

## Spiders (Aranei) of the Arctic Island Sibiryakova, Kara Sea, Russia

## Пауки арктического острова Сибирякова, Карское море, Россия

Andrei V. Tanasevitch<sup>1</sup>, Leonid B. Rybalov<sup>1</sup>, Iraida G. Vorobeva<sup>2</sup>  
 А.В. Танасевич<sup>1</sup>, Л.Б. Рыбалов<sup>1</sup>, И.Г. Воробьева<sup>2</sup>

<sup>1</sup> A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Leninsky prospekt 33, Moscow 119071, Russia. E-mails: tanasevitch@gmail.com; lrybalov52@mail.ru

Институт проблем экологии и эволюции имени А.Н. Северцова РАН, Ленинский проспект 33, Москва 119071, Россия.

<sup>2</sup> Mari State University, Yoshkar-Ola, Lenina Sq. 1. vigir@mail.ru

Марийский государственный университет, Йошкар-Ола, пл. Ленина 1.

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КЛЮЧЕВЫЕ СЛОВА: Российская Арктика, тундра, хорология, список видов, ловушки Барбера, почвенные пробы.

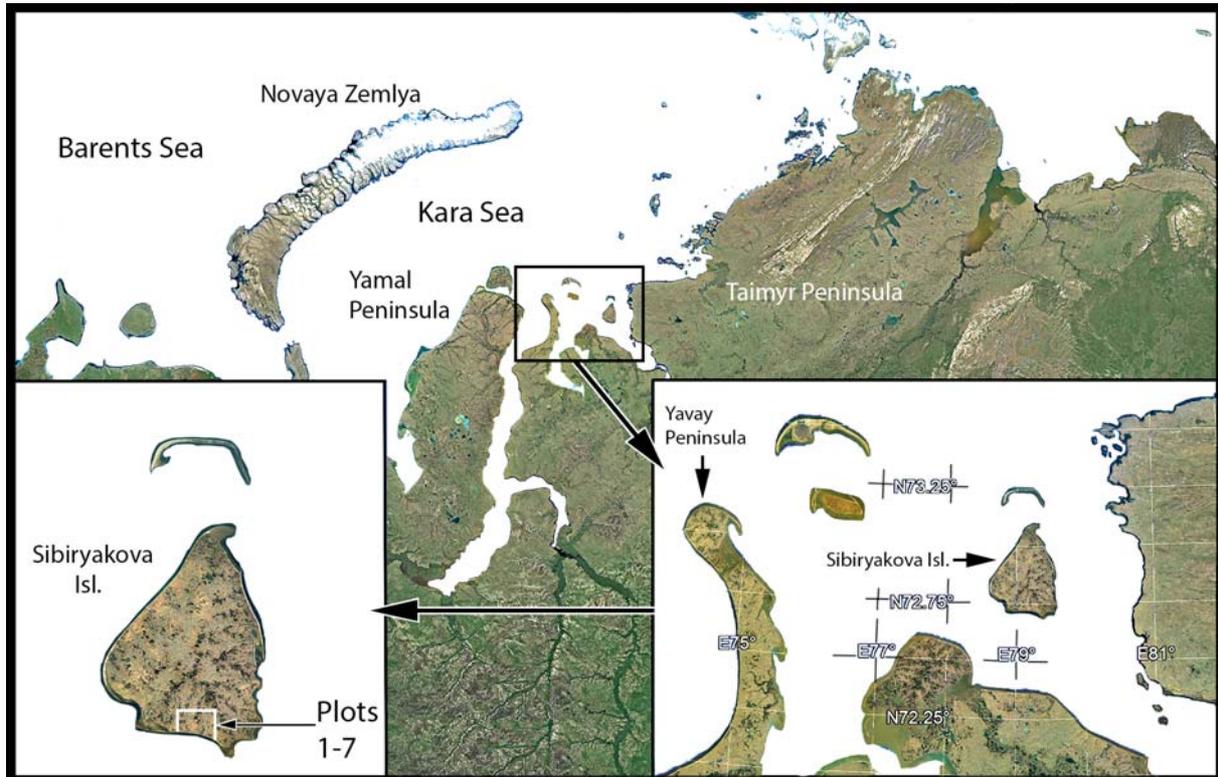
**ABSTRACT.** The Sibiryakova Island was found to be inhabited by 13 spider species of a single family Linyphiidae. In the composition of zoogeographic elements, the island fauna can be characterized as Siberian and consisting mostly of species with Siberian and Siberian-Nearctic ranges. In the composition of zonal fractions, the fauna is arctic and represented mainly by pure arctic components (11 species), with a small proportion of polyzonal species (2). Hypoarctic and boreal elements are absent. The study concerned the fauna and inhabitants of seven different types of vegetative communities: zonal (3) and intrazonal (4). The zonal (most pessimal) community — the moss-lichen polygonal tundra — is characterized, as compared to other areas, by the least number of species found (4) and by the least abundance of their populations (the exception is *Halorates spetsbergensis* (Thorell, 1872)). The vast majority of the fauna (10 species) and population is concentrated in the most wet intrazonal biotopes — the moss-cotton grass polygonal tundra. Three species, *Erigone psychrophila* Thorell, 1872, *H. spetsbergensis* and *Mecynargus tundricola* Eskov, 1988, explore the whole range of biotopes, both zonal and intrazonal, though the highest dynamic density/activity is seen only in the latter ones. It was confirmed that the spider fauna in wet intrazonal biotopes is considerably richer and their inhabitants are more abundant and represented by a wider range of latitudinal fractions than in other kinds of vegetative communities of the arctic tundras. The dynamic density/activity of spiders is more than twice in intrazonal communities as compared to zonal biotopes. The pitfall traps are responsible for all the 13 island spider species found, the soil samples (40) found only 7 species. The density of spider population comprised from 10 specimens/sq. m. in swampy moss-lichen tundra to 46 specimens/sq. m. in moss-lichen polygonal one. Spiders are the dominating group of the soil macrofauna of arctic tundras. Based on the results of the pitfall trap catching, their proportion in the col-

lection of land invertebrates comprised 60–91% in early July and 10–49% in the second part of July. Spiders comprise 27–63% of the macrofauna in the soil samples. Each of the 13 spider species of the Sibiryakova Island is characterized by distribution between the vegetation types, the range and belonging to the zonal fraction are indicated.

In addition, the species *Agyneta decora* (O. Pickard-Cambridge, 1871) is recorded in the Yamal Peninsula (Sabetta, northern Yamal) for the first time.

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**РЕЗЮМЕ.** На острове Сибирякова найдено 13 видов пауков одного семейства Linyphiidae. По составу зоогеографических элементов фауну острова можно охарактеризовать как сибирскую, составленную в большинстве своём видами с сибирскими и сибирско-неарктическими ареалами. По составу зональных фракций фауна арктическая, представлена в основном чисто арктическими элементами (11 видов), с малым участием полизональных форм (2 вида). Гипоарктические и бореальные элементы отсутствуют. Изучена фауна и население семи различных типов растительных сообществ: зональных (3) и интразональных (4). Зональное (наиболее пессимальное) сообщество — мохово-лишайниковая полигональная тундра, — по сравнению с остальными участками, характеризуется наименьшим числом найденных здесь видов (4) и наименьшей численностью их популяций (исключение *Halorates spetsbergensis* (Thorell, 1872)). Большая часть фауны (10 видов) и населения сосредоточена в наиболее влажном интразональном биотопе — мохово-пушицевой полигональной тундре. Три вида, *Erigone psychrophila* Thorell, 1872, *H. spetsbergensis* и



Map. Collecting plots on the Sibiryakova Island.

Карта. Месторасположение площадок на о-ве Сибирякова.

*Mecynargus tundricola* Eskov, 1988 осваивают весь спектр биотопов, как зональных, так и интразональных, но наибольшую динамическую плотность показывают лишь в последних. Подтверждено, что во влажных интразональных биотопах фауна пауков существенно богаче, их население обильнее и представлено более широким спектром широтных фракций, чем в других типах растительных сообществ арктических тундр. Динамическая плотность пауков в интразональных сообществах более чем вдвое превышает этот показатель в зональных биотопах. Ловушками Барбера собраны все 13 видов пауков острова, почвенными пробами (40 проб) учтено лишь 7. Плотность населения пауков составила от 10 экз./кв.м. в заболоченной мохово-лишайниковой тундре до 46 экз./кв.м. в мохово-лишайниковой полигональной. Пауки — доминирующая группа почвенной мезофауны местных арктических тундр. По данным сбора ловушками на их долю в начале июля приходится 60–91% всех пойманных наземных беспозвоночных, во второй половине июля — 10–49%. В почвенных пробах пауки составляют 27–63% всей мезофауны. Для каждого из 13 видов пауков о-ва Сибирякова приведено распределение по типам растительности, указан тип ареала и принадлежность к зональной фракции.

В дополнение, вид *Agyneta decora* (O. Pickard-Cambridge, 1871) впервые указан для п-ова Ямал (Сабетта, северный Ямал).

## Introduction

Among islands of Russian Arctic beyond the archipelagos, there are perhaps only four relatively well studied in respect to araneofauna: Bolshoy Aynov and Dolgiy islands in the Barents Sea; Vaygach and Shokalsky islands in Kara Sea, and Wrangel Island in the Chukchi Sea. The fauna of spiders of Bolshoy Aynov comprises 17 species [Nekhaeva, Nekhaev, 2011], that of Dolgiy — 52 [Marusik *et al.*, 2016], Vaygach — 21 [Tanasevitch, 2017b], Shokalsky — 14 [Nekhaeva, 2018] and Wrangel — 37 species [Khruleva, 1987]. Besides the species lists, the authors revealed some zoogeographic peculiarities of the fauna, specified the ranges of its representatives, detected some chorological groups and their distribution in zonal-landscape types of vegetation. Other similar islands of Russian Arctic (beyond the archipelagos) are very unsatisfactorily studied: Kolguev Island is known as inhabited by only one species [Tanasevitch, 2017a], Oleniy — by 3 [Tanasevitch, 2017a], and Belyi — by five species [Holm, 1970; Tanasevitch, 2017a].

Among islands of Russian Arctic within archipelagos, Novaya Zemlya can be regarded the most studied: 23 species [Tanasevitch, 2017b, 2018]. Inventories of other archipelagos are considerably shorter: Franz Josef Land — two species [Bulavintsev, Babenko, 1983], Severnaya Zemlya — three [Eskov, 1985], and Novosibirskiye Ostrova — five [Eskov, 1985; Marusik *et*

*al.*, 1993]. At the same time it cannot be expected that the spider fauna of these archipelagos will considerably increase because they are situated in the polar deserts zone or in the arctic tundra subzone [Matveyeva, 1998], which are characterized by extremal existence conditions and, respectively, a very poor biota.

## Material, methods and sampling

The present paper is based on the extensive material collected by I. Vorobeva on the Sibiriyakova Island (see the Map) in the period from June 29 to August 1, 1989. Spiders were collected by soil sampling, pitfall trapping and by hand collecting. Pitfall traps (200 ml plastic cups, filled at 2/3 by 2% formaldehyde solution) were positioned in seven studied biotopes in lines of 5–10 traps. In total, 2536 adult spider specimens were gained and examined. The data on lines with 5 and 10 traps were reconsidered for 100 trap/days. The text contains data on adult (identified) spiders, non-adult specimens were accounted in the total number (soil samples) or in the dynamic density (pitfall traps). The macrofaunal soil samples were taken at the area of 0.25x0.25 m, layer-by layer, 8 samples per plot. In total, 40 samples were taken on plots No. 2 to No. 7.

Range types of spiders are given according to Tanasevitch & Rybalov [2015]; Tanasevitch & Nekhaeva [2016] and Tanasevitch & Khruleva [2017] with a few additions and corrections.

Abbreviations used in the text: PCD — projective cover of vegetation degree; TPCD — total projective cover of vegetation degree.

## Region and localities

The Sibiriyakova Island is situated in the southern Kara Sea at the exit from the Yenisei River Bay, between Gydan and Taimyr peninsulas. This is an alluvial plain island with a flat relief and a number of thermokarst lakes and small rivers. Their by-mouth areas are represented by saline short-grass meadows littered by a huge amount of driftwoods taken out from the Yenisei River; the plains covered by arctic tundras. Micro- and nanorelief permafrost. There is no frost-free period. The soils are subsoil-frozen tundra-sandy, subsoil-frozen tundra-boggy and oozy, always weak in thickness, often with dense root mat. The vegetation is rather variable: 15 species of mixomicetes, 71 species of lichens, 83 species of mosses, 160 species and subspecies of vesicular plants [Kuvaev *et al.*, 1994; Matveyeva, Zanokha, 1984].

According to geobotanical regionalization, the Sibiriyakova Island lies in the arctic tundra subzone of the tundra zone [Matveyeva, 1998].

NOTE: 1989 summer was extremely cold even for the Arctic [Kuvaev *et al.*, 1994], which probably decreased the probability of revealing the more number of spider species, as well as their activity and numbers.

## Typification of plant communities

The scheme proposed by Yuri I. Chernov [1978] for classifying plant communities of the Arctic has been used for the analysis of zonal-landscape distribution of tundra spiders. Based on this classification, there are three main zonal-landscape types of plant communities in the tundra: zonal, intrazonal and azonal (for more details, see Tanasevitch & Koponen [2007]; Tanasevitch & Rybalov [2015]; Tanasevitch & Khruleva [2017]). Brief description of the types of vegetation on the Sibiriyakova Island is given below.

**Zonal plant communities (Zonal** in text below) — the plant communities that are restricted to the watershed of one zone (subzone), defining the vegetation zonal face of the landscape. In zonal communities, abiotic factors are more extreme as compared to those in intrazonal communities and therefore living conditions are more adverse. In the investigated area, the zonal plant associations are represented by different variants of undershrub-sedge-lichen-moss tundra rare with spots of bare ground.

In the studied area, the intrazonal communities are represented by moss-lichen-, dwarf willow-moss-sedge- and undershrub-moss-lichen polygonal tundra on watershed.

The numbers of studied plots are given in the order of their increasing humidity.

**Plot No. 1.** Moss-lichen polygonal tundra on watershed with spots of bare ground (sand) on left bank of Lagernaya River, 72.722819°N 79.258800°E, [1]. Polygons ca. 6–10 m in diameter, bordered with swampy hollows. Spots of bare sand ca. 5–10% of biotope. Total projective cover degree (TPCD) ca. 95%. Tundra communities with domination of lichens, projective cover degree (PCD) ca. 75–80%: *Parmelia stygia*, *Alectoria nigricans*, *Pertusaria* sp., *Thamnolia vermicularis*, etc.; mosses PCD ca. 10%: *Polytrichum strictum*, *Hylocomium splendens* var. *alaskanum*, *Dicranum spadicum*, etc. Angiospermae ca. PCD 10–15%): *Novosieversia glacialis*, *Dryas punctata*, *Salix nummularia*, *Lloydia serotina*, *Luzula confusa*, *Potentilla hypartica*, *Saxifraga foliolosa*, *Hierochloë alpina*. Soil: gleyic podburs (enti-gleyic podzols); soil texture — sand. This site first freed from the snow and thawed.

**Plot No. 2.** Undershrub-moss-lichen polygonal tundra on left bank of Lagernaya River, 72.713939°N 79.312019°E, [2]. TPCD ca. 100%. Tundra communities with domination of lichens (PCD ca. 60%): *Cetraria cucullata*, *Cetraria tenuiðolia*, *Cetraria islandica*, *Cladonia amaurocraea*, *Cladonia mitis*, *Cladonia gracilis*, *Dactylina arctica*, *Alectoria nigricans*, etc.; mosses (PCD ca. 20%): *Dicranum spadicum*, *Aulacomnium turgidum*, *Polytrichum alpinum*, *Hylocomium splendens* var. *alaskanum*, etc.; dwarf shrubs and grasses (PCD ca. 20%): *Salix nummularia* (PCD ca. 10%), *Dryas punctata* (PCD ca. 6%), *Vaccinium vitis-idea* (PCD ca. 1%), *Polygonum viviparum* (PCD ca. 3%), *Luzula confusa* (PCD ca. 3%), *L. wahlenbergii*, etc. Soil: peat gleyzems (histic gleysols); soil texture

— sand, excessively moistened. Permafrost at the middle summer ca. 12–15 cm.

**Plot No. 3.** Dwarf willow-moss-sedge polygonal tundra on gentle S-slope (1–2°) of watershed, 15–20 m a.s.l., 72.724371°N 79.167811°E, [3]. Polygons ca. 10–15 m in diameter. There are small hollows with water. TPCD ca. 100%, *Salix pulchra* (40%), *S. repens* (PCD ca. 30%), *Luzula confusa* (PCD ca. 10%), *L. wahlenbergii* (PCD ca. 10%), *Pedicularis sudetica* (PCD ca. 1–2%), *Saxifraga nivalis* (PCD ca. 1%); mosses (PCD ca. 3%): *Polytrichum strictum*, *Aulacomnium turgidum*, *Hylocomium splendens* var. *alascanum*; lichens (PCD ca. 1%): *Dactylina arctica*, *Pertusaria* sp., *Nephroma arcticum*. Soil: gleyic podburs (enti-gleyic podzols); soil texture — sand, well drained.

**Intrazonal plant communities (Intra** in text below) — the plant communities that are distributed across one or several zones (subzones); the typical examples being swamps and river valley vegetation: e.g., willow stands in flood-plains, meadows, rocky and/or grassy slopes, forest stands on river banks or river terraces, etc. Commonly, parts of intrazonal communities are situated on the watershed among zonal vegetation types: these are willow shrubs in depressions, shrubby lake shores, flat-hill peatbogs with sedge fens, or sphagnum bogs in depressions, grassy slopes of small brooks, etc. The intrazonal communities are characterized by a smoother gradient of climatic factors (especially, of temperature and humidity), making living conditions there significantly less pessimal.

In the studied area, the intrazonal communities are represented by grass-undershrub- and undershrub-grass-moss-lichen tundra on bank terraces, as well as by swampy moss-lichen tundra on watershed.

**Plot No. 4.** Grass-dwarf shrubs tundra on first S-slope (5–7°) terrace of right bank of Lagernaya River, 72.732500°N 79.245069°E, [4], with bare sandy spots occupy 50% of biotope. TPCD ca. 50%: grass associations with dwarf shrubs: *Dryas punctata* (PCD ca. 10%), *Salix nummularia* (PCD ca. 10%), *Minuartia arctica* (PCD ca. 1%), *Novosieversia glacialis* (PCD ca. 5%), *Luzula confusa* (PCD less than 1%), *Polygonum viviparum* (PCD less than 1%), *Arctagrostis latifolia* (PCD less than 1%), *Deschampsia glauca* (PCD less than 1%), *Alopecurus alpinus* (PCD ca. 1%); sporadic: *Trisetum spicatum*, *Androsace bungeana*, *Artemisia tilesii*, *Lloydia serotina*; sporadic: mosses & lichens. Soil: podburs (enti-umbic podzols); soil texture — sand.

**Plot No. 5.** Dwarf shrubs-grass-moss-lichen tundra on gentle slope of bank in valley of Izvilistaya River (72.759689°N 79.176889°E), [5]. Microrelief well-developed hummocks/pingos, polygons of loam ca. 15–20 m, occupy 40% of biocenosis. TPCD ca. 60%: lichens (PCD ca. 40–50%): *Alectoria nigricans*, *Pertusaria* sp., *Parmelia stypia*, *Dactylina arctica*, *Cetraria nivalis*, *Ochrolechia frigida*; undershrubs & grasses (PCD ca. 10–20%): *Salix nummularia* (PCD ca. 15%), *Luzula confusa* (PCD ca. 1–2%), *Ryas punctata* (PCD ca. 1–2%), *Oxyria digyna* (PCD less than

1%), *Festuca cryophila* (PCD less than 1%), *Draba nivalis* & *Polygonum viviparum* (PCD ca. 2%), *Potentilla hyparctica* (PCD ca. less than 1%); sporadic: *Pedicularis oederi*, *Pedicularis hirsute*, *Poa alpigena*, *Saxifraga cernua*, *Lloydia serotina*, *Minuartia arctica*; mosses: *Dicranum spadiceum*, *Polytrichum strictum*. Soil: cryozems (calcic cryosols); soil texture — sand.

**Plot No. 6.** Wet moss-cotton-grass polygonal tundra on edge of watershed in middle flow of Izvilistaya River, 72.744419°N 79.135550°E, at distance of 60 m from bay bank, [6]. There are small hollows with water. TPCD ca. 100%: *Eriophorum angustifolium* & *E. scheuchzeri* (PCD ca. 95%), *Calamagrostis holmii* (PCD ca. 2–3%), *Polygonum viviparum* (PCD ca. 1%), *Carex ensifolia* (PCD ca. 1%), sporadic: *Poa arctica*, *Saxifraga foliolosa*, *Pedicularis hirsute*, *Lycopodium selago*; mosses: *Dicranum spadiceum*, *Drepanocladus uncinatus*, *Aulacomnium turgidum*; lichens: *Cetraria* sp., *Dactylina arctica*, *Nephroma arcticum*. Soil: peat gleyzems (histic gleysols), excessively moistened.

**Plot No. 7.** Swampy moss-lichen tundra in shallow depression on watershed, 72.744731°N 79.190139°E, [7]. Swampy spots ca. 15–20 m, separated with sedge-*Eriophorum* communities ca. 1.5–2 m wide. TPCD ca. 100%. Mosses and lichens (PCD ca. 95%): *Dicranum spadiceum*, *Aulacomnium turgidum*, *Sphagnum* sp., *Polytrichum strictum*, *Drepanocladus uncinatus*; *Cladonia gracilis*, *C. amaurocraea*, *C. rangiferina*, *Cetraria delisei*, *C. islandica* var. *arctica*, *Thamnochloa vermicularis*. Angiospermae sporadic (PCD ca. 5%): *Salix polaris* (PCD ca. 1–2%), *Luzula wahlenbergii* (PCD ca. 1%), *Saxifraga nivalis* (PCD ca. 1%), *Polygonum viviparum* (PCD ca. 1%). Soil: peat gleyic soil (gleyi-histic albeluvisols), with thick layer of peat ca. 15–18 cm; soil texture — loamy sand.

**NOTE:** The data on population in plot No. 7 are not included in the tables of calculation of the numbers in the general analysis of the fauna and population because this area of tundra was flooded for nearly the entire summer of 1989, which has led to impossibility of soil sampling and exposing the pitfall traps during the main period of investigations. Therefore, the data on the plot No. 7 are only informative.

**Azonal communities** — the plant communities that are not confined by a certain zone (subzone) but distributed across many zones (subzones), and usually represented by specific beach plant communities on seashore, marshlands, and pebble banks of rivers and seas. This type of communities has not been addressed in this investigation.

### List of spiders of the Sibiriyakova Island

Families are given in the alphabetic order. Abbreviations **Zonal** and **Intra** correspond to investigated types of plant communities, numbers in square brackets correspond to numbers of certain above-described biotopes. Numbers following after “pitfall traps” mean a number of traps in line.

*Agynera decora* (O. Pickard-Cambridge, 1871)

**MATERIAL.** **Intra.** 2 ♂♂, grass-dwarf shrubs tundra on terrace [4], pitfall traps 5, 2–11.VII.1989.

**REMARKS.** Known from the southern tundra subzone on Dolgiy Island [Marusik *et al.*, 2016] and Taymyr [Osipov, 2003], as well as from the arctic tundra subzone in Yakutia [Tanasevitch, Nekhaeva, 2016], and Yamal Peninsula: 2 ♂♂, northern Yamal, environs of Sabetta, 71.237528°N 72.113524°E, slightly disturbed sphagnum-cloud-berry (*Sphagnum* sp. and *Rubus chamaemorus*) plant community, pitfall traps, 16–27.VII.2017, leg. L. Rybalov and A. Bastrakov (**new locality!**). In the Nearctic, *A. decora* was recorded from Alaska and Yukon Territory [Dupérré, 2013]. The species is new for the fauna of the Yamal Peninsula.

**RANGE.** Palaearctic-West Nearctic polyzonal.

*Arcterigone pilifrons* (L. Koch, 1879)

**MATERIAL.** **Zonal.** 11 ♂♂, 4 ♀♀, dwarf willow-moss-sedge polygonal [3], pitfall traps 5, 29.VI.–8.VII.1989; 1 ♂, 1 ♀, [3], pitfall traps 5, 21–31.VII.1989; 14 ♂♂, 4 ♀♀, [3], pitfall traps 10, 29.VI.–8.VII.1989; 1 ♂, 1 ♀, [3], soil sample No. 21, layer 0–1 cm, 10.VII.1989; 1 ♂, [3], soil sample No. 23, layer 1–4 cm, 10.VII.1989.

**Intra.** 1 ♂, 1 ♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 10, 29.VI.–8.VII.1989; 3 ♂♂, 2 ♀♀, [6], pitfall traps 5, 29.VI.–8.VII.1989.

**RANGE.** Siberian-West Nearctic arctic.

*Diplocephalus barbiger* (Roewer, 1955)

**MATERIAL.** **Zonal.** 1 ♂, undershrub-moss-lichen polygonal tundra [2], pitfall traps 10, 20–30.VII.1989.

**Intra.** 7 ♂♂, 2 ♀♀, dwarf willow-moss-sedge polygonal tundra [4], pitfall traps 5, 29.VI.–8.VII.1989; 1 ♂, 1 ♀, grass-dwarf shrubs tundra on terrace [5], pitfall traps 5, 2–11.VII.1989; 5 ♂♂, 1 ♀, [5], pitfall traps 10, 2–11.VII.1989; 1 ♀, [5], pitfall traps 5, 21–31.VII.1989; 2 ♂♂, 4 ♀♀, [5], pitfall traps 10, 21–31.VII.1989; 29 ♂♂, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 29.VI.–8.VII.1989; 80 ♂♂, 9 ♀♀, [6], pitfall traps 10, 29.VI.–8.VII.1989; 2 ♀♀, [6], pitfall traps 5, 21–31.VII.1989; 6 ♂♂, [6], pitfall traps 10, 20–31.VII.1989.

**RANGE.** Siberian-Nearctic arctic.

*Erigone arctica palaeartica* Braendegaard, 1934

**MATERIAL.** **Zonal.** 8 ♂♂, dwarf willow-moss-sedge polygonal tundra [3], pitfall traps 5, 29.VI.–8.VII.1989; 3 ♀♀, [3], pitfall traps 5, 21–31.VII.1989; 1 ♂, 1 ♀, [3], pitfall traps 5, 21–31.VII.1989; 3 ♀♀, [3], pitfall traps 5, 21–31.VII.1989; 4 ♀♀, [3], pitfall traps 10, 29.VI.–8.VII.1989.

**Intra.** 3 ♂♂, 10 ♀♀, grass-dwarf shrubs tundra on terrace [4], pitfall traps 5, 2–11.VII.1989; 1 ♀, [4], pitfall traps 5, 21–31.VII.1989; 1 ♂, 4 ♀♀, [4], pitfall traps 10, 21–31.VII.1989; 15 ♂♂, 25 ♀♀, [4], pitfall traps 10, 21–31.VII.1989; 1 ♀, swampy moss-lichen tundra in depression on watershed [7], soil sample No. 32, layer 0–1 cm, 26.VII.1989.

**RANGE.** East European arctic.

*Erigone psychrophila* Thorell, 1872

**MATERIAL.** **Zonal.** 1 ♀, moss-lichen polygonal tundra [1], pitfall traps 5, 20–30.VII.1989; 1 ♂, [1], pitfall traps 10, 20–30.VII.1989; 2 ♀♀, undershrub-moss-lichen polygonal tundra [2], pitfall traps 5, 29.VI.–8.VII.1989; 2 ♂♂, 4 ♀♀, [2], pitfall traps 5, 20–30.VII.1989; 2 ♂♂, 4 ♀♀, [2], pitfall traps 10, 29.VI.–8.VII.1989; 24 ♂♂, 15 ♀♀, dwarf willow-moss-sedge polygonal

tundra [3], pitfall traps 5, 29.VI.–8.VII.1989; 9 ♂♂, 11 ♀♀, [3], pitfall traps 5, 21–31.VII.1989; 44 ♂♂, 26 ♀♀, [3], pitfall traps 10, 29.VI.–8.VII.1989.

**Intra.** 15 ♂♂, 24 ♀♀, grass-dwarf shrub tundra on terrace [4], pitfall traps 10, 21–31.VII.1989; 3 ♂♂, 4 ♀♀, dwarf shrubs-grass-moss-lichen tundra [5], pitfall traps 5, 2–12.VII.1989; 14 ♂♂, 3 ♀♀, [5], pitfall traps 10, 2–11.VII.1989; 1 ♂, 1 ♀, [5], pitfall traps 10, 21–31.VII.1989; 26 ♂♂, 6 ♀♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 29.VI.–8.VII.1989; 21 ♂♂, 25 ♀♀, [6], pitfall traps 5, 21–31.VII.1989; 40 ♂♂, 25 ♀♀, [6], pitfall traps 10, 29.VI.–8.VII.1989; 7 ♂♂, 4 ♀♀, swampy moss-lichen tundra in depression on watershed [7], pitfall traps 10, 22.VII.–1.VIII.1989.

**RANGE.** Holarctic arctic.

*Gibothorax tchernovi* Eskov, 1989

**MATERIAL.** **Intra.** 17 ♂♂, 18 ♀♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 21–31.VII.1989; 5 ♀♀, [6], pitfall traps 10, 29.VI.–8.VII.1989; 22 ♂♂, 35 ♀♀, [6], pitfall traps 10, 20–31.VII.1989.

**RANGE.** Siberian arctic.

*Halorates spetsbergensis* (Thorell, 1872)

**MATERIAL.** **Zonal.** 5 ♂♂, 90 ♀♀, moss-lichen polygonal tundra [1], pitfall traps 5, 29.VI.–8.VII.1989; 5 ♂♂, 40 ♀♀, [1], pitfall traps 5, 20–30.VII.1989; 12 ♂♂, 60 ♀♀, [1], pitfall traps 10, 29.VI.–8.VII.1989; 7 ♂♂, 60 ♀♀, [1], pitfall traps 10, 20–30.VII.1989; 2 ♂♂, undershrub-moss-lichen polygonal tundra [2], pitfall traps 5, 29.VI.–8.VII.1989; 3 ♀♀, [2], pitfall traps 5, 20–30.VII.1989; 12 ♂♂, 18 ♀♀, [2], pitfall traps 10, 29.VI.–8.VII.1989; 5 ♀♀, [2], pitfall traps 10, 20–30.VII.1989; 6 ♂♂, 9 ♀♀, dwarf willow-moss-sedge polygonal tundra [3], pitfall traps 5, 29.VI.–8.VII.1989; 1 ♂, 1 ♀, [3], pitfall traps 5, 21–31.VII.1989; 7 ♂♂, [3], pitfall traps 10, 21–31.VII.1989.

**Intra.** 15 ♀♀, grass-dwarf shrub tundra on terrace [4], pitfall traps 10, 29.VI.–8.VII.1989; 5 ♂♂, 21 ♀♀, [4], pitfall traps 5, 2–11.VII.1989; 17 ♀♀, [4], pitfall traps 5, 21–31.VII.1989; 4 ♂♂, 15 ♀♀, [4], pitfall traps 10, 21–31.VII.1989; 20 ♂♂, 40 ♂♂, [4], pitfall traps 10, 2–11.VII.1989; 40 ♂♂, 70 ♀♀, dwarf shrubs-grass-moss-lichen tundra [5], pitfall traps 5, 2–12.VII.1989; 80 ♂♂ & ♀♀, [5], pitfall traps 5, 21–31.VII.1989; 80 ♂♂, 60 ♀♀, [5], pitfall traps 10, 2–11.VII.1989; 120 ♂♂ & ♀♀, [5], pitfall traps 10, 21–31.VII.1989; 2 ♀♀, [5] soil sample No. 34, layer 0–0.5 cm, 18.VII.1989; 2 ♂♂, [5], soil sample No. 34, layer 0–1.5 cm, 18.VII.1989; 1 ♂, [5], soil sample 35, layer 0–0.5 cm, 18.VII.1989; 1 ♀, [5], soil sample No. 36, layer 0–0.5 cm, 18.VII.1989; 1 ♀, [5], soil sample No. 37, layer 0–0.5 cm, 18.VII.1989; 2 ♀♀, [5], soil sample No. 37, layer 0.5–1.5 cm, 18.VII.1989; 1 ♀, [5], soil sample No. 38, layer 0–0.5 cm, 18.VII.1989; 1 ♀, [5], soil sample No. 40, layer 0–1 cm, 18.VII.1989; 25 ♂♂, 40 ♀♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 10, 20–31.VII.1989; 1 ♀, swampy moss-lichen tundra in depression on watershed [7], pitfall traps 10, 22.VII.–1.VIII.1989.

**RANGE.** Holarctic arctic.

*Hilaira nivalis* Holm, 1937

**MATERIAL.** **Zonal.** 1 ♀, undershrub-moss-lichen polygonal tundra [2], pitfall traps 5, 29.VI.–8.VII.1989; 1 ♂, 5 ♀♀, [2], pitfall traps 10, 29.VI.–8.VII.1989; 9 ♂♂, 17 ♀♀, dwarf willow-moss-sedge polygonal tundra [3], pitfall traps 5, 29.VI.–8.VII.1989; 14 ♂♂, 4 ♀♀, [3], pitfall traps 10, 29.VI.–8.VII.1989; 1 ♀, [3], soil sample No. 19, layer 0–1.5 cm, 10.VII.1989.

**Intra.** 2 ♀♀, dwarf shrubs-grass-moss-lichen tundra [5], pitfall traps 5, 2–12.VII.1989; 3 ♂♂, 4 ♀♀, [5], pitfall traps 10, 2–11.VII.1989; 43 ♂♂, 27 ♀♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 29.VI.–8.VII.1989; 2 ♂♂, [6], pitfall traps 5, 21–31.VII.1989; 9 ♂♂, 1 ♀, [6], pitfall traps 10, 20–31.VII.1989; 110 ♂♂, 70 ♀♀, [6], pitfall traps 10, 29.VI.–8.VII.1989; 1 ♂,

swampy moss-lichen tundra in depression on watershed [7], pitfall traps 10, 22.VII.–1.VIII.1989.

RANGE. West Siberian arctic.

### *Hilaira proletaria* (L. Koch, 1879)

**MATERIAL.** **Intra.** 23 ♂♂, 25 ♀♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 29.VI.–8.VII.1989; 7 ♂♂, [6], pitfall traps 5, 21–31.VII.1989; 7 ♂♂, 4 ♀♀, [6], pitfall traps 10, 29.VI.–8.VII.1989; 14 ♂♂, 1 ♀, [6], pitfall traps 10, 20–31.VII.1989; 2 ♂♂, swampy moss-lichen tundra in depression on watershed [7], pitfall traps 10, 22.VII.–1.VIII.1989.

RANGE. Siberian-West Nearctic.

### *Masikia indistincta* (Kulczyński, 1908)

**MATERIAL.** **Zonal.** 1 ♂, 1 ♀, undershrub-moss-lichen polygonal tundra [2], pitfall traps 5, 29.VI.–8.VII.1989; 1 ♀, [2], pitfall traps 5, 20–30.VII.1989; 11 ♂♂, 5 ♀♀, [2], pitfall traps 10, 29.VI.–8.VII.1989; 1 ♀, [2], soil sample No. 5, layer 2–4 cm, 16.VII.1989; 2 ♀♀, [2], soil sample No. 8, layer 0–2 cm, 16.VII.1989; 1 ♀, [2], soil sample No. 8, layer 2–4 cm, 16.VII.1989; 21 ♂♂, 11 ♀♀, dwarf willow-moss-sedge polygonal tundra [3], pitfall traps 5, 29.VI.–8.VII.1989; 23 ♂♂, 12 ♀♀, [3] pitfall traps 10, 29.VI.–8.VII.1989; 1 ♂, 1 ♀, [3], pitfall traps 10, 21–31.VII.1989.

**Intra.** 56 ♂♂, 4 ♀♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 29.VI.–8.VII.1989; 2 ♂♂, 1 ♀, [6], pitfall traps 5, 21–31.VII.1989; 20 ♂♂, 40 ♀♀, [6], pitfall traps 10, 29.VI.–8.VII.1989; 71 ♀♀, [6], pitfall traps 10, 20–31.VII.1989; 1 ♀, [6], soil sample No. 14, layer 0–1 cm, 22.VII.1989; 1 ♀, swampy moss-lichen tundra in depression on watershed [7], soil sample No. 29, layer 1–4 cm, 26.VII.1989.

RANGE. Siberian–Nearctic arctic.

### *Mecynargus tundricola* Eskov, 1988

**MATERIAL.** **Zonal.** 3 ♂♂, moss-lichen polygonal tundra [1], pitfall traps 5, 29.VI.–8.VII.1989; 1 ♂, 1 ♀, [1], pitfall traps 10, 29.VI.–8.VII.1989; 2 ♂♂, undershrub-moss-lichen polygonal tundra [2], pitfall traps 5, 29.VI.–8.VII.1989; 2 ♀♀, [2], pitfall traps 5, 20–30.VII.1989; 12 ♂♂, 6 ♀♀, [2], pitfall traps 10, 29.VI.–8.VII.1989; 2 ♂♂, 3 ♀♀, [2], pitfall traps 10, 20–30.VII.1989; 1 ♀, [2], soil sample No. 1, layer 0–2 cm, 16.VII.1989; 2 ♀♀, [2], soil sample No. 1, 0–2 cm, 16.VII.1989; 1 ♀, [2], soil sample No. 3, layer 0–2 cm, 16.VII.1989; 1 ♀, [2], soil sample No. 2, layer 2–4 cm, 16.VII.1989; 4 ♂♂, dwarf willow-moss-sedge polygonal tundra [3], pitfall traps 5, 29.VI.–8.VII.1989; 2 ♀♀, [3], pitfall traps 5, 21–31.VII.1989; 5 ♀♀, [3], pitfall traps 10, 21–31.VII.1989.

**Intra.** 1 ♂, grass-dwarf shrub tundra on terrace [4], pitfall traps 10, 2–11.VII.1989; 2 ♂♂, [4], pitfall traps 10, 29.VI.–8.VII.1989; 2 ♂♂, dwarf shrubs-grass-moss-lichen tundra [5], pitfall traps 10, 2–11.VII.1989; 2 ♂♂, [5], pitfall traps 5, 21–31.VII.1989; 1 ♀, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 29.VI.–8.VII.1989; 29 ♂♂, 41 ♀♀, [6], pitfall traps 10, 20–31.VII.1989; 1 ♀, [6], soil sample No. 14, layer 1–4 cm, 22.VII.1989; 1 ♂, swampy moss-lichen tundra in depression on watershed [7], pitfall traps 10, 22.VII.–1.VIII.1989; 1 ♂, [7], soil sample No. 27, layer 1–4 cm, 25.VII.1989.

RANGE. Siberian arctic.

### *Pelecopsis parallela* (Wider, 1834)

**MATERIAL.** **Zonal.** 1 ♀, dwarf willow-moss-sedge polygonal tundra [3], pitfall traps 10, 21–31.VII.1989.

RANGE. Palaearctic polyzonal.

### *Semljicola arcticus* (Eskov, 1989)

**MATERIAL.** **Zonal.** 3 ♂♂, moss-lichen polygonal tundra [1], pitfall traps 5, 29.VI.–8.VII.1989; 1 ♂, 1 ♀, [1], pitfall traps 10,

29.VI.–8.VII.1989; 4 ♂♂, 8 ♀♀, undershrub-moss-lichen polygonal tundra [2], pitfall traps 5, 29.VI.–8.VII.1989; 8 ♂♂, 5 ♀♀, [2], pitfall traps 5, 20–30.VII.1989; 15 ♂♂, 5 ♀♀, [2], pitfall traps 10, 29.VI.–8.VII.1989; 6 ♂♂, 6 ♀♀, [2], pitfall traps 10, 20–30.VII.1989; 1 ♀, [2], soil sample No. 2, layer 2–4 cm, 16.VII.1989; 5 ♂♂, 2 ♀♀, dwarf willow-moss-sedge polygonal tundra [3], pitfall traps 5, 29.VI.–8.VII.1989; 3 ♂♂, 3 ♀♀, [3], pitfall traps 5, 21–31.VII.1989; 7 ♂♂, 4 ♀♀, [3], pitfall traps 10, 29.VI.–8.VII.1989; 2 ♂♂, 4 ♀♀, [3], pitfall traps 10, 21–31.VII.1989; 1 ♀, [3], soil sample No. 17, layer 0–1 cm, 10.VII.1989.

**Intra.** 1 ♂, 3 ♀♀, dwarf shrubs-grass-moss-lichen tundra [5], pitfall traps 5, 21–31.VII.1989; 3 ♂♂, 2 ♀♀, [5], pitfall traps 10, 2–11.VII.1989; 3 ♂♂, wet moss-cotton-grass polygonal tundra [6], pitfall traps 5, 29.VI.–8.VII.1989; 5 ♂♂, [6], pitfall traps 10, 29.VI.–8.VII.1989.

RANGE. Siberian arctic.

## Results and Discussion

### Interesting records

Among findings on the island, only one can be perhaps considered as interesting: *Agyneta decora*, — a rare polyzonal element of the arctic island fauna, which is known, besides the Sibiryakova Island, only from Dolgiy Island [Marusik *et al.*, 2016], see details above in the List of spiders.

The Sibiryakova Island is situated in the vicinities of the Yenisei River mouth, and it would be logical to suggest that the river flow with driftwoods (see above) or with trash brings towards the island the elements of more southern, hypoarctic and/or boreal faunas. Regrettably, we were unable to reveal any of such species. Probably, they do exist but live in marsh environments, which have not been covered by our investigations, or they simply cannot survive in the very pessimal conditions on the island, even having been introduced.

### Fauna and population composition

In total, 13 spider species have been collected on the island. All of them belong to the family Linyphiidae and represented by two zonal/latitudinal fractions: arctic fraction (11 species) and polyzonal fraction (two species), see details in Tanasevitch & Khruleva [2017]. All species from the arctic fraction are purely arctic elements and in classification/typification of Chernov [1978], a part of them can be characterized as euarctic: *Arcterigone pilifrons*, *Diplocephalus barbiger*, *Erigone psychrophila*, *Halorates spetsbergensis*, *Hilaira proletaria*, *Semljicola arcticus*; or as hemiarctic: *Erigone arctica palaeartica*, *Gibothorax tchernovi*, *Hilaira nivalis*, *Masikia indistincta* and *Mecynargus tundricola*. Two species, *Agyneta decora* and *Pelecopsis parallela* are polyzonal.

The absence of wolf-spiders, Lycosidae, large and active predators, was not surprising. Lycosidae are absent also on nearby (again in the subzone of arctic tundras) Shokalsky Island [Nekhaeva, 2018]. They were not found also on Vaygach Island situated much southern, at the border between Kara and Pechora seas [Tanasevitch, 2017b]. Lycosidae are known only from

Table 1. Spider records by pitfall traps.  
Таблица 1. Данные учёта пауков почвенными ловушками.

Species	Types of plant communities					
	Zonal communities			Intrazonal communities		
	Plots in tundra					
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
	Number of collected specimens					
<i>Agyneta decora</i>				2		
<i>Arcterigone pilifrons</i>			35			7
<i>Diplocephalus barbiger</i>		1		9	15	126
<i>Erigone a. palaeartica</i>			20	59		
<i>E. psychrophila</i>	2	14	129	39	26	143
<i>Gibothorax tchernovi</i>						97
<i>Halorates spetsbergensis</i>	279	40	24	137	450	65
<i>Hilaira nivalis</i>		7	44		9	262
<i>H. proletaria</i>						81
<i>Masikia indistincta</i>		19	69			194
<i>Mecynargus tundricola</i>	5	27	11	3	4	71
<i>Pelecopsis parallela</i>			1			
<i>Semljicola arcticus</i>	5	57	30		9	8
Total specimens	<b>291</b>	<b>165</b>	<b>363</b>	<b>249</b>	<b>513</b>	<b>1054</b>
Total species	<b>4</b>	<b>7</b>	<b>9</b>	<b>6</b>	<b>6</b>	<b>10</b>

Dolgy Island [Marusik *et al.*, 2016] situated even southward — in the subzone of southern tundras and having recent connection with closely situated continent. Wolfspiders on Dolgy Island are represented by five species [Marusik *et al.*, 2016], of which only one species is arctic, and the other belong to the boreal fraction. The absence of Lycosidae on arctic islands can be explained by severe conditions of arctic tundras which do not allow them to survive until the adult state. It can be also suggested the presence of a strong pressure of birds which actively eat out these large spiders, especially during the nestling breeding. It can be noted also that the fauna of Ragozinka (mainland Taimyr), situated at about the same latitude in 40–50 km eastward of the Sibiryakova, was characterized by presence of at least one species of Lycosidae — the arctic species *Alopecosa mutabilis* (Kulczyński, 1908) [Eskov, 1985]. However, it cannot be excluded that the borders of tundra subzones in West Taimyr, as compared to that, are somewhat southward shifted, and Ragozinka, in the opinion of Matveyeva & Zanolka [1997], is situated near the border between typical and arctic tundras. It cannot be excluded that the absence of Lycosidae representatives in the fauna is a certain marker of arctic tundras.

Therefore, in the composition of zoogeographic elements, the fauna of the island can be characterized as

Siberian and mostly composed of Siberian and Siberian-Nearctic ranges. In the composition of zonal fractions of the island fauna, it is arctic and is represented by purely arctic elements (11 species) at a small inclusion of polyzonal species (2). Hypoarctic and boreal elements are absent.

Among purely arctic elements, three species, *Erigone psychrophila*, *Halorates spetsbergensis* and *Mecynargus tundricola*, are dominants widely explore all the biotopes, both zonal (most pessimal) and intrazonal, though being most abundant in the latter ones (see Table 1). Arctic *Semljicola arcticus* was not found in only one (intrazonal) biotope, though, on the contrary, it is most abundant in the zonal communities. Polyzoal *Agyneta decora* and *Pelecopsis parallela*, have been found only as singletons in intrazonal and zonal communities, respectively.

The most pessimal community — the zonal moss-lichen polygonal tundra — as compared to other areas, is characterized by the least number of species found (4) and their least dynamic density (see Tables 1 & 2). All these typical arctic faunistic elements were found in the zonal polygonal tundra only as single specimens, except the only case, *Halorates spetsbergensis*, which probably realized here its reproductive abilities at the situation of lack of the competition, despite the pessimal living conditions. Two other zonal communities,

Table 2. Spider records by pitfall traps: dynamic density/activity of spiders (per 100 trap-days).  
Таблица 2. Данные учёта почвенными ловушками: динамическая плотность/активность пауков  
(на 100 ловушко-суток).

	Types of plant communities					
	Zonal communities			Intrazonal communities		
	Plots in tundra					
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Traps positioning period	29.VI– 8.VII	29.VI– 8.VII	29.VI– 8.VII	2– 12.VII	2– 12.VII	29.VI– 8.VII
Number of collected spiders per 100 trap-days	97	101	173	198	258	458
Traps positioning period	20– 30.VII	20– 30.VII	21– 31.VII	21– 31.VII	21– 31.VII	21– 31.VII
Number of collected spiders per 100 trap-days	154	29	107	80	184	312

Table 3. Spider records by soil samples (spms/sq. m).  
Таблица 3. Данные учёта пауков почвенными пробами (в экз./кв. м).

Species	Types of plant communities					
	Zonal communities			Intrazonal communities		
	Plots in tundra					
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
	Number of collected specimens					
<i>Agyneta decora</i>						
<i>Arcterigone pilifrons</i>			6			
<i>Diplocephalus barbiger</i>						
<i>Erigone a. palaeartica</i>						
<i>E. psychrophila</i>						
<i>Gibothorax tchernovi</i>						
<i>Halorates spetsbergensis</i>					22	
<i>Hilaira nivalis</i>			2			
<i>H. proletaria</i>						
<i>Masikia indistincta</i>		8				2
<i>Mecynargus tundricola</i>		10				2
<i>Pelecopsis parallela</i>						
<i>Semljicola arcticus</i>		2	2			
Aranei juv.		26	20		12	32
Spider quantity per 1 sq. m.	*	<b>46</b>	<b>30</b>	*	<b>34</b>	<b>36</b>

\* due to a strong impounding of the plots, the soil samples were not taken in due course.

undershrub-moss-lichen- and dwarf willow-moss-sedge polygonal tundras, were much richer in species (7 and 9, respectively) and showed a considerably higher catching efficiency of the pitfall traps, which probably is connected with their higher humidity.

Intrazonal vegetable communities are generally more humid and are characterized by less pessimal living conditions as compared to zonal ones. This probably

explains their richer faunal composition (12 vs. 10) and much more abundant population of spiders: the catching efficiency of the pitfall traps in intrazonal communities is 2.2 times higher than in the zonal ones (see Tables 1 & 2). The richest in the number of species (10) and the population density is the moistened moss-cotton grass polygonal tundra (plot No. 6). Just in this area many species reach their maximal abun-

Table 4. Spider abundance (spms/sq. m) in soil samples and their share in the total population of macrofauna. Таблица 4. Численность пауков (экз./кв. м) в почвенных пробах и их доля в общем населении мезофауны.

	Types of plant communities				
	Zonal communities		Intrazonal communities		
	Plots in tundra				
	No. 2	No. 3	No. 5	No. 6	No. 7
Aranei (spms/sq. m)	46	30	34	36	10
Share of spiders in the total population of macrofauna	51%	18%	63%	27%	14%
Total abundance of macrofauna (spms/sq. m)	92	166	52	136	74

dance (as expressed in dynamic density): *Diplocephalus barbiger*, *Erigone psychrophila*, *Hilaira nivalis*, *H. proletaria*, and *Gibothorax tchernovi*. The two latter species live only there and are rather abundant.

This study confirms the conclusions of many authors (see Tanasevitch, Rybalov, 2015; Tanasevitch, Nekhaeva, 2016; Tanasevitch, Khruleva, 2017; Khruleva *et al.*, 2018, etc.) that humid intrazonal biotopes possess a considerably richer spider fauna, their population is more abundant and represented by a wider array of latitudinal fractions, as compared to other types of vegetable communities of arctic tundras.

### Spiders in the soil macrofauna structure

Accounts by the pitfall traps and soil samples have shown that spiders are the main group among population of the soil macrofauna of local arctic tundras: they were dominant in almost all biotopes studied. Thus, the proportion of spiders comprised 27–63% in most plots, and only the plot No. 7 was different in the marginal participation of spiders in the total population (14%), less of that of most other soil invertebrates, which can be explained by marked impoundment of this plot in 1989 (see Table 4). As compared to data from pitfall traps, the taxonomic composition of spiders in the soil samples was much poorer: the samples revealed only seven species of 13 (see Table 3). Significantly, all these species from the trap data were dominant in the same biotopes, that is the soil samples found only the most abundant species of a certain biocoenosis (see Table 1).

Spiders are the dominant group in the soil macrofauna in local arctic tundras: during the season they mainly account for 30 to 60% of the total population of soil macrofauna. The proportion of spiders changes in dependence on the vegetation period terms: in the beginning (late June to early July) it comprised 60–91%, in the second half of summer — 10–49%. Spiders are the first group of large soil invertebrates becoming active just after the snow melting. By the late July, almost all biocoenoses contain either just appeared or becoming active other invertebrate groups, which were

before in a diapause or in a latent condition (inactive juveniles).

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