



Vegetation of the surroundings of the scientific research station “Kytalyk” (northeastern Yakutia, Russia)

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ABSTRACT

The surroundings of the Kytalyk research station in the Yana-Indigirka Lowland are characterized by low coenotic diversity determined by the relief of the area. Eight associations and 2 subassociations have been identified, of which 4 associations and 1 subassociation are described for the first time. Among them, 2 associations (*Cladonio amaurocraeae*–*Betuletum exilis* Khitun **ass. nov.**, *Peltigero scabrosae*–*Eriophoretum vaginati* Khitun **ass. nov.**) and the subassociation *Carici arctisibiricae*–*Hylocomietum alaskani luzuletosum tundricolae* Khitun **subass. nov.** are assigned to the recently validated class of zonal vegetation *Carici arctisibiricae*–*Hylocomietea alaskani* Matveyeva et Lavrinenko 2023. The association *Leptobryo pyriformis*–*Arctagrostietum arundinaceae* Khitun **ass. nov.** is included in the class of anthropogenic vegetation *Matricario*–*Poetea arcticae* A. Ishbirdin in Sumina 2012. The association *Eriophoro angustifolii*–*Sphagnetum obtusi* Khitun **ass. nov.** is placed in the mire class *Scheuchzerio palustris*–*Caricetea fuscae* Tx. 1937. A provisional association, *Ranunculo affinis*–*Dryadetum punctatae* Khitun **ass. prov.** has not yet been assigned to any class, another provisional association *Bryo pseudotriquetri*–*Caricetum stantis* Khitun **ass. prov.** and subassociation *Meesio triquetris*–*Caricetum stantis triglochinetosum maritimi* Khitun **subass. prov.** are assigned to the class *Scheuchzerio palustris*–*Caricetea fuscae*. Additionally, 5 communities have been described.

Keywords: Kytalyk, syntaxonomy, northeastern Yakutia, southern hypoarctic tundra, subzone E, meadows, mires, tundra

РЕЗЮМЕ

Телятников М.Ю., Хитун О.В., Чернядьева И.В., Кузьмина Е.Ю., Урбанавичене И.Н., Королева Т.М., Итуррате-Гарсия М., Землянский В., Шапман-Штруб Г. Растительность окрестностей исследовательской станции «Кыталык» (Северо-Восточная Якутия, Россия). Окрестности исследовательской станции Кыталык в Яно-Индигирской низменности характеризуются низким ценотическим разнообразием, обусловленным рельефом территории. Выделено 8 ассоциаций, 2 субассоциаций, из которых 4 ассоциации и 1 субассоциация описаны впервые. Из них 2 ассоциации (*Cladonio amaurocraeae*–*Betuletum exilis* Khitun **ass. nov.**, *Peltigero scabrosae*–*Eriophoretum vaginati* Khitun **ass. nov.**) и субасс. *Carici arctisibiricae*–*Hylocomietum alaskani* Matveyeva 1994 *luzuletosum tundricolae* Khitun **subass. nov.**) отнесены к недавно валидизированному классу зональной растительности *Carici arctisibiricae*–*Hylocomietea alaskani* Matveyeva et Lavrinenko 2023. Ассоциация *Leptobryo pyriformis*–*Arctagrostietum arundinaceae* Khitun **ass. nov.** включена в класс антропогенной растительности *Matricario*–*Poetea arcticae* A. Ishbirdin in Sumina 2012. Ассоциация *Eriophoro angustifolii*–*Sphagnetum obtusi* Khitun **ass. nov.** помещена в болотный класс *Scheuchzerio palustris*–*Caricetea fuscae* Tx. 1937. Предварительно выделены: ассоциация *Ranunculo affinis*–*Dryadetum punctatae* Khitun **ass. prov.**, она пока не отнесена к какому-либо классу; ассоциация *Bryo pseudotriquetri*–*Caricetum stantis* Khitun **ass. prov.** и субассоциация *Meesio triquetris*–*Caricetum stantis triglochinetosum maritimi* Khitun **subass. prov.** отнесены к классу *Scheuchzerio palustris*–*Caricetea fuscae*. Также описаны 5 сообществ.

Ключевые слова: синтаксономия, Кыталык, Северо-Восточная Якутия, южные субарктические тундры, луга, болота, тундры

The plant cover of the Yakutian tundra zone has been studied since 1930-s (see: Perfil'eva et al. 1991). The first survey of vegetation in the lower reaches of the Indigirka River was published by Sheludyakova (1938). Tyrtikov (1958) described tundra vegetation in the vicinity of the Chokhurdakh settlement, and Kriuchkov (1968) studied tussock moss–lichen–*Eriophorum vaginatum* tundra in the Yana–Indigirka lowland. Boch (1975) investigated wetland vegetation in the Indigirka lower reaches.

In recent years, there has been growing interest in the study and classification of vegetation using the Braun-Blanquet method. This approach has been applied in the classification of alar vegetation in central Yakutia (Mirkin et al. 1985), segetal vegetation (Mirkin et al. 1988), ruderal vegetation (Cherosov et al. 2005), and in several regional studies across different parts of Yakutia (Telyatnikov et al. 2013, 2014, 2015). Telyatnikov and co-authors (2015) worked in the lower reaches of the Indigirka River, however, they did not visit the locality described in the present study, which differs in topography and vegetation from the areas they surveyed.

Our paper focuses on the vegetation of a relatively small area (less than 70 km²), but it includes the international research station "Kytalyk"—a base for numerous ecological, hydrological, and cryological studies (van Huissteden et al. 2005, Minke et al. 2009, Blok et al. 2010, Schirrmeister et al. 2012, De Klerk et al. 2014, Iturrate-Garcia et al. 2016, 2020, Levina et al., 2022, Rietze et al. 2024 among others). Vegetation data from the station have further contributed to several pan-arctic studies (García Criado et al. 2023, Thomas et al. 2020). The station's surroundings are part of the National Park "Kytalyk" (at the time of our study, it was a resource reserve). The park covers 1 885 000 ha and is primarily aimed at wetland conservation and the protection of Yakutian populations of endangered bird species.

Floristic diversity in the park is relatively low: 275 vascular plant species have been recorded in the region (Egorova 2016). However, the local flora around the station is even

poorer, with only 134 species. In 2013, we recorded 132 species (Khitun et al. 2020), and in 2019, Vitalii Zemlianskii found 2 rare in locality species — *Astragalus alpinus* L. s.str. and *Huperzia arctica* (Tolm.) Sipl. The low floral diversity can be attributed to the flat lowland topography and low diversity of habitat types (Khitun et al. 2020).

A list of lichens in the national park was recently published (Evdokimov et al. 2022); however, the authors did not survey the area surrounding the station, and some of the lichens found in our study are not included in their list (*Baeomyces placophyllus*, *Cetraria laevigata*, *C. nigricans*, *Cladonia acuminata*, *C. borealis*, *C. digitata*, *C. sulphurina*, *Masonhalea inermis*, *Ochrolechia inaequatula*, *Peltigera frippii*, *P. neckeri*). Our work is the first to focus on the vegetation of the station's immediate surroundings and the adjacent part of the national park. Due to logistical constraints and other research priorities, we were unable to adequately sample all vegetation and habitat types. As a result, many vegetation types are provisionally described as "communities". Hopefully the prodromus presented in this paper will be expanded in the future.

The aim of this paper is to provide a comprehensive survey and classification of vegetation in the vicinity of the research station using the Braun-Blanquet approach. This study also contributes to the Circumpolar Arctic Vegetation Archive (Walker et al. 2018, Zemlianskii et al. 2023). A detailed description of this vegetation will serve as a baseline for future international studies. Additionally, we provide information on mosses and lichens found in various communities and habitats, which may assist scientists in species identification in their fieldwork in the vicinity of the station.

MATERIAL AND METHODS

Study area

Location, geology and topography

From 8 to 22 July 2013 a survey of flora and vegetation was carried out in the surroundings of the Kytalyk research station (70°49'N 147°29'E), hereafter referred to as "Kyt-

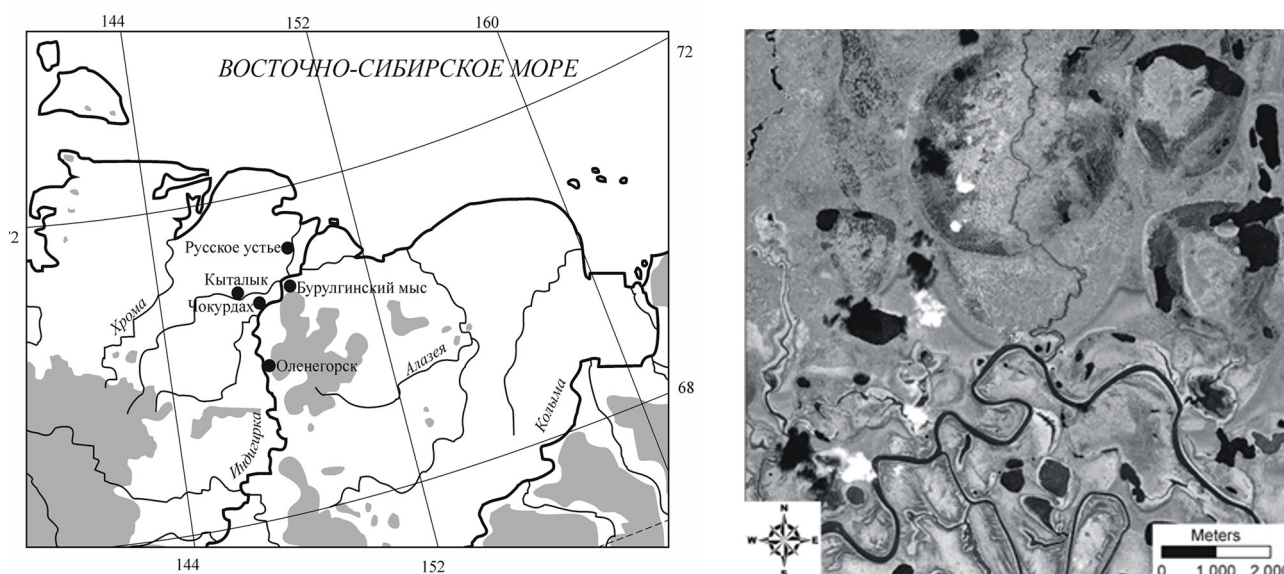


Figure 1 Location of the Kytalyk research station and nearest settlements (left) and satellite image (GeoEye-1) of the surroundings of the station (right). Note: Egg-formed alas depression divided by small creek is well visible on the satellite image. The station is built at the place of creek's flow into the Berelekh

lyk”. The station is located on the left bank of the Berelekh River in its lower reaches, 28 km northwest of the Chokurdakh settlement in northern Yakutia (Fig. 1). The Berelekh is a low left tributary of the Indigirka River.

The studied territory is a part of the Yana-Indigirka Lowland, which is an accumulative plain formed by Tertiary and Quaternary loess loams. In the surroundings of the station 3 main landscape elements are clearly distinguishable:

1. A frequently flooded flood plain (3–4 m a.s.l.) and first terrace (7–10 m a.s.l.) of the Berelekh River. The flood plain is often separated from sandbanks by stripes of willow thickets up to 2 m height. The flood plain is characterized by frost crack polygonal microtopography.

2. An alas (i.e., a drained thaw-lake basin) depression of Holocene age, approximately 5.5 km in diameter, is occupied by polygonal mires with numerous thermokarst lakes and occasional pingo hills. The Konsor Syan Creek flows from north to south through the alas and discharges into the Berelekh River near the station. The bottom of the alas depression lies at 4–6 m a.s.l., so it is difficult to differentiate between flood plain and alas (Schirrmeyer et al. 2012). Two elevation levels, differing by about 1–1.5 m, can be distinguished in alas both visually and in the satellite imagery

3. Yedoma ridges, up to 30 m a.s.l., are composed of ice-rich fine sand and loam deposits from the Middle to Late Pleistocene Ice Complex, permeated by syngenetic secondary ice wedges (Romanovskii 1993). Two such elongated ridges occur within the study area.

The entire area lies within a zone of continuous permafrost, with frozen deposits up to 300 m thick and temperatures of -4 to -6°C (Geocryological Map 1991).

Climate

The climate of the Indigirka Lowland is characterized by a high degree of continentality (Gavrilova 1998). Climate data for this area are available only from the weather station in Chokurdakh, WMO 21946 (<http://www.pogodaiklimat.ru/history/21946.htm>). The mean annual air temperature is -14.3°C, the mean January temperature is -32.9°C and the mean temperature of the warmest month, July is +10.5°C (for the period 1996 to 2013). Annual precipitation typically ranges from 150 to 250 mm. Recent data show a slight warming trend (Koroleva et al. 2019).

Vegetation

The vegetation of the studied area belongs to the Omoloi-Indigirka district of the Yana-Indigirka subprovince of the East Siberian province of subarctic tundra (Aleksandrova 1980). According to zonal division schemes (Yurtsev 1994, CAVM Team 2003), “Kytalyk” lies near the northern boundary of the southern hypoarctic tundra subzone, zone E, respectively. The vegetation has more southern appearance because of predominance of intrazonal communities but the ratio of geographic elements in the local flora is closer to northern hypoarctic.

Zonal habitats are represented by relatively well-drained yedoma ridges which make up less than 5 % of the studied area. These ridges and their northern slopes are occupied by low-shrub-moss-cotton-grass tussock tundra with *Eriophorum vaginatum*, *Ledum palustre* subsp. *decumbens*, *Betula exilis*, *Salix pulchra*, and *Calamagrostis holmii*. Their southern slopes host communities, which are dominated by ericoid

dwarf shrubs (*Ledum palustre* subsp. *decumbens*, *Vaccinium uliginosum* subsp. *microphyllum*, *V. vitis-idaea* subsp. *minus*, *Arctous alpina*, *Empetrum subboreale*), along with various herbs (*Pyrola grandiflora*, *Pedicularis capitata*, *Saxifraga nelsoniana*, *Bistorta plumosa*, *Valeriana capitata*) and a well-developed moss cover. The slopes of pingos are covered with communities dominated by *Dryas*, with sparse herbs and grasses. Eroded cut banks of the Berelekh River are covered by pioneer herb-grass communities containing *Arctagrostis arundinacea*, *Puccinellia borealis*, *Equisetum arvense* subsp. *boreale*, *Descurainia sophioides*, and *Draba juvenilis*. The floodplain inside meanders is occupied by alternating high (up to 2 m) dense willow thickets (*Salix pulchra*, *S. lanata* ssp. *richardsonii*) and wet meadows with *Carex aquatilis* subsp. *stans* or *Calamagrostis purpurea*. In the alas depression, the higher level is occupied by high-centered polygons with dwarf birch-moss-lichen communities on the polygons and *Eriophorum angustifolium*-*Sphagnum* oligotrophic communities in the troughs. At the lower level of the alas, low-centered polygons with ponds inside the polygons and herbaceous-sphagnum vegetation on the rims are common. Herb-sedge-Amblystegiaceae moss fens with species such as *Meezia triquetra*, *Scorpidium revolvens*, *Hamatocaulis vernicosus*, *Carex rariflora*, *C. chordorrhiza* and *C. rotundata* are widespread in the wettest parts of the alas.

Sampling and data analysis

A total of 99 relevés of plots ranging from 16 to 25 m² were made, of which 60 were used in this paper. We identified all species and estimated total vegetation cover (%) and cover (%) of the major growth forms. Cover-abundance scores of all species are given according to the following scale: +: < 1 %; 1: 1–5 %; 2: 6–25 %; 3: 26–50 %; 4: 51–75 %; 5: 76–100 %. Canopy height and thickness of moss layer were measured with a ruler. Active layer thickness was measured with a metal rod with a centimeter scale. Soil cores were sampled by M. Iturrate-Garcia at selected sites and analyzed in the lab at the University of Zurich for pH and carbon and nitrogen content (see: Iturrate-Garcia et al. 2016 for details). In the field, the mechanical composition of soils was estimated following Bogolyubov et al. (2001). Coordinates of the plots and altitude were recorded with a Garmin GPS device.

Vegetation classification followed the Braun-Blanquet sorted-table method (Westhoff & van der Maarel 1973), using the TURBOVEG database (Hennekens & Schaminée 2001), sorting with MegaTab (Hennekens 1996), and constructing the hierarchy of relevé groups with TWINSpan (Hill 1979). At this stage we identified the diagnostic (character) species, differential and constant species and discard intermediate (between synataxa) relevés. The new syntaxonomic units were named according to the International Code of Phytosociological Nomenclature (Theurillat et al. 2021).

Diagnostic species of the classes Matricario-Poetea arcticae A. Ishbirdin in Sumina 2012, Scheuchzerio palustris-Caricetea fuscae Tx.1937 are given in accordance with Mucina et al. (2016) and Ermakov (2012), of the class Carici arctisibiricae-Hylocomietea alaskani Matveeva et Lavrinenko 2023 after Matveeva & Lavrinenko

(2023) (Ermakov et al. 2025). The nomenclature of vascular plants species followed Sekretareva (2024). We deliberately use outdated nomenclature to maintain continuity with the works of Russian Arctic phytocoenologists, as well as with the names of syntaxonomic units. The nomenclature for mosses and lichens followed Ignatov et al. (2006) and Esslinger (2021) respectively. Species constancy in the tables was determined as follows: I: 1–20 %, II: 21–40 %, III: 41–60 %, IV: 61–80 %, V: 81–100 % (Mirkin & Naumova 1998).

Abbreviations: diagnostic species = d. sp.; relevé = rel.; above sea level = a.s.l.

RESULTS

We used cluster analysis to establish the hierarchy of distinguished syntaxa. The dendrogram (Fig. 2) was generated using the Past software package (2012). The correlation coefficient was used as a measure of similarity. Additionally, 3 syntaxa previously described in the Siberian Arctic were included in the analysis: 1) the association of herbaceous mires *Meesio triquetris*–*Caricetum stantis* Matveyeva 1994 (from the class *Scheuchzeria palustris*–*Caricetea fuscae* Tx. 1937); 2) the subassociation of herb-dwarf shrub tundra *Rhytidio rugosi*–*Dryadetum punctatae* Matveyeva 1998 *empetretosum subholarctici* Telyatnikov et al. 2015 from the class *Carici rupestris*–*Kobresietea bellardii* Ohba 1974 first described in the lower reaches of the Indigirka River on the Kondakov Plateau; 3) the association of dwarf shrub tundra *Alectorio nigricantis*–*Diapensietum obovatae* Telyatnikov et al. in Koroluk et al. 2023, from the class *Loiseleurio procumbentis*–*Vaccinietea* Eggler ex Schubert 1960 first distinguished in the lower reaches of the Anabar River.

The dendrogram is represented by 3 main clusters: the first (ABC) includes 3 subclusters with tundra vegetation types, the second (D) – vegetation of herbaceous and herbaceous-moss mires and the third (E) – with pioneer vegetation. Syntaxa of zonal tundra vegetation from the class *Carici arctisibiricae*–*Hylocomietum alaskani* are grouped in subcluster A. Branch B is attached to A with rather low similarity; it consists of only one syntaxon of dry herbaceous–dwarf shrub tundra from the class *Carici rupestris*–*Kobresietea bellardii*. Branch C represents dwarf shrub tundra from the class *Loiseleurio procumbentis*–*Vaccinietea*. Branches in cluster D represent syntaxa of alliances *Sphagno*–*Caricion canescens* Passarge (1964) 1978 nom. conserv. propos. (D1), *Caricion stantis* Matveyeva 1994 (D2), *Drepanocladion exannulati* Krajina 1933 (D3). Cluster E is represented by one branch joining vegetation from recovery stages on disturbed habitats *Matricario*–*Poetea arcticae* A. Ishbirdin in Sumina 2012.

Zonal dwarf shrub–sedge–moss tundra vegetation

Zonal communities occupy a very small area in the studied region; they are confined to the flattened top surfaces and slopes of the yedoma hills. We have tentatively identified three syntaxa at the rank of association or subassociation and assigned them to the recently validated tundra vegetation

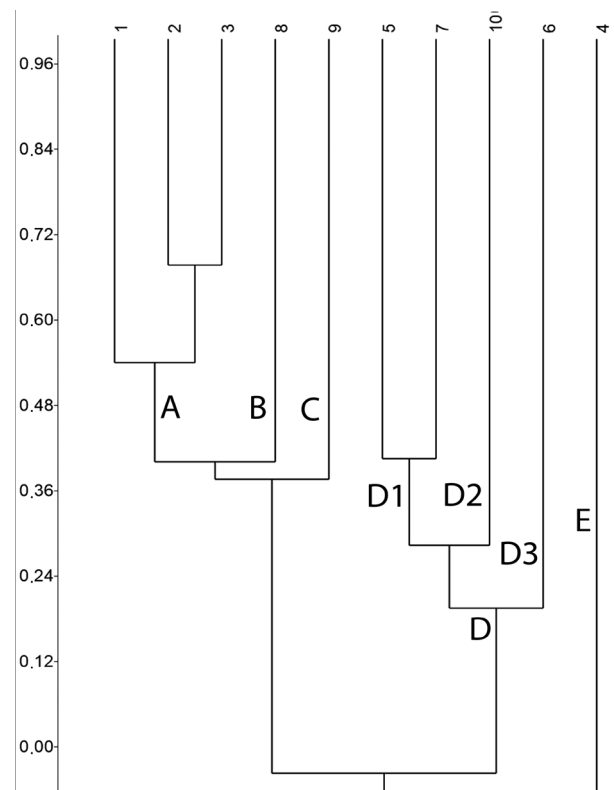


Figure 2 The similarity dendrogram of vegetation syntaxa in the Kytalyk research station surroundings (Subzone E, southern hypoarctic tundra, Yakutia). Syntaxa: 1 – subass. *Carici arctisibiricae*–*Hylocomietum alaskani* *luzuletosum tundricolae* Khitun **subass. nov.**, 2 – ass. *Peltigero scabrosae*–*Eriophoretum vaginati* Khitun **ass. nov.**, 3 – ass. *Cladonio amaurocraeae*–*Betuletum exilis* Khitun **ass. nov.**, 4 – ass. *Leptobryo pyriformis*–*Arctagrostietum arundinaceae* Khitun **ass. nov.**, 5 – ass. *Eriophoro angustifolii*–*Sphagnetum obtusi* Khitun **ass. nov.**, 6 – ass. *Bryo pseudotriquetri*–*Caricetum stantis* Khitun **ass. nov.**, 7 – subass. *Meesio triquetris*–*Caricetum stantis* *triglochinetosum maritimi* Khitun **subass. nov.**, 8 – subass. *Rhytidio rugosi*–*Dryadetum punctatae* *empetretosum subholarctici* Telyatnikov et al. 2015, 9 – ass. *Alectorio nigricantis*–*Diapensietum obovatae* Telyatnikov et al. in Koroluk et al. 2023, 10 – variant *Meesio triquetris*–*Caricetum stantis* Matveyeva 1994 **typicum**

class *Carici arctisibiricae*–*Hylocomietea alaskani* Matveyeva et Lavrinenko 2023, two orders (*Caricetalia arctisibirico*–*lugentis* Matveyeva et Lavrinenko 2023, *Eriophoretalia vaginati* Matveyeva et Lavrinenko 2023), and two alliances (*Carici arctisibiricae*–*Hylocomion alaskani* Matveyeva et Lavrinenko 2023 and *Cassiope tetragonae*–*Eriophorion vaginati* Matveyeva et Lavrinenko 2023). This class unites zonal tundra communities of interfluvies in the tundra zone, widespread in Eurasia and North America (Matveyeva & Lavrinenko 2023). The diagnostic species of the class found in the study area are listed in Table 1.

Order ***Caricetalia arctisibirico*–*lugentis*** Matveyeva et Lavrinenko 2023 – zonal dwarf shrub–sedge–moss tundra vegetation in the southern and typical tundra subzones of Eurasia and North America (Matveyeva & Lavrinenko 2023)

Diagnostic species: d. sp. of the class + *Bistorta plumosa*, *Carex bigelowii* subsp. *arctisibirica* s.l., *Luzula tundricola*, *Pedicularis lapponica*, *Rhytidium rugosum*, *Salix glauca* s.l., *S. lanata* s.l., *S. reptans*.

Vegetation found on the most well-drained marginal parts of ridges, as well as on their gentle and relatively steep slopes (since the ridges are very low, truly steep slopes are absent), was assigned to the alliance Carici arctisibiricae–Hylocomion alaskani.

Alliance Carici arctisibiricae–Hylocomion

alaskani Matveyeva et Lavrinenko 2023 – dwarf-shrub–sedge–moss zonal communities on watersheds in the typical and southern tundra subzones of the East European and Siberian sectors of the Russian Arctic (Matveyeva & Lavrinenko 2023)

Diagnostic species: d. sp. of the order + *Carex bigelowii* subsp. *arctisibirica*, *Epilobium davuricum*, *Eriophorum brachy-therum*, *Eutrema edwardsii*, *Nephroma expallidum*, *Psoroma hypnorum*.

We assigned 2 associations and 1 subassociation to this alliance.

Ass. Carici arctisibiricae–Hylocomietum

alaskani Matveyeva 1994 (Matveyeva 1994) (Table 1, rel. 1–7)

Diagnostic species: *Aulacomnium turgidum*, *Carex bigelowii* subsp. *arctisibirica*, *Dryas punctata*, *Hylocomium splendens* s.l., *Ptilidium ciliare*, *Tomentypnum nitens*.

Subass. Carici arctisibiricae–Hylocomietum

alaskani luzuletosum tundricolae Khitun

subass. nov. (Table 1, rel. 1–7, Table 3, col. A, Figure 3A, 3B)

Diagnostic species: *Arctous alpina*, *Carex vaginata* subsp. *quasivaginata*, *Bistorta plumosa*, *Luzula tundricola*, *Orthilia obtusata*, *Pedicularis capitata*, *Salix hastata*, *Tofieldia coccinea*.

Holotypus: rel. 3 (34) (Table 1) [Hereafter: first is number in the table, in brackets is number in the database]. Republic of Sakha (Yakutia), Allaikhevskii district, middle reaches of the Berelekh River. Herb–dwarf shrub–moss tundra. Coordinates: 70.825964°N 147.462896°E. Altitude 21 m a.s.l. Gentle slope of the elongated hillock – a remnant of a yedoma. Inclination 5°, aspect 170°. Hummocky microtopography. Soil: gleyzem on light loam. Organic horizon is 10 cm, below – greyish mineral ground. Cover: dwarf shrubs – 40 %, bryophytes – 60 %, grasses – 15 %, lichens – 10 %, shrubs – 15 %. Date: 11.07.2013. Author: O.V. Khitun.

Distribution and ecology. Northern part of the subzone E in the northeastern Yakutia. Gentle and steep convex slopes of low hills with various exposures, moderate drainage and moisture conditions. Hummocky microtopography. Altitude: 17–22 m a.s.l. Soils: slightly acidic to almost neutral (pH = 5.4–6.4) gleyzems on light loams.

Composition and structure. The stands have two vertical strata. The prostrate dwarf-shrub–lichen–moss understory is closed. The herb–upright dwarf shrub (*Ledum palustre* subsp. *decumbens*)–low shrub (*Betula exilis*, *Salix glauca*) overstory is well developed, about 10–20 cm tall, with only occasional flowering shoots of herbs reaching up to 30 cm. Cover of shrubs is 15–35 %, and of herbs is 10–25 %. Grasses (*Arctagrostis latifolia*, *Festuca brachyphylla*) and forbs (*Saxifraga nelsoniana*, *Valeriana capitata*, *Parrya nudicaulis*) are the most common. The cover of dwarf shrubs (*Arctous alpina*, *Ledum palustre* subsp. *decumbens*, *Vaccinium vitis-idaea* subsp. *minus*, *Vaccinium uliginosum* subsp. *microphyllum*) is 20–40 %, of bryophytes (*Hylocomium splendens*, *Aulacomnium turgidum*, *Sanionia uncinata*, *Dicranum elongatum*) is 40–75 % and of lichens (*Flavocetraria cucullata*, *Peltigera aphthosa*, *Cladonia gracilis*, *Cetraria islandica*) is 10–20 %.

Note. The subassociation C.a–H.a. luzuletosum tundricolae is very close in composition and structure to the previously identified vicariant of the same association, C.a–H.a. vicar. *Pinguicula villosa* Matveyeva 1994 nom. inval. (Table 3, col. I). In the subassociation we propose, there is both the set of diagnostic species of the association Carici arctisibiricae–Hylocomietum alaskani (*Hylocomium splendens*, *Aulacomnium turgidum*, *Dryas punctata*, *Ptilidium ciliare*, *Carex bigelowii* subsp. *arctisibirica*, *Tomentypnum nitens*) as well as most of the diagnostic species of the vicariant C.a–H.a. vicar. *Pinguicula villosa* – *Tofieldia coccinea*, *Pedicularis capitata*, *Salix hastata*, *Arctous alpina*, *Betula exilis* s.l., *Carex vaginata*, *Ledum palustre* subsp. *decumbens*, *Pedicularis lapponica*, *Bistorta plumosa*, *Salix pulchra*, *Vaccinium uliginosum* subsp. *microphyllum*. The subass. C.a–H.a. luzuletosum tundricolae, as well as the vicariant, occur in the subzone E in Siberia.

Tussock tundra

Tussock (*Eriophorum vaginatum*) tundra on the flat and concave parts of the ridge and on its northern slopes, as well as dwarf birch–lichen–moss tundra on the high-center polygons of tundra–mire complexes, we assigned to the alliance Cassiopo tetragonae–Eriophorion vaginati of the order Eriophoretalia vaginati.

Order **Eriophoretalia vaginati** Matveyeva et Lavrinenko 2023 – tussock communities dominated by *Eriophorum vaginatum* with the participation of *Sphagnum* species, occurring on poorly drained flat, slightly concave, or slightly convex watersheds composed of heavy loams, in the southern (mainly) and typical (less often) tundra subzones of the Arctic (with an optimum in the Beringian sector) (Matveyeva & Lavrinenko 2023)

Diagnostic species: *Calamagrostis holmii*, *Cassiope tetragona*, *Eriophorum angustifolium*, *E. vaginatum*, *Salix pulchra*, *Tephrosia atropurpurea*, *Sphagnum angustifolium*, *S. fimbriatum*, *S. girgensohnii*, *S. rubellum*, *S. squarrosum*, *S. warnstorffii*.

Alliance Cassiopo tetragonae–Eriophorion

vaginati Matveyeva et Lavrinenko 2023

Diagnostic species of the alliance and its ecology are the same as for the order. We distinguish 2 associations.

Ass. Peltigero scabrosae–Eriophoretum

vaginati Khitun **ass. nov.** (Table 1, rel. 8–17, Table 3, col. B, Fig. 3C)

Diagnostic species: *Eriophorum vaginatum*, *Peltigera frippii*, *P. scabrosa*, *Polytrichum juniperinum*.

Holotypus: Rel. 16 (15) (Table 1). Republic of Sakha (Yakutia), Allaikhevskii District, middle reaches of the Berelekh River. *Betula exilis*–*Ledum palustre* subsp. *decumbens*–green moss–cottongrass tussock tundra. Coordinates: 70.828958°N 147.46927°E. Altitude: 23 m. Upper part of a gentle ridge slope, 2° inclination, aspect 270°. Soils: gleyzem on medium loam. Cover – bryophytes: 50 %, herbs: 45 %, dwarf shrubs: 30 %, lichens: 15 %, low shrubs: 15 %. Date: 09.07.2013. Author: O.V. Khitun.

Distribution and ecology. Northern part of the subzone E in northeastern Yakutia. Gentle slopes and flat tops of yedoma hills with moderate drainage conditions (but less well-drained than the habitats of the previous association) and sufficient moisture. The surface features a hummocky microrelief, overlain by nanorelief formed by cottongrass tussocks up to 20 cm high and 20–30 cm in diameter. Altitude: 21–23(30) m a.s.l. Soils: gleyzems on light and medium loamy substrates, near-neutral in acidity (pH = 5.5–6.4) with a weakly developed (up to 10 cm) organic horizon.

Composition and structure. Communities have 2 vertical strata. The overstory consists of shrubs, Labrador tea and

Syntaxon	A							B							C							D			A	B	C	D					
Plot area, m ²	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	16	16	16	16	16	16	16	16	16	16	16	16	16					
Height of shrubs (cm)	15	15	15	20	25	25	15	10	15	10	15	10	12	15	12	10	20	18	15	10	20	15	15	15	20	10	15	50	35				
Aspect (°)	105	105	170	220	200	200	270	200	-	180	-	200	200	290	45	270	5	-	-	-	-	-	-	-	-	180	270	0	5				
Inclination (°)	5	10	5	10	3	3	1	1	0	1	0	2	2	1	3	2	5	0	0	0	0	0	0	0	0	15	15	0	20				
Altitude (m)	19	20	21	17	20	22	22	21	21	22	22	21	23	22	23	21	6	6	7	7	8	8	10	9	25	24	34	28					
Number of species	52	57	64	63	47	50	48	36	45	40	36	30	35	38	45	44	48	33	15	26	21	22	18	23	26	23	59	40	52				
Cover total, %	90	98	99	98	98	100	95	100	100	98	100	100	100	100	100	99	100	100	100	100	100	100	100	100	90	90	80	90					
shrubs	15	20	15	20	25	35	20	20	10	15	10	15	12	20	15	15	20	60	65	70	22	73	70	41	73	73	40	35	30				
dwarf shrubs	40	20	40	25	30	25	35	30	15	25	30	10	10	25	20	30	20	2	1	-	60	-	10	3	3	70	50	10	40				
herbs	10	20	15	15	20	25	25	40	70	50	50	60	70	70	60	45	50	5	1	2	5	2	5	5	5	20	20	50	35				
lichens	10	20	10	15	15	10	20	15	10	10	10	5	5	10	15	15	10	10	25	25	30	15	15	40	15	15	10	10	5				
bryophytes	40	50	60	75	50	40	70	65	45	50	45	45	40	50	50	50	55	90	65	90	75	70	90	80	75	90	25	50	10	20			
Rel. number in the database	32	33	34*	48	85	86	98	3	4	5	6	8	9	13	14	15*	35	19	20	21*	24	25	26	27	61	88	38	39	40	41			
Rel. number in the table	1	2	3*	4	5	6	7	8	9	10	11	12	13	14	15	16*	17	18	19	20*	21	22	23	24	25	26	27	28	29	30			
Number of relevés																														7	10	9	4

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Table 1. Continued.

Rel. number in the table	1	2	3*	4	5	6	7	8	9	10	11	12	13	14	15	16*	17	18	19	20*	21	22	23	24	25	26	27	28	29	30	A	B	C	D			
<i>Distichium capillaceum</i>	+	+	.	.	.	+	+	.	+	+	.	.	.	.	.	.	.	+	.	.	+	1	.	.	.	.	.	.	.	1	III	II	II	III			
<i>Festuca brachyphylla</i>	1	1	1	.	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	IV	.	.	V			
<i>Luzula confusa</i>	1	+	1	1	.	1	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	1	1	1	1	IV	I	.	V			
<i>Luzula nivalis</i>	.	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.			
<i>Petasites frigidus</i>	.	.	.	1	.	.	.	.	.	.	1	1	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	I	II	.	II				
<i>Poa arctica</i>	1	1	1	1	1	1	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	1	.	1	1	1	V	.	II	V				
<i>Saxifraga nelsoniana</i>	1	1	1	1	1	1	1	1	1	1	1	1	.	1	1	1	1	.	.	.	.	.	.	.	.	.	1	1	1	1	V	IV	.	IV			
<i>Stellaria ciliatosepala</i>	1	+	1	1	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	V	.	.	V			
<i>Valeriana capitata</i>	1	1	1	1	.	1	1	1	.	1	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	1	1	1	1	V	II	I	V			
Other species																																					
<i>Adoxa moschatellina</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	I	.	.	IV			
<i>Arctagrostis arundinacea</i>	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	2	1	I	.	.	V			
<i>Anulacommium palustre</i>	1	1	1	1	1	1	.	.	1	1	2	2	2	1	1	1	1	.	.	1	.	.	1	1	2	.	1	.	.	.	V	V	III	II			
<i>Betula exilis</i>	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4	2	4	4	3	4	4	1	1	.	1	V	V	IV				
<i>Bistorta vivipara</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	I	.	.	III			
<i>Bryocaulon divergens</i>	1	.	1	1	.	.	1	+	+	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	1	1	.	.	III	III	.	III			
<i>Bryoria nitidula</i>	.	.	1	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	.	.			
<i>Cetraria laevigata</i>	+	1	1	1	.	.	1	1	+	.	.	.	.	.	.	1	.	1	1	1	1	1	1	1	1	1	1	.	.	IV	II	II	II				
<i>Cetraria islandica</i>	1	1	1	1	1	1	1	1	1	+	1	1	1	.	1	1	1	1	1	1	1	1	1	1	1	1	1	.	1	V	V	V	III				
<i>Cladonia borealis</i>	.	.	+	.	.	.	.	.	.	+	.	.	+	+	.	+	.	+	1	1	1	1	1	.	1	.	.	.	.	I	II	IV	.				
<i>Cladonia cornuta</i>	.	.	+	.	.	.	.	.	.	.	+	.	.	+	.	.	.	+	.	+	1	.	.	1	.	1	.	.	.	.	I	I	III	.			
<i>Cladonia deformis</i>	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	I	I	II			
<i>Cladonia gracilis</i>	1	1	1	1	1	1	1	1	1	1	.	.	1	1	1	1	1	.	1	1	1	1	1	1	1	1	1	1	.	V	IV	IV	IV				
<i>Cladonia pyxidata</i>	+	.	1	.	.	+	+	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	1	1	.	III	I	.	III			
<i>Cladonia sulphurina</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	I	II	.			
<i>Delphinium chamissonis</i>	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	2	.	II	.	.	III			
<i>Dicranum elongatum</i>	2	.	1	2	.	1	1	2	.	2	.	1	2	2	2	2	1	.	.	1	.	.	2	1	2	2	.	.	.	.	IV	IV	III	.			
<i>Dicranum fuscens</i>	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	V	V	III	III			
<i>Dicranum laevigens</i>	.	1	.	2	.	2	2	2	.	2	2	2	2	2	2	1	2	3	3	2	3	3	4	4	3	3	1	2	.	.	III	V	V	III			
<i>Draba hirta</i>	.	+	.	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	III	.	.	V			
<i>Empetrum subboreale</i>	1	.	1	1	1	.	.	.	.	.	.	.	.	.	1	.	1	1	.	.	.	.	.	.	.	.	1	1	1	.	III	II	.	IV			
<i>Equisetum arvense</i> subsp. <i>boreale</i>	1	1	1	2	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	V	.	.	III			
<i>Eurynchiastrium pulchellum</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	I	III			
<i>Flavocetraria cucullata</i>	1	2	1	2	2	1	2	2	1	2	1	1	1	1	2	2	1	1	2	2	2	2	2	3	2	2	1	1	1	.	V	V	IV				
<i>Flavocetraria nivalis</i>	.	1	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	III	.	.	II			
<i>Gowardia nigricans</i>	+	+	+	.	.	.	.	+	+	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	1	1	.	.	III	III	.	III			
<i>Ledum palustre</i> subsp. <i>decumbens</i>	2	1	2	1	.	2	1	2	2	2	2	2	2	2	2	2	2	.	1	.	.	.	1	1	.	.	2	.	1	V	V	II	III				
<i>Obroblechia inaequatula</i>	1	.	1	.	1	1	2	+	+	+	.	.	+	.	1	+	+	.	.	.	.	.	1	.	1	1	1	1	.	IV	IV	II	III				
<i>Orthocaulis binsheadii</i>	.	.	.	.	.	.	.	.	+	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.	.			
<i>Pedicularis hirsuta</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	I	.	.	III			
<i>Pedicularis langsdoeffii</i>	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	II	I	.	III			
<i>Pedicularis interioroides</i>	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	III	.	.	III		
<i>Peltigera aphthosa</i>	+	+	.	+	+	+	+	+	+	+	+	+	1	1	1	1	1	.	.	.	1	1	.	.	.	.	.	+	1	IV	V	II	III				
<i>Peltigera canina</i>	.	.	1	1	+	.	1	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	III	I	.	III			
<i>Peltigera leucophlebia</i>	.	1	1	1	.	1	.	1	1	1	1	1	1	.	1	1	1	2	.	.	1	1	.	1	1	1	.	.	.	III	IV	.	.				
<i>Poa alpigena</i>	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	I	.	.	IV			
<i>Poblia nutans</i>	+	+	+	.	.	.	.	.	.	.	.	.	.	.	1	1	1	.	.	.	1	.	1	.	.	.	.	1	1	.	III	II	II	III			
<i>Polytrichum alpinum</i>	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	1	+	.	.	III	.	.	III			
<i>Polytrichum hyperboreum</i>	.	2	1	1	2	.	3	.	1	.	.	.	.	.	1	2	2	3	.	2	2	.	.	.	2	1	.	.	1	.	IV	II	III	II			
<i>Polytrichum piliferum</i>	.	.	1	1	.	1	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	I	.	I			
<i>Pyrola rotundifolia</i>	1	1	1	1	2	2	.	.	1	1	.	.	1	.	1	.	1	.	.	.	.	.	.	.	.	.	1	.	1	.	V	II	.	III			
<i>Sanionia uncinata</i>	2	2	1	1	1	2	1	.	.	1	1	1	1	.	1	1	1	.	.	.	1	.	1	1	1	2	2	2	1	V	IV	III	V				
<i>Saxifraga hircifolia</i>	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	II			
<i>Sphaerophorus globosus</i>	1	1	1	1	.	1	+	+	+	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	1	1	1	.	IV	III	.	IV			
<i>Sphagnum compactum</i>	.	.	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	I	I	.			
<i>Sphagnum teres</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	1	.	.	.	.	.	.	.	.	.	.	II	.			
<i>Sphenolobus minutus</i>	+	+	+	1	.	1	1	1	1	1	1	1	1	1	1	.	1	1	2	2	1	1	1	1	1	1	.	.	.	V	V	V	.				
<i>Stereocaulon alpinum</i>	.	+	+	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	I	.	.			
<i>Thamnochloa vermicularis</i>	1	1	1	.	.	1	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	1	1	+	.	III	I	.	III			
<i>Vaccinium uliginosum</i> subsp. <i>microphyllum</i>	1	1	2	1	1	2	.	1	1	1	1	1	1	1	1	1	1	1	.	.	.	.	.	.	.	.	1	1	.	.	V	V	.	III			
<i>Vaccinium vitis idaea</i> subsp. <i>minus</i>	2	2	2	2	2	1	2	2	1	2	2	1	2	1	2	2	2	1	.	.	4	.	.	2	1	1	2	2	1	1	V	V	III	V			

Note. Single occurrence: *Alnus fruticosa* 17(+); *Androsace septentrionalis* 27(+); *Carex aquatilis* subsp. *stans* 9(1), 25(1); *Draba nivalis* 27(+); *Pedicularis gymnostachya* 30(1); *Polemonium acutiflorum* 30(1); *Taraxacum longicorne* 27(+), 29(+). Lichens: *Baeomyces placophyllus* 14(1); *Caloplaca* sp. 28(1); *Cetraria nigricans* 3(1), 16(1); *Cetraria fastigiata* 20(1); *Cladonia cenotea* 20(+); *C. cyanipes* 21(1); *C. furcata* 15(+), 23(1); *C. macrocerus* 2(+), 9(+); *C. digitata* 18(+); *C. rangiferina* 9(1); *Megaspore verrucosa* 28(1); *Pannaria pezizoides* 9(+); *Peltigera extenuata* 6(+); *P. kristinssonii* 4(+); *P. neckeri* 13(+); *P. polydactylon* 14(1); *Pertusaria panyrga* 3(1). Mosses: *Abietinella abietina* 27(+), 28(+); *Brachythecium* sp. 7(1); *Bryum* sp. 1(+), 24(1); *Ceratodon purpureus* 1(1); *Climacium dendroides* 5(+), 6 (1); *Cratoneuron filicinum* 27(+), 28(+); *Dicranum acutifolium* 9(1), 14(1); *Hamatocaulis vernicosus* 9(+); *Hennediella heimi* subsp. *arctica* 6(+); *Leptobryum pyriforme* 30 (1); *Lophozia ventricosa* subsp. *uliginosa* 15(+); *Marchantia polymorpha* 2(+); *Orthocaulis kumzeanus* 18(1), 14(1); *Plagiothecium berggrenianum* 11(1), 30(2); *Poblia cruda* 29

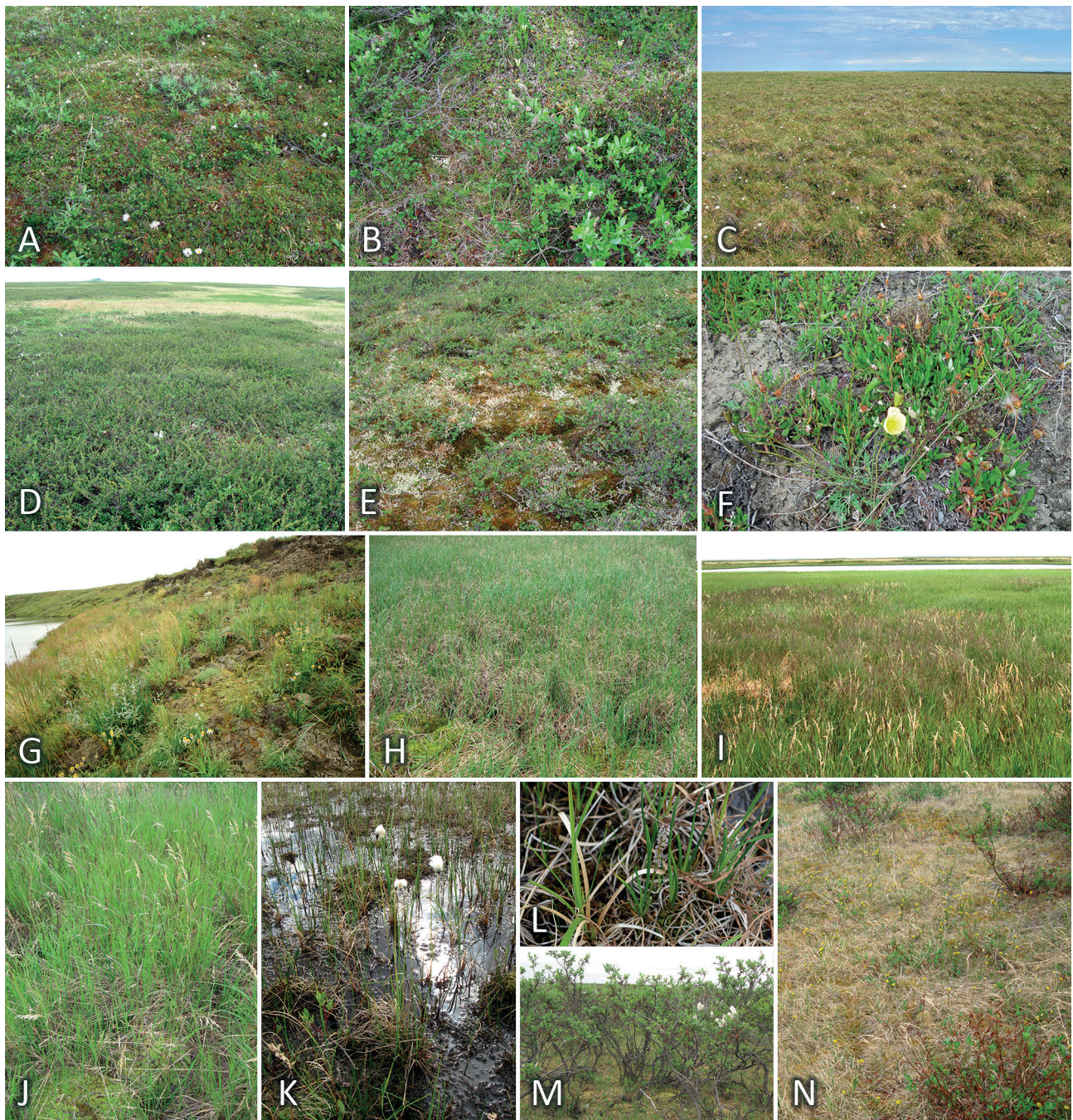


Figure 3 Plant communities and habitats. A – subass. *Carici arctisibiricae*–*Hylocomietum alaskani luzuletosum tundricolae* on the upper part of convex slope of yedoma ridge; B – close up of the previous subassociation; C – ass. *Peltigero scabrosae*–*Eriophoretum vaginati* on the gently sloping top of the yedoma ridge; D – ass. *Cladonio amaurocraeae*–*Betuletum exilis* on the high-centered polygon in polygonal complex on the alas bottom; E – close up of the previous association; F – close up of the ass. *Ranunculo affinis*–*Dryadetum punctatae* on the slope of the pingo; G – ass. *Leptobryo pyriformis*–*Arctagrostietum arundinaceae* on the steep slope of lake depression; H – ass. *Eriophoro angustifolii*–*Sphagnetum obtusae* in the wet hollows in alas depression; I – ass. *Bryo pseudotriquetri*–*Caricetum stantis* in the flood plain of the lake; J – close up of the previous association; K – subass. *Meesio triquetris*–*Caricetum stantis triglochinetosum maritimi* (*Triglochin maritimum* is a new species for Yana-Indigirka Lowland); L – close up of the previous subassociation; M – comm. *Salix pulchra*–*Sphagnum squarrosum* on the terrace of a small river; N – comm. *Ranunculus nivalis*–*Sanionia uncinata* at the foot of the yedoma hill, transition to willow thickets on flood plain, the only snowbed community found in the area. All photographs were taken in the surroundings of the Kytalyk research station, middle reaches of the Berelekh River by Olga Khitun.

herbs, reaching up to 20 cm high. *Eriophorum vaginatum* dominates (up to 70 %), forming tussocks. Herbs such as *Arctagrostis latifolia*, *Carex bigelowii* subsp. *arctisibirica*, and *Saxifraga nelsoniana* are constant but not abundant. Among the shrubs, *Betula exilis* and *Salix pulchra* predominate. Lichen–dwarf shrub–moss understory occupies the spaces

between the tussocks. The cover is 40–65 % for mosses, 10–20 % for shrubs, and 5–15 % for lichens. Among mosses, *Hylocomium splendens*, *Dicranum laevigens* and *Aulacomnium turgidum* are the most abundant, while *Aulacomnium palustre* and *Tomentypnum nitens* occur with lower abundance. The most common dwarf shrubs are *Ledum palustre* subsp.

decumbens and *Vaccinium vitis-idaea* subsp. *minus*. *Flavocetraria cucullata* is the most abundant lichen, while species of the genus *Peltigera* are consistently present but not abundant.

Synonymy. Similar communities, under the name “*Salix pulchra*–*Eriophorum vaginatum* polydominant green-moss with arctic-alpine dwarf shrubs tundra”, were described by Perfil'eva et al. (1991). According to the authors, these phytocoenoses are widespread in the subzone of typical tundra (i.e. subzone D).

Note. The association differs both from the *Sphagno girgensohnii*–*Eriophoretum vaginatum* association described in Alaska (Walker et al. 1994) (Table 3, col. N) and from the recently identified *Arctagrostis latifoliae*–*Eriophoretum vaginatum* Lavrinenko et al. Lapshina in Larinenko 2022 (Lavrinenko et al. 2022) (Table 3, col. M). Of the 9 diagnostic species of the first association, 2 are also found in ours, and of the 6 diagnostic species of the latter, likewise 2 occur in our association. None of the sphagnum species listed in either of them is present in our association.

In terms of species composition, our association is transitional between the two orders *Eriophoretalia vaginati* and *Caricetalia arctisibirico-lugentis*. However, considering the appearance and structure of the community shaped by *Eriophorum vaginatum* as the community's key species along with the presence of diagnostic species of the order *Eriophoretalia vaginati* and the absence of such species from the order *Caricetalia arctisibirico-lugentis*, we assign the described community to the first order.

Dwarf birch tundra on high-centered polygons

Ass. **Cladonio amaurocraeae–Betuletum exilis** Khitun ass. nov. (Table 1, rel. 18–26, table 3, column. C, Fig. 3D, E)

Diagnostic species: *Cladonia amaurocraea*, *C. carneola*, *C. chlorophaea*, *Polytrichum juniperinum*.

Holotypus: rel. 20 (21) (Table 1). Republic of Sakha (Yakutia), Allaikhovskii District, middle reaches of the Berelekh River. Dwarf birch–*Cetraria cucullata*–*Dicranum* tundra. Coordinates: 70.833053°N 147.490213°E. Altitude: 7 m a.s.l. The community occupies a high-center polygon in a tundra–mire complex in an alas depression. Peaty soil on gleyed sandy loam ground. The organic horizon is brown, poorly decomposed, 10–12 cm thick; below it begins the gley horizon. Cover of bryophytes – 90 %, herbs – 2 %, lichens – 25 %, shrubs – 70 %. Date: 15.07.2013. Author: O.V. Khitun.

Distribution and ecology. Northern part of the subzone E in northeastern Yakutia. Communities are confined to high-centered polygons (ca. 40–60 cm high) in polygonal tundra–mire complexes and extensive slightly elevated “walls” (about 50 cm high) between low-centered polygons within alas depression. They also occur on flat surfaces of lake and river terraces. Altitude is 6–10 m a.s.l. Soils are peaty, underlain by gleish sandy loams and loams; an organic horizon is 10–15 cm thick, dark-brown weakly decomposed peat, soils are neutral in acidity (pH = 6.4–6.8).

Composition and structure. The plant communities are two-layered. The herb–shrub overstory is well developed, ca. 15 cm high (rarely up to 20 cm), and is almost closed (average projective cover about 70 %). The shrub *Betula exilis* dominates in this layer; herbs are scarce (1–5 %), not constant. The lichen–moss understory is closed; mosses form a carpet with patches of lichens. The moss layer is about 7 cm thick and is formed by *Dicranum laevigens*, *Polytrichum juniperinum*, *Aulacomnium turgidum*, *Sphenolobus minutus*. Among lichens, *Flavocetraria cucullata* dominates, *Cetraria islandica* and *Cladonia gracilis* occur with high constancy, diversity of lichens is rather high in these stands. Among dwarf shrubs, *Ledum palustre* subsp. *decumbens* and *Vaccinium vitis-idaea* subsp. *minus* are present.

Note. We assigned the ass. *Cladonio amaurocraeae*–*Betuletum exilis* to the alliance *Cassiopo tetragonae*–*Eriophorion vaginati* because it lacks diagnostic species of the alliance *Carici arctisibiricae*–*Hylocomion alaskani*, while it does contain diagnostic species of the first alliance – *Calamagrostis holmii* and *Salix pulchra* – as well as sparse and inconsistent occurrences of *Sphagnum teres* and *Eriophorum vaginatum*.

Vegetation on pingos

Herb–moss–spotted dryas tundras occupy an intermediate position between three classes: *Carici arctisibiricae*–*Hylocomietea alaskani*, *Loiseleurio procumbentis*–*Vaccinietea*, and *Carici rupestris*–*Kobresietea bellardii* Ohba 1974. Due to the insufficient number of relevés, we do not assign them to any class, order, or alliance.

Provisionally distinguished ass. **Ranunculo affinis–Dryadetum punctatae** Khitun ass. prov. (Table 1, rel. 27–30, Table 3, col. D, Fig. 3F)

Diagnostic species: *Alopecurus alpinus*, *Artemisia tilesii*, *Bryoerythrophyllum recurvirostrum*, *Cerastium maximum*, *Elymus macrourus*, *Encalypta rhabdocarpa*, *Lecanora epybrion*, *Minuartia rubella*, *Papaver lapponicum* subsp. *orientale*, *Peltigera rufescens*, *Potentilla stipularis*, *Ranunculus affinis*, *Timmia austriaca*, *Trisetum spicatum*.

Distribution and ecology. Northern boundary of subzone E in northeastern Yakutia. The community occupies the middle parts of steep southern and western slopes of large cryogenic mounds (pingo, or “bulgunnyakh”) located on the bottoms of dried-up lakes. Pingos are 16–25 m tall, the altitude on the summit of the highest one is 34.5 m a.s.l. However, in the study area, these phytocoenoses were recorded only on the tallest mound. The slopes of other pingos were covered with dwarf shrub–moss communities similar to those on the slopes of yedomas. Moisture conditions are moderate. Soils are mineral, with very thin organic horizon on sandy and sandy-loam substrates.

Composition and structure. The stands are two-layered. The shrub–herb overstory is rather closed and about 20 cm high. Herb cover is 20–30 (50) %, shrub cover 20–40 %. The grasses are represented by *Arctagrostis arundinacea*, *Elymus macrourus*, *Festuca brachyphylla*, *Poa arctica*, along with forbs such as *Parrya nudicaulis*, *Stellaria ciliatosepala*, *Potentilla stipularis* and *Valeriana capitata*. Among shrubs, *Salix glauca* predominates; *Salix reptans* was found only in these habitats. The moss–dwarf-shrub understory ranges from moderately closed to closed. The cover of dwarf shrubs (*Dryas punctata*, *Vaccinium vitis-idaea* subsp. *minus*) varies from (10) 40 to 70 %, and of bryophytes (*Sanionia uncinata*, *Timmia austriaca*, *Bryoerythrophyllum recurvirostrum*, *Encalypta rhabdocarpa*) from 10 to 50 %. Lichens, while constant in occurrence, are not abundant.

Note. In this community rare (for this area, due to the rarity of dry sandy slopes) crustose (*Megaspora verrucosa*, *Psoroma hypnorum*, *Caloplaca* sp., *Lecanora epibryum*, *Ochrolechia inaequatula*) and some foliose (*Peltigera rufescens*, *P. canina*) lichens were recorded.

Pingos are known to provide a variety of habitats (Walker et al. 1985), even in “Kytalyk” there were portions of slopes covered by thick willow thickets or portions dominated by horsetail regrowing after old landslide. We cannot cover the diversity of all communities in this paper. However, one community found on the northern slope of the pingo in the floodplain on the right side of the Berelekh River we want to describe as it was very unusual for the studied area. It is the only one community on the slope with

Table 2. Associations *Leptobryo pyriformis*–*Arctagrostietum arundinaceae* (E), *Eriophoro angustifolii*–*Sphagnetum obtusi* (F), *Bryo pseudotriquetri*–*Caricetum stantis* (G), and subassociation *Meesio triquetris*–*Caricetum stantis triglochinetosum maritimi* (H).

[illegible]

Table 2. Continued.

Rel. number in the table	1*	2	3	4	5	6	7	8	9	10	11*	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	E	F	G	H		
<i>Saxifraga hirculus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	I	.	I	
<i>Sphagnum fimbriatum</i>	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	
<i>Sphagnum platyphyllum</i>	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.	
<i>Sphagnum warnstorffii</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	I	.	
<i>Warnstorffia pseudostraminea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	.	.	.	.	II	.	
Diagnostic species of the order Caricetalia fuscae and alliance Drepanocladion exannulati (Ord-Cf)																																
<i>Carex aquatilis</i> subsp. <i>stans</i> All-Cs	.	.	.	.	.	.	1	.	1	.	.	2	4	.	2	3	4	4	1	2	4	4	3	1	3	2	.	III	V	V		
<i>Polytrichum jensenii</i>	.	.	.	.	.	.	1	+	.	.	2	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	III	I	.	.	
Diagnostic species of the alliance Caricion stantis (All-Cs)																																
<i>Dupontia fischeri</i>	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	1	.	.	.	.	.	.	1	1	1	1	1	.	II	I	II	
<i>Pedicularis interioroides</i>	.	1	.	.	.	1	1	.	.	.	1	.	1	1	1	.	.	.	.	.	1	.	1	1	1	1	.	I	III	.	V	
Other species																																
<i>Arctagrostis latifolia</i>	1	1	.	.	.	1	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	II	II	.	I	
<i>Artemisia tilesii</i>	1	.	1	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	IV	.	.	.	
<i>Aulacomnium turgidum</i>	.	.	.	.	.	+	1	.	1	.	.	1	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	I	III	.	I	
<i>Betula exilis</i>	.	.	.	.	.	1	1	.	1	+	1	1	1	1	1	.	.	.	.	.	.	.	1	.	.	.	.	V	.	.	I	
<i>Bistorta vivipara</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	1	.	.	.	.	.	II	.	I	
<i>Bryum</i> sp.	1	1	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.	
<i>Calamagrostis holmii</i>	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.	1	.	.	.	.	.	II	.	I	
<i>Calliergon cordifolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	1	1	.	.	.	.	.	.	.	II	I	
<i>Cardamine pratensis</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	1	.	.	.	.	.	.	I	.	II	.
<i>Dicranum laevidens</i>	.	.	.	.	.	.	1	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
<i>Distichium capillaceum</i>	.	.	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	1	.	.	.	II	.	III	
<i>Epilobium davuricum</i>	1	.	.	.	.	+	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	I	I	.	I
<i>Eriophorum brachyantherum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	1	1	.	.	.	.	.	III	
<i>Hieracloë pauciflora</i>	.	.	.	.	.	.	.	.	.	.	1	.	1	1	.	.	.	.	.	.	1	.	1	1	.	.	.	.	II	.	III	
<i>Luzula wahlenbergii</i>	.	.	.	.	.	.	.	.	.	.	1	1	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	
<i>Marchantia polymorpha</i>	1	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.	
<i>Pedicularis labradorica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.	.
<i>Peltigera leucophlebia</i>	+	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	II	.	.
<i>Poa arctica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	1	.	.	.	.	.	.	II	.	I	
<i>Poblia cruda</i>	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	IV	.	.	.
<i>Pyrola rotundifolia</i>	+	+	.	.	.	.	+	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	II	.	.
<i>Rumex arcticus</i>	.	1	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1	1	.	.	.	I	I	.	II
<i>Salix glauca</i>	1	1	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	IV	.	.	I
<i>Salix pulchra</i>	2	1	.	.	.	2	2	.	1	1	1	1	1	.	.	.	.	.	.	.	1	1	1	.	.	.	.	II	IV	.	III	
<i>Sanionia uncinata</i>	1	.	.	.	.	2	.	+	.	.	.	.	.	.	.	2	.	1	.	1	.	.	1	.	.	.	.	I	I	III	I	
<i>Saxifraga cernua</i>	.	1	1	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	II	I	.	I
<i>Saxifraga hieracifolia</i>	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	II	.	.	I
<i>Saxifraga nelsoniana</i>	.	.	.	1	1	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	II	I	.	.
<i>Sphagnum orientale</i>	.	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	.	.
<i>Tephrosia palustris</i>	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III	.	.	.	.
<i>Utricularia intermedia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	1	.	.	.	.	III	.
<i>Valeriana capitata</i>	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	III	.	.	II	.

Note. Single occurrence: *Parrya nudicaulis* 4(1); *Alopecurus alpinus* 1(1); *Andromeda polifolia* subsp. *pumila* 15 (1); *Arctophila fulva* 16 (2); *Carex marina* 14(1), 23(1); *Chrysosplenium alternifolium* subsp. *sibiricum* 23(1); *Cochlearia arctica* 3(+), 4(+); *Delphinium chamissonis* 5(1); *Dryas punctata* 4(1); *Eriophorum vaginatum* 13(1), 15(1); *Eutrema edwardsii* 4(+); *Gastrochneis apetala* 23 (1), 24(+); *Hippuris* × *lanceolata* 17(1), 26(1); *Ledum palustre* subsp. *decumbens* 7(1); *Pedicularis capitata* 4(1); *P. birsuta* 26(+); *P. lapponica* 9(1), 15(1); *P. pennellii* 13(1); *Petasites frigidus* 1(1); *Polemonium acutiflorum* 23(1); *Potentilla stipularis* 18(1); *Puccinellia borealis* 2(1), 4(2); *Ranunculus pallasii* 16(1), 18(1); *R. pygmaeus* 1(1); *Salix boganiensis* 5(+); *S. hastata* 4(2), 5(2); *S. lanata* 22(1); *S. myrtilloides* 15(+); *S. reptans* 15(1); *Saxifraga foliolosa* 13(1); *S. radiata* 23(1); *Stellaria ciliatosepala* 5(+), 23(1); *S. peduncularis* 4(+); *Orthothecium chryseon* 25(1); *Poblia bulbifera* 1(1), 3(1); *P. nutans* 11(1); *Polytrichastrum alpinum* 12(1); *Polytrichum juniperinum* 11(1); *P. canina* 9(1); *P. frippii* 9(1); *P. occidentalis* 12(1); *P. venosa* 1(+). Mosses: *Bryoerythrophyllum recurvirostrum* 4(1), 5(1); *Bryum cyclophyllum* 18(1), 19(1); *Calliergon megalophyllum* 22(1), 26(1); *Climacium dendroides* 19(1); *Dicranella crista* 1(1), 3(1); *Hennediella heimii* var. *arctica* 4(+), 5(+); *Mesoptychia sabbergii* 14(1); *Orthothecium chryseon* 25(1); *Poblia bulbifera* 1(1), 3(1); *P. nutans* 11(1); *Polytrichastrum alpinum* 12(1); *Polytrichum juniperinum* 11(1); *Pseudobryum cinclidoides* 20(1), 23(1); *Rhizomnium andrewsianum* 20(1); *R. pseudopunctatum* 25(1); *R. punctatum* 11(1); *Sarmentypnum sarmentosum* 20(1); *Scapania curta* var. *grandiretis* 10(1); *Schistochloopsis incisa* 12(1); *Sphagnum aongstroemii* 12(1); *S. lenense* 12(1); *Tritomaria exsectiformis* 12(1); *T. quinqueidentata* 7(1).

Author of the relevés: Khitun O.V. Location of the relevés: Sakha (Yakutia) Republic, Allaikhovskii ulus (district), low reaches of the Berelekh River, northern border of the southern tundra subzone. Coordinates (°N °E) and dates: 1 – 70.830484° 147.442484°, 14.07.2013; 2 – 70.823953° 147.493321°, 14.07.2013; 3 – 70.83165° 147.43966°, 14.07.2013; 4 – 70.82595° 147.48645°, 20.07.2013; 5 – 70.82675° 147.48688°, 20.07.2013; 6 – 70.830450° 147.44195°, 14.07.2013; 7 – 70.82644° 147.46479°, 10.07.2013; 8 – 70.831706° 147. 490862°, 14.07.2013; 9 – 70.831699° 147.493591°, 14.07.2013; 10 – 70.83339° 147.49259°, 15.07.2013; 11 – 70.834305° 147.491609°, 15.07.2013; 12 – 70.834291° 147.496712°, 16.07.2013; 13 – 70.827826° 147.445387°, 21.07.2013; 14 – 70.833266° 147.484553°, 19.07.2013; 15 – 70.845772° 147.468779°, 19.07.2013; 16 – 70.831044° 147.515709°, 13.07.2013; 17 – 70.823168° 147.496481°, 20.07.2013; 18 – 70.823168° 147.496481°, 20.07. 2013; 19 – 70.823953° 147.493321°, 20.07.2013; 20 – 70.830225° 147.44293°, 21.07.2013; 21 – 70.82539° 147.443309°, 16.07.2013; 22 – 70.825003° 147.4427°, 16.07.2013; 23 – 70.827269° 147.443891°, 21.07.2013; 24 – 70.827269° 147.443891°, 21.07.2013; 25 – 70.827269° 147.443891°, 21.07.2013; 26 – 70.827269° 147.443891°, 21.07.2013.

Abbreviations. All-Cs – alliance Caricion stantis, All-S-Cc – alliance Sphagno–Caricion canescentis, Ord-Cf – order Caricetalia fuscae and alliance Drepanocladion exannulati, Cl-Sp-Cf – class Scheuchzerio palustris–Caricetea fuscae, Cl-M-Pa – Matricario–Poetea arcticae. * – holotypus.

Sphagnum dominance. It probably should be assigned to the alliance Cassiope tetragona–Eriophoron vaginata Matveyeva et Lavrinenko 2023.

Community *Ledum palustre* subsp. *decumbens*–*Sphagnum lenense*

Rel. 75 (in data base). Coordinates: 70.825022°N 147.463012°E. Inclination 15°. Aspect 5°. Altitude: 14.5 m a.s.l. Total cover is 100%, low shrubs (*Betula exilis*, *Salix pulchra*) 15%, dwarf shrubs

(*Ledum palustre* subsp. *decumbens*, *Vaccinium vitis-idaea* subsp. *minus*) 25 %, herbs 10 %, lichens 10 %, mosses 90 %. Soil is sandy, gleyzem. Organic horizon is 10–12 cm, peaty, poorly decomposed, pH = 5.9. Date: 20.07.2013. Author: O.V. Khitun.

Composition and cover-abundance scores: *Arctagrostis latifolia* (2), *Aulacomnium palustre* (1), *A. turgidum* (1), *Betula exilis* (2), *Calamagrostis holmii* (1), *Cetraria islandica* (+), *Cladonia gracilis* (1), *Dactylina arctica* (+), *Dicranum laevidens* (2), *Eriophorum vaginatum* (1), *Hylocomium splendens* (2), *Flavocet-*

Table 3. Synoptic table of syntaxa distinguished within the study area and selected syntaxa from the classes *Loiseleurio procumbentis*–*Vaccinieta*, *Carici rupestris*–*Kobresietea bellardii*, *Matricario*–*Poetea arctica* and *Scheuchzerio palustris*–*Caricetea fuscae* described previously in the tundra zone of Siberia.

Syntaxa	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Number of relèves	7	10	9	4	5	9	5	6	6	10	14	6	8	26
D. sp. Carici arctisibiricae–Hylocomietum alaskani														
<i>Aulacomnium turgidum</i> Cl-Ca-Ha, Cl-L-V	V	V	V	III	III	I	V	IV	II	V	V	V	V	V
<i>Carex bigelowii</i> subsp. <i>arctisibirica</i> Cl-Ca-Ha	V	III	III							II	V	V	V	V
<i>Dryas punctata</i> Cl-Ca-Ha, Cl-Cr-Kb	V	IV	V	I				V	I		V	II		
<i>Hylocomium splendens</i>	V	V	I	III				IV	II		V	V	V	V
<i>Ptilidium ciliare</i> Cl-Ca-Ha	II	V	III						I		V	V	III	III
<i>Tomenytnum nitens</i> Cl-Ca-Ha	II	V	II		IV			II		I	V	II	IV	IV
Diff. sp. subass. luzuletosum tundricolae														
<i>Luzula tundricola</i>	V			III				IV	I					
<i>Pedicularis capitata</i> Cl-Cr-Kb	V			I						I	V	II		
<i>Tofieldia coccinea</i> Cl-Cr-Kb	IV			II				IV			V	II		
<i>Orthilia obtusata</i>	III			II							II			
<i>Salix hastata</i>	III			II										
D. sp. Peltigero scabrosae–Eriophoretum vaginati														
<i>Eriophorum vaginatum</i> Cl-Ca-Ha	I	V	II		I			III			V	V		
<i>Peltigera scabrosa</i>		V	I								I	III		
<i>Peltigera frippii</i>	I	V	I		I			III						
<i>Polytrichum juniperinum</i>	III	V	IV		I						III			
D. sp. ass. Cladonia amaurocratae–Betuletum exilis														
<i>Cladonia amaurocrata</i>	II	II	V					IV	II		V	V	IV	
<i>Cladonia carneola</i> Cl-L-V		II	III										II	
<i>Cladonia chlorophaea</i>	I	II	III		I			V			III			
D. sp. ass. Ranunculo affinis–Dryadetum punctatae														
<i>Artemisia tilesii</i>				V	V									
<i>Trisetum spicatum</i>				V										
<i>Alopecurus alpinus</i>				IV	I					II				
<i>Bryoxybryophyllum recurvirostrum</i>				IV	II									
<i>Cerastium maximum</i>				IV						I				
<i>Ehymus macrourus</i>				IV										
<i>Encalypta rhabdocarpa</i>				IV										
<i>Lecanora epibryon</i>	I			IV				I						
<i>Minuartia rubella</i>				IV						IV				
<i>Peltigera rufescens</i>				IV				IV						
<i>Potentilla stipularis</i>				IV		I		II						
<i>Ranunculus affinis</i>				IV				I						
<i>Timmia austriaca</i>				IV										
D. sp. ass. Leptobryum pyriformis–Arctagrostietum arundinaceae														
<i>Arctagrostis arundinacea</i>	I			V	V									
<i>Draba hirta</i>	III			V	V									
<i>Leptobryum pyriforme</i>		I		V										
<i>Aloina brevirostris</i>				IV										
<i>Ceratodon purpureus</i>	II			V										
<i>Draba juvenilis</i>	I			IV										
<i>Funaria hygrometrica</i>				IV										
<i>Adoxa moschatellina</i>	I			IV										
D. sp. ass. Eriophoro angustifolii–Sphagnetum obtusi														
<i>Sphagnum obtusum</i> Cl-Sp-Cf				V										
<i>Eriophorum angustifolium</i> s. l.		I	I	II	V	III	III			II	III	I	II	
<i>Salix fuscescens</i>				IV										
D. sp. ass. Bryo pseudotriquetri–Caricetum stantis														
<i>Bryum pseudotriquetrum</i>				V						II				
<i>Calliergonella lindbergii</i>				IV										
<i>Sphagnum squarrosum</i> Cl-Sp-Cf				III	IV	II				V				
<i>Sarmentypnum exannulatum</i>				II	IV									
<i>Calamagrostis purpurea</i> Cl-M-Pa				I	III									
<i>Caltha arctica</i> All-Cs				II	III	II				III				
<i>Plagiommium ellipticum</i>				III	I									
<i>Ranunculus gmelinii</i>				III										
<i>Stellaria crassifolia</i>				I	III									
D. sp. ass. Meesio triquetris–Caricetum stantis														
<i>Aulacomnium palustre</i> Cl-Sp-Cf	V	V	II	IV				V		II		I	IV	
<i>Scorpidium revolvens</i>				I				V		V				
<i>Meesia triquetra</i> Cl-Sp-Cf				I				V		V				
<i>Aneura pinguis</i>				I				IV		II				
<i>Cinclidium latifolium</i> Cl-Sp-Cf								III		V				
<i>Eriophorum russeolum</i>								II		V				
Diff. sp. ass. Meesio triquetris–Caricetum stantis														
<i>Carex chordorrhiza</i> Cl-Sp-Cf						I		V						
<i>Carex rariflora</i>								V			I			
<i>Carex rotundata</i>						I		V						
D. sp. subass. M. t.–C. s. triglochinetosum maritimi														
<i>Scorpidium scorpioides</i> Cl-Sp-Cf						I		V						
<i>Calliergon richardsonii</i> Cl-Sp-Cf						II		IV						

Table 3. Continued.

Syntaxa	A	B	C	D	E	F	G	H	I	J	K	L	M	N
<i>Campylopus stellatus</i> Cl-Sp-Cf	.	.	.	.	.	.	.	.	IV	.	.	.	.	.
<i>Flexicarpus flexicaule</i> Cl-Ca-Ha	.	.	.	.	.	.	.	.	IV	.	.	V	.	.
<i>Juncus triglumis</i> Cl-Sp-Cf	.	.	.	.	.	I	.	.	IV	.	.	III	.	.
<i>Triglochin maritimum</i>	.	.	.	.	.	.	.	.	IV	.	.	.	.	.
D. sp. ass. Rhytidio rugosi–Dryadetum punctatae														
<i>Astragalus alpinus</i> subsp. arcticus Cl-Cr-Kb	.	.	.	.	.	.	.	.	V	I	.	.	.	.
<i>Rhytidium rugosum</i>	III	I	.	III	.	.	.	.	V	.	.	II	.	.
<i>Arctous alpina</i> Cl-L-V	V	I	.	III	.	.	.	.	IV	.	.	IV	IV	.
<i>Minuartia arctica</i>	.	.	.	.	.	.	.	.	IV	I	.	III	.	.
<i>Pedicularis amoena</i>	.	.	.	.	.	.	.	.	IV	.	.	.	.	.
<i>Poa alpigena</i> Cl-M-Pa	I	.	.	IV	.	.	.	I	IV	.	.	.	.	.
<i>Flavocetraria nivalis</i> Cl-L-V, Cl-Cr-Kb	III	.	.	II	.	.	.	.	III	IV	.	.	IV	II
D. sp. subass. R.r.–D.p. empetretosum subholarctici														
<i>Empetrum subholarcticum</i> Cl-L-V	III	II	.	IV	.	.	.	.	V	.	.	V	.	.
<i>Ledum palustre</i> subsp. decumbens	V	V	II	III	.	I	.	.	V	V	.	V	V	V
<i>Vaccinium vitis idaea</i> subsp. minus Cl-L-V	V	V	III	V	.	.	.	.	V	III	.	V	V	V
<i>Cladonia rangiferina</i>	.	I	.	.	.	.	.	.	IV	IV	.	V	V	V
<i>Peltigera lepidophora</i>	.	.	.	.	.	.	.	.	IV	.	.	.	.	.
<i>Pyrola rotundifolia</i>	V	II	I	III	II	II	.	.	IV	.	.	IV	I	III
D. sp. ass. Alectorio nigricantis–Diapensietum obovatae														
<i>Alectorio nigricans</i>	III	III	.	III	.	.	.	.	II	V	.	.	I	.
<i>Bryocaulon divergens</i>	III	III	.	III	.	.	.	.	I	V	.	II	II	.
<i>Cassiope tetragona</i> Cl-Cr-Kb	III	II	.	.	.	.	.	.	V	.	.	V	IV	IV
<i>Diapensia obovata</i>	.	.	.	.	.	.	.	.	V	.	.	.	.	.
<i>Alectorio ochroleuca</i> Cl-L-V	.	.	.	.	.	.	.	.	II	IV	.	II	I	.
<i>Hieracium alpinum</i> Cl-L-V	.	.	.	.	.	.	.	.	IV	IV	.	.	.	.
<i>Calamagrostis holmii</i>	IV	III	IV	III	.	I	.	I	.	.	.	V	.	.
<i>Cladonia arbuscula</i> s.l.	.	.	.	.	.	.	.	.	II	III	.	V	V	III
<i>Sphaerophorus globosus</i> Cl-L-V	IV	II	.	IV	.	.	.	.	I	III	.	III	IV	.
D. sp. of the Meesio triquetris–Caricetum stantis typicum var. typica														
<i>Polytrichum jensenii</i>	.	.	.	.	.	II	I	.	.	.	V	.	.	.
<i>Cinclidium arcticum</i>	.	.	.	.	.	.	.	.	.	.	IV	.	.	.
<i>Comarum palustre</i> Cl-Sp-Cf	.	.	.	.	.	III	IV	.	.	.	I	.	.	.
D. sp. of the Carici arctisibiricae–Hylocomietum alaskani vicar. Pinguicula villosa														
<i>Betula nana</i> Cl-L-V	.	.	.	.	.	.	.	.	.	.	V	.	V	.
<i>Bistorta plumosa</i>	III	I	.	II	.	.	.	.	II	II	.	.	IV	.
<i>Pedicularis lapponica</i> Cl-L-V	II	III	.	.	.	I	.	.	.	.	V	II	III	.
<i>Pinguicula villosa</i>	.	.	.	.	.	.	.	.	.	.	V	.	.	.
<i>Salix pulchra</i>	III	V	IV	II	III	IV	.	III	.	III	.	V	V	V
<i>Vaccinium uliginosum</i> subsp. microphyllum Cl-L-V	V	V	.	III	.	.	.	.	V	.	.	V	V	IV
<i>Carex fuscicula</i>	.	.	.	.	.	.	.	.	.	.	.	IV	.	.
<i>Carex vaginata</i> Cl-Sp-Cf	II	.	.	II	.	.	.	.	.	.	.	IV	.	.
<i>Valeriana capitata</i> Cl-Ca-Ha	V	II	I	V	III	.	.	II	V	I	.	IV	.	.
<i>Andromeda polifolia</i> subsp. pumila	.	.	.	.	.	.	.	.	.	.	.	III	.	II
<i>Rumex arcticus</i>	.	.	.	.	.	.	.	.	.	.	.	III	.	.
D. sp. ass. Arctagrostio latifoliae–Eriophoretum vaginati														
<i>Sphagnum balticum</i>	.	.	.	.	.	.	.	.	.	.	.	V	IV	.
<i>Sphagnum lenense</i>	.	.	.	.	.	.	.	.	.	.	.	IV	II	.
<i>Orthocaulis binsteadii</i>	.	.	.	.	.	.	.	.	.	.	.	V	III	.
<i>Salix glauca</i>	V	I	.	V	V	.	.	I	IV	I	.	III	.	.
D. sp. subass. Sphagno-Eriophoretum vaginati typicum														
<i>Sphagnum rubellum</i>	.	.	.	.	.	.	.	.	.	.	.	V	V	.
<i>Sphagnum warnstorfii</i>	.	.	I	.	.	.	I	.	.	.	.	V	V	.
<i>Rubus chamaemorus</i>	.	.	.	.	.	.	.	.	.	.	.	II	V	.
<i>Sphagnum angustifolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Petasites frigidus</i> Cl-Ca-Ha	I	II	.	II	I	.	.	.	.	.	.	IV	IV	.
<i>Sphagnum girgensohnii</i>	.	.	.	.	.	.	.	.	.	.	.	.	III	.
<i>Pohlia nutans</i>	III	II	I	III	.	I	.	.	.	.	.	I	II	.
D. sp. class Carici arctisibiricae–Hylocomietea alaskani (Cl-Ca-Ha)														
<i>Achoriphragma nudicaule</i>	V	I	.	V	I	.	.	.	IV	II	.	III	.	.
<i>Arctagrostis latifolia</i>	V	IV	V	IV	III	II	.	I	.	III	.	V	V	I
<i>Blepharostoma trichophyllum</i> s.l.	.	I	I	.	.	.	.	.	.	.	.	.	I	III
<i>Distichium capillaceum</i>	III	I	II	III	III	.	.	III	.	.	.	V	.	.
<i>Dactylina arctica</i> Cl-Ca-Ha	IV	IV	I	.	.	.	.	.	IV	V	.	V	V	IV
<i>Festuca brachyphylla</i> Cl-M-Pa	IV	.	.	V	I	.	.	.	III	I	.	IV	.	.
<i>Luzula confusa</i>	IV	I	.	V	.	.	.	.	.	V	V	I	.	.
<i>Luzula nivalis</i> Cl-Cr-Kb	III	.	.	.	.	.	.	.	II	.	.	V	I	.
<i>Poa arctica</i> Cl-Cr-Kb	V	.	I	V	.	I	.	I	IV	II	.	IV	II	I
<i>Saxifraga hirculus</i> Cl-Sp-Cf	.	.	.	.	.	I	.	.	I	.	.	V	.	.
<i>Saxifraga nelsoniana</i>	V	IV	.	IV	II	I	.	.	III	I	.	III	I	II
<i>Stellaria peduncularis</i>	.	.	.	.	.	I	.	.	IV	I	.	.	.	.
D. sp. class Matricario–Poetea arcticae (Cl-M-Pa)														
<i>Chrysosplenium tetrandrum</i>	.	.	.	.	II	.	.	.	.	.	.	.	.	.
<i>Descurainia sophioides</i>	I	.	.	.	III	.	.	.	.	.	.	.	.	.
<i>Equisetum arvense</i> subsp. boreale	V	.	.	.	V	.	.	.	.	.	.	.	.	.
<i>Tripleurospermum bookeri</i>	.	.	.	.	IV	.	.	.	.	.	.	.	.	.

Table 3. Continued.

Syntaxa	A	B	C	D	E	F	G	H	I	J	K	L	M	N
D. sp. class Scheuchzerio palustris–Caricetea fuscae (Cl-Sp-Cf)														
<i>Calamagrostis neglecta</i>	.	.	.	.	.	I	I	III	.	.	.	.	.	.
<i>Calliergon giganteum</i>	.	.	.	.	.	.	.	I	III	.	.	V	.	.
<i>Carex saxatilis</i> subsp. <i>lasxa</i>	.	.	.	.	.	.	.	.	II	.	.	.	.	.
<i>Catoscopium nigratum</i>	.	.	.	.	.	.	.	.	II	.	.	.	.	.
<i>Cinclidium stygium</i>	.	.	.	.	.	.	I	III	.	.	.	.	.	.
<i>Cinclidium subrotundum</i>	.	.	.	.	.	.	.	II	.	.	.	.	.	.
<i>Drepanocladus arcticus</i>	.	.	.	.	.	.	.	II	.	.	.	.	.	.
<i>Epilobium palustre</i>	.	.	.	.	.	.	.	I	.	.	.	.	.	.
<i>Equisetum variegatum</i>	.	.	.	.	.	.	.	II	.	.	.	.	.	.
<i>Eriophorum scheuchzeri</i>	.	.	.	.	II	I	.	.	.	.	.	.	.	.
<i>Eurynchiastrium pulchellum</i>	.	.	II	.	.	.	.	.	.	.	.	.	.	.
<i>Hamatocaulis vernicosus</i>	I	.	.	.	.	I	II	V	.	.	.	.	.	.
<i>Juncus castaneus</i>	.	.	.	.	.	.	.	I	.	.	.	II	.	.
<i>Minnartia stricta</i>	.	.	.	.	.	.	.	I	.	.	.	.	.	.
<i>Sphagnum beringense</i>	.	I	.	.	.	.	.	.	.	.	.	.	.	.
<i>Sphagnum fimbriatum</i>	.	.	.	.	.	I	.	.	.	.	.	.	.	.
<i>Sphagnum platyphyllum</i>	.	.	.	.	.	I	.	.	.	.	.	.	.	.
<i>Sphagnum teres</i>	.	.	II	.	.	I	.	.	.	.	.	.	.	.
<i>Warnstorfia pseudostraminea</i>	.	.	.	.	.	.	II	.	.	.	.	.	.	.
D. sp. of the class Loiseleurio procumbentis–Vaccinietaea (Cl-L-V)														
<i>Betula exilis</i>	V	V	V	IV	I	V	.	I	V	II	.	.	.	V
<i>Dicranum fuscescens</i>	III	.	.	III	.	.	.	.	.	.	.	.	.	.
<i>Flavocetraria cucullata</i> Cl-Cr-Kb	V	V	V	III	.	II	.	.	.	V	V	.	V	V
<i>Ochrolechia frigida</i>	.	.	.	.	.	.	.	.	.	I	.	II	III	.
<i>Thamnolia vermicularis</i>	III	I	.	III	.	.	.	.	II	III	.	V	V	III
D. sp. of the class Carici rupestris–Kobresietea bellardii (Cl-Cr-Kb)														
<i>Bistorta vivipara</i>	I	.	.	III	.	I	.	I	V	.	II	V	.	I
<i>Cladonia pocillum</i>	.	.	.	.	.	.	.	.	II	.	.	II	.	.
<i>Lloidia serotina</i>	.	.	.	.	.	.	.	.	I	.	.	.	.	.
<i>Saxifraga cernua</i>	I	.	.	III	I	.	.	I	.	.	II	.	.	.
<i>Stereocaulon rivulorum</i>	.	.	.	.	.	.	.	.	II	.	.	.	.	.

Syntaxa: Cl-Ca-Ha – class Carici arctisibiricae–Hylocomietaea alaskani, Cl-L-V – class Loiseleurio procumbentis–Vaccinietaea, Cl-Sp-Cf – class Scheuchzerio palustris–Caricetea fuscae, Cl-M-Pa – Matricario–Poetea arcticae, Cl-Cr-Kb – class Carici rupestris–Kobresietea bellardii.

A – subass. Carici arctisibiricae–Hylocomietum alaskani luzuletosum tundricolae Khitun **subass. nov.**, **B** – ass. Peltigero scabrosae–Eriophoretum vaginati Khitun **ass. nov.**, **C** – ass. Cladonio amaurocraeae–Betuletum exilis Khitun **ass. nov.**, **D** – ass. Ranunculo affinis–Dryadetum punctatae **ass. nov.**, **E** – ass. Leptobryo pyriformis–Arctagrostietum arundinaceae Khitun **ass. nov.**, **F** – ass. Eriophoro angustifolii–Sphagnetum obtusi Khitun **ass. nov.**, **G** – ass. Bryo pseudotriquetri–Caricetum stantis Khitun **ass. nov.**, **H** – subass. Meesio triquetris–Caricetum stantis triglochietosum maritimi Khitun **subass. nov.**, **I** – subass. Rhytidio rugosi–Dryadetum punctatae empetretoosum subholarctici Telyatnikov et al. 2015, **J** – ass. Alecutorio nigricantis–Diansietum obovatae Telyatnikov et al. in Koroluk et al. 2023, **K** – vicariant Meesio triquetris–Caricetum stantis vicar. typical var. typica, **L** – vicariant Carici arctisibiricae–Hylocomietum alaskani vicar. *Pinguicula villosa*, **M** – ass. Arctagrostio latifoliae–Eriophoretum vaginati Lavrinenko et al. 2022, **N** – subass. Sphagno girgensohnii–Eriophoretum vaginati typicum M. Walker, D. Walker et Auerbach ex M. Walker in Matveyeva et Lavrinenko 2023.

D. sp. – diagnostic species; **Dif. sp.** – differential species.

raria cucullata (2), *Ledum palustre* subsp. *decumbens* (3), *Luzula confusa* (+), *Poa arctica* (+), *Parrya nudicaulis* (1), *Peltigera leucophlebia* (+), *P. scabrosa* (+), *P. neckeri* (+), *Petasites frigidus* (1), *Polytrichum hyperboreum* (2), *Pyrola rotundifolia* (1), *Salix pulchra* (1), *Sanionia uncinata* (1), *Senecio atropurpureus* (+), *Sphagnum aongstroemii* (1), *S. lenense* (4), *Sphenolobus minutus* (1), *Vaccinium vitis-idaea* subsp. *minus* (1), *Valeriana capitata* (1).

Vegetation of disturbed sites

Communities at successive stages of recovery after natural disturbances (such as cryogenic landslides and river banks erosion) are referred to the class **Matricario–Poetea arcticae** A. Ishbirdin in Sumina 2012, the order

Chamerio–Betuletalia nanae Khusainov et al. in Sumina 2012, and the alliance **Chamerio angustifolii–Matricarion hookeri** A. Ishbirdin et al. 1996.

The class comprises vegetation of anthropogenically and naturally disturbed surfaces in the tundra zone of Eurasia and North America (Sumina 2012, Mucina 2016). The diagnostic species of the class found in the study area are listed in Table 2. The order includes vegetation communities disturbed by natural processes such as cryoturbation, thawing, sliding, solifluction, and water erosion, as well as by human activities, in northern Eurasia and North America (Sumina 2012, Mucina 2016). The alliance is distinguished in northern Eurasia. We assigned 1 association to this alliance.

Ass. Leptobryo pyriformis–Arctagrostietum arundinaceae Khitun **ass. nov.** (Tabl. 2, rel. 1–6, Table 3, col. E, Fig. 3G)

Diagnostic species: *Arctagrostis arundinacea*, *Adoxa moschatelina*, *Draba birta*, *D. juvenilis*, *Ceratodon purpureus*, *Leptobryum pyriforme*, *Funaria hygrometrica*, *Aloina brevirostris*.

Holotypus: rel. 1 (51) (Table 1). Republic of Sakha (Yakutia), Allaikhovskii District, middle reaches of the Berelekh River. Slope of the lake depression, inclination 10°, aspect 200°, moss-grass-forb stage of recovery of clayey cryogenic landslide. Coordinates: 70.830484°N 147.442484°E. Altitude: 31 m a.s.l. Soils are not developed, clayey or sandy loam. Cover of mosses is 35 %, herbs 60 %, dwarf shrubs 1 %, lichens 1 %, shrubs 12 %. Date: 14.07.2013. Author: O.V. Khitun.

Distribution and ecology. Northern part of subzone E in northeastern Yakutia. Communities occur on gentle and steep, convex and concave slope sections disturbed by cryogenic landslides or coastal erosion. Microrelief varies from almost leveled (at landslide sites) to hummocky in places of cryogenic heaving in the upper parts of yedoma slopes toward thermokarst lakes or eroded slopes of high river banks. Altitude ranges from 10–12 m a.s.l. on riverbank slopes to 32 m on yedoma slopes. Moisture is sufficient and temporarily excessive (due to permafrost degradation). Grounds are loams and sandy loams; the organic horizon is absent; pH = 5.4–5.8.

Composition and structure. Two vertical strata are clearly distinguishable. The upper shrub–herb layer is well developed, reaching 20–30 cm in height. Herbs (*Arctagrostis arundinacea*, *Poa alpigena* subsp. *colpodea*, *Equisetum arvense* subsp. *boreale*, *Artemisia tilesii*, *Descurainia sophioides*, *Tripleurospermum hookeri*) dominate, their cover varies noticeably (30–90 %) and their distribution across the surface is uneven. Interestingly, the boreal species *Adoxa moschatelina*, which in tundra typically occurs beneath shrubs or on warm slopes, is most abundant here on disturbed substrates. Shrubs (*Salix glauca*, *S. pulchra*, *S. bastata*) are sparse during the early stages of recovery but attain significant cover in later successional stages. The lower moss layer ranges from sparse to moderately closed (10–40 %), represented by separate patches of mosses in microdepressions. Mosses are represented by pioneer species: *Leptobryum pyriforme*, *Ceratodon purpureus*, *Funaria hygrometrica*.

Note. Although some diagnostic species of the association *Tripleurospermum hookeri*–*Poetum alpigenae* Czerepov, Sleptsova et Mironova 2005 (Czerepov et al. 2005) are recorded in the association we describe (such as *Artemisia tilesii*, *Descurainia sophioides*, *Tripleurospermum hookeri*, *Equisetum arvense* subsp. *boreale*, *Poa alpigena* subsp. *colpodea*), it is distinguished by the constant and rather significant presence of mosses (*Leptobryum pyriforme*, *Aloina brevirostris*,

Ceratodon purpureus, *Funaria hygrometrica*), as well as by herbs such as *Arctagrostis arundinacea*, *Draba hirta*, *D. juvenilis* and *Adoxa moschatellina*. This specificity may be related to the lowland position of the study area, prolonged floods, high soil moisture in the surroundings, and the relatively small size of disturbed patches, which maintain humidity due to supra-permafrost waters. The combination of these factors has ensured an unusually large role of bryophytes in such communities. While the association *Tripleurospermo hookeri*–*Poetum alpigenae* is represented by communities of the initial stages of disturbance overgrowth, the association we describe is represented by stands of somewhat later successional stages.

Mires

Mire communities with sedges, cotton-grasses and Amblystegiaceae mosses are the most widespread in the surroundings of the station. We assign them to the class *Scheuchzerio palustris*–*Caricetea fuscae* Tx. 1937, order *Caricetalia fuscae* Koch 1926 and 3 alliances: *Sphagno*–*Caricion canescentis* Passarge (1964) 1978 nom. conserv. propos., *Drepanocladion exannulati* Krajina 1933 and *Caricion stantis* Matveyeva 1994. The class comprises sedge-moss vegetation of fens, transitional mires and bogs in Boreal and Arctic regions of the Northern Hemisphere (Mucina 2016, Matveeva & Lavrinenko 2021).

Diagnostic species of the class are listed in Table 2. The order is represented by sedge-moss vegetation on acidic peat, peaty or mineral waterlogged soils in boreal, subarctic and arctic regions of the Northern Hemisphere and in the mountains in southern Europe and Siberia (Mucina et al. 2016, Matveeva & Lavrinenko 2021). The alliance *Sphagno*–*Caricion canescentis* includes poor acidic fens or transitional mires in nemoral, boreal and tundra zones. They are poor both in respect of species richness and mineral supply but still have ground water feed and their nutrient availability is better than in ombrotrophic bogs. (Mucina 2016, Peterka et al. 2017, Lapshina et al. 2021). This alliance is represented by 1 association.

Ass. ***Eriophoro angustifolii*–*Sphagnetum obtusi*** Khitun ass. nov. (Table 2, rel. 7–15, Table 3, col. F, Fig. 3H).

Diagnostic species: *Eriophorum angustifolium*, *Salix fuscescens*, *Sphagnum obtusum*, *Tomentypnum nitens*.

Holotypus: Relevé 11 (28), (Table 2). Republic of Sakha (Yakutia), Allaikhovskii district, middle reaches of the Berelekh River. Cotton-grass–sphagna mire. Coordinates: 70.834305°N 147.491609°E. Altitude 16 m a.s.l. Wet hollows between high-centered polygons in tundra–mire complex in the lake depression. No inclination. Peat horizon is 20 cm thick, below – mineral ground. Soils are peaty gley on sandy grounds. Herbs cover 75 %, mosses 40 %, shrubs 5 %, lichens 1 % of the surface. Date: 15.07.2013. Author: O.V. Khitun.

Distribution and ecology. Northern boundary of subzone E in northeastern Yakutia. Community occurs in wet hollows, thermokarst troughs between flat polygons in polygonal complexes, also in small wet depressions on the flat watersheds and in river or lake flood-plains. Altitude 10–30 m a.s.l. Soils peaty gley on sandy grounds, slightly acidic (pH=5.0–5.8).

Composition and structure. The stands have 2 vertical strata. The upper layer is 40 cm high and composed mainly of graminoids with solitary low shrubs (*Betula exilis*, *Salix pulchra*). It can be from rather sparse to almost closed.

Among herbs *Eriophorum angustifolium* (up to 70 %) and *Carex aquatilis* subsp. *stans* (up to 20 %) predominate. The moss stratum varies from patchy to closed, with *Sphagnum obtusum* dominating, while *Aulacomnium palustre* and *Tomentypnum nitens* are not abundant.

Note. In this association we included both coenoses dominated by *Eriophorum angustifolium* and *Carex aquatilis* subsp. *stans* with low *Sphagnum* cover, and coenoses with an almost closed cover of sphagnum mosses (*Sphagnum obtusum*, *S. beringiense*) and less abundant graminoids. After obtaining more data, the latter probably should be treated as a separate variant.

On rather low rims in low-centered polygonal complexes, a community has been recorded that is transitional to the *Caricion stantis* alliance. It is not surprising, because communities of central depressions and shallow ponds inside polygons belong to that alliance. The presence of mosses (*Meesia triquetra*, *Sphagnum warnstorffii*) indicates certain mineral enrichment.

Community *Carex aquatilis* subsp. *stans*–*Sphagnum obtusum*

An herbaceous–sedge–sphagnum community on the rims of low-centered polygonal complex on the bottom of an alas depression.

Relevé 37 (in the database). Sakha Republic (Yakutia), Allaikhovskii District, middle reaches of the Berelekh River. Coordinates: 70.84714°N 147.453208°E. Slope 0°. Absolute elevation 8 m. Moss turf thickness up to 15 cm. Total cover: 100 %; shrubs 2 %, subshrubs 10 %, herbs 15 %, lichens 0 %, mosses 100 %. Soils are swampy, peaty on sandy substrate. We measured the peat horizon thickness as ca. 25 cm (that was the depth of the active layer), but according to measurements in the end of the growing season, thickness of peat horizon on rims exceeded 80 cm (Shirmeister et al. 2012). Date: 12.07.2013. Author: O.V. Khitun.

Composition and cover-abundance scores: *Arctagrostis latifolia* (+), *Calamagrostis holmii* (1), *Carex aquatilis* subsp. *stans* (2), *Comarum palustre* (1), *Dupontia fisheri* (1), *Hierochloë pauciflora* (1), *Ledum palustre* subsp. *decumbens* (1), *Luzula wahlenbergii* (+), *Pedicularis lapponica* (1), *P. penellii* (+), *Pyrola rotundifolia* (+), *Salix pulchra* (1), bryophytes: *Aulacomnium turgidum* (1), *Meesia triquetra* (1), *Sphagnum obtusum* (4), *S. orientale* (1), *S. warnstorffii* (2), *S. beringiense* (2), *Sarmentypnum sarmentosum* (1).

Such communities represent one of the early stages of the development of a low-centered polygonal complex with relatively low, narrow and moist rims and waterlogged central part.

Alliance ***Drepanocladion exannulati*** comprises vegetation of the slightly acidic poor fens or transitional mires in boreal and tundra zones as well as in mountains of the northern Eurasia (Mucina 2016, Matveeva & Lavrinenko 2021). Diagnostic species are the same as for the order *Caricetalia fuscae* Koch 1926. We assigned one association to this alliance.

Ass. ***Bryo pseudotriquetri*–*Caricetum stantis*** Khitun ass. prov. (Table 2, rel. 16–20, Table 3, col. G, Figs 3I, 3J) – mesotrophic sedge-grass fens or grassy swamps

Diagnostic species: *Bryum pseudotriquetrum*, *Calamagrostis purpurea*, *Calliergonella lindbergii*, *Caliba arctica*, *Plagiommium ellipticum*, *Ranunculus gmelinii*, *Sphagnum squarrosum*, *Stellaria crassifolia*, *Sarmentypnum exannulatum*.

Distribution and ecology. Northern boundary of southern hypoarctic tundra subzone in northeastern Yakutia. Stands occur in flood plains of rivers and lakes in combination with other vegetation types (shrub thickets, sphagnum mires) on

low often waterlogged elements of topography. Altitude 8–12 m a.s.l. Soils: alluvial humic on sand. pH = 5.6–5.8

Composition and structure. Graminoids dominate in these stands, forming almost closed stratum up to 50 cm high (*Carex aquatilis* subsp. *stans*, *Eriophorum angustifolium*, *Calamagrostis purpurea*). Mosses are less abundant and moss stratum is poorly exhibited (cover 10–15 %). Mosses grow either sparse but evenly or as patches in more wet microdepressions. Most common mosses are *Sphagnum squarrosum* and *Sarmentypnum exannulatum*.

Alliance **Caricion stantis** – sedge-moss vegetation of fens, waterlogged depressions in low centered polygonal complexes, wide shallow runoff depressions in the tundra zone of Eurasia and North America (Matveyeva & Lavrinenko 2021)

Diagnostic species: *Carex aquatilis* subsp. *stans*, *Dupontia fisheri*, *Calliergon giganteum*, *Caliba arctica*, *Hamatocaulis vernicosus*, *Pedicularis sudetica* (Ermakov 2012).

We assigned to this alliance 1 subassociation of previously described association.

Ass. **Meesio triquetris–Caricetum stantis**
Matveyeva 1994 (Matveyeva 1994)

Diagnostic species: *Aneura pinguis*, *Aulacomnium palustre*, *Cinclidium latifolium*, *Eriophorum russeolum*, *Scorpidium revolvens*, *Meesia triquetra*, *Sphagnum squarrosum*.

Subass. **Meesio triquetris–Caricetum stantis triglochinetosum maritimi** Khitun subass. prov. (Table 2, rel. 21–26, Table 3 col. H, Fig. 3K, 3L) – sedge-moss fens

Distribution and ecology. Northern part of subzone E in northeastern Yakutia. Stands occur on low waterlogged parts of river and lake terraces, especially if there is some inclination and flow. Altitude is 8–10 m a.s.l. Inclination 0–2°. Soils alluvial peaty-gley soils on sandy loam or loam.

Composition and structure. The stands are composed of herbs and mosses. The upper herbaceous layer is well developed, reaching 30–40 cm in height, its projective cover is 45–95 %. *Carex aquatilis* subsp. *stans* and *Carex chordorrhiza* dominate, while *Carex rariflora* and *Carex rotundata* occur sparsely. Species such as *Juncus triglumis*, *Triglochin maritimum*, and *Pedicularis sudetica* ssp. *interioroides* are present in solitary abundance but rather constantly. Mosses form a continuous cover. Mosses indicating mineral enrichment prevail, including *Scorpidium revolvens* and *Meesia triquetra*, while *Aulacomnium palustre*, *Aneura pinguis*, *Calliergon richardsonii*, *Campylopus stellatus*, *Flexitrichum flexicaule*, and *Scorpidium scorpioides* are less abundant.

Note 1. With a greater number of relevés and a survey of a larger area, it would probably be possible to distinguish several variants of the subassociation Meesio triquetris–Caricetum stantis triglochinetosum maritimi, depending on the dominant sedge species or the degree of waterlogging.

Note 2. *Triglochin maritimum* L. is very rare in Arctic Yakutia and it was not recorded in Yana-Indigirka Lowland previously. So, its presence in "Kytalyk" is a new finding for the whole region. In this community, several other rare species were recorded, which occurred in very limited local areas: *Gastrolychnis apetala*, *Eriophorum brachyantherum*, *Carex marina*, *C. saxatilis* subsp. *laxa*.

Willow thickets

In the studied area, several types of willow thickets were described; unfortunately, the small number of relevés does not allow us to distinguish any syntaxa. We provide examples of several communities.

Community *Salix pulchra–Sphagnum squarrosum*

We preliminarily assign it to the class Scheuchzerio palustris–Caricetea fuscae Tx.1937.

Relevé 44. (Fig. 3M). Republic of Sakha (Yakutia), Allai-khovsky District, middle reaches of the Berelekh River. Coordinates: 70.831093°N 147.514063E. Altitude: 6 m a.s.l. Terrace of a small river crossing an alas and flowing into the Berelekh slightly downstream from the station. Slightly hummocky surface with isolated sphagnum tussocks. Peaty soils on sandy ground. pH = 5.1. Date: 13.07.2013. Author: Khitun O.V.

Composition and cover-abundance scores: *Aulacomnium palustre* (+), *A. turgidum* (1), *Carex aquatilis* subsp. *stans* (2), *Hylocomium splendens* (1), *Peltigera leucophlebia* (+), *P. aphthosa* (+), *Petasites frigidus* (1), *Poa alpigena* (1), *P. arctica* (+), *Pyrola rotundifolia* (+), *Salix lanata* (2), *S. pulchra* (4), *Saxifraga cernua* (+), bryophytes: *Sanionia uncinata* (1), *Sphagnum fimbriatum* (1), *S. squarrosum* (4), *S. teres* (1), *Tomentypnum nitens* (+).

The total cover reaches 100 %. Moss cover is nearly closed, accounting for about 90 %. Lichens are present in small amounts, herbs contribute approximately 8 %, and shrubs dominate with about 60 % cover. Three vertical strata can be distinguished: a shrub layer 1.5–2.1 m high, an herbaceous layer about 30 cm high, and a ground moss layer.

A similar community was described by Perfil'eva et al. (1991) on the Kondakovsky Plateau as *Salix pulchra*–sphagnum willow thickets, in which *Sphagnum squarrosum* predominated and *Aulacomnium turgidum* was present. According to Perfil'eva et al. (1991), such community is a dynamic stage of development of alases; grassy swamps become overgrown with willow as the area rises and dries out.

Another variant of willow copses, very dense, practically without ground cover was described on the floodplain of the Berelekh River.

Community *Stellaria crassifolia–Salix pulchra* – dense willow thickets practically without understory

We do not assign it to any class; it contains species of both Scheuchzerio palustris–Caricetea fuscae Tx.1937 and Carici arctisibiricae–Hylocomietum alaskani Matveyeva 1994.

Rel. 81 (in data base). Republic of Sakha (Yakutia), Allai-khovsky district, middle reaches of the Berelekh River. Coordinates: 70.824365°N 147.492848°E. Altitude: 4 m a.s.l. Low floodplain of the Berelekh on the right bank. Slightly hummocky surface. Soils: alluvial peaty-humic on sand. pH = 5.8, active layer thickness is 64 cm. 20.07.2013. Author: O.V. Khitun

Composition and cover-abundance scores: *Calamagrostis neglecta* (1), *Carex aquatilis* subsp. *stans* (2), *Eriophorum angustifolium* (+), *Equisetum arvense* subsp. *boreale* (2), *Petasites frigidus* (2), *Salix bogaidensis* (+), *S. glauca* (2), *S. lanata* (2), *S. pulchra* (4), *Stellaria crassifolia* (+), bryophytes: *Aulacomnium turgidum* (1), *Bryum* sp. (+), *Calliergon cordifolium* (2), *Calliergonella lindbergii* (1), *Cinclidium subtundum* (+), *Polytrichum longisetum* (+), *Hylocomium splendens* subsp. *alaskanum* (1), *Polytrichum jensenii* (1), *Sanionia uncinata* (2), *Sphagnum squarrosum* (1), *Sarmentypnum exannulatum* (1), *Warnstorffia pseudostraminea* (+).

Total cover is 90 %. Shrub cover is 90 %, grasses 5 %, bryophytes 10 %. Three vertical strata are clearly exhibited. The shrub layer consists of willow (*Salix pulchra*, *S. lanata*, *S. glauca*) up to 90 %, about 1.7–2.3 m high. The herbaceous layer is very sparse, almost absent. The moss cover is sparse, about 10 %. Litter covers 70 % of the surface.

Such thickets of willow shrubs stretch in a narrow strip along the riverbed on sections of the low floodplain, alternating

with patches of sedge- or reedgrass-moss fens (ass. *Bryopseudotriquetri*–*Caricetum stantis*), further up the valley giving way to cotton-grass-sedge-sphagnum mires. Our community resembles the foothill floodplain willow stands described by Perfil'eva and co-authors (at least in terms of their ecological affinity), but differs by having a very poorly developed herbaceous layer.

Nival vegetation

A distinctive feature of “Kytalyk” is the nearly absence of snowbed habitats and nival communities. Only once we found a community, containing some species typical of nival communities. Notably, it is the only location where *Salix polaris*, *Ranunculus pygmaeus*, *R. nivalis*, and the Red Data Book species *Parnassia kotzebuei* were recorded.

Community ***Ranunculus nivalis*–*Sanionia uncinata*** – herb-moss nival tundra

Preliminary it can be assigned to Salicetea herbaceae.

Rel. 50 (in database). (Fig. 3N). A small (ca. 20 m²) slightly concave area at the lower part of a hill slope, on the edge of a dense floodplain willow thickets (*Salix pulchra*) with moss cover dominated by *Sanionia uncinata*. This site can be considered as a place where a snowbed might have existed. Inclination 3°, aspect 180°. Coordinates: 70.824595°N 147.47551°E. Altitude 19 m a.s.l. Soil: peaty-humic gleyzem underlain by loam, pH = 5.3, active layer thickness is 22 cm. Total vegetation cover 100 %; willows 10 %, grasses 30 %, bryophytes 95 %, lichens 1 %. Date: 14.07.2013. Author: O.V. Khitun.

Composition and cover-abundance scores: *Adoxa moschatellina* (+), *Alopecurus alpinus* (+), *Arctagrostis arundinaceae* (1), *A. latifolia* (+), *Artemisia tilesii* (+), *Betula exilis* (+), *Carex aquatilis* subsp. *stans* (2), *Cerastium regellii* (+), *Chrysosplenium alternifolium* subsp. *sibiricum* (+), *Draba juvenilis* (+), *Equisetum arvense* subsp. *boreale* (2), *Petasites frigidus* (1), *Poa alpigena* subsp. *colpodea* (1), *Poa arctica* (+), *Ranunculus nivalis* (1), *R. pygmaeus* (+), *Rumex arcticus* (+), *Salix hastata* (1), *S. glauca* (+), *S. polaris* (+), *S. pulchra* (2), *Saxifraga hircifolia* (+), *S. nelsoniana* (+), *Stellaria ciliatosepala* (+), *Parnassia kotzebuei* (+), *Polemonium acutiflorum* (+), *Valeriana capitata* (+), bryophytes: *Aulacomnium palustre* (+), *A. turgidum* (+), *Brachythecium* sp.(+), *Sanionia uncinata* (5), lichens: *Cetraria islandica* (+), *Peltigera aphthosa* (+).

DISCUSSION

The vegetation around the Kytalyk station is characterized by low syntaxonomic diversity, which is determined by the specific topographic and edaphic conditions – low elevation and weakly dissected terrain, as well as the widespread presence of sandy loam soils. Due to very little elevation differences, our zonal group includes communities not only from the hilltops, but also from the slopes, ridge edges, and the drained moss mounds of polygonal tundra complexes. Hilltops and gentle slopes of the yedoma are occupied by a specific variant of tussock tundra (ass. *Peltigero scabrosae*–*Eriophoretum vaginati*). Tussock tundras dominated by *Eriophorum vaginatum* have been considered a zonal vegetation type in the eastern part of the Gydan Peninsula (Gorodkov 1935, Telyatnikov et al. 2021), but they are most widespread east of Taimyr on low watersheds composed of heavy loams (Matveeva & Lavrinenko 2023). They are also widespread in Alaska, where they were first described following the Braun-Blanquet approach as the association *Sphagno*

girgensohnii–*Eriophoretum vaginati* M. Walker, D. Walker et Auerbach ex M. Walker in Matveeva et Lavrinenko 2023. *Eriophorum vaginatum* is also found in small amounts, but consistently, in communities of *Carici arctisibiricae*–*Hylocomietum alaskani* on light or medium loams and is usually confined to non-sorted circles (Matveeva 1998, Matveeva & Lavrinenko 2023). These two associations, *Carici arctisibiricae*–*Hylocomietum alaskani* Matveeva et Lavrinenko 2023 and *Sphagno girgensohnii*–*Eriophoretum vaginati*, share many species. Matveeva (1998) notes the existence of various transitional communities between these associations (and corresponding orders), including communities almost completely lacking either *Sphagnum*-mosses or *Eriophorum vaginatum*. In “Kytalyk”, we observed a tussock community with *Eriophorum vaginatum*, without *Sphagnum* mosses, instead featuring mosses typical of sedge-moss tundra. Green moss-dominated *Eriophorum vaginatum* tundras are very characteristic of the northern hypoarctic tundras (subzone D) of Yakutia, while in the southern hypoarctic tundras (subzone E), a range of transitions is observed: from lichen-green moss to green moss-sphagnum tundras (Perfil'eva et al. 1991). In the Indigirka River Basin, various stages of transition from hummocky-tussock *Eriophorum vaginatum* dominated tundras to hummock tundras with *Eriophorum vaginatum* can be observed (Perfil'eva et al. 1991). One of these transitional stages (ass. *Peltigero scabrosae*–*Eriophoretum vaginati*) was documented on yedoma hills in Kytalyk.

One of the most widespread communities in the area is the *Eriophoro angustifolii*–*Sphagnetum obtusi* mires. They have formed in areas of ice wedges degradation and transformation of polygonal complexes from low-centered into high-centered.

Herbaceous wet meadows or fens of the ass. *Bryopseudotriquetri*–*Caricetum stantis* lacking a peat horizon and dominated by reedgrass or sedges (*Carex aquatilis* subsp. *stans*) with poorly developed moss layer, are less common, they occur mainly on floodplains.

The most species-rich eutrophic fens belong to the subassociation *Meesio triquetris*–*Caricetum stantis triglochinetosum maritimi*. They are confined to the central troughs and margins of shallow ponds within low-centered polygons, or to the wettest parts of lake basins where water movement and mineral enrichment occur.

Relatively small areas are occupied by floodplain willow thickets. Among the willows, *Salix pulchra* absolutely dominates, with a mix of *S. glauca*, *S. lanata*, *S. hastata*, and the extremely rare *S. boganidensis*. At least two types of willow thickets can be distinguished based on differences in the ground layer: sphagnum-dominated and almost bare-ground with sparsely distributed *Amblistegiaceae* mosses.

The communities of recovering landslides on the slopes of lake basins and river banks (ass. *Leptobryo pyriformis*–*Arctagrostietum arundinaceae*) are rather special. They represent the more advanced stages of recovery, characterized by the increased role of mosses, while stands of the association *Tripleurospermo hookeri*–*Poetum alpigenae* correspond to the pioneer stage of reco-

very; they were lacking around the station. This absence is likely due to the weakening of solifluction processes as the slopes gradually flatten. Another reason is that first stages of recovery is ongoing faster here due to relatively small size of disturbances and sufficient moisture conditions.

Snowbeds and the corresponding communities are practically absent; their analogue (com. *Ranunculus nivalis*–*Sanionia uncinata*) was found only once. The same about steppe-like forb-grass communities on the slopes of pingos which are almost absent in “Kytalyk”, whereas they are rather common on the right bank of the Indigirka River at outcrops of Kondakov Plateau (Telyatnikov et al. 2015) and in Alaska (Walker et al. 1985). In the studied area, the slopes of pingos were mostly occupied by dwarf birch–dwarf shrub–sedge–moss communities of the same composition as on the slopes of yedoma (subass. *Carici arctisibiricae*–*Hylocomietum alaskani* *luzuletosum tundricolae*).

The specific of local conditions was reflected in the somewhat unusual ecological preferences of certain species. It was unexpected to find *Salix hastata* almost on the top of a hillock. In the West Siberian Arctic, this species is typically found in mesophytic nival communities at the foot of slopes, where there is abundant snow in winter, but it melts rather quickly. In “Kytalyk,” however, this willow spreads from the lower part of the slope, where it is much more abundant, up to the edge of the hilltop, where only single individuals remain. A similar situation occurs with the boreal species *Orthilia obtusata*. The reason may be that the hillocks here are very low (20–30 m) and are formed by relatively light soils, which reduces the differences between the lower and upper parts of the slopes. In Taimyr, *Salix hastata* has also been recorded on flat interfluvies in southern tundra, growing together with alder (Matveyeva 1998). *Alnus fruticosa* was noted in “Kytalyk” on the slopes of the yedoma hill among tussock tundra, with a single shrub about 50 cm tall on the northern slope, and nearby, on the western slope, several shrubs up to 70 cm tall along with young shoots up to 20 cm. At the same time, *Epilobium davuricum* and *Eriophorum brachyantherum* (from the diagnostic group of the class *Carici arctisibiricae*–*Hylocomietea alaskani*, usually associated with moist non-sorted circles in zonal communities on interfluvies (Matveyeva 1998; also authors’ observations in the West Siberian Arctic), in “Kytalyk” were found on wet exposed peat, sphagnum ridges in lowland fens or on overgrown landslides.

In the vicinity of Kytalyk, a successional series of alas transformation can be observed, as drainage improves and the surface rises, progressing from fens and wet meadows to the transformation of low-center polygons to high-centered polygonal complexes (de Klerk et al. 2014). As a result, first derivative communities of the zonal tundras of the alliance *Carici concoloris*–*Aulacomnion turgidi* Telyatnikov et al. in Koroluk et al. 2023 appear and later in more drained areas, communities from the alliances *Carici arctisibiricae*–*Hylocomion alaskani* Matveyeva et Lavrinenko, 2023 and *Cassiopo tetragonae*–*Eriophorion vaginati* Matveyeva et Lavrinenko, 2023 appear as well.

Prodromus of the vegetation in the surroundings of the research station “Kytalyk”

Class

Order

Alliance

Association

Subassociation

Carici arctisibiricae–*Hylocomietea alaskani* Matveyeva et Lavrinenko 2023

Caricetalia arctisibirico–*lugentis* Matveyeva et Lavrinenko 2023

Carici arctisibiricae–*Hylocomion alaskani* Matveyeva et Lavrinenko 2023

Carici arctisibiricae–*Hylocomietum alaskani* Matveyeva 1994

Carici arctisibiricae–*Hylocomietum alaskani* *luzuletosum tundricolae* Khitun **subass. nov.**

Cladonio amaurocraeae–*Betuletum exilis* Khitun **ass. nov.**

Eriophoretalia vaginati Matveyeva et Lavrinenko 2023

Cassiopo tetragonae–*Eriophorion vaginati* Matveyeva et Lavrinenko 2023

Peltigero scabrosae–*Eriophoretum vaginati* Khitun **ass. nov.**

Comm. *Ledum palustre* subsp. *decumbens*–*Sphagnum lenense*

Class ?

Order ?

Alliance ?

Comm. *Stellaria crassifolia*–*Salix pulchra*

Class ?

Order ?

Alliance ?

Ranunculo affinis–*Dryadetum punctatae* Khitun **ass. prov.**

Matricario–*Poetea arcticae* A. Ishbirdin in Sumina 2012

Chamerio–*Betuletalia nanae* Khusainov et al. in Sumina 2012

Chamerio angustifolii–*Matricarion hookeri* A. Ishbirdin et al. 1996

Leptobryo pyriformis–*Arctagrostietum arundinaceae* Khitun **ass. nov.**

Salicetea herbaceae Br.-Bl. 1948

Order ?

Alliance ?

Comm. *Ranunculus nivalis*–*Sanionia uncinata*

Scheuchzerio palustris–*Caricetea fuscae* Tx. 1937

Caricetalia fuscae Koch 1926

Sphagno–*Caricion canescentis* Passarge (1964) 1978 **nom. conserv. propos.**

Eriophoro angustifolii–*Sphagnetum obtusi* Khitun **ass. nov.**

Drepanocladion exannulati Krajina 1933

Bryo pseudotriquetri–*Caricetum stantis* Khitun **ass. prov.**

Caricion stantis Matveyeva 1994

Meesio triquetris–*Caricetum stantis* Matveyeva 1994

Meesio triquetris–*Caricetum stantis* *triglochinetosum maritimi* Khitun **subass. prov.**

Comm. *Carex aquatilis* subsp. *stans*–*Sphagnum obtusum*

Order ?

Alliance ?

Comm. *Salix pulchra*–*Sphagnum squarrosum*

CONCLUSIONS

The vegetation of Katalyk is assigned into 3 classes, 8 associations, 2 subassociations, and 5 communities. It significantly complements the existing results on the syntaxonomy of this region, which is related to the peculiarities of Katalyk's landscapes.

A new association of zonal tussock cotton-grass tundra, *Peltigero scabrosae*–*Eriophoretum vaginati* Khitun **ass. nov.**, is described. It differs from the well-known *Sphagno girgensohnii*–*Eriophoretum vaginati* association by the very low phytocoenotic role of sphagna. Sphagna are present only in small amounts (*Sphagnum compactum*). The association of *Dicranum* dominated dwarf birch tundra *Cladonio amaurocraeae*–*Betuletum exilis* Khitun **ass. nov.** growing on high centered polygons in an alas depression, is similar to the former in species composition, though completely different in appearance.

The most widespread in the vicinity of the station are sedge–sphagnum oligo-mesotrophic fens – *Eriophoro angustifolii*–*Sphagnetum obtusi* Khitun **ass. nov.** Sedge–reedgrass–sparse moss meadow mires (*Bryo pseudotriquetri*–*Caricetum stantis* Khitun **ass. prov.**) are limitedly spread on flood plain, alternating with various types of willow thickets with either *Sphagnum* dominated or almost absent understory.

In the vicinity of the station, we did not find communities of dwarf-shrub and shrub tundra (class *Loiseleurio procumbentis*–*Vaccinieta* Egger ex Schubert 1960), cryophytic grass meadows (*Carici rupestris*–*Kobresietea bellardii* Ohba 1974), or snowbed meadows and tundra (*Salicetea herbaceae*), which are common near the settlement of Chokurdakh, 28 km southeast of the station.

Despite the floristic and coenotic poverty of the area, the communities described by us are quite comparable in richness to similar communities in other parts of the Arctic.

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