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Argiope spiders (Araneidae Clerk, 1757), new records of three species from Gharyan (Libya)

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Abstract. The cosmopolitan or banded garden spider, *Argiope trifasciata* (Forskål, 1775), the lobed spider, *A. lobata* (Pallas, 1772) and the MENA lobed spider, *A. sector* (Forsskål, 1776) are reported, figured and described for the first time in Gharyan city, northwestern of Libya, based on adult female specimens gathered from different plants:- amaranth, haloxylon, prickly saltwort, retama, safflower, vetches, across various sites in the city. Unpublished reports of *Argiope* species were recorded in 1934 along the Libyan coast.

Keywords: Araneidae, orb-weaver, *Argiope* species, new record, Libya.

Introduction

With 191 genera and 3129 recorded species, the spider family Araneidae Clerk 1757 (orb-weaver spiders) presently constitutes the third-largest family of spiders after Salticidae (688, 6742) and Linyphiidae (635, 4864) with a worldwide distribution. Araneidae spiders are three-clawed, ecribellate, entelegyne, medium to large-sized spiders, with eight eyes in two rows (lateral eye groups widely separated from median eyes), with a globose abdomen extending over the carapace, and legs usually furnished with relatively short, numerous spines (Jocqué & Dippenaar-Schoeman 2007, Nentwig et al. 2024). Within Araneidae, the genus *Argiope* Audouin, 1826 is currently the seventh largest spider genus (89 species) after *Araneus* (Clerck, 1757), *Mangora* (O. Pickard-Cambridge), *Cyclosa* (Menge, 1866), *Neoscona* (Simon, 1864), *Micrathena* (Sundevall, 1833), and *Metazygia* (F. O. Pickard-Cambridge) with 560, 190, 176, 124, 117, and 90 species, respectively (World Spider Catalog 2024). *Argiope* includes large orb-weaver spiders, which were among the first to be described due to their striking coloration and relatively large body size (Bjørn 1997). These spiders are found throughout all continents, except for the poles (Dentici 2018). The lifespan of *A. trifasciata* is approximately one year, spanning from the spawning of eggs to the emergence of spiderlings from the egg cases that survived the winter, and ending in spring. Adult spiders can be found between late June and late September (Al-Kaaby et al. 2024). The phenomenon of ballooning (an air-borne dispersal mechanism facilitated by silken threads) is mainly practiced by spiderlings in large quantities (Ramirez & Haakonsen 1999, Abel et al. 2020). Moreover, various reports (both in the field and the laboratory) revealed that the ballooning behavior is not obligatory for *A. trifasciata* spiderlings before constructing a prey-capture orb web, and also not necessary for the development of this species and other *Argiope*

species (i.e., *A. bruennichi* and *A. aurantia*) (Walter et al. 2005). Many possible hidden factors are known to cause ballooning (temperature, humidity, wind, vibration, stress, light, and vision); among the aforementioned factors, ballooning behavior in *A. trifasciata* spiderlings is more probably initiated by a vibratory stimulus on vegetation, i.e., knocking or fanning (Weyman 1993). Three *Argiope* species were recorded in Libya: *A. lobata* (Pallas, 1772), as reported by Zavattari (1934) and Bosmans (unpublished data); *A. trifasciata* (Forskål, 1775), as reported by Zavattari (1934); and *A. sector* (Forsskål, 1776), as reported by Bjørn (1997). In this paper, we report new records of three *Argiope* species based on female specimens collected from various plants in private farms in Gharyan, northwestern Libya.

Materials and methods

The specimens were collected from their webs situated in private farms in two locations (32°06'09.3"N 13°01'59.9"E, 32°08'54.4"N 13°02'51.4"E) of Gharyan city (a mountainous city, 105 kilometers south of Tripoli). The specimens were collected from different plants:- *A. sector* (Forsskål, 1776): amaranth, haloxylon, prickly saltwort, retama, safflower, vetches; *A. lobata* (Pallas, 1772): prickly saltwort, safflower, thistle; *A. trifasciata* (Forskål, 1775): Deverra, safflower. The samples were kept separately in glass jars containing 75% alcohol and transferred to the Zoology Department Laboratory, Faculty of Science, Gharyan University. The examination was conducted using a dissecting Stereomicroscope (Leica ES2) and photographed with a macro camera on a mounted mobile device (Xiaomi 13 Ultra). Image editing and measurements were performed using ImageJ image processing and Analysis software program (V 1.8.0).

Results

Family Araneidae Clerck, 1757

Genus *Argiope* Audouin, 1826

Argiope trifasciata (Forskål, 1775)
(Fig. 1A)

Material examined: 1 individual, collected by Abdulhamed Etriieki, Adult: ♀ Medium-sized.

Description: Female; basically, the abdomen is oval, crossed dorsally by several white and pale-yellow bands, interrupted by thin black stripes (Fig. 1A). These bands have a somewhat organized, erratic appearance of *A. bruennichi* counterparts. The legs are yellowish to brown, interrupted by black annulations (Fig. 1A, B).

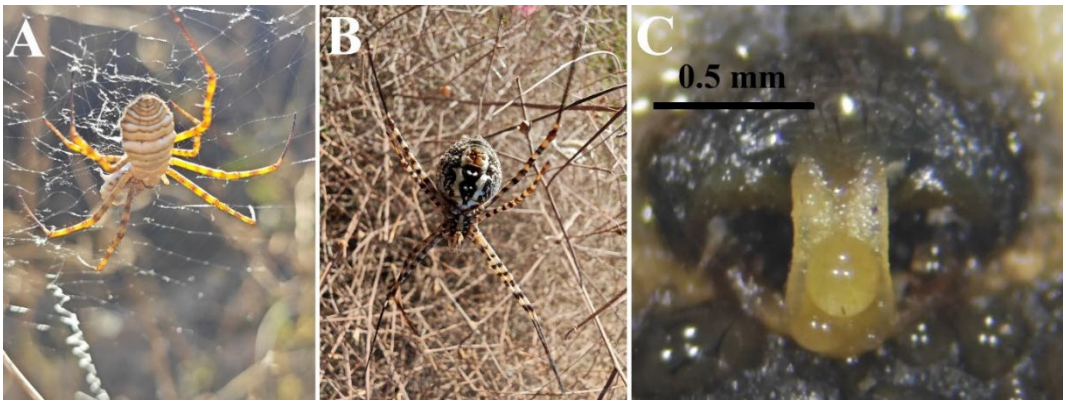

Figure 1. *Argiope trifasciata*, female. A. habitus, dorsal view; B. habitus, ventral view; C. epigyne, ventral view.

Epigyne: ventrally, the epigyne has a sclerotized septum (plate), elevated anteriorly, forming a large bump which laterally confines the two genital openings; the septum ends anteriorly with a unique bifid pattern (Fig. 1C). The bottom of the two genital openings is formed by the rear folding of the plate into two round extensions. Furthermore, the anterior elevated portion of the plate extends over the outer edge of the anterior bump, rather than merging.

Common names: cosmopolitan spider or banded garden orb-web spider (Ramirez & Haakonsen 1999, Feulner & Roobas 2015, Abel et al. 2020).

Argiope sector (Forsskål, 1776)
(Fig. 2 A)

Material examined: 1 individual, collected by Amal Hmaid, Adult: ♀ large-sized.

Description: Female; abdomen is broad and lobed, with seven large lateral bluntly rounded lobes, three on each side and one posteriorly (Fig. 2A). Although the dorsal abdominal pattern of most adult female specimens had pale grey/brown markings on yellowish white background which appear relatively variable, the underside of the abdomen has white/greyish-brown areas forming a complex but unique pattern; these ventral markings were highly consistent in all female specimens from different times and localities. The underside abdominal patterns of all related female specimens were similar and evident, with a central outline mimicking a "mouse" or "bear" face (Fig. 2A).

Epigyne: viewing the epigyne ventrally exhibits a wide epigynal roof, completely hiding the epigynal opening; the roof has distinct median notch and knob, both surrounded by two depressions in front of a thick shining rim (Fig. 2 C); atria (epigynal openings) open posteriorly, and a septum (median plate) is situated directly below the overhanging roof.

Common name: The MENA lobed Spider (Feulner & Roobas 2015).

Argiope lobata (Pallas, 1772)
(Fig. 3A)

Material examined: 1 example, collected by Hamida Khbaish, Adult: ♀ large-sized.

Description: Female; dorsally, abdomen is yellowish-silver colored and lacks transverse bands; it has eight large lateral lobes, four on each side, and one additional median lobe (caudal tail) posteriorly (Fig. 3 A, B).

Epigyne: the epigynal rim is not apparent; in the underside view, the epigynal roof has an anterior protrusion (bulge) that extends posteriorly, forming a tongue-like median projection, partially covering the epigynal openings (Fig. 3C). When viewed posteriorly, the epigynal roof appears narrowed to meet the septum.

Common names: The lobed spider (Feulner & Roobas 2015, Lindecke & Wall 2016).

Figure 2. *Argiope sector*, female. A. habitus, ventral view; B. habitus, anterior view; C. epigyne, ventral view.

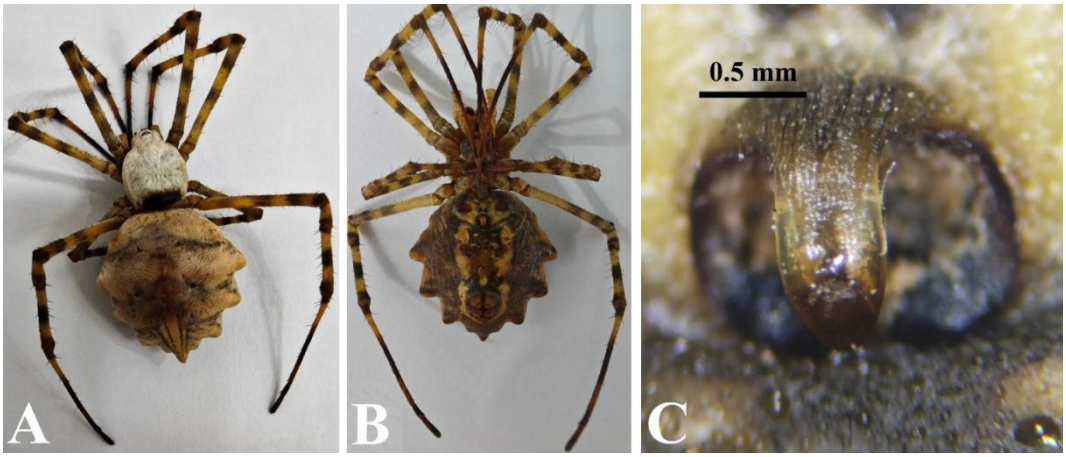

Figure 3. *Argiope lobata*, female. A. habitus, dorsal view; B. habitus, ventral view; C. epigyne, ventral view.

Discussion

Although this is the first record of *A. trifasciata* in Libya since Zavattari (1934) in Ain Zara (Tripoli) and Benghazi, its presence is not unexpected, as it is regarded as a cosmopolitan species distributed in more than 50 countries across six continents (Abel et al. 2020). This worldwide distribution has been attributed to the capability of this spider to spread across vast distances by passive air (wind) movement using silken threads, in a fascinating dispersal mechanism termed 'ballooning' (Bell et al. 2005).

The unique central pattern on the ventral abdominal surface of *A. sector* resembles a "Mickey Mouse" or "Teddy Bear" face, as named by Feulner & Roobas (2015) in their description of *A. sector* in the United Arab Emirates. This is the first report of *A. sector* in Libya since the first record by Bjørn (1997), who reported this species in eastern Libya (Cyrenaica).

Many authors have indicated that both *A. sector* and *A. lobata* are very similar; however, they can be distinguished by the distinctive ventral abdominal pattern of *A. sector*, as well as the more widespread distribution of *A. lobata* (Jäger 2012). This is the first record of *A. lobata* in Libya since the reports of Zavattari (1934) in Tripoli, Sokna, and Benghazi, and the work of Bosmans (unpublished).

These *Argiope* species constructed their webs on several plant species, consistent with the general finding that almost all genera in the orb-weaver family Araneidae do not exhibit host plant specificity; moreover, all specimens were found in open habitats, which are typically preferred by ballooning spiders (Hesselberg et al. 2023). Many recent undocumented reports from amateur photographers claim the presence of *Argiope* species in Tarhuna, Msallata, Bani Walid, Qasr Bin Ghashir, Ain Zara (Tripoli), Farwa Island, Qasr Al-Akhyar, Silin (Al Khums), Sirte, Benghazi, and Al-Jabal Al-Akhdar on different types of wild and domestic vegetation; the last six areas are on the Libyan Mediterranean coast. Other recent records of *A. trifasciata* were documented on the Mediterranean islands (Malta, Sicily, and Sardinia) (Di Pompeo et al. 2011), suggesting widespread dispersal capability, either actively via ballooning or passively via human movement.

To date, 312 spider species from 38 families have been recorded in Libya (Nentwig et al. 2024). To date, three *Argiope* species have been recorded in Libya, based on the records of Zavattari (1934), Bjørn (1997), or unpublished data from Bosmans.

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