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Authors: García, Javier, and Suárez, Daniel

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## A spider survey in a protected area of La Palma (Canary Islands, Spain) reveals five new records for the island

Javier García & Daniel Suárez



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**Abstract.** During a survey of spiders in the protected area of Montaña de La Breña (La Palma, Canary Islands), a total of 54 species from 24 families were recorded. *Porrhoclubiona minor*, *Leptodrassus albidus*, *Macarophaeus varius*, *Silhouettella loricatula* and *Ballus chalybeius* are reported for the first time for La Palma.

**Keywords:** COBRA protocol, distribution, faunistics, laurel forest, Macaronesia

**Zusammenfassung.** Spinnenerfassungen in einem Schutzgebiet auf La Palma (Kanarische Inseln, Spanien) mit fünf Neunachweisen für die Insel. Bei einer Untersuchung des Schutzgebietes Montaña de La Breña (La Palma, Kanarische Inseln) wurden 54 Arten aus 24 Familien erfasst. *Porrhoclubiona minor*, *Leptodrassus albidus*, *Macarophaeus varius*, *Silhouettella loricatula* und *Ballus chalybeius* werden erstmals für La Palma nachgewiesen.

The Canary Islands are an archipelago of volcanic origin located off northwest Africa, comprising seven major islands. The second-highest island, La Palma, is 1.77 million years old and comprises two large volcanoes; the extinct northern shield volcano and the southern volcanic ridge, the most active volcanic region in the Canaries (Troll & Carracedo 2016). Due to its height, in this island five main vegetation belts are present; spurge scrub (0–200 m of altitude), thermo-sclerophyllous woodland (200–500 m), laurel forest (500–1200 m), pine forest (1200–1900) and summit broom scrub (above 1900 m) (Garzón-Machado et al. 2013). Among them, laurel forest may be one of the most interesting ecosystems because, as for most taxa, in this ecosystem spider richness reaches its maximum (Suárez 2018). In La Palma, there are well preserved laurel forest areas in the northeast as well as some relicts at mid-altitudes in the southeast.

Among the more than 500 spider species that have been reported for the Canary Islands, 127 can be found at La Palma (Suárez 2018, Bellvert 2018). However, distribution patterns within the island remain unknown as there are many localities with just few species recorded and even gaps without any single record (empty quadrats in Fig 1a). This poorly understood distribution, usually called ‘Wallacean shortfall’, is important as the lack of knowledge is a problem in conservation biology when making practical decisions (Bini et al. 2006), especially in protected areas. For this reason, in this article a spider survey in the protected area of Montaña de la Breña (Fig 1b) has been conducted in order to increase the known distribution of the spider species of the island. In this protected area, four species have been previously reported; *Nigma tuberosa* Wunderlich, 1987 (Dictynidae), *Oecobius palmensis* Wunderlich, 1987 (Oecobiidae), *Pholcus ornatus* Bösenberg, 1895 (Pholcidae) and *Lasaeola striata* (Wunderlich, 1987) (Theridiidae) (Gobierno de Canarias 2018).

### Material and methods

The study site, Montaña de la Breña (Protected Area Code: ES7020072), is a Special Area of Conservation of the Natura

2000 Network with a surface of 26.15 ha located in the south-east of the island at an altitude of 565 m. This old tephritic volcanic cone is covered mainly by a dry laurel forest while on the southern slope there is a canary pine (*Pinus canariensis*) plantation as well as a nitrophilous shrubby community of *Artemisia thuscula* and *Rumex lunaria* (García et al. 2018). The study area was divided into four sectors, matching with the 500 m × 500 m quadrats used in the Canary Biodiversity DataBase (Gobierno de Canarias 2018). The coordinates of the centres of the four sectors are 28.6342°N/17.7826°W (Sector 1), 28.6340°N/17.7806°W (Sector 2), 28.6326°N/17.7813°W (Sector 3) and 28.6325°N/17.7825°W (Sector 4).

Sampling was conducted between November 2014 and January 2015 (three days; 14 hours of sampling effort) and between November 2018 and January 2019 (two days; 4 hours of sampling effort), applying several collecting methods, following the COBRA protocol (Cardoso et al. 2009), such as active aerial searching (AAS), litter sifting (LIT), beating (BET), sweeping (SWE), ground and wood searching (GWS) and pitfall trapping (PIT). Active collecting methods (AAS, BET, SWE and GWS) were conducted during an hour per plot and per date. A grid of 48 non-baited pitfall traps were laid, filled with propylene glycol and retired after two weeks. Regarding sifting, a total number of 6 samples of 2 m<sup>2</sup> of leaves litter were obtained with a Winkler sieve. Then, spiders were extracted from those samples with the Berlese funnel method. The habitats were not documented. All specimens are preserved in 70 % ethanol and deposited in the collection of the first author. Global distribution data were taken from the World Spider Catalog (2018).

### Results

A total number of 430 individuals (undeterminable juveniles excluded) were collected, belonging to 54 species of 24 different families. Regarding richness per quadrat, both Sectors 1 and 4 harboured up to 23 species, while in Sectors 2 and 3, 36 and 34 species were found, respectively (Tab. 1).

### Agelenidae

#### *Lycosoides coarctata* (Dufour, 1831)

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 2, SWE, 15. Nov. 2014, 2 j.; Sector 2, PIT, 1.–15. Nov. 2014, 1 ♀; Sector 3, GWS, 6. Jan. 2015, 1 ♀.

**Distribution.** Mediterranean.

Javier GARCÍA, Departamento de Biología Animal, Edafología y Geología. Facultad de Ciencias. Universidad de La Laguna. 38206 La Laguna (Tenerife, Spain); E-mail: jgarper91@gmail.com  
Daniel SUÁREZ, Departamento de Biología Animal, Edafología y Geología. Facultad de Ciencias. Universidad de La Laguna. 38206 La Laguna (Tenerife, Spain); E-mail: danielsura94@gmail.com

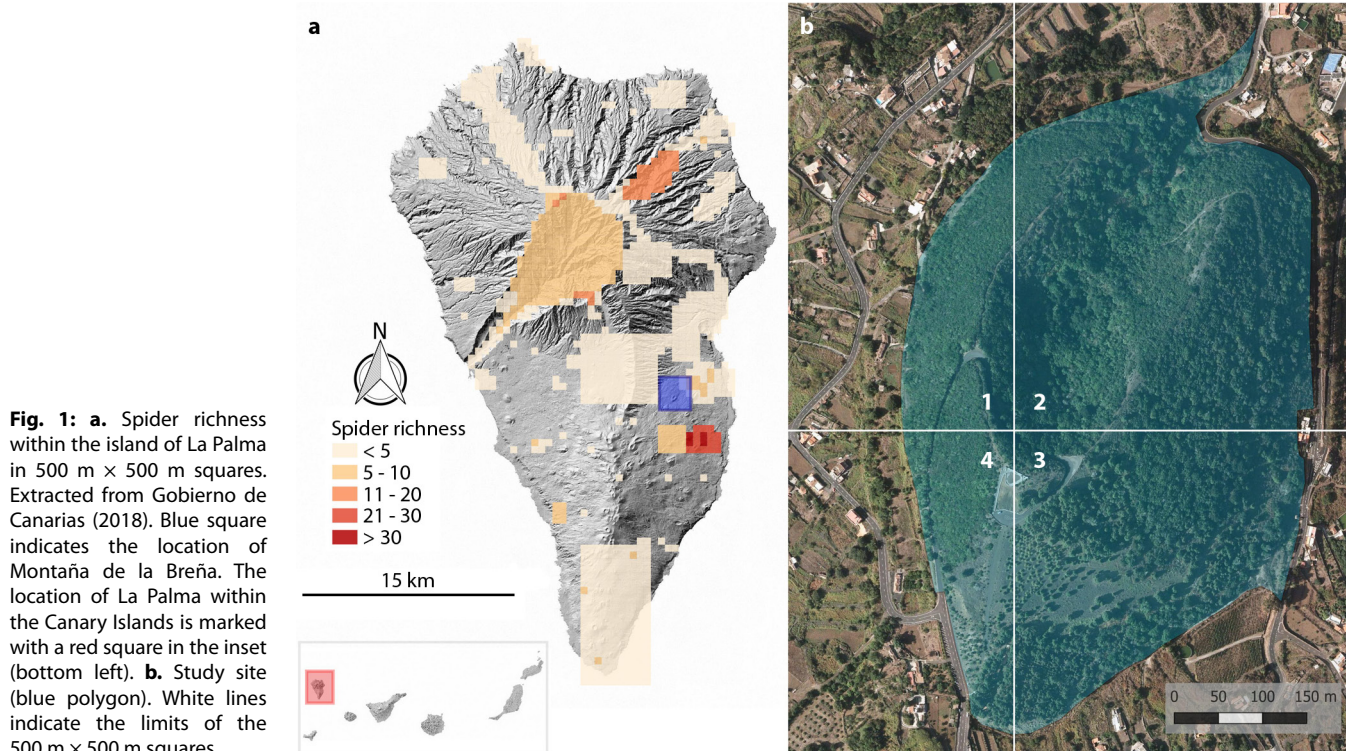
submitted 3.2.2019, accepted 24.2.2019, online 25.3.2019

**Tab. 1:** Number of specimens collected in each sector (S), species abundance, species richness and family richness

| Taxa                               | S1 | S2 | S3 | S4 | Total |
|------------------------------------|----|----|----|----|-------|
| <b>Agelenidae</b>                  |    |    |    |    |       |
| <i>Lycosoides coarctata</i>        | .  | 3  | 1  | .  | 4     |
| <i>Tegenaria pagana</i>            | .  | 5  | .  | 1  | 6     |
| <b>Araneidae</b>                   |    |    |    |    |       |
| <i>Araniella maderiana</i>         | .  | .  | 1  | .  | 1     |
| <i>Argiope trifasciata</i>         | .  | .  | 1  | 1  | 2     |
| <i>Cyrtophora citricola</i>        | 1  | .  | 1  | 1  | 3     |
| <i>Mangora acalypha</i>            | .  | .  | .  | 1  | 1     |
| <i>Neoscona crucifera</i>          | 17 | 10 | 8  | 3  | 38    |
| <i>Zygiella minima</i>             | .  | .  | 1  | .  | 1     |
| <b>Cheiracanthiidae</b>            |    |    |    |    |       |
| <i>Cheiracanthium canariensis</i>  | 9  | 9  | .  | 1  | 19    |
| <b>Clubionidae</b>                 |    |    |    |    |       |
| <i>Porrhocclubiona minor</i>       | 5  | 13 | 5  | 7  | 30    |
| <b>Dictynidae</b>                  |    |    |    |    |       |
| <i>Lathys denticbelis</i>          | .  | 1  | 2  | .  | 3     |
| <i>Nigma puella</i>                | .  | .  | .  | 4  | 4     |
| <i>Nigma tuberosa</i>              | .  | 1  | .  | 1  | 2     |
| <b>Dysderidae</b>                  |    |    |    |    |       |
| <i>Dysdera calderensis</i>         | 1  | 1  | .  | .  | 2     |
| <i>Dysdera crocata</i>             | .  | 11 | 2  | .  | 13    |
| <b>Gnaphosidae</b>                 |    |    |    |    |       |
| <i>Leptodrassus albidus</i>        | .  | .  | 8  | 2  | 10    |
| <i>Macarophaeus varius</i>         | 1  | 16 | 2  | .  | 19    |
| <i>Nomisio musiva</i>              | 9  | .  | .  | 2  | 11    |
| <i>Setaphis gomerae</i>            | 1  | 2  | 1  | 3  | 7     |
| <b>Linyphiidae</b>                 |    |    |    |    |       |
| <i>Microlinyphia johnsoni</i>      | 4  | 3  | .  | .  | 7     |
| <i>Minicia gomerae</i>             | .  | .  | 11 | .  | 11    |
| <i>Walckenaeria hierropalma</i>    | 2  | 2  | 2  | .  | 6     |
| <b>Lycosidae</b>                   |    |    |    |    |       |
| <i>Alopecosa canaricola</i>        | 6  | .  | .  | 3  | 9     |
| <b>Mimetidae</b>                   |    |    |    |    |       |
| <i>Ero flammeola</i>               | .  | .  | 3  | .  | 3     |
| <b>Oecobiidae</b>                  |    |    |    |    |       |
| <i>Oecobius narvus</i>             | .  | 1  | 2  | .  | 3     |
| <b>Oonopidae</b>                   |    |    |    |    |       |
| <i>Silhouettella loricatula</i>    | .  | .  | 1  | .  | 1     |
| <b>Oxyopidae</b>                   |    |    |    |    |       |
| <i>Oxyopes kraepelinorum</i>       | 3  | 5  | 19 | 1  | 28    |
| <b>Philodromidae</b>               |    |    |    |    |       |
| <i>Pulchellodromus punctigerus</i> | 10 | 1  | 4  | .  | 15    |
| <b>Pholcidae</b>                   |    |    |    |    |       |
| <i>Pholcus ornatus</i>             | .  | 1  | .  | .  | 1     |
| <i>Spermophorides mercedes</i>     | .  | 4  | 1  | .  | 5     |
| <b>Pisauridae</b>                  |    |    |    |    |       |
| <i>Cladynis insignis</i>           | .  | 4  | .  | .  | 4     |
| <b>Salticidae</b>                  |    |    |    |    |       |
| <i>Ballus chalybeius</i>           | 1  | .  | .  | .  | 1     |
| <i>Chalcoscirtus infimus</i>       | .  | 1  | .  | 1  | 2     |
| <i>Cyrrba algerina</i>             | .  | .  | 1  | 3  | 4     |

| Taxa                              | S1        | S2         | S3         | S4        | Total      |
|-----------------------------------|-----------|------------|------------|-----------|------------|
| <i>Euophrys canariensis</i>       | .         | .          | 1          | .         | 1          |
| <i>Macaroeis nidicolens</i>       | 3         | 11         | 8          | .         | 22         |
| <b>Sicariidae</b>                 |           |            |            |           |            |
| <i>Loxosceles rufescens</i>       | .         | 2          | .          | .         | 2          |
| <b>Sparassidae</b>                |           |            |            |           |            |
| <i>Olios canariensis</i>          | .         | 3          | 1          | .         | 4          |
| <b>Theridiidae</b>                |           |            |            |           |            |
| <i>Echinotheridion gibberosum</i> | .         | 1          | .          | .         | 1          |
| <i>Episinus maderianus</i>        | .         | .          | 1          | .         | 1          |
| <i>Kochiura aulica</i>            | 8         | 21         | 5          | 2         | 36         |
| <i>Lasaeola striata</i>           | .         | 4          | .          | 1         | 5          |
| <i>Macaridion barretti</i>        | 6         | 5          | .          | 1         | 12         |
| <i>Paidiscura orotavensis</i>     | 2         | 1          | 3          | 3         | 9          |
| <i>Rhomphaea nasica</i>           | 1         | 1          | .          | .         | 2          |
| <i>Rhomphaea rostrata</i>         | .         | .          | 1          | .         | 1          |
| <i>Steatoda grossa</i>            | .         | 3          | .          | .         | 3          |
| <i>Steatoda nobilis</i>           | .         | 2          | 2          | .         | 4          |
| <b>Tetragnathidae</b>             |           |            |            |           |            |
| <i>Metellina minima</i>           | .         | 1          | .          | .         | 1          |
| <b>Thomisidae</b>                 |           |            |            |           |            |
| <i>Misumena spinifera</i>         | 1         | 3          | 2          | 2         | 8          |
| <i>Synema globosum</i>            | 1         | 7          | 8          | 3         | 19         |
| <i>Xysticus verneau</i>           | .         | .          | 4          | 2         | 6          |
| <b>Uloboridae</b>                 |           |            |            |           |            |
| <i>Hyptiotes flavidus</i>         | 1         | 3          | 1          | .         | 5          |
| <b>Zoropsidae</b>                 |           |            |            |           |            |
| <i>Zoropsis rufipes</i>           | 1         | 7          | 4          | .         | 12         |
| <b>Species abundance</b>          | <b>94</b> | <b>169</b> | <b>118</b> | <b>49</b> | <b>430</b> |
| <b>Species richness</b>           | <b>23</b> | <b>36</b>  | <b>34</b>  | <b>23</b> | <b>54</b>  |
| <b>Family richness</b>            | <b>14</b> | <b>21</b>  | <b>19</b>  | <b>11</b> | <b>24</b>  |

***Tegenaria pagana* C. L. Koch, 1840****Determination.** Nentwig et al. (2018).**Material examined.** Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 2 ♂♂, 2 j.; Sector 2, GWS, 14. Jan. 2019, 1 ♀; Sector 4, AAS, 10. Nov. 2018, 1 ♂.**Distribution.** Europe to Central Asia. Introduced to USA, Mexico, Brazil, Chile.**Araneidae*****Araniella maderiana* (Kulczyński, 1905)****Determination.** Wunderlich (1992).**Material examined.** Sector 3, GWS, 15. Nov. 2014, 1 ♀.**Distribution.** Canary Islands and Madeira.***Argiope trifasciata* (Forsskål, 1775)****Determination.** Nentwig et al. (2018).**Material examined.** Sector 3, AAS, 6. Jan. 2015, 1 ♀; Sector 4, AAS, 6. Jan. 2015, 1 ♀.**Distribution.** North, Central and South America. Introduced to Africa, Portugal to Israel, China, Japan, Australia (Tasmania) and Pacific Islands.



### *Cyrtophora citricola* (Forsskål, 1775)

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 j.; Sector 3, AAS, 15. Nov. 2014, 1 ♀; Sector 4, AAS, 10. Nov. 2018, 1 j.

**Distribution.** Southern Europe, Africa, Middle East, Pakistan, India, China, Japan. Introduced to Dominican Rep., Costa Rica, Colombia, Brazil.

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

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 4, BET, 10. Nov. 2018, 1 ♀.

**Distribution.** Madeira, Europe, North Africa, Turkey, Middle East, Caucasus, Russia (Europe to South Siberia), Central Asia and China.

### *Neoscona crucifera* (Lucas, 1839)

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 1, BET, 9. Jan. 2015, 2 jj.; Sector 2, SWE, 15. Nov. 2014, 4 jj.; Sector 2, BET, 23. Dec. 2014, 6 jj.; Sector 3, BET, 14. Nov. 2014, 2 j.; Sector 3, AAS, 15. Nov. 2014, 2 ♀♀, 3 jj.; Sector 4, BET, 14. Nov. 2014, 1 ♂, 2 jj.

**Distribution.** North America. Introduced to Hawaii, Canary Islands and Madeira.

### *Zygiella minima* Schmidt, 1968

**Determination.** Wunderlich (1987).

**Material examined.** Sector 3, BET, 14. Nov. 2014, 1 ♀.

**Distribution.** Canary Islands and Madeira.

### Cheiracanthiidae

#### *Cheiracanthium canariense* Wunderlich, 1987

**Determination.** Wunderlich (1987).

**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 ♂, 1 j.; Sector 1, SWE, 10. Nov. 2018, 7 jj.; Sector 2, SWE, 15. Nov. 2014, 2 jj.; Sector 2, BET, 23. Dec. 2014, 2 ♂♂, 1 ♀, 3 jj.; Sector 2,

PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 j.; Sector 4, SWE, 10. Nov. 2018, 1 j.

**Distribution.** Canary Islands, Turkey and Egypt.

### Clubionidae

#### *Porrhoclubiona minor* (Wunderlich, 1987) (Fig. 2a, b)

**Determination.** Wunderlich (1987).

**Material examined.** Sector 1, LIT, 19. Nov. 2014, 2 jj.; SWE, 10. Nov. 2018, 1 ♂, 3 jj.; Sector 2, BET, 23. Dec. 2014, 3 ♀♀, 6 jj.; Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 ♂, 3 jj.; Sector 3, BET, 14. Nov. 2014, 5 jj.; Sector 4, BET, 14. Nov. 2014, 3 jj.; Sector 4, SWE, 10. Nov. 2018, 4 jj.

**Distribution.** Canary Islands. New record for La Palma.

### Dictynidae

#### *Lathys dentichelis* (Simon, 1883)

**Determination.** Wunderlich (1992).

**Material examined.** Sector 2, LIT, 14. Jan. 2019, 1 ♀; Sector 3, LIT, 14. Jan. 2019, 2 ♀♀.

**Distribution.** Azores, Canary Islands.

#### *Nigma puella* (Simon, 1870)

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 4, SWE, 10. Nov. 2018, 1 ♀, 3 jj.

**Distribution.** Europe, Azores, Madeira, Canary Islands.

#### *Nigma tuberosa* Wunderlich, 1987

**Determination.** Wunderlich (1987).

**Material examined.** Sector 2, BET, 23. Dec. 2014, 1 ♂; Sector 4, GWS, 6. Jan. 2015, 1 ♀.

**Distribution.** Canary Islands.

### Dysderidae

#### *Dysdera calderensis* Wunderlich, 1987

**Determination.** Arnedo et al. (1996).

**Material examined.** Sector 1, LIT, 19. Nov. 2014, 1 ♂; Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 ♂.

**Distribution.** Canary Islands.

***Dysdera crocata* C. L. Koch, 1838**

**Determination.** Arnedo et al. (1996).

**Material examined.** Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 ♀, 1 ♂; Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 2 ♀♀, 6 jj.; Sector 2, GWS, 14. Jan. 2019, 1 ♂; Sector 3, GWS, 14. Jan. 2019, 2 ♀♀, 1 ♂.

**Distribution.** Europe, Caucasus, Iraq, Central Asia. Introduced to North America, Chile, Brazil, Australia, New Zealand, Hawaii and Canary Islands.

**Gnaphosidae**

***Leptodrassus albidus* Simon, 1914 (Fig. 2c)**

**Determination.** Murphy (2007).

**Material examined.** Sector 3, LIT, 14. Nov. 2014, 7 jj.; Sector 3, BET, 14. Nov. 2014, 1 jj.; Sector 4, LIT, 14. Nov. 2014, 1 ♀; Sector 4, BET, 14. Nov. 2014, 1 j.

**Distribution.** Azores, Canary Islands, Spain to Greece (Crete), Turkey and Israel. New record for La Palma.

***Macarophaeus varius* (Simon, 1893) (Fig. 2d)**

**Determination.** Wunderlich (2011).

**Material examined.** Sector 1, SWE, 10. Nov. 2018, 1 j.; Sector 2, GWS, 15. Nov. 2014, 1 j.; Sector 2, GWS, 14. Jan. 2019, 2 ♂♂; Sector 2, LIT, 14. Jan. 2019, 13 jj.; Sector 3, GWS, 14. Jan. 2019, 2 jj.

**Distribution.** Canary Islands. New record for La Palma.

***Nomisio musiva* (Simon, 1899)**

**Determination.** Wunderlich (2011).

**Material examined.** Sector 1, LIT, 19. Nov. 2014, 7 j.; Sector 1, AAS, 10. Nov. 2018, 2 j.; Sector 4, LIT, 14. Nov. 2014, 1 ♀; Sector 4, AAS, 10. Nov. 2018, 1 j.

**Distribution.** Canary Islands.

***Setaphis gomerae* (Schmidt, 1981)**

**Determination.** Platnick & Murphy (1996).

**Material examined.** Sector 1, LIT, 19. Nov. 2014, 1 ♂; Sector 2, LIT, 14. Nov. 2014, 1 j.; Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 j.; Sector 3, LIT, 14. Jan. 2019, 1 j.; Sector 4, LIT, 14. Nov. 2014, 3 jj.

**Distribution.** Canary Islands.

**Linyphiidae**

***Microlinyphia johnsoni* (Blackwall, 1859)**

**Determination.** Wunderlich (1987).

**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 ♀; Sector 1, SWE, 10. Nov. 2018, 2 ♂♂; Sector 2, SWE, 15. Nov. 2014, 1 j.; Sector 2, GWS, 14. Jan. 2019, 2 ♀♀.

**Distribution.** Canary Islands and Madeira.

***Minicia gomerae* Schmidt, 1975**

**Determination.** Wunderlich (1987).

**Material examined.** Sector 3, LIT, 14. Nov. 2014, 2 ♀♀, 1 j.; Sector 3, LIT, 14. Jan. 2019, 8 ♀♀.

**Distribution.** Canary Islands.

***Walckenaeria hierropalma* Wunderlich, 1987**

**Determination.** Wunderlich (1987).

**Material examined.** Sector 1, SWE, 10. Nov. 2018, 1 ♀; Sector 2, SWE, 15. Nov. 2014, 1 ♀; Sector 3, LIT, 14. Nov. 2014, 1 ♀; Sector 3, BET, 14. Nov. 2014, 1 ♀.

**Distribution.** Canary Islands.

**Lycosidae**

***Alopecosa canaricola* Schmidt, 1982**

**Determination.** Wunderlich (1992)

**Material examined.** Sector 1, LIT, 19. Nov. 2014, 1 ♂, 1 j.; Sector 1, AAS, 10. Nov. 2018, 4 jj.; Sector 4, AAS, 10. Nov. 2018, 2 ♂♂, 1 ♀.

**Distribution.** Canary Islands.

**Mimetidae**

***Ero flammeola* Simon, 1881**

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 3, LIT, 14. Nov. 2014, 1 ♀, 1 j.; Sector 3, LIT, 14. Jan. 2019, 1 ♀.

**Distribution.** Portugal to Greece (Corfu), Turkey, Israel and Canary Islands.

**Oecobiidae**

***Oecobius navus* Blackwall, 1859**

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 2, GWS, 15. Nov. 2014, 1 ♀; Sector 3, LIT, 14. Nov. 2014, 1 ♀, 1 j.

**Distribution.** Europe to North Africa. Introduced to China, New Zealand, Canada, USA and South America.

**Oonopidae**

***Silhouettella loricatula* (Roewer, 1942) (Fig. 2e)**

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 3, LIT, 14. Nov. 2014, 1 ♂.

**Distribution.** Europe to Central Asia, North Africa and Canary Islands. New record for La Palma.

**Oxyopidae**

***Oxyopes kraepelinorum* Bösenberg, 1895**

**Determination.** Bellvert (2018).

**Material examined.** Sector 1, BET, 9. Jan. 2015, 3 jj.; Sector 2, BET, 23. Dec. 2014, 1 ♀, 3 jj.; Sector 2, LIT, 14. Jan. 2019, 1 ♀; Sector 3, LIT, 14. Nov. 2014, 3 jj.; Sector 3, BET, 14. Nov. 2014, 12 jj.; Sector 3, GWS, 15. Nov. 2014, 4 jj.; Sector 4, LIT, 14. Nov. 2014, 1 j.

**Distribution.** Canary Islands.

**Philodromidae**

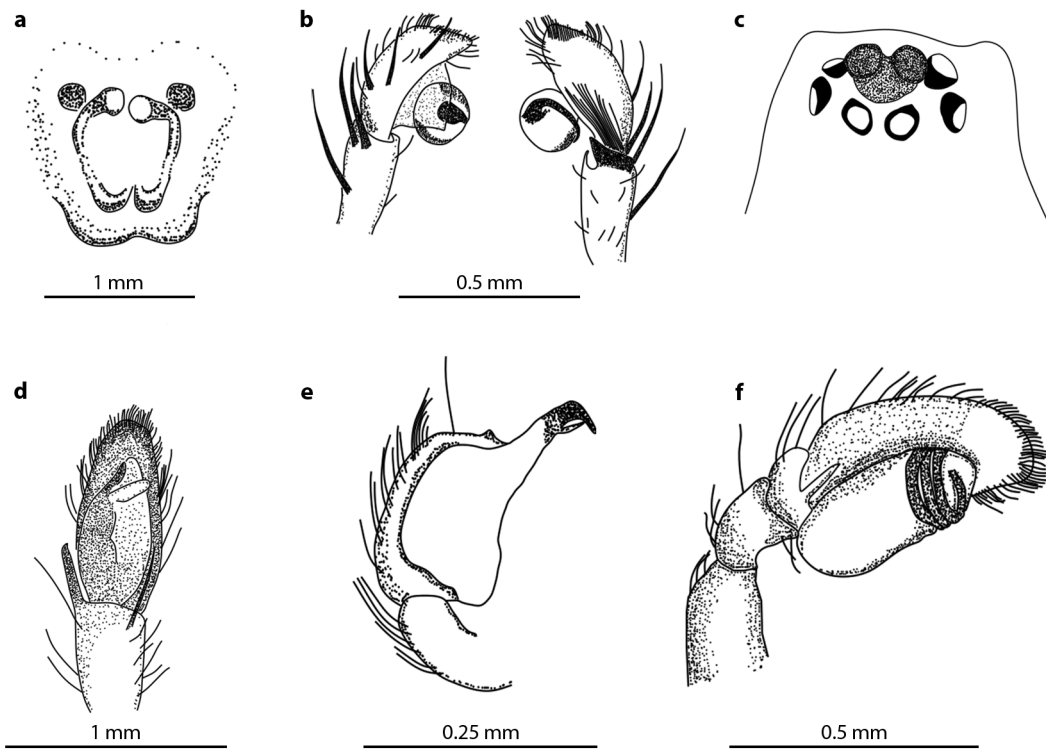
***Pulchellodromus punctiger* (O. Pickard-Cambridge, 1908)**

**Determination.** Muster et al. (2007)

**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 j.; Sector 1, SWE, 10. Nov. 2018, 9 jj.; Sector 2, BET, 23. Dec. 2014, 1 j.; Sector 3, BET, 14. Nov. 2014, 1 ♀, 1 j.; Sector 3, GWS, 14. Jan. 2019, 2 jj.

**Distribution.** Canary Islands, Spain.

**Pholcidae*****Pholcus ornatus* Bösenberg, 1895****Determination.** Wunderlich (1987).**Material examined.** Sector 2, GWS, 14. Jan. 2019, 1 ♀.**Distribution.** Canary Islands.***Spermophorides mercedes* (Wunderlich, 1987)****Determination.** Wunderlich (1987).**Material examined.** Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 ♀, 2 jj.; Sector 2, LIT, 14. Jan. 2019, 1 ♀; Sector 3, LIT, 14. Nov. 2014, 1 j.**Distribution.** Canary Islands.**Pisauridae*****Cladycnis insignis* (Lucas, 1838)****Determination.** Wunderlich (1987).**Material examined.** Sector 2, GWS, 14. Jan. 2019, 1 ♀, 3 jj.**Distribution.** Canary Islands.**Salticidae*****Ballus chalybeius* (Walckenaer, 1802) (Fig. 2f)****Determination.** Nentwig et al. (2018).**Material examined.** Sector 1, LIT, 19. Nov. 2014, 1 ♂.**Distribution.** Europe, North Africa to Central Asia. New record for La Palma.***Chalcoscirtus infimus* (Simon, 1868)****Determination.** Nentwig et al. (2018).**Material examined.** Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 ♀; Sector 4, LIT, 14. Nov. 2014, 1 j.**Distribution.** Southern, Central Europe to Central Asia.***Cyrba algerina* (Lucas, 1846)****Determination.** Nentwig et al. (2018).**Material examined.** Sector 3, GWS, 15. Nov. 2014, 1 j.; Sector 4, GWS, 6. Jan. 2015, 1 ♀, 2 jj.**Distribution.** Canary Islands to Central Asia.***Euophrys canariensis* Denis, 1941****Determination.** Wunderlich (1987).**Material examined.** Sector 3, LIT, 14. Nov. 2014, 1 ♀.**Distribution.** Canary Islands.***Macaroeris nidicolens* (Walckenaer, 1802)****Determination.** Wunderlich (1992).**Material examined.** Sector 1, BET, 9. Jan. 2015, 2 jj.; Sector 1, SWE, 10. Nov. 2018, 1 ♀; Sector 2, SWE, 15. Nov. 2014, 5 jj.; Sector 2, GWS, 15. Nov. 2014, 3 j.; Sector 2, BET, 23. Dec. 2014, 3 jj.; Sector 3, LIT, 14. Nov. 2014, 2 j.; Sector 3, LIT, 14. Jan. 2019, 3 ♀♀, 3 jj.**Distribution.** Macaronesia, Europe, North Africa to Turkey, Caucasus, Turkmenistan, Iran. Introduced to Sri Lanka.**Sicariidae*****Loxosceles rufescens* (Dufour, 1820)****Determination.** Nentwig et al. (2018).**Material examined.** Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 2 ♀♀.**Distribution.** South Europe, North Africa to Iran. Introduced to USA, Macaronesia, South Africa, India, China, Japan, Korea, Laos, Thailand, Australia and Hawaii.**Sparassidae*****Olios canariensis* (Lucas, 1838)****Determination.** Wunderlich (1987).**Material examined.** Sector 2, BET, 23. Dec. 2014, 2 jj.; Sector 2, GWS, 14. Jan. 2019, 1 j.; Sector 3, BET, 14. Nov. 2014, 1 ♀.**Distribution.** Canary Islands.**Tetragnathidae*****Metellina minima* (Denis, 1953)****Determination.** Wunderlich (1992).**Material examined.** Sector 2, GWS, 14. Jan. 2019, 1 ♂.**Distribution.** Canary Islands.**Theridiidae*****Echinotheridion gibberosum* (Kulczyński, 1899)****Determination.** Wunderlich (1987).**Material examined.** Sector 2, GWS, 14. Jan. 2019, 1 ♀.**Distribution.** Canary Islands and Madeira.***Episinus maderianus* Kulczyński, 1905****Determination.** Schenkel (1938).**Material examined.** Sector 3, BET, 14. Nov. 2014, 1 ♂.**Distribution.** Canary Islands and Madeira.***Kochiura aulica* (C. L. Koch, 1838)****Determination.** Nentwig et al. (2018).**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 j.; Sector 2, SWE, 15. Nov. 2014, 9 ♀♀; Sector 2, BET, 23. Dec. 2014, 1 ♀, 1 ♂, 10 jj.; Sector 3, BET, 14. Nov. 2014, 5 jj.; Sector 4, BET, 14. Nov. 2014, 2 jj.**Distribution.** Canary Islands, Cape Verde to Azerbaijan.***Lasaeola striata* (Wunderlich, 1987)****Determination.** Wunderlich (1987).**Material examined.** Sector 2, SWE, 15. Nov. 2014, 1 ♀, 2 ♂♂; Sector 2, BET, 23. Dec. 2014, 1 ♂; Sector 4, LIT, 14. Nov. 2014, 1 ♂.**Distribution.** Canary Islands.***Macaridion barretti* (Kulczyński, 1899)****Determination.** Wunderlich (1992).**Material examined.** Sector 1, SWE, 10. Nov. 2018, 1 ♀, 5 jj.; Sector 2, BET, 23. Dec. 2014, 2 ♀♀, 3 jj.; Sector 4, SWE, 10. Nov. 2018, 1 j.**Distribution.** Canary Islands and Madeira.***Paidiscura orotavensis* (Schmidt, 1968)****Determination.** Knoflach & Thaler (2000).**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 j.; Sector 1, SWE, 10. Nov. 2018, 1 ♂; Sector 2, BET, 23. Dec. 2014, 1 ♂; Sector 3, BET, 14. Nov. 2014, 1 ♀, 1 ♂, 1 j.; Sector 4, BET, 14. Nov. 2014, 1 ♀; Sector 4, SWE, 6. Jan. 2015, 2 jj.**Distribution.** Canary Islands and Madeira.***Rhomphaea nasica* (Simon, 1873)****Determination.** Lissner (2017).**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 ♀; Sector 2, BET, 23. Dec. 2014, 1 ♀.**Distribution.** Canary Islands, Portugal, Spain, France, Italy, Croatia, Greece, Africa and Saint Helena.



**Fig. 2:** **a.** *Porrhoclubiona minor* (Wunderlich, 1987), epigyne in ventral view; **b.** *Porrhoclubiona minor* (Wunderlich, 1987), male palp in prolateral and retrolateral view; **c.** *Leptodrassus albidus* Simon, 1914, eye pattern; **d.** *Macarophaeus varius* (Simon, 1893), male palp in ventral view; **e.** *Silhouettella loricatula* (Roewer, 1942), male palp in prolateral view; **f.** *Ballus chalybeius* (Walckenaer, 1802), male palp in prolateral view

### *Rhomphaea rostrata* (Simon, 1873)

**Determination.** Lissner (2017).

**Material examined.** Sector 3, GWS, 15. Nov. 2014, 1 ♀.

**Distribution.** Canary Islands, Portugal, Spain, France, Italy, Bosnia and Herzegovina, Croatia and Greece.

### *Steatoda grossa* (C. L. Koch, 1838)

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 2, GWS, 14. Jan. 2019, 1 ♀.

**Distribution.** Europe, Turkey, Caucasus, Russia (Europe to Far East), Central Asia, China, Korea, Japan. Introduced to North America, Ecuador, Peru, Chile, Hawaii Islands, Macaronesia and Algeria.

### *Steatoda nobilis* (Thorell, 1875)

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 2, SWE, 15. Nov. 2014, 1 j.; Sector 2, PIT, 23. Dec. 2014 – 6. Jan. 2015, 1 ♀; Sector 3, GWS, 15. Nov. 2014, 1 ♀, 1 j.

**Distribution.** Macaronesia. Introduced to USA, Chile, Europe, Turkey and Iran.

### Thomisidae

#### *Misumena spinifera* (Blackwall, 1862)

**Determination.** Kulczyński (1899).

**Material examined.** Sector 1, SWE, 10. Nov. 2018, 1 j.; Sector 2, SWE, 15. Nov. 2014, 1 ♀; Sector 2, BET, 23. Dec. 2014, 1 ♀, 1 j.; Sector 3, BET, 14. Nov. 2014, 1 ♀, 1 ♂; Sector 4, BET, 14. Nov. 2014, 1 ♂; Sector 4, GWS, 6. Jan. 2015, 1 ♀.

**Distribution.** Canary Islands and Madeira.

#### *Synema globosum* (Fabricius, 1775)

**Determination.** Nentwig et al. (2018).

**Material examined.** Sector 1, LIT, 19. Nov. 2014, 1 j.; Sector 2, SWE, 15. Nov. 2014, 2 ♀♀, 2 jj.; Sector 2, BET, 23. Dec.

2014, 3 jj.; Sector 3, BET, 14. Nov. 2014, 4 jj.; Sector 3, LIT, 14. Jan. 2019, 3 ♀♀, 1 j.; Sector 4, SWE, 10. Nov. 2018, 2 ♀♀, 1 j.

**Distribution.** Europe, Turkey, Israel, Caucasus, Russia to Central Asia, Iran, China, Korea and Japan.

### *Xysticus verneui* Simon, 1883

**Determination.** Wunderlich (1992).

**Material examined.** Sector 3, BET, 14. Nov. 2014, 1 ♀, 2 jj.; Sector 3, LIT, 14. Jan. 2019, 1 ♂; Sector 4, LIT, 14. Nov. 2014, 2 ♂♂.

**Distribution.** Canary Islands and Madeira.

### Uloboridae

#### *Hyptiotes flavidus* (Blackwall, 1862)

**Determination.** Wunderlich (2017).

**Material examined.** Sector 1, BET, 9. Jan. 2015, 1 ♀; Sector 2, BET, 23. Dec. 2014, 2 ♀♀; Sector 2, GWS, 14. Jan. 2019, 1 ♀; Sector 3, BET, 14. Nov. 2014, 1 ♀.

**Distribution.** Canary Islands, Madeira, Mediterranean, Russia (Europe) and Caucasus.

### Zoropsidae

#### *Zoropsis rufipes* (Lucas, 1838)

**Determination.** Wunderlich (1987).

**Material examined.** Sector 2, SWE, 15. Nov. 2014, 2 jj.; Sector 2, BET, 23. Dec. 2014, 1 j.; Sector 2, LIT, 14. Jan. 2019, 1 ♀, 3 jj.; Sector 3, LIT, 14. Nov. 2014, 3 jj.; Sector 3, LIT, 14. Jan. 2019, 1 j.

**Distribution.** Canary Islands and Madeira.

### Discussion

Five new local records (*Porrhoclubiona minor*, *Leptodrassus albidus*, *Macarophaeus varius*, *Silhouettella loricatula*, *Ballus chalybeius*) have been detected, thus increasing the number

of species for La Palma to 132. Regarding the study site, 51 species have been newly reported for this protected area. Moreover, Sectors 2 and 3 are, with this new information, among the richest 500 m × 500 m quadrats of La Palma. Sector 1 and 4 were the ones where the least richness was found, mainly because the sampling area was lower than in Sector 2 and 3. The sampling methods which recovered the higher species abundance was foliage beating (131 individuals), followed by vegetation sweeping (120 individuals). However, the higher richness was recovered by sifting, with 27 species. Twenty species were collected just with one type of sampling method, which points the importance of applying several methods to potentially survey every single niche.

A total of 160 females (37.2 %) and 70 males (16.0 %) was collected, thus indicating that more than half of the specimens were adults. *Neoscona crucifera*, an introduced species, was the most abundant one with 38 individuals. It was followed by *Kochiura aulica* (36 specimens), *Porrhoclubiona minor* (30) and *Oxyopes kraepelinorum* (28). All of these species were collected all four plots. The most abundant species that was collected in just one plot was *Minicia gomerae*, with 11 individuals just in the Sector 3. In contrast, 11 species were represented by just one individual. It is noticeably that almost 50 % of the species collected (29 species) were Macaronesian endemics, which indicates the high level of endemism of the spider assemblages in laurel forest areas. Also, they were more abundant (207 individuals) than introduced species (61). In general, introduced species were more linked to the nitrophilous community than to the laurel forest, but some individuals were collected in the more preserved areas. As Montaña de la Breña is a narrow laurel forest relict, even a higher richness should be expected in the wider and more humid laurel forests of the north of La Palma.

A similar research was carried out by the first author in the same area following the same protocol (García et al. 2018) and obtained 839 specimens of 102 beetle species, almost double the number of spiders in this study, but the proportion of endemic species was the same for both groups. This pattern is rather common in the Canary Islands; beetles seem to be much more diverse and abundant than spiders as was shown by Hernández-Teixidor et al. (2009, 2011) in malpais de La Rasca (Tenerife) and by Oromí et al. (2003) and Macías et al. (2004) on the islet of Montaña Clara, both conducted in sweet spurge shrubs. In this study, the family Theridiidae was the one with the highest richness (10 species) while in Hernández-Teixidor et al. (2011) and Macías et al. (2004), that family only recovered four and three species, respectively. Also, in those studies the number of Salticidae and Gnaphosidae species was higher than in this study, thus indicating that species belonging to those families maybe more adapted to xeric conditions while Theridiidae species seem to prefer more humid areas.

Spider inventories in the Canary Islands are still necessary because the spider fauna is not well studied (Wunderlich 2011: 353) and chorological data is crucial to assess the conservation status of the endemic spider species. Moreover, if these surveys are repeated through time, reliable trends in distributional range and population size can be measured. Cardoso et al. (2017) suggested that most endemic spiders from Madeira are in a favourable situation as laurel forests are well preserved. As the spider assemblage in the Canary laurel

forest highlights for its richness and endemism, conservation efforts should be focused on the protection of this habitat in order to preserve its biota.

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