Standardised inventories of spiders (Arachnida, Araneae) of Macaronesia I: The native forests of the Azores (Pico and Terceira islands)

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Abstract

Background

The data presented here come from samples collected as part of two recent research projects (NETBIOME - ISLANDBIODIV and FCT - MACDIV) which aimed at understanding the drivers of community assembly in Macaronesian islands. We applied the sampling protocol COBRA (Conservation Oriented Biodiversity Rapid Assessment, Cardoso 2009) in sixteen 50 m x 50 m native forest plots in the Azorean Islands of Pico (6 plots) and Terceira
(10 plots) to assess spider diversity. Through this publication, we contribute to the knowledge of the arachnofauna of the Azores and, more specifically, to that of the islands of Pico and Terceira.

**New information**

The collected samples yielded 8,789 specimens, of which 45% were adults (3,970) belonging to 13 families, 36 species and three morphospecies that have yet to be described. Species of the family Linyphiidae dominated the samples, with 17 species and two morphospecies that have yet to be described (48% of the taxa). Out of the identified (morpho)species, 16 were introduced, 13 Azorean endemic (three of which were undescribed) and seven native (five of them Macaronesian endemics). We report the first record of the introduced species *Haplodrassus signifer* and *Agyneta decora* in Pico Island.

**Keywords**

Arthropoda, Araneae, Azores, Terceira, Pico, native forest, exotic species, standardised sampling

**Introduction**

Despite six centuries of disturbance and land use changes, the Azorean islands still contain areas covered by unique native forest (Triantis et al. 2010). This forest accounts for about 5% of the total area of the archipelago and is mainly present on the islands of Flores, Pico and Terceira (Gaspar et al. 2010). From a conservation perspective, the importance of these forests resides in their being home to numerous endemic arthropod species, many of which have been given different status of conservation concern following the IUCN Red List criteria (see for the insects Borges et al. 2017, Borges et al. 2018a). Furthermore, many species – mainly arthropods – await discovery and taxonomic description, despite the high rate of taxonomic descriptions in the last decades (Lobo and Borges 2010). For instance, 24 out of the known 26 endemic spiders have been described since 1989 (Borges and Wunderlich 2008, Borges et al. 2010, Crespo et al. 2013, Crespo et al. 2014).

Indeed, the effective, appropriate and efficient conservation of ecologically valuable areas requires knowing the identity and colonisation status of species (i.e. endemic, native non-endemic or introduced), often provided by large-scale projects such as the EU NETBIOME funded ISLANDBIODIV (*Understanding biodiversity dynamics in tropical and subtropical islands in an aid to science based conservation action*) and the Portuguese FCT funded MACDIV (*Macaronesian Islands as a testing ground to assess biodiversity drivers at multiple scales*). Both ISLANDBIODIV and MACDIV aim to unveil the diversity patterns in vascular plants, springtails, beetles and spiders at local and regional scales in Macaronesian islands (see Emerson et al. 2016, Cicconardi et al. 2017, Borges et al. 2018a).
2018b). Here we present the information on the species collected in the Azorean forest plots that are part of the ISLANDBIODIV and MACDIV projects.

**Sampling methods**

**Study extent:** On each of the Azorean islands of Pico and Terceira, we established six and ten 50 m x 50 m plots along a longitudinal distance of 20 km and 13 km, respectively. In Pico, each plot is located at increasing distances from a first, reference plot (Table 1): 0.1, 1, 5, 10 and 20 km (Fig. 1), covering the three existing forest fragments in order to test distance decay patterns on beta diversity in a log scale within project MACDIV. In Terceira, the 10 plots were randomly distributed in the four main fragments of native forest also to test patterns of alpha and beta diversity (see Cicconardi et al. 2017, Borges et al. 2018b). All plots were located in mid to high elevation native forest dominated by *Juniperus brevifolia*, *Laurus azorica* and *ilex perado* subsp. *azorica* trees (see Borges et al. 2018b for more details on the surveyed habitats) (Fig. 2).

| Plot  | Longitude        | Latitude      |
|-------|------------------|---------------|
| Pico 1| -28.2017136846   | 38.437588     |
| Pico 2| -28.2117989478   | 38.43737      |
| Pico 3| -28.2259599451   | 38.43491      |
| Pico 4| -28.257662125    | 38.4561062785 |
| Pico 5| -28.2731451278   | 38.4876669302 |
| Pico 6| -28.4228543692   | 38.4998686917 |
| Terceira 1| -27.1971972222 | 38.7320583333 |
| Terceira 2| -27.2005772537 | 38.7364977463 |
| Terceira 3| -27.2271119278 | 38.7334147054 |
| Terceira 4| -27.2193222222 | 38.7617777778 |
| Terceira 5| -27.3074033132 | 38.7355657746 |
| Terceira 6| -27.3313027778 | 38.7520777778 |
| Terceira 7| -27.233098     | 38.75214      |
Sampling description: We sampled all plots using the optimised and standardised COBRA (Conservation Oriented Biodiversity Rapid Assessment) protocol for temperate forests (Cardoso 2009). Different variants of the COBRA protocol for spiders and beetles have
already been applied in oceanic islands (Emerson et al. 2016) and for spiders on tropical forests (Malumbres-Olarte et al. 2016, Malumbres-Olarte et al. 2018). Although originally developed and optimised for mainland temperate and Mediterranean habitats, COBRA protocols have been recently proposed as the standard protocols for inventoring and monitoring spiders and beetles in island forest ecosystems (Borges et al. 2018c). The COBRA protocol, when applied to temperate forests, consists of: four night aerial samples (1 hour / sample), two day sweeping samples and two night sweeping samples (1 hour / sample), two day beating samples and two night beating samples (1 hour / sample) and 12 pitfall samples (4 traps / sample). Specifically for islands, we added two sampling methodologies to also cover beetle diversity (Borges et al. 2018c): two diurnal active aerial searching under bark, lichens and bryophytes (ABS) (1 hour / sample) and two diurnal active aerial searching in decaying trunks, dead wood on the ground and under stones (GWS) (1 hour / sample). We collected all samples in July 2016 (Pico, MACDIV) and in June-September 2012 (Terceira, ISLANDBIODIV).

**Geographic coverage**

**Description:** Pico and Terceira Islands, the Azores, Macaronesia, Portugal

**Coordinates:** 38.434491 and 38.7617777778 Latitude; -28.4228543692 and -27.1971972222 Longitude.

**Taxonomic coverage**

**Taxa included:**

| Rank   | Scientific Name | Common Name |
|--------|-----------------|-------------|
| order  | Araneae         | Spiders     |

**Temporal coverage**

**Single date:** 2012-6-01; 2016-9-26.

**Collection data**

**Collection name:** Dalberto Teixeira Pombo insect collection at the University of Azores

**Collection identifier:** DTP

**Specimen preservation method:** All specimens were preserved in 96% ethanol

**Curatorial unit:** Dalberto Teixeira Pombo insect collection at the University of Azores (Curator: Paulo A. V. Borges)
Usage rights

Use license:  Open Data Commons Attribution License

IP rights notes:  CC-BY 4.0

Data resources

Data package title: MACDIV_COBRA_Azores_Forest

Resource link:  https://www.gbif.org/dataset/6aa5ac09-2b55-4078-bd2d-ec94fb91850a

Number of data sets:  1

Data set name: MACDIV_COBRA_Azores_Forest

Download URL:  https://www.gbif.org/dataset/6aa5ac09-2b55-4078-bd2d-ec94fb91850a

Data format: Darwin Core Archive

Data format version: version 1

Description: The following data table includes all the records for which a taxonomic identification of the species was possible. The dataset submitted to GBIF is structured as a sample event dataset, with two tables: event (as core) and occurrences. The data in this sampling event resource have been published as a Darwin Core Archive (DwCA), which is a standardised format for sharing biodiversity data as a set of one or more data tables. The core data table contains 423 records (eventID). One extension data table also exists. An extension record supplies extra information about a core record. The number of records in each extension data table is illustrated in the IPT link. This IPT archives the data and thus serves as the data repository. The data and resource metadata are available for downloading in the downloads section. The versions table lists other versions of the resource that have been made publicly available and allows tracking changes made to the resource over time.

In Suppl. material 1, we provide a file with two tables, one with the sampling event data and the other with the species abundance data.

| Column label             | Column description                                      |
|--------------------------|---------------------------------------------------------|
| Table of Sampling Events | Table with sampling events data (beginning of table)    |
| id                       | Unique identification code for sampling event data      |
| eventID                  | Identifier of the events, unique for the dataset        |
| samplingProtocol         | The sampling protocol used to capture the species       |
| sampleSizeValue          | The numeric amount of time spent in each sampling       |
| Field Name                  | Description                                                                 |
|----------------------------|-----------------------------------------------------------------------------|
| sampleSizeUnit             | The unit of the sample size value                                           |
| samplingEffort             | The amount of time of each sampling                                         |
| eventDate                  | Date or date range the record was collected                                |
| eventTime                  | Time of the day the record was collected                                   |
| startDayOfYear             | The earliest ordinal day of the year on which the event occurred            |
| endDayOfYear               | The latest ordinal day of the year on which the event occurred              |
| year                       | Year of the event                                                          |
| month                      | Month of the event                                                         |
| day                        | Day of the event                                                           |
| habitat                    | The surveyed habitat                                                       |
| fieldNumber                | The code given to each sample                                              |
| locationID                 | Identifier of the location                                                 |
| islandGroup                | Name of archipelago                                                        |
| island                     | Name of the island                                                         |
| country                    | Country of the sampling site                                               |
| countryCode                | ISO code of the country of the sampling site                               |
| stateProvince              | Name of the region of the sampling site                                    |
| municipality               | Name of the municipality                                                   |
| locality                   | Name of the locality                                                       |
| minimumElevationInMetres   | Minimum elevation in metres                                                |
| maximumElevationInMetres   | Maximum elevation in metres                                                |
| locationRemarks            | Details on the locality site                                               |
| verbatimCoordinates        | The Verbatim coordinates                                                   |
| decimalLatitude            | Approximate centre point decimal latitude of the field site in GPS coordinates |
| decimalLongitude           | Approximate centre point decimal longitude of the field site in GPS coordinates |
| geodeticDatum              | The reference point for the various coordinate systems used in mapping the earth |
| coordinateUncertaintyInMetres | Uncertainty of the coordinates                                           |
| coordinatePrecision        | Precision of the coordinates                                               |
| georeferenceSources        | A list (concatenated and separated) of maps, gazetteers or other resources used to georeference the Location, described specifically enough to allow anyone in the future to use the same resources. |
| Table of Species Abundances | Table with species abundance data (beginning of new table)                |
| Field                      | Description                                                                 |
|----------------------------|-----------------------------------------------------------------------------|
| id                         | Unique identification code for species abundance data                       |
| type                       | Type of the record, as defined by the Public Core standard                  |
| licence                    | Reference to the licence under which the record is published                |
| institutionID              | The identity of the institution publishing the data                          |
| collectionID               | The identity of the collection publishing the data                           |
| institutionCode            | The code of the institution publishing the data                              |
| collectionCode             | The code of the collection where the specimens are conserved                |
| datasetName                | Name of the dataset                                                         |
| basisOfRecord              | The nature of the data record                                               |
| dynamicProperties          | The name of the scientific project funding the sampling                     |
| occurrenceID               | Identifier of the record, coded as a global unique identifier               |
| catalogNumber              | Record number of the specimen in the collection                             |
| recordedBy                 | Name of the person who performed the sampling of the specimens              |
| individualCount            | Total number of individuals captured                                        |
| organismQuantity           | Total number of individuals captured, as numeric                            |
| organismQuantityType       | The unit of the identification of the organisms                             |
| sex                        | The sex and quantity of the individuals captured                            |
| lifeStage                  | The life stage of the organisms captured                                    |
| establishmentMeans         | The process of establishment of the species in the location, using a controlled vocabulary: 'native non-endemic', 'introduced', 'endemic' |
| occurrenceStatus           | Information about the presence/absence of the species                      |
| eventID                    | A unique identifier of an occurrence                                        |
| identifiedBy               | Name of the person who made the identification                              |
| dateIdentified             | Date on which the record was identified                                     |
| scientificName             | Complete scientific name including author and year                          |
| kingdom                    | Kingdom name                                                                |
| phylum                     | Phylum name                                                                  |
| class                      | Class name                                                                   |
| order                      | Order name                                                                   |
| family                     | Family name                                                                  |
| genus                      | Genus name                                                                   |
| specificEpithet            | Specific epithet                                                             |
Additional information

Results

We collected 3,930 adult specimens (45% of all specimens), which we identified to 36 species and three morphospecies, belonging to 13 families (Tables 2, 3). Of the 39 taxa, 19 belonged to the family Linyphiidae (17 species and two morphospecies) and six species to Theridiidae. The remaining families were represented by one or two taxa. The most widespread species were Gibbaranea occidentalis Wunderlich, 1989 (endemic), Lathys dentichelis (Simon, 1883) (native), Acorigone acoreensis (Wunderlich, 1992) (endemic), Tenuiphantes miguelensis (Wunderlich, 1992) (Macaronesian), Macaroeris cata (Blackwall, 1867) (native) and Sancus acoreensis (Wunderlich, 1992) (endemic), which were present in all plots of both islands. Three additional species were present in 15 out of the 16 plots: Canariphantes acoreensis, Microlinyphia johnsoni and Savigniorrhipis acoreensis. Plots had between 15-23 (morpho)species of spiders, with the Terceiran Plot 8 having the maximum of 23 (morpho)species, followed by Plot 3 of Terceira (21 species).

| Family      | Species                                      | Biog.Cat. | Prev.Rec. | Pico 1 | Pico 2 | Pico 3 | Pico 4 | Pico 5 | Pico 6 |
|-------------|----------------------------------------------|-----------|-----------|--------|--------|--------|--------|--------|--------|
| Araneidae   | Gibbaranea occidentalis Wunderlich, 1989      | END       | P, T      | 12     | 4      | 4      | 7      | 14     | 23     |
| Clubionidae | Cheiracanthium erraticum (Walckenaer, 1802)  | INT       | P, T      | 0      | 0      | 1      | 0      | 0      | 1      |
| Dictynidae  | Lathys dentichelis (Simon, 1883)              | MAC       | P, T      | 23     | 31     | 10     | 6      | 7      | 1      |
| Dictynidae  | Nigma puella (Simon, 1870)                    | INT       | P, T      | 0      | 0      | 0      | 0      | 0      | 6      |
| Dysderidae  | Dysdera crocata C. L. Koch, 1838              | INT       | P, T      | 0      | 0      | 0      | 1      | 3      | 0      |
| Gnaphosidae | Haplodrassus signifer (C. L. Koch, 1839)      | INT       | T         | 0      | 1      | 0      | 0      | 0      | 0      |

Table 2.

Abundance, biogeographic category and previous records of (morpho)species in each of the plots on Pico island. Abbreviations: Biogeographic category (Biog. cat): Endemic (END); Introduced (INT); Macaronesian (MAC); Native (NAT); Unknown (UK). Previous records (Prev. Rec.): Pico (P), Terceira (T), unrecorded (UR).
| Linyphiidae | Linyphiidae morphospecies 1220 | UK | UR | 0 | 0 | 0 | 0 | 0 | 0 |
|------------|-------------------------------|----|----|---|---|---|---|---|---|
| Linyphiidae | Linyphiidae morphospecies 1265 | UK | UR | 3 | 0 | 0 | 0 | 0 | 0 |
| Linyphiidae | *Acrogone acoreensis* (Wunderlich, 1992) | END | P, T | 6 | 5 | 7 | 1 | 1 | 1 |
| Linyphiidae | *Agyneta decora* (O. P.-Cambridge, 1871) | INT | T | 0 | 0 | 0 | 0 | 0 | 0 |
| Linyphiidae | *Canariphantes acoreensis* (Wunderlich, 1992) | END | P, T | 2 | 12 | 0 | 7 | 6 | 6 |
| Linyphiidae | *Erigone atra* Blackwall, 1833 | INT | P, T | 0 | 1 | 1 | 1 | 0 | 2 |
| Linyphiidae | *Erigone autumnalis* Emerton, 1882 | INT | P, T | 0 | 0 | 2 | 0 | 0 | 0 |
| Linyphiidae | *Erigone dentipalpis* (Wider, 1834) | INT | P, T | 0 | 0 | 2 | 0 | 0 | 0 |
| Linyphiidae | *Mermessus bryantae* (Ivie & Barrows, 1935) | INT | P, T | 0 | 0 | 0 | 0 | 0 | 0 |
| Linyphiidae | *Microlinyphia johnsoni* (Blackwall, 1859) | MAC | P, T | 5 | 5 | 3 | 35 | 0 | 7 |
| Linyphiidae | *Minicia floresensis* Wunderlich, 1992 | END | P, T | 18 | 4 | 7 | 0 | 0 | 0 |
| Linyphiidae | *Oedothorax fuscus* (Blackwall, 1834) | INT | P, T | 0 | 1 | 0 | 4 | 0 | 0 |
| Linyphiidae | *Palliduphantes schmitzi* (Kulczyński, 1899) | MAC | P, T | 1 | 0 | 0 | 2 | 0 | 9 |
| Linyphiidae | *Porhomma borgesii* Wunderlich, 2008 | END | P, T | 0 | 0 | 0 | 0 | 0 | 0 |
| Linyphiidae | *Prinerigone vagans* (Audouin, 1826) | INT | P, T | 0 | 0 | 0 | 0 | 0 | 0 |
| Linyphiidae | *Savigniorrhapis acoreensis* Wunderlich, 1992 | END | P, T | 15 | 31 | 10 | 15 | 0 | 13 |
| Linyphiidae | *Tenuiphantes miguelensis* (Wunderlich, 1992) | MAC | P, T | 4 | 5 | 10 | 102 | 107 | 73 |
| Linyphiidae | *Tenuiphantes tenuis* (Blackwall, 1852) | INT | P, T | 2 | 1 | 8 | 4 | 3 | 5 |
| Linyphiidae | *Walckenaeria grandis* (Wunderlich, 1992) | END | P, T | 13 | 3 | 0 | 0 | 0 | 0 |
| Family      | Species                          | Geographical Category | Plot 1 | Plot 2 | Plot 3 | Plot 4 | Plot 5 | Plot 6 | Plot 7 | Plot 8 | Plot 9 | Total |
|------------|----------------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| Lycosidae  | *Pardosa acorensis* Simon, 1883  | END P, T              | 28     | 8      | 24     | 1      | 0      | 0      |        |        |        |       |
| Mimetidae  | *Ero furcata* (Villers, 1789)    | INT P, T              | 0      | 0      | 0      | 0      | 1      | 0      |        |        |        |       |
| Pisauridae | *Pisaura acoreensis* Wunderlich, 1992 | END P, T         | 1      | 1      | 0      | 0      | 0      | 0      |        |        |        |       |
| Salticidae | *Macaroeris cata* (Blackwall, 1867) | NAT P, T            | 12     | 8      | 13     | 1      | 5      | 3      |        |        |        |       |
| Salticidae | *Neon acoreensis* Wunderlich, 2008 | END P, T            | 0      | 0      | 0      | 0      | 4      | 0      |        |        |        |       |
| Tetragnathidae | *Metellina sp. 133* UK T | UK T                  | 0      | 0      | 0      | 0      | 0      | 0      |        |        |        |       |
| Tetragnathidae | *Metellina meriana* (Scopoli, 1763) | INT P, T          | 4      | 4      | 2      | 17     | 51     | 8      |        |        |        |       |
| Tetragnathidae | *Sancus acoreensis* (Wunderlich, 1992) | END P, T       | 35     | 38     | 19     | 14     | 11     | 50     |        |        |        |       |
| Theridiidae | *Lasaeola oceanica* Simon, 1883 | END P, T             | 0      | 0      | 12     | 0      | 8      | 2      |        |        |        |       |
| Theridiidae | *Neottiura bimaculata* (Linnaeus, 1767) | INT P, T       | 0      | 0      | 0      | 0      | 2      | 0      |        |        |        |       |
| Theridiidae | *Rugathodes acoreensis* Wunderlich, 1992 | END P, T    | 39     | 61     | 69     | 0      | 0      | 19     |        |        |        |       |
| Theridiidae | *Steatoda nobilis* (Thorell, 1875) | MAC P, T             | 0      | 0      | 0      | 0      | 4      | 0      |        |        |        |       |
| Theridiidae | *Theridion melanurum* Hahn, 1831 | INT P, T             | 0      | 0      | 0      | 0      | 19     | 1      |        |        |        |       |
| Thomisidae  | *Xysticus cor* Canestrini, 1873  | NAT P, T             | 3      | 6      | 10     | 1      | 0      | 2      |        |        |        |       |

**Species richness**

19 20 19 17 17 18

**Table 3.**

Abundance, biogeographic category and previous records of (morpho)species in each of the plots on Terceira island.
| Species                        | 17 | 12 | 19 | 27 | 15 | 8 | 11 | 13 | 24 | 27 | 251 |
|-------------------------------|----|----|----|----|----|---|----|----|----|----|-----|
| *Lathys dentichelis* (Simon, 1883) | 4  | 3  | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 17  |
| *Nigma puella* (Simon, 1870)   | 0  | 0  | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 6   |
| *Dysdera crocata* C. L. Koch, 1838 | 1  | 0  | 4  | 0  | 0  | 0 | 0  | 0  | 2  | 0  | 17  |
| *Haplodrassus signifer* (C. L. Koch, 1839) | 0  | 0  | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 1   |
| Linyphiidae morphospecies 1220 | 0  | 0  | 0  | 0  | 2  | 0 | 0  | 0  | 0  | 0  | 2   |
| Linyphiidae morphospecies 1265 | 0  | 0  | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 3   |
| *Acorigone acoreensis* (Wunderlich, 1992) | 6  | 6  | 2  | 6  | 12 | 3 | 9  | 12 | 3  | 2  | 82  |
| *Agyneta decora* (O. P.-Cambridge, 1871) | 0  | 0  | 1  | 0  | 3  | 0 | 0  | 3  | 0  | 0  | 7   |
| *Canariphantes acoreensis* (Wunderlich, 1992) | 9  | 13 | 12 | 10 | 22 | 3 | 6  | 8  | 4  | 1  | 121 |
| *Erigone atra* Blackwall, 1833 | 0  | 0  | 1  | 0  | 0  | 1 | 0  | 0  | 0  | 0  | 7   |
| *Erigone autumnalis* Emerton, 1882 | 0  | 0  | 0  | 0  | 0  | 0 | 0  | 0  | 2  | 0  | 4   |
| *Erigone dentipalpis* (Wider, 1834) | 0  | 0  | 0  | 0  | 0  | 0 | 0  | 0  | 0  | 0  | 2   |
| *Mermessus bryantae* (Ivie & Barrows, 1935) | 0  | 0  | 0  | 0  | 0  | 0 | 0  | 0  | 1  | 0  | 1   |
| *Microlinyphia johnsoni* (Blackwall, 1859) | 4  | 30 | 2  | 8  | 11 | 13| 9  | 5  | 6  | 5  | 148 |
| *Minicia floresensis* Wunderlich, 1992 | 0  | 1  | 0  | 0  | 1  | 0 | 0  | 1  | 4  | 0  | 5   |
| *Oedothorax fuscus* (Blackwall, 1834) | 0  | 0  | 1  | 0  | 0  | 0 | 0  | 0  | 1  | 0  | 7   |
| *Palliduphantes schmitzi* (Kulczynski, 1899) | 0  | 0  | 0  | 0  | 0  | 2 | 0  | 0  | 0  | 0  | 14  |
| *Porromma borgesi* Wunderlich, 2008 | 0  | 1  | 2  | 2  | 1  | 0 | 0  | 4  | 1  | 1  | 12  |
| *Prinerigone vagans* (Audouin, 1826) | 0  | 1  | 0  | 0  | 0  | 0 | 0  | 0  | 1  | 0  | 2   |
| *Savigniorrhips acoreensis* Wunderlich, 1992 | 26 | 63 | 23 | 22 | 11 | 56| 16 | 16 | 15 | 35 | 367 |
| *Tenuiphantes miguelensis* (Wunderlich, 1992) | 18 | 13 | 11 | 18 | 4  | 36| 5  | 39 | 10 | 24 | 479 |
### Species Richness

| Species                     | Count |
|-----------------------------|-------|
| Tenuiphantes tenuis (Blackwall, 1852) | 15    |
| Walckenaeria grandis (Wunderlich, 1992) | 20    |
| Pardosa acorensis Simon, 1883 | 21    |
| Ero furcata (Villers, 1789) | 20    |
| Pisaura acoreensis Wunderlich, 1992 | 17    |
| Macaroeris catar (Blackwall, 1867) | 18    |
| Neon acoreensis Wunderlich, 2008 | 15    |
| Metellina sp. 133 | 15    |
| Metellina merianae (Scopoli, 1763) | 20    |
| Sancus acoreensis (Wunderlich, 1992) | 17    |
| Lasaeola oceanica Simon, 1883 | 15    |
| Neottiura bimaculata (Linnaeus, 1767) | 19    |
| Rugathodes acoreensis Wunderlich, 1992 | 17    |
| Steatoda nobilis (Thorell, 1875) | 15    |
| Theridion melanurum Hahn, 1831 | 19    |
| Xysticus cor Canestrini, 1873 | 17    |

**Four species accounted for 54% of all specimens:**

- **Rugathodes acoreensis** (753 specimens) (Fig. 3),
- **Sancus acoreensis** (506) (Fig. 4),
- **Tenuiphantes miguelensis** (479) (Fig. 5) and
- **Gibbonarae occidentalis** (392) (Fig. 6). These species occur in different forest micro-habitats: the orb-weaver, *G. occidentalis*, occurs in both canopy and intermediate understorey; the theridiid, *R. acoreensis*, is mostly a canopy species; the tetragnathid, *S. acoreensis*, is usually associated with shrubs; and *T. miguelensis* is a forest ground linyphiid, building its sheet-webs between small holes in the ground or small crevices in volcanic rocks.
Figure 3. [doi]
*Rugathodes acoreensis* Wunderlich, 1992 (Credit: Enésima Mendonça, Azorean Biodiversity Portal).

Figure 4. [doi]
*Sancus acoreensis* (Wunderlich, 1992) (Credit: Pedro Cardoso).
Figure 5. DOI
Tenuiphantes miguelensis (Wunderlich, 1992) (Credit: Pedro Cardoso).

Figure 6. DOI
Gibbaranea occidentalis Wunderlich, 1989 (Credit: Paulo A. V. Borges).
Of the 39 collected species, 34 have been recorded previously in both Pico and Terceira islands (Borges et al. 2010). In total, we recorded 13 endemic species, 16 introduced, five Macaronesian, two native and three of unknown biogeographic category but possibly also endemic (which will be subject to a molecular and morphological integrative taxonomic description). Two of the 16 introduced species (Haplodrassus signifer and Agyneta decora) were recorded in Pico for the first time (cf. Borges et al. 2010).

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Image taken by Enésima Mendonça is open access at AZORESBIOPORTAL led by PAVB. This manuscript is also a contribution to the updated checklist of Azorean arthropods that is being prepared within the newly launched project AZORESBIOPORTAL –PORBIOTA (ACORES-01-0145-FEDER-000072), financed by FEDER in 85% and by Azorean Public funds by 15% through Operational Program Azores 2020.

Author contributions

PAVB, PC, FR and BCE conceived the study design and sampling programme. PAVB, PC, LCFC, RG, FP, RC, CR, RN, MTF, IRA and FR performed spider sampling. PAVB and LCFC performed spider identification. JM-O analysed the data and JM-O and PAVB led the writing. All authors commented on the final version of the manuscript.

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Supplementary material

Suppl. material 1: MACDIV_ISLANDBIOD_Spiders_Azores_Base_GBIF  
Authors: Malumbres-Olarte, J et al.
Data type: Species abundances and sampling events
Brief description: In this contribution, we present detailed data on the distribution and abundance of spider species found in Azores forest plots (six in Pico and 10 in Terceira).
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