

The species of *Argiope* (Araneae: Araneidae) found in Ghana, West Africa, with a description of the male of *Argiope flavipalpis* (Lucas)

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Summary

In Ghana, West Africa, two species of *Argiope* were found at Legon in the coastal savanna region: *A. trifasciata* Forskål, 1775 and *A. flavipalpis* (Lucas, 1858). *Argiope flavipalpis* has been confused with *A. cuspidata* Thorell, 1859, and though the nomenclatural position is still doubtful, it was decided to synonymise the two provisionally (syn. nov.). The male is described here for the first time. This species is not the same as that assigned to *A. flavipalpis* by Strand (1908) and di Caporiacco (1941), from north and east Africa.

Introduction

From February 1969 to August 1973 a study was made of the araneid spiders, including two species of *Argiope*, on the campus of the University of Ghana, Legon (ca 16 km north of Accra; 5°40' N, 0°10' W; altitude 100-140 m) (Edmunds, 1980). The surrounding area is coastal savanna (Lawson, 1966), though the campus is mainly park-like with mown grass and pruned shrubs. However, in some areas the vegetation is not attended to, and in others crops are grown. *A. trifasciata* Forskål was found exclusively in long grass. The other species of *Argiope* occurred in various types of vegetation, e.g. grass, weeds, in crops or at the base of shrubs, where it built a web with a cruciform or diagonal stabilimentum. In a paper by Ewer (1972), describing the stabilimentum, the species was provisionally identified as *A. flavipalpis* (Lucas), and a similar larger

spider, collected from a forest area, was identified as *A. cuspidata* Thorell.

In this study mature females of *A. flavipalpis* were seen at Legon, at Cape Coast (ca 145 km west of Accra, also in coastal savanna), and in the forest at Mount Atewa, Kibi (ca 160 km north-west of Accra). At the latter site, larger mature females were also seen that were at first assumed to be *A. cuspidata*. However, all spiders that were collected and examined had similar epigynes, regardless of size, and this was confirmed by microscopic examination after dissection and clearing.

Males are much smaller and not easily found; they leave their webs once they are mature, and are only occasionally found in the webs of females. As the populations were present throughout the year and development was asynchronous, mature females would usually be available for mating with males as soon as the latter were ready (Edmunds, 1980). Two male *A. flavipalpis* were collected from the web of a large sized female at Mount Atewa.

***Argiope trifasciata* Forskål, 1775**

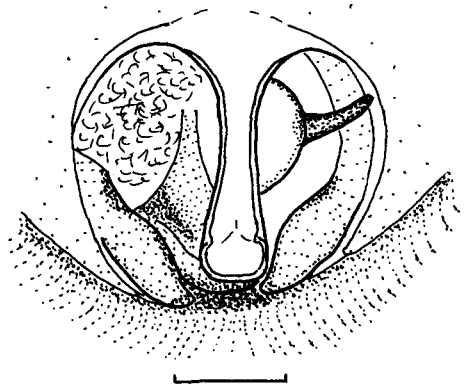
Distribution and description

This is a widespread species, being found in the western hemisphere, Africa and Asia, though it is absent from Europe (Bonnet, 1955; Levi, 1968). It has been well described, most recently by Levi (1968), therefore its identification presented no problems. Various aspects of its biology have been studied, most recently by Enders (1974, 1975a, b) and Tolbert (1975, 1979). The appearance of specimens varies throughout its range (Levi, 1968). Levi describes spiders from North Carolina, but specimens from Legon differ slightly. The males are smaller: total length 3.7 mm, with shorter legs: leg I 9.2 mm. The legs and carapace are reddish brown and the abdomen is almost entirely yellow and white (fawn in preserved specimens) with hardly any of the dark marks found in the American specimen. The Ghanaian females varied in size, larger specimens being similar in size to the American specimen; total length 10.7-16.5 mm, leg I 19.0-27.5 mm. The abdomen shape is similar with only a short post-spinneret tail (cf. specimens from West Indies described by Levi, 1968). The general colouration is

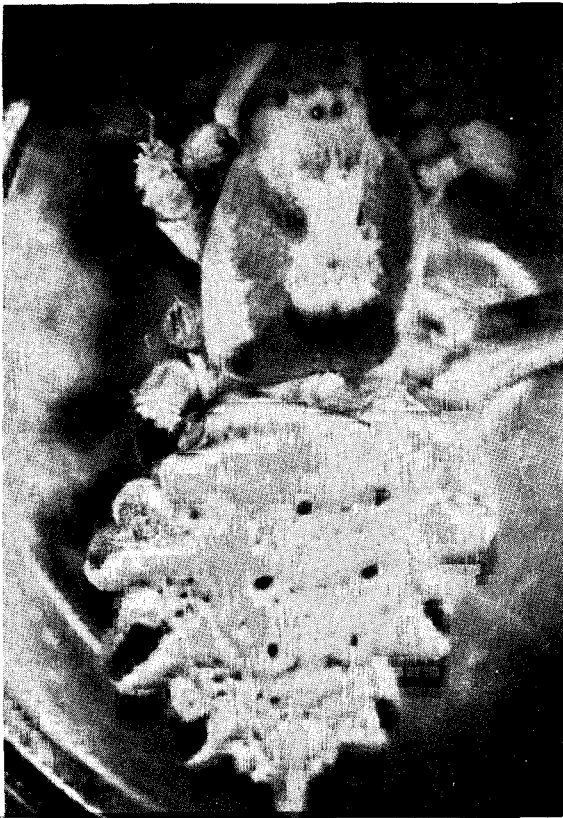
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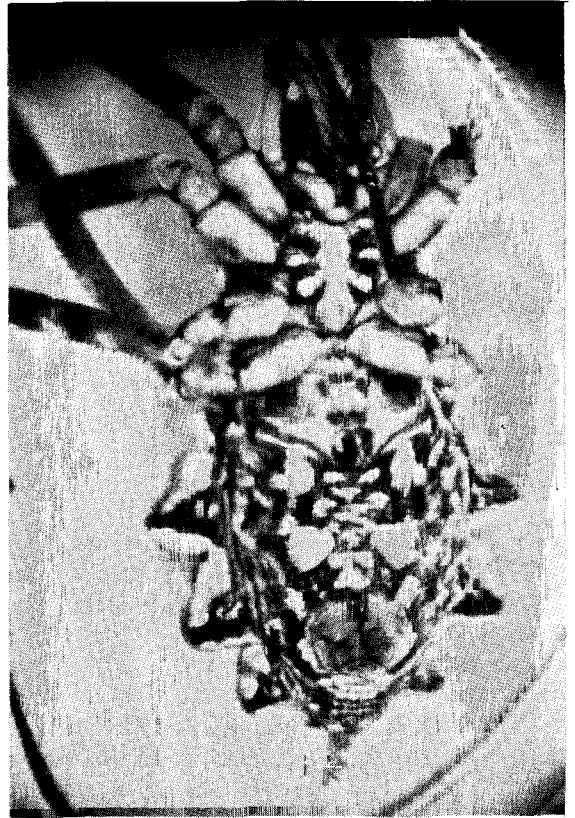
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Figs. 1-4: Specimen identified by Strand as *Argiope flavipalpis*, locality "Afrika", now in Senckenberg Museum. 1-2 Epigyne; 3 Carapace and abdomen, dorsal view; 4 Ditto, ventral view. Scale lines: 1, 2 = 0.5 mm; 3, 4 = 5.0 mm.

similar to the American specimen, but the median dark band on the ventral surface of the abdomen is narrower and has no, or only two small, pale spots. Many areas that are white or fawn in preserved specimens are yellow in live ones. The dorsal surface of the abdomen has transverse white and yellow bands that are separated by thin reddish brown lines. The whole of the dorsal surface, including the carapace, and especially the anterior end of the abdomen, is covered with hairs orientated longitudinally which, due to refraction, give a silvery appearance to live spiders. Spiderlings on emergence are entirely pale brown with scattered lighter marks, two dark spots on the posterior of the abdomen and dark spinnerets; the dark stripes develop slowly, e.g. a juvenile of ca 2 mm length is mainly yellow with reddish brown marks forming interrupted lines.

Argiope flavipalpis (Lucas)

Nomenclature of A. flavipalpis and A. cuspidata Thorell

The female of *A. flavipalpis* was described by Lucas (1858, as *Epeira flavipalpis*) from a specimen from Gabon, but without a description of the epigyne; the location of the type specimen is unknown (H. W. Levi and M. Vachon, pers. comm.). Capello (1866) assigned four female spiders from Angola to *A. flavipalpis*, giving a description and small drawings of dorsal and ventral views, but without mentioning the epigyne. *A. cuspidata* was initially described briefly by Thorell (1859) from one female from "Caffraria" (now eastern Cape of Good Hope Province), without a description of the epigyne, and more fully with a description of the epigyne in 1868 (reprinted 1910). Karsch (1879) described *A. pechueli* from West Africa without a description of the epigyne; it was described more fully with a description of the epigyne by Strand (1906) from specimens from South Cameroun and Lomé (now in Togo). De Lessert (1930) synonymised *A. pechueli* with *A. cuspidata*, the latter having priority, and he gave a drawing of the epigyne of a specimen from the Congo. The epigyne of the type specimen of *A. cuspidata* Thorell (from Stockholm Museum) is shown in Fig. 5; that of the type specimen of *A. pechueli* (from Berlin Museum) is similar though sunk

in, confirming de Lessert's opinion.

Pocock (1899) synonymised *A. pechueli* with *A. flavipalpis*, but Strand (1908) disagreed and assigned a north African specimen to *A. flavipalpis*, describing the epigyne as deeply concave with a septum, similar to that of *A. lobata* Pallas. Figures 1 and 2 show the epigyne of a specimen from the Senckenberg Museum, Frankfurt (accession No. 3541, locality 'Afrika') ascribed by Strand to *A. flavipalpis*. A male from Ethiopia was also assigned to *A. flavipalpis* by di Caporiacco (1941); it is now in the Università degli Studi, Florence, together with females similar to that called *A. flavipalpis* by Strand.

Recently Ewer (1972) and Edmunds (1980) have used the name *A. flavipalpis* for specimens from Ghanaian savanna and referred briefly to larger specimens from Ghanaian forest as *A. cuspidata*. Robinson & Robinson (1980) use *A. flavipalpis* for spiders from Ibadan, Nigeria and *A. cuspidata* for those from Natal, South Africa. Ewer and I undoubtedly have the same species, and from Figs. 6-12 it can be seen that the larger ("*A. cuspidata*") is conspecific with the smaller specimens (*A. flavipalpis*). They are also conspecific with the specimen from Ibadan that was sent to me by M. H. Robinson, and with Thorell's type specimen of *A. cuspidata*, and are very similar in appearance to *A. flavipalpis* figured by Capello (1866). The Robinsons' observations on courtship add evidence to the theory that they are dealing with the same species from West and South Africa. They say that *A. cuspidata* "was closely similar in appearance, web structure and habitat preference to *A. flavipalpis* . . . Apart from these details . . . we can detect no difference between the courtship behaviour of *A. cuspidata* and *A. flavipalpis*, but find numerous striking similarities." All these specimens are not conspecific with those assigned to *A. flavipalpis* by Strand and di Caporiacco.

It remains uncertain whether Strand's *A. flavipalpis* or Thorell's *A. cuspidata* is synonymous with *A. flavipalpis* Lucas, but the brief descriptions of colour and geographical considerations support the possible synonymy of *A. cuspidata* and *A. flavipalpis* Lucas. H. W. Levi (pers. comm.) considers that Strand's identifications were often inaccurate, and that as *A. flavipalpis* has been used more often for West African specimens by recent authors, it should be retained for West and South African spiders, as

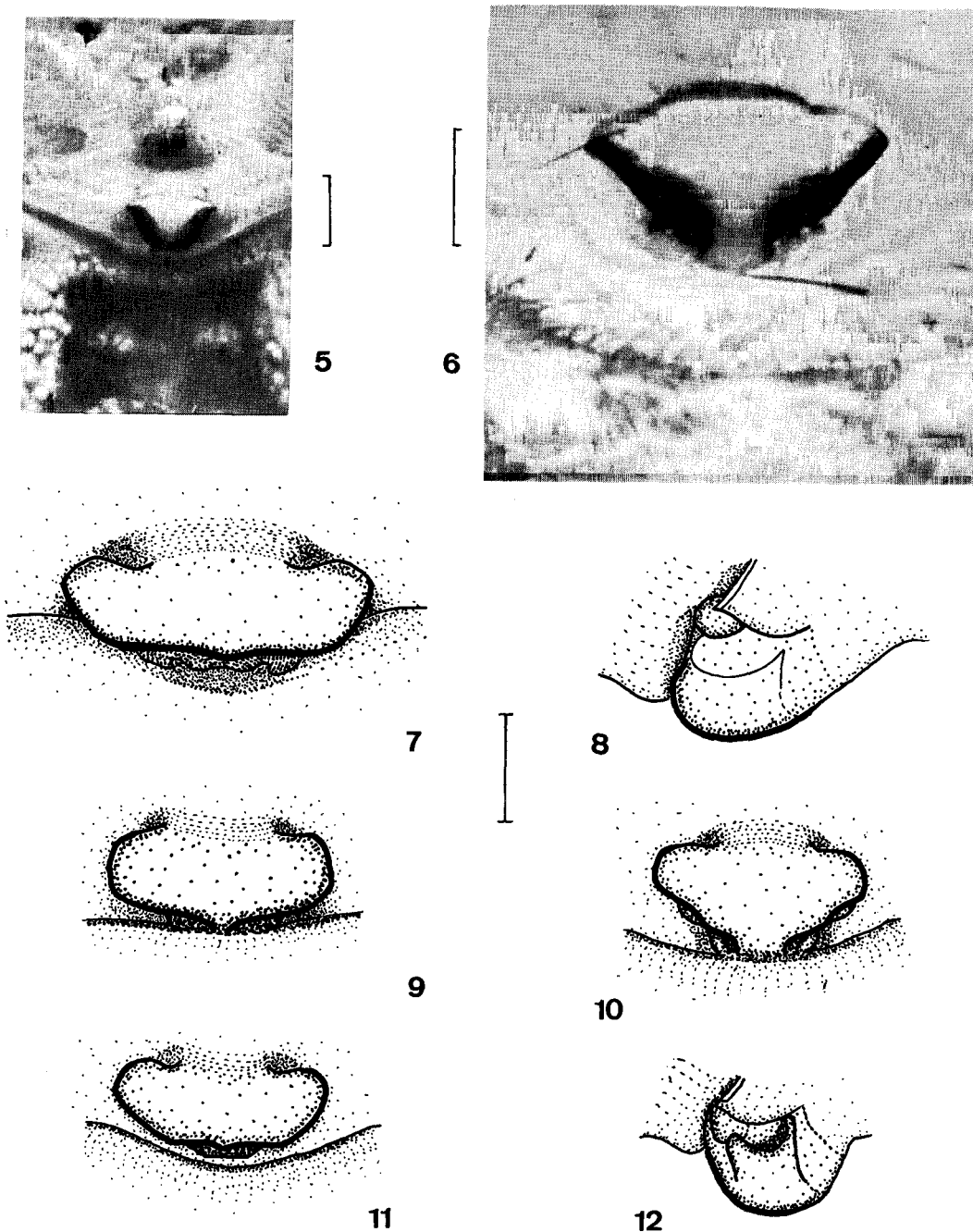
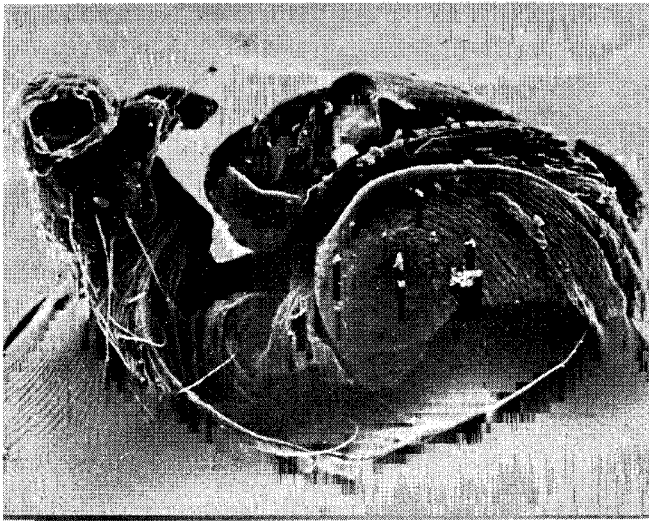
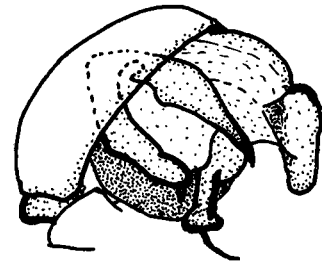


Fig. 5: *Argiope cuspidata* Thorell, type specimen, locality "Caffraria", now in Stockholm Museum. Epigyne. Scale line = 1.0 mm.

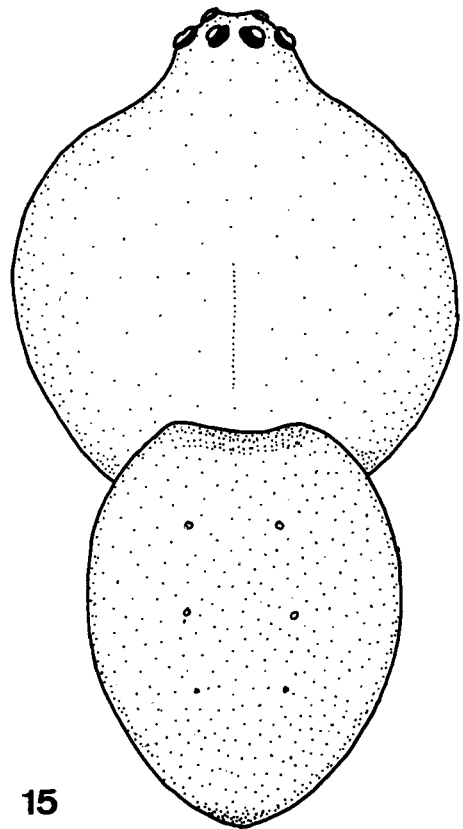
Figs. 6-12: *Argiope flavipalpis*, females from Ghana. Epigynes. 6-8 Large females from Mount Atewa (6-7 Ventral view; 8 Lateral view); 9-10 Two small females from Legon, ventral view; 11-12 Small female from Mount Atewa (11 Ventral view; 12 Lateral view). Scale lines = 0.5 mm.



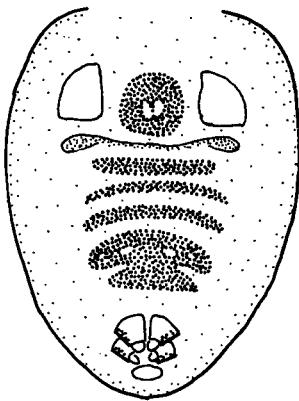
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Figs. 13-16: *Argiope flavipalpis*, male from Mount Atewa, Ghana. 13 Electron micrograph of right pedipalp, mesal view; 14 Drawing of left pedipalp, mesal view; 15 Carapace and abdomen, dorsal view; 16 Abdomen, ventral view. Scale lines 0.5 mm.

described in the next section, until the situation is further reviewed. The identity of the spiders from North and East Africa, assigned to *A. flavipalpis* by Strand and di Caporiacco, including the male described for the first time by the latter, remains unknown. The male of *A. flavipalpis*, as used in this paper, has not so far been described; it is described here and compared with that described by di Caporiacco. Specimens of both sexes are deposited in the British Museum (Natural History), Accession Number: BM(NH) 1981.9.21.2-4.

Distribution and Description

A. flavipalpis is an African species (Bonnet, 1955) whose distribution and biology are not well known. It has been found in West Africa, both in savanna and forest (Karsch, 1879; Strand, 1906; Ewer, 1972; Robinson & Robinson, 1980; pers. obs.), in the Congo (de Lessert, 1930) and South Africa (Thorell, 1859; Robinson & Robinson, 1980).

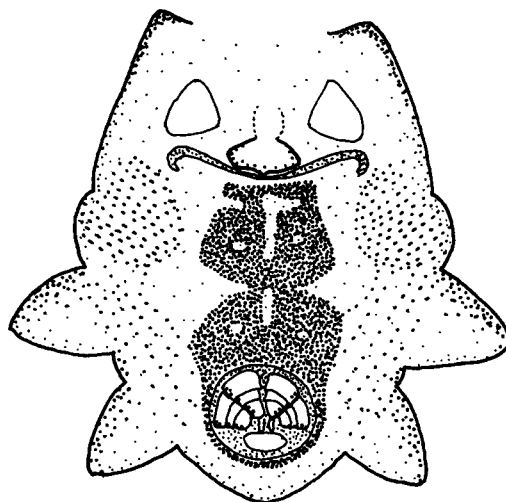
Male (preserved specimen): Total length: 5.5 mm. Carapace: length 2.2 mm, width 1.9 mm, almost circular with eyes on anterior projection (Fig. 15), yellowish fawn, suffused with dark brown at edges, eyes surrounded by dark brown. Sternum: heart-shaped, yellow suffused with dark mottling, dark marks at bases of legs. Legs: I: 7.4 mm, II: 6.9 mm, III: 4.9 mm, IV: 6.3 mm, spiny, yellowish brown, slightly darker and greyer at distal end of femur and tibia and on patella, but no true annulations (cf. ♀), some dark spots, leg I suffused with dark grey, especially anterior edge, leg IV suffused with dark grey, especially ventrally. Pedipalps (Figs. 13, 14): tibia fawn, paracymbium reddish fawn, other parts reddish brown. Abdomen: oval with slight anterior shoulders and posterior end slightly pointed, but no lobes (cf. ♀) (Fig. 15); dorsal surface yellowish brown with slight scattering of white guanophores, slightly darker brown at anterior and lateral edges, but with no distinct band (cf. ♀); ventral surface yellowish fawn with anterior central darker area between lung books and transverse darker lines varying in number and degree of fusion (Fig. 16).

Female (live spider, on preservation specimens become fawn, and white and yellow indistinguishable). Descriptions of females are given by Lucas (1858) and Capello (1866), as *A. cuspidata* by Thorell

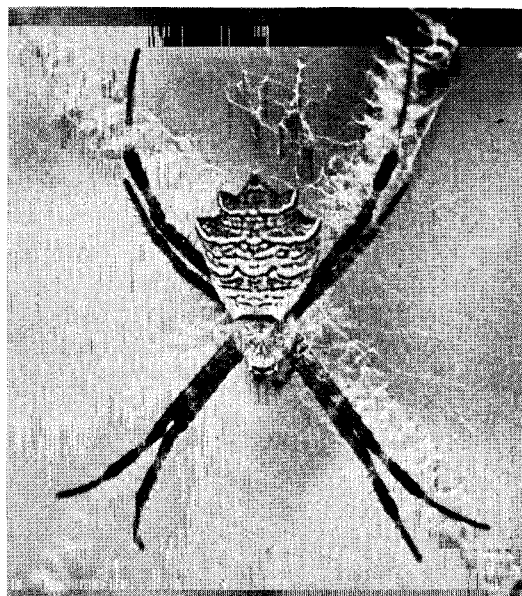
(1868), and as *A. pechueli* by Karsch (1879) and Strand (1906). Strand and de Lessert (1930) point out that individuals vary in colour, especially of the dorsal surface of the abdomen and the legs. *Small specimens from Legon*: Total length: 8.2-14.1 mm. Carapace: length 3.4-5.0 mm, width 3.0-4.8 mm, pale brown with white hairs, eyes (Fig. 17) surrounded by dark brown. Sternum: yellow with dark lateral bands. Legs: I: 18.5-26.0 mm, II: 18.5-26.0 mm, III: 11.5-15.0 mm, IV: 18.0-24.5 mm, pale brown markedly annulated with black. Abdomen: anterior edge truncated with marked shoulders, posterior end pointed with two pairs of marked postero-lateral lobes, giving the posterior end of the abdomen a five lobed appearance, and a pair of much smaller lobes mid-way along the abdomen; dorsal surface white, rarely yellow, pigment occurring in polygonal guanophores, with a fine dark network between them, darker towards posterior end, where the guanophores are smaller (extent of dark area varies between individuals), irregular black transverse lines, black band across anterior edge, extending midway laterally (Fig. 20 shows dorsal surface of live specimen on its web); ventral surface with yellow irregular longitudinal lines separated by central bilobed area, and surrounded by brown (Figs. 18, 19). Epigyne: approximately rectangular or triangular with rounded edges, about three times as broad as long, yellowish with dark edges, the extent to which it overlaps or is overlapped by the epigastric furrow varies (Figs. 7-12); Fig. 21 shows ducts in a cleared epigyne of a larger specimen from Mount Atewa, the ducts of a smaller specimen are identical, any difference being attributable to distortion on mounting. *Larger specimens from Mount Atewa*: Total length: 14.0-18.2 mm. Carapace: length 6.0-7.2 mm, width 5.5-6.8 mm. Legs: I: 28.0-34.0 mm, II: 28.0-34.0, III: 17.5-21.0 mm, IV: 27.5-33.0 mm. Although some specimens from the forest area of Mount Atewa were similar in colour to those at Legon, yellow individuals were commoner, and others, especially larger spiders, were darker with brown legs in which annulations were scarcely discernible; these approach the description of *pechueli* var. *preussi* (Strand, 1906). During the growth of females the characteristic colour and shape develop slowly; spiderlings on emergence are almost entirely pale grey, with oval abdomens. After the 4th or 5th



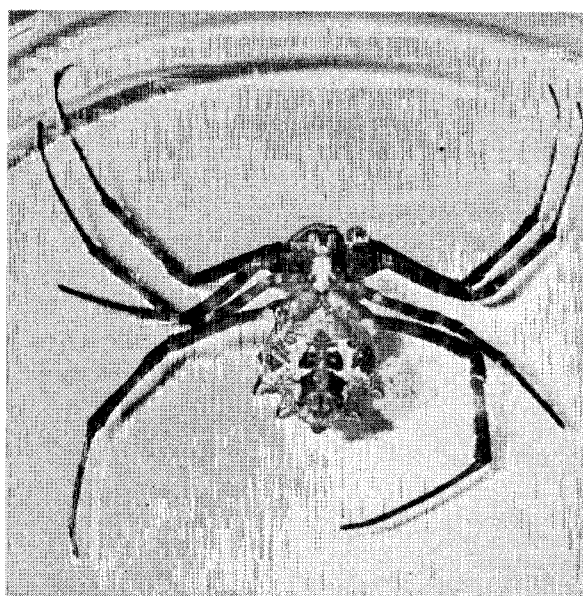
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Figs. 17-19: *Argiope flavipalpis* from Mount Atewa, Ghana. 17 Female, eyes; 18 Large female, abdomen, ventral view; 19 Large female, ventral view.

Fig. 20: *Argiope flavipalpis* from Legon, Ghana. Dorsal view of small female on web. Scale lines: 17 = 0.5 mm; 18 = 2.0 mm; 19, 20 = 5.0 mm.

post-emergence moult, the abdomen becomes more angled, anterior shoulders develop before posterior lobes, and the third pair of lobes are more noticeable in the large females from the forest, which have probably undergone an extra moult (Edmunds, 1982). The black line on the anterior edge of the abdomen appears at the 6th moult or later. Legs are initially pale, annulations appear about the 6th moult.

Discussion

The male of *A. flavipalpis* described here differs from that described by di Caporiacco (1941) as "*A. flavipalpis*". The pedipalp has a smaller, rounder and more compact paracymbium, and shorter less pointed apophyses. There are differences in colour, though probably not much significance should be attached to them as di Caporiacco had only one male and I had only two. The main differences appear to be in colour of the carapace, which is red in di Caporiacco's specimen and yellowish in mine, and in the legs of the former having more dark spots and annulations. Sternum and abdomen colour appear to be too similar or indistinct to be of use in distinguishing the species.

The mature females of *A. flavipalpis* from Ghana differ from the specimen in the Senckenberg Museum that Strand assigned to "*A. flavipalpis*". The differences in the epigyne are best seen by comparing Fig. 1 with 5, and Fig. 2 with 7 and 9-11. That of the former is a convex hump about three times as broad

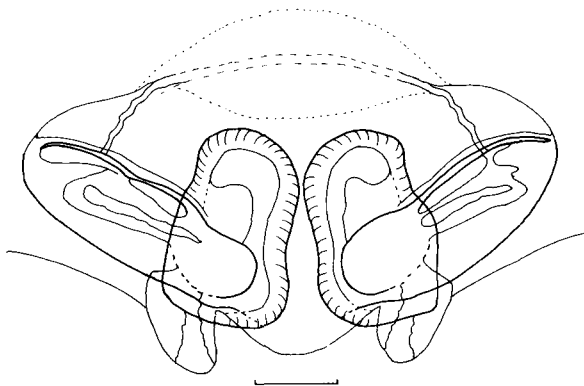


Fig. 21: *Argiope flavipalpis*, large female from Mount Atewa, Ghana. Camera lucida drawing of cleared epigyne. Scale line = 0.2 mm.

as long, whereas that of the latter is rounded in outline and deeply concave, with a wavy anterior edge from which a septum projects backwards to the base of the concavity. The colour patterns of both surfaces of the abdomen appear to be sufficiently distinct to allow separation of the species in the field. Figs. 3 and 4 show the dorsal and ventral surfaces of Strand's specimen. If Fig. 20 is compared with Fig. 3, it can be seen that the Ghanaian specimen has a dark band on the anterior edge of the abdomen, which is absent in Strand's specimen, whereas the latter has dark marks on the lobes which are not found in the former. The differences in the pattern of light and dark areas on the ventral surfaces are seen by comparing Fig. 19 with 4.

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