New data on spiders (Arachnida: Aranei) of the Central Yamal Peninsula, with notes on biotopic preferences of the dominant species

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KEY WORDS: Araneae, Arctic, habitat preferences, species list, tundra, collecting methods.

ABSTRACT: Studying the local fauna of spiders in the vicinity of the Seyakha village (Yamal Peninsula, Siberian Arctic), I identified a total of 47 species belonging to seven families. Five species (Agyneta decora, A. ripariensis, Masikia caliginosa, Metopobactrus prominulus, and Walckenaeria clavicornis) have been recorded for the fauna of Yamal for the first time. The fauna of the Southern, Central, and Northern Yamal differ in species richness (comprised of a total of 165, 61, and 36 species, respectively). I compared the effectiveness of estimations of the species richness for spiders at high latitudes using pitfall traps and a sifter and found no significant differences between these methods. The composition of the dominant species differed between the sample sets collected using pitfall traps and a sifter, although all of these species were present in both sample sets. I found no clear biotopic preferences for populations of the majority of dominant spider species in the Central Yamal.

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RéSUMÉ: В локальной фауне пауков окрестностей поселка Сеяха (Ямал, Сибирская Арктика) выявлено 47 видов, принадлежащих к 7 семействам. Пять видов (Agyneta decora, A. ripariensis, Masikia caliginosa, Metopobactrus prominulus, Walckenaeria clavicornis) впервые отмечены для фауны Ямала. Фауна Южного, Среднего и Северного Ямала различаются по видовому богатству (165, 61 и 36 видов соответственно). При оценке эффективности учета видового богатства пауков в высоких широтах с помощью ловушек и сифтера достоверных отличий между этими методами не выявлено. Состав доминирующих видов в материалах для обоих методов различался, хотя все эти виды присутствовали в обоих выборках. Для популяций большинства домinantных видов пауков на Среднем Ямале четких биотопических предпочтений не обнаружено.

Introduction

To date, most of the available data on the spiders of the Siberian Arctic has been obtained from isolated studies conducted at the local level in different sectors of the Arctic. The predominant collection methods were pitfall traps and sifter, as well as manual collection from soil samples or moss and litter samples [Eskov, 1986b, 1988; Eskov, Marusik, 1994; Khruleva, 2009; Tanasevitch, Rybalov, 2015; Marusik, Koponen, 2015; Marusik et al., 2016; Tanasevitch, Nekhaeva, 2016; Tanasevitch, Krissanova, 2016; Tanasevitch, Khruleva, 2017; Khruleva et al., 2018; Nekhaeva, 2018, 2020; Tanasevitch et al., 2020; etc.]. Between the aforementioned methods, pitfall traps and sifter are easier to use and are suitable for the most commonly occurring groups (surface and litter dwelling species). It is obvious that these methods cannot be directly compared, and as researchers use them in different proportions, the contribution of each method to the final result also differs from study to study. However, since no analysis has been performed on the combined data, effects of the methods on the results are unclear.

The Yamal Peninsula is located in the extreme northwest of West Siberia (Fig. 1). This is the youngest...
Fig. 1. Map (A) and a view of the studied area (B). The location of Seyakha village is indicated with a circle. Bioclimate subzones are marked with color [according to CAVM Team, 2003; Walker et al., 2005]: blue (1) — subzone B; green (2) — subzone C; yellow (3) — subzone D; orange (4) — subzone E.

This work presents new data on the local spider fauna of the Central Yamal and analyzes data on the composition of the spider fauna in various parts of Yamal and adjacent territories. In addition, I assess the effectiveness of estimations of the species richness of spiders at high latitudes using pitfall traps and sifter, and also identify and discuss the biotopic preferences of the dominant species.

Materials and methods

Study Area

The Yamal Peninsula is one of the most flat regions of the Arctic (the maximum height is 92 m above mean sea level) [Rebristaya, 2013]. Its length from south to north exceeds 750 km, including the subzones ranging from the northern forest-tundra to the arctic tundra [Rebristaya, 1999]. On the basis of bioclimate zonation, the territory of the Yamal Peninsula is divided in the present study into Southern, Central, and Northern Yamal, which correspond to subzones E, D, and C on the Circumpolar Arctic Vegetation Map [CAVM Team, 2003; Walker et al., 2005] (Fig. 1, A).

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Table 1. Description of the studied sites in the vicinities of Seyakha village.

Таблица 1. Описание точек сбора в окрестностях пос. Сеяха.

| No. | Habitat                     | Coordinates             | Collecting method | t, °C |
|-----|-----------------------------|-------------------------|-------------------|-------|
| 1   | Dryas tundra                | N70.14056° E72.52494°   | PT (7-19.07; 132), Sif | 9.3   |
| 2   | Forb meadow at the slope    | N70.14085° E72.52528°   | PT (7-19.07; 116), Sif | 10.7  |
| 3   | Snow patch at the foot of the slope | N70.14091° E72.52584°   | PT (7-19.07; 120), Sif | 6.8   |
| 4   | Willowshrub with Sphagnum   | N70.14141° E72.52358°   | PT (7-19.07; 120), Sif, HC, Sw | –     |
| 5   | Peat bog with cloudberries  | N70.14123° E72.52236°   | PT (7-19.07; 120), Sif | –     |
| 6   | Sedge-green moss bog with Sphagnum spots | N70.14178° E72.52192°   | PT (7-19.07; 120), Sif, HC | 8.8   |
| 7   | A strip of willows along the lake | N70.14205° E72.51788°   | PT (7-19.07; 120), Sif | –     |
| 8   | Lake coastline with sedge   | N70.14205° E72.51688°   | PT (7-19.07; 120) | –     |
| 9   | Zoogenic biotope (Lemmus habitat) in zonal tundra | N70.14766° E72.51563° | PT (7-19.07; 72) | –     |
| 10  | Undershurb-moss-lichen polygonal tundra (=zonal tundra) | N70.14866° E72.51760° | PT (7-19.07; 120) | 8.5   |
| 11  | Zoogenic meadow with sagebrush at the top of the hill | N70.15242° E72.44421° | PT (8-20.07; 120), Sif | –     |
| 12  | Marsh-like communities on the Gulf of Ob coast with Arctophila | N70.16923° E72.56144° | PT (8-16.07; 120), Sw, HC | –     |
| 13  | Coastal sedge-cottongrass bog on the Seyakha R. bank | N70.17425° E72.53335° | PT (8-20.07; 106) | –     |
| 14  | Longstanding drifts on the Seyakha R. bank with rich motley grass | N70.17425° E72.53335° | PT (8-20.07; 106), Sif | –     |
| 15  | Different places in village vicinities | – | HC | –     |

Abbreviations: HC — hand collecting, PT — pitfall traps (collecting time and total number of trap-days is given in parenthesis), Sif — sifting moss and litter, Sw — sweeping, t — average daily temperature, °C (according to the data of the loggers installed in the litter), «–» — no data.

Sample Collection

Spiders were collected from July 6 to July 22, 2020. The main collection methods were pitfall traps and sifting. In addition to these, material was collected by hand and by sweeping. Information on the collection sites and methods is given in Table 1. The pitfall traps were made out of 200 ml plastic cups, 100 mm high with an opening of 65 mm in diameter, filled in by one third with water. The traps were surveyed every two to four days. The material was sorted in the field and fixed in 98% ethanol; then it was transported to the laboratory and identified under a stereomicroscope. The total material accounted for 1612 trap-days; a total of 1910 spider specimens were collected, of which 1198 (62.7%) adult specimens were identified to the species level.

Data Analysis

I evaluated the local species richness in PAST Version 4.04 with the non-parametric species richness estimator Chao2 ± SD [Colwell, Coddington, 1994; Hammer et al., 2001]. Juveniles were not used in the calculations, unless otherwise noted.

Faunal similarity between regions was estimated using the Kulczynski index (K) for qualitative data (presence/absence). The resemblance matrix was visualized using the UPGMA algorithm.

The significance of differences between the number of species collected by different methods was assessed using t-test. Similarity percentage analysis (SIMPER; also performed in PAST 4.04) was used to identify the individual contribution of species to dissimilarities between the two sample sets collected by different methods. In these cases, I used data from biotopes where both methods were used.

“Dominant species” hereafter refers to the species, proportion of which is equal to or greater than 4% of the total number of collected specimens (subdominants and higher on the scale of Engelmann [1978]).

Published Data Sources

To assess the degree of faunal similarity of different parts of Yamal with the adjacent territories, I compiled lists of species using data from this study and published data on spider faunas of the northeastern Europe (for Kanin Peninsula, the list includes 75 species; Kolguev Isl., Barents Sea, 25 species; Novaya Zemlya and Vaygach Isl., respectively 25 and 22 species; Dolgiy Isl., Barents Sea, 51 species; Yugorsky Peninsula, 55 species; vicinity of the city of Vorkuta, Komi Republic, 123 species) and Siberia (Northern and Southern Yamal, respectively 36 and 165 species; Shokal-
Hypselistes jacksoni (O. Pickard-Cambridge, 1903), Oreoneta uralensis, Mecynargus paetulus, cola lapponicus, tasetiger, Agyneta allosubtilis.

Data on the distribution of individual species were obtained from the sources listed above. For some species, the borders of the distribution ranges were revised based on the latest taxonomic and faunistic studies, data on which were obtained from World Spider Catalog [2021] and Bibliography on spiders of Russia and post-USSR republics [Mikhailov, 2012, 2019]. Accepted abbreviations

- $F_r$ — index of relative biotopic preferences;
- $K$ — Kulczynski index;
- SIMPER — Similarity percentage analysis.

The nomenclature follows World Spider Catalog [2021]. All materials used in the present study are temporarily stored in my personal collection and to be deposited in the Zoological Museum of the Moscow State University, Russia.

Results

Spider Fauna Local to the Vicinity of Seyyakha Village

I identified a total of 47 species (two of which could not be reliably identified to species level) belonging to seven families (Table 2). The expected number for the region is 55±7 species. Linyphiidae was the predominant group on the basis of species richness (85.1%, 40 species). Lycosidae and Thomisidae were represented by a single species each. Five families (Tetragnathidae, Gnaphosidae, Araneidae, and Theridiidae) were represented by a single species each. Five species (Agyneta decora, A. ripariensis, Masikia caliginosa, Metopobactrus prominulus, and Walckenaeria clavicornis) have not been previously recorded for the fauna of Yamal. It should be noted that the records from the vicinity of Seyyakha come from one of the northernmost parts of distribution range for three species (A. decora, A. ripariensis, and M. prominulus).

Species Composition of Yamal

In addition to the species collected during this study, 14 more species were previously recorded in the Central Yamal (Alapecosa hirtipes (Kulczyński, 1907), Agyneta allosubtilis Loksa, 1965, A. brusnevi (Kulczyński, 1908), A. nigripes (Simon, 1884), Bathypantes setiger F. O. Pickard-Cambridge, 1894, Erigone remota L. Koch, 1869, E. tirolesis L. Koch, 1872, Hypselistes jacksoni (O. Pickard-Cambridge, 1903), Mecynargus paetulus (O. Pickard-Cambridge, 1875), Oreoneta uralensis Saaristo et Marusik, 2004, Oreoneta sp., Praestigia groenlandica Holm, 1967, Semilikiola lapponicola (Holm, 1939), and Styloceteter lehtine.
Table 2. Spiders collected in the Central Yamal near Seyakha village and their abundance in the surveyed biotopes.

Таблица 2. Пауки, собранные на Среднем Ямале в окр. пос. Сеяха, и их обилие в обследованных биотопах.

| Species \ Habitat number | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 |
|--------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| *Fam. Linyphiidae*       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Agyneta decora (O. Pickard-Cambridge, 1871) | 5  | 3  |10  | 7  | 8  | 2  | 1  |    |    |    |    |    |    |    |3  |
| Agyneta ripariensis Tanasevitch, 1984  |    | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Arcterigone pilifrons (L. Koch, 1879)  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Bathypantes gracilis (Blackwall, 1841) |    |    |    |    |    | 2  | 2  |    |    |    |    |    |    |    |    |
| Bathypantes humilis (L. Koch, 1879)    | 3  | 1  | 1  | 7  |11  | 1  | 4  | 1  | 2  | 2  |    |    |    |    |    |
| Collinsia holmgreni Thorell, 1871      | 46 |118 | 2  | 7  | 1  | 5  | 1  | 3  |    |    |    |    |    |    |    |
| Collinsia spetsbergensis (Thorell, 1871) |    |    |    |    | 1  |    |    |    |    |    |    |    |    |    |    |
| Dactylopistes video (Chamberlin et Ivie, 1947) * |    |    |    |    | 1  |    |    |    |    |    |    |    |    |    |    |
| Diplocephaulus barbiger (Roewer, 1955)  | 6  | 2  |    | 1  | 5  | 2  |    |    |    |    |    |    |    |    |    |
| Erigone arctica palaearctica Brøndegaard, 1934 | 2  |    |    | 1  |12  | 3  |    |    |    |    |    |    |    |    |    |
| Erigone longipalpis (Sundevall, 1830)  | 4  |    |    | 2  |    |    |    |    |    |    |    |    |    |    |    |
| Erigone psychrophila Thorell, 1871      | 1  |    |    | 1  |    |    |    |    |    |    |    |    |    |    |    |
| Erigone whymperi O. Pickard-Cambridge, 1877 |    |    |    |    | 1  |    |    |    |    |    |    |    |    |    |    |
| Gibothorax tchernovi Eskov, 1989        | 1  | 1  |15  | 1  |17  | 12 | 30 | 1  |    |    |    |    |    |    |    |
| Hilaira glacialis (Thorell, 1871)      | 4  | 27 |12  | 1  | 7  | 7  | 2  |    |    |    |    |    |    |    |    |
| Hilaira incondita (L. Koch, 1879)      | 2  |    |    |    | 3  | 10 | 7  | 3  |    |    |    |    |    |    |    |
| Hilaira nubigena Hull, 1911 *          | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Hilaira proletaria (L. Koch, 1879)     | 1  | 17 | 1  | 1  | 1  | 2  |    |    |    |    |    |    |    |    |    |
| Masikia caliginosa Millidge, 1984      | 11 |104 | 1  |    |    |    |    |    |    |    |    |    |    |    |    |

Note: Habitat number corresponds to that in Table 1. Species marked with an asterisk (*) were represented by females only.
| Species \ Habitat number | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 |
|--------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| **Fam. Linyphiidae**     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| *Masikia indistincta* (Kulczyński, 1908) | 23 | 4  | 32 | 1  | 3  | 1  | 1  | 5  | 29 |    |    |    |    |    |    |
| *Mecynargus tundricola* Eskov, 1988 | 2  | 8  | 28 | 4  |    |    |    |    |    |    |    |    |    |    |    |
| *Metopobactrus prominulus* (O. Pickard-Cambridge, 1873) | 5  | 3  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |
| *Mughiphantes sobrius* (Thorell, 1871) * | 1  | 1  | 3  | 3  |    |    |    |    |    |    |    |    |    |    |    |
| *Oreoneta ?leviceps* (L. Koch, 1879) * | 1  |    | 1  |    |    |    | 1  |    | 1  |    |    |    |    |    |    |
| *Paraglyphesis polaris* Eskov, 1991 * | 1  | 1  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |
| *Pelecopsis mengei* (Simon, 1884) | 1  |    | 4  | 3  | 2  | 3  | 5  | 1  |    |    |    |    |    |    |    |
| *Pelecopsis parallela* (Wider, 1834) | 1  |    |    |    | 1  |    |    |    |    |    |    |    |    |    |    |
| *Pseudocyba miracula* Tanasevitch, 1984 | 1  |    | 1  |    |    |    |    |    |    |    |    |    |    |    |    |
| *Semićicola alticola* (Holm, 1950) | 1  | 21 | 1  | 3  | 36 | 3  | 2  | 20 | 6  |    |    |    |    |    |    |
| *Semićicola arcticus* (Eskov, 1899) | 1  | 1  | 7  | 1  |    |    |    |    |    |    |    |    |    |    |    |
| *Semićicola barbiger* (L. Koch, 1879) | 2  | 3  | 29 | 4  | 2  | 5  | 2  |    |    |    |    |    |    |    |    |
| *Semićicola simplex* (Kulczyński, 1908) | 2  | 2  | 17 | 2  |    |    |    |    |    |    |    |    |    |    |    |
| *Silometaoides spagnicola* Eskov et Marusik, 1992 | 3  | 4  | 1  |    | 1  | 2  |    |    |    |    |    |    |    |    |    |
| *Tarsiphantes latithorax* Strand, 1905 | 43 | 6  |    |    |    |    |    |    |    |    |    |    |    |    |    |
| *Tmeticus nigriceps* (Kulczyński, 1916) | 2  |    |    | 1  | 4  |    |    |    |    |    |    |    |    |    |    |
| *Tubercithorax subarcticus* (Tanasevitch, 1984) | 9  | 9  | 4  | 1  |    |    |    |    |    |    |    |    |    |    |    |
| *Wabasso hilairoides* Eskov, 1988 * | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| *Walckenaeria clavicornis* (Emerton, 1882) | 1  | 9  |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Linyphiidae gen. sp. 1 * | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Linyphiidae gen. sp. 2 * | 1  |    |    |    | 1  | 1  | 1  | 1  |    |    |    |    |    |    |    |
Table 2 (continued).
Таблица 2 (продолжение).

| Species \ Habitat number | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Fam. Lycosidae           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Alopecosa mutabilis* (Kulczyński, 1908) | 3   | 2   |     |     |     | 1   |     |     |     | 5   |     |     |     |     |     |
| *Pardosa septentrionalis* (Westring, 1861) | 2   | 1   | 1   | 3   | 1   |     |     |     |     |     | 1   |     |     |     |     |
| Fam. Tetragnathidae      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Pachygnatha clercki* Sundevall, 1823 |     |     |     |     |     |     | 3   | 2   | 4   | 7   | 8   | 11  | 7   | 9   | 2   | 3   | 2   | 5   | 2   |
| Fam. Thomisidae          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Ozyptila arctica* Kulczyński, 1908 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Psammitis albidus* (Grese, 1909) * |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Fam. Gnaphosidae         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Micaria constricta* Emerton, 1894 |     |     |     |     |     |     | 3   | 4   |     |     |     |     |     |     |     |     |     |     |
| Fam. Araneidae           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| *Larinioides cornutus* (Clerck, 1757) * |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Fam. Theridiidae         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Theridiidae gen.sp.      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Total adult              | 17  | 118 | 145 | 166 | 110 | 91  | 81  | 48  | 32  | 11  | 14  | 52  | 139 | 134 | 40  |     |     |     |     |
| Total species            | 4   | 11  | 10  | 20  | 14  | 20  | 14  | 12  | 10  | 6   | 4   | 14  | 9   | 21  | 15  |     |     |     |     |
Fig. 3. The effectiveness of estimation of the species richness of spiders using pitfall traps (PT) and sifter (Sif): (a) box plot and (b) the number of species collected in separate habitats (numbers of biotopes on the abscissa axis as in Table 1).

Fig. 4. The individual contribution of species to dissimilarities between the two sample sets collected by pitfall traps (PT) and sifter (Sif): (a) relative species contribution to differences between samples (SIMPER). Only species that contribution >3% are depicted; (b) number of individual species collected by different methods.

Pitfall Traps vs Sifting: Spider Diversity and Composition of Dominant Species

The pitfall traps captured a total of 35 species (Chao2 = 44±5), 12 of which were collected exclusively by that method. The material collected by sifter contained 31 species in total (Chao2 = 39±6), eight of which were collected exclusively by this method. The number of species collected by pitfall traps in a given habitat varied from three to seventeen, and the number of species collected using a sifter varied from one to fourteen (Fig. 3). In general, a greater number of species were caught by pitfall traps in each of the studied habitats (Fig. 3, b) (see Supplementary Materials).

There were no significant differences between the numbers of species collected using different methods (t = 1.01, p = 0.31). It should be noted, however, that the dataset of samples collected using pitfall traps is more balanced and has lower variance (Fig. 3, a).

In total, 23 out of 43 collected species were caught by both methods; SIMPER indicated that 11 of these 23 species contributed the most to the difference between two sample sets obtained by different methods (Fig. 4, a). Altogether these species determine 75.7% of the differences. All of them were collected by both traps and sifting. However, the composition of the dominant species differs for both collecting methods (the only exception is *Masikia indistincta*) (Fig. 4, b). For example, in the pitfall traps, such species as *Collinsia*...
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Fig. 5. The relative biotopic preferences of the dominant species of spiders collected by pitfall traps in the vicinity of Seya ha village. The abscissa shows the values of the $F_{ij}$ index, and the ordinate shows the biotope numbers, as in Table 1. Abbreviations: A dec — Agyneta decora; C hol — Collinsia holmgreni; G tch — Gibothorax tchernovi; M ind — Masikia indistincta; P cle — Pachygnatha clercki; S sim — Semljicola simplex.

Discussion

General Commentary on the Fauna

According to the araneogeographic zonation of the Northern Holarctic, Yamal, like the whole of Western Siberia, is a transitional region between the Angarian and European regions [Eskov, 1988]. K. Eskov [1986b, 1988] suggested that species from Siberia have the best conditions to penetrate into Northern Europe due to the influence of zonal factors. New data on the local spider faunas of the northeastern part of the Russian Plain and Yamal Peninsula confirmed this conclusion [Mazura, 2000; Mazura, Esyunin, 2001; Tanasevitch, Koponen, 2007; Esyunin, Laetin, 2009; Tanasevitch, Nekhaeva, 2014; Tanasevitch, Rybalov, 2015; Tanasevitch, Khruleva, 2017; Makarova et al., 2019; Nekhaeva, 2020; et al.]. For example, many Siberian spider species were found in the Northeastern Europe. It has been suggested that during the last glaciation, the distribution ranges of the majority of such species had the highest number of specimens; while in the sifting material, species with the most specimens collected were Semljicola alticola (17%), S. barbarica (13%), Tarsiphantes latithorax (13%), Hilaira glacialis (12%), M. indistincta (12%), Mecynargus tundricola (8%), and Tuberculithorax subarcticus (6%).
Fig. 6. The relative biotopic preferences of the dominant species of spiders collected by sifter in the vicinity of Seyaha village. The abscissa shows the values of the \( F_{ij} \) index, and the ordinate shows the biotope numbers, as in Table 1. Abbreviations: S alt — *Semljicola alticola*; S bar — *Semljicola barbiger*; T lat — *Tarsiphantes latithorax*; M tun — *Mecynargus tundricola*; T sub — *Tubercithorax subarcticus*; H gla — *Hilaira glacialis*.

Fig. 7. The relative biotopic preferences of *Masikia indistincta* collected by sifter in the vicinity of Seyaha village. The abscissa shows the values of the \( F_{ij} \) index, and the ordinate shows the biotope numbers, as in Table 1.

I found no clear biotopic preferences for the populations of the majority of the dominant spider species in the Central Yamal. Only *Tarsiphantes latithorax* and *Mecynargus tundricola* are probably stenotopic. The former species was most abundant in the forb meadow, and the latter, in the peat bog. *Collinsia*

**Methodological Aspect**

Pitfall traps captured species better when either the local fauna of Central Yamal in its entirety or only individual habitats were considered (Fig. 3). The number of species caught only by pitfall traps also exceeded the number of species caught only by the sifter (moreover, in the latter case, all species were represented by single specimens) (see Supplementary Materials). However, I found no significant differences between the number of species collected using pitfall traps and a sifter. At the same time, the nonparametric estimation of species richness as calculated for each method separately is almost the same. It can be preliminarily concluded that both methods are effective for pioneer studies of the spider fauna at high latitudes (at least in subzone D, Fig. 1).

The difference in the composition of dominant species is obviously due to the collection of specimens from the populations of different microhabitats. It is known that the inhabitants of the litter are less diverse, but more specific than the surface-dwelling species [Huhta, 1971]. Thus, the dominant species from the sifting material were comprised mostly of small (except for *Hilaira glacialis*) linyphiids inhabiting moss and litter. It is important to note that all dominants were present in the materials collected using both methods. Therefore, it is necessary to consider the collection method in ecological studies: in particular, when studying the structure of communities or assessing the biotopic distribution of individual species both at the community level and across the entire range.

**Features of the Biotopic Distribution of Dominants**

I found no clear biotopic preferences for the populations of the majority of the dominant spider species in the Central Yamal. Only *Tarsiphantes latithorax* and *Mecynargus tundricola* are probably stenotopic. The former species was most abundant in the forb meadow, and the latter, in the peat bog. *Collinsia*
holmgreni appears to prefer the snow patch, where the majority of its specimens were collected. The increased number of C. holmgreni individuals in the forb meadow is probably an artifact caused by the proximity of these biotopes. For other species, I can note selectivity in regards to the type of inhabited biotopes (for example, on the basis of the degree of moisture or the presence of a pronounced moss cover). For example, Gibothorax tchernovi prefers coastal waterlogged habitats; Agyneta decora, Semilicula simplex, S. barbiger, Hilaira glacialis, and Masikia indistincta inhabited mainly boggy habitats with pronounced moss cover; Tubercithorax subarcicus prefers the Dryas tundra and zoogenic meadow; S. alticolola prefers willow thickets. Pachygnatha clercki appears to be eurytopic.

The ability of spiders to inhabit a wide range of habitats was also noted for the spiders of Europe [Duffey, 2005], Siberia [Eskov, 1981; 1986a, b], and when comparing the topological distribution of spiders in various Arctic regions of Eurasia [Khruleva et al., 2018]. At the same time, K. Eskov [1981] emphasizes that, despite a wide biotopic plasticity for most species, a preference for a certain type of biotopes where spiders reach the greatest abundance could be noted. This observation is consistent not only with my data on the spiders of Central Yamal, but also the data on the spider populations on the spit in Kolyuchin Bay (Chukotka), where most of the species are confined to wet areas [Khruleva et al., 2018]. In other parts of the distribution range in the Eurasion sector of the Arctic, the same species prefer similar habitats [Khruleva et al., 2018]. For example, G. tchernovi and Masikia caliginosa inhabited mainly coastal waterlogged habitats in the surveyed areas of the northern Palearctic [Tanasevitch, Nekhaeva, 2016; Tanasevitch, Khruleva, 2017; Nekhaeva, 2018; Nekhaeva et al., 2019].

Obviously, high biotopic plasticity is one of the factors determining the success of spiders at high latitudes [Duffey, 2012]. For example, it has been established that the confinement of individual species even to the largest landscape units (for example, taiga or floodplain) in Southern Yamal is lower than in Mirnyoe (the middle course of the Yenisei River) [Eskov, 1981, 1986b]. Differences in biotopic preferences (extreme in some cases) in different parts of the distribution range, as known for European [Duffey, 2005] and Siberian spiders [Eskov, 1981, 1986b], seem to be expressed weakly at high latitudes. In the Arctic, the influence of physical factors increases as the conditions become more extreme [Chernov, 1989]. These factors can in turn determine the selectivity of species for certain types of inhabited communities.

Supplementary data. The following materials are available online (in one file).

Table S1. List of spider species found in different parts of Yamal.

Table S2. Spider collection effectiveness with pitfall traps (PT) and sifter (Sif).

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References

CAVM Team. 2003. Circumpolar Arctic Vegetation Map. (1:7,500,000 scale), Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska. ISBN: 0-9767525-0-6, ISBN-13: 978-0-9767525-0-9

Chernov Yu.I. 1989. [Thermal conditions and Arctic biota] // Ecologiya. No.2. P.49–57 [in Russian].

Colwell R.K., Coddington J.A. 1994. Estimating terrestrial biodiversity through extrapolation // Philosophical Transactions of the Royal Society (Series B). Vol. 345. P.101–118.

Coulson S.J., Convey P., Akara K., Aarik L., A’vila-Jimenez M.L., Babenko A., Biersma E.M., Boström S., Brittain J.E., Carlsson A.M., Christoffersen K., De Smet W.H., Ektem E., Fjellberg A., Füreder L., Gustafsson D., Gwiazdowicz D.J., Hansen L.O., Holmstrup M., Hulé M., Kaczmarek L., Kolicka M., Kuklin V., Lakka H.-K., Lebedeva N., Makarova O., Maruldo K., Melekhina E., Ødegaard F., Pilskog H.E., Simon J.C., Solfhey T., Solli G., Stur E., Tanasevitch A., Taskaeva A., Velle G., Zawierucha K., Zmudeyziiska-Skarbek K. 2014. The terrestrial and freshwater invertebrate biodiversity of the archipelagoes of the Barents Sea; Svalbard, Franz Josef Land and Novaya Zemlya // Soil Biology & Biochemistry. Vol.68. P.440–470.

Duffey E. 2005. Regional variation of habitat tolerance by some European spiders (Araneae) – a review // Arachnologische Mitteilungen. Bd.29. P.25–34.

Duffey E. 2012. Spider populations and their response to different habitat types // Bulletin of the British Arachnological Society. Vol.15. Pt.7. P.213–222.

Engelmann H.D. 1978. Zur Dominanzenklassifizierung von Bodenarthropoden // Pedobiologia. Bd.18. S.378–380.

Ekov K.Yu. 1981a. Analysis of spatial distribution of spiders in the Enisei taiga] // Zoologicheskii zhurnal. Vol.60. No.3. P.353–362 [in Russian with English summary].

Ekov K.Yu. 1986a. [Fauna of spiders (Aranei Linyphiidae) // Pedobiologia. Vol.15. Pt.7. P.213–222.

Engelmann H.D. 1978. Zur Dominanzklassifizierung von Bodenarthropoden // Pedobiologia. Bd.18. S.378–380.

Ekov K.Yu. 1981a. [Analysis of spatial distribution of spiders in the Enisei taiga] // Zoologicheskii zhurnal. Vol.60. No.3. P.353–362 [in Russian with English summary].

Ekov K.Yu. 1986a. [Fauna of spiders (Aranei Linyphiidae) // Pedobiologia. Vol.15. Pt.7. P.213–222.

Ekov K.Yu. 1981b. [Spiders of Northern Siberia (chorological analysis)] Moscow. Abstract of the PhD thesis. 21 p. [In Russian].

Ekov K.Yu. 1988. [Spiders of Central Siberia] // Materialy po faune Srednei Sibiri i prilzhashchikh raionov Mongoli. Moscow: IEMEZh AN SSSR. P.101–155 [in Russian with English summary].

Ekov K.Yu., Marusik Y.M. 1994. New data on the taxonomy and faunistics of North Asian linyphiid spiders (Araneae Linyphiidae) // Arthropoda Selecta. Vol.2 (for 1993). No.4. P.41–79.

Eysynin S.L., Efimkin V.E. 1996. Catalogue of the spiders (Arachnida, Araneae) of the Urals. Ioscow: KMK Scientific Press Ltd. 229 p. [In English and Russian].

Eysynin S.L., Laetin A.M. 2009. More on the spider fauna (Arachnida, Araneae) of the lower reaches of Ob River and South

New data on spiders of the Central Yamal Peninsula
