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

Authors: Polchaninova, Nina, García-Mijangos, Itziar, Berastegi, Asun, Dengler, Jürgen, and Biurrun, Idoia

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

Nina Polchaninova, Itziar García-Mijangos, Asun Berastegi, Jürgen Dengler & Idoia Biurrun

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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

Zusammenfassung. Neue Daten zur Spinnenfauna (Araneae) von Navarra, Spanien: Ergebnisse des 7. EDGG Field Workshop. Multi-Taxon-Untersuchungen sind ein wichtiger Teil der Biodiversitätsforschung. Wir haben im Rahmen des 7th EDGG Field Workshop trockenes Grünland in der Provinz Navarra (Spanien) untersucht. Insgesamt wurden in 14 Untersuchungsflächen 99 Spinnenarten aus 15 Familien erfasst, darunter waren 47 neu für Navarra. Damit umfasst die Spinnenliste Navarras nun 322 Arten. In dieser ersten Erfassung von Spinnen speziell in Grünland in Spanien wurden 78 Arten in Navarra und 69 auf der Iberischen Halbinsel erstmals in diesem Habitattyp erfasst. Grünland in den submediterran feuchten und den oberen supramediterran trockenen Regionen gehört zu den pflanzensoziologischen Klassen Festuco-Brometea und Festuco-Ononidetea und war am artenreichsten (26 bzw. 23 Spinnenarten). Dagegen waren die Klassen der mesomediterranen semi-ariden Region (Lygeo-Stipetea und Salicornietea fruticosae) die artenärmsten (jeweils vier Spinnenarten).

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 55 families (Morano et al. 2014). Conducting such a huge job, the catalogue authors concluded that the spider fauna of the Iberian Peninsula is still severely incompletely studied. The territory has been unevenly surveyed, there is a shortage in the data on species habitat distribution, and only some families have a sufficient species list (Cardoso & Morano 2010).

The Eurasian Dry Grassland Group EDGG (Vrahnakis et al. 2013) organizes research expeditions (so-called Field Workshops) since 2009, aimed at sampling standardized, high-quality data on species composition and diversity of grasslands and related communities (Dengler et al. 2016). Data collection initially focused on plant diversity; the 7th Field Workshop conducted in the region of Navarre in Spain (Biurrun et al. 2014) was the first example to include invertebrate collection, namely spiders, in the sampling protocol. This opened the opportunity to expand information about spiders in the study region and specify their distribution in various types of grasslands.

The Iberian spider catalogue includes 539 spider records in the region of Navarre, which correspond to 231 species in 141 genera and 35 families; the 79 collecting localities are documented in 37 papers (Morano et al. 2014). Spider habitat distribution in Navarre is known only for 13 cave species (see Morano et al. 2014) and for 149 species from oak and beech-oak forests (Castro & Ferrandez 1998, Castro & Alberdi 2002, Castro & Barriuso 2004, Castro 2009, 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-

Nina POLCHANINOVA, Department of Zoology and Animal Ecology, V.N. Karazin Kharkiv National University, 4 Maid. Svobody, Kharkiv 61022 Ukraine; E-mail: n.polchaninova@karazin.ua
Itziar GARCÍA-MIJANGOS, Department of Plant Biology and Ecology, University of the Basque Country UPV/EHU, P.O. Box 644, Bilbao, Spain; E-mail: itziar.garcia@ehu.es
Asun BERASTEGI, Department of Biodiversity, Gestión Ambiental de Navarra, S.A., Padre Adoain 219 Bajo, 31015 Pamplona, Spain; E-mail: aberastg@ganasa.es
Jürgen DENGLER, Vegetation Ecology Group, Institute of Natural Resource Sciences (IUNR), Zurich University of Applied Sciences (ZHAW), Grüentalstr. 14, Postfach, 8820 Wädenswil, Switzerland; E-mail: juergen.dengler@zhaw.ch
Plant Ecology, Bayreuth Center of Ecology and Environmental Research (BayCEER), University of Bayreuth, Universitätsstr. 30, 95447 Bayreuth, Germany
German Centre for Integrative Biodiversity Research (iDiv), Deutscher Platz 5e, 04103 Leipzig, Germany
Idoia BIURRUN, Department of Plant Biology and Ecology, University of the Basque Country UPV/EHU, P.O. Box 644, Bilbao, Spain; E-mail: idoia.biurrun@ehu.es

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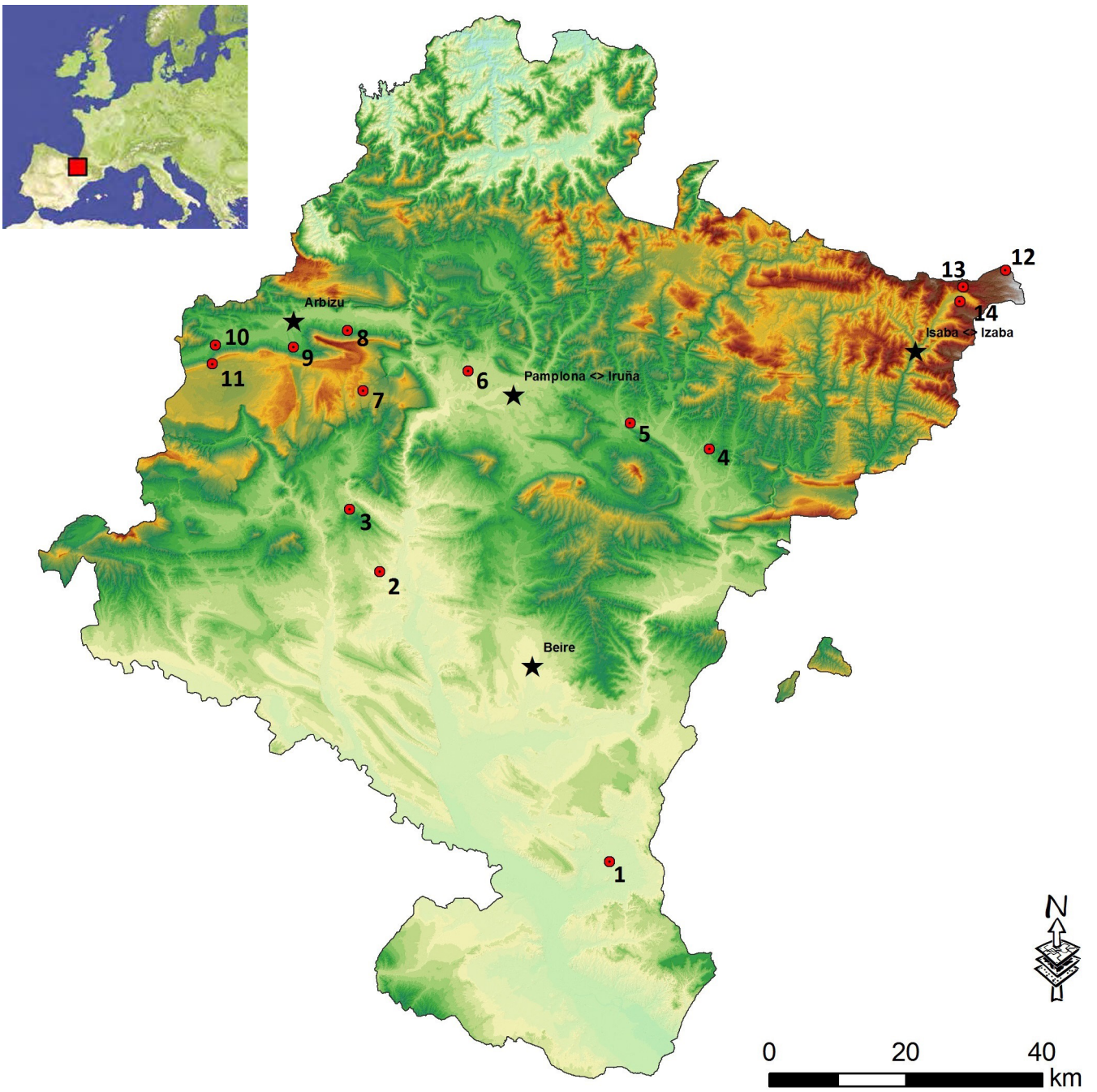

Fig. 1: Collecting localities of the 7th EDGG Field Workshop in Navarre. For locality numbers, see Material and methods.

tains 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 xerophitic 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).

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

Mediterranean Region

1 – Bardenas Reales, (42.203°N, 1.498°W), 295-318 m a.s.l., 16.06.2014. Mesomediterranean semiarid climate, a – Lygeo-Stipetea, b – Salicornietea fruticosae

2 – Between Oteiza and Larraga, (42.579°N, 1.887°W), 370–390 m a.s.l., 17.06.2014. Mesomediterranean upper dry climate, Lygeo-Stipetea and patched 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 – Urraúl Bajo-Sansoain, (42.73°N, 1.29°W), 561–580 m a.s.l., 19.06.2014. Supramediterranean subhumid climate, Festuco-Ononidetea

5 – Liberri, (42.76°N, 1.43°W), 500–523 m a.s.l., 19.06.2014. Supramediterranean subhumid climate, a – Festuco-Brometea, b – 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. Supratemperate 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. Supratemperate hyperhumid climate, a – Festuco-Brometea, b – Elyno-Seslerietea

Alpine Region

12 – Larra-Arlas, Mtn. La Contienda, (42.96°N, 0.75°W), 1725-1970 m a.s.l., 20.06.2014. Orotemperate hyperhumid climate, slope with patched *Genista occidentalis*,

13 – Larra-Belagua, Lakora, (42.94°N, 0.84W°), 1423–1560 m a.s.l., 21.06.2014. Supratemperate 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 & Abrous (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, 1♂, 1♀.

Araneidae Clerck, 1757 (9)

!*Aculepeira armida* (Audouin, 1826)

[2], foot slope with dense herbs and shrubs, 2♂♂, 6♀♀.

!*Aculepeira ceropegia* (Walckenaer, 1802)

[10], 1♀ (MNKhNU); [14], 1♀.

***Araniella cucurbitina* (Clerck, 1757)**

[3a], 1♂, 1♀; [7], *Juniperus* shrubland, 3♂♂ (MNKhNU); [8], 3♂♂ 2♀♀; [9], 1♀ (MNKhNU); [10], 1♀; [13], 1♀; [14], 1♂.

!*Araniella opisthographa* (Kulczyński, 1905)

[8], on shrubs, 1♂; [11a], 2♂♂, 1♀; [11b], 3♂♂.

***Cyclosa conica* (Pallas, 1772)**

[8], open woodland, on a tree branch, 1♀ (MNKhNU).

!*Gibbaranea gibbosa* (Walckenaer, 1802)

[8], forest edge, 1♀.

***Mangora acalypha* (Walckenaer, 1802)**

[1], 1♀, bank of a brook; [1a], 1♂, 2♀♀; [1b] 1♂ 2♀♀; [2], 3♀♀; [3a], 3♂♂, 2♀♀; [3b], 2♀♀; [4], 1♂ 1♀; [5a], 3♂, 7♀; [5b] 1♂, 6♀; [6], 2♀♀; [7], 2♀♀; [8], 3♂♂, 6♀♀; [9], 5♀♀; [10] 1♂, 1♀; [11a], 1♂, 4♀♀; [13] 3♀; [14], 1♀.

***Nemoscolus laurae* (Simon, 1868)**

[3a], 1♂, [4], 1♀; [11], forest edge, 1♀.

***Neoscona adianta* (Walckenaer, 1802)**

[1a], 1♂, 1♀; [2], Ligeo-Stipetea, 1♂, 1♀; foot slope with dense grass and shrubs, 3♂♂, 3♀♀ (MNKhNU); [4], 1♀; [5a]

2 ♂♂, 1♀; [5b], 2 ♂♂, 1♀; [6], near the road, 2♀♀; Festuco-Brometea, 3♂♂, 1♀, [8], 3♂♂ 2♀♀; [9], 2♂♂, 3♀♀.

Dictynidae O. Pickard-Cambridge, 1871 (4)
***Brigittea latens* (Fabricus, 1775)**
[8], 1♀.
! *Dictyna arundinacea* (Linnaeus, 1758)
[6], shrubs on the foot slope, 1♂; Festuco-Brometea, 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], 1♂, 1♀; [8], 1♀ (MNKhNU); [9], forest edge, 1♂; Festuco-Brometea, 1♂, 2♀ (MNKhNU).

Gnaphosidae Pocock, 1898 (13)
! *Callilepis nocturna* (Linnaeus, 1758)
[7], 4♀♀; [10], 1♀, all under stones.
! *Civizelotes civicus* (Simon, 1878)
[7], under stones, 1♀.
***Drassodes cupreus* (Blackwall, 1834)**
[7], under stones, 1♀; [11], 1♀.
! *Drassodes fugax* (Simon. 1787)
[12], on the ground under shrubs, 1♂.
***Drassodes lapidosus* (Walckenaer, 1802)**
[7], 2♀♀; [11a], 1♀; [13], 1♂, all under stones.
! *Drassodes pubescens* (Thorell, 1856)
[6], under stones near the road, 1♀.
***Drassyllus praeficus* (L. Koch, 1866)**
[8], under stones, 3♀♀.
***Gnaphosa occidentalis* Simon, 1878**
[7], 4♀♀; [8], 2♀; [11], 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).
! *Zelotes atroceruleus* (Simon, 1878)
[7], under stones near the road, 1♂.

Linyphiidae Blackwall, 1859 (10)
***Agyneta rurestris* (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], 6♀♀; [4], 2♀♀; [6], on a footslope in shrubs, 1♀; Festuco-Brometea, 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♀.
! *Microlinyphia 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♀.
! *Pelecopsis bucephala* (O. Pickard-Cambridge, 1875)
[1], bank of a brook, 4♀♀.
! *Prinerigone vagans* (Audouin, 1826)
[8], under the trees near a brook, 1♀; [11a], 1♀.
***Tenuiphantes tenuis* (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 pulverulenta* (Clerck, 1757)**
[3a], 1♀.
! *Pardosa blanda* (C. L. Koch, 1833)
[12], 5♂♂.
***Pardosa hortensis* (Thorell, 1872)**
8], 1♀; [9], 1♀.
! *Pardosa monticola* (Clerck, 1757)
[8], 2♀; [9], 1♀; [11], pasture, 3♀; [13], 2♂♂, 3♀♀; [14], 2♂♂, 2♀♀.
***Pardosa nigriceps* (Thorell, 1856)**
[12], 1♀.
! *Pardosa tenuipes* L. Koch, 1882
[12], 1♂.
***Pardosa pullata* (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 heterophthalmus* (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], stony slope with sparse vegetation, 1♂, 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* (Kastrygina, Kovblyuk & Polchaninova, 2016)**
[3a], 1♂, 1♀ (MNKhNU); [6], 1♂, 1♀ (ZMMU) (Kastrygina et al., 2016).
! *Thanatus atratus* Simon, 1885
[2], 1♂; [8], stony place with sparse vegetation, 1♂.
! *Thanatus formicinus* (Clerck, 1757)
[12], 1♂.
! *Tibellus oblongus* (Walckenaer, 1802)
[4], 1♂; [5a], 1♂; [6], 1♂.

Pisauridae Simon, 1890 (1)
***Pisaura mirabilis* (Clerck, 1757)**
[1], near a brook, 1♀; [3a], 1♀; [4] 1♀.

Salticidae Blackwall, 1841 (14)
! ***Asianellus festivus* (C. L. Koch, 1834)**
[2], stony slope with sparse vegetation, 1♀.
! ***Chalcoscirtus infimus* (Simon, 1868)**
[11], stony wall, 1♂.
***Euophrys gambosa* (Simon, 1868)**
[3c], 1♂; [8], 1♀.
! ***Euophrys herbigrada* (Simon, 1871)**
[4], 1♂; [10], 1♀.
! ***Evarcha michailovi* Logunov, 1992**
[3a], 1♂, 1♀; [3b], 1♀; [4], 1♂.
***Macaroeris nidicolens* (Walckenaer, 1802)**
[2], 1♂ on a shrub; [8], 2♂♂ on tree branches.
***Heliophanus cupreus* (Walckenaer, 1802)**
[8], 1♀; [11], forest edge, 2♀♀ (MNKhNU); [11a], 1♂; [11b], 1♂, 2♀♀ (MNKhNU).
! ***Heliophanus dubius* C. L. Koch, 1835**
[14], 1♂, 1♀.
***Heliophanus flavipes* (Hahn, 1832)**
[7], 1♀; [8], 2♀♀, (MNKhNU); [a], 1♀; [10], 1♀; [13], on shrubs, 1♀; on grass, 1♀.
***Heliophanus kochii* Simon, 1868**
[8], 1♂.
! ***Heliophanus tribulosus* Simon, 1868**
[8], 1♂.
***Pellenes tripunctatus* (Walckenaer, 1802)**
[6], 1♀; [7], 3♀♀; [8], 1♂; [14], 3♀♀.
***Phlegra fasciata* (Hahn, 1826)**
[7], 1♀; [12], 2♂♂, 2♀♀ (MNKhNU).
! ***Salticus scenicus* (Clerck, 1757)**
[7], 1♂, 1♀; [12], on a stone, 1♀.

Theridiidae Sundewall, 1833 (12)
***Anelosimus vittatus* (C. L. Koch, 1836)**
[8], single tree, 1♂; [11], forest edge, 1♀.
! ***Dipoena melanogaster* (C. L. Koch, 1837)**
[7], *Juniperus* shrubland, 1♂; [8], under the tree, 1♀ (MNKhNU).
! ***Enoplognatha thoracica* (Hahn, 1833)**
[5], on the ground near the road, 1♀.
! ***Heterotheridion nigrovariegatum* (Simon, 1873)**
[8], 1♀.
***Kochiura aulica* (C. L. Koch, 1838)**
[7], *Juniperus* shrubland, 1♂; [8], forest edge, 1♂.
! ***Lasaeola convexa* (Blackwall, 1870)**
[3a], 1♀; [5a], 1♀; [5b], 1♀; [11a], 1♀.
***Neottiura bimaculata* (Linnaeus, 1767)**
[9], 1♂ (MNKhNU).
! ***Phylloneta impressa* (L. Koch, 1881)**
[1], wheat field, 1♀; [2], footslope, on shrubs, 1♂, 1♀; [3b], 1♀; [6], grass along the road, 1♀, [7], 1♂; [8], 2♂♂, 2♀♀; (MNKhNU), 1♂; [9], 1♂, 1♀; [10], 1♀.
! ***Phylloneta sisyphia* (Clerck, 1757)**
[7], 1♂.
***Simitidion simile* (C. L. Koch, 1836)**
[3b], 1♀; [7], *Juniperus* shrubland, 1♀; shrubs on the hay meadow, 2♀♀; [8], 1♂.
***Steatoda albomaculata* (De Geer, 1778)**
[2], under a shrub on a stony slope, 1♂ juv.
***Theridion pinastri* L. Koch, 1872**
[8], on shrubs, 1♀ (MNKhNU).

Thomisidae (11)
! ***Heriaeus oblongus* Simon, 1918**
[6], grass on the roadside, 2♂♂.
***Misumena vatia* (Clerck, 1757)**
[5a], 1♀; [5b], 2♂♂; [6], 1♂; [8], 1♀.
! ***Ozyptila pauxilla* (Simon, 1870)**
[7], *Juniperus* shrubland, 1♂.
***Runcinia grammica* (C. L. Koch, 1837)**
[1a], 3♂♂; [1b], 2♂♂, 1♀; [2], 2♂♂, 1♀; [3a], 3♂♂ (MNKhNU); [4], 1♂; [6], shrubs on top slope, 1♂, on grass, 1♂; [7], 1♂; [8], 1♂ 1♀.
***Synema globosum* (Fabricius, 1775)**
[3a], 1♂ 4♀♀; [4], 2♀♀; [6], shrubs on the foot slope, 1♀; [8], 2♂♂.
***Thomisus onustus* Walckenaer, 1805**
[2], stony slope with sparse vegetation, 1♂, 1♀; [3a], 2♂♂, 1♀; [5b], 1♂ 1♀; [6], 1♂, 1♀; [8], 1♂.
! ***Xysticus acerbus* Thorell, 1872**
[6], 1♀.
***Xysticus cristatus* (Clerck, 1758)**
[4], 1♀; [5], on the roadside, 1♀; [6], on shrubs, 2♀♀, on grass, 1♂; [8], 1♂; [9], 2♀; [10], 1♀; [11], forest edge, 1♂, 1♀; [11b], 1♂, 1♀ (MNKhNU); [14], 3♂♂ (MNKhNU).
***Xysticus erraticus* (Blackwall, 1834)**
[8], in detrtus, 1♂; [14], 1♂.
! ***Xysticus kempeleni* Thorell, 1872**
[4], 1♀; [5b], 1♀.
! ***Xysticus kochi* Thorell, 1872**
[4], 1♀ (MNKhNU); [8], 2♀♀.

Uloboridae (1)
! ***Uloborus walckenaerius* Latreille, 1806**
[2], sparse vegetation on the foot slope, 1♂; [3a], 1♀; [5a], 2♂♂.

Zodariidae (1)
! ***Zodarion pseudoelegans* Denis, 1933**
[3], in grass between pine trees, 1♀.

A total of 99 spider species from 15 families were recorded during the Field Workshop. The families Salticidae, Gnaphosidae, Theridiidae and Thomisidae were the most species-rich (14, 12, 12 and 11 species, respectively). *Mangora acalypha* was the most widespread species, it occurred in 13 localities out of 14. *Araniella cucurbitina, Xysticus cristatus* and *Phylloneta impressa* were found in eight localities, *Neoscona adianta* and *Runcinia grammica* in seven localities.

Spider species composition was poorest in Bardenas Reales [1], at the bottom of the mountain pass of Puerto de Urbasa [10], and the Larra-Arlas Mountains [12] (7–8 species only), and the richest in Ihabar [8] (43 species) (Tab. 1). If only the spiders collected in grasslands are considered, the same localities were again the poorest, and Ihabar the richest (26 species) followed by the hills in vicinity of Lorca [3] (23 species). Ihabar is located in the Atlantic biogeographic region while Lorca in the Mediterranean one. In the investigated

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

	Localities/Biogeographic regions													
	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	19	7	11	16

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 Orgi (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 spider 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 *Asianellus festivus* and *Evarcha 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 cupres*, *Gnaphosa lugubris*, *G. occidentalis*, *Haplodrassus typhoni*, *Zelotes atroceruleus*, *Gonatium 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 Vedado de Eguaras, an 'oasis' of *Pinus 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, *Araniella cucurbitina* inhabits dry and semi-humid biotops 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-Brometea grasslands in the mesotemperate humid climate (Ihabar) and the Festuco-Ononidetea 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 fruticosae 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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