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Distribution of the genus *Anyphaena* in the Western Mediterranean region, with the first record of *Anyphaena alboirrorata* in the Maghreb (Araneae: Anyphaenidae)

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Abstract. New data on the distribution of the genus *Anyphaena* Sundevall, 1833 in Mediterranean Europe and North Africa are given. *Anyphaena alboirrorata* Simon, 1878 is newly recorded in the Maghreb. The species was found in the Saharan and the Tell Atlas in Algeria, in one locality in Morocco and three localities in central north Tunisia. In addition, *Anyphaena numida* Simon, 1897 is presented as new to Morocco, together with a further record from Algeria and Tunisia. Supplementary material from Spain was examined and the data are also given. *Anyphaena sabina* L. Koch, 1866 is recorded for the first time in Algeria since records by Denis in 1937.

Key Words: Algeria, Morocco, Saharan Atlas, species range, spiders, Tunisia

Zusammenfassung. Verbreitung der Gattung *Anyphaena* im westlichen Mittelmeerraum, mit dem Erstnachweis von *Anyphaena alboirrorata* im Maghreb. Neue Daten zur Verbreitung der Gattung *Anyphaena* im mediterranen Europa und Nordafrika werden präsentiert. *Anyphaena alboirrorata* Simon, 1878 wurde erstmals im Maghreb nachgewiesen. Die Art wurde im Sahara- und Tellatlas in Algerien, von einer Lokalität in Marokko sowie drei Lokalitäten im nördlichen Bereich von Zentraltunesien gefunden. Zusätzlich wird der Erstnachweis von *Anyphaena numida* Simon, 1897 für Tunesien sowie ein weiterer Nachweis aus Algerien vorgestellt. Ergänzendes Material aus Spanien wurde untersucht und wird ebenfalls präsentiert. *Anyphaena sabina* L. Koch, 1866 ist zum ersten Mal seit dem Fund von Denis im Jahr 1937 in Algerien nachgewiesen.

The spider family Anyphaenidae, commonly called ghost spiders, has long been considered a subfamily of the Clubionidae and the former Drassidae (today Gnaphosidae), but they are sufficiently distinctive to be ranked as an independent family (e.g. Platnick 1974, Ramirez 2003). According to Urones et al. (1995) the position of the tracheal stigma, the structure of lamelliform claw tufts and the extension of its tracheal system seem to be determining features for the whole family. These spiders are mostly nocturnal, wandering hunters.

Anyphaenidae include 57 genera and 614 species worldwide (World Spider Catalog 2022), but only a few species live in the western Palaearctic region (Nentwig et al. 2022). The genus *Anyphaena* is the largest and most unique genus of this family, distributed in Europe and North Africa. From a total of 87 species (World Spider Catalog 2022), 61 are known from North and central America (70%), 18 from Asia (21%), six from Europe (7%) and only two (2%) from Africa: *Anyphaena numida* Simon, 1897 and *Anyphaena sabina* L. Koch, 1866 (Nentwig et al. 2022). In addition to these two species, we add a further one, *Anyphaena alboirrorata* Simon, 1878, which was newly collected in Algeria, Morocco and Tunisia and, which is therefore also new to the Maghreb region.

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Material and methods

Study area. The research was conducted in three countries: Algeria, Morocco and Tunisia. In Algeria, three regions were investigated. The first one was the Ouled Naïl Range in the Saharan Atlas, on the edge of the desert. This dryland is becoming presently heavily degraded in the process of desertification (Benderradji et al. 2006, Guit & Nedjimi 2020). Two sites were sampled in this region. Djellal Chergui, naturally occurring Aleppo pine trees, 12 km south-east of Djelfa and Sahary Guebli (Fig. 1), 300 km south of Algiers, which is considered as a one of the most important natural stands of Aleppo pine forests in the arid zones of the Algerian Saharan Atlas. Both sites have a semi-arid, cold winter climate, with an annual average temperature of 21.6°C. The average precipitation is estimated at 300 mm/year. The second investigated area in Algeria was Aïn Yagout, located 35 km north-east of Batna in the Aurès region, which is a part of the Saharan Atlas. The third studied region was located in the forest of Djebel Babor in Sétif, a part of the Tell Atlas massif, located just 15 km from the Mediterranean Sea. The precipitation can reach over 2000 mm/year in this area.

In Morocco, the study sites were situated in the two northern provinces: the region of Larache in the province of Tangier and the Maâmora Forest in the province of Rabat. The spiders were sampled here in an Atlantic cork oak (*Quercus suber* L.) forest. In Tunisia, the material was collected from the northern governorates: Kasserine, El Kef and Zaghouan. The map was created with d-maps (2021).

Sampling. Material was collected using pitfall traps or by hand. Specimens were preserved in 70% ethanol. A stereomicroscope (Nikon SMA 1270) was used for the specimens' examination and a Moticam camera mounted on a Realux microscope and Olympus SZX7 stereomicroscope to take photographs. Material was collected in Algeria between 1989 and 2003 by the fourth author and in 2018 by the first author from natural Aleppo pine stands. In Morocco, individuals of *Anyphaena* were collected by the second author during 1989.

Fig. 1: Sampling area for *Anyphaena alboirrorata*: natural strips of forests in Djebel Bahrara (Sahary Guebli)

In Tunisia, spiders were collected in 2003 and in Spain between 1996 and 1999 by the fourth author.

Abbreviations

CRB: Collection Robert Bosmans, CAH: Collection Aicha Habita, CYA: Collection Youcef Alioua, CSB: Collection Souâd Benhalima.

Results

***Anyphaena* Sundevall, 1833**

***Anyphaena alboirrorata* Simon, 1878** (Figs 2-4a, 5a)

For detailed taxonomic references, see the World Spider Catalog (2022).

Previous records in the Western Mediterranean. FRANCE: Marseille, Toulon (Simon 1878); Marseille, Nice, Perpignan, Toulon (Simon 1932). SPAIN: Balearic Islands, Cáceres, Cádiz, Huelva, Huesca, Jaén, Madrid, Navarra, Salamanca, Zaragoza (Branco et al. 2019, De Biurrun et al. 2019); Valladolid (Urones 1996). PORTUGAL: Bragança (Morano et al. 2019), Guarda (Machado 1949). ITALY: Bari, Bologna, Forli'-Cesena, Perugia, Trieste, Udine (Pantini & Isaia 2019).

New records. ALGERIA: Sétif: Djebel Babor (31.50972°N, 5.48750°E), 1750 m a.s.l., pitfall trap in a *Cedrus* forest, 22. Oct. 1989, 1 ♀ (CRB). Batna: Ain Yagout (35.77444°N, 6.41638°E), 950 m a.s.l, 27. Dec. 2016, 1 ♀ (CYA). Djelfa: Djebel Bahrara (34.79944°N, 3.29055°E), 1170 m a.s.l., pitfall trap in a natural forest, 20. Dec. 2018, 1 ♀ (CAH); Djebel Djellal (34.57152°N, 3.39027°E), 1356 m a.s.l., pitfall trap in a natural forest, 20. Dec. 2018, 1 ♀ (CAH). MOROCCO: Tanger-Tétouan-El Hoceima: Larache, Rhaba El Khalifa (35.12138°N, 6.71972°W), 33 m a.s.l., pitfall trap in litter layer of *Quercus suber* forest, 12.–19. Jan. 1989, 1 ♀ (CSB). TUNISIA: Kasserine: Haidra S. (35.54472°N, 8.45750°E), 950 m a.s.l., under stones in a *Pinus* forest, 4. Mar. 2005, 4 ♀♀ (CRB). Le Kef: Hammam Mellègue (36.11638°N, 8.48972°E), 900 m a.s.l., under stones in a *Pinus* forest, 4. Mar. 2005, 1 ♀ (CRB). Zaghouan: El Fahs S. (36.37416°N, 9.90638°E), 195 m a.s.l., under stones in a *Pinus* forest, 27. Jan. 2003, 1 ♀ (CRB). SPAIN: Cuenca: Casillas de Ranera (39.78333°N, 1.25000°W), 800 m a.s.l., under stones in a *Pinus* forest, 8. Apr. 1997, 1 ♀ (CRB); Molina de Aragón (40.86083°N, 1.83277°W), 1050 m a.s.l., stones in a *Pinus* forest, 14. Apr. 1998, 2 ♀♀ (CRB). Granada: El Baúl (37.42805°N, 2.92916°W), 900 m a.s.l., under stones in a *Quercus ilex* L. forest, 11. Apr. 1999, 2 ♀♀ (CRB). Jaén: Jabalcuz (37.73111°N, 3.80916°W), 700 m a.s.l., under stones in *Pinus* forest, 12. Apr. 1998, 2 ♀♀ (CRB). Teruel: Aguaviva (40.80166°N, 0.15277°W), 540 m a.s.l., under stones in *Pinus* forest, 2. Apr. 1996, 2 ♀♀ (CRB). idem, 8. Apr. 1997, 1 ♀ (CRB). Valladolid: Tordesillas, SW (41.48055°N, 5.05361°W), 670 m a.s.l., litter of a *Pinus* forest, 10. Apr. 1996, 4 ♀♀ (CRB). Zaragoza: Daroca (41.11444°N, 1.41444°W), 775 m a.s.l., under stones in *Pinus* plantation, 14. Apr. 1998, 2 ♀♀ (CRB).

Distribution. Southern and western part of the Mediterranean region (World Spider Catalog 2022). In Morocco, *Any-*

Fig. 2: *Anyphaena alboirrorata* from Djelfa (Algeria). Female, ventral view (Oger 2021)

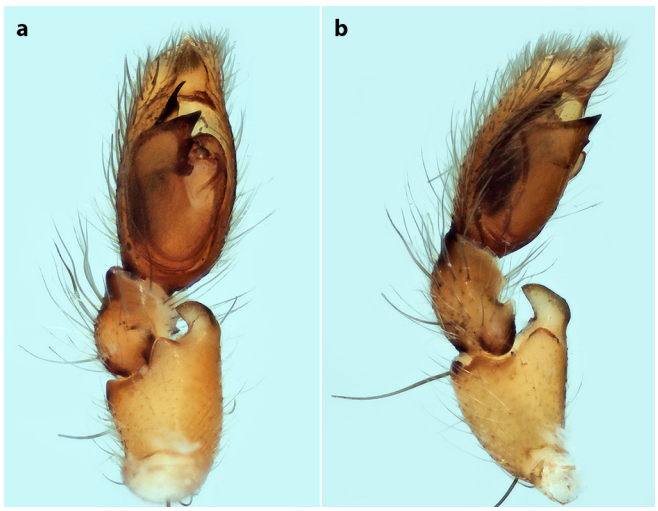

Fig. 3: Male palp of *Anyphaena alboirrorata* from Djelfa (Algeria). **a.** ventral view; **b.** prolateral view (Oger 2021)

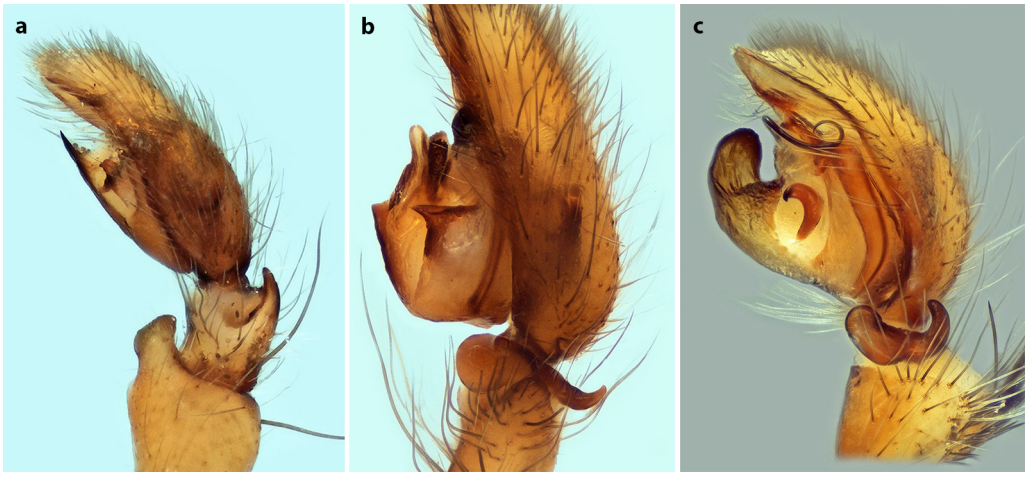

Fig. 4: Male palps in retrolateral view. **a.** *Anyphaena alboirrorata* from Djelfa (Algeria); **b.** *Anyphaena numida* from France; **c.** *Anyphaena sabina* from France (Oger 2021)

phaena alboirrorata was collected in the northern part, while in Algeria, the species occupies a steppe region (Djelfa). For Tunisia, the species was collected in the west-central part. These are the first records for the three countries.

***Anyphaena numida* Simon, 1897** (Figs 4b, 5b)
For detailed taxonomic references, see the World Spider Catalog (2022).
Previous records in the Western Mediterranean. FRANCE: Pyrennees-Orientales, 1000 m (Simon 1932). ALGERIA: Algiers: Algiers, 36.73222°N, 3.08750°E (Simon 1896). El Harrach (Maison Carré), 36.71277°N, 3.14888°E (Simon 1896). Blida: Gorges de La Chiffa, 36.40000°N, 2.76666°E (Simon 1896). PORTUGAL: Bragança, Portalegre (Morano et al. 2019), Braga (Machado 1937), Guarda, Porto (Simon 1897). SPAIN: Asturias, Ávila, Andorra, Barcelona, Cáceres, Cantabria, Gipuzkoa, Madrid, Salamanca, Segovia (De Biurrun et al. 2019, Morano et al. 2019), A Coruña (Simon 1897), Zamora (Urones 1987).
New records. ALGERIA: Tizi Ouzou: Djurdjura mountains, Tala Guilef (36.47666°N, 3.99666°E), 1400 m a.s.l., litter in *Cedrus* forest, 25. Nov. 1985, 1 ♀ (CRB). MOROCCO: Rabat-Salé-Kénitra: Maâmora cork forest, Sidi Amira (34.05166°N, 6.15083°W), 129 m a.s.l., pitfall trap in litter layer of *Quercus suber* forest, 1.–6. Nov. 1989, 2 ♀♀ (CSB).
Distribution. Portugal, Spain and France (World Spider Catalog 2022) and United Kingdom (Harvey 2017). In the Maghreb the species occurs only in Algeria and Morocco. It is the first record for Morocco.

***Anyphaena sabina* L. Koch, 1866** (Figs 4c, 5c)
For detailed taxonomic references, see World Spider Catalog (2022).
Previous records in the Western Mediterranean. FRANCE: Corsica (Simon 1932), Bouches-du-Rhône, Pyrénées-Orientales, Midi de la France (Le Peru 2007). ITALY: Cagliari, Carbonia-Iglesias Catania, Catanzaro, Cosenza, Firenze, Foggia, Forli'-Cesena, Grosseto Lecee, Medio Campidano Nuoro Olbia-Tempio, Oristano, Perugia, Roma, Salerno, Sassari, Siracusa, Udine, Venezia (Pantini & Isaia 2019). Isola del Giglio (Simon 1932). SPAIN: Andorra, Ávila, Barcelona, Cáceres, Cádiz, Granada, La Rioja, Salamanca, Zaragoza (Morano et al. 2019; Pantini & Isaia 2019). PORTUGAL: Bragança, Faro, Portalegre, Porto, Setúbal (Morano et al. 2019). ALGERIA: Mila: Djebel Daya (Denis 1937).
New records. ALGERIA: Tissemsilt: Theniet-el-Had National Park, Rond Point des Cèdres (35°52'15"N 1°56'41"E), 1550 m a.s.l., *Cedrus* forest, 23. May 1987, 1 ♀ (CRB). Blida: Chréa National Park (36.42916°N, 2.88055°E), 1520 m a.s.l., *Cedrus* forest, 20. May 1988, 1 ♂ (CRB).
Distribution. Southern Europe, United Kingdom, Turkey, Caucasus (World Spider Catalog 2022). In the Maghreb, the species is found only in Algeria.
Distinguishing the three species. Males are easily distinguished by the shape of the tibial retrolateral apophyses (Fig. 4a-c). The females differ in the shape of their epigyne: *A. alboirrorata* lacks an anterior hood (Fig. 5a), *A. numida* has a narrow (Fig. 5b) and *A. sabina* has a very wide one (Fig. 5c).

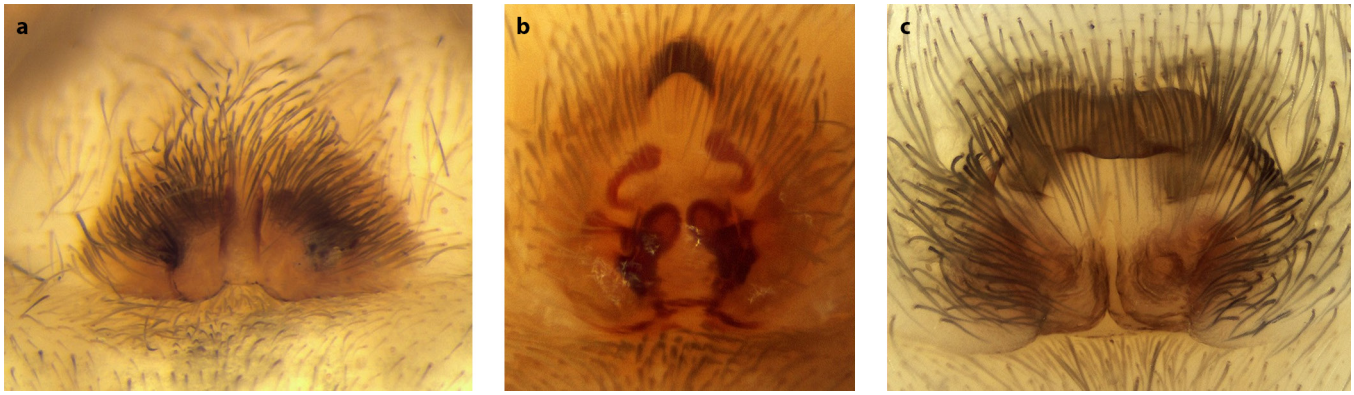

Fig. 5: Ventral view of epigynes. **a.** *Anyphaena alboirrorata* from Djelfa (Algeria); **b.** *Anyphaena numida* from France; **c.** *Anyphaena sabina* from France (Oger 2021)

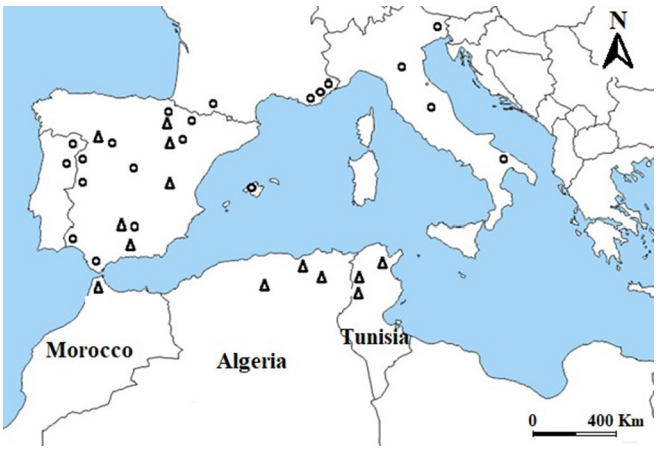

Fig. 6: Distribution of *Anyphaena alboirrorata* in the Western Mediterranean region. Circles: previous records (Simon 1878, 1932, Machado 1949, Branco et al. 2019, De Biurrun et al. 2019, Morano et al. 2019, Pantini & Isaia 2019), triangles: new records

Discussion

Three *A. alboirrorata* females were collected in the canopy of naturally occurring Allepo pine trees in Djelfa, where they were living in tree foliage. According to Simon (1878), this *Anyphaena* species lives on tall plants and shrubs. Soyer (1963) collected it on a hill and around salt flats (France), Urones et al. (1995) on vegetation in dry and open areas with a predominance of heather (Portugal and Spain). Urones (1996) also found it on vegetation in open or dry areas such as moors, open pine forests and oak forests (Portugal, Spain and Balearic Islands). Our result is in accordance with these previously published data, since our localities consisted of dry habitats. Apparently, *A. alboirrorata* prefers dry and hot areas with dense vegetation providing support for silken threads of their retreat.

The new records in Algeria, Tunisia and Morocco are the most southern points in the known distribution of *A. alboirrorata*. It was captured at several localities in the northernmost parts of the countries (Fig. 6), from the coast to the steppe region. This suggests that the species is fairly widespread in the region and occupies a large spectrum of different habitats. Soyer (1963) showed that adults are found late and early in the year. In Spain, the females were collected in spring (Urones 1996), however, in Algeria and Morocco adults were also found during the winter.

Anyphaena numida was collected from a cork oak forest in Tunisia. This is in accordance with Urones et al. (1995) who mentioned different Mediterranean forest types as a typical habitat for the species.

The here presented data show that the Maghreb region is still largely unexplored, and more efforts are needed to uncover the occurrence and distribution of spiders and other arachnids.

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