguished are interpreted as the following alliances:

Aconito rubicundi-Abietion sibiricae

Dark taiga forests of this alliance are encountered along creeks and small rivers in the areas where climatic features are less continental due to the moderating influence of Lake Baikal. In winter, the snow cover is deep and usually prevents soil freezing. Fern- and forb-rich

forests of the *Matteuccio struthiopteridis-Abietetum sibiricae* inhabit wet and nutrient-rich soils in floodplains where the local microclimate is comparatively warm (for example due to the influence of the hot spring such as occurs in Dzelinda). Small-leaved floodplain forests of the *Calamagrostio langsdorffii-Populetum suaveolentis* occur along the middle courses of the rivers where the velocity of the current is still high but the floodplain is already comparatively broad with a flat bottom (cf. DANIHELKA & CHYTRÝ 1995). The *Cardamino macrophyllae-Abietetum sibiricae* occurs in narrow-strips along small streams in middle altitudes and near the timberline. The *Equiseto hyemalis-Abietetum sibiricae* replaces the above communities on the river terraces which are only rarely flooded but still markedly influenced by the ground water (cf. CHYTRÝ et al. 1995).

Pino sibiricae-Laricion sibiricae

This alliance includes mesic forests which are widespread in the Baikal area where the annual temperature range is moderated by the lake and the climate is comparatively wet due to the influence of NW (Atlantic) air masses. These forests are confined to the terraces of Baikal and its tributary rivers beyond the influence of ground water, and to the gently sloping lower hillsides. They were found on Svyatoi Nos and the west-facing foothills of the Barguzinskii Range, where they chiefly occur near the Baikal coast with the most pronounced maritime climatic features. Another locality is Dzelinda where Atlantic air masses impose a strong effect on vegetation due to the E-W orientation of the Verkhnyaya Angara valley. The *Calamagrostio obtusatae-Abietetum sibiricae* includes dark taiga forests whereas the *Calamagrostio obtusatae-Laricetum sibiricae* possesses a light coniferous canopy (CHYTRÝ et al. 1995, DANIHELKA & CHYTRÝ 1995). The pattern of variation observed within these two associations and interpreted syntaxonomically at the level of subassociations, reflects the geographical differences between Svyatoi Nos and the southern part of the Barguzinskii Range on the one hand and Dzelinda on the other. The *Maianthemo bifolii-Pinetum sibiricae* includes forests of the coolest habitats within the alliance's ecological range, affected by cool winds from Lake Baikal (CHYTRÝ et al. 1995, DANIHELKA & CHYTRÝ 1995).

Vaccinio-Pinion pumilae

Both krummholz communities of dwarf cedar pine *Pinus pumila* and the stands of shrubby birch *Betula divaricata* are assigned to this alliance. These communities form the subalpine belt of the Svyatoi Nos and Barguzinskii Range. It is difficult to find a clear floristic distinction between *Pinus pumila* and *Betula divaricata* communities except for the presence of the dominant species. However, the differences in the habitat requirements of *Betula divaricata* on wind-protected sites on flat land (deeper and longer snow cover) and *Pinus pumila* on wind-exposed slopes support the concept of separation of the *Pleurozio schreberi-Betuletum divaricatae* from the *Pinus pumila* communities. The proper *Pinus pumila* communities are divided into the more thermophilous *Festuco ovinae-Pinetum pumilae* on the south-facing slopes or at lower altitudes near the timberline, and the more chionophilous *Pleurozio schreberi-Pinetum pumilae* in cooler habitats.

Cladonio stellaris-Laricion gmelinii

This alliance includes species-poor communities dominated by *Larix gmelinii* in areas with an ultracontinental climate in the Vitimskoe mountain plateau and the eastern part of the Stanovoe Uplands, i.e. the area where permafrosts are widespread. Winters are cold and dry and there is little protective snow cover, but in summer climatic drought is partly compensated

by slow thawing of the frozen soil which spreads the meltwater more evenly over time. As the extreme climate and permafrost impose an overriding effect on the floristic variation, the communities assigned to this alliance possess a low level of floristic differentiation, although they are found on contrasting topographies. The *Artemisio commutatae-Laricetum gmelinii* is a peculiar type within this group, characterized by the occurrence of several steppe species. It is encountered on the tops or on south-facing slopes of comparatively high (> 3 m), sandy elevations (in Russian "*grivy*") in the floodplain where permafrost is found deep below the ground in summer. The *Calamagrostio lapponicae-Laricetum gmelinii* occurs on the lower parts of south-facing slopes of the Tsipa valley and on the north-facing slopes of sandy elevations in the floodplain. The *Cladonio stellaris-Laricetum gmelinii pinetosum pumilae* is found on hillsides in the upper part of the forest belt whereas the *C. s.-L. g. typicum* is a predominant type in middle and lower altitudes. In small intermontane valleys, the *Cladonio stellaris-Laricetum gmelinii* may be also found on those sites at the bottom of the valleys which are not influenced by ground water. On the terraces and footslope accumulations on the bottom of the extensive and broad Bauntovskaya depression, the above communities are replaced by the *Vaccinio uliginosi-Laricetum gmelinii.* The *Moehringio lateriflorae-Laricetum gmelinii* is typical of rich and well-drained soils on coastal banks or elevations in a floodplain which are rarely flooded.

Hieracio umbellati-Pinion sylvestris

Xerophilous light taiga forests of this alliance are found on well-drained soils under a continental summer-warm climate. Low precipitation, in some places coinciding with high slope inclination, implies low levels of protective snow cover in winter. Floristic variation within this alliance is mainly due to the habitat peculiarities in particular localities. Within the *Pino sibiricae-Laricion sibiricae* range where the climate is comparatively wet, these forests are encountered in leeward sites of east- and south-facing slopes (*Spiraeo mediae-Pinetum sylvestris* in Dzelinda and *Vicio nervatae-Pinetum sylvestris* in Svyatoi Nos and the southern part of the Barguzinskii Range) or in the lee of the Svyatoi Nos mountain range on the Svyatoi Nos isthmus (*Calamagrostio epigei-Pinetum sylvestris*). The other communities occur in the Barguzin river basin east of the Barguzinskii Range which imposes a barrier to the westerly winds and consequently the climate is rather dry. Also, the temperature continentality is more pronounced in this region as the moderating influence of Baikal decreases but permafrosts are not so widespread there. The *Pinus pumila-Populus tremula* community is found in the Gremyachaya valley where it occurs on hillsides, being a kind of transition to the *Vaccinio-Pinion pumilae* communities. Similar habitats in Umkhei are covered with the *Scorzonero radiatae-Pinetum sylvestris*, whereas on the bottoms of the valleys in this locality the *Cypripedio guttati-Pinetum sylvestris* is developed.

Ordination

Ordination of the constancy table (Fig. 2) revealed a strong gradient of the first axis from the wet riverine forests (*Aconito rubicundi-Abietion sibiricae*) through mesic forests (*Pino sibiricae-Laricion sibiricae*) to xeric types (*Hieracio umbellati-Pinion sylvestris*) and krummholz communities (*Vaccinio-Pinion pumilae*). The second axis mainly accounts for the variation in ultracontinental cryophilous larch forests (*Cladonio stellaris-Laricion gmelinii*).

DISCUSSION

The five alliances distinguished in this paper belong to 3 groups with different phytogeographical affinities:

(1) Western group of Euro-Siberian mesophilous forests on deep and comparatively nutrient-rich soils (*Aconito rubicundi-Abietion sibiricae* and *Pino sibiricae-Laricion sibiricae*).

(2) North-eastern group of ultracontinental forests of north-eastern Asia at high altitudes or on permafrosts (*Vaccinio-Pinion pumilae*, *Cladonio stellaris-Laricion gmelinii*).

(3) Southern group of southern Siberian xerophilous forests on dry soils (*Hieracio umbellati-Pinion sylvestris*).

Western group

The western group (Tab. 2, columns 1–8; see Appendix pp. 58–75) is characterized by species with a wide distribution in dark coniferous forests from eastern Europe or the Urals to central Siberia, such as *Pinus sibirica*, *Larix sibirica*, *Abies sibirica*, *Picea obovata*, *Atragene sibirica* (*Pinus sibirica* group in HILBIG & KNAPP 1983), and by circumboreal suboceanic species that avoid the ultracontinental area of NE Siberia, for example *Trientalis europaea* or *Rubus saxatilis* (*Goodyera repens* group in HILBIG & KNAPP 1983). This group is clearly related to the *Vaccinio-Piceetea* class. To our present knowledge, the *Pino-Laricion* is distributed not only in the Baikal area but also in the West Sayan (*Rhododendro daurici-Laricion sibiricae* in ZHITLUKHINA & ALIMBEKOVA 1987) and northern Mongolia (*Rhododendro daurici-Laricetum sibiricae* and *Vaccinio vitis-idaeae-Laricetum sibiricae* in HILBIG 1995). The eastern counterpart of this alliance is the *Betulo lanatae-Piceion ajanensis*, described by PETELIN (1990) from the mountain ranges in the Far East, characterized by *Picea ajanensis*, *Betula lanata* and *Pinus pumila.*

The alliance *Aconito rubicundi-Abietion sibiricae* occupies a special position wihin this group. By its habitat characteristics and its floristic composition it is closely related to the alliance *Milio-Abietion* that includes the *Abies sibirica* forests from the north and west-facing slopes of the Altai (ZHITLUKHINA 1988, ERMAKOV 1995b). Due to comparatively high precipitation, the protective effect of snow cover in winter and a lower degree of temperature continentality in that region, many species of the European broad-leaved forests occur under the *Abies sibirica* canopy (e.g., *Asarum europaeum*, *Daphne mezereum*, *Galium odoratum*, *Sanicula europaea*, *Viburnum opulus*). Most of these species approach their eastern distribution limits there and the *Milio-Abietion* forests are considered as relicts of the Pliocene broad-leaved deciduous forests. Consequently, MIRKIN et al. (1989), KOROTKOV et al. (1991) and ERMAKOV (1995b) assigned the *Milio-Abietion* to the *Fagetalia sylvaticae* (*Querco-Fagetea*). Most of the species of broad-leaved forests do not occur any more in the Transbaikal area, but *Adoxa moschatellina*, *Melica nutans*, *Milium effusum*, *Paris quadrifolia* and some others persist. The forests with coincidental occurrence of several of these species are also likely to have a relict status, as shown by EPOVA (1956, 1960) for the Khamar-Daban Mts. Apart from their impoverishment in the species of broad-leaved forests, the main feature distinguishing the Transbaikalian relict forests from those of the Altai is the predominance of the *Vaccinio-Piceetea* species in the field layer, although an important feature of this class, the vigorous moss carpets, are absent. That is why these forests cannot be assigned to the

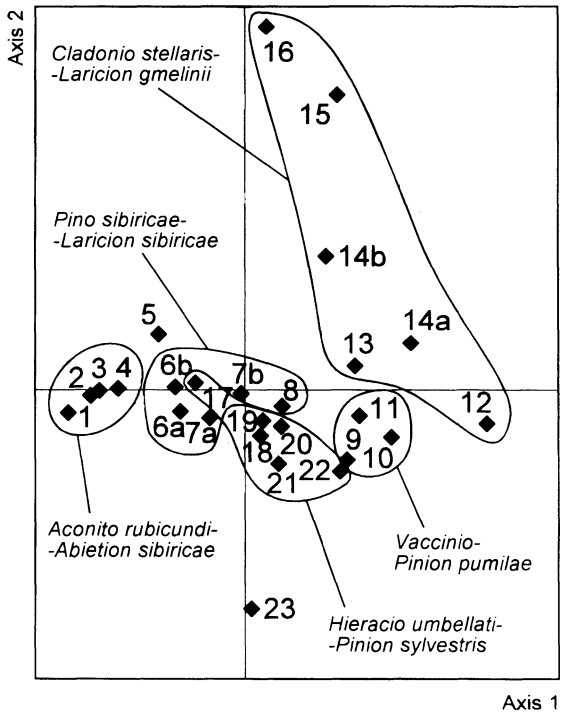

Fig. 2. Correspondence analysis of associations and subassociations of forests and krummholz in northern Buryatia based on log2-transformed percentage constancy. Numbers of associations and subassociations correspond to those in Tab. 2.

Milio-Abietion, which is an alliance of the *Querco-Fagetea*, and must be treated as a vicarious alliance within the *Vaccinio-Piceetea*, viz the newly described *Aconito rubicundi-Abietion.*

Besides the dominance of *Abies sibirica* and an admixture of some other coniferous species, small-leaved trees and shrubs play an important role in the *Aconito-Abietion* communities, such as *Betula pendula* s.l., *Populus tremula*, *Duschekia fruticosa* and some others. In the *Calamagrostio langsdorffii-Populetum suaveolentis*, even the small-leaved trees with NE Asian distribution, such as *Populus suaveolens* and *Chosenia arbutifolia*, dominate the canopy. These forests, however, possess the *Aconito-Abietion* undergrowth which is markedly different from that of the *Chosenion arbutifoliae* from the Magadan region (SINEL'NIKOVA 1995).

North-eastern group

The north-eastern group has a very few species typical solely of this group but it is clearly negatively characterized by the absence of many species of the western and southern groups (Tab. 2, columns 9–16). Positive preferentials especially include the dominant woody plants (*Larix gmelinii*, *Betula divaricata*). Phytogeographically, there is a high proportion of the species with NE Siberian ranges, such as *Larix gmelinii*, *Pinus pumila*, *Betula exilis*, *Rhododendron aureum* (*Pinus pumila* group in HILBIG & KNAPP 1983). This vegetation is confined to the areas with cool summers and very short growing seasons, either in the east Asian mountains (*Vaccinio-Pinion pumilae*, see KOBAYASHI 1971, WILMANNS et al. 1985, NESHATAEVA 1990, GRISHIN et al. 1996) or in the ultracontinental inland part of north-eastern

Siberia where permafrosts are widespread (PESTRYAKOV 1991). Southern counterparts with *Larix sibirica* were reported from the mountains of northern Mongolia (*Betulo fuscae-Laricetum sibiricae* in HILBIG 1995). The affinities of the north-eastern group to the *Vaccinio-Piceetea* are less clear because of the lack of many western species: nevertheless, a few *Vaccinio-Piceetea* species that indicate the relations to this class do occur, such as *Vaccinium vitis-idaea*, *V. uliginosum*, *Ledum palustre*, *Carex globularis*, *Pleurozium schreberi*, *Cladonia arbuscula*, *C. rangiferina*, *C. stellaris*, *Dicranum polysetum*, and some others. On the other hand, the communities of the north-eastern group are distinct from the other European and western Siberian *Vaccinio-Piceetea* communities in terms of floristic composition, phytogeographical affinities, macroclimate and soil. That is why we propose to assign them to a separate order of north-eastern Asian ultracontinental *Larix gmelinii* forests and *Pinus pumila* krummholz, with the diagnostic species *Betula divaricata*, *B. ermanii*, *B. exilis*, *B. fruticosa*, *Larix gmelinii* (incl. *L. cajanderi*), *Pinus pumila*, and *Rhododendron aureum*. This order includes the alliances *Vaccinio-Pinion pumilae*, *Cladonio stellaris-Laricion gmelinii*, and also the *Vaccinio-Laricion cajanderi* which has been ineffectively described by PESTRYAKOV (1991). Concerning the name, for this order, SUZUKI (1964) proposed the order *Vaccinio-Pinetalia pumilae* as a superior syntaxon for the *Vaccinio-Pinion pumilae*, and this name must be, for priority reasons, also used for the order in its new delimitation presented here.

Southern group

The southern group (Tab. 2, columns 17–23) includes light *Pinus sylvestris* or *Larix sibirica* forests which are characterized by an occurrence of temperate-subboreal (southern Siberian) species such as *Pulsatilla patens* s.l. (mainly *P. flavescens*) and *Lupinaster pentaphyllus* (*Trifolium lupinaster* group in HILBIG & KNAPP 1983). This group was first recognized by ZHITLUKHINA & MIRKIN (1987) and ERMAKOV (1995a) who assigned it to a new class *Irido ruthenicae-Laricetea sibiricae*. The alliance *Hieracio umbellati-Pinion sylvestris* may be most probably assigned to this class due to its similar habitat affinities and the occurrence of some diagnostic species indicated by ERMAKOV, such as *Larix sibirica*, *Carex pediformis*, *Rhytidium rugosum*, *Vicia nervata*, *Bromopsis pumpelliana*, *Aster alpinus*, *Scorzonera radiata*. On the other hand, there is also a distinct group of the *Vaccinio-Piceetea* species in the *Hieracio-Pinion* communities, including *Vaccinium vitis-idaea*, *Maianthemum bifolium*, *Pyrola incarnata* and some others. This group reflects the transitional character of the *Hieracio-Pinion* communities between the classes *Irido-Laricetea* and *Vaccinio-Piceetea* due to its geographical position on the northern limit of the *Irido-Laricetea*. Also, it is evident from Tab. 2 and the ordination diagram (Fig. 2) that the relationships between the *Hieracio-Pinion* and the western group of *Vaccinio-Piceetea* are closer than between the western and north-eastern group of *Vaccinio-Piceetea*.

Floristic impoverishment of the *Hieracio-Pinion* communities makes it difficult to classify this alliance into the orders proposed by ERMAKOV (1995a, 1997), i.e. the high-altitudinal *Festuco ovinae-Laricetalia sibiricae* and low-altitudinal *Astero alpini-Laricetalia sibiricae*. Almost no diagnostic species of these orders, as indicated by ERMAKOV, occur in the *Hieracio-Pinion* communities, except for the constant presence of *Festuca ovina* which can hardly be considered a "good" diagnostic species because of its very broad ecological range. Preliminarily, we suggest assigning the *Hieracio-Pinion* to the *Astero alpini-Laricetalia sibiricae* because there are certain similarities to some communities of the *Sedo*

hybridi-Pinenion sylvestris suballiance, classified by ERMAKOV in this order. The occurrence of *Hieracium umbellatum*, *Polygonatum odoratum*, *Rhododendron dauricum*, *Vaccinium vitis-idaea* and some other species is notable.

The *Calamagrostio epigei-Pinetum sylvestris* is an exceptional type within this group. The high performance of lichens and mosses and a species-poor field layer indicate its relations to the Scandinavian lichen-rich pine forests of the *Cladonio-Pinetum* (see KIELLAND-LUND 1967, 1981, OKSANEN & AHTI 1982, DIERSSEN 1996). The *Cladonio-Pinetum* still occurs in the Lower Irtysh valley in western Siberia (KUSTOVA 1988). The *Calamagrostio-Pinetum* cannot be identified with it because of the occurrence of eastern species such as *Rhododendron dauricum* and *Pinus pumila*; nevertheless, it shows clear affinities to the European alliances *Phyllodoco-Vaccinion* and *Dicrano-Pinion.* On the basis of our Buryatian data, however, it is hardly possible to separate the *Calamagrostio-Pinetum* from the other *Hieracio umbellati-Pinion sylvestris* communities so we provisionally assign it to the *Hieracio-Pinion.*

SYNTAXONOMICAL SYNOPSIS

Vaccinio-Piceetea BR.-BL. in BR.-BL. et al. 1939
Vaccinio-Pinetalia sibiricae ZHITLUKHINA et ALIMBEKOVA 1987 ms. *ad interim*
Aconito rubicundi-Abietion sibiricae ANENKHONOV et CHYTRÝ 1998
Matteuccio struthiopteridis-Abietetum sibiricae ANENKHONOV et al. in ANENKHONOV et CHYTRÝ 1998
Calamagrostio langsdorffii-Populetum suaveolentis DANIHELKA et al. in ANENKHONOV et CHYTRÝ 1998
Cardamino macrophyllae-Abietetum sibiricae CHYTRÝ et al. in ANENKHONOV et CHYTRÝ 1998
Equiseto hyemalis-Abietetum sibiricae CHYTRÝ et al. in ANENKHONOV et CHYTRÝ 1998
? Alliance
Carici cinereae-Pinetum sylvestris CHYTRÝ et al. in ANENKHONOV et CHYTRÝ 1998
Pino sibiricae-Laricion sibiricae GUINOCHET ex DOSTÁLEK et al. 1988
Calamagrostio obtusatae-Abietetum sibiricae DANIHELKA et al. in ANENKHONOV et CHYTRÝ 1998
– *typicum* DANIHELKA et al. in ANENKHONOV et CHYTRÝ 1998
– *goodyeretosum repentis* ANENKHONOV et ÜNAL in ANENKHONOV et CHYTRÝ 1998
Calamagrostio obtusatae-Laricetum sibiricae CHYTRÝ et al. in ANENKHONOV et CHYTRÝ 1998
– *typicum* CHYTRÝ et al. in ANENKHONOV et CHYTRÝ 1998
– *goodyeretosum repentis* ANENKHONOV et ÜNAL in ANENKHONOV et CHYTRÝ 1998
Maianthemo bifolii-Pinetum sibiricae DANIHELKA et al. in ANENKHONOV et CHYTRÝ 1998
Vaccinio-Pinetalia pumilae SUZUKI 1964
Vaccinio-Pinion pumilae SUZUKI 1964
Festuco ovinae-Pinetum pumilae ANENKHONOV et al. in ANENKHONOV et CHYTRÝ 1998
Pleurozio schreberi-Pinetum pumilae CHYTRÝ et al. 1995
Pleurozio schreberi-Betuletum divaricatae ANENKHONOV et al. in ANENKHONOV et CHYTRÝ 1998

Cladonio stellaris-Laricion gmelinii ANENKHONOV et CHYTRÝ 1998
Artemisio commutatae-Laricetum gmelinii ANENKHONOV in ANENKHONOV et CHYTRÝ 1998
Calamagrostio lapponicae-Laricetum gmelinii ANENKHONOV in ANENKHONOV et CHYTRÝ 1998
Cladonio stellaris-Laricetum gmelinii ANENKHONOV et ÜNAL *ad interim*
– *pinetosum pumilae* ANENKHONOV et ÜNAL *ad interim*
– *typicum* ANENKHONOV et ÜNAL *ad interim*
Vaccinio uliginosi-Laricetum gmelinii ANENKHONOV in ANENKHONOV et CHYTRÝ 1998
Moehringio lateriflorae-Laricetum gmelinii ANENKHONOV in ANENKHONOV et CHYTRÝ 1998
Irido ruthenicae-Laricetea sibiricae ZHITLUKHINA et MIRKIN ex ERMAKOV 1995
Astero alpini-Laricetalia sibiricae ERMAKOV 1995
Hieracio umbellati-Pinion sylvestris ANENKHONOV et CHYTRÝ 1998
Spiraeo mediae-Pinetum sylvestris ANENKHONOV et ÜNAL in ANENKHONOV et CHYTRÝ 1998
Pinus pumila-Populus tremula community
Cypripedio guttati-Pinetum sylvestris ANENKHONOV et ÜNAL in ANENKHONOV et CHYTRÝ 1998
Calamagrostio epigei-Pinetum sylvestris ANENKHONOV et CHYTRÝ 1998
Vicio nervatae-Pinetum sylvestris ANENKHONOV et CHYTRÝ 1998
Scorzonero radiatae-Pinetum sylvestris ANENKHONOV et ÜNAL in ANENKHONOV et CHYTRÝ 1998
Incertae sedis
Padus asiatica-Pinus sibirica community

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Encl. Appendix pp. 47–75

APPENDIX

Descriptions of new syntaxa

New alliances

***Aconito rubicundi-Abietion sibiricae* ANENKHONOV et CHYTRÝ all. nova hoc loco**
Nomenclature type: *Equiseto hyemalis-Abietetum sibiricae* CHYTRÝ et al. in ANENKHONOV et CHYTRÝ 1998 (described in this paper)
Diagnostic species: *Abies sibirica*, *Aconitum rubicundum*, *Actaea erythrocarpa*, *Adoxa moschatellina*, *Aegopodium alpestre*, *Athyrium filix-femina*, *Cacalia hastata*, *Cardamine macrophylla*, *Dryopteris carthusiana*, *Lonicera pallasii*, *Milium effusum*, *Paris quadrifolia*, *P. verticillata*, *Ribes nigrum*, *Senecio nemorensis*, *Urtica dioica*, *Veratrum lobelianum*.

***Cladonio stellaris-Laricion gmelinii* ANENKHONOV et CHYTRÝ all. nova hoc loco**
Nomenclature type: *Vaccinio uliginosi-Laricetum gmelinii* ANENKHONOV in ANENKHONOV et CHYTRÝ 1998 (described in this paper)
Diagnostic species: *Betula divaricata*, *B. fruticosa*, *Calamagrostis lapponica*, *Carex globularis*, *Larix gmelinii*, *Pinus pumila*, *Rhytidium rugosum*.

***Hieracio umbellati-Pinion sylvestris* ANENKHONOV et CHYTRÝ all. nova hoc loco**
Nomenclature type: *Vicio nervatae-Pinetum sylvestris* ANENKHONOV et CHYTRÝ 1998 (described in this paper)
Diagnostic species: *Dendranthema zawadskii*, *Hieracium umbellatum*, *Lathyrus humilis*, *Maianthemum bifolium*, *Pinus pumila*, *Rhododendron dauricum*, *Silene repens*, *Spiraea media*, *Vaccinium vitis-idaea*.

New associations and subassociations

Matteuccio struthiopteridis-Abietetum sibiricae ANENKHONOV, ÜNAL, CHYTRÝ et DANIHELKA **ass. nova hoc loco**
Nomenclature type: CHYTRÝ et al. (1995): Tab. 5, rel. 4.

Calamagrostio langsdorffii-Populetum suaveolentis DANIHELKA, CHYTRÝ et ANENKHONOV **ass. nova hoc loco**
Nomenclature type: DANIHELKA & CHYTRÝ (1995): Append. 4, rel. 10.

Cardamino macrophyllae-Abietetum sibiricae CHYTRÝ, ANENKHONOV et VALACHOVIČ **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 2.

Equiseto hyemalis-Abietetum sibiricae CHYTRÝ, ANENKHONOV, DANIHELKA et ÜNAL **ass. nova hoc loco**
Nomenclature type: CHYTRÝ et al. (1995): Tab. 5, rel. 10.

Carici cinereae-Pinetum sylvestris CHYTRÝ, ANENKHONOV, DANIHELKA et ÜNAL **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 6.

Calamagrostio obtusatae-Abietetum sibiricae DANIHELKA, CHYTRÝ, ANENKHONOV et ÜNAL **ass. nova hoc loco**
Nomenclature type: DANIHELKA & CHYTRÝ (1995): Append. 4, rel. 16.

C. o.-A. s. typicum DANIHELKA, CHYTRÝ et ANENKHONOV **subass. nova hoc loco**
Nomenclature type: identical with the type of the association

C. o.-A. s. goodyeretosum repentis ANENKHONOV et ÜNAL **subass. nova hoc loco**
Nomenclature type: Dzelinda, lower part of the slope 2 km N of Dzelinda hot spring, 650 m a.s.l., area 100 m^2, aspect E, slope 15°, cover E_3 = 70%, E_2 = 15%, E_1 = 15%, E_0 = 50%, height E_3 = 21 m, E_2 = 1.7 m, 9 Aug 1996 (ANENKHONOV).
E_3: *Pinus sibirica* 3, *Picea obovata* 2b, *Abies sibirica* 2a, *Betula pendula* s.l. 1, *Larix gmelinii* +;
E_2: *Abies sibirica* 2a, *Pinus sibirica* 2a, *Betula pendula* s.l. 1, *Picea obovata* 1, *Duschekia fruticosa* 1, *Pinus pumila* 1, *Sorbus sibirica* +, *Salix caprea* r;

E_1: *Linnaea borealis* 2a, *Vaccinium myrtillus* 2a, *Diphasiastrum complanatum* 2m, *Lycopodium annotinum* 2m, *L. clavatum* 2m, *Maianthemum bifolium* 2m, *Orthilia secunda* 2m, *Vaccinium vitis-idaea* 2m, *Trientalis europaea* 1, *Calamagrostis obtusata* +, *Carex pallida* +, *Equisetum pratense* +, *E. sylvaticum* +, *Goodyera repens* r, *Rosa acicularis* 1, *Abies sibirica* juv. 1, *Sorbus sibirica* juv. 1, *Pinus sibirica* juv. +;
E_0: *Pleurozium schreberi* 3, *Hylocomium splendens* 2b, *Polytrichum commune* 2m, *Ptilium crista-castrensis* 2m, *Dicranum polysetum* 1.

Calamagrostio obtusatae-Laricetum sibiricae CHYTRÝ, ANENKHONOV, DANIHELKA, ÜNAL et VALACHOVIČ **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 10.

C. o.-L. s. typicum CHYTRÝ, ANENKHONOV, DANIHELKA et VALACHOVIČ **subass. nova hoc loco**
Nomenclature type: identical with the type of the association name.

C. o.-L. s. goodyeretosum repentis ANENKHONOV et ÜNAL **ass. nova hoc loco**
Nomenclature type: Dzelinda, hillside 1 km N of Dzelinda hot spring, 750 m a.s.l., area 100 m^2, aspect S, slope 20^o, cover E_3 = 60%, E_2 = 10%, E_1 = 30%, E_0 = 70%, height E_3 = 23 m, E_2 = 10 m, 6 Aug 1996 (ANENKHONOV & ÜNAL).
E_3: *Pinus sylvestris* 3, *Pinus sibirica* 2a, *Betula pendula* s.l. +, *Larix gmelinii* + ;
E_2: *Pinus sibirica* 2b, *Duschekia fruticosa* 2a, *Betula pendula* s.l. 1, *Pinus pumila* 1, *Sorbus sibirica* +, *Pinus sylvestris* +;
E_1: *Linnaea borealis* 2b, *Maianthemum bifolium* 2a, *Vaccinium vitis-idaea* 2a, *Orthilia secunda* 2m, *Calamagrostis langsdorffii* 1, *Goodyera repens* 1, *Pyrola chlorantha* 1, *Rosa acicularis* 1, *Atragene sibirica* +, *Diphasiastrum complanatum* +, *Pedicularis labradorica* +, *Viola* sp. +, *Pinus sibirica* juv. 2m, *Salix caprea* juv. r;
E_0: *Pleurozium schreberi* 4, *Ptilium crista-castrensis* 2a, *Dicranum polysetum* 2m, *Cladonia rangiferina* +, *Cladonia stellaris* +.

Maianthemo bifolii-Pinetum sibiricae DANIHELKA, ANENKHONOV, CHYTRÝ et PEŠOUT **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 24.

Festuco ovinae-Pinetum pumilae ANENKHONOV, VALACHOVIČ et CHYTRÝ **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 28.

Pleurozio schreberi-Betuletum divaricatae ANENKHONOV, CHYTRÝ, DANIHELKA, VALACHOVIČ et ÜNAL **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 43.

Artemisio commutatae-Laricetum gmelinii ANENKHONOV **ass. nova hoc loco**
Nomenclature type: Tsipa, sandy elevation ("*griva*") 3 km S of the Gorbylok river mouth, 1070 m a.s.l., area 400 m^2, cover E_3 = 35%, E_1 = 10%, E_0 = 20%, height E_3 = 10 m, 10 Jul 1989 (ANENKHONOV).
E_3: *Larix gmelinii* 3, *Pinus sylvestris* 2;
E_1: *Carex argunensis* 1, *Vaccinium vitis-idaea* 1, *Agrostis trinii* +, *Artemisia commutata* +, *Campanula rotundifolia* +, *Carex pediformis* s.l. +, *Poa botryoides* +, *Selaginella rupestris* +, *Silene repens* +;
E_0: *Cladonia arbuscula* 2, *C. rangiferina* 2, *Peltigera* sp. 1, *Cetraria islandica* +, *Polytrichum piliferum* +.

Calamagrostio lapponicae-Laricetum gmelinii ANENKHONOV **ass. nova hoc loco**
Nomenclature type: Tsipa, hillside N of Busani lake, 1200 m a.s.l., area 400 m^2, aspect S, slope 40^o, cover E_3 = 20%, E_2 = 40%, E_1 = 30%, height E_3 = 10 m, E_2 = 1.6 m, 24 Jun 1989 (ANENKHONOV).
E_3: *Larix gmelinii* 2;
E_2: *Rhododendron dauricum* 3;
E_1: *Carex argunensis* 2, *Vaccinium vitis-idaea* 1, *Artemisia tanacetifolia* +, *Astragalus propinquus* +, *Atragene ochotensis* +, *Calamagrostis lapponica* +, *Campanula rotundifolia* +, *Carex pediformis* s.l. +, *Poa botryoides* +, *Sanguisorba tenuifolia* +;
E_0: *Rhytidium rugosum* 4, *Cladonia arbuscula* 3, *C. rangiferina* 2.

Vaccinio uliginosi-Laricetum gmelinii ANENKHONOV **ass. nova hoc loco**
Nomenclature type: Tsipa, near Tret'yakovskie lakes, 1060 m a.s.l., area 400 m^2, E_3 = 20%, E_2 = 25%, E_1 = 60%, E_0 = 55%, height E_3 = 16 m, E_2 = 1.2 m, 13 Jul 1989 (ANENKHONOV).

E_3 : *Larix gmelinii* 3;
E_2 : *Betula divaricata* 1, *Salix divaricata* +;
E_1 : *Ledum decumbens* 4, *Vaccinium vitis-idaea* 3, *Carex globularis* 1, *Rosa acicularis* 1, *Vaccinium uliginosum* 1, *Bistorta alopecuroides* +, *Calamagrostis lapponica* +, *Campanula turczaninovii* +, *Equisetum pratense* +, *Rhododendron parvifolium* +, *Saussurea parviflora* +, *S. amurensis* r;
E_0 : *Cladonia arbuscula* 3, *Polytrichum commune* 3, *Aulacomnium palustre* 1, *Cladonia rangiferina* 1, *Cladonia* sp. 1, *Rhytidium rugosum* 1.

Moehringio lateriflorae-Laricetum gmelinii ANENKHONOV **ass. nova hoc loco**
Nomenclature type: Tsipa, forest near the Kavyktakan river in the middle part of its valley, 1100 m a.s.l., area 100 m^2, cover E_3 = 30%, E_2 = 15%, E_1 = 15%, E_0 = 90%, height E_3 = 12 m, E_2 = 2 m, 5 Aug 1992 (ANENKHONOV).
E_1: *Larix gmelinii* 4;
E_2: *Betula fruticosa* 2, *Salix bebbiana* 2, *Pentaphylloides fruticosa* r, *Salix rhamnifolia* r;
E_1: *Rosa acicularis* 1, *Calamagrostis langsdorffii* 1, *Pyrola incarnata* 1, *Vaccinium vitis-idaea* 1, *Aegopodium alpestre* +, *Carex globularis* +, *C. pallida* +, *Rubus arcticus* +, *Saussurea amurensis* +, *Moehringia lateriflora* r;
E_0: *Aulacomnium palustre* 5, *Hylocomium splendens* 2, *Peltigera aphthosa* 1, *Rhytidium rugosum* 1, *Polytrichum commune* +, *Tomenthypnum nitens* +

Spiraeo mediae-Pinetum sylvestris ANENKHONOV et ÜNAL **ass. nova hoc loco**
Nomenclature type: Dzelinda, the slope of terrace 4 km W of the railway station Istochnik Dzelinda, 600 m a.s.l., area 100 m^2, aspect E, slope 50°, cover E_3 = 55%, E_2 = 25%, E_1 = 15%, height E_3 = 21 m, E_2 = 2 m, 8 Jul 1996 (ANENKHONOV & ÜNAL).
E_3: *Pinus sylvestris* 3, *Betula pendula* s.l. 2a, *Larix gmelinii* 1;
E_2: *Betula pendula* s.l. 2a, *Rhododendron dauricum* 2a, *Pinus sibirica* 1, *Pinus sylvestris* 1, *Populus tremula* 1, *Spiraea media* 1, *Larix gmelinii* +, *Pinus pumila* +, *Swida alba* r;
E_1: *Artemisia tanacetifolia* 2a, *Lathyrus humilis* 2a, *Vaccinium vitis-idaea* 2a, *Carex* sp. 2m, *Equisetum pratense* 2m, *Linnaea borealis* 2m, *Maianthemum bifolium* 2m, *Calamagrostis epigeios* 1, *Rosa acicularis* 1, *Spiraea media* 1, *Equisetum hyemale* +, *E. scirpoides* +, *Hieracium* sp. +, *Pulsatilla patens* s.l. +, *Rubus arcticus* +, *Vicia cracca* +, *Viola* sp. +, *Pinus sibirica* juv. 1, *Rhododendron dauricum* juv. 1, *Populus tremula* juv. +.

Cypripedio guttati-Pinetum sylvestris ANENKHONOV et ÜNAL **ass. nova hoc loco**
Nomenclature type: Umkhei island, 600 m a.s.l., area 100 m^2, cover E_3 = 35%, E_2 = 5%, E_1 = 80%, E_0 = 40%, height E_3 = 30 m, E_2 = 2.5 m, 4 Jul 1996 (ÜNAL).
E_3: *Pinus sylvestris* 3, *Populus tremula* 1, *Larix gmelinii* +;
E_2: *Betula pendula* s.l. +, *Cotoneaster melanocarpus* +, *Pinus sylvestris* +, *Populus suaveolens* +, *Sorbus sibirica* +;
E_1: *Pyrola chlorantha* 2b, *P. incarnata* 2b, *Rubus saxatilis* 2a, *Equisetum pratense* 2a, *Carex* sp. 2m, *Equisetum hyemale* 2m, *Maianthemum bifolium* 2m, *Lathyrus humilis* 1, *Lupinaster pentaphyllus* 1, *Fragaria orientalis* 1, *Cypripedium guttatum* 1, *Vicia nervata* 1, *Hieracium umbellatum* +, *Rosa acicularis* +, *Orthilia secunda* 1, *Solidago dahurica* +, *Pinus sylvestris* juv. 2m, *Sorbus sibirica* juv. r;
E_0: *Rhytidium rugosum* 3.

Calamagrostio epigei-Pinetum sylvestris ANENKHONOV et CHYTRÝ **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 45.

Vicio nervatae-Pinetum sylvestris ANENKHONOV et CHYTRÝ **ass. nova hoc loco**
Nomenclature type: this paper, Tab. 1, rel. 54.

Scorzonero radiatae-Pinetum sylvestris ANENKHONOV et ÜNAL **ass. nova hoc loco**
Nomenclature type: Umkhei, second terrace of the Barguzin river 2.2 km W of Umkhei island, 650 m a.s.l., area 100 m^2, cover E_3 = 35%, E_2 = 40%, E_1 = 20%, E_0 = 1%, height E_3 = 30 m, E_2 = 1.5 m, 15 Jul 1996 (ANENKHONOV).
E_3: *Pinus sylvestris* 3, *Larix gmelinii* 2a;
E_2: *Rhododendron dauricum* 3;

E_1: *Artemisia tanacetifolia* 2a, *Vaccinium vitis-idaea* 2a, *Bromopsis inermis* 2m, *Dendranthema zawadskii* 2m, *Lathyrus humilis* 2m, *Pulsatilla patens* s.l. 2m, *Antennaria dioica* 1, *Carex pediformis* s.l. 1, *Lupinaster pentaphyllus* 1, *Scorzonera radiata* 1, *Aster alpinus* +, *Geranium eriostemon* +, *Vicia amoena* +, *Viola gmeliniana* +, *Pinus sylvestris* juv.1;
E_0: *Cladonia arbuscula* 1.

Syntaxonomical and nomenclatural notes

***Pino sibiricae-Laricion sibiricae* GUINOCHET ex DOSTÁLEK et al. 1988**

We emend this alliance by the exclusion of the Korean *Rhododendro aurei-Laricetum olgensis* DOSTÁLEK et al. 1988 and vegetation units distinguished by HILBIG & KNAPP (1983: Tab. 3) from the original diagnosis (cf. DOSTÁLEK et al. 1988). HILBIG & KNAPP's *Rhododendron dauricum-Larix sibirica* and *Anemone crinita-Larix sibirica* forests, and possibly also their *Cacalia hastata-Larix sibirica* forest are the *Irido-Laricetea* units. The emendated alliance has approximately the same contents as the ineffectively described alliance *Rhododendro daurici-Laricion sibiricae* ZHITLUKHINA et ALIMBEKOVA 1987 ms.

***Irido ruthenicae-Laricetea sibiricae* ZHITLUKHINA et MIRKIN ex ERMAKOV 1995**

This class was originally proposed in a manuscript by ZHITLUKHINA & MIRKIN (1987). ERMAKOV (1995a) elaborated a new syntaxonomical classification within this class and validly published the name *Irido-Laricetea sibiricae*, with the *Astero alpini-Laricetalia sibiricae* as a nomenclature type. Later (ERMAKOV 1997, SOLOMESHCH et al. 1997) a new name of this class, *Rhytidio rugosi-Laricetea sibiricae*, was introduced. However, the *Irido ruthenicae-Laricetea sibiricae* must be kept as the correct name for priority reasons (Art. 29 of the Code). We suggest completing the original form of the name "*Irido-Laricetea sibiricae*" (ERMAKOV 1995a) by the epitheton "*ruthenica*". It is clear that both ZHITLUKHINA & MIRKIN (1987) and ERMAKOV (1995a) meant *Iris ruthenica* ~~although~~ they did not mention the species epitheton, because in both papers it is the only *Iris* species present in the phytosociological tables and ZHITLUKHINA & MIRKIN (1987: 39) mention this species among the diagnostic species of the class.

Relevés used for the synthesis in Tab. 2

Matteuccio struthiopteridis-Abietetum sibiricae: 2 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 4–5, Bol'shoi Chivyrkui; 6 rels. by ANENKHONOV & ÜNAL (unpubl.), Dzelinda.

Calamagrostio langsdorffii-Populetum suaveolentis: 5 rels. in DANIHELKA & CHYTRÝ (1995): Append. 4, rel. 10–14, Bol'shaya Cheremshana; 2 rels. by CHYTRÝ, ANENKHONOV & DANIHELKA (unpubl.), Nesterikha.

Cardamino macrophyllae-Abietetum sibiricae: 4 rels. in this paper: Tab. 1, rel. 1–4, Svyatoi Nos; 3 rels. by VALACHOVIČ, ANENKHONOV & HODÁLOVÁ (unpubl.), Gremyachaya.

Equiseto hyemalis-Abietetum sibiricae: 8 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 6–13, Bol'shoj Chivyrkuj; 1 rel. by VALACHOVIČ, ANENKHONOV & HODÁLOVÁ (unpubl.), Gremyachaya; 9 rels. by ANENKHONOV & ÜNAL (unpubl.), Dzelinda.

Carici cinereae-Pinetum sylvestris: 4 rels. in this paper: Tab. 1, rel. 5–8, Svyatoi Nos; 5 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 14–18, Bol'shoi Chivyrkui; 1 rel. by ANENKHONOV & ÜNAL (unpubl.), Dzelinda.

Calamagrostio obtusatae-Abietetum sibiricae typicum: 3 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 19-21, Bol'shoi Chivyrkui; 11 rels. in DANIHELKA & CHYTRÝ (1995): Append. 4, rel. 15–25, Bol'shaya Cheremshana.

Calamagrostio obtusatae-Abietetum sibiricae goodyeretosum repentis: 14 rels. by ANENKHONOV & ÜNAL (unpubl.), Dzelinda.

Calamagrostio obtusatae-Laricetum sibiricae typicum: 14 rels. in this paper: Tab. 1, rel. 9–22, Svyatoi Nos; 5 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 22–26; 3 rels. by VALACHOVIČ, ANENKHONOV & HODÁLOVÁ (unpubl.), Gremyachaya; 1 rel. by CHYTRÝ, ANENKHONOV & DANIHELKA (unpubl.), Nesterikha.

Calamagrostio obtusatae-Laricetum sibiricae goodyeretosum repentis: 5 rels. by ANENKHONOV & ÜNAL (unpubl.), Dzelinda.

Maianthemo bifolii-Pinetum sibiricae: 2 rels. in this paper: Tab. 1, rel. 23–24, Svyatoi Nos; 4 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 30–33, Bol'shoi Chivyrkui; 6 rels. in DANIHELKA & CHYTRÝ (1995): Append. 4, rel. 26-31, Bol'shaya Cheremshana.

Festuco ovinae-Pinetum pumilae: 5 rels. in this paper: Tab. 1, rels. 25–29, Svyatoi Nos; 11 rels. by VALACHOVIČ, ANENKHONOV & HODÁLOVÁ (unpubl.), Gremyachaya.

Pleurozio schreberi-Pinetum pumilae: 13 rels. in this paper: Tab. 1, rels. 30–42, Svyatoi Nos; 9 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 34–42; 2 rels. by VALACHOVIČ, ANENKHONOV & HODÁLOVÁ (unpubl.), Gremyachaya.

Pleurozio schreberi-Betuletum divaricatae: 1 rel. in this paper: Tab. 1, rel. 43, Svyatoi Nos; 2 rels. by CHYTRÝ et al. (1995): Tab. 1, rel. 24–25; 1 rel. by VALACHOVIČ, ANENKHONOV & HODÁLOVÁ (unpubl.), Gremyachaya; 2 rels. by ANENKHONOV & ÜNAL (unpubl.), Dzelinda.

Artemisio commutatae-Laricetum gmelinii: 7 rels. by ANENKHONOV (unpubl.), Tsipa.

Calamagrostio lapponicae-Laricetum gmelinii: 8 rels. by ANENKHONOV (unpubl.), Tsipa.

Cladonio stellaris-Laricetum gmelinii pinetosum pumilae: 6 rels. by ANENKHONOV (unpubl.), Dzhirga; 4 rels. by ANENKHONOV & ÜNAL (unpubl.), Balan-Tomur.

Cladonio stellaris-Laricetum gmelinii typicum: 3 rels. by ANENKHONOV (unpubl.), Tsipa; 4 rels. by ANENKHONOV & ÜNAL (unpubl.), Balan-Tomur.

Vaccinio uliginosi-Laricetum gmelinii: 26 rels. by ANENKHONOV (unpubl.), Tsipa (22), China (2) and Tsipikan (2).

Moehringio lateriflorae-Laricetum gmelinii: 9 rels. by ANENKHONOV (unpubl.), Tsipa (8) and China (1).

Spiraeo mediae-Pinetum sylvestris: 3 rels. by ANENKHONOV & ÜNAL (unpubl.), Dzelinda.

Pinus pumila-Populus tremula community: 5 rels. by VALACHOVIČ, ANENKHONOV & HODÁLOVÁ (unpubl.), Gremyachaya.

Cypripedio guttati-Pinetum sylvestris: 11 rels. by ANENKHONOV & ÜNAL (unpubl.), Umkhei.

Calamagrostio epigei-Pinetum sylvestris: 8 rels. in this paper: Tab. 1, rel. 44–51, Svyatoi Nos.

Vicio nervatae-Pinetum sylvestris: 11 rels. in this paper: Tab. 1, rel. 52–62, Svyatoi Nos; 3 rels. in CHYTRÝ et al. (1995): Tab. 5, rel. 27–29, Bol'shoi Chivyrkui; 1 rel. by CHYTRÝ, ANENKHONOV & DANIHELKA (unpubl.), Nesterikha.

Scorzonero radiatae-Pinetum sylvestris: 10 rels. by ANENKHONOV & ÜNAL (unpubl.), Umkhei.

Padus asiatica-Pinus sibirica community: 6 rels. in this paper: Tab. 1, rels. 63–68, Svyatoi Nos.

Table 1

Forest and krummholz communities in the Svyatoi Nos Peninsula.

1–4 *Cardamino macrophyllae-Abietetum sibiricae*
5–8 *Carici cinereae-Pinetum sylvestris*
9–22 *Calamagrostio obtusatae-Laricetum sibiricae*
23–24 *Maianthemo bifolii-Pinetum sibiricae*
25–29 *Festuco ovinae-Pinetum pumilae*
30–42 *Pleurozio schreberi-Pinetum pumilae*
43 *Pleurozio schreberi-Betuletum divaricatae*
44–51 *Calamagrostio epigei-Pinetum sylvestris*
52–62 *Vicio nervatae-Pinetum sylvestris*
63–68 *Padus asiatica-Pinus sibirica* comm.

Relevé nr.	1234	5678	90123456789012	34	56789	0123456789012	3	45678901	23456789012	345678
			1111111111222	22	22222	3333333333444	4	44444455	55555555666	666666
E_3 – tree layer										
Cardamino macrophyllae-Abietetum sibiricae										
Abies sibirica	.422	....	..11.....3...	..	.....	.....	.	.....	.....	.....
Calamagrostio obtusatae-Laricetum sibiricae										
Larix sibirica	+...	..22	23332232332321	21	.....	.....	.	1	.2...12..11	.....
***Maianthemo bifolii-Pinetum sibiricae* and *Padus asiatica-Pinus sibirica* comm.**										
Pinus sibirica	....	...+	+..1.....3r.1	23	.....	.....	.	.....	.....	333233
Other species										
Pinus sylvestris	....	2322	3223432333.333	1.	.....	.....	.	44444444	22443344433	.3.3..
Betula pendula s.l.	41.1	.1+.	123..2..12...1	22	.....	.....	.	.11.....	1.....r1.	...1..
Populus tremula	1...	....	11....32.....2	..	.....	.....	.	.....	.....1.	.....
E_2 – shrub layer										
Cardamino macrophyllae-Abietetum sibiricae										
Lonicera pallasii	.222	....	...+..1.....	..	.....	.....	.	.....	.....	.....
Festuco ovinae-Pinetum pumilae										
Juniperus sibirica	....	....	.....	..	.+.12	.....	.	.....	.....	.....
Pleurozio schreberi-Betuletum divaricatae										
Betula divaricata	....	....	.....	..	.....	.....r.....2	5	.....	.....	.....
Vicio nervatae-Pinetum sylvestris										
Populus tremula	+...	....	+..11....+....	..	1+...	.....	.	.....	1+.+++2....	.....
***Padus asiatica-Pinus sibirica* comm.**										
Padus asiatica	....	....	.....	..	.....	.....	.	.....	.....	334323
Sorbus sibirica	+.+.	....	..+..+.1.++.++	..	..1..	.....	.	.....	+..+.....	222222
Cotoneaster melanocarpus	....	....	.....1.....	..	.....	.....	.	.....	.....	.112+2
Festuco ovinae-Pinetum pumilae* and *Pleurozio schreberi-Pinetum pumilae										
Pinus pumila	...2	....	.1.....21..2.	23	34452	5445545533555	+	31.....+	+..r22231..	1...+.
Other species										
Duschekia fruticosa	2131	...2	222.+.1.121133	..	21.1.	.2.....	.	....112.	1.321.231.1	.....
Rhododendron dauricum	+...	...+	2412433243+324	..	.....	.....	.	..3+2333	..211....12	.....
Betula pendula s.l.	1...	..22	+.2.1..31.221.	..	++2.1	.....	.	+...+.+.	+.+..21....	.....
Pinus sibirica	+.+.	..+.	...2++.1.1....	1.	.....	.....	.	1.11...1	.1+.....r+	.....
Pinus sylvestris	....	..3.	1...12..1.....	..	.....	.....	.	....2..1	12+11.....	.....
Salix caprea	1...	....	.1+.....	..	.....	.....	.	.....	..++.....	.....
Spiraea salicifolia	....	1..2	....++.....	..	.....	.....	.	..r.....	.....	.....
Spiraea media	....	....	...+...1.....	..	.....	.....	.	.....	r+.....2.	.....
Abies sibirica	+.1.	....	...2..+.....	..	.....	.....	.	.....	.....	.....
Rubus matsumuranus	....	....	..+.....+	..	1	.....	.	.....	.....+.....	.....
E_1 – field layer										
Cardamino macrophyllae-Abietetum sibiricae										
Aconitum rubicundum	122r	....	.+.r...+.....	..	.....	.....	.	.....	.....	.....
Cardamine macrophylla	22.3	....	.....	..	.....	.....	.	.....	.....	.....
Calamagrostis langsdorffii	.222	....	.....	..	.....	.....	.	.....	.....	.....
Saxifraga aestivalis	.+21	....	.....	..	.....	.....	.	.....	.....	.....
Angelica decurrens	.+11	....	.....	..	.....	.....	.	.....	.....	.....

Relevé nr.	1234	5678	1111111111222 90123456789012	22 34	22222 56789	3333333333444 0123456789012	4 3	44444455 45678901	55555555666 23456789012	666666 345678
Veratrum lobelianum	.+++	....	.....	..	.....	.....	.	.....	.....	.....
Anthriscus sylvestris	1..2	....	.....	..	.....	.....	.	.....	.....	.....
Chrysosplenium alternifolium	++..	....	.....	..	.....	.....	.	.....	.....	.....
Carici cinereae-Pinetum sylvestris										
Carex cinerea	....	4311	.....	..	.....	.....	.	.....	.....	.....
Calamagrostis neglecta	....	2212	.....	..	.....	.....	.	.....	.....	.....
Vaccinium uliginosum	....	1++2	.....	..	.....	.....	+	..1.....	.....	.....
Carex appendiculata	....	++++	.....	..	.....	.....	.	.....	.....	.....
Salix myrtilloides	....	+.+.	.....	..	.....	.....	.	.....	.....	.....
Carex capitata	....	.1.+	.....	..	.....	.....	.	.....	.....	.....
Chamaedaphne calyculata	....	..2+	.....	..	.....	.....	.	.....	.....	.....
Calamagrostio obtusatae-Laricetum sibiricae										
Calamagrostis obtusata	+.2.	....	+3221+1.21212.	..	.....	.....	.	.....+	..1.+.+....	.....
Pyrola incarnata	+...	....	1111..11r1121.	..	.....	.....	.	.....	.....+...+	.....
Rubus saxatilis	+...	....	+2..+1+1.r..1.	..	.....	.....	.	.....	.....1.	.....
Galium boreale	....	....	.+++.1.++++...	..	.....	.....	.	.....	.....+.	.....
Mitella nuda	....	....	+.+1+++1..2...	..	.....	.....	.	.....	.....	.....
Trientalis europaea	r...	...r	+.++...+++.++.	..	.....	.....	.	.....	.....	.....
Carex pediformis s.l.	....	....	.1.1.232++.+..	..	..+.2	.....	.	.....	+1.....	.....
Orthilia secunda	....	....	++r+.1+....+..	..	.....	.....	.	.....	..+...+....	.....
Aegopodium alpestre	....	....	r++...+1..1.+.	..	.....	.....	.	.....	.....	.....
Vicia venosa	....	....	.++..212...r..	..	.....	.....	.	.....	.....	.....
Diphasiastrum complanatum	....	....	.+.+1..+11..1.	..	.....	.....	.	.....	.....	.....
Lilium pilosiusculum	r...	....	.+.+.+.+rr..r.	..	.....	.....	.	.....	.....	.....
Calamagrostio epigei-Pinetum sylvestris										
Calamagrostis epigeios	....	.1..	.....	..	.....	.....	.	.11+2.1.	.....2+	11+...
Vicio nervatae-Pinetum sylvestris										
Pulsatilla patens s.l.	....	....	+...rr.....	..	...r.	.....	.	.....+..	++11++2+111	.....
Vicia nervata	....	....	.....+.....	..	.....	.....	.	.....	+++11+..11.	.....
Dendranthema zawadskii	....	....	.....+.....	..	.....	.....	.	.....	+1++++...++	.....
Antennaria dioica	....	....	.....	..	.+...	.....	.	..r...+.	+.1++.+r...	.....
***Padus asiatica-Pinus sibirica* comm.**										
Festuca baicalensis	....	....	.....	..	.....	.....	.	.....	.....	2.1111
Stellaria dichotoma	....	....	.....	..	.....	.....	.	.....	.....	+++11.
Polygonatum odoratum	....	....	.....	..	.....	.....	.	.....	.+.....	1+.1.1
Aconogonon ochreatum	....	....	.....	..	.r..+	.....	.	.....	.....	..+++r
Leymus littoralis	....	....	.....	..	.....	.....	.	.....	.....	.+.++.
Other species										
Vaccinium vitis-idaea	+...	..11	.1213+12221332	23	32322	23+2313.2+322	2	33332223	2.332233423	.....
Rosa acicularis	....	...+	++1++..+11+++1	11	1.112	.....	.	++++..++	r+.+..+..2.	111111
Ledum palustre s.l.	...+	..33	2113+.++33232.	2+	.....	2+22..3.3...2	.	1.+...2.	.....	.....
Maianthemum bifolium	++..	....	11111+12111121	.1	.....	.....	.	.1+.+1.1	1	.+.1.1
Bergenia crassifolia	++++	....	1+1++.+.+.3...	1.	21+3.	.21..++..2...	+	.....	.....11....	.....
Festuca ovina s.l.	...+	....	.....r.....+..	..	.1.11	+.....+....	+	121112++	+.1111.1+..	.+....
Linnaea borealis	.+1+	....	2.212r2+131221	1.	.....	.....	.	.....	.....+.	.....
Empetrum sibiricum s.l.	....	..++	.....	23	.....	..1.+311....2	2	3+22+.2+	.....	.....
Chamaenerion angustifolium	+..+	.1..	++2.+...++.r..	..	1+.1.	.....	.	.....r	.....+r....	..1...
Hieracium umbellatum	....	....	.....	..	.....	.....	.	..+++.+.	r.+1111r...	+.1+..
Arctostaphylos uva-ursi	....	....	.....	..	1..2.	.....	.	.....21+	1..+1..22.1	...+..
Sanguisorba officinalis	....	....	+...r..+...++r	..	.....	.....	.	.....	..+.....++	.....
Silene repens	....	....	.....	..	.....	.....	.	.....	++r+.+.....	++.++.
Equisetum pratense	2r.+	....	.1.....+.r....	..	.....	.....	.	.....	.....	.....
Solidago dahurica	.+..	....	.+..++.1...r..	..	.....	.....	.	.....	.....+.	.....
Carex ericetorum	....	....	.....	..	.....	.....	.	....++.+	..+.+++....	.....
Saxifraga bronchialis	....	....	.....	..	+r1..	.....	.	.....	r1..++.....	.....
Equisetum hyemale	....	..++	...+.....	..	.....	.....	.	..+.1.+.	.....	.....
Geranium bifolium	....	....	.+.+.1.+.....	..	.....	.....	.	.....	.....1r	.....

Relevé nr.	1234	5678	90123456789012	34	56789	0123456789012	3	45678901	23456789012	345678
			1111111111222	22	22222	3333333333444	4	44444455	55555555666	666666
Poa angustifolia	....	....	.....1+.....	..	+.+..	.....	.	.....	.1.....1.	.....
Campanula rotundifolia	....	....	.....	..	++...	.....	.	.r.....	r1.r.....	.....
Sorbus sibirica juv.	+..+	....	.....+.+.....	..	.....	.....	.	.....	.....	....2.
Aquilegia sibirica	..+.	....	.....++..r...	..	.....	.....	.	.....	.....+	.....
Pedicularis labradorica	....	...r	.....	.+	.....	.....	.	..+.+...	.....r....	.....
Scorzonera radiata	....	....	.....+.....	..	.....	.....	.	.....	....++...++	.....
Moehringia lateriflora	....	....	.....++..+.+.	..	.....	.....	.	.....	.....1.	.....
Lathyrus humilis	....	....	.....111.	..	.....	.....	.	.....	+.....1.	.....
Atragene sibirica	r.+.	....	.+.....+.....	..	.....	.....	.	.....	.....	.....
Thalictrum minus s.l.	+...	....	.....r...+.	..	.....	.....	.	.....	.+.....	.....
Milium effusum	.1..	....	.+.....++.....	..	.....	.....	.	.....	.....	.....
Poa sp.	..1.	....	.....+...+	..	.....	.....	.	.....	.....	....+
Hieracium ganeschinii	....	....	.....+.....+.	..	.....	.....	.	.....	r.....+....	.....
Pinus sylvestris juv.	....	....	.....+.....	..	.....	.....	.	....++..	.....+....	.....
Allium splendens	....	....	.....	..	..+..	.....	.	.....	r+.....	.r....
Calamagrostis korotkyi	....	....	.....	..	+.1..	.....	.	.....	.....r+..	.....
Rhododendron aureum	....	....	.....	..	.....	..2.....2.2	1	.....	.....	.....
Poa sibirica	2...	.r..	.....1.	..	.....	.....	.	.....	.....	.....
Trollius asiaticus s.l.	.+.+	....	.....+...	..	.....	.....	.	.....	.....	.....
Betula pendula s.l. juv.	....	.1..	.+.....	..	.....	.....	.	...+....	.....	.....
Luzula pallidula	....	.r..	.....	..	.....	.....	.	.r..+...	.....	.....
Cimicifuga foetida	....	....	+.....+.....	..	.....	.....	.	.....	.....1.	.....
Dactylorhiza fuchsii	....	....	.+r.....	..	.....	.....	.	....r...	.....	.....
Juniperus sibirica juv.	....	....	.r.....	..	..+..	.....	.	.....	.....r...	.....
Gymnocarpium dryopteris	....	....	..+1.....	..	.....	.....	.	.....	.....+.....	.....
Carex korshinskyi	....	....	.....3.....	..	.....	.....	.	.....	+2.....	.....
Padus asiatica juv.	....	....	.....+.....	..	.....	.....	.	.....	.....	...12.
Pinus sibirica juv.	....	....	.....r.+.....	..	.....	.....	.	....+...	.....	.....
Luzula pilosa	....	....	.....+.+..1..	..	.....	.....	.	.....	.....	.....
Spiraea media juv.	....	....	.....+.....	..	.....	.....	.	.....	....1+.....	.....
Viola sp.	....	....	.....+.....	..	.....	.....	.	.....	....+....r.	.....
Erysimum hieracifolium	....	....	.....	..	.....	.....	.	.....	.+.....	.rr...
Linaria acutiloba	....	....	.....	..	.....	.....	.	.....	.+.....	..r+..
Lupinaster pentaphyllus	....	....	.....	..	.....	.....	.	.....	..+1+.....	.....
Epipactis helleborine	....	....	.....	..	.....	.....	.	.....	..++..+....	.....
Selaginella rupestris	....	....	.....	..	.1+..	.....	.	.....	....1.....	.....
Artemisia lagocephala	....	....	.....	..	..+..	.....r.....	.	.....	....+.....	.....
Woodsia ilvensis	....	....	.....	..	.+...	.r.....+.....	.	.....	.....	.....
E_0 – ground layer										
Calamagrostio obtusatae-Laricetum sibiricae										
Ptilium crista-castrensis	....	....	12+.+.1..11111	.+	.....	1	.	.....	..2..1.....	....1.
Hylocomium splendens	+...	....	.....2..2.1+1	1.	.....	.....	.	.....	.....	.....
Pleurozio schreberi-Pinetum pumilae										
Cetraria cucullata	....	....	.....	..	.....	...23+1....+1	+	.....	.....	.....
Calamagrostio epigei-Pinetum sylvestris										
Cladonia arbuscula	....	...2	.....+....	..	.....	.....+.+...	.	+22.121+	.....	.+....
Cladonia cervicornis	....	....	.....	..	.....	.....	.	.r...+++	.....	.....
***Padus asiatica-Pinus sibirica* comm.**										
Sanionia uncinata	....	....	.....	..	.....	.....	.	.....	.....1.	.2+.+.
Pleurozio schreberi-Pinetum pumilae* and *Calamagrostio epigei-Pinetum sylvestris										
Cladonia stellaris	....	..11	+.....1..+..	..	...1.	1132.2311...3	+	112222.+	....1..1..r	.....
Cladonia rangiferina	....	..1.	.....+..1..	..	..+1.	+1221.2.1.1.2	1	+122.3.1	.....+.1...	.....
Other species										
Pleurozium schreberi	....	.232	323343..433451	25	...+.	34....2.4.1..	3	532.2123	..1..1.....	12+22.
Dicranum polysetum	....	.2.2	+1..+...11.11.	21	.....	..2.1.1.r....	.	+.222122	..1+.2.....	...22.
Polytrichum commune	....	.121	..2.....	1.	.....	.....+...2.1	3	.....	.....	.....
Cladonia amaurocraea	....	....	.+.....	..	.....	.1+.....1.	.	...22...	....21.....	.+....
Cetraria islandica	....	....	.....1.....	..	.....	+..1..1.....	1	..+.....	....1..+...	.....
Polytrichum piliferum	....	....	.....	..	...+.	.....	.	.r...+.+	+.....	.....

Relevé nr.	1234	5678	1111111111222 90123456789012	22 34	22222 56789	3333333333444 0123456789012	4 3	44444455 45678901	55555555666 23456789012	666666 345678
Ptilidium pulcherrimum	....	....	.+.....	..	.....	.+.....	.	.+.....	.....+...+.	....+.
Polytrichum juniperinum	....	....	..2.....+....	..	.....	.....	.	....1.++	.....	.....
Dicranum fuscescens	....	....	.....	..	.....	.+.....3..	.	.2.....	.....+.	.....
Cladonia pyxidata	....	....	.....	..	.2...	.++....r.....	.	.....	.....	.....
Cetraria nivalis	....	....	.....	..	..2..	+.....+..2.	.	.....	.....	.....
Ptilidium ciliare	....	....	.....	..	...+.	+.....r..+.	.	.....	.....	.....
Aulacomnium palustre	....	..1+	..1.....	..	.....	.....	.	.....	.....	.....
Peltigera malacea	....	...+	.....	..	.....	.....	.	.+...+..	.....	.....
Ceratodon purpureus	....	....	.....	..	.....	.....	.	.....	.....+....	1....+
Xanthoparmelia somloënsis	....	....	.....	..	1.1..	.....	.	.....	....1.....	.....
Alectoria ochroleuca	....	....	.....	..	.....	..+..2.....1.	.	.....	.....	.....

In one or two relevés only:

E_2: *Ribes nigrum* 1:1, 4:1, *Sambucus sibirica* 1:+, 15:1, *Rosa acicularis* 1:+, 57:+, *Larix sibirica*: 8:1, 9:+, *Crataegus sanguinea* 63:+, 64:+, *Rubus* sp. 1:+, *Ribes spicatum* 2:2, *Ribes fragrans* 3:2, *Cotoneaster tjuliniae* 10:+;

E_1: *Paris verticillata* 1:+, 12:r, *Aconitum rubicundum* 2:1, 11:r, *Thalictrum* sp. 3:+, 12:r, *Abies sibirica* juv. 4:1, 9:r, *Agrostis clavata* 6:+, 46:r, *Euphrasia stricta* 6:+, 50:+, *Pedicularis resupinata* 10:+, 19:+, *Lycopodium annotinum* 12:2, 16:+, *Rubus arcticus* 12:+, 21:1, *Viola brachysepala* 13:+, 17:+, *Goodyera repens* 13:r, 16: r, *Artemisia tanacetifolia* 17:r, 61:r, *Equisetum scirpoides* 18:1, 19:1, *Festuca* sp. 18:+, 19:+, *Viola uniflora* 19:+, 20:1, *Phlojodicarpus popovii* 25:+, 27:1, *Pulsatilla turczaninovii* 25:+, 27:+, *Astragalus propinquus* 27:+, 28:1, *Thymus* cf. *baicalensis* 27:+, 53:1, *Dianthus versicolor* 27:+, 53:+, *Youngia tenuifolia* 27:+, 56:+, *Trisetum agrostideum* 33:+, 43:+, *Sorbaria pallasii* 37:r, 39:1, *Larix sibirica* juv. 48:+, 49:r, *Dracocephalum nutans* 52:+, 53:+, *Androsace amurensis* 52:r, 53:+, *Veronica incana* 53:1, 55:r, *Hylotelephium* cf. *maximum* 53:+, 55:r, *Galium verum* 53:+, 67:+, *Dryopteris fragrans* 54:r, 57:+, *Dianthus superbus* 54:r, 57:+, *Pyrola chlorantha* 55:r, 57:+, *Carex reventa* 56:1, 59:1, *Pteridium aquilinum* 58:+, 29:1, *Elytrigia repens* 65:+, 66:1, *Aconogonon sericeum* 65:r, 66:+, *Urtica angustifolia* 1:1, *Myosotis nemorosa* 2:+, *Urtica dioica* 2:+, *Senecio nemorensis* 4:1, *Carex rostrata* 5:1, *Comarum palustre* 5:1, *Epilobium palustre* 5:+, *Eriophorum russeolum* 5:1, *Naumburgia thyrsiflora* 5:+, *Carex limosa* 6:+, *C. globularis* 7:1, *Iris ruthenica* 9:1, *Cypripedium guttatum* 10:r, *Epipogium aphyllum* 10:r, *Equisetum sylvaticum* 12:2, *Duschekia fruticosa* juv. 13:+, *Euphorbia* sp. 14:+, *Melica nutans* 14:+, *Lonicera pallasii* juv. 15:1, *Fragaria* sp. 15:+, *Pleurospermum uralense* 18:r, *Carex* sp. 19:1, *Asplenium septentrionale* 19:+, *Viola brachyceras* 19:+, *Euphorbia maackii* 20:r, *Bromopsis inermis* 21:+, *Actaea erythrocarpa* 22:+, *Cotoneaster* sp. 27:+, *Vaccinium myrtillus* 28:3, *Salix* sp. juv. 29:+, *Calamagrostis lapponica* 42:1, *Anemonastrum sibiricum* 43:r, *Corallorrhiza trifida* 46:+, *Rhododendron dauricum* juv. 51:1, *Hieracium* ×*robustum* 52:r, *Artemisia sericea* 53:2, *Cotoneaster melanocarpus* 53:1, *Orostachys spinosa* 53:1, *Alyssum obovatum* 53:+, *Campanula glomerata* 53:+, *Hieracium* sp. 53:+, *Papaver nudicaule* 53:+, *Phlomoides tuberosa* 53:+, *Sisymbrium heteromallum* 53:+, *Brachypodium pinnatum* 54:1, *Saussurea elongata* 61:+, *Thesium repens* 61:r, *Lappula squarrosa* 64:r, *Lathyrus pilosus* 65:r, *Isatis oblongata* 66:+;

E_0: *Calliergon* sp. 2:3, 4:2, *Bryum* sp. 4:2, 25:+, *Brachythecium salebrosum* 10:1, 68:+, *Dicranum muehlenbeckii* 33:2, 42:1, *Cetraria hiascens* 40:1, 42:1, *Pylaisiella polyantha* 61:1, 68:+, *Hypogymnia physodes* 61:+, 68:+, *Plagiomnium affine* 1:2, *P. cuspidatum* 2:1, *Sphagnum* sp. 4:1, *S. squarrosum* 5:2, *S. cuspidatum* 6:+, *Paludella squarrosa* 7:2, *Sphagnum capillifolium* 8:1, *Polytrichum strictum* 11:+, *Brachythecium starkei* 19:+, *Stereocaulon paschale* 28:1, *Cladonia cornuta* 28:+, *Cladonia coniocraea* 28:r, *Dicranum* sp. 30:1, *Cynodontium strumiferum* 31:1, *Cladonia botrytes* 31:+, *Sphenolobus saxicola* 31:+, *Tetralophozia setiformis* 32:1, *Cladonia deformis* 32:+, *Hypnum plicatulum* 33:1, *Lophozia ventricosa* 33:+, *Stereocaulon* sp. 35:+, *Cetraria* sp. 38:+, *Peltigera* sp. 39:+, *Umbilicaria* sp. 41:1, *Menegazzia terebrata* 41:+, *Nephroma arcticum* 41:+, *Vulpicida juniperinus* 41:+, *Dicranum spadiceum* 41:+, *Usnea* sp. 44:1, *Aulacomnium acuminatum* 48:1, *Parmelia sulcata* 61:+, *Hypogymnia bitteri* 61:+, *Cladonia squamosa* 61:+, *Orthotrichum rupestre* 61:+, *Evernia mesomorpha* 61:+, *Cnestrum glaucescens* 61:+, *Hedwigia ciliata* 61:r, *Dicranum bergeri* 61:r, *Usnea longissima* 61:r, *Physcia stellaris* 68:+, *Cladonia fimbriata* 68:+, *Bryum caespiticium* 68:+.

Header data of the relevés in Tab. 1

1 – relevé nr., 2 – area (m^2), 3 – aspect, 4 – slope (°), 5 – altitude (m a.s.l.), 6 – cover tree layer (%), 7 – cover shrub layer (%), 8 – cover field layer (%), 9 – cover ground layer (%), 10 – number of species, 11 – date, 12 – localities. Unless indicated otherwise, toponyms in locality field denote settlements.

1	2	3	4	5	6	7	8	9	10	11	12
1	200	S	5	640	80	30	90	10	36	1991/07/27	2.5 km NNE of Glinka
2	50	SW	5	1050	70	40	90	50	25	1991/08/08	6 km SE of Markov cape
3	75	W	5	1100	20	70	80	0	19	1991/08/08	6.5 km SE of Markov cape
4	75	WNW	5	1200	20	40	80	50	27	1991/08/13	8.5 km SSE of Markov cape
5	200	-	0	460	20	5	80	10	13	1991/08/05	4 km ESE of Glinka, El'zikha forest
6	200	-	0	460	50	5	70	50	19	1991/08/05	4 km ESE of Glinka, El'zikha forest
7	200	-	0	460	40	50	70	80	24	1991/08/05	3.5 km ESE of Glinka
8	200	-	0	460	40	50	80	80	15	1991/08/06	6 km SE of Glinka
9	400	-	0	470	60	20	40	50	33	1991/07/28	1 km W of Kulinoe
10	200	-	0	500	70	70	90	30	43	1991/08/04	0.8 km NE of Glinka
11	400	-	0	480	60	70	80	80	34	1991/08/17	0.5 km NE of Kordon
12	200	-	0	470	80	60	80	40	35	1991/08/18	0.5 km SW of Kordon
13	200	NW	5	480	70	70	80	70	29	1991/08/25	3 km NNE of Kulinoe
14	200	WNW	20	500	70	40	80	40	35	1991/08/01	NE margin of Monakhovo
15	200	E	5	550	80	50	70	15	31	1991/07/30	0.5 km N of Kurbulik
16	200	E	5	500	60	70	70	20	38	1991/08/02	1 km NNW of Katun'
17	200	-	0	480	70	80	90	80	33	1991/08/14	3 km WSW of Glinka
18	400	-	0	460	70	65	75	50	34	1991/08/14	2.5 km ENE of Makarov cape
19	400	N	5	510	80	20	90	20	32	1991/08/28	1.7 km WSW of Kurbulik cape
20	400	-	0	470	70	40	60	70	31	1991/08/24	2.5 km W of Kulinoe, near the Burtui bridge
21	400	-	0	480	60	50	80	90	31	1991/08/25	0.5 km NW of Glinka
22	400	NE	20	480	80	90	15	5	19	1991/08/28	2 km N of Kurbulik, Okun'ovaya bay
23	400	-	0	465	40	10	60	75	16	1992/06/25	near Orlovskii cape
24	400	-	0	459	50	30	70	80	13	1991/08/28	3 km W of Kurbulik cape, Krestovskaya bay
25	100	SW	30	1550	0	70	70	5	17	1991/08/07	4 km NW of Glinka
26	200	SE	50	1300	0	70	10	10	16	1991/08/08	7 km SE of Markov cape
27	150	W	25	1600	0	80	40	20	25	1991/08/11	4.4 km NW of Glinka
28	100	SW	20	1250	0	80	45	10	20	1991/08/13	6 km NW of Makarov cape
29	25	SW	15	900	0	20	40	0	11	1991/08/14	2.5 km NW of Makarov cape
30	100	NE	10	1700	0	70	25	50	11	1992/06/28	4.5 km of Makarov cape

31	100	NNW	35	1400	0	80	60	70	17	1991/08/07	3.5 km NW of Glinka
32	200	N	40	1450	0	70	40	70	14	1991/08/08	7.5 km SE of Markov cape
33	50	NW	15	1750	0	90	40	60	11	1991/08/12	5.5 km NW of Glinka
34	100	NW	5	1620	0	90	40	40	6	1991/08/12	4.8 km N of Makarov cape
35	100	E	45	1550	0	70	25	15	8	1991/08/14	3.5 km NW of Makarov cape
36	100	NNW	15	1400	0	80	70	90	13	1991/08/13	9km SSE of Markov cape
37	100	S	25	1450	0	90	5	5	8	1991/08/14	4 km NNW of Makarov cape
38	100	-	0	1750	0	90	25	90	11	1992/06/28	5.5 km NW of Glinka
39	100	SE	20	1750	0	75	15	5	7	1992/06/28	5.5 km NW of Glinka
40	100	-	0	1845	0	90	20	95	8	1991/08/12	5.7 km NW of Glinka
41	25	SW	3	1675	0	90	20	45	12	1991/08/12	4 km NW of Makarov cape
42	25	NE	15	1470	0	80	30	60	14	1991/08/13	6 km NW of Makarov cape
43	100	SSW	5	1750	0	80	40	90	16	1991/08/12	5.5 km NW of Glinka
44	400	-	0	458	60	40	70	60	15	1991/08/25	3.5 km ESE of Glinka, El'zikha forest
45	200	-	0	460	60	5	60	70	20	1991/07/30	5 km ESE of Glinka, El'zikha forest
46	200	-	0	460	60	40	60	60	25	1991/07/30	5 km ESE of Glinka, El'zikha forest
47	200	-	0	460	60	5	60	60	14	1991/08/05	4 km ESE of Glinka, El'zikha forest
48	200	-	0	460	60	50	40	70	26	1991/08/06	6 km SE of Glinka
49	200	-	0	460	70	40	50	60	19	1991/08/21	5 km NNW of the ferry in Ust'-Barguzin
50	200	-	0	460	70	60	70	30	20	1991/08/21	4.5 km NNW of the ferry in Ust'-Barguzin
51	200	-	0	460	80	60	60	60	24	1991/08/22	4 km N of the ferry in Ust'-Barguzin
52	400	SE	30	1100	40	15	30	1	30	1992/06/29	3.2 km NW of the mouth of the Makarov creek
53	100	SE	40	500	20	10	60	0	37	1991/08/02	1 km NE of Monahovo, Chivyrkuiskii bay coast
54	200	SSE	30	800	70	60	50	10	27	1991/08/07	2 km NW of Glinka
55	200	S	30	900	60	30	60	1	25	1991/08/07	2.2 km NW of Glinka
56	200	S	40	1000	50	40	40	30	29	1991/08/07	2.4 km NW of Glinka
57	200	S	45	1050	30	30	30	20	29	1991/08/07	2.5 km NW of Glinka
58	200	SE	20	1050	80	30	50	1	24	1991/08/08	6 km SE of Makarov cape
59	200	SSW	30	1050	70	70	60	10	15	1991/08/14	3 km NW of Makarov cape
60	400	SW	20	1100	70	10	40	0	10	1991/08/14	2.6 km NW of Makarov cape
61	400	SE	25	540	60	20	60	10	42	1991/08/27	1 km SW of Katun'
62	400	SE	10	530	50	20	40	0	17	1991/08/27	1 km NW of Monakhovo
63	50	-	0	460	30	70	40	5	14	1991/07/30	7 km SE of Glinka, Barguzinskii bay coast
64	50	-	0	460	60	50	10	40	21	1991/07/30	6 km SE of Glinka, Barguzinskii bay coast
65	50	-	0	460	30	80	15	1	18	1991/07/30	6 km SE of Glinka, Barguzinskii bay coast
66	50	-	0	460	40	60	20	30	22	1991/07/30	5 km SE of Glinka, Barguzinskii bay coast
67	40	-	0	460	50	50	30	40	19	1991/08/05	10 km SE of Glinka, Barguzinskii bay coast
68	400	-	0	457	40	85	10	15	18	1991/08/15	5 km SE of Glinka, Kedrovka forest

Table 2

Synoptic table of the forest and krummholz vegetation in Svyatoi Nos Peninsula and northern Buryatia. The numbers are percentage constancies. Species in one or two colums only with constancy < 15% or in 3 colums with constancy < 10% are not shown. The constancy for the ground layer was calculated separately, excluding the relevés in which cryptogams were not identified.

1 *Matteucio struthiopteridis-Abietetum sibiricae*
2 *Calamagrostio langsdorffii-Populetum suaveolentis*
3 *Cardamino macrophyllae-Abietetum sibiricae*
4 *Equiseto hyemalis-Abietetum sibiricae*
5 *Carici cinereae-Pinetum sylvestris*
6a *Calamagrostio obtusatae-Abietetum sibiricae typicum*
6b *C. o.-A. s. goodyeretosum repentis*
7a *Calamagrostio obtusatae-Laricetum sibiricae typicum*
7b *C. o.-L. s. goodyeretosum repentis*
8 *Maianthemo bifolii-Pinetum sibiricae*

Community	1	2	3	4	5	6a	6b	7a	7b	8
Nr. of relevés	8	7	7	18	10	14	14	23	5	12
Nr. of relevés (ground layer recorded)	7	7	5	16	10	14	14	23	5	12
E_3 – tree layer										
Matteucio struthiopteridis-Abietetum sibiricae										
Alnus sibirica	38	.	.	17	.	.	.	.	.	.
Calamagrostio langsdorffii-Populetum suaveolentis										
Populus suaveolens	.	100	.	6	10	.	.	.	.	.
Chosenia arbutifolia	.	71	.	.	.	.	.	.	.	.
Sorbus sibirica	.	57	.	6	.	7	.	.	.	.
Vaccinio-Pinetalia sibiricae										
Pinus sibirica	25	43	.	39	40	57	93	46	40	100
Abies sibirica	75	86	57	83	10	100	64	17	.	50
Picea obovata	50	.	.	50	50	7	64	.	20	.
Vaccinio-Pinetalia sibiricae* and *Hieracio umbellati-Pinion sylvestris										
Betula pendula s.l.	38	43	86	61	80	50	100	67	40	75
Populus tremula	75	14	29	39	.	36	50	38	.	.
***Pino sibiricae-Laricion sibiricae* and *Hieracio umbellati-Pinion sylvestris* (incl. *Carici cinereae-Pinetum sylvestris*)**										
Pinus sylvestris	13	14	.	11	60	14	21	96	100	58
Larix sibirica	.	.	14	.	40	43	.	88	.	33
Cladonio stellaris-Laricion gmelinii										
Larix gmelinii	.	.	.	.	.	.	36	.	60	.
E_2 – shrub layer										
Carici cinereae-Pinetum sylvestris										
Spiraea salicifolia	.	.	.	.	30	.	.	8	.	.
Moehringio lateriflorae-Laricetum gmelinii										
Salix bebbiana	.	.	.	.	.	.	.	.	.	.
Pentaphylloides fruticosa	.	.	.	.	.	.	.	.	.	.
Salix pyrolifolia	.	.	.	.	.	.	.	.	.	.
Salix rhamnifolia	.	.	.	.	.	.	.	.	.	.
Vaccinio uliginosi-Laricetum gmelinii* and *Moehringio lateriflorae-Laricetum gmelinii										
Betula fruticosa	.	.	.	.	.	.	.	.	.	.

9 *Festuco ovinae-Pinetum pumilae*
10 *Pleurozio schreberi-Pinetum pumilae*
11 *Pleurozio schreberi-Betuletum divaricatae*
12 *Artemisio commutatae-Laricetum gmelinii*
13 *Calamagrostio lapponicae-Laricetum gmelinii*
14a *Cladonio stellaris-Laricetum gmelinii pinetosum pumilae*
14b *C. s.-L. g. typicum*
15 *Vaccinio uliginosi-Laricetum gmelinii*
16 *Moehringio lateriflorae-Laricetum gmelinii*
17 *Spiraeo mediae-Pinetum sylvestris*
18 *Pinus pumila-Populus tremula* comm.
19 *Cypripedio guttati-Pinetum sylvestris*
20 *Calamagrostio epigei-Pinetum sylvestris*
21 *Vicio nervatae-Pinetum sylvestris*
22 *Scorzonero radiatae-Pinetum sylvestris*
23 *Padus asiatica-Pinus sibirica* comm.

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
16	24	6	7	8	10	7	26	9	3	5	11	8	15	10	6
11	23	5	7	8	7	6	19	9	3	5	11	8	15	10	6
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13	.	.	.	25	.	29	8	11	100	80	64	25	27	20	17
.	.	.	14	25	.	.	.	.	67	100	64	.	13	10	.
.	.	.	86	25	.	.	.	.	33	40	91	100	93	90	33
.	4	.	.	.	.	.	.	.	.	.	.	13	40	.	.
.	.	.	71	100	100	100	96	100	67	.	46	.	.	80	.
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Community	1	2	3	4	5	6a	6b	7a	7b	8
Spiraeo mediae-Pinetum sylvestris										
Populus tremula	50	.	29	39	.	21	43	29	20	.
Swida alba	.	.	.	6	.	.	.	.	.	.
Spiraea media	.	.	.	6	.	.	.	17	.	.
***Padus asiatica-Pinus sibirica* comm.**										
Padus asiatica	75	14	.	6	10	.	.	.	.	.
Cotoneaster melanocarpus	.	.	.	.	.	.	.	4	.	.
Crataegus sanguinea	.	.	.	.	.	.	.	.	.	.
Aconito rubicundi-Abietion sibiricae										
Lonicera pallasii	13	43	57	33	10	.	.	17	.	.
Ribes nigrum	.	29	43	28	.	.	.	.	.	.
Vaccinio-Pinetalia sibiricae										
Abies sibirica	38	71	29	78	50	93	100	33	.	25
Picea obovata	25	14	.	33	40	7	86	.	60	.
Vaccinio-Pinetalia sibiricae* and *Hieracio umbellati-Pinion sylvestris										
Betula pendula s.l.	.	14	43	33	80	50	86	46	100	58
Pinus sibirica	13	43	29	39	40	57	79	46	80	42
***Pino sibiricae-Laricion sibiricae* and *Hieracio umbellati-Pinion sylvestris* (incl. *Carici cinereae-Pinetum sylvestris*)**										
Pinus sylvestris	.	14	.	.	30	7	14	42	80	8
Vaccinio-Pinetalia pumilae										
Betula divaricata	.	.	.	.	.	.	.	.	.	.
Other species										
Duschekia fruticosa	13	71	86	17	20	64	50	79	60	.
Sorbus sibirica	50	43	29	72	20	43	79	50	40	.
Pinus pumila	.	.	14	17	10	29	64	38	80	67
Rhododendron dauricum	.	.	14	.	10	.	.	71	.	.
Larix gmelinii	.	.	.	.	.	.	7	.	20	.
Salix caprea	.	.	14	6	.	7	7	13	40	.
Juniperus sibirica	.	.	.	.	20	.	.	.	.	.
Salix rosmarinifolia	.	.	.	.	10	.	.	.	.	.
Salix abscondita	.	.	.	.	.	.	.	.	.	.
Larix sibirica	.	.	.	.	10	7	.	13	.	8
Salix sp.	.	.	.	.	.	.	.	.	.	.
Sorbaria sorbifolia	.	.	.	.	10	.	.	.	.	.
Alnus sibirica	13	.	.	17	.	.	21	.	.	.
Sambucus sibirica	.	.	14	11	.	7	.	8	.	8
Rubus matsumuranus	.	.	.	6	.	.	.	13	.	.
Betula exilis	.	.	.	.	.	.	.	.	.	.
E_1 – field layer										
Matteucio struthiopteridis-Abietetum sibiricae										
Matteuccia struthiopteris	88	29	.	6	.	.	.	.	.	.
Filipendula palmata	75	.	.	6	20	.	.	.	.	.
Circaea alpina	63	29	.	17	10	.	.	.	.	.
Pteridium aquilinum	50	.	.	6	.	.	7	.	.	.
Padus asiatica juv.	50	.	.	11	.	.	.	4	.	.
Phegopteris connectilis	38	.	.	28	.	.	14	.	.	.
Ribes spicatum juv.	38	.	14	11	10	.	.	.	.	.
Epilobium palustre	38	.	.	6	10	.	.	.	.	.
Crepis sibirica	38	.	.	.	.	.	.	.	.	.
Chelidonium majus	25	.	.	6	.	.	.	.	.	.

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
13	.	.	.	.	.	.	.	.	100	60	55	.	53	20	.
.	.	.	.	.	.	.	.	.	67	.	9	.	.	.	.
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31	4	.	.	13	.	.	4	11	100	20	64	38	40	50	.
.	.	.	.	.	.	.	.	.	67	.	9	50	33	.	.
6	.	.	.	.	.	.	.	.	100	20	55	25	53	30	.
50	13	100	.	.	70	43	46	.	.	40	.	.	.	.	.
69	4	17	.	.	20	14	15	.	.	40	9	38	53	10	.
6	.	17	.	13	10	.	.	.	33	20	36	.	13	.	100
100	100	83	.	25	100	43	.	.	33	100	.	38	47	.	33
.	.	.	57	88	.	.	12	.	33	.	.	75	40	60	.
.	4	.	.	.	30	43	15	33	33	.	18	.	.	10	.
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19	.	17	.	.	10	.	.	.	.	.	.	.	.	.	.
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Community	1	2	3	4	5	6a	6b	7a	7b	8
Cinna latifolia	25	.	.	6	.	.	.	.	.	.
Scutellaria galericulata	25	.	.	.	.	.	.	.	.	.
Pulmonaria mollis	25	.	.	.	.	.	.	.	.	.
Calamagrostio langsdorffii-Populetum suaveolentis										
Thalictrum minus s.l.	38	100	14	39	.	.	.	13	.	.
Anthriscus sylvestris	25	86	57	.	.	.	.	.	.	.
Moehringia lateriflora	.	86	14	28	30	.	.	17	.	.
Lamium album	13	71	.	.	.	.	.	.	.	.
Diplazium sibiricum	13	57	.	22	.	14	.	.	.	.
Poa palustris	13	57	.	.	10	.	14	.	.	.
Carex iljinii	.	43	.	6	.	14	.	.	.	33
Astragalus secundus	.	29	.	.	.	.	.	.	.	.
Aconitum longiracemosum	.	29	.	.	.	.	.	.	.	.
Lonicera pallasii juv.	.	29	.	11	10	7	.	4	.	.
Matteucio struthiopteridis-Abietetum sibiricae* and *Calamagrostio langsdorffii-Populetum suaveolentis										
Cacalia hastata	100	100	14	44	.	.	.	.	.	.
Senecio nemorensis	75	57	14	.	.	.	.	.	.	.
Cardamino macrophyllae-Abietetum sibiricae										
Angelica decurrens	.	57	86	.	.	.	.	.	.	.
Saxifraga aestivalis	.	.	86	11	.	.	.	.	.	.
Cardamine macrophylla	25	43	86	17	10	.	.	.	.	.
Chrysosplenium alternifolium	.	.	71	.	.	.	.	.	.	.
Caltha palustris	.	.	43	22	30	.	.	.	.	.
Aconitum ambiguum	.	.	29	.	.	.	.	.	.	.
Trollius asiaticus	.	.	29	.	.	.	.	4	.	.
Carici cinereae-Pinetum sylvestris										
Carex cinerea	.	.	.	.	60	.	.	.	.	.
Calamagrostis neglecta	.	.	.	.	40	.	.	.	.	.
Carex appendiculata	.	.	.	.	40	.	.	.	.	.
Smilacina trifolia	.	.	.	11	30	.	.	.	.	.
Carex capitata	.	.	.	.	20	.	.	.	.	.
Pedicularis resupinata	.	.	.	.	20	.	.	8	.	.
Poa sibirica	.	.	14	.	20	.	.	4	.	.
Calamagrostio obtusatae-Laricetum sibiricae typicum										
Luzula pilosa	.	.	.	6	.	.	7	25	.	.
Viola brachyceras	.	.	.	6	.	7	.	21	.	.
Calamagrostio obtusatae-Laricetum sibiricae goodyeretosum repentis										
Goodyera repens	.	.	.	.	.	.	57	8	80	.
Salix caprea juv.	.	.	.	.	.	7	.	4	20	.
Maianthemo bifolii-Pinetum sibiricae										
Anthoxanthum alpinum	.	.	.	.	.	.	.	.	.	33
Artemisio commutatae-Laricetum gmelinii										
Poa botryoides	.	.	.	.	.	.	.	.	.	.
Artemisia commutata	.	.	.	.	.	.	.	.	.	.
Carex argunensis	.	.	.	.	.	.	.	.	.	.
Agrostis trinii	.	.	.	.	.	.	.	.	.	.
Selaginella rupestris	.	.	.	.	.	.	.	.	.	.
Silene jeniseensis	.	.	.	.	.	.	.	.	.	.
Androsace septentrionalis	.	.	.	.	.	.	.	.	.	.
Rumex acetosella	.	.	.	.	.	.	.	.	.	.

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
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Community	1	2	3	4	5	6a	6b	7a	7b	8
Calamagrostio lapponicae-Laricetum gmelinii										
Calamagrostis lapponica	.	.	.	.	.	.	7	.	.	.
Astragalus propinquus	.	.	.	.	.	.	.	.	.	25
Cladonio stellaris-Laricetum gmelinii pinetosum pumilae										
Rhododendron aureum	.	.	.	.	.	.	.	.	.	.
Oxycoccus microcarpus	.	.	.	.	.	.	.	.	.	.
Hierochloë sp.	.	.	.	.	.	.	.	.	.	.
Cladonio stellaris-Laricetum gmelinii typicum										
Bistorta elliptica	.	.	.	.	.	.	.	.	.	.
Vaccinio uliginosi-Laricetum gmelinii										
Rhododendron parvifolium	.	.	.	.	.	.	.	.	.	.
Saussurea amurensis	.	.	.	.	.	.	.	.	.	.
Moehringio lateriflorae-Laricetum gmelinii										
Angelica tenuifolia	.	.	.	.	.	.	.	.	.	.
Trollius vicarius	.	.	.	.	.	.	.	.	.	.
Spiraeo mediae-Pinetum sylvestris										
Spiraea media juv.	13	.	.	6	.	.	.	4	.	.
Equisetum scirpoides	.	29	14	6	.	.	.	13	.	.
Rhododendron dauricum juv.	.	.	.	.	.	.	.	8	.	.
***Pinus pumila-Populus tremula* comm.**										
Chamaenerion angustifolium	13	57	43	33	20	21	.	46	20	.
Pedicularis labradorica	.	.	.	.	30	.	7	4	20	17
Pinus pumila juv.	.	.	.	.	.	7	14	8	20	.
Calamagrostis purpurea	.	.	.	.	.	.	.	.	.	.
Solidago dahurica	.	29	14	6	10	.	.	21	.	.
Hieracium ganeschinii	.	.	.	.	.	.	.	8	.	.
Hieracium ×robustum	.	.	.	.	.	.	.	.	.	.
Cypripedio guttati-Pinetum sylvestris										
Fragaria orientalis	25	.	.	6	.	.	.	.	.	.
Cypripedium guttatum	.	.	.	.	.	.	.	4	.	.
Ranunculus propinquus	.	.	.	.	10	.	.	.	.	.
Anemone sylvestris	.	.	.	.	.	.	.	.	.	.
Viola dactyloides	.	.	.	.	.	.	.	.	.	.
Thalictrum simplex	.	.	.	.	.	.	.	.	.	.
Brachypodium pinnatum	.	.	.	.	.	.	.	.	.	.
Achillea asiatica	.	.	.	.	.	.	.	.	.	.
Herminium monorchis	.	.	.	.	.	.	.	.	.	.
Festuca rubra	.	.	.	.	.	.	.	.	.	.
Thalictrum aquilegifolium	.	.	.	.	.	.	.	.	.	.
Phlomoides tuberosa	.	.	.	.	.	.	.	.	.	.
Carex delicata	.	.	.	.	.	.	.	.	.	.
Juncus arcticus	.	.	.	.	.	.	.	.	.	.
Sonchus arvensis	.	.	.	.	.	.	.	.	.	.
Aster sibiricus	.	.	.	.	.	.	.	.	.	.
Phragmites australis	.	.	.	.	.	.	.	.	.	.
Veronica longifolia	.	.	.	.	.	.	.	.	.	.
Cirsium esculentum	.	.	.	.	.	.	.	.	.	.
Valeriana transjenisensis	.	.	.	.	.	.	.	.	.	.
Astragalus kaufmannii	.	.	.	.	.	.	.	.	.	.
Calamagrostio epigei-Pinetum sylvestris										
Larix sibirica juv.	.	.	.	.	.	7	.	.	.	.

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
.	4	.	14	88	10	14	35	33	.	20	.	.	.	.	.
25	.	.	14	75	.	.	.	11	.	20	.	.	13	40	.
6	25	33	.	.	50	.	.	.	.	.	.	.	.	.	.
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38	8	17	43	50	10	.	4	56	33	100	9	13	33	20	17
.	.	17	.	13	20	29	4	33	.	80	9	25	7	.	.
44	.	.	.	.	.	.	.	.	.	80	.	.	.	10	.
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Community	1	2	3	4	5	6a	6b	7a	7b	8
Luzula pallidula	.	.	.	.	10	.	.	.	.	.
Vicio nervatae-Pinetum sylvestris										
Epipactis helleborine	.	.	.	.	.	.	.	.	.	.
Calamagrostio epigei-Pinetum sylvestris* comm. and *Vicio nervatae-Pinetum sylvestris										
Arctostaphylos uva-ursi	.	.	.	.	.	.	.	.	.	8
Carex ericetorum	.	.	.	.	.	.	.	.	.	.
Scorzonero radiatae-Pinetum sylvestris										
Scorzonera radiata	.	.	.	.	.	.	.	4	.	8
Aster alpinus	.	.	.	.	.	.	.	.	.	.
Sanguisorba officinalis	.	.	.	.	.	.	.	25	.	.
Bromopsis inermis	.	.	.	.	.	.	.	4	.	.
Vicia amoena	.	.	.	.	.	.	.	.	.	.
Artemisia sericea	.	.	.	.	.	.	.	.	.	.
Schizonepeta multifida	.	.	.	.	.	.	.	.	.	.
Stemmacantha uniflora	.	.	.	.	.	.	.	.	.	.
***Padus asiatica-Pinus sibirica* comm.**										
Festuca baicalensis	.	.	.	.	.	.	.	.	.	.
Stellaria dichotoma	.	.	.	.	.	.	.	.	.	.
Polygonatum odoratum	.	.	.	.	.	.	.	.	.	.
Leymus littoralis	.	.	.	.	.	.	.	.	.	.
Elytrigia repens	.	.	.	.	.	.	.	.	.	.
Linaria acutiloba	.	.	.	.	.	.	.	.	.	.
Aconogonon sericeum	.	.	.	.	.	.	.	.	.	.
Erysimum hieracifolium	.	.	.	.	.	.	.	.	.	.
Isatis oblongata	.	.	.	.	.	.	.	.	.	.
Lappula squarrosa	.	.	.	.	.	.	.	.	.	.
Aconito rubicundi-Abietion sibiricae										
Aconitum rubicundum	38	71	100	56	10	.	.	17	.	.
Paris verticillata	50	71	14	17	.	.	29	4	.	.
Milium effusum	50	29	29	22	.	.	.	13	.	.
Paris quadrifolia	38	14	14	56	10	.	21	.	.	.
Ribes nigrum juv.	38	14	29	28	.	.	14	4	.	.
Urtica dioica	63	57	43	.	.	.	.	.	.	.
Oxalis acetosella	38	71	.	56	10	.	14	.	.	.
Actaea erythrocarpa	25	14	.	17	.	.	.	4	.	.
Athyrium filix-femina	25	14	.	17	.	.	.	.	.	.
Dryopteris carthusiana	13	14	.	28	10	7	7	.	.	.
Adoxa moschatellina	25	14	.	6	.	.	.	.	.	.
Cirsium helenioides	13	.	14	11	.	.	.	.	.	.
Aconito rubicundi-Abietion sibiricae* and *Carici cinereae-Pinetum sylvestris										
Veratrum lobelianum	25	14	86	50	50	.	21	.	.	.
Aegopodium alpestre	25	71	29	28	40	7	.	33	.	.
Pino sibiricae-Laricion sibiricae										
Pinus sibirica juv.	13	.	.	6	20	21	71	13	100	.
Vaccinium myrtillus	.	.	.	6	10	36	36	13	40	33
Diphasiastrum complanatum	.	.	.	.	.	14	29	46	60	42
Orthilia secunda	.	.	.	11	.	36	79	42	100	8
Lycopodium clavatum	.	.	.	.	.	14	29	4	20	.
Vaccinio-Pinetalia sibiricae										
Calamagrostis langsdorffii	50	86	86	67	30	21	79	4	40	8
Abies sibirica juv.	38	29	14	28	10	36	64	13	20	.

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
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56	4	50	.	.	.	.	.	.	.	20	.	.	7	.	.
6	.	.	.	.	.	.	.	.	.	20	.	.	.	.	.
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.	4	17	.	.	.	.	.	.	.	.	.	.	.	.	.

Community	1	2	3	4	5	6a	6b	7a	7b	8
Equisetum pratense	38	71	86	83	30	7	79	13	.	8
Trientalis europaea	25	43	14	94	50	29	71	33	.	17
Sorbus sibirica juv.	13	.	29	33	10	29	57	17	20	8
Linnaea borealis	.	14	57	50	40	86	93	88	80	92
Mitella nuda	38	57	.	44	10	14	7	38	.	.
Lilium pilosiusculum	13	71	14	22	.	36	.	33	.	.
Lycopodium annotinum	13	.	.	22	.	29	43	13	.	33
Geranium albiflorum	.	.	14	33	20	14	14	4	.	.
***Vaccinio-Pinion pumilae* and *Padus asiatica-Pinus sibirica* comm.**										
Aconogonon ochreatum	.	.	.	.	.	.	.	.	.	.
Vaccinio-Pinion pumilae										
Anemonastrum sibiricum	.	.	.	.	.	.	.	.	.	.
Hieracio umbellati-Pinion sylvestris										
Pulsatilla patens s.l.	.	.	.	.	.	7	.	13	40	.
Lathyrus humilis	.	.	.	28	.	.	14	21	.	.
Hieracium umbellatum	.	.	.	6	.	.	.	.	.	.
Pinus sylvestris juv.	.	.	.	.	.	7	7	8	40	.
Dendranthema zawadskii	.	.	.	.	.	.	.	4	.	.
Lupinaster pentaphyllus	.	.	.	.	.	.	.	.	.	.
Vicia nervata	.	.	.	.	.	.	.	13	.	.
Bromopsis pumpelliana	.	.	.	.	.	.	.	.	.	.
Cotoneaster melanocarpus	.	.	.	.	.	.	.	.	.	.
Vaccinio-Pinetalia sibiricae* and *Hieracio umbellati-Pinion sylvestris										
Atragene sibirica	13	29	29	28	10	21	14	17	40	.
Calamagrostis obtusata	38	100	57	83	30	100	43	75	.	.
Gymnocarpium dryopteris	38	29	29	72	.	21	57	13	.	.
Vicia venosa	38	14	.	22	20	.	7	25	.	.
Populus tremula juv.	50	.	.	28	.	29	21	17	.	.
Pyrola incarnata	.	29	14	.	30	14	7	75	.	8
Rubus saxatilis	63	14	14	33	.	.	36	42	.	.
Equisetum hyemale	75	29	.	67	30	.	7	4	.	.
Vaccinio-Pinion pumilae* and *Hieracio umbellati-Pinion sylvestris										
Festuca ovina s.l.	.	.	14	.	10	7	.	17	.	58
Antennaria dioica	.	.	.	6	.	14	.	4	.	.
Vaccinio-Pinetalia pumilae* and *Hieracio umbellati-Pinion sylvestris										
Silene repens	.	.	.	.	.	.	.	.	.	.
Campanula rotundifolia	.	.	.	.	.	.	.	4	.	.
Pulsatilla turczaninovii	.	.	.	.	.	.	.	.	.	.
Other species										
Rosa acicularis	13	43	14	44	50	21	93	88	80	50
Vaccinium vitis-idaea	.	.	14	6	60	71	86	96	100	92
Maianthemum bifolium	38	86	43	83	20	36	79	96	60	75
Carex pediformis s.l.	25	71	.	17	.	64	.	58	20	.
Ledum palustre s.l.	.	.	14	.	60	14	.	58	40	83
Bergenia crassifolia	.	14	57	11	.	86	29	46	.	8
Viola sp.	63	.	.	11	.	.	7	13	20	.
Vaccinium uliginosum	.	.	.	.	80	.	.	.	20	50
Galium boreale	25	57	.	44	10	7	7	42	.	.
Carex globularis	.	.	.	6	60	.	36	.	20	8
Artemisia tanacetifolia	.	.	.	6	.	.	.	4	20	.
Carex sp.	50	.	.	11	.	.	7	4	20	.
Empetrum sibiricum s.l.	.	.	.	.	50	14	.	.	.	83

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
.	.	.	.	50	.	14	4	44	67	.	64	.	.	.	.
.	.	.	.	.	.	.	.	11	.	.	9	.	.	.	.
.	.	.	.	.	.	.	.	.	33	20	9	.	7	.	17
.	8	33	.	13	.	14	.	.	67	40	.	.	7	.	.
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69	13	17	.	.	10	.	.	.	.	.	.	.	.	.	67
44	4	33	.	.	.	.	.	.	.	.	.	.	.	.	.
13	.	.	.	.	.	.	.	.	67	40	9	13	73	80	.
.	.	.	.	13	.	.	.	11	100	.	64	.	27	100	.
13	.	.	.	.	.	.	.	.	.	40	46	50	53	10	50
.	.	.	.	.	.	.	.	.	.	20	64	25	7	80	.
6	.	.	.	.	.	.	.	.	.	40	27	.	67	60	.
.	.	.	.	25	.	.	8	.	.	.	73	.	27	60	.
.	.	.	.	.	.	.	.	.	.	.	55	.	67	30	.
.	.	.	.	.	.	.	.	.	.	.	36	.	7	20	.
.	.	.	.	.	.	.	.	.	.	.	9	.	7	20	.
.	.	.	.	.	.	.	.	.	67	.	46	.	.	20	.
.	17	.	.	.	.	.	.	.	.	20	9	13	20	.	.
.	.	.	.	.	.	.	.	.	.	20	.	.	13	.	.
.	.	.	.	.	.	.	.	11	33	.	27	.	13	20	.
19	.	.	.	.	.	.	.	.	67	80	27	.	.	10	.
.	.	.	.	.	.	14	.	11	33	.	64	.	13	10	.
.	.	.	.	.	.	.	.	.	67	.	82	.	7	.	.
.	.	.	.	.	.	.	.	.	67	.	55	38	.	.	.
81	17	83	.	.	.	.	4	.	.	100	18	100	47	10	17
25	.	33	.	.	.	.	.	.	.	20	.	25	47	40	.
19	.	.	71	13	.	.	.	11	33	60	27	.	40	10	67
69	4	33	57	13	10	.	.	.	.	60	.	13	20	.	.
13	.	.	57	13	.	.	.	.	.	.	36	.	.	40	.
31	4	.	29	38	10	29	8	78	100	.	64	75	67	60	100
100	88	83	71	100	100	86	73	33	67	100	18	100	87	70	.
13	.	.	57	50	.	.	4	.	100	40	73	63	7	20	50
31	.	.	71	13	10	.	.	.	36	60	18	.	33	50	.
.	54	17	.	38	70	86	92	22	.	.	.	38	.	.	.
75	33	83	.	.	20	.	.	.	.	60	.	.	13	.	.
.	.	.	.	25	.	.	4	.	67	20	18	.	13	10	.
.	4	50	14	38	50	57	89	11	.	.	.	13	.	.	.
.	.	.	.	.	.	.	.	.	67	.	82	.	13	10	.
.	4	.	.	13	20	43	69	67	.	.	.	.	.	.	.
.	.	.	14	75	.	.	8	22	67	.	73	.	13	100	.
.	.	.	.	.	10	.	.	11	33	.	18	.	.	10	.
.	38	33	.	.	40	14	4	.	.	.	.	88	.	.	.

Community	1	2	3	4	5	6a	6b	7a	7b	8
Rubus matsumuranus juv.	25	29	.	11	.	7	.	.	.	.
Betula pendula s.l. juv.	13	.	.	17	10	7	21	4	.	.
Carex pallida	.	.	.	22	20	14	43	.	.	.
Equisetum sylvaticum	25	.	.	28	30	.	50	4	.	17
Schizachne callosa	25	14	.	6	.	14	.	4	.	.
Rubus arcticus	.	.	.	22	50	.	36	8	.	.
Saussurea parviflora	.	14	.	6	10	.	.	.	.	.
Aquilegia sibirica	.	.	29	6	.	.	.	17	.	.
Pyrola chlorantha	.	.	.	.	.	.	21	4	40	.
Poa sp.	25	29	14	.	.	.	.	8	.	.
Melica nutans	25	.	.	22	.	.	7	13	.	.
Equisetum arvense	.	14	.	6	10	.	.	.	.	.
Geranium vlassowianum	.	14	.	.	10	.	.	4	.	.
Hieracium sp.	.	14	.	.	.	.	.	.	.	.
Vicia cracca	.	.	.	6	30	.	.	.	.	.
Dactylorhiza fuchsii	.	.	.	6	.	.	7	8	.	.
Calamagrostis epigeios	.	.	.	.	10	.	.	.	.	.
Juniperus sibirica juv.	.	.	.	.	.	.	.	4	.	.
Dianthus superbus	.	.	.	.	.	.	.	.	.	.
Calamagrostis korotkyi	.	.	.	.	.	.	.	.	.	.
Betula divaricata juv.	.	.	.	.	.	.	.	.	.	.
Viola uniflora	25	.	.	11	.	21	.	17	.	.
Pleurospermum uralense	13	14	.	.	.	.	.	4	.	.
Viola sacchalinensis	13	14	.	.	.	.	.	8	.	.
Equisetum palustre	.	.	14	6	20	.	.	.	.	.
Swida alba juv.	.	.	.	6	10	.	.	.	.	.
Youngia tenuifolia	.	.	.	.	.	.	.	.	.	.
Salix sp. juv.	.	.	.	.	.	.	.	.	.	.
Campanula turczaninovii	.	.	.	.	.	.	.	.	.	.
Alnus sibirica juv.	25	.	.	11	.	.	7	.	.	.
Myosotis cespitosa	13	.	29	.	20	.	.	.	.	.
Poa pratensis	.	14	.	.	10	.	.	.	.	.
Thalictrum sp.	.	.	14	6	.	.	.	4	.	.
Picea obovata juv.	.	.	.	6	.	.	14	.	20	.
Geranium eriostemon	.	.	.	6	.	.	.	.	.	.
Salix myrtilloides	.	.	.	.	20	.	.	.	.	.
Geranium bifolium	.	.	.	.	10	.	.	17	.	.
Lathyrus pilosus	.	.	.	.	10	.	.	.	.	.
Taraxacum macilentum	.	.	.	.	.	.	.	.	.	.
Poa angustifolia	.	.	.	.	.	.	.	8	.	.
Larix gmelinii juv.	.	.	.	.	.	.	.	.	20	.
Astragalus sp.	.	.	.	.	.	.	.	.	.	.
Galium verum	.	.	.	.	.	.	.	.	.	.
Calamagrostis sp.	.	.	.	.	.	.	.	.	.	.
Bistorta vivipara	.	.	.	.	.	.	.	.	.	.
Allium splendens	.	.	.	.	.	.	.	.	.	.
Thymus serpyllum	.	.	.	.	.	.	.	.	.	.
Oxytropis sp.	.	.	.	.	.	.	.	.	.	.
Carex sp.	.	.	.	.	.	.	.	.	.	.
Chamaedaphne calyculata	.	.	.	.	20	.	.	.	.	.
Elymus caninus	.	14	.	.	.	.	.	.	.	.
Sorbaria sorbifolia juv.	.	.	14	.	.	.	.	.	.	.
Viola gmeliniana	.	.	.	.	.	.	.	.	.	.
Saxifraga bronchialis	.	.	.	.	.	.	.	.	.	.
Galium triflorum	13	.	.	17	.	.	.	.	.	.
Hedysarum alpinum	.	.	.	.	.	.	.	.	.	.

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
.	4	.	.	.	.	.	.	.	33	.	9	.	7	10	.
.	4	.	.	.	.	.	.	.	.	.	9	13	.	.	.
.	.	17	.	.	30	.	23	22	.	.	.	.	.	.	.
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.	.	.	.	.	.	.	8	56	67	.	.	.	.	.	.
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.	.	17	.	.	.	.	.	.	33	.	18	.	7	.	.
.	.	.	.	.	.	.	.	.	33	.	46	.	.	10	.
.	.	.	.	.	.	.	.	.	.	.	18	13	.	.	.
.	.	.	.	.	.	.	.	.	67	.	.	63	13	.	50
6	4	17	.	.	.	.	.	.	.	.	.	.	13	.	.
19	.	.	14	.	.	.	4	.	.	20	.	.	13	.	.
19	.	.	.	.	20	29	.	.	.	.	.	.	13	20	.
13	4	17	.	.	.	14	4	.	.	.	.	.	.	.	.
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6	.	.	.	.	.	.	.	.	.	.	9	.	7	10	.
6	.	.	.	.	10	.	4	.	.	.	9	.	.	.	.
.	.	.	.	13	.	.	8	11	.	.	9	.	.	.	.
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13	.	.	.	.	.	.	.	.	.	.	.	.	13	.	.
.	.	.	.	.	.	14	.	.	.	.	.	.	.	30	.
6	.	.	.	.	.	.	.	.	.	20	18	.	.	.	.
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6	.	17	.	.	.	.	.	.	.	.	9	.	.	.	.
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6	.	.	.	.	.	.	.	.	.	.	.	.	20	.	17
6	.	.	.	.	.	.	.	.	.	.	.	.	7	10	.
.	.	.	.	.	.	.	.	.	.	.	18	.	.	10	.
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Community	1	2	3	4	5	6a	6b	7a	7b	8
Salix krylovii	.	.	.	.	.	.	.	.	.	.
Trisetum agrostideum	.	.	.	.	.	.	.	.	.	.
Astragalus saralensis	.	.	.	.	.	.	.	.	.	.
E_0 – ground layer										
Calamagrostio langsdorffii-Populetum suaveolentis										
Plagiomnium cuspidatum	.	43	20	.	.	.	.	.	.	.
Plagiomnium undulatum	.	29	.	.	.	.	.	.	.	.
Cardamino macrophyllae-Abietetum sibiricae										
Calliergon sp.	.	.	40	.	.	.	.	.	.	.
Carici cinereae-Pinetum sylvestris										
Aulacomnium palustre	.	.	.	6	40	.	.	8	.	.
Sphagnum squarrosum	.	.	.	.	20	.	.	.	.	.
Sphagnum capillifolium	.	.	.	.	20	.	.	.	.	.
Calamagrostio obtusatae-Abietetum sibiricae typicum										
Barbilophozia barbata	.	.	.	.	.	21	.	.	.	.
Dicranum elongatum	.	.	.	.	.	21	.	.	.	8
Festuco ovinae-Pinetum pumilae										
Stereocaulon sp.	.	.	.	.	.	.	.	.	.	.
Pleurozio schreberi-Betuletum divaricatae										
Brachythecium mildeanum	.	.	.	.	.	.	.	.	.	.
Cladonia arbuscula subsp. *mitis*	.	.	.	.	.	.	.	.	.	.
Artemisio commutatae-Laricetum gmelinii										
Stereocaulon paschale	.	.	.	.	.	.	.	.	.	.
Cladonio stellaris-Laricetum gmelinii pinetosum pumilae										
Cetraria cucullata	.	.	.	.	.	.	.	.	.	8
Cladonio stellaris-Laricetum gmelinii typicum										
Aulacomnium turgidum	.	.	.	.	.	.	.	.	.	.
Ptilidium ciliare	.	.	.	.	.	.	.	.	.	.
***Pinus pumila-Populus tremula* comm.**										
Dicranum bergeri	.	.	.	.	.	.	.	.	.	.
Brachythecium reflexum	.	.	.	13	.	.	.	.	.	.
Cladonia foliacea	.	.	.	.	.	.	.	.	.	.
Orthodicranum montanum	.	.	.	.	.	.	.	.	.	.
Calamagrostio epigei-Pinetum sylvestris										
Cladonia cervicornis	.	.	.	.	.	.	.	.	.	.
Peltigera malacea	.	.	.	.	10	.	.	.	.	.
***Padus asiatica-Pinus sibirica* comm.**										
Bryum caespiticium	.	.	.	.	.	.	.	.	.	.
Brachythecium salebrosum	.	.	.	.	.	.	.	4	.	.
Cladonia fimbriata	.	.	.	.	.	.	.	.	.	.
Physcia stellaris	.	.	.	.	.	.	.	.	.	.
Aconito rubicundi-Abietion sibiricae										
Rhytidiadelphus triquetrus	29	14	.	31	.	.	7	.	.	.
Pino sibiricae-Laricion sibiricae										
Ptilium crista-castrensis	.	.	.	19	.	57	57	63	40	42

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
.	.	17	.	.	.	.	.	.	.	.	.	.	.	.	.
.	4	17	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	17	.	.	.	.	.	.	.	.	.	.	.	.	.
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18	.	.	[43]	.	.	.	5	11	.	.	.	.	.	.	.
.	26	20	.	.	[71]	33	5	.	.	.	.	.	.	.	.
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9	17	.	.	.	.	[33]	.	.	.	.	.	.	7	10	.
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.	9	.	.	13	14	33	.	.	.	20	.	.	20	.	17

Community	1	2	3	4	5	6a	6b	7a	7b	8
Cladonio stellaris-Laricion gmelinii										
Rhytidium rugosum	.	.	.	.	.	.	.	.	.	.
Vaccinio-Pinetalia sibiricae										
Hylocomium splendens	14	14	20	31	10	43	57	33	.	25
Vaccinio-Pinetalia pumilae* and *Hieracio umbellati-Pinion										
Cetraria islandica	.	.	.	.	.	.	.	4	.	.
Polytrichum piliferum	.	.	.	.	.	7	.	.	.	8
Other species										
Pleurozium schreberi	.	29	.	50	70	86	79	83	80	100
Cladonia rangiferina	.	.	.	.	20	21	14	21	60	58
Dicranum polysetum	.	.	.	6	40	50	50	54	80	83
Cladonia arbuscula	.	.	.	.	10	.	.	8	20	.
Cladonia stellaris	.	.	.	.	30	.	.	25	60	42
Polytrichum commune	.	.	.	.	70	14	43	4	40	58
Sanionia uncinata	.	14	.	25	10	57	.	.	.	8
Peltigera aphthosa	.	.	.	.	.	7	7	4	20	8
Polytrichum juniperinum	.	14	.	13	.	7	.	13	.	.
Dicranum sp.	.	.	.	.	.	29	14	.	.	8
Abietinella abietina	.	29	.	6	30	.	7	.	.	.
Cladonia sp.	.	.	.	.	.	.	.	8	.	.
Peltigera sp.	.	.	.	.	.	.	.	4	.	.
Ptilidium pulcherrimum	.	.	.	6	.	.	.	4	.	.
Ceratodon purpureus	.	.	.	6	.	7	.	.	.	8
Dicranum scoparium	.	.	.	6	10	7	.	.	.	.
Peltigera canina	.	.	.	.	.	.	14	.	20	.
Cladonia amaurocraea	.	.	.	.	.	.	.	4	.	.
Cetraria sp.	.	.	.	.	.	.	.	4	.	.
Cladonia pyxidata	.	.	.	.	.	.	.	.	.	8
Polytrichum sp.	.	.	.	.	.	.	.	.	.	.
Sphagnum sp.	.	.	20	.	.	.	.	.	.	.
Pohlia nutans	.	.	.	13	.	.	.	.	.	8
Dicranum fuscescens	.	.	.	13	.	.	.	.	.	.
Cladonia gracilis	.	.	.	.	10	7	.	4	.	17
Stereocaulon alpinum	.	.	.	.	.	.	.	.	.	8
Cetraria nivalis	.	.	.	.	.	.	.	.	.	.
Calliergon stramineum	14	.	20	.	20	.	.	.	.	.
Plagiomnium medium	14	.	.	6	.	.	.	.	.	.
Brachythecium erythrorrhizon	.	14	.	6	10	.	.	.	.	.
Pylaisiella polyantha	.	14	.	.	.	.	.	.	.	.
Rhizomnium pseudopunctatum	.	.	20	6	10	.	.	.	.	.
Bryum sp.	.	.	20	.	.	.	.	.	.	8
Hypogymnia physodes	.	.	.	.	10	.	.	.	.	.
Alectoria ochroleuca	.	.	.	.	.	.	.	.	.	.
Ptilidium sp.	.	.	20	.	.	.	7	.	.	.
Tomenthypnum nitens	.	.	.	.	.	.	.	.	.	.
Xanthoparmelia somloënsis	.	.	.	.	.	.	.	.	.	.

9	10	11	12	13	14a	14b	15	16	17	18	19	20	21	22	23
.	.	.	57	63	14	50	26	89	.	.	36	.	7	50	.
.	4	20	.	.	14	.	.	33	.	.	.	.	.	10	.
9	17	40	43	.	57	50	16	.	.	.	.	13	13	10	.
46	.	20	43	13	.	.	.	.	.	20	.	38	13	.	.
27	65	80	.	13	71	33	5	.	.	80	.	88	13	10	83
46	70	60	86	63	100	100	79	11	.	40	.	75	20	20	.
9	17	.	.	.	.	17	5	.	.	20	.	88	27	10	33
27	17	20	86	63	71	83	79	22	.	.	9	88	.	30	17
27	65	40	14	.	100	100	37	.	.	.	.	88	20	10	.
9	22	60	.	.	.	33	32	22	.	.	.	.	.	.	.
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.	.	20	.	.	.	.	16	33	.	.	9	.	.	10	.
.	4	40	.	.	.	.	5	.	.	40	.	38	.	.	.
.	9	.	.	.	29	17	5	44	.	.	.	.	.	.	.
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45	.	20	14	.	.	50	21	.	.	40	.	.	.	.	.
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9	22	20	.	.	.	.	.	.	.	.	.	.	7	.	.
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