First records of *Coscinida tibialis*, *Dipoenoides emiliae* and *Zodarion aurorae* (Araneae: Theridiidae, Zodariidae) from the Republic of Moldova

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Abstract. Three species, *Coscinida tibialis* Simon, 1895, *Dipoenoides emiliae* (Lecigne, 2023), and *Zodarion aurorae* Weiss, 1982 are newly recorded from the Republic of Moldova. These records contribute to our knowledge of the European spider fauna, especially concerning their distribution and ecological preferences. The record of *C. tibialis* represents the northernmost known occurrence of the species. *Zodarion aurorae* is recorded from two sampling sites within the Chișinău Botanical Garden, representing the third known locality worldwide; the species was previously known only from two localities in Romania. *Dipoenoides emiliae* is recorded from Moldova, representing only the second known locality worldwide, while the Moldovan specimen is the third known male. Their characteristic features, photographs of habitus and genitalia, notes on their phenology, habitat, an overview of the currently known distribution, and information on the dominant species of the studied spider assemblages are provided.

Keywords: artificial ecosystems, botanical garden, faunistics, pitfall traps, spiders

Zusammenfassung. Erstnachweise von *Coscinida tibialis*, *Dipoenoides emiliae* und *Zodarion aurorae* (Araneae: Theridiidae, Zodariidae) für die Republik Moldau. Drei Arten, *Coscinida tibialis* Simon, 1895, *Dipoenoides emiliae* (Lecigne, 2023) und *Zodarion aurorae* Weiss, 1982, werden erstmals für die Republik Moldau nachgewiesen. Diese Nachweise erweitern die Kenntnis der europäischen Spinnenfauna, insbesondere hinsichtlich Verbreitung und ökologischer Ansprüche der Arten. Der Fund von *C. tibialis* ist das nördlichste bekannte Vorkommen der Art. *Z. aurorae* wurde an zwei Untersuchungsflächen im Botanischen Garten Chișinău nachgewiesen. Dies ist der weltweit dritte bekannte Fundort, bisher war die Art nur von zwei Fundorten in Rumänien bekannt. *Dipoenoides emiliae* wird ebenfalls aus Moldau gemeldet, ist damit der zweite bekannte Fundort weltweit und ist das dritte bekannte Männchen. Für die Arten werden charakteristische Merkmale, Fotos von Habitus und Genitalien, Angaben zu Phänologie und Habitat sowie eine Übersicht der derzeit bekannten Verbreitung gegeben. Außerdem werden die dominanten Arten der untersuchten Spinnengemeinschaften genannt.

Currently, the spider fauna of the Republic of Moldova comprises 372 species (Nentwig et al. 2026), based on a recent synthesis of published records, new material and taxonomic inventory (Vasiliev & Mikhailov 2023), together with subsequent faunistic additions (Vasiliev et al. 2025). This number is approximately one-third of that reported from neighbouring Romania and Ukraine (Nentwig et al. 2026), indicating that the Moldovan spider fauna remains insufficiently researched. Earlier studies mainly concerned spider assemblages of agricultural habitats, including crop fields and apple, apricot and walnut orchards (Karpenko & Legotay 1980, Talitsky & Legotay 1982). The records of these three species belonging to the genera *Coscinida*, *Dipoenoides* and *Zodarion* expand our knowledge of both the Moldovan and European spider faunas.

The genus *Coscinida* Simon, 1895 comprises 18 species distributed predominantly in Africa and Asia. The type species, *Coscinida tibialis* Simon, 1895, is known from Africa, southern Europe and western Asia, while records from India and Thailand are considered introductions (Nentwig et al. 2026, World Spider Catalog 2026). *Coscinida tibialis* is a ground-dwelling species inhabiting litter and the underside of stones and occurring in both natural and anthropogenic habitats (Knoflach et al. 2005). It has been recorded from woodland margins adjacent to urban areas in Portugal (Crespo et al. 2010), under hollow bricks in a garden in Cagnes-sur-Mer, France (Oger & Gros 2016), and recently from a pomegranate orchard in Solapur District, India (Manthen & Hippargi 2023).

The genus *Dipoenoides* Chamberlin, 1925 comprises 35 species distributed worldwide (World Spider Catalog 2026). Recent taxonomic revisions of Hadrotarsinae have substantially clarified generic limits within the subfamily: numerous species formerly placed in *Euryopis* Menge, 1868 were transferred to *Emertonella* Bryant, 1945 (Hu et al. 2026), which was subsequently synonymized with *Dipoenoides* due to nomenclatural priority (Hu 2026), resulting in updated combinations for several taxa, including *Dipoenoides emiliae* (Lecigne, 2023). This species was described from the island of Corfu (Greece) based on two male specimens collected on a hotel wall, both lacking the left pedipalp; it remains known only from the type locality, and the female is unknown. According to the original description, it does not closely resemble other European representatives of the genus (Lecigne 2023).

The genus *Zodarion* Walckenaer, 1826 currently comprises 176 species distributed worldwide except Antarctica (World Spider Catalog 2026); 157 of them occur in the Western Palaearctic (Nentwig et al. 2026). *Zodarion aurorae* Weiss, 1982 was described from the Romanian Nature Reserve "Hanu Conachi River Sand Dunes", Galați District. The species was recorded in various sandy habitats, from open dune vegetation to more vegetated depressions with birch stands. In the reserve, the species is a dominant element of the epigeic spider assemblage in open sandy dune habitats and was abundant in pitfall traps from April to October 1977. It shows a relatively

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even distribution among different plant communities and prefers xerothermic conditions. Males are most active in May and June, while immatures reappear in autumn, suggesting overwintering at the subadult stage (Weiss & Marcu 1979). Another specimen of this species was collected in the Danube Delta, Letea, Tulcea District, Romania, on 28. May 1998, by P. J. van Helsdingen. Its description, illustrations and measurements were provided by Bosmans (2009) and Bosmans et al. (2019).

The spider fauna of the Republic of Moldova remains poorly studied despite recent faunistic studies (Vasiliev et al. 2025), and new faunistic data continue to refine our knowledge of its diversity. During recent sampling in the National Chișinău Botanical Garden "Alexandru Ciubotaru" (hereafter Chișinău Botanical Garden), three species previously unrecorded from the country were collected: *Coscinida tibialis* Simon, 1895, *Dipoenoides emiliae* (Lecigne, 2023), and *Zodarion aurorae* Weiss, 1982. Here we report these species as new records for Moldova and provide information on their distribution and diagnostic characters.

Material and methods

Study area and sampling sites. The study was conducted in the Chișinău Botanical Garden, an urban green area in the south-eastern part of Chișinău, Republic of Moldova. Covering 104 ha, the garden comprises a mosaic of planted and semi-natural habitats, including stands of introduced trees, mainly *Robinia pseudoacacia* L. and species of *Pinus*, *Picea* and *Juglans*, as well as patches dominated by native woody species such as *Quercus robur* L., *Quercus petraea* (Matt.) Liebl., *Quercus pubescens* Willd., *Fraxinus excelsior* L. and *Carpinus betulus* L. The garden was designed to represent major vegetation types of the Republic of Moldova and currently includes meadow and steppe-like vegetation, forest patches, and artificial lakes with wetland margins.

Spiders were sampled at eight sites within the Chișinău Botanical Garden, designated by the internal field codes GS1–GS8. The present paper includes material from three of these sites, GS1, GS4 and GS8. These sites are shown in Fig. 1 and described below.

Habitat description. GS1 (46.97203°N, 28.88574°E) was located in an artificial pine plantation. The tree layer, with shading of ca. 60%, was dominated by *Pinus sylvestris* L. with a height of 15–25 m and trunk diameters of 25–40 cm. The shrub layer, reaching up to 2 m in height, included *Amorpha fruticosa* L., *Cerasus tomentosa* (Thunb.) Loisel., *Crataegus monogyna* Jacq., *Euonymus europaeus* L., *Ligustrum vulgare* L., *Rosa canina* L. and *Swida sanguinea* (L.) Opiz, as well as seedlings of *Quercus robur* L., *Cerasus avium* (L.) Moench, *Fraxinus excelsior* L., *Acer platanoides* L., *Acer tataricum* L. and *Juglans regia* L., and sprouts of *Robinia pseudoacacia* L. The grass layer had a projective cover of 50–60% and included species of diverse habitats, including several weed species.

GS4 (46.9708°N, 28.8827°E) was also located in an artificial pine plantation. The tree layer, with shading of ca. 90%, was dominated by *Pinus sylvestris* L. with a height of 20–25 m



Fig. 1: Map and photographs of sampling sites in the Chișinău Botanical Garden. **a.** map showing the locations of GS1, GS4 and GS8; **b.** GS1, artificial pine plantation**; c.** GS4, artificial pine plantation; **d.** GS8, artificial birch plantation

and trunk diameters of 25–40 cm. The shrub layer, reaching up to 2 m in height, included *Amorpha fruticosa* L., *Cerasus tomentosa* (Thunb.) Loisel., *Ligustrum vulgare* L., *Rosa canina* L. and *Swida sanguinea* (L.) Opiz, as well as seedlings of *Tilia* × *europaea* L., *Acer platanoides* L., *Cerasus avium* (L.) Moench and *Quercus robur* L., and sprouts of *Robinia pseudoacacia* L. The grass layer had a projective cover of ca. 5% and, as at the previous site, included various species, many of them ruderal. The trap line was placed in close proximity to *Ligustrum vulgare*.

GS8 (46.9739°N, 28.8857°E) was located in an artificial birch plantation on a slope beyond a path running along the lake. From May to July, the grass layer was regularly mown. The tree layer, with shading of ca. 50%, was dominated by *Betula pendula* Roth with a height of 20–25 m and trunk diameters of 30–40 cm, with an understorey of *Juglans nigra* L. and *Juglans regia* L. reaching up to 15 m in height. The shrub layer, reaching 2–3 m in height, included *Acer platanoides* L., *Amorpha fruticosa* L., seedlings of *Cerasus avium* (L.) Moench and *Swida sanguinea* (L.) Opiz. The grass layer had a projective cover of 90–100% and consisted predominantly of steppe and ruderal species, with small groups of *Phragmites australis* (Cav.) Trin. ex Steud., indicating the close proximity of groundwater. The trap line was surrounded by the following plant species: *Achillea setacea* Waldst. & Kit., *Ballota nigra* L., *Elytrigia repens* (L.) Nevski, *Poa angustifolia* L. and *Viola suavis* M. Bieb.

Spider sampling. Spiders were collected using pitfall traps installed at each sampling site. At each site, five traps were placed at 5 m intervals. Each trap consisted of two plastic cups placed one inside the other and inserted into the soil so that the upper edge was flush with the ground surface. The cups had a volume of 500 ml, a depth of 15 cm and a rim diameter of 9 cm. The inner cup was perforated to allow drainage of rainwater and snowmelt. The traps were filled with a 4% formaldehyde solution and were operated continuously from March 2024 to November 2025, with samples collected at monthly intervals.

Vegetation assessment. Vegetation structure at the sampling sites was assessed based on vascular plant composition. Most vascular plant species were identified in situ, whereas uncertain specimens were collected and determined in the laboratory with the aid of herbarium material and standard identification keys.

Meteorological data. Meteorological data were obtained from the State Hydrometeorological Service of the Republic of Moldova and correspond to the Chișinău station (47.0°N, 28.9°E, 168 m ASL). Observations followed the guidelines of the World Meteorological Organization (WMO No. 8) and the standard instructions for hydrometeorological stations: air temperature and relative humidity were recorded at 2 m above the ground surface, soil surface temperature on bare soil during the warm season and on the snow cover in winter, and precipitation was measured with standard collectors mounted at 2 m.

Mapping. Maps were created in QGIS 3.34.10-Prizren (QGIS Development Team 2024) using the MapTiler QGIS plugin 3.5.2 and MapTiler (MapTiler 2026) Basic and Bright basemaps based on MapTiler Planet v3. Map data © MapTiler © OpenStreetMap contributors, licensed under the Open Database License (ODbL 1.0). Distribution records plotted in Fig. 2 were compiled from published records cited for each species, GBIF occurrence data, and the new material examined in the present study. GBIF data were restricted to preserved specimens. Records without coordinates were not plotted. GBIF records corresponding to localities already reported in the literature were plotted only once.

Morphological examination and imaging. Microscopic images of the general habitus and genitalia were captured using an Olympus SC100 digital camera attached to an Olympus SZX16 stereomicroscope. Image processing was carried out in Olympus Stream Basic 1.9.4 (Olympus Soft Imaging Solutions GmbH). Photographs taken at different focal depths were combined into extended depth-of-field composites using Zerene Stacker 1.04 (Zerene Systems, LLC).

Some photographs were taken with a Canon EOS 5D Mark II digital camera mounted on a Zeiss Axio Zoom V16 stereomicroscope. Image stacks were created manually and merged using AxioVision 40LE, version 4.6.3.0.

The identification of *Dipoenoides emiliae* was confirmed by Dr Lecigne.

Measurements, abbreviations and specimen deposition. All measurements are given in millimeters. The following abbreviations are used in the descriptions: AM, AL, PM and PL for anterior median, anterior lateral, posterior median and posterior lateral eyes, respectively; a for AM–AM, b for AM–AL, c for PM–PM and d for PM–PL.

Specimens are deposited in the Institute of Landscape Ecology, Slovak Academy of Sciences, Branch Nitra, Slovakia.

Results

Theridiidae Sundevall, 1833

Coscinida Simon, 1895

Coscinida tibialis Simon, 1895

Material examined. REPUBLIC OF MOLDOVA: Chișinău, Chișinău Botanical Garden, 1 ♂, 7. Jul.–8. Aug. 2024 (average air temperature 25.8°C, soil temperature 32.1°C, relative humidity 47.5%, total precipitation 55 mm), artificial birch plantation (GS8), 99 m ASL, A. Vasiliev leg.; 1 ♀, 7. Aug.–4. Sep. 2024 (average air temperature 25.4°C, soil temperature 30.9°C, relative humidity 40.6%, total precipitation 6 mm), artificial pine plantation (GS4), 126 m ASL, A. Vasiliev leg. (Fig. 1).

Description. Male. Measurements: prosoma 0.68 long, 0.62 wide; opisthosoma 1.04 long; leg I: femur 0.92, patella 0.29, tibia 0.82, metatarsus 0.61, tarsus 0.52; metatarsus I with five trichobothria; position of first trichobothrium 0.16. Eyes: AM 0.029, AL 0.043, PM 0.055, PL 0.033; a 0.045, b 0.040, c 0.026, d 0.031.

Female. Measurements: prosoma 0.70 long, 0.56 wide; opisthosoma 1.08 long; leg I: femur 0.74, patella 0.18, tibia 0.72, metatarsus 0.62, tarsus 0.46; metatarsus I with five trichobothria; position of first trichobothrium 0.27. Right leg I absent. Eyes: AM 0.035, AL 0.051, PM 0.053, PL 0.045; a 0.018, b 0.033, c 0.023, d 0.019. Photographs of male and female: Fig. 3a–d.

Distribution. Algeria (Simon 1895, Denis 1954, Knoflach et al. 2005), Angola (Miller 1970), Cape Verde (island) (Knoflach et al. 2005), France (Oger & Gros 2016), Georgia (Seropian et al. 2023), India (Manthen & Hippargi 2023), Israel (Levy 1998), Ivory Coast (Knoflach et al. 2005, GBIF.org 2026), Portugal (Crespo et al. 2010), South Africa (GBIF.org

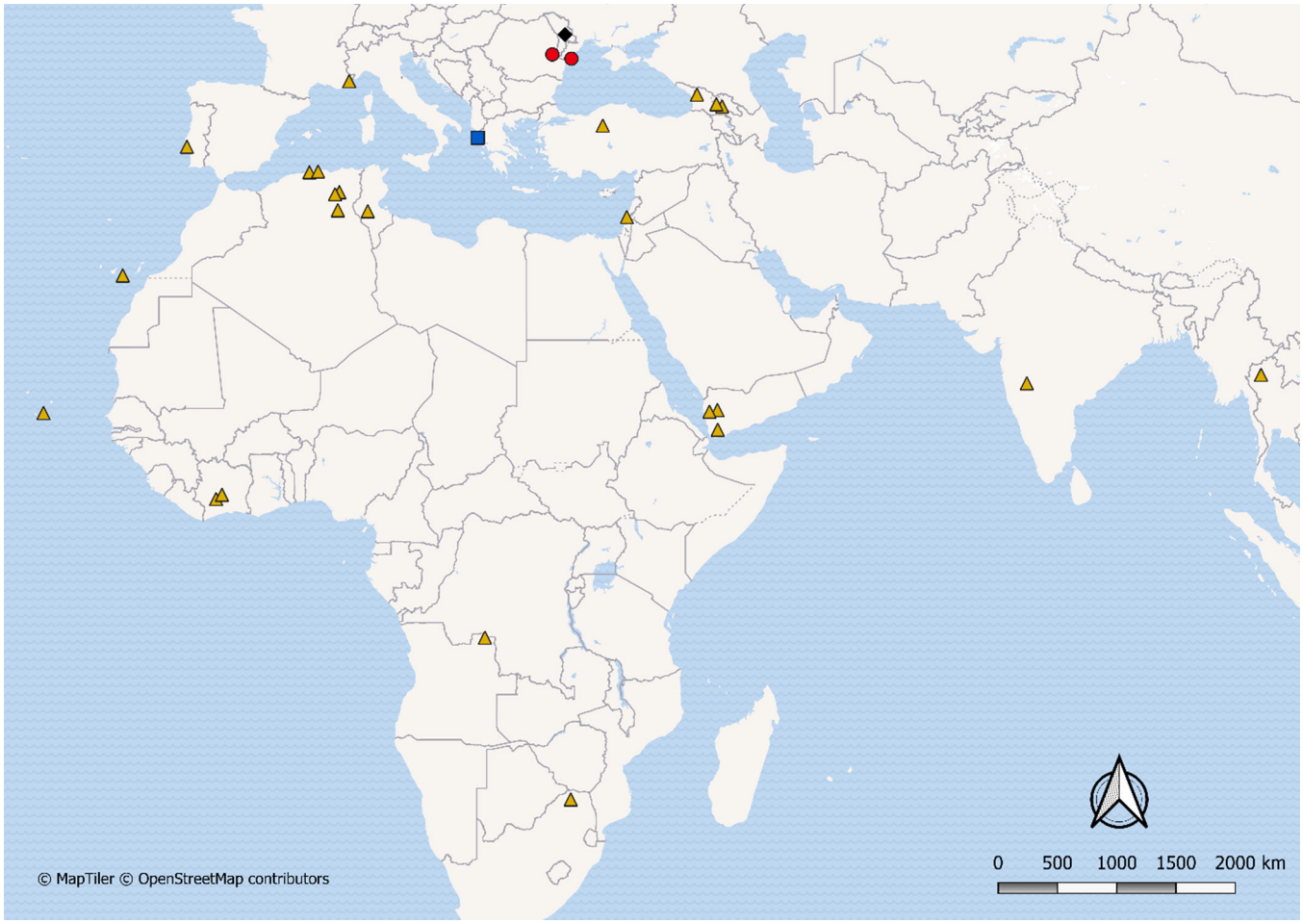

Fig. 2: Distribution of *Coscinida tibialis* (orange triangles), *Dipoenoides emiliae* (blue square), and *Zodarion aurorae* (red circles). Black rhombus indicates Chișinău, the new locality for all three species. Records are based on published data cited for each species and the present material; additional GBIF preserved-specimen records were included for *C. tibialis*

2026), Spain (Gran Canaria) (Knoflach et al. 2005), Thailand (Knoflach et al. 2005), Tunisia (Knoflach et al. 2005), Türkiye (Marusik & Kunt 2010), Yemen (Knoflach et al. 2005), Zimbabwe (GBIF.org 2026) (Fig. 2).

***Dipoenoides* Chamberlin, 1925**
***Dipoenoides emiliae* (Lecigne, 2023)**
Material examined. REPUBLIC OF MOLDOVA: Chișinău, Chișinău Botanical Garden, 1 ♂, 31. May–4. Jul. 2025 (average air temperature 20.9°C, soil temperature 29.1°C, relative humidity 52.9%, total precipitation 12.3 mm), artificial birch plantation (GS8), 99 m ASL, A. Vasiliev leg. (Fig. 1).
Description. Male. Measurements: total length 2.03; prosoma 0.86 long, 0.72 wide; sternum 0.47 long, 0.39 wide. Eyes: PM 0.044, PL 0.032; c 0.102, d 0.094. Legs: tibia I 0.374, metatarsus I 0.352; patella + tibia IV 0.814 (0.945 of prosoma length). Position of trichobothrium (metatarsus I) 0.41.

Left palp absent. Left leg II absent. Right leg IV missing distal segments beyond the femur (Fig. 3e–f).

General colouration agrees with the original description of *Dipoenoides emiliae* by Lecigne (2023), except for the pale spots on the opisthosoma. In the Moldovan specimen, only two distinct pale spots are visible; they are larger and more elongate than those illustrated in the type material.
Distribution. Greece (Corfu) (Lecigne 2023) (Fig. 2).

Zodariidae Thorell, 1881
***Zodarion* Walckenaer, 1826**
***Zodarion aurorae* Weiss, 1982**
Material examined. REPUBLIC OF MOLDOVA: Chișinău, Chișinău Botanical Garden, 1 ♂, 31. May–4. Jul. 2025 (average air temperature 20.9°C, soil temperature 29.1°C, relative humidity 52.9%, total precipitation 12.3 mm), artificial birch plantation (GS8), 99 m ASL, A. Vasiliev leg.; 1 ♂, 29. May–4. Jul. 2025 (average air temperature 20.5°C, soil temperature 28.4°C, relative humidity 54.3%, total precipitation 13.3 mm), artificial pine plantation (GS1), 129 m ASL, A. Vasiliev leg. (Fig. 1).
Description. Male. Measurements: prosoma 1.48 long, 1.01 wide; opisthosoma 1.48 long, 0.98 wide. Leg I 4.87 (femur 1.34, patella 0.38, tibia 1.16, metatarsus 1.27, tarsus 0.72). Eyes: AM 0.109, AL 0.05, PM 0.049, PL 0.048; a 0.064, b 0.044, c 0.178, d 0.08 (Fig. 3g-j).

Prosoma brown, opisthosoma black. Legs predominantly yellow to yellow-brown; femur I black, femora II–III brown, femur IV dark yellow; tibia I yellow with grey inner side, tibiae II–IV dark yellow; metatarsi and tarsi yellow to bright yellow.
Distribution. Romania (Weiss & Marcu 1979, Weiss 1982, Bosmans et al. 2019) (Fig. 2).

Co-occurring species. At GS1, the most abundant co-occurring species were *Pardosa alacris* (C. L. Koch, 1833) (n = 773),

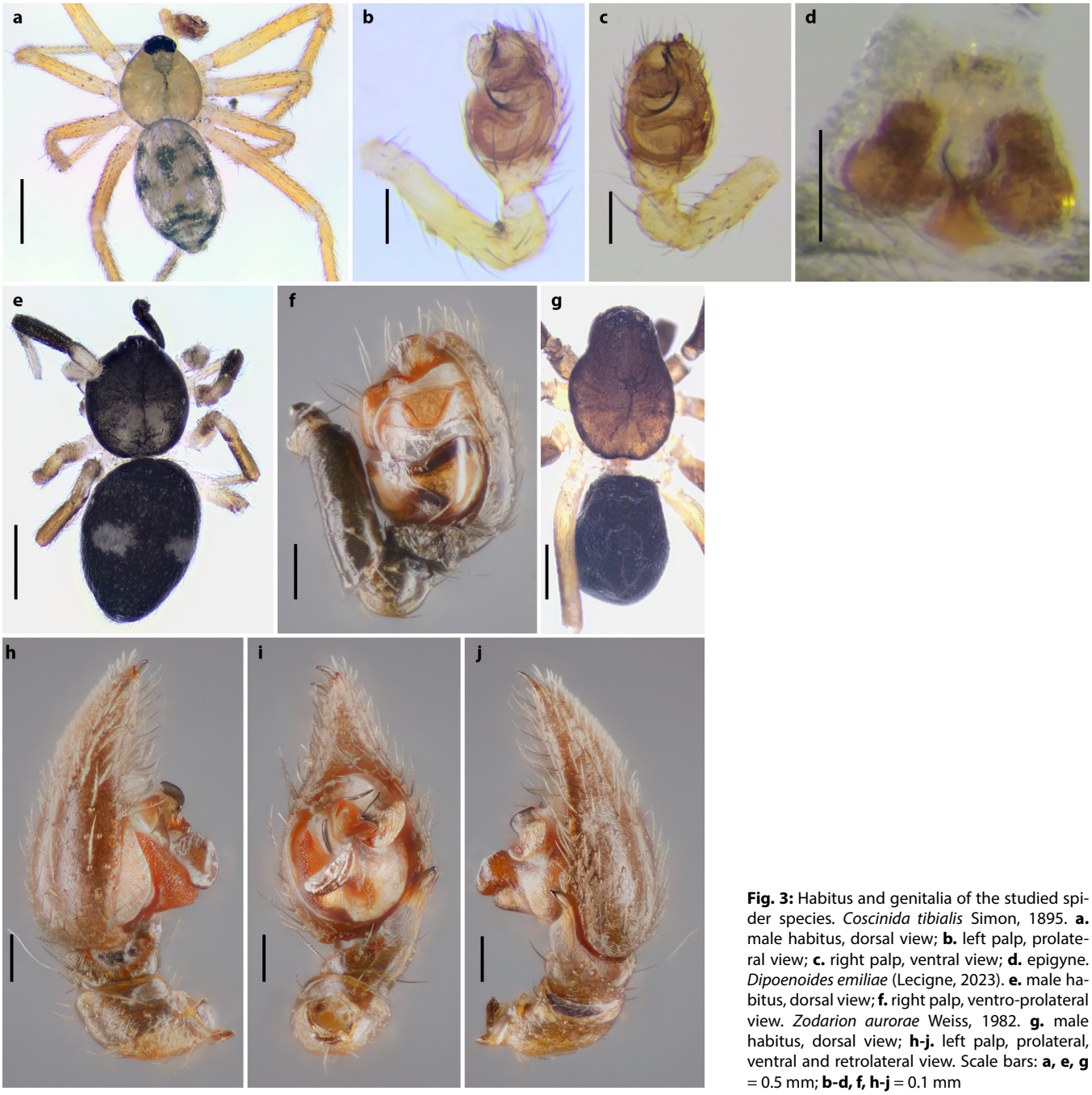

Fig. 3: Habitus and genitalia of the studied spider species. *Coscinida tibialis* Simon, 1895. **a.** male habitus, dorsal view; **b.** left palp, prolateral view; **c.** right palp, ventral view; **d.** epigyne. *Dipoenoides emiliae* (Lecigne, 2023). **e.** male habitus, dorsal view; **f.** right palp, ventro-prolateral view. *Zodarion aurorae* Weiss, 1982. **g.** male habitus, dorsal view; **h-j.** left palp, prolateral, ventral and retrolateral view. Scale bars: **a, e, g** = 0.5 mm; **b-d, f, h-j** = 0.1 mm

Drassyllus villicus (Thorell, 1875) (n = 112), *Harpactea rubicunda* (C. L. Koch, 1838) (n = 75) and *Amaurobius pallidus* L. Koch, 1868 (n = 74). At GS4, the most abundant species were *P. alacris* (n = 646), *A. pallidus* (n = 106), *D. villicus* (n = 81) and *Pardosa lugubris* (Walckenaer, 1802) (n = 54). At GS8, the most abundant species were *P. alacris* (n = 479), *Aulonia albimana* (Walckenaer, 1805) (n = 152), *D. villicus* (n = 71) and *Drassyllus praeficus* (L. Koch, 1866) (n = 65).

Discussion

The present records increase the number of spider species known from the Republic of Moldova from 372 to 375. These three species previously unrecorded from Moldova were collected in artificial plantations within the Chișinău Botanical Garden. Similar faunistically important records from botanical gardens and other urban green areas have been reported from Perm and Kharkiv (Plakkhina et al. 2025, Polchaninova et al. 2025). Studies of botanical garden greenhouses have also documented synanthropic and introduced arachnids, including species new to regional or national faunas (Kielhorn 2008, Šestáková et al. 2017), although all specimens in the present study were collected outdoors. The records of *Coscinida tibialis*, *Dipoenoides emiliae* and *Zodarion aurorae* therefore show that urban green areas such as the Chișinău Botanical Garden can provide faunistically important records of overlooked species, particularly in insufficiently studied regions.

The three species were recorded in outdoor plantations that differed considerably in vegetation structure. GS4 was a strongly shaded pine plantation with sparse herbaceous cover, whereas GS1 had a more developed herb layer, and GS8 was a birch plantation with dense, predominantly steppe and ruderal vegetation. *Coscinida tibialis* occurred at both GS4 and GS8, and *Z. aurorae* at GS1 and GS8, indicating that neither species was restricted to a single vegetation structure within the

garden. Despite these habitat differences, the epigeic spider assemblages showed considerable similarity: *Pardosa alacris* was strongly dominant at all three sites and *Drassyllus villicus* was among the most abundant species at each site. Thus, the three focal species were collected within well-developed outdoor ground-active spider assemblages rather than in isolated indoor or greenhouse environments. The two specimens of *C. tibialis* were recorded during warm summer periods with similar mean air and soil temperatures, whereas relative humidity and especially precipitation differed between the two periods. Both males of *Z. aurorae* were collected from late May to early July, which agrees with the previously reported peak activity of males in May and June in Romania (Weiss & Marcu 1979). Because *D. emiliae* is represented by a single specimen, no climatic or habitat preference can be inferred from the present record.

The three records differ in the plausibility of natural occurrence versus human-mediated introduction. For *Z. aurorae*, a natural occurrence appears most plausible because the species was previously known from neighbouring Romania (Weiss & Marcu 1979, Weiss 1982, Bosmans et al. 2019), and the Moldovan specimens were collected at two different outdoor sites. Their occurrence in late spring and early summer also agrees with the known phenology of males in Romania (Weiss & Marcu 1979). Although the Romanian records are mainly associated with sandy habitats, the two Moldovan sites were non-sandy plantations differing considerably in vegetation structure, suggesting that the species may be less strictly associated with sandy substrates than previously indicated. The record of *C. tibialis* may likewise represent a previously overlooked natural occurrence, considering its broad distribution from Africa through southern Europe to western Asia and its occurrence in both natural and anthropogenic habitats (Miller 1970, Knoflach et al. 2005, Crespo et al. 2010, Oger & Gros 2016, Manthen & Hippargi 2023, Seropian et al. 2023). Its occurrence at two structurally contrasting outdoor sites is consistent with this broad ecological range. Human-mediated dispersal cannot be excluded, but there is no direct evidence for it. The status of *D. emiliae* is more difficult to interpret because the species was previously known only from Corfu, where it was collected on the exterior wall of a hotel (Lecigne 2023). The Moldovan specimen was instead collected in a pitfall trap in an outdoor birch plantation. Although both known localities are anthropogenically influenced, there is no evidence for a particular introduction pathway between Corfu and Chișinău. The available data are therefore insufficient to determine whether the Moldovan record represents a natural occurrence or human-mediated introduction.

Conflict of interest. The authors declare no conflicts of interest.

Use of AI-based technologies. ChatGPT (OpenAI) was used to assist with language editing and wording during the revision of the manuscript. All scientific content and interpretations were reviewed by the authors, who take full responsibility for the final text.

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Author contributions

Alexandr Vasiliev: material collection, spider identification, main idea and writing of the manuscript, mapping, measurements and description of specimens, spider photography, manuscript correction and revision; Peter Gajdoš: manuscript correction and revision; Tatiana Izverscaia and Veaceslav Ghendov: plant identification and descriptions of the study sites; Lucia Švecová: spider photography and image processing.

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