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New data on the spider fauna (Araneae) of Navarre, Spain: results from the 7th EDGG Field Workshop

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Abstract. Multi-taxon investigations are of great importance in biodiversity research. We sampled spiders during the 7th EDGG Field Workshop aimed at studying dry grassland diversity in Navarre, Spain. A total of 99 spider species from 15 families were recorded from 14 localities. Of these, 47 species were new to Navarre. To date, the list of spiders of Navarre accounts for 322 species. During this first dry grassland-specific study of spiders in Spain, 78 species were recorded for the first time in this type of habitat in Navarre, and for 69 species it is a newly recorded habitat in the Iberian Peninsula. The grasslands growing in the submediterranean humid and supramediterranean upper dry territories, belonging to Festuco-Brometea and Festuco-Ononidetea phytosociological classes, were the richest in terms of inhabiting spiders (26 and 23 species respectively) while the communities of mesomediterranean semi-arid area (Lygeo-Stipetea and Salicornietea fruticosae classes) were the poorest (four species each).

Keywords: dry grassland, fauna inventory, habitat distribution, Iberian Peninsula, spiders

The spider fauna of the Iberian Peninsula and of the Balearic Islands is relatively well catalogued. Pedro Cardoso presented a preliminary checklist of Portuguese spiders in 2000 (Cardoso 2000). In 2004, Eduardo Morano published a list of recorded species of Iberian spiders together with a bibliography of available publications on that topic (Morano 2004). This review provided the number of species, Iberian endemics, collecting localities and references for each administrative region of Spain and Portugal. It also revealed the best and worst studied regions of the Iberian Peninsula, and thus outlined promising areas for future investigations.

The next stage of synthesis was the creation of an electronic catalogue of the Iberian spiders (Morano & Cardoso in Cardoso & Morano 2010). An accompanying paper presented an updated checklist of spiders with respect to the provinces and a comparative analysis of the records, species and endemic species in each family and province (Cardoso & Morano 2010). The third (and latest) version of the Iberian spider catalogue provided maps of collecting localities and exhaustive data on the records of 1382 species in 381 genera and 141 families (Morano et al., 2014). The current paper presents spider records from the 7th EDGG Field Workshop, thus providing a major supplement to the list of spiders of Navarre, and reports the first data on spider species composition in the dry grasslands of the study region.

Material and methods

Study area

Navarre is a Spanish region located in the north-central part of the Iberian Peninsula, ranging from the Pyrenean Moun-
mountains in the northeast to the Ebro depression in the south (Fig. 1). Three biogeographic units are represented in Navarre: Alpine, Atlantic and Mediterranean. The climate changes from Mediterranean in the south of the study area to temperate in the north, with the temperate sub-Mediterranean type in transitional areas. The ombrotype varies from semiarid to subhumid in the Mediterranean Region and from humid to hyperhumid in the Atlantic and Alpine Regions (Peralta et al. 2013). The natural vegetation is highly diverse, given the marked climatic and biogeographic gradient. Deciduous oak and beech forests prevail in the northern areas and Mediterranean evergreen woodlands and scrubs in the south (Loidi & Báscones 2006, Peralta et al. 2013). Sampling was carried out in a great variety of grasslands, ranging from subalpine grasslands, through mesic meadows, dry grasslands to endorheic basins, belonging to ten associations and six phytosociological classes (Berastegi 2013), most of them being semi-natural, i.e. maintained by human activity.

Subalpine grasslands belong to the class Juncetea trifidi, which groups acidophilous swards of the Pyrenees. Basophilous subalpine and supratemperate grasslands in the high mountains are included in the class Elyno-Seslerietea. At middle elevation, in submediterranean territories, the sampled grasslands belong to the classes Festuco-Brometea and Festuco hystricis-Ononidetea striatae. The former occupies deep baso-neutrophilous soils and the latter, rich in dwarf scrubs, grows in shallow and stony soils. The class Lygeo sparti-Stipetea tenacissimae comprises basophilous xerophytic grasslands from dry and semiarid Mesomediterranean areas. Finally, communities growing in endorheic areas with salty soils are included in the class Salicornietea fruticosae (Mucina et al. 2016).

Fig. 1: Collecting localities of the 7th EDGG Field Workshop in Navarre. For locality numbers, see Material and methods.
Data collection
Material was collected on 16–23 June 2014 during the 7th EDGG Field Workshop in Navarre (Biurrun et al. 2014). Fourteen localities were chosen for the dry grassland survey along the climatic and biogeographic gradient (Fig. 1). Spiders were sampled using a standard procedure of sweep netting and hand collecting. In addition to grasslands, we collected spiders in adjacent habitats, and the species were included in the general list.

Below, the study localities, grouped by biogeographic regions, are listed with the following information: locality, geographical coordinates in WGS84, elevation, date of collection, ombro- and thermotype of climate, and phytosociological class of grassland vegetation. Different vegetation classes studied in the same locality are marked with a letter (a, b).

Collecting localities
Mediterreanean Region
1 – Bardenas Reales, (42.203°N, 1.498°W), 295–318 m a.s.l., 16.06.2014. Mesomediterranean semi-arid climate, a – Lygoco-Stipeata, b – Salicornietea fruticosa
2 – Between Oteiza and Larraga, (42.579°N, 1.887°W), 370–390 m a.s.l., 17.06.2014. Mesomediterranean upper dry climate, Lygoco-Stipeata and patch shrub thickets on the slope bottom
3 – Lorca, (42.66°N, 1.94°W), 510–533 m a.s.l., 17.06.2014. Supramediterranean upper dry climate, a – Festuco-Ononidetea, b – Festuco-Brometea
4 – Liberri, (42.76°N, 1.43°W), 500–523 m a.s.l., 19.06.2014. Supramediterranean subhumid climate, Festuco-Ononidetea
5 – 6 – Munarriz, Sierra de Andia, (42.82°N, 1.90°W), 950–1078 m a.s.l., 18.06.2014. Mesotemperate humid climate, Festuco-Brometea, a – Festuco-Ononidetea
Atlantic Region
6 – Iza, (42.84°N, 1.72°W), 427–450 m a.s.l., 18.06.2014. Mesotemperate humid climate, Festuco-Brometea
7 – Munarriz, Sierra de Andia, (42.82°N, 1.90°W), 950–978 m a.s.l., 18.06.2014. Supramediterranean humid climate, Festuco-Brometea
8 – Ihabar, (42.90°N, 1.92°W), 569–596 m a.s.l., 22.06.2014. Mesotemperate humid climate, Festuco-Brometea
9 – Unanu, (42.87°N, 2.02°W), 600–610 m a.s.l., 22.06.2014. Mesotemperate humid climate, Festuco-Brometea
10 – Puerto de Urbasa, bottom of the mountain pass, (42.87°N, 2.17°W), 600–615 m a.s.l., 23.06.2014. Mesotemperate humid climate, Festuco-Ononidetea
11 – Puerto de Urbasa, top of the mountain pass, (42.858°N, 2.181°W), 903–945 m a.s.l., 23.06.2014. Supramediterranean hyperhumid climate, a – Festuco-Brometea, b – Elyno-Seslerietea
Atlantic Region
12 – Larra-Arlas, Mtn. La Contienda, (42.96°N, 0.75°W), 1725–1970 m a.s.l., 20.06.2014. Orotomediterranean hyperhumid climate, climate with patch Genista occidentalis, d – Festuco-Brometea
13 – Larra-Belagua, Lakora, (42.94°N, 0.84°W), 1423–1560 m a.s.l., 21.06.2014. Supramediterranean hyperhumid climate, Juncetea trifidi, pasture
14 – Belagua-Arrako, (42.92°N, 0.85°W) 934–968 m a.s.l., 21.06.2014. Supratemperate hyperhumid climate, Festuco-Brometea on the river terrace

Spider species list
Adult individuals of spiders were identified using Heimer & Nentwig (1991) and Nentwig et al. (2018). For the identification of some rare or sibling species we used Bosmans & Abrouss (1992), Barriento (1994), Kastrygina & Kovblyuk (2016), Spasojevic et al. (2016), Bosmans et al. (2018) and Isaia et al. (2018).

The annotated checklist of spiders is arranged alphabetically for families and within families following the nomenclature of the World Spider Catalog (WSC 2018). The list is based on the collected adult individuals; we mention juveniles only if adults were absent from a given locality. The number of the locality is provided with a letter if a species was collected in the grassland vegetation of the above-mentioned type. In other cases, we specify both locality and habitat (edge of a beech forest, under stones, etc.). The total number of collected species in a particular family is given in parenthesis after the family name. Species new to Navarre are indicated with an exclamation mark (!).

The bulk of the collected material is deposited in N. Polchaninova’s private collection (Kharkiv, Ukraine). Some specimens have been donated to the Museum of Nature of the V.N. Karazin Kharkiv National University, Ukraine (NMKhNU).

Results
Checklist of species

Agelenidae C. L. Koch, 1837 (1)
Eratigena picta (Simon, 1870)
[11], edge of a beech forest, 1d, 1η

Aranaeidae Clerck, 1757 (9)
! Aculepeira armida (Audouin, 1826)
[2], foot slope with dense herbs and shrubs, 2δδ, 6δη
! Aculepeira ceropogia (Walckenaer, 1802)
[10], 1η (NMKhNU); [14], 1η

Araeimella cucurbitina (Clerck, 1757)
[3a], 1d, 1η; [7], Juniperus shrubland, 3δδ (NMKhNU); [8], 3δδ 2δη; [9], 1η (NMKhNU); [10], 1η; [13], 1η; [14], 1η

! Araeimella opisthographa (Kulczyński, 1905)
[8], on shrubs, 1δ; [11a], 2δδ, 1η; [11b], 3δδ

Cyclosa conica (Pallas, 1772)
[8], open woodland, on a tree branch, 1δ (NMKhNU).
! Gibbaranea gibbosa (Walckenaer, 1802)
[8], forest edge, 1η

Mangora acalypha (Walckenaer, 1802)
[1], 1η, a bank of a brook; [1a], 1δ, 2δη; [1b] 1δ 2δη; [2], 3δη; [3a], 3δδ, 2δη; [3b], 2δη; [4], 1d 1η; [5a], 3δ, 7δ; [5b] 1δ, 6δ; [6], 2δη; [7], 2δη, 8; 3δδ, 6δ; [9], 5δδ; [10] 1δ, 1η; [11a], 1δ, 4δδ; [13] 3δ; [14], 1η

Nemoscola aurata (Simon, 1868)
[3a], 1δ, 4δ; [4], 1η; [11], forest edge, 1η

Neoscona adianta (Walckenaer, 1802)
[1a], 1δ, 1η; [2], Ligeo-Stipeata, 1δ, 1η, foot slope with dense grass and shrubs, 3δδ, 3δη (NMKhNU); [4], 1η; [5a]
2 ḋ, 1̇; [5b], 2 ḋ, 1̇; [6], near the road, 2♀; Festuco-Brometeca, 3 ḋ, 1̇; [8], 3 ḋ 2♀; [9], 2 ḋ, 3♀.

Dictynidae O. Pickard-Cambridge, 1871 (4)

**Brigitta lateris** (Fabricus, 1775)
[8], 1♂.

***Dictyna arundinacea*** (Linnaeus, 1758)
[6], shrubs on the foot slope, 1δ; Festuco-Brometeca, 1♀.

***Dictyna uncinata*** Thorell, 1856
[9], forest edge, 1♂.

***Nigma flavescens*** (Walckenaer, 1830)
[3a], 2♀; [7], tree branch, 1♀.

Eutichuridae Lehtinen, 1967 (1)

***Cheiracanthium pennyi*** O. Pickard-Cambridge, 1873
[4], 1δ, 1♀; [8], 1♀ (MNKhNU); [9], 1♂, under stones, 1♀.

***Drassodes cupreus*** (Simon, 1878)
[12], under stones near the road, 1♀.

***Drassodes lapidosus*** (Walckenaer, 1802)
[7], 2♀; [11a], 1♀; [13], 1♂, all under stones.

***Drassodes fugax*** (Simon, 1787)
[6], under stones near the road, 1♀.

***Drassyllus praeficus*** (Blackwall, 1841)
[13], 3♀; [14], 2♂, 2♀.

***Drassodes cupreus*** (Simon, 1878)
[12], in detritus near a path, 1♀.

***Drassodes tenuipes*** (Thorell, 1856)
[8], 1♀; [9], 1♀.

***Gnaphosa occidentalis*** Simon, 1878
[7], 4♀, 1♂; [10], 1♀, all under stones.

***Haplodrassus typhon*** (Simon, 1878)
[8], in detritus near a path, 1♀.

***Micaria albovittata*** (Lucas, 1846)
[13], on a shrub, 1♀.

***Nomisia exornata*** (C. L. Koch, 1839)
[8], under a stone, 1♀.

***Trachyzelotes pedestris*** (C. L. Koch, 1837)
[9], in detritus, 1♂ (MNKhNU).

***Zeolos atroceruleus*** (Simon, 1878)
[7], under stones near the road, 1♂.

Linyphiidae Blackwall, 1859 (10)

***Agyneta rarestrum*** (C. L. Koch, 1836)
[8], 1♂; [11b], 1♂ (MNKhNU); [13], 1♂.

***Erigone dentipalpis*** (Wider, 1834)
[6], on a footslope in shrubs, 1♂.

***Frontinella frutetorum*** (C. L. Koch, 1834)
[3a], 2♂♂; [4], 2♀; [6], on a footslope in shrubs, 1♂; Festuco-Brometeca, 2♀; [7], Juniperus shrubland, 1♂, 1♀; [8], 1♀; [11a], 2♂♂; [11b], 1♀, 1♂.

***Gonatium rubens*** (Blackwall, 1833)
[13], in detritus on the forest edge, 1♀.

***Maso sundevalli*** (Westring, 1851)
[8], forest edge, 1♀; [11a], 1♀.

***Microlymphia impigra*** (O. Pickard-Cambridge, 1871)
[14], 1♂.

***Neriene clathrata*** (Sundevall, 1830)
[1], grass near a brook, 1♂; [3a], on the ground, 1♂; [7], Juniperus shrubland, 1♀.

***Pelecospus biceps*** (O. Pickard-Cambridge, 1875)
[1], bank of a brook, 4♀.

***Prineringa vagans*** (Audouin, 1826)
[8], under the trees near a brook, 1♂; [11a], 1♀.

***Tenuiphantes tenus*** (Blackwall, 1852)
[3a], 1♀; [8], 1♂; [11], forest edge, 1♀; [11a] 1♀; [11b], 2♀; [14], 1♀.

Lycosidae Sundevall, 1833 (9)

***Alopecosa farinosa*** (Herman, 1879)
[8], 2♀.

***Alopecosa pulversilenta*** (Clerck, 1757)
[3a], 1♀.

***Pardosa blanda*** (C. L. Koch, 1833)
[12], 5♂♂.

***Pardosa bortensis*** (Thorell, 1872)
[8], 1♀; [9], 1♀.

***Pardosa monticola*** (Clerck, 1757)
[8], 2♀; [9], 1♀; [11], pasture, 3♂; [13], 2♂♂, 3♀; [14], 2♂♂, 2♀.

***Pardosa nigricans*** (Thorell, 1856)
[12], 1♂.

***Pardosa tenuipes*** L. Koch, 1882
[12], 1♂.

***Pardosa pallidula*** (Clerck, 1757)
[13], 3♂; [14], 2♂, 2♀.

***Piratula latitans*** (Blackwall, 1841)
[1], near a brook, 1♂; [14], river bank, 1♀.

Oxyopidae Thorell, 1870 (3)

***Oxyopes heteropbthalmus*** (Latreille, 1804)
[2], 1♀ (MNKhNU); [3a] 1♂ 1♀; [3b], 1♀; [4], 3♀; [5b] 1♂, 1♂; [7], 1♂; [9], 1♀.

***Oxyopes lineatus*** Latreille, 1806
[4], 1♀, 2♀.

***Oxyopes nigripalpis*** Kulczyński, 1891
[1a], 1♂, 1♀ (MNKhNU); [2], 1♀; [3a], 2♂♂ 3♀; [4], 1♀; [14], 1♀.

Philodromidae Thorell, 1870 (8)

***Philodromus albidus*** Kulczyński, 1911
[3a], 1♀.

***Philodromus aureolus*** (Clerck, 1757)
[14], tree branch, 1♂.

***Philodromus cespitum*** (Walckenaer, 1802)
[3b], 1♀; [6], 1♂; [8], 1♀.

***Philodromus dispar*** Walckenaer, 1826
[8], 1♂; [14], 1♀, both on tree branches.

***Pulchellodromus navarrus*** (Kastryngina, Kóvbylyk & Polchaninova, 2016)
[3a], 1♂, 1♀ (MNKhNU); [6], 1♂, 1♀ (ZMMU) (Kastyngina et al., 2016).

***Thanatus atratus*** Simon, 1885
[2], 1♂; [8], 1♀; [3a], 2♂♂ 3♀; [4], 1♀; [14], 1♀.

***Thanatus formicinus*** (Clerck, 1757)
[12], 1♂.

***Tibellus oblongus*** (Walckenaer, 1802)
[4], 1♂; [5a], 1♂; [6], 1♂.
Pisaura mirabilis (Clerck, 1757)

Salticidae Blackwall, 1841 (1)

Simitidion simile (C. L. Koch, 1836)

(Clerck, 1757)

Phylloneta sisyphia

![Phylloneta impressa](https://bioone.org/journals/Arachnologische-Mitteilungen:-Arachnology-Letters)

Neottiura bimaculata (Linnaeus, 1767)

Lasaeola convexa

Kochiura aulica

Heterotheridion nigrovariegatum (Simon, 1873)

Enoplognatha thoracica (Hahn, 1833)

Salticus scenicus (Simon, 1871)

Phlegra fasciata (Walckenaer, 1802)

Pellenes tripunctatus (Walckenaer, 1802)

Phegusa fasciata (Hahn, 1826)

Salticus scenicus (Clerck, 1757)

Heliophanus cupreus (C. L. Koch, 1837)

Heliophanus dubius (C. L. Koch, 1835)

Heliophanus flavipes (Hahn, 1832)

Heliophanus kochi Simon, 1868

Heliophanus cymbi (Simon, 1868)

Theridididae Sundewall, 1833 (12)

Anelosiminae vittatus (C. L. Koch, 1836)

Dipoena melanogaster (C. L. Koch, 1837)

Enoplognatha thoracica (Hahn, 1833)

Notirompigraphus aulica (C. L. Koch, 1838)

Lasaeola convexa (Blackwall, 1870)

Epomis acromedius (Linnaeus, 1767)

Phylloidon impressa (C. L. Koch, 1881)

Phylloneta impressa (C. L. Koch, 1881)

Acroorthidion nigraevarigatum (Simon, 1873)

Kochiura aulica (C. L. Koch, 1838)

Lasaeola convexa (Blackwall, 1870)

Neottiura bimaculata (Linnaeus, 1767)

Phylloneta impressa (C. L. Koch, 1881)

Phylloneta sisyphia (Clerck, 1757)

Simitidion simile (C. L. Koch, 1836)

Salticidae Blackwall, 1841 (14)

!Asianellus festivus (C. L. Koch, 1834)

Chalcidiscus infimus (Simon, 1868)

Euophrys gambosa (Simon, 1868)

Euophrys berbigrada (Simon, 1871)

Evarcha michailovi Logunov, 1992

Macaroeris nidicolens (Walckenaer, 1802)

Heliophanus cymbi (Simon, 1868)

Heliophanus flavipes (Hahn, 1832)

Heliophanus kochi Simon, 1868

Heliophanus cymbi (Simon, 1868)

Pellenes tripunctatus (Walckenaer, 1802)

Phegusa fasciata (Hahn, 1826)

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Salticus scenicus (Clerck, 1757)

Heliophanus cupreus (C. L. Koch, 1837)

Heliophanus dubius (C. L. Koch, 1835)

Heliophanus flavipes (Hahn, 1832)

Heliophanus kochi Simon, 1868

Heliophanus cymbi (Simon, 1868)
grasslands, we recorded 51 spider species in the Atlantic region, 36 species in the Mediterranean region, and 18 species in the Alpine region.

Two phytosociological classes, Festuco-Odonidetea and Festuco-Brometea, were the most widespread in the study area. The former hosted 32 spider species and the latter 41 species (Tab. 1).

**Discussion**

Prior to our study, 275 spider species were known from Navarre, 231 species listed in the Iberian spider catalogue (Morano et al. 2014) and additional 44 species recorded from the oak forest of Orgí (Lizaso) (Castro & Barriuso 2004). We found 99 species from 15 families. Of these, 47 species are new to Navarre including one species described as new to science (Kastrygina et al. 2015). Thus, the total list of spiders has been enlarged to 322 species. By number of species registered, Navarre can now be included in the top six provinces of Spain and Portugal regarding species richness: Huesca – 430 species, Barcelona – 356, Coimbra – 321, Madrid – 313 and Salamanca – 300 species (Morano et al. 2014). Nevertheless, considering a large gradient of altitudinal and climatic conditions, the spider species list of Navarre is certainly far from complete.

For *Asianella festiva* and *Exarcha michailovi*, we provide the second record for the Iberian Peninsula. Both species were previously found in Catalonia (Barrientos et al. 2015, Logunov 2015). Nine species from our collection (*Drassodes cupreus*, *Gnaphosa lugubris*, *Haplodrassus typhonii*, *Zelotes atrocruceus*, *Genatium rubens*, *Trichoncus affinis*, *Heliophanus dubius*, *Heterotheridion nigrovariegatum*) are also rare in the Peninsula. They have been recorded from a maximum of five localities (Morano et al. 2014).

In all the study localities, arachnological researches were conducted for the first time. In Bardenas Reales, spiders had been previously collected only in Vedeado de Egurajas, an ‘oasis’ of *Pinitus halepensis* in the semi-arid area (Romano in Morano et al. 2014). There were no previous specific studies on dry grassland spiders in Spain. The records of 78 species are new for this type of habitat in Navarre; for 69 species, it is a newly recorded habitat in the Iberian Peninsula.

The most widespread species from our collection (*Mangora acalypha*, *Neoscona adianta*, *Phylloneta impressa*) are grassland generalists. *Mangora acalypha* also occurs in open forests in herb and tree layers. *Xysticus cristatus* is an euryoecious species, *Arianella cecucritina* inhabits dry and semi-humid biotopes in open landscapes (Buchar & Růžička 2002, Polchaninova & Prokopenko 2013, Nentwig et al., 2018). *Runcinia grammica* is a common species in xerothermic grasslands (Polchaninova 2012).

The Festuco ‒ Brometia grasslands in the mesotemperate humid climate (Ihabar) and the Festuco ‒ Onionidetea in the submediterranean subhumid climate (Lorca) hosted the richest spider communities (26 and 23 species, respectively). Interestingly, the grasslands of Ihabar were also the richest in terms of plant diversity (Biurrun et al. 2014). The poorest was the vegetation of Lygeo ‒ Stipetea and Salicornietea fracticosae phytosociological classes in the mesomediterranean semi-arid climate in Bardenas Reales (four spider species each). A higher abundance of spider species collected in the Atlantic grasslands can be explained by a wide variety of altitudes and habitats (from stony pastures to slopes with dense shrubs and herbs) compared with the studied grasslands in the Mediterranean and Alpine regions. Spider communities of the Iberian dry grasslands need further investigation for more detailed analysis.

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**Tab. 1:** Number of spider species recorded from collecting localities (for locality number see Material and methods)

| Mediterranean | Atlantic | Alpine |
|---------------|----------|--------|
| 1  | 2          | 3       | 4   | 5    | 6    | 7    | 8    | 9   | 10   | 11  | 12  | 13  | 14 |
| Grasslands   |           |         |     |     |      |      |      |     |      |     |     |     |     |
| 4  | 10         | 23      | 18  | 8   | 15   | 14   | 26   | 12  | 7    | 11  | 6   | 9   | 13 |
| Total       | 8          | 11      | 26  | 18  |      | 10   | 19   |     | 22   | 43  | 12  | 7   | 11  | 16 |
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