New records for Europe: *Argiope trifasciata* (Forsskål, 1775) from Italy and Malta (Araneae, Araneidae)

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Summary

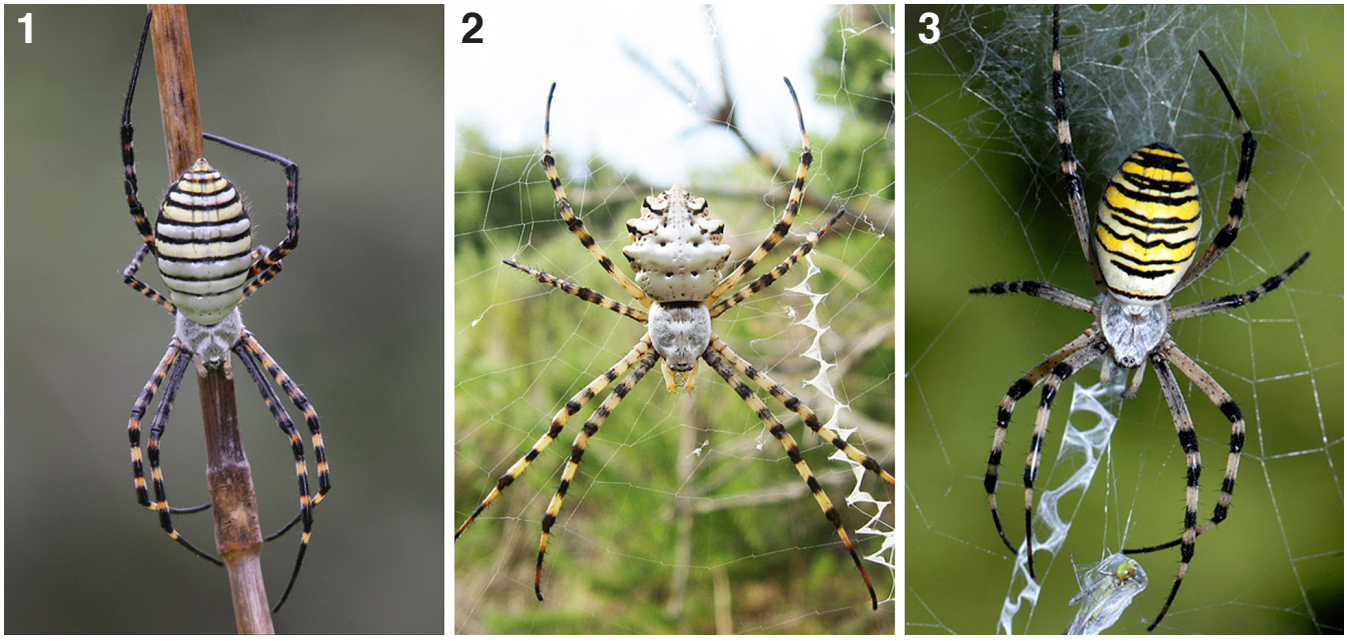
Both the actual finding of several specimens and numerous photographic reports allow us to ascertain for the first time in Italy, precisely in the Mediterranean areas of Sicily and Sardinia, and in Malta, the presence of *Argiope trifasciata* (Forsskål, 1775) (Araneae, Araneidae). With the help of habitus and genital macro photographs, the collected specimens are described and compared with the other congeneric European species. General ecology and European distribution are also discussed.

Introduction

The family Araneidae is currently the third largest family of spiders. It presently contains 168 genera and 3006 species (Platnick 2011) widely distributed around the world. Within this family, *Argiope* Audouin, 1826 is one of the most familiar and extensively studied genera. The 78 currently described species (Platnick 2011) occur on all continents except Antarctica, mainly in the tropical and subtropical zones.

Since the second half of the 1700s, two species have been known for Europe, both of which also occur on Italian and Maltese territory. *Argiope bruennichi* (Scopoli, 1772) is recorded for most European countries with exceptions such as Ireland, Albania, and Bosnia (van Helsdingen 2011). However, considering the favourable climatic and ecological conditions of the last two, the apparent absence of this species is probably due to lack of data. The second European species, *Argiope lobata* (Pallas, 1772), being relatively more xero-thermophilic, is limited to southern Europe. It occurs on all Black Sea and Mediterranean facing countries including North Africa, and reaches into southern Russia. During the early 1900s a third European species was described and recorded for Portugal: *Argiope acuminata* Franganillo, 1920. However, it has never been seen or collected since then and therefore we consider it potentially invalid.

It was not until 1985 (Morano & Ferrández 1985; van Helsdingen 2011) that *Argiope trifasciata* (Forsskål, 1775), the Egyptian holotype (Cairo) of which has been lost, was recorded for the first time on the European mainland. Being a widespread species with a cosmopolitan distribution, it was previously known to occur on several archipelagos of the southern Atlantic coast (such as Madeira and the Canary Islands) but thought to be absent from the European continent (Levi 1983, 2004; Platnick 2011). It was, however, collected from the south-eastern Spanish mainland (Morano & Ferrández 1985) and, more recently, from southern Portugal and the Balearic Islands (Cardoso & Morano 2010). With these new records of *A. trifasciata* from insular Italy and Malta we bring a new addition to the spider faunas of both countries, extending its known European distribution.



Figs. 1–3: European species of *Argiope*, ♀ habitus. **1** *A. trifasciata*; photo by Antonino La Spina; **2** *A. lobata*; photo by Gioele Tropea; **3** *A. bruennichi*; photo by Emanuele Biggi.

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Fig. 4: *Argiope trifasciata*, ♀, Sardinia: Parco Naturale Regionale Molentargius Saline (CA): ventral view.

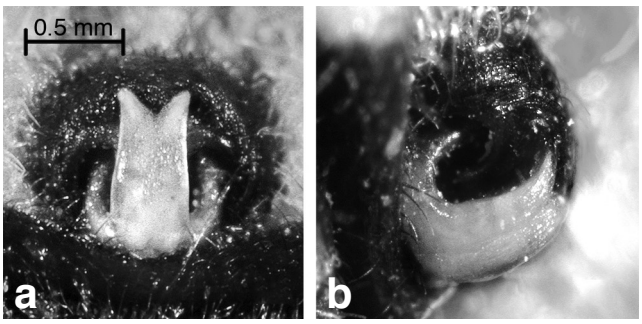

Fig. 5: *Argiope trifasciata*, ♀, Sardinia: Parco Naturale Regionale Molentargius Saline (CA), epigyne: **a** ventral view; **b** lateral view.

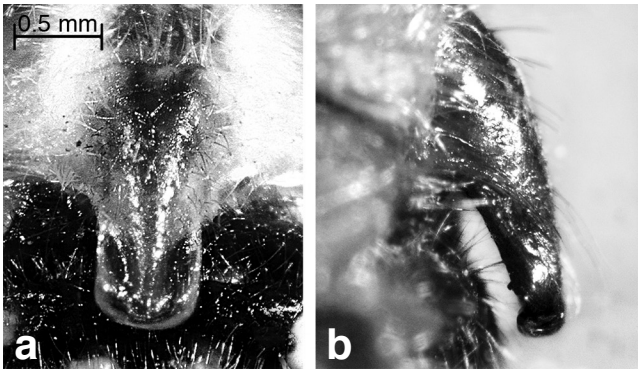

Fig. 6: *Argiope bruennichi*, ♀, Lombardy: Sovico (MB), epigyne: **a** ventral view; **b** lateral view.

Material and methods

The collected specimens are preserved in 75% alcohol, while the egg sacs are kept dry. Both the specimens and the egg sacs are preserved among the authors' private collections. Specimens were examined using a Leica MZ16 stereomicroscope. Measurements are in millimetres (mm) and are presented as: femur–patella–tibia–metatarsus–tarsus (total).

Results

Argiope trifasciata (Forsskål, 1775)

ITALY: 2♀ and 4 egg sacs, Sardinia, Parco Naturale Regionale Molentargius Saline, Is Arenas, (Cagliari), 39°13'16.41"N, 9°9'49.62"E, September 2010, R. Rattu leg.; 1♀, Sardinia, Quartu Sant'Elena (Cagliari), 39°14'37.92"N, 9°10'36.57"E, August 2010, S. Piredda leg.

Photographic reports: ITALY: 3♀, Sicily, Bosco di Santo Pietro in Caltagirone (Catania), January 2010; 1♀, Sicily, Siracusa (Siracusa), July 2009; 1♀, Sardinia, Capoterra loc. La Maddalena (Cagliari), November 2009; 1♀, Sardinia, Domus de Maria (Cagliari), July 2010. MALTA: 1♀, Malta Island, November 2009.

The genus *Argiope* is, among the Araneidae, easily distinguishable by its overall morphology, the usually striking abdominal markings (Figs. 1–3), and the typical eye pattern, the posterior row of which is strongly procurved (Roberts 1995; Levi 2004). Considering these factors, all specimens observed, both preserved and photographed (see Fig. 9 for distribution map), can easily be assigned to the genus.

A. trifasciata is readily distinguished from *A. lobata* by the obvious differences in habitus and abdominal pattern, and especially by the lack of the distinctive abdominal lobes (Fig. 2) which surround its edge in the latter (Levi 1983). In contrast, *A. bruennichi* (Fig. 3) is similar to *A. trifasciata* in terms of abdominal morphology but can be differentiated from the latter by both dissimilarities in abdominal markings and in the number and intensity of leg bandings. While differences between these two species are minor compared to those which discern *A. lobata*, they are still easily noticeable on the field.

Analysis and observations

Habitus and genital traits of the collected specimens were compared with Levi's descriptions (1968, 1983, 2004). Both appeared to be particularly coherent with the traits of Egyptian specimens described in 1968, especially the epigyne which coincides perfectly. Photographic reports from Sicily and Malta allow us to positively identify the specimens without any doubt as *A. trifasciata*. These high definition photographs clearly show both the typical habitus and especially the unique shape of the genitalia which effectively matches the one we observed in the analysed specimens.

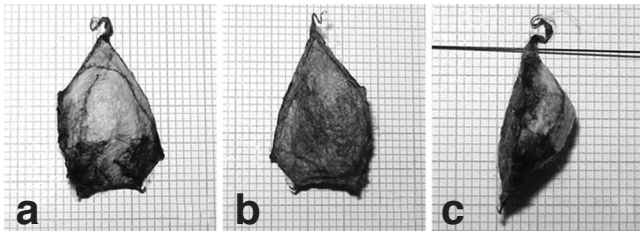

Fig. 7: *Argiope trifasciata*, Sardinia: Parco Naturale Regionale Molentargius Saline (CA), egg sac: **a** front view; **b** posterior view; **c** lateral view.

Dorsally, the oval abdomen is transversed by a series of white and pale yellow bands, separated by thin black stripes (Fig. 1). The bandings are quite orderly compared to the irregular appearance of the ones observed in *A. bruennichi* (Fig. 3). In addition, the black leg annulations, as opposed to the latter, are more intense and extend into the femur, especially on its ventral side (Fig. 4).

The epigyne (Fig. 5) is substantially different from that of A. *bruennichi* (Fig. 6) which lacks a septum. The sclerotized plate is raised anteriorly, forming a large bulge which laterally borders the two genital openings. Posteriorly, the septum folds into two circular expansions which comprise the floor of the two genital pits. Additionally, the anterior raised part of the septum overhangs the rim of the anterior bulge, instead of being fused with it. The septum terminates anteriorly with a distinctive bifurcation.

The body length of the three analysed females varied between 14 mm and 17 mm according to the degree of abdominal swelling. The size of the carapace, however, was generally consistent in all three, measuring 6 mm in length and 5 mm in width. We report the following leg measurements for a specimen of Quartu Sant'Elena (Cagliari): L1—8.5–3.0–6.0–8.0–2.0 (27.5); L2—8.1–2.5–5.4–8.8–2.0 (26.8); L3—4.8–1.3–2.8–4.5–1.5 (14.9); L4—8.0–2.8–4.7–8.0–2.0 (25.5).

At the present time, no adult male has been collected.

Four egg sacs were found in close proximities to the webs of several adult females. These were anchored to the surrounding vegetation by several tough suspension threads and measured approximately 20 mm in height and had a width ranging from 7 mm to 15 mm in the widest part. Their appearance (Fig. 7) is quite distinctive and is noticeably different from that of the spherical egg sacs of *A. bruennichi*. All have a polygonal shape, bounded by straight margins. The periphery of each egg sac is conspicuously thickened and serves as the starting point for the numerous attachment threads which support it. One of the sides, which constitutes the basal plate, is clearly flattened. The other is instead strongly convex and contains the eggs and the egg chamber. The whole structure is enveloped in a tough outer layer of olive-coloured silk which aids in crypsis. Additionally, from one of the egg sacs hatched several hundred spiderlings which measured approximately 1mm in body length.

Notes on ecology, habitat and European distribution

Most sightings and most of the collected specimens come from coastal areas of the Gulf of Cagliari, southern Sardinia, where the climate is markedly Mediterranean. Although there is microhabitat heterogeneity throughout the region, *A. trifasciata* appears to be a generally thermophilic sun-loving species. Webs are built among the dense Mediterranean shrubland, which typically consists of psammophytes, xerophytes (*Salicornia* sp., *Arthrocnemum* sp., *Salsola* sp.) and occasionally rushes (*Juncus* sp.). The collected females had built their large stabilimentum-bearing orbwebs among the lower layers of the shrubland, between the lower bushes and the taller graminoids (Fig. 8).

Fig. 8: Sardinia: Parco Naturale Regionale Molentargius Saline (CA), a typical Mediterranean habitat composed of xerophytes, shrubs and sporadic trees; photo by Roberto Rattu.

Two specimens were photographed in Sicily, in the close proximity of the nature reserve of Bosco di Santo Pietro, Caltagirone (CT). Vegetation here is more heterogeneous and consists of Mediterranean shrubland and garrigue, numerous xerophytes (*Thymus* sp.) and occasional oak trees (*Quercus suber*). The climate of this area is still Mediterranean and, even though the level of humidity is slightly higher, in terms of average temperatures it does not differ from the coastal areas of Sardinia. A third specimen was recorded near Siracusa (SR), an area of lower altitude and of closer proximity to the coastline compared to Bosco Santo Pietro.

In Malta, this species has been recorded from an open field composed mainly of Mediterranean xerophytic vegetation and tall graminoids. This zone lies in close proximity to an urban area and has, therefore, been colonized also by several ruderal species. Overall, climatic conditions are generally similiar to those observed in Sicily and Sardinia. All areas share similar mild winters: minimum temperatures practically never drop below 0°C and frosts do not occur.

Compared to the other two European species, *A. trifasciata* appears to be more thermophilic and confined to Mediterranean habitats, being frequent in coastal and low altitude areas. It is, therefore, absent from regions with frequent frosts and freezes. This is coherent with what is known for the rest of its limited European distribution, such as southern Portugal and south-eastern Spain (Morano & Ferrández 1985; Cardoso & Morano 2010). Due to the presence of several climatically homogeneous areas of southern Europe, such as the southern Italian mainland, the Aeolian Islands, southern Greece and western Turkey, we also believe that its current restricted range could indeed

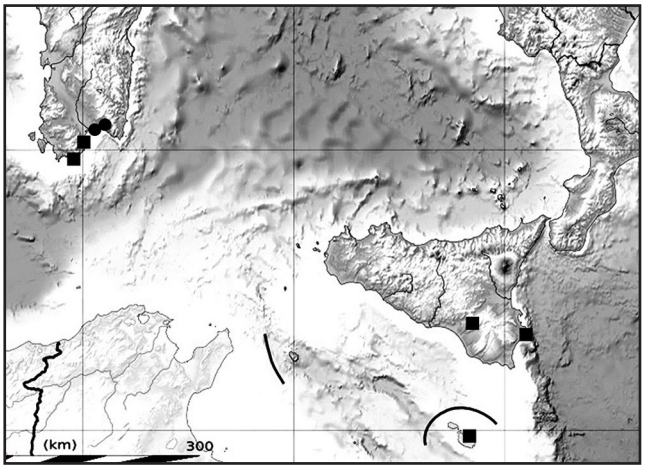

Fig. 9: Distribution map showing records of *Argiope trifasciata*: ● = preserved specimens; ■ = photographed specimens.

be wider. With future targeted samplings we are willing to ascertain if this is the case.

Conclusions

The observations we made on our analysed specimens and the confirmed occurrence of abundant populations in some of the areas, including that of mature females with egg sacs, allow us to safely ascertain the presence of *A. trifasciata* in Sicily, Sardinia, and Malta. We believe that, due to its large, striking, and easily distinguishable appearance, the chances for it to have gone unnoticed from the 1700s until today are extremely low. However, we cannot completely rule out the possibility of it being a long-established species which could have been either overlooked or misidentified as *A. bruennichi* in the past. Nevertheless, we consider *A. trifasciata* to be recently introduced and naturalized to Europe, almost definitely from North Africa.

Aknowledgments

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We want to dedicate this first work of ours to the memory of Dr Ilic Farabegoli and Prof. Claudio Arnò, founders of the Associazione Italiana di Aracnologia, always helpful on its forum (www.forum.aracnofilia.org) and source of indispensable scientific input which greatly expanded our knowledge on arachnids.

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