Memoranda Soc. Fauna Flora Fennica 102: 12–18. 2026
Helsinki 5 March 2026

ISSN 0373-6873 (print)
ISSN 1796-9816 (online)

Long-term persistence and recent introductions of alien and synanthropic spiders (Araneae) in hothouses of the Botanic Garden, University of Turku, Southwest Finland

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Eleven synanthropic spider species, including seven alien ones, are known from the hothouses of the Botanic Garden, University of Turku, located on Ruissalo Island. *Coleosoma floridanum* (Theridiidae), *Howaia mogera* (Nesticidae) and *Triaeris stenaspis* (Oonopidae) represent the northernmost known populations of these species in Europe. *Coleosoma* and *Triaeris* have lived in Ruissalo hothouses at least since the previous samplings in the 1990s, and *Parasteatoda tepidariorum* (Theridiidae) is known to have occurred there as early as the late 1950s. Some alien species, like *Pholcus phalangiodes* (Pholcidae), *Uloborus plumipes* (Uloboridae) and *Howaia mogera* have spread (i.e. been introduced) to Finland rather recently and they have been discovered in Ruissalo greenhouses in the last couple of decades. Conditions for spiders in this human-maintained small ecosystem are discussed.

Introduction

Anthropochorous spiders are a globally interesting and much-studied phenomenon (e.g. Taucare-Ríos et al. 2013, Szinetár et al. 2020, Szinetár & Kovács 2024, Nentwig et al. 2025 a). The numbers of alien species are increasing, and their distribution areas are expanding, due to global trade and transport, see e.g. for spiders Nentwig (2015) and for insects Zhao et al. (2022). A good example is an early report by Hackman (1960), in which he listed exotic tropical spider species that had been imported with banana shipments to Finland since early 1930s, originating from Africa, and Central and South America. Naturally, these did not become established in Finland. Several authors have dealt with anthropochorous spider species in Finland, e.g. Huhta (1972), Terhivuo (1993), Koponen (1997a), Terhivuo (2002), Pajunen et al. (2008), Fritzén (2013), Koponen et al. (2015) and Zamani & Koponen (2025). A special case are the alien species originating from the tropics and living here only in hothouses, i.e. in heated greenhouses (Hackman 1955, Koponen 1990, 1997b). Similar artificial habitats with at least temporary exotic spider populations are aquarium shops (Koponen 2014).

Fig. 1. View from the Neotropical hothouse in the Ruissalo Botanic Garden. Photo: Kari Kaunisto.

We will present here the spider species known in hothouses of the Botanic Garden, University of Turku, Finland. This small-sized, isolated man-made ecosystem has a tropical-subtropical climate and diverse vegetation. In addition, it is a home to many other alien animal species that have been introduced due to human activity.

The study site

The Botanic Garden of the University of Turku is situated on the Ruissalo island in Turku (60°26,01' N, 22° 10,37' E), belonging to the oak forest zone of SW Finland. The island is separated from the mainland only by a very narrow strait.

The Botanic Garden with two greenhouses (total area 760 m^2) was established in 1956, a palm house and an additional greenhouse were built in 1972. A new modern greenhouse-complex, including a laboratory greenhouse for research, was completed to replace old greenhouses in 1998. The total area of greenhouses (including a cafeteria and a seminar room) is ca. 10 000 sq.m. (Degerholm et al. 2016). There are six parts (houses) presenting plants from different areas and climates to the public. About 2 500 plant species grow in these greenhouses. No pesticides are used, the pest control is maintained by biological control organisms.

Material and methods

Spiders were collected and observed in three parts of the greenhouse complex, in the Neotropical (Fig. 1), Paleotropical and Subtropical ("Araucaria") houses.

Studied hothouses	area sq.m	temperature night	day	humidity (min – max)
Neotropical	290	18°	23°	89% – 100% RH
Paleotropical	170	17°	21°	80% – 90% RH
Araucaria	165	12°	18°	85% – 90% RH

We used pitfall traps (2 traps/hothouse), handpicking and visual observation. The sampling time was from 30 April to 19 September 2025. Data from previous greenhouses studied in the 1990s is also included, as well as other earlier observations in the present greenhouses. Collected spider material is deposited in the Zoological Museum, University of Turku (ZMUT). The photographed specimens are from the Ruissalo greenhouses.

Results

Seven alien and four other synanthropic species are known in the Ruissalo hothouses. Some native species were also found. The unpublished older records below are based on the spider database of the Zoological Museum, University of Turku.

Alien species

Ostearius melanopygius (Linyphiidae), origin Australia or New Zealand. It was found for the first time in Ruissalo greenhouses in 2005 (Pajunen et al. 2008), several specimens were collected in 2008 and some in later years, however, not found in the present study.

Howaia mogera (Nesticidae), origin Asia (Fig. 2). The species was found from Ruissalo in 2012, and it lives there in moderate numbers in two studied tropical hothouses. This species is difficult to find due to hiding behaviour and small size, some specimens were caught by pitfall traps during the present study.

Triaeris stenaspis (Oonopidae), origin Africa (Fig. 3). This parthenogenetic tiny spider was found by the author SK in the previous greenhouse in 1996, it is occurring in great numbers on the ground of the Neotropical house, collected by pitfalls both in the earlier (Koponen 1997b) and the present study.

Pholcus phalangioides (Pholcidae), origin Asia. It was found in 2008, and it is now very abundant in all parts of the greenhouse complex.

Coleosoma floridanum (Theridiidae), origin America (Fig. 4). The species was found in 1990 (Koponen 1990), and it is occurring now in all studied three hothouses.

Fig. 2. ***Howaia mogera*** **(Nesticidae) is a ground-living species and was found here in 2012. Photo: Niclas Fritzén.**

Fig. 3. ***Triaeris stenaspis*** **(Oonopidae), a tiny parthenogenetic ground-living species is known in the Neotropical hothouse since 1996. Photo: Kari Kaunisto.**

Fig. 4. ***Coleosoma floridanum*** **(Theridiidae) was observed in Ruissalo hothouses already in 1990. Photo: Kari Kaunisto.**

Parasteatoda tepidariorum (Theridiidae), origin Asia (Fig. 5). This widely distributed cosmopolitan species was recorded in the old greenhouse already in 1959 by Pekka T. Lehtinen, it is very abundant in all parts of the greenhouse complex.

Uloborus plumipes (Uloboridae), origin Africa (Fig. 6). The species that has recently spread to Finland was found in Ruissalo in the 2010s and it is now very abundant in all greenhouses.

Of the alien species, *Coleosoma*, *Parasteatoda*, *Pholcus* and *Uloborus* were found in all three studied hothouses, *Howaia* in the two tropical houses and *Triaeris* only in the Neotropical house.

Ostearius was not observed in the present study. In a recent publication (Zamani & Koponen 2025), both *Coleosoma* and *Triaeris* were estimated to have been lost during the demolition of the old greenhouse, however, the current study shows that both have a permanent population in Ruissalo.

The most visible spiders in all parts of the Ruissalo greenhouse complex are the alien species *Pholcus phalangioides*, *Parasteatoda tepidariorum* and *Uloborus plumipes*, with their nets.

Fig. 5. ***Parasteatoda tepidariorum*** **(Theridiidae) is very abundant in hothouses, it was found here already in the late 1950s. Photo: Kari Kaunisto.**

Fig. 6. ***Uloborus plumipes*** **(Uloboridae) has established in Finland and the Ruissalo Botanic Garden in the early 2000s. Photo: Kari Kaunisto.**

Synanthropic species

Eratigena atrica (Agelenidae), European species, found occasionally in Ruissalo greenhouses. The species is commonly found in buildings in southern and central Finland.

Lepthyphantes leprosus (Linyphiidae), Palaearctic species, a few females found during the present study in the Araucaria house, occurs in southern and central Finland.

Steatoda castanea (Theridiidae), Palaearctic species, found occasionally in Ruissalo greenhouses, an indoor-living species in southern Finland.

Steatoda grossa (Theridiidae), Palaearctic species, found here sparsely in the 1990s (Koponen 1990), some records from buildings in southern Finland.

Eratigena atrica was reported from Finland more than 50 years ago (Huhta 1972), and other three present synanthropic species are known to occur in Finland already in the 19th century.

Discussion

The first scientist to report introduction of alien species may have been Pehr Kalm, Professor of Economics in the old Royal Academy of Turku. He considered origin of plant and animal species which he found during a research journey to North America in 1748–51 (Koponen 2025, Väre et al. 2025). Since Kalm's time, an enormous body of knowledge on alien species has been accumulated. According to the UN's 2023 report, there are

over 37 000 known alien animal and plant species worldwide (www.unep.org/resources/report/invasive-alien-species-report). Information on the alien species in Europe is presented by the European Comission (easin.jrc.ec.europa.eu/easin) encouraging citizen science work regarding invasive alien species. Regarding European spiders, Nentwig (2015) reported 184 alien species introduced to Europe, of which 51 were established.

The Ruissalo hothouses are suitable habitats for alien species of several animal groups. Due to the diverse fauna, prey items of spiders are available both on the ground (e.g. springtails, mites, minute dipterans) and among vegetation (e.g. dipterans, thrips, homopterans, orthopterans, mites, and their predators). On the other hand, probable predators of spiders are the very abundantly occurring Greenhouse camel crickets (*Tachycines asynamorus*), which are both predators and herbivores. In addition, certain present spider species, especially *Pholcus phalangioides*, are known predators of other spiders (Nentwig et al. 2025a), and they might reduce the number of spiders also in Ruissalo hothouses.

The control of plant pests, especially insects, is essential in greenhouse conditions. Different pesticides were common earlier, but during the last couple of decades biological control organisms have been used in Ruissalo. However, occasionally chemical control has been used against ants and some potted plants have been treated with Provanto insecticid sticks.

Several, mainly alien, phytophagous (”pest”) arthropods occur in the Ruissalo greenhouses. These include e.g. aphids, scale insects (mealybugs and soft scales), spider mites, thrips, sciarid flies, stick insects, crickets and butterfly larvae. Control methods applied in the greenhouses comprise manual removal, water spraying, application of pine soap solution (2.5%), glue traps and the use of biological control organisms. The following control animals have been used as ”biopesticide” agents in 2021–25: several species of parasitic wasps, predatory mites, ladybeetles and predatory bugs, a vespiform thrip, a predatory nematode, and larvae of aphid midges, hoverflies and green lacewings. Interestingly, also one of our alien spiders, *Uloborus plumipes*, is known as an effective predator of scale insects, and its use as a biological control agent in greenhouses has been considered (Nentwig et al. 2025). The diverse composition of arthropods, including pests and their control species, provides a rich food source for spiders in this small man-maintained ecosystem.

Neotropical butterflies were introduced to the Botanic Garden for public display, in 2024 and 2025. Approximately 60 pupae were ordered every two weeks. The butterflies hatched in the Neotropical hothouse between May and September. Butterflies continue flying into the late autumn. Mainly nymphalid, including blue morphos, and papilionid genera were introduced. Larvae of some species, especially morphos, proved to be pests in the hothouses.

An important way of spreading of alien and anthropocorous spiders is through plant trade and transport (e.g. Zamani & Koponen 2025). Exchange of plants and seeds between botanical gardens was earlier more common than nowadays. The Ruissalo Garden received in 2021–25 ca. 450 plant specimens from several foreign, mainly European, countries, the majority of these were orchids. Seed exchange is still rather active, with 410 botanical gardens on the exchange list.

Some spider species have reached Finland and the hothouses in Ruissalo during a few recent decades. So, *Howaia mogera*, *Pholcus phalangioides* and *Uloborus plumipes* are newcomers and were not found in the old greenhouses studied in the 1990s (Koponen 1990, 1997b). *Howaia* was found for the first time in Finland, here in Ruissalo, in 2012, *Pholcus* was recorded from Finland in 2002 (Terhivuo 2002) and *Uloborus* in 2000 (Pajunen et al. 2008). These species have totally changed the earlier, by *Parasteatoda tepidariorum* dominated, faunal structure. *Pholcus* and *Uloborus* are nowadays, together with *Parasteatoda*, the most visible spider species in Ruissalo greenhouses.

Three alien species, *Coleosoma floridanum*, *Howaia mogera* and *Triaeris stenaspis* have their northernmost known populations in Europe, probably even worldwide, here in Ruissalo (60°N), the closest European finds are from Denmark (56°N; Nentwig et al. 2025b). The second northernmost occurrences of *Coleosoma* and *Howaia* are reported from West Siberia, in the Botanical Garden of the Perm University (58°N) (Plakkhina & Esyunin 2022).

The alien salticid spider *Hasarius adansoni*, which was reported already 70 years ago from a greenhouse in the Botanic Garden, University of Helsinki (Hackman 1955), has not been found in Ruissalo. During recent years it has been observed also in the Tropic house of the Korkeasaari Zoo, Helsinki, and in the Botanical Garden, University of Oulu, in northern Finland (Karjalainen 2022).

Only native species are subject to endangered assessments. However, the species, which have here their northernmost known European populations (*Coleosoma floridanum*, *Triaeris stenaspis* and *Howaia mogera*) could be compared with real threatened species (cf. Koponen 1999). Hopefully they will survive the renovations coming soon to the greenhouses in Ruissalo.

Eleven synanthropic, including seven alien species, are known from the Ruissalo greenhouse complex. Despite the northern location and isolation, the number of alien species is comparable to the results of studies in Slovakia, Poland and Switzerland, for example. During a ten-year study in greenhouses of the Botanical Garden of the PJ Šafárik University in Košice, Slovakia, five alien spiders were found (Šestáková et al. 2017), and in nine studied hothouses in Swizerland nine alien species among the total 19 spider species were recorded (Hänggi et al. 2021). Nine alien species were recorded also in a palm house in Poznan, Poland (Szymkowiak et al. 2025). A higher number of alien spiders, 12 aliens among the total 20 species, was found in tropical greenhouses at Rotterdam Zoo, the Netherlands (Bloem & Noordijk 2021).

Acknowledgements. We wish to thank the staff of the Botanic Garden for their help and patience during the collecting work, and Niclas R. Fritzén for the photograph of *Howaia mogera*.

References

Bloem, G.J. & Noordijk, J. 2021: Arachnids (Arachnida: Araneae, Mesostigmata, Pseudoscorpiones) from tropical greenhouses at Rotterdam Zoo (the Netherlands), including a pholcid spider new to Europe. – Arachnologische Mitteilungen / Arachnology Letters 61: 36–44. doi: 10.30963/aramit6106

Degerholm, L., Jussila, O., Kasvi, A., Laine, S., Manner, J., Paloheimo, V., Pentinsaari, O., Rainio, R., Stokes, D., Suominen, O. & Valli, A. 2016: Ruissalon kasvitieteellinen puutarha 60 vuotta (The Botanic Garden of Ruissalo 60 years). – 195 p. Ruissalon Kasvitieteellisen Puutarhan Ystävät.

Fritzén, N.R. 2013: The synatropic Oecobius navus (Araneae: Oecobiidae) established indoors in southern Finland. – Memoranda Societatis pro Fauna et Flora Fennica 89: 32–34.

Hackman, W. 1955: Hasarius adansoni Audouin (Araneae, Salticidae) funnen i växthus i Helsingfors. – Memoranda Societatis pro Fauna et Flora Fennica 30: 12.

Hackman, W. 1960: Spindlar inkomna med bananlaster till Finland. – Memoranda Societatis pro Fauna et Flora Fennica 35: 63–66.

Hänggi, A., Bobbitt, I., Kranz-Baltensperger, Y., Bolzern, A. & Gilgado, J.D. 2021: Spiders (Araneae) from Swiss hothouses, with records of four species new for Switzerland. – Arachnologische Mitteilungen / Arachnology Letters 62: 67–74. doi: 10.30963/aramit6207

Huhta, V. 1972: Loxosceles laeta (Nicolet) (Araneae, Loxoscelinae), a venomous spider established in a building in Helsinki, Finland, and notes on some other synanthropic spiders. – Annales Entomologici Fennici 38: 152–156.

Karjalainen, S. 2022: Suomen hyppyhämähäkit (The jumping spiders of Finland). – 272 p. Docendo.

Koponen, S. 1990: A tropical spider, Coleosoma floridanum (Araneae, Theridiidae), found in the Botanical Garden of the University of Turku, Finland. – Memoranda Societatis pro Fauna et Flora Fennica 66: 106–107.

Koponen, S. 1997a: A population of Amaurobius ferox in an apartment near Turku – the first record in Finland (Araneae, Amaurobiidae). – Memoranda Societatis pro. Fauna Flora Fennica 73: 57–58.

Koponen, S. 1997b: Triaeris stenaspis Simon (Araneae, Oonopidae) found in the Botanical Garden of the University of Turku, Finland. – Entomologica Fennica 8: 7.

Koponen, S. 1999: Exotic threatened spiders (Araneae) in greenhouse. – Proceedings of the 24th Nordic Congress of Entomology, Tartu: 75–76.

Koponen, S. 2014: A cosmopolitan spider, Smeringopus pallidus (Blackwall, 1858) (Araneae, Pholcidae), in an aquarium shop in Turku, Finland. – Memoranda Societatis pro Fauna et Flora Fennica 90: 16. journal.fi/msff/article/view/48570/14196

Koponen, S. 2025: Arachnid observations by Pehr Kalm during his journey to North America (1748–51). – Arachnologische Mitteilungen / Arachnology Letters 69: 16–18. doi: 10.30963/aramit6905

Koponen, S., Pajunen, T., Fritzén, N,R. & Österblad, I. 2015: Pholcus phalangioides in Finland (Araneae, Pholcidae). – Memoranda Societatis pro Fauna et Flora Fennica 91: 41–43. journal.fi/msff/article/view/53553/16690

Plakkhina, E.V. & Esyunin, S.L. 2022: New data on introduced spider species (Arachnida: Aranei) from the Urals. – Arthropoda Selecta 31(3): 363–371. doi: 10.15298/arthsel.31.3.13

Nentwig, W. 2015: Introduction, establishment rate, pathways and impact of spiders alien to Europe. – Biological Invasions 17: 2757–2778.

Nentwig, W., Ansorg, J., Cushing, P.E., Kranz-Baltensperger, Y. & Kropf, C. 2025a: House spiders – worldwide. – 223 p. Springer.

Nentwig, W., Blick, T., Bosmans, R., Hänggi, A. & Kropf, C. 2025b: Spiders of Europe. Version 12.2025. Online at www.araneae.nmbe.ch, accessed on 18.12.2025. https://doi.org/10.24436/1

Pajunen, T., Terhivuo, J. & Koponen, S. 2008: Contributions to anthropochorous spiders (Araneae) in Finland. – Memoranda pro Societatis pro Fauna et Flora Fennica 84: 110–116.

Šestáková, A., Suvák, M., Krajčovičová, K., Kaňuchová, A. & Christophoryová, J. 2017: Arachnids from the greenhouses of the Botanical Garden of the PJ Šafárik University in Košice, Slovakia (Arachnida: Araneae, Opiliones, Palpigradi, Pseudoscorpiones). – Arachnologische Mitteilungen / Arachnology Letters 53: 19–28. doi: 10.5431/aramit5304

Szinetár, C. & Kovács, G. 2024: Magyarország épületlakó pókjai (The building-dweller spiders of Hungary). – 183 p. Szombathelyi Arachnológiai Mühely. (in Hungarian)

Szinetár, C., Kovács, G., Urák, I. & Gajdoš, P. 2020: Synanthropic spider fauna of the Carpathian Basin in the last three decades. – Biologia Futura 71: 31–38. doi.org/10.1007/s42977-020-00009-5

Szymkowiak, P., Konecka, E., Rutkowski, T., Pecyna, A. & Szwajkowski, P. 2025: Alien spiders in a palm house with the first report of parthenogenetic Triaeris stenaspis (Araneae: Oonopidae) infected by Wolbachia from new supergroup X. – Scientific Reports 15(1). doi.org/10.1038/s41598-025-93540-1

Taucare-Ríos, A., Brescovit, A.D. & Canals, M. 2013: Synanthropic spiders (Arachnida: Araneae) from Chile. – Revista Ibérica de Aracnología 23: 49–56.

Terhivuo, J. 1993: Novelties to the Finnish spider fauna (Araneae) and notes on species having bitten man. – Memoranda Societatis pro Fauna et Flora Fennica 69: 53–56

Terhivuo, J. 2002: Pholcus phalangioides (Fuesslin) (Araneae, Pholcidae) – a synanthropic spider established indoors in southern Finland. – Memoranda Societatis pro Fauna et Flora Fennica 78: 9–12.

Väre, H., Koponen, S. & Niemelä, P. 2025: Pehr Kalm as a North American natural history source of the 18th century. – Memoranda Societatis pro Fauna et Flora Fennica 101: 42–73. journal.fi/msff/article/view/173100/115652

Zamani, A. & Koponen, S. 2025: First Nordic record of Pandava laminata (Araneae: Titanoecidae), with a synopsis of anthropochorous species of spiders in Finland. – Arachnologische Mitteilungen / Arachnology Letters 69: 5–9. doi: 10.30963/aramit6903

Zhao, Z., Hui, C., Peng, S., Wang, Y., Reddy, G.V.P., Li, Z. & Kleunen, M. van 2022: The global exchange and accumulation of alien insect species. – Authorea, June 2022. doi: 10.22541/au.165607745.53620662/v1