

**Northern limits of distribution of the spider families (Aranei)
occurring the Boreal Province of the Holarctic Realm.
Families from Amaurobiidae to Corinnidae**

**Северные границы распространения семейств пауков (Aranei),
встречающихся в Бореальной области Голарктического царства.
Семейства от Amaurobiidae до Corinnidae**

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KEY WORDS: Araneae, biogeography, Palaearctic, Nearctic.

КЛЮЧЕВЫЕ СЛОВА: Araneae, биогеография, Палеарктика, Неарктика.

ABSTRACT. A study of the northern distribution limits of ten spider families revealed various patterns within the Boreal Province of the Holarctic Realm. It was shown that the families Amaurobiidae, Araneidae, Argynonetidae, and Clubionidae penetrate into the tundra zone, with Araneidae having the most uniform northern boundary across the entire Holarctic. It was determined that a number of families have similar northern limits in Eurasia and western North America, but are shifted further south in eastern North America. The family Cheiracanthiidae reaches 65°N in Yakutia, while in other regions it is limited to 50–62°N. It was demonstrated that Agelenidae extends further north in North America than in Eurasia. It was established that the northern boundaries of Araneidae and Argynonetidae are formed by several genera. It was concluded that the families Atypidae, Anyphaenidae, Cicurinidae, and Cheiracanthiidae penetrated into the Boreal Province relatively recently and are confined to its southern and central parts.

How to cite this paper: Marusik Yu.M., Mikhailov K.G. 2025. Northern limits of distribution of the spider families (Aranei) occurring the Boreal Province of the Holarctic Realm. Families from Amaurobiidae to Corinnidae // *Arthropoda Selecta*. Vol.34. No.4. P.611–616. doi: 10.15298/arthsel.34.4.13

РЕЗЮМЕ. Изучение северных границ ареала десяти семейств пауков показало различные паттерны распределения в пределах Бореальной области Голарктики. Показано, что Amaurobiidae, Araneidae, Argynonetidae и Clubionidae проникают в тундровую

зону, причём Araneidae имеет наиболее «ровную» северную границу по всей Голарктике. Определено, что ряд семейств имеет сходные северные пределы в Евразии и западной Северной Америки, но смещены южнее на востоке Северной Америки. Семейство Cheiracanthiidae достигает 65° с.ш. в Якутии, тогда как в других регионах ограничено 50–62° с. ш. Показано, что Agelenidae продвигается севернее в Северной Америке, чем в Евразии. Определено, что северные границы Araneidae и Argynonetidae формируются несколькими родами. Сделан вывод, что Atypidae, Anyphaenidae, Cicurinidae и Cheiracanthiidae проникли в Бореальную область сравнительно недавно и ограничены её южными и центральными районами.

Introduction

Spiders are among the best groups of organisms to serve as indicators in zoogeographical studies. As generalist predators, most spider species are not highly specialized, and their distribution does not depend directly on specific plants (as in herbivorous animals) or hosts (as in parasitic organisms). Instead, their ranges are determined primarily by climatic, microclimatic, and historical factors. Several schemes have been proposed for the biogeographical division of the Northern Hemisphere. Some authors treat the Palaearctic and Nearctic as separate realms [Udvardy, 1975; Olson *et al.*, 2001; Holt *et al.*, 2013], whereas many others regard them as

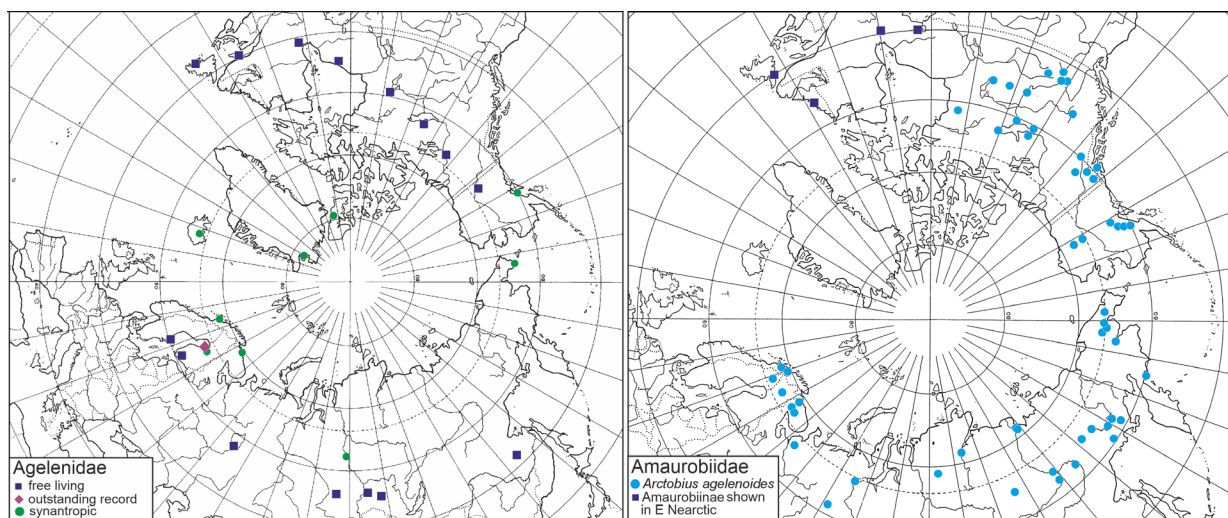


Fig. 1. Northernmost records of spider families Agelenidae and Amaurobiidae.

Рис. 1. Наиболее северные находки пауков семейств Agelenidae и Amaurobiidae.

subunits of a single Holarctic Realm. These classifications, however, do not fully explain the strong faunal similarities across northern regions at the species, genus, and family levels.

A third approach considers the Holarctic as a one realm, without recognizing the Palearctic and Nearctic as distinct biogeographical subunits. In this view, all northern territories are united within a Boreal or Circumboreal sub-realm [Bobrinski *et al.*, 1946; Good, 1947; Bobrinski, 1951; Takhtajan, 1978; Kryzhanovskii, 2002], also referred to as the ‘Region eurosibérienne-boréoaméricaine’ [Braun-Blanquet, 1919: 511] or Canadian–European–Angaran sub-realm [Eskov, 1988]. In this study, we refer to it as the Boreal Province. This province is characterized by a lack of endemic families of spiders, shared set of spider families and numerous genera distributed throughout its extent, with several dozen genera not known outside of it.

In this series of papers, we aim to document the northernmost distribution limits of different spider families occurring within the Boreal Province of the Holarctic Realm. Our goal is to establish baseline data for these limits in a changing world and to analyze regional differences within the Boreal Province.

Material and methods

We accumulated data from different internet resources like GBIF, or catalog of certain countries (Finland) countries check-lists, publications — taxonomic, faunistic, regional revisions like Leech [1972], Chamberlin & Gertsch [1958], The insects and arachnids of Canada [Dondale, Redner, 1982; Dondale *et al.*, 2003], Almquist [2006], check-lists [Marusik *et al.*, 1992, 1993; Paquin *et al.*, 2010], personal card-file of all spider species records in Russia (KM, see also Mikhailov [2024]). Information from GBIF was used with certain reservations.

Family survey

Agelenidae C.L. Koch, 1837

Fig. 1.

It is a globally distributed family, comprising 1,458 extant species in 98 genera [WSC, 2025], and is one of only 13 spider families with over 1,000 species. In Europe, free-living species occur up to about 60°N latitude, including *Agelena labyrinthica* (Clerck, 1758), *Tegenaria ferruginea* (Panzer, 1801), and *Textrix denticulata* (Olivier, 1789). In Siberia, the family’s northern limit is defined by *Pireneitega birulai* (Ermolaev, 1927). In North America, the northernmost occurrence is represented by the genus *Agelenopsis* Giebel, 1869, with the most northerly record being *Agelenopsis utahana* (Chamberlin et Ivie, 1933) near the Arctic Circle in Alaska and the Yukon Territory (GBIF data). The widespread Eurasian species *A. labyrinthica* reaches around 50°N in Siberia. The cosmopolitan and synanthropic *Tegenaria domestica* (Clerck, 1758) has been reported from many northern settlements.

Amaurobiidae Thorell, 1869

Fig. 1.

It is a globally distributed family comprising 208 species in 27 genera [WSC, 2025]. The northern distribution limit of this family in Eurasia and the western half of North America is defined by a single species, *Arctobius agelenoides* (Emerton, 1919), which belongs to a monotypic genus and subfamily. Its distribution was recently mapped by Marusik & Omelko [2025]. This species extends into the tundra zone, with its northernmost record located in northern Yakutia (ca. 71°N) [Marusik *et al.*, 1993]. In the eastern half of North America, the northernmost occurrences of the family belong to several species of *Amaurobius* C.L. Koch, 1837 [Leech, 1972].

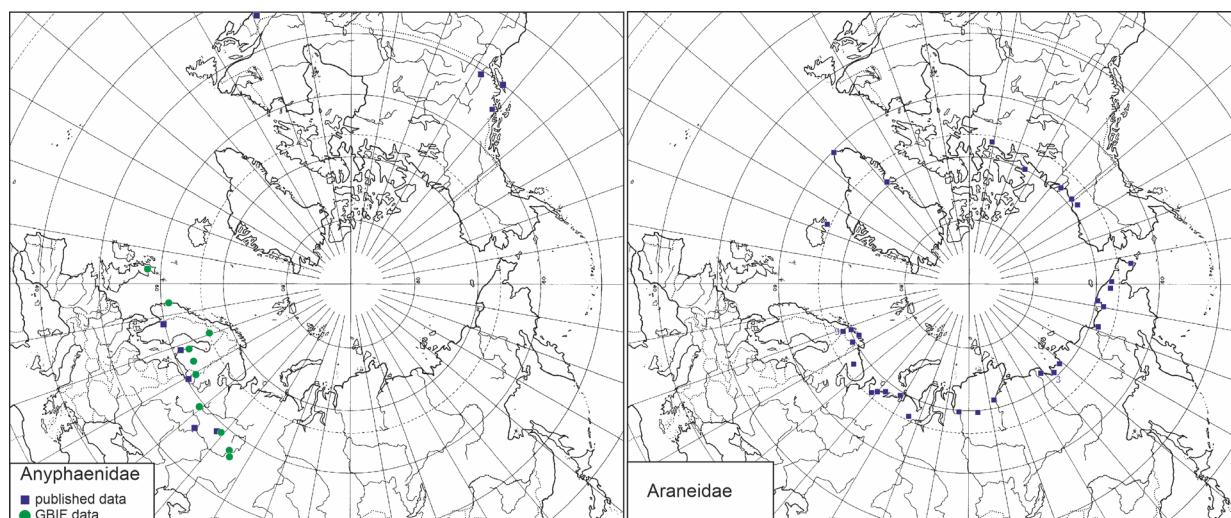


Fig. 2. Northernmost records of spider families Anyphaenidae and Araneidae.

Рис. 2. Наиболее северные находки пауков семейств Anyphaenidae и Araneidae.

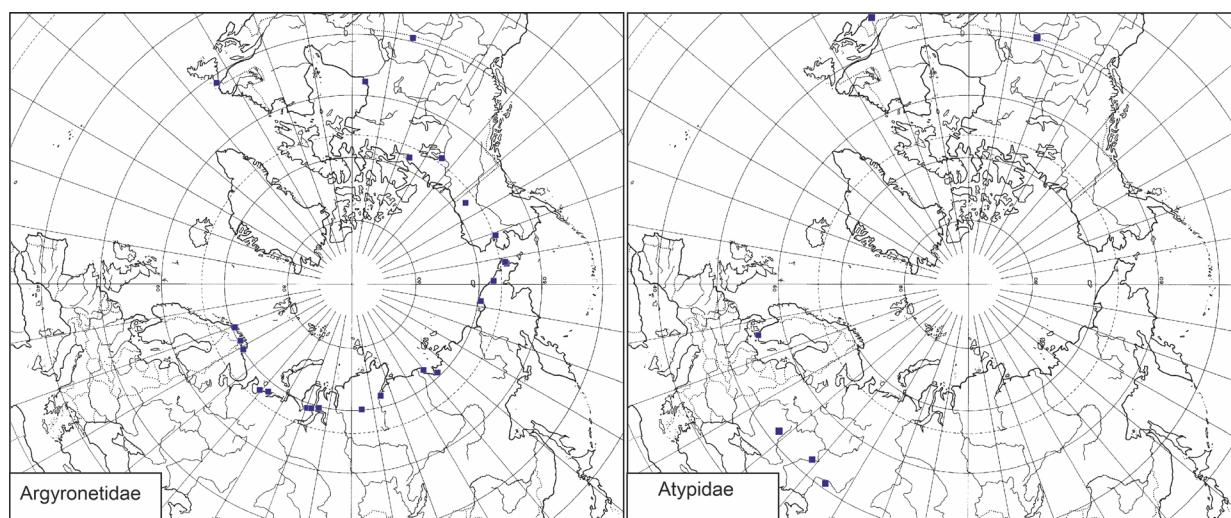


Fig. 3. Northernmost records of spider families Argyronetidae and Atypidae.

Рис. 3. Наиболее северные находки пауков семейств Argyronetidae и Atypidae.

Anyphaenidae Bertkau, 1878

Fig. 2.

This is a relatively large family comprising 654 species in 59 genera [WSC, 2025]. Although globally distributed, the family is poorly represented in Africa and Asia, with only one species reported from India and 18 species, including two endemic genera, known from East Asia [WSC, 2025]. Only one genus, *Anyphaena* Sundevall, 1833, occurs in the Holarctic. It is the largest genus in the family, containing 110 described species. Based on the morphology of the copulatory organs, *Anyphaena* is likely a polyphyletic taxon. The northern distribution limit in Europe is defined by *A. accentuata* (Walckenaer, 1802) (Fig. 2). The family is absent from Siberia. In North America, most records of the genus lie south of 50°N, with the northernmost localities found in western Canada (54.1°N, 129.9°W).

NOTE. GBIF records suggest a broader European distribution for the genus, including localities north of the Arctic Circle in Sweden (67°N, 21.3°E). In contrast, the confirmed northern limit in western Canada lies farther south.

Araneidae Clerck, 1758

Fig. 2.

This is the third largest spider family of the order, comprising 3,159 extant species in 198 genera [WSC, 2025]. In addition, several dozen fossil species and genera have been described. Araneidae has a global distribution and extends into the tundra zone, where it is represented by several genera. In northern Finland, nine species belonging to eight genera have been recorded at latitudes close to 70°N [Koponen *et al.*, 2013]. In Taimyr Peninsula, six species from four genera have been found at 71.5°N

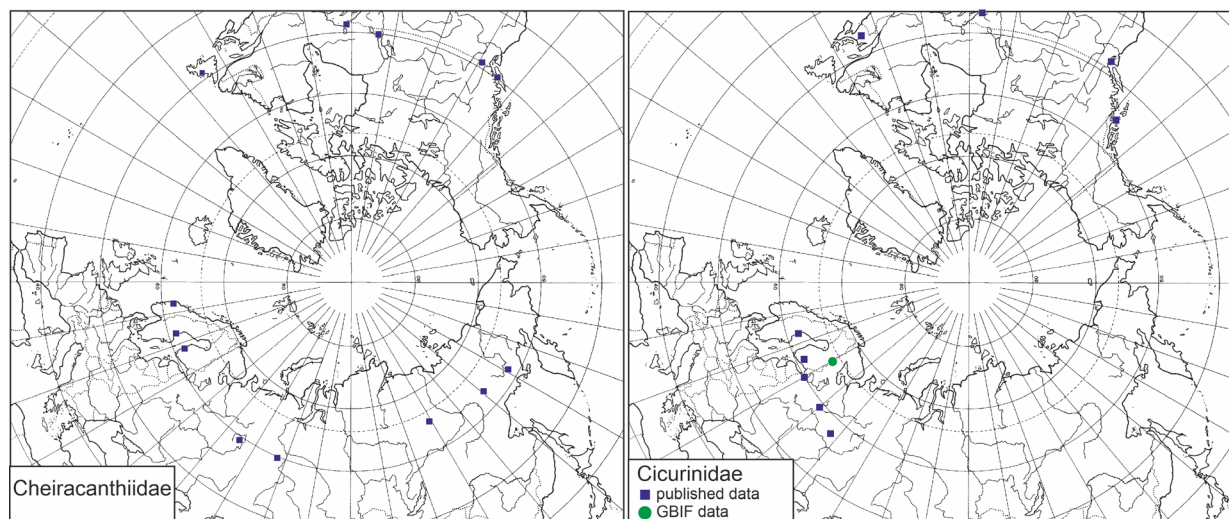


Fig. 4. Northernmost records of spider families Cheiracanthiidae and Cicurinidae.

Рис. 4. Наиболее северные находки пауков семейств Cheiracanthiidae и Cicurinidae.

(personal data). The northern boundary of the family is roughly uniform across the Holarctic. Unlike most other families discussed in this paper (except Argyronetidae), the family's limit in the tundra zone is defined by multiple species across several genera, rather than by a single genus with one or two species.

Argyronetidae Thorell, 1869

Fig. 3.

This is a small, widely distributed family comprising 74 species in 12 genera. It occurs in most major biogeographic realms but is absent from the Neotropical Realm [WSC, 2025]. In the Eurasia, the northern distribution limit is defined by three species representing three genera: *Argyroneta aquatica* (Clerck, 1758), *Arctella lapponica* Holm, 1945, and *Hackmania prominula* (Tullgren, 1948). Both species found up to 70°N near Kevo (not in the map), whereas the former is restricted to Eurasia. The northern boundary of the family lies farther north in Eurasia, and all three species extend into the tundra zone.

Atypidae Thorell, 1870

Fig. 3.

This is a small family of mygalomorph spiders comprising 61 species in three genera [WSC, 2025]. It is the only family of Mygalomorphae occurring in the Boreal Province of Eurasia. In northern Eurasia, it is represented by a single genus, *Atypus* Latreille, 1804, which reaches southern Sweden and the southern Urals (near Orenburg) [Esyunin, Efimik, 1996]. This genus also occurs in the Maritime Province of Russia, south of the Boreal subdivision. In North America, there are five families of the suborder Mygalomorphae, four of which are absent from Eurasia. Atypidae is represented in the American part of the Boreal subdivision by a single species of *Sphodros* Walckenaer, 1835, which has been recorded in southernmost Quebec [Paquin, Duperré, 2003].

Cheiracanthiidae Wagner, 1887

Fig. 4.

This is a relatively small, globally distributed family comprising 385 extant species in 15 genera [WSC, 2025]. Only one genus, *Cheiracanthium* C.L. Koch, 1839, is known from the northern Holarctic. Based on morphological evidence, the genus is not monophyletic. Unlike in most other families, the northernmost records occur farther north in Siberia (approximately 65°N) than in Europe (around 62°N) or North America (south of 50°N).

Cicurinidae F.O. Pickard-Cambridge, 1893

Fig. 4.

This is a small family restricted to the Holarctic Realm and Southeast Asia, with 183 currently known species in four genera [WSC, 2025]. *Cicurina* Menge, 1871 — the most species-rich genus of the family — defines the northernmost limit of its distribution in both hemispheres. In Europe, it reaches approximately 60°N in Finland [Koponen *et al.*, 2013] and 62°N in Sweden [GBIF data]. A GBIF record from Russian Karelia at about 64.5°N is most likely based on a misidentification. In the Nearctic, all northernmost localities lie south of 48°N, except for isolated records from southernmost Alaska (around 56°N). In Asia, the genus is known north to South Korea [GBIF data] and Hokkaido [Shinkai *et al.*, 2024].

Clubionidae Simon, 1878

Fig. 5.

This medium-sized family comprises 878 extant species in 18 genera [WSC, 2025]. It is nearly globally distributed but is largely absent from the Neotropics. It is one of the best studied families in the Holarctic due to several regional revisions [Edwards, 1958; Dondale, Redner, 1982; Mikhailov, 2003]. The family's northernmost records in the Holarctic lie at approximately 70°N, with

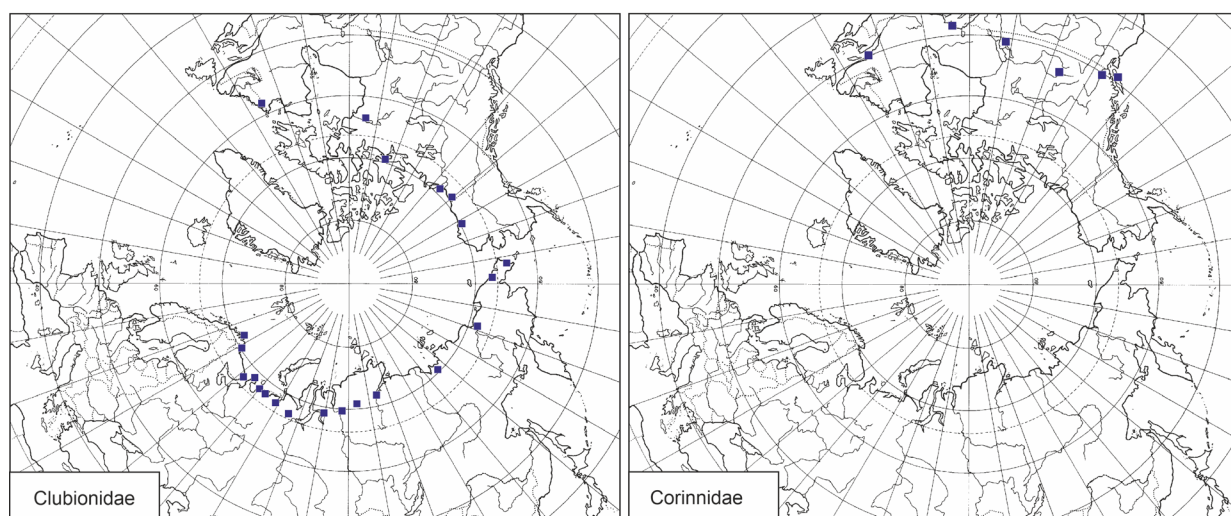


Fig. 5. Northernmost records of spider families Clubionidae and Corinnidae.

Рис. 5. Наиболее северные находки пауков семейств Clubionidae и Corinnidae.

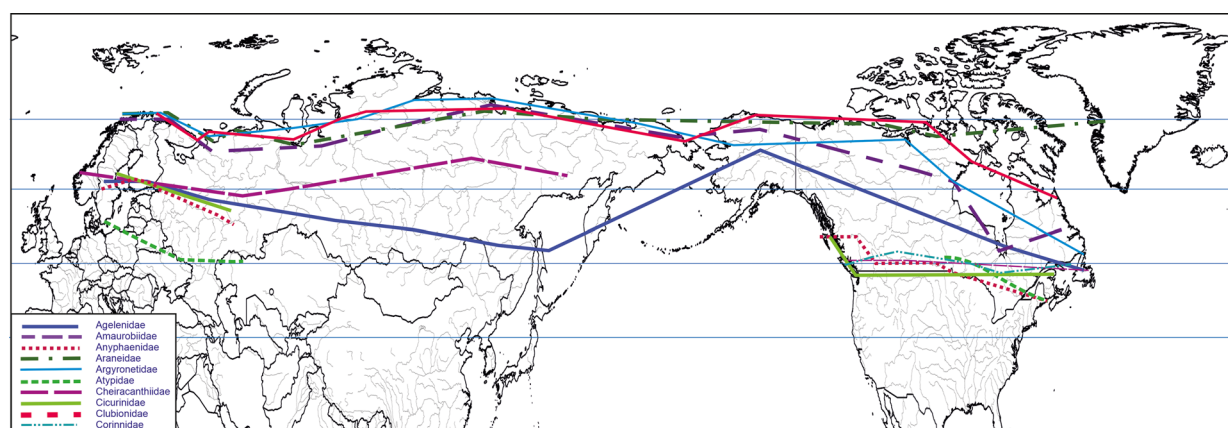


Fig. 6. Northernmost limits of distribution of 10 families.

Рис. 6. Северные границы распространения 10 семейств пауков.

the furthest north being from the Gamvik area in Norway (c. 71°N, GBIF) and the Taimyr Peninsula (72.26°N [Kh-ruleva, Osipov, 2019]). All these northernmost records are from species of the genus *Clubiona*, representing several different species groups.

Corinnidae Karsch, 1880

Fig. 5.

This is a relatively large family comprising 76 genera and 892 currently recognized species [WSC, 2025]. It has a wide global distribution but is notably absent from most of the northern Eurasia, including all of Europe (except the Iberian Peninsula), Kazakhstan, Kyrgyzstan, Tajikistan, the Asian part of Russia, Mongolia, and northern China [WSC, 2025; Nentwig *et al.*, 2025]. In Asia, its northernmost known localities are in Turkmenistan and Uzbekistan, south of 42°N [Mikhailov, Marusik, 2010].

The family is reported in the Boreal subdivision only in North America, with its northernmost record at 53.6°N

in Saskatchewan [GBIF]. In Europe, it is confined to the Iberian Peninsula, reaching its northern parts. The genus *Castianeira* Keyserling, 1879 delimits northern boundary in both the New and Old Worlds.

Discussion

The families examined in this study exhibit different distribution patterns within the Boreal subdivision and differing northern range boundaries (Fig. 6). Four families penetrate the tundra zone: Amaurobiidae, Araneidae, Argyronetidae, and Clubionidae. Among these, only Araneidae has its northernmost records at nearly the same latitude across the Holarctic. Four other families — Amaurobiidae, Argyronetidae, Anyphaenidae, and Clubionidae — share similar northern limits in Eurasia and western North America, but have a more southern distribution in eastern North America.

The family Cheiracanthidae has its northernmost record in Yakutia (ca. 65°N), while its general northern

distribution limit lies further south, reaching a maximum of about 62°N in Eurasia and 50°N in North America.

Two families, Atypidae and Cicurinidae, were found only within the Boreal subdivision in both Europe and North America. In contrast, only one family, Agelenidae, has a more northern distribution in North America than in Eurasia. It reaches 65°N in Canada and Alaska, whereas all Siberian records are south of 60°N, and its northernmost records in Fennoscandia are at approximately 61°N.

In two families, Araneidae (the most species- and genus-rich family among those compared) and Argynnetidae, the northern distribution limit in the Arctic is formed by more than two genera.

Judging from their distribution patterns and global diversity, Atypidae, Anyphaenidae, and Cicurinidae appear to have invaded the Boreal subdivision relatively recently, reaching only as far north as approximately 60–62°N in Europe and extending to the southern boundary of the province in North America. Same is true for Cheiracanthiidae in the New World.

Compliance with ethical standards

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

Ethical approval: No ethical issues were raised during our research.

Acknowledgements. We are grateful to Seppo Koponen (Turku, Finland) and Mikhail M. Omelko (Vladivostok, Russia) for their valuable comments, which have improved our manuscript. The work of K.G. Mikhailov was conducted under the state assignment of the Lomonosov Moscow State University.

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Responsible editor S. Koponen