

FIRST RECORD OF *CYRTOPHORA CITRICOLA* (FORSKÅL) FROM COSTA RICA, WITH NOTES ON SOME RELATED SPECIES (ARANEAE: ARANEIDAE)

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Abstract: *Cyrtophora citricola* (Forskål, 1775) is herein reported from Heredia, Alajuela and Puntarenas provinces, Costa Rica; this is also the first record of the species from Central America. Additionally, new distribution records of *Gea heptagon* (Hentz, 1850), *Kapogea cyrtophoroides* (F.O.P. Cambridge, 1904) and *Kapogea sellata* (Simon, 1895) are reported from this Central American country.

Key words: Araneidae, *Cyrtophora citricola*, *Gea heptagon*, *Kapogea cyrtophoroides*, *Kapogea sellata*, distribution, Central America, Costa Rica.

Primer registro de *Cyrtophora citricola* (Forskål) de Costa Rica, con notas sobre otras especies próximas (Araneae: Araneidae)

Resumen: Se reporta por primera vez la araña *Cyrtophora citricola* (Forskål, 1775) de Costa Rica, de las provincias de Heredia, Alajuela y Puntarenas; este constituye también el primer registro de la especie para Centro América. Por otra parte, se aportan nuevos registros a la distribución conocida para Costa Rica de las arañas *Gea heptagon* (Hentz, 1850), *Kapogea cyrtophoroides* (F.O.P. Cambridge, 1904), y *Kapogea sellata* (Simon, 1895).

Palabras clave: Araneidae, *Cyrtophora citricola*, *Gea heptagon*, *Kapogea cyrtophoroides*, *Kapogea sellata*, distribución, América Central, Costa Rica.

The orb weavers (*Cyrtophora* Simon, 1864, *Kapogea* Levi, 1997, *Mecynogea* Levi, 1997 and *Manogea* Levi, 1997, *Gea* C. L. Koch, 1843 and *Argiope* Audouin, 1826) have been treated taxonomically as if they form a related group, and are considered to represent a new clade in the family Araneidae (Levi, 1997; Coddington, 1989) proposed the monophyly of Cyrtophorinae based in genitalic morphology and web architecture, and included at least the genera *Cyrtophora* and *Mecynogea*.

All these genera are characterized by a procurved or straight posterior eye row (posterior lateral eyes anterior to the posterior medians), except *Manogea porracea* and most *Cyrtophora* (Levi, 1997). Another character that also helps in identifying this group of araneids is the combined patellae and relatively short tibiae length of each leg, relative to the rest of genera in the family (Levi, 1997). However, the most interesting feature of the group could be the spinning habits wherein *Cyrtophora*, *Mecynogea*, *Manogea* and *Kapogea* all make horizontal, dome-shaped webs supported by a tangled webbing (Levi, 1997).

Cyrtophora citricola was first reported in America from Colombia, where it has been found in 1996 (Levi, 1997), and later in 1999 from the Dominican Republic (Alayon *et al.*, 2001). The first report from the United States was for Florida (Mannion *et al.*, 2002). More records have been reported during the past three years; (Soares & de María, 2004) cited it from Brazil, (Starr, 2005) noted it from Haiti and (Sánchez & Teruel, 2006) reported the species from Cuba. (Edwards, 2006) adds new records from Florida and show data about local infestation of the spider.

In Costa Rica, the webs of *Cyrtophora citricola* were first found in Heredia and Alajuela provinces in 2002, but specimens were not identified until now. The spider makes its webs principally in 'living fences' that border old coffee

plantations and include plants of "Spineless Yucca" or "Itabo", (Agavaceae: *Yucca elephantipes*). One of the first webs reported to the author was found in a cut off tree in an old coffee plantation (Fig. 1). In Puntarenas province, this spider was found in steel supports of a long bridge. Apparently, the habitat preference, along fence rows and bridges, of the species in Costa Rica is similar to other reported records in Miami (Mannion *et al.*, 2002; Edwards 2006) and the Cuba and Dominican Republic in the Caribbean (Alayon *et al.*, 2001; Sánchez & Teruel, 2006), especially.

The genus *Gea* in the Americas is known only by the species *G. heptagon*, its distribution extends from the USA to Argentina (Levi, 1968, 2004). In Central America, (Levi, 1997) reported three records of this species from Panamá, two in close proximity to the Canal Zone (Panamá province) and a third from Chiriquí province. After that no precise record of the species was known for Costa Rica until Levi, 2004, cited one record in Turrialba, Cartago province. Here is added, Limón province. Its occurrence and that of several related *Gea* species in the Southwest Pacific suggests that it might be introduced in America (Levi, 2004).

The genus *Kapogea* currently is represented in Costa Rica by only two species, *K. cyrtophoroides* reported by (Levi 1997) from the provinces of Heredia, San José and Puntarenas, and *K. sellata*, a much less common species first reported in Costa Rica by (Levi, 1997) and found only in Limón province.

Material and methods

The examined specimens are deposited at National Institute for Biodiversity (INBio), Costa Rica, and at the Milwaukee Public Museum, Wisconsin, USA. The methods used for establishing identity follow (Levi, 1997). Genitalia were

dissected using micro scissors (Roboz RS-5611 and RS-5620) and subsequent observations were made using an Olympus SZ-60 stereomicroscope. Genitalia were cleared in a 20% KOH solution and immersed in double boil until clear; specimens were then stained using Alcian Blue pigment (Sigma Co.). Images were obtained using a digital camera attached to the stereoscope and adjusted using Adobe Photoshop software.

Taxonomy

Cyrtophora citricola (Forskål, 1775)

Fig. 1 a-c, 2a-c, 3

DESCRIPTION. General coloration black to pale yellow. Abdomen with central dorsal red-white zigzag lines, but not visible along total length of the abdomen, especially in light colored specimens. Legs are the color of the body and banded with dark articles. Female abdomen with humps anterior and medially, biforked posteriorly in males and females (Fig 1). Posterior eye row strongly recurved in both sexes. Females about 13.8 mm long while males are much shorter, only about 2.5 mm.

VARIATION. The female specimens collected in Heredia exhibit great variation in color (Fig. 1). Most of the juvenile specimens are reddish (Fig. 1D). In mature specimens, color varied from black to pale yellow. Specimens from Heredia are smaller, with six specimens ranging in length from 7.8 mm to 9.5 mm. Females from Puntarenas province with black to pale yellow coloration but slightly larger than those from Heredia, with the total length of five specimens ranging from 10.4 mm to 13.8 mm. Males from both sites similar have a total length of about 2.5 mm, black in color, but some specimens do not have the typical posterior biforked abdomen.

DISTRIBUTION IN COSTA RICA. Costa Rica, Heredia province: La Valencia, El Barreal, Llorente, San Joaquín and San Lorenzo de Flores. Alajuela province: Cruce Manolos. Puntarenas province: bridge spanning the Río Tarcoles. (Fig. 3)

NATURAL HISTORY. Females and males can be found in the same web; this was more common in Heredia than in Puntarenas. In general, this species does not build a large colony in Costa Rica that measures several meters of joined webs as has been reported elsewhere (Sanchez & Teruel, 2006; Alayon *et al.*, 2001). Most of the spiders made single webs in plants of "Spineless Yucca" while the specimen from Llorente de Flores was found in a small orange tree. **SPECIMENS EXAMINED.** COSTA RICA, **Heredia**, La Valencia, in plants of "Itabo"; 25 April 2006; 1200 m; 9:58:12N - 84:06:42W; collected by Carlos Víquez, Angel Solis and Carlos Hernández; 5 mature females, 5 mature males, 3 juveniles (INBio). **Heredia**, Llorente de Flores, in a small orange tree; 26 April 2006; 1054 m; 10:00:02N -84:09:26W; collected by Carlos Víquez; 1 mature female (INBio). **Puntarenas**, beneath the bridge spanning the Río Tárcoles; 19 May 2006; 100-200 m; 9:48:03N -84:36:27W; collected by Carlos Víquez, 5 mature females, 2 mature males (INBio).

The records from San Joaquín (10:00:22N - 84:09:13W), San Lorenzo (10:00:54N -84:08:59W), Cruce Manolos (9:59:56N -84:16:26W) and El Barreal (9:58:15N - 84:08:23W) are based in Carlos Víquez and Angel Solis secure observation of webs between August and October 2006.

Gea heptagon (Hentz, 1850)

Fig. 4a-c, 6.

DESCRIPTION. Posterior eye row procurved (posterior lateral eyes anterior to posterior medians). General coloration yellow-brown, with dark bands on legs. Abdomen with a dark median posterior triangle, also with white-silver transverse bands. Ventrally, the sternum has a median longitudinal white line that is anteriorly incomplete. The abdomen has four white spots between genitalia and spinnerets. Total length 5.9 mm. Carapace 2.5 mm long.

DISTRIBUTION IN COSTA RICA. Turrialba, Cartago province, Sector Cocori, Limón Province. (fig 7)

COMMENTS. The distribution of this species is Central America south to Panama. (Levi, 1968). In Levi (2004), are included new records including one specific for Costa Rica, this represents the second record of the species. It is not a common species in collections and here the specimen came from a Malaise trap.

SPECIMENS EXAMINED. COSTA RICA, **Limón**, Sector Cocori, 50 km north of Cariari; DIC 1994; 100 m; 10:38:51N - 83:43:51W; collected by Elias Rojas #4525; 1 mature female (INBio).

Kapogea cyrtophoroides (F.O.P.- Cambridge, 1904)

Fig. 5a-b, 6.

DESCRIPTION. Posterior eye row straight. Coloration of female light orange-brown, anterior legs without bands, posterior with some dusty brown bands. Abdomen with humps located dorsally and with a pair of longitudinal zigzag white lines. Venter with white branches on a black area, extending from genitalia to spinnerets. Total length 12.9 mm; carapace 5.3 mm long.

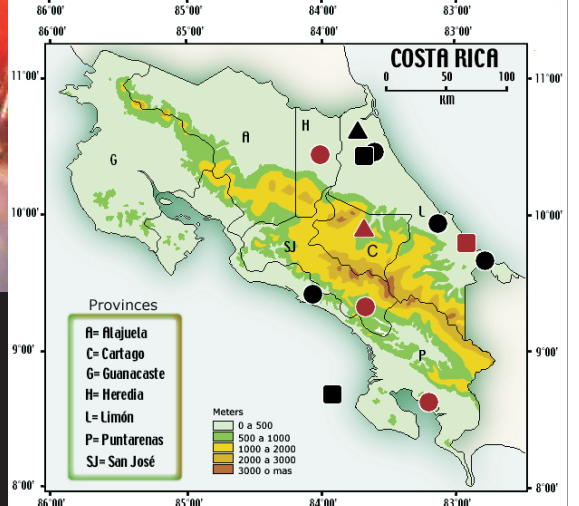
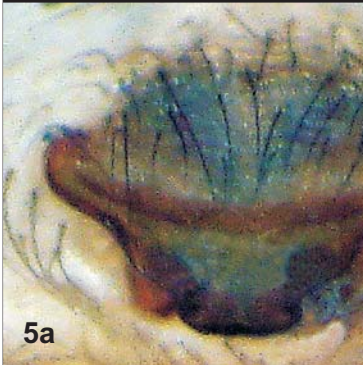
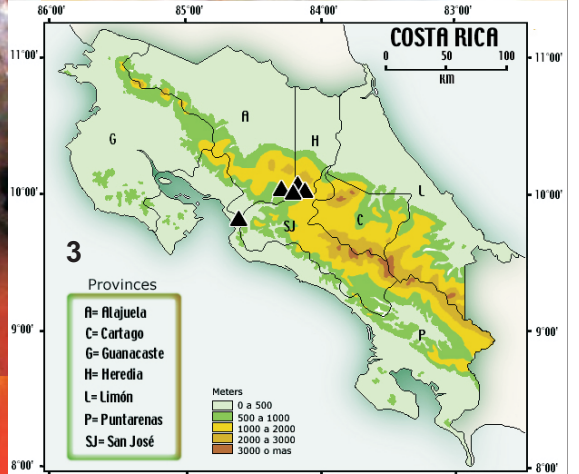
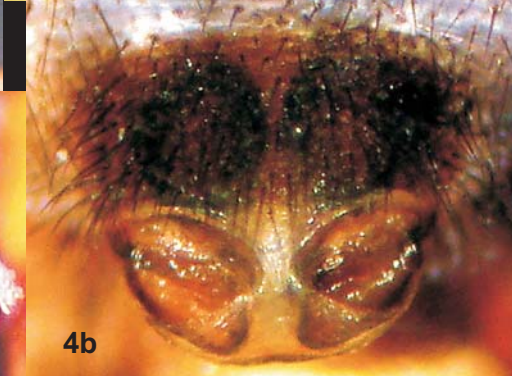
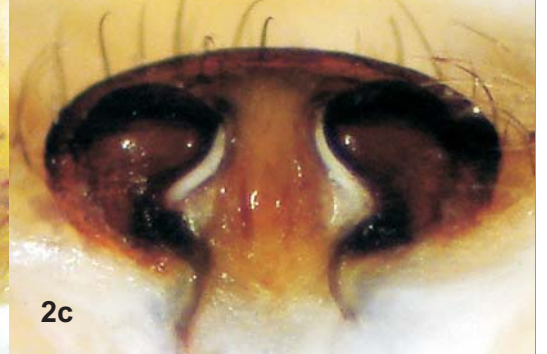
No male specimens were collected, but (Levi, 1997) described it as being dark colored, having legs with brown bands, an abdomen with a pair of jagged lines dorsally, and another pair of broken white lines ventrally.

VARIATION. The variation in total length of three female specimens was from 8.7 mm to 12.9 mm. Only the largest specimen had light bands on posterior legs; the other two did not. The dorsal zigzag white line was not clear or was dark brown colored in some specimens.

DISTRIBUTION IN COSTA RICA. Levi (1997) noted this species for La Selva, Heredia province, Quizarra, San José province, and also from 3 km NE of Golfito in Puntarenas province. This report adds new specimens from Hone Creek, Agua Fria and Fila Asunción, Limón province, and El Silencio, Puntarenas province. (Fig 7)

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Fig. 1. *Cyrtophora citricola*. A, Extensive covering of webbing on a cut off tree; B-C, adult female coloration, B, black; C, pale yellow. **Fig. 2.** *Cyrtophora citricola*. A, left male palpus; B-C, female genitalia B, ventral; C, posterior. **Fig. 3.** Records of *Cyrtophora citricola* in Costa Rica (triangles). **Fig. 4.** *Gea heptagon*. A, mature female; B-C, female epigynum; B, ventral; C, dorsal cleared. **Fig. 5. a-b:** *Kapogea cyrtophoroides*. a. female epigynum ventral; b. dorsal cleared; **c-d:** *Kapogea sellata*. c. female epigynum ventral; d. dorsal cleared. **Fig. 6.** Records of *Gea heptagon* (triangle), *Kapogea cyrtophoroides* (circles) and *Kapogea sellata* (squares) in Costa Rica.. Records from Levi (1997), appears more clear color.



NATURAL HISTORY. Female specimens were only collected by hand in small trees bordering trails and in webs on lianas in organic cacao plantations; only one male was collected beating cacao plants.

SPECIMENS EXAMINED. COSTA RICA, **Puntarenas**, Savegre, El Silencio, Cataratas; 22 June 2003; 74 m; 09:24:41N - 84:01:45W; collected manually by Carlos Viquez and M. Hernández. #74357; 1 juvenile female (INBio). **Limón**, Sector Agua Fría, on the banks of the Río Agua Fría. 2-4 October 1997; 10-20 m; 10:26:19N -83:34:51W; collected by Carlos Viquez. #47670 and 47671; 1 juvenile female and 1 mature female (INBio). Matama, Fila Asunción; 2 August 2003; 900 m; 13:41:24N -86:59:48W; collected manually by M. Aguirre. #74274, 1 juvenile female (INBio). Hone Creek, farm of Alberto Moore, parcel #3, Cacao-Cordia-banano; 12-15 March 2004; 10-20 m; 14:02:03N - 87:15:11W; collected manually by Carlos Viquez, 1 juvenile female (MPM); Same locality, 14-17 May 2004, 1 mature female (INBio). Same locality data, 4-7 June 2004, 1 mature female (MPM). Same locality data, 3 September 2004, transecto en mangos, 1 mature male (MPM).

***Kapogea sellata* (Simon, 1895)**

Fig. 5c-d, 6.

DESCRIPTION. Posterior eye row straight. General coloration of female, light yellow-brown, all legs with brown bands, anterior tibiae with a dark band distally. Abdomen without humps or longitudinal lines, with a dark patch interiorly framed by a white line; sides light medially. Venter similar to *K. cyrtophoroides*; sternum white medially and maxillae white distally. Total length 15.8 mm, carapace about 7 mm long. No males collected but Levi (1997) described it as dark brown with yellowish color between eyes and a pair of elongate patches behind eyes. Legs with first coxae and femora dark, other light, distal end of tibiae with wide brown rings (bands). Abdomen with anterior patch as in females.

VARIATION. Only one juvenile female was collected, but the colors are darker in general.

DISTRIBUTION. (Levi, 1997) recorded this species from Peshurst, Limón province; here are two more records, Agua Fría, Limón province and Isla del Caño, Puntarenas province (Fig 7).

COMMENTS. In Agua Fría, Limón province, it was collected sympatrically with the closely related *K. cyrtophoroides*.

SPECIMENS EXAMINED. COSTA RICA, **Limón**, Sector Agua Fría, orillas del Río Agua Fría. 2-4 October 1997; 10-20 m; 10:26:19N -83:34:51W; Carlos Viquez. #47671, 1 juvenile female (INBio). **Puntarenas**, Puesto en la Isla del Caño and around the archaeological site; 23-28 February 1998; 0-40 m; 10:19:55N -85:31:51W; #49479, 1 mature female (INBio).

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