

RARE SPIDERS OF THE GENUS *CYCLOCOSMIA* (ARACHNIDA: ARANEAE: CTENIZIDAE) FROM TROPICAL AND SUBTROPICAL CHINA

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ABSTRACT. – Two species of the ctenizid spider genus *Cyclocosmia* from tropical and subtropical China are diagnosed, described and illustrated. One of them, *Cyclocosmia latusicosta*, is found to be new to science. The relationships between all known species of the genus *Cyclocosmia* are discussed.

KEY WORDS. – Araneae, Ctenizidae, *Cyclocosmia*, new species, China

INTRODUCTION

Spiders of the genus *Cyclocosmia* Ausserer, 1871, are fascinating because their abdomen is abruptly truncated and ends in a hard, heavily sclerotized disc strengthened by series of raised ribs separated by narrow grooves (Gertsch & Platnick, 1975). The spiders usually live at steeply sloping banks of sandy clay, covered with moist leaf litter, where they dig 7-15 cm deep vertical burrows with a hinged door attached to the entrance. Like all other trapdoor spiders, *Cyclocosmia* leads an extremely sedentary existence. It is distinct in having developed a morphological defense to cope with intruders. When the spider retreats headfirst to the bottom of its burrow, the abdominal disc fits tightly against the round walls of the burrow and forms an impenetrable false bottom (Gertsch & Wallace, 1936; Gertsch & Platnick, 1975). Due to the successful camouflage of the trapdoor, *Cyclocosmia* is very difficult to find and collect, and therefore it is often considered as one of the rarest spiders.

Being a small genus of the family Ctenizidae, *Cyclocosmia* only comprises six named species worldwide (Platnick, 2005; Schwendinger, 2005): *C. truncata* (Hentz, 1841) and *C. torreyi* Gertsch & Platnick, 1975, in the USA, *C. loricata* (C. L. Koch, 1842) in Mexico and Guatemala, *C. ricketti* (Pocock, 1901) in China, *C. siamensis* Schwendinger, 2005, and *C. lannaensis* Schwendinger, 2005, in Thailand. Gertsch & Platnick (1975) revised the then known species of this genus and pointed out that the ribs and grooves of the abdominal disc, the number of setae on the seam of the disc, and the shape of the spermathecae are valuable characters for species discrimination. However, they found no significant differences in the male palps among three American species, but the male palps in the species from Thailand are distinct from each other (Schwendinger, 2005).

This study is a part of our research on the taxonomy and biogeography of Chinese mygalomorph spiders funded by the NSFC, in which mygalomorphs are considered as important objects for studies on biogeography and phylogeny. Spiders of the genus *Cyclocosmia* are interesting mygalomorphs with unique morphology and biology. In this study, two species of *Cyclocosmia* from tropical and subtropical China are reported and one of them is considered to be new to science.

MATERIALS AND METHODS

All measurements in this paper are in millimeters. Leg measurements are given as: total length (femur, patella, tibia, metatarsus, tarsus). Dissected epigynes were cleared in 10% KOH for approximately 15 minutes at room temperature of 18-25°C and then rinsed in distilled water. Abdominal rib counts follow Gertsch & Platnick (1975). SEM micrographs were taken on a KYKY 2800 scanning electron microscope. All specimens are deposited in the Museum of Hebei University, Hebei, China (MHBHU). The abbreviations used are: ALE – anterior lateral eyes, AME – anterior median eyes, PLE – posterior lateral eyes, PME – posterior median eyes, MOA – median ocular area.

TAXONOMY

Cyclocosmia Ausserer, 1871

Cyclocosmia Ausserer, 1871: 144 (Type species by monotypy: *Mygale truncata* Hentz, 1841); Gertsch & Platnick, 1975: 5.
Chorizops Ausserer, 1871: 144 (Type species by monotypy: *Actinopus loricatus* C. L. Koch, 1842); Roewer, 1942: 146;

Bonnet, 1956: 1078. First synonymized by Banks (1910), but removed from synonymy by Petrunkevitch (1911) and all subsequent authors until resynonymized by Gertsch & Platnick (1975).

Halonoproctus Pocock, 1901: 209 (Type species by monotypy: *Halonoproctus ricketti* Pocock, 1901). First synonymized by Simon, 1903.

Diagnosis. – *Cyclocosmia* can be easily distinguished from all other ctenizids by its distinctly truncate abdomen forming a caudal disc bearing ribs and grooves. Although two other

genera, *Galeosoma* and *Idiosoma* of the family Idiopidae, have similar abdominal form, they are not closely related to *Cyclocosmia*. These idiopid spiders possess eyes arranged in three rows rather than two, which is characteristic for ctenizids. In addition, the abdomen of the genus *Galeosoma* is abruptly truncate but bears no ribs or grooves, whereas that of the genus *Idiosoma* bears ribs or grooves but is only moderately truncate (Gertsch & Platnick, 1975).

Description. – See Gertsch & Platnick (1975).



Fig. 1. Abdomen of *Cyclocosmia ricketti* (Pocock, 1901), caudal view.

KEY TO CHINESE SPECIES OF *CYCLOCOSMIA*

1. Abdominal disc with 23-33 ribs on each side; an elevated central zone inside each of the upper muscle impressions absent; length of spermathecae less than one and a half times their width *Cyclocosmia ricketti*
- Abdominal disc with 20-23 ribs on each side; an elevated central zone inside each of the upper muscle impressions present; length of spermathecae two times their width *Cyclocosmia latusicosta*

***Cyclocosmia ricketti* (Pocock, 1901)**
(Figs. 1-2)

Halonoproctus ricketti Pocock, 1901: 209, pl. 21, fig. 1.

Cyclocosmia ricketti: Simon, 1903: 885, Figs. 1044-1047; Gertsch & Platnick, 1975: 18-19, Figs. 28, 29, 32, 36 (part); Chen & Zhang, 1991: 32, Fig. 25; Song, Zhu & Chen, 1999: 36, Figs. 16H, K-L (part); Schwendinger, 2005: 227, Figs. 2-8, pl. 1D.

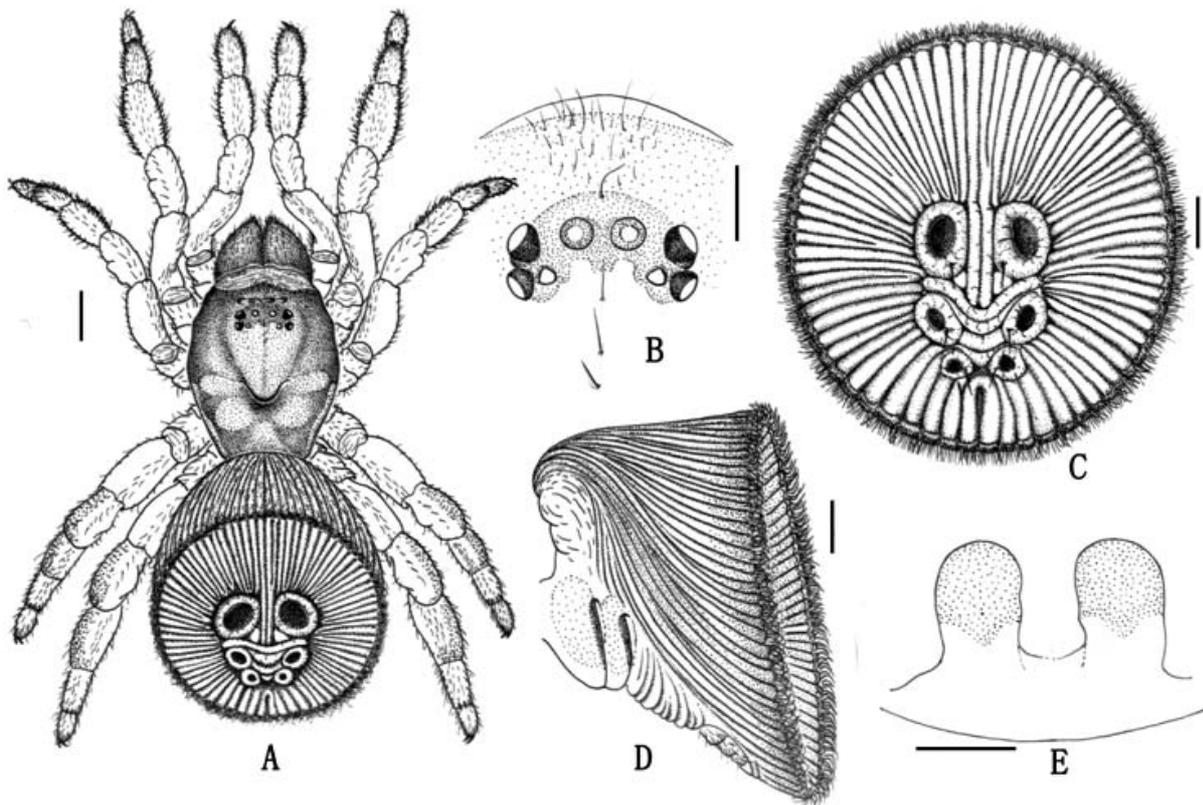


Fig. 2. *Cyclocosmia ricketti* (Pocock, 1901): A, habitus of female; B, ocular area, dorsal view; C, abdomen, caudal view; D, same, lateral view; E, spermathecae, dorsal view. Scale bars: A, B, E = 1.0 mm, C-D = 2.0 mm.

Material examined. – 1 female, Taishun, Zhejiang, China, coll. Z. F. Chen, Dec.1989.

Diagnosis. – *Cyclocosmia ricketti* differs from the American species of *Cyclocosmia* in the abdominal disc with 23-33 ribs on each side (Fig. 2C) and the parallel-sided spermathecae (Fig. 2E). It is similar to *Cyclocosmia latusicosta*, new species, in the shape of spermathecae, but can be distinguished from the latter by the length of spermathecae being less than one and a half times its width (Fig. 2E), abdominal disc with 23-33 ribs on each side, and an elevated central zone absent inside the upper pair of muscle impressions (Fig. 2C). It is also similar to *Cyclocosmia siamensis* Schwendinger, 2005 (Schwendinger, 2005: 231, Figs. 9-30, pl. 1C) in the shape of spermathecae, but differs from the latter in the upper and median pair of muscle impressions on opisthosomal disc separated by one transversal rib, all ribs lacking hairs with dark, short, cylindrical, upright proximal portion and light, long, flat, reclining distal portion, rib angles lacking bottlebrush-like bristles bent toward the centre (Fig. 2C).

Description of new female. Total length, including chelicerae, 25.83; chelicerae 4.32 long; carapace 11.07 long, 8.91 wide; abdomen 15.57 long, 15.30 wide.

Carapace (Fig. 2A) red-brown and smooth, with a few marginal hairs and a long bristle in front of ocular area, four long bent bristles in longitudinal row running through ocular area. Carapace curved in front and straight behind, widest at coxae II. Ocular area black, with a black band in front of fovea and beside ocular area respectively. Cervical groove and radial furrows distinct. Fovea deep and procurved, U-shaped, its greatest width occupying one fourth of carapace width at that point.

Eyes (Fig. 2B) set on low tubercle, ocular area 1.00 long, 2.43 wide anteriorly, 2.43 wide posteriorly, occupying two fifths of carapace width at that point. Clypeus height 1.46. Anterior eye row straight and posterior eye row recurved, both rows almost equal in length. Ratio of eyes, ALE: AME: PLE: PME (0.53: 0.45: 0.40: 0.25). ALE-AME 0.30, AME-AME 0.20, PLE-PME 0.08, PME-PME 1.18. MOA 0.91 long, 1.10 wide in front, 1.68 wide at back.

Chelicerae red-brown, inner margin with 11 teeth, outer margin with nine teeth and 15 denticles between them. Rastellum raised on prominent angled projection and consisting of many short black teeth. Labium yellow-brown, 1.56 long, 2.28 wide, with three black cuspules anteriorly. Maxilla yellow-brown, 4.50 long, 2.61 wide, armed with 15 black cuspules at base. Sternum yellow-brown, 6.75 long, 6.30 wide, with numerous long black setae, two pairs of small round sigilla near margin opposite coxae I and II, and a pair of large, irregularly outlined posterior sigilla. Palpal patella with one proventral distal spine.

Legs yellow-brown, with tibiae, metatarsi and tarsi darker in color, short and stout, with erect setae ventrally. Tibiae and tarsi of pedipalps, and tibiae, metatarsi and tarsi of legs I and II with numerous horn-like spines, metatarsus III with a few short dorsal and two ventral spines, tarsus III with a few dark spines prolaterally and ventrally, metatarsus IV with four short spines. Paired claws with a single large tooth, unpaired claw lacking tooth. Pedipalp with single claw bearing one tooth. Measurements of legs: I 21.15 (7.20, 4.14, 4.23, 3.60, 1.98), II 18.09 (5.85, 4.05, 3.15, 3.06, 1.98), III 17.46 (5.58, 4.23, 2.52, 2.97, 2.16), IV 22.32 (6.21, 5.40, 4.23, 4.14, 2.43). Leg

formula: 3214. Tibia I 1.98 wide, tibia II 1.98 wide, tibia III 2.25 wide, tibia IV 2.25 wide.

Abdomen (Fig. 2C-D) funnel-shaped and dark yellow-brown. Caudal disc slightly concave, 13.95 in transversal diameter and 15.30 in longitudinal diameter, with two ribs running dorsoventrally and 32/33 radiating ribs on each side; each rib angle with 25 or more bristles. Abdominal disc with six well-marked muscle impressions. Four spinnerets, with inner pair small and one-segmented, and outer pair much longer and three-segmented. Two spermathecae (Fig. 2E), sack-like, parallel-sided, each one with a length less than one and a half times its width.

Male. Unknown.

Distribution. – China (Fujian, Hunan, Zhejiang, Sichuan).

Remarks. – Song *et al.* (1999: 36, Figs. 16H, K-L, pl. 1A-B) provided the illustrations of *Cyclocosmia ricketti* basing on a female specimen collected from Zhangjiajie, Hunan Province, China (drawn by Mr. J. F. Wang). However, the drawing of the disc (Song *et al.*, 1999: Fig. 16L) was copied from Gertsch & Platnick, 1975: Fig. 29, and it showed to be *C. siamensis*.

Cyclocosmia latusicosta, new species (Figs. 3-6)

Holotype. – Female, Aidian Village (21°49'N 107°18'E), Ningming County, Guangxi, China, coll. M. S. Zhu, J. X. Zhang and F. Zhang, 25 Aug.2004.

Paratypes. – 4 females, same data as for the holotype.

Diagnosis. – The new species is similar to *Cyclocosmia ricketti*, especially in the shape of its spermathecae, but differs from the latter by the spermathecae being two times longer than wide (Figs. 6F-J), abdominal disc with 20/23 ribs on each side, and each upper muscle impression with an elevated central zone (Fig. 6B). It is also similar to *Cyclocosmia siamensis* Schwendinger, 2005 (Schwendinger, 2005: 231, figs. 9-30, pl. 1C) in the shape of spermathecae, but differs



Fig. 3. Burrow entrance and trapdoor of *Cyclocosmia latusicosta*, new species.

from the latter in the upper and median pair of muscle impressions on opisthosomal disc separated by one transversal rib, all ribs lacking hairs with dark, short, cylindrical, upright proximal portion and light, long, flat, reclining distal portion, abdominal disc with 20-23 ribs on each side, and each upper muscle impression with an elevated central zone (Fig. 6B).

Description. – **Female.** Holotype total length, including chelicerae, 33.56; chelicerae 4.50 long; carapace 12.78 long, 11.25 wide; abdomen 17.20 long, 16.38 wide.

Carapace black-brown and smooth, with a few hairs and four long bent bristles in longitudinal row running through ocular area. Carapace curved in front and straight behind, widest at coxae III. Ocular area darker in color. Cervical groove and radial furrows distinct. Fovea deep and procurved, U-shaped, its greatest width occupying one fifth of carapace width at that point.

Eyes (Fig. 6A) set on low tubercle, ocular area 1.25 long, 3.06 wide anteriorly, 3.09 wide posteriorly, occupying one third of carapace width at that point. Clypeus height 1.80. Anterior eye row straight and posterior eye row slightly recurved, both rows subequal in width. Ratio of eyes, ALE: AME: PLE: PME (0.75: 0.51: 0.54: 0.37). ALE-AME 0.40, AME-AME 0.27, PLE-PME 0.08, PME-PME 1.39. MOA 1.05 long, 1.29 wide at front, 2.19 wide at back.

Chelicerae (Fig. 6E) black-brown, inner margin with 10-12 teeth of different size, outer margin with eight or nine large teeth and 23 denticles between them. Rastellum raised on prominent angled projection and consisting of many short black teeth. Labium dark red-brown, 2.16 long, 2.52 wide, with three black cuspules anteriorly. Maxilla dark red-brown, 5.40 long, 3.15 wide, armed with 12-17 cuspules at base and many small cuspules in anterior part. Sternum red-brown, 7.47 long, 7.56 wide, with numerous long black setae, two pairs of small round sigilla near margin opposite coxae I and II, and a pair of large indistinctly outlined posterior sigilla. Palpal patella with one proventral distal spine.



Fig. 4. Abdomen of *Cyclocosmia laticosta*, new species, paratype, caudal view.

Legs black-brown, short and stout, with erect setae and hairs ventrally. Legs III and IV distinctly thicker and stronger than legs I and II. Tibiae and tarsi of pedipalps and tibiae, metatarsi and tarsi of legs I and II with numerous horn-like spines, metatarsus and tarsus III with a few scattered spines dorsally and ventrally, metatarsus IV with several small spines at tip. Paired claws with a single large tooth, occasionally accompanied by a denticle, unpaired claw lacking tooth. Pedipalp with single claw bearing one tooth. Measurements of legs: I 22.95 (8.55, 4.95, 4.14, 3.60, 1.71), II 21.60 (7.65, 4.50, 3.51, 3.69, 2.25), III 20.88 (6.03, 4.95, 3.42, 3.78, 2.70), IV 27.27 (7.29, 5.58, 4.50, 6.93, 2.97). Leg formula: 3214. Tibia I 2.52 wide, tibia II 2.25 wide, tibia III 2.97 wide, tibia IV 2.88 wide.

Abdomen (Figs. 6B-D) dark yellow-brown, with crescent-shaped sclerite posterior to spinnerets and anus not connected to ventral median rib angle. Caudal disc convex, with two ribs running dorsoventrally and 20/23 radiating ribs on each side; ribs wide and grooves deep; each rib angle distinctly elevated carrying 46-52 long and smooth bristles and a few bottlebrush-like bristles rising from inner surface of rib angle and bent towards disc center. All ribs with many granular structures in different size (Fig. 4). Abdominal disc with six well-marked muscle impressions, the upper pair with an elevated central zone connected to the outer rim of each of these muscle impressions, and separated from median pair by only one transversal rib, second (lower) transversal rib wide, running into upper portion of ring around median muscle impression. Disc surface with only three pairs of bristles on the rims of muscle impressions. Four spinnerets, with inner pair small and one-segmented, and outer pair much longer and three-segmented. Two sack-like, parallel-sided spermathecae (Fig. 6F), each one almost two times longer than wide.

Male. Unknown.

Etymology. – Latin: latus = wide; Latin: costa = rib.

Variation. Measurements and rib counts (females, n=5): Body length: 33.03-33.56, carapace length 12.78-13.50, width 11.25-12.24; rib counts 20-23 (20/21, 21/20, 21/21, 22/21, 20/23). Spination of patellae: One female possesses one proventral spine on its right palpal patella, two proventral spines on the other palpal patella. Another female has one proventral spine on its right palpal patella, and none on the other palpal patella. Other specimens are the same as holotype. Labium with 2-3 cuspules.

Burrow. Burrows found at a sloping earth bank with moist leaf litter were about 16 cm in depth and 22 mm in diameter, narrowed near the bottom. The hinged entrance door was 32 mm in diameter, made of moss, earth and silks. The inside of the burrow was lined with a thin silk layer (Fig. 3).

Distribution. – Known only from the type locality in southeastern China, near the border to Vietnam.

DISCUSSION

According to the shape of spermathecae, the two Chinese species of the genus *Cyclocosmia* (*C. ricketti* and *C. latusicosta*, new species) and one of the Thailand species (*C. siamensis*) seem to be more primitive than the other Thailand species (*C. lannaensis*) and the three American species (*C. truncata*, *C. torreya* and *C. loricata*) because their spermathecae are simple and parallel-sided, whereas the spermathecae of the latter are more complex. Among the four Asian species, *C. ricketti* and *C. latusicosta*, new species, from China are more closely related because their ribs of disc are smooth and lack setae. *C. lannaensis* is more derived than the other three Asian species due to its medially constricted spermathecae with knob-shaped apices, and its ribs of disc

with many knob-like tubercles. Although the shape of spermathecae of *C. lannaensis* is similar to the American species *C. loricata*, it seems to be more closely related to the other Asian species than the American species, because its apices of spermathecae are round but not “T”-shaped as *C. loricata*. Among the American species, *C. truncata* and *C. torreya* from the USA seem to be more closely related to each other. As Gertsch & Platnick (1975) pointed out, their spermathecae are so similar that it is very difficult to distinguish them on the basis of genitalic characters alone. The distribution and relationship of these seven species suggest that this genus already existed before the splitting of Laurasia, and that the Asian and American species were later geographically separated.

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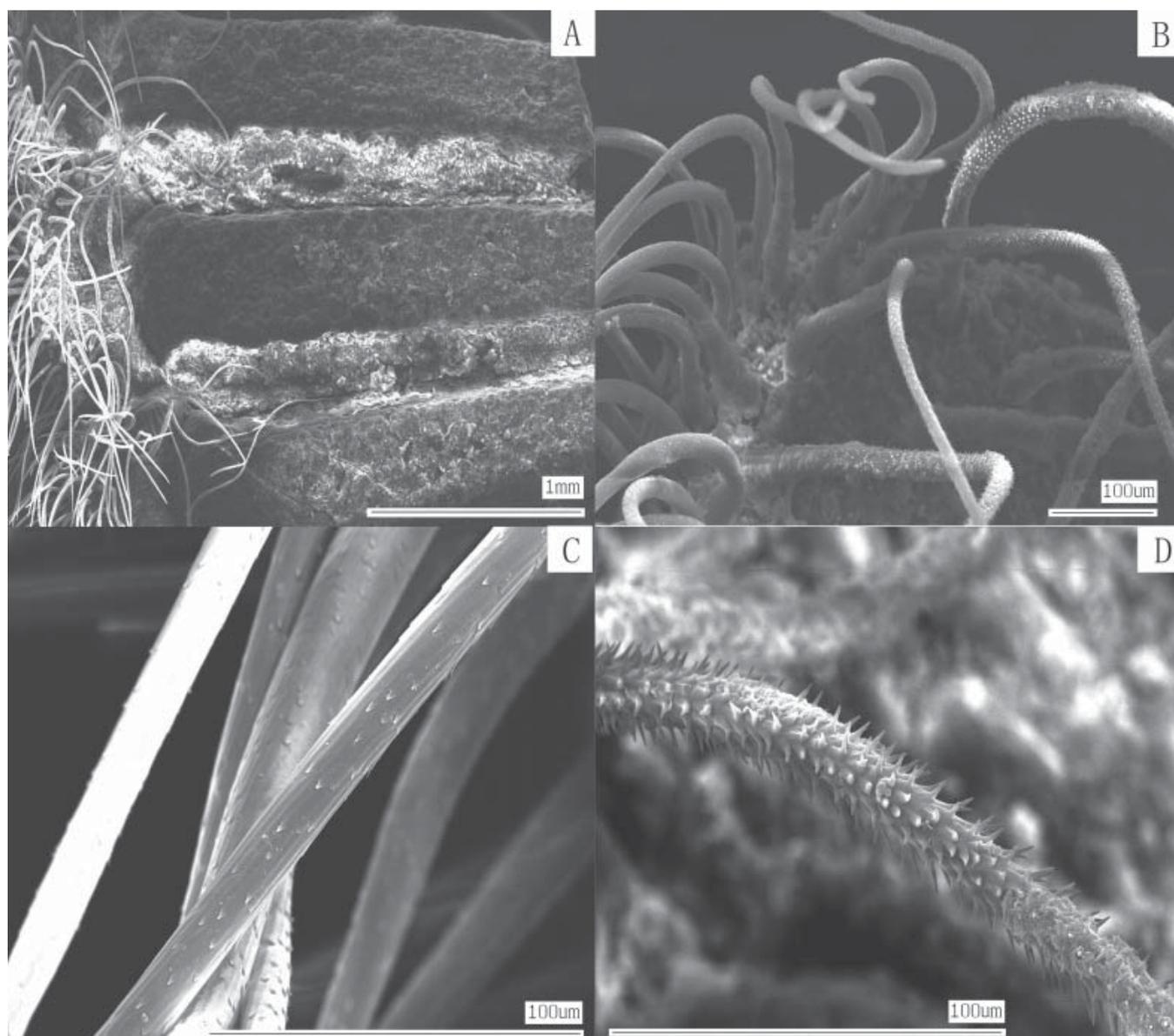


Fig. 5. *Cyclocosmia latusicosta*, new species, paratype (SEM micrographs). A, detail of ribs; B, detail of inner side of rib angles showing two kinds of bristles; C, detail of long and smooth bristles; D, detail of bottlebrush-like bristles.

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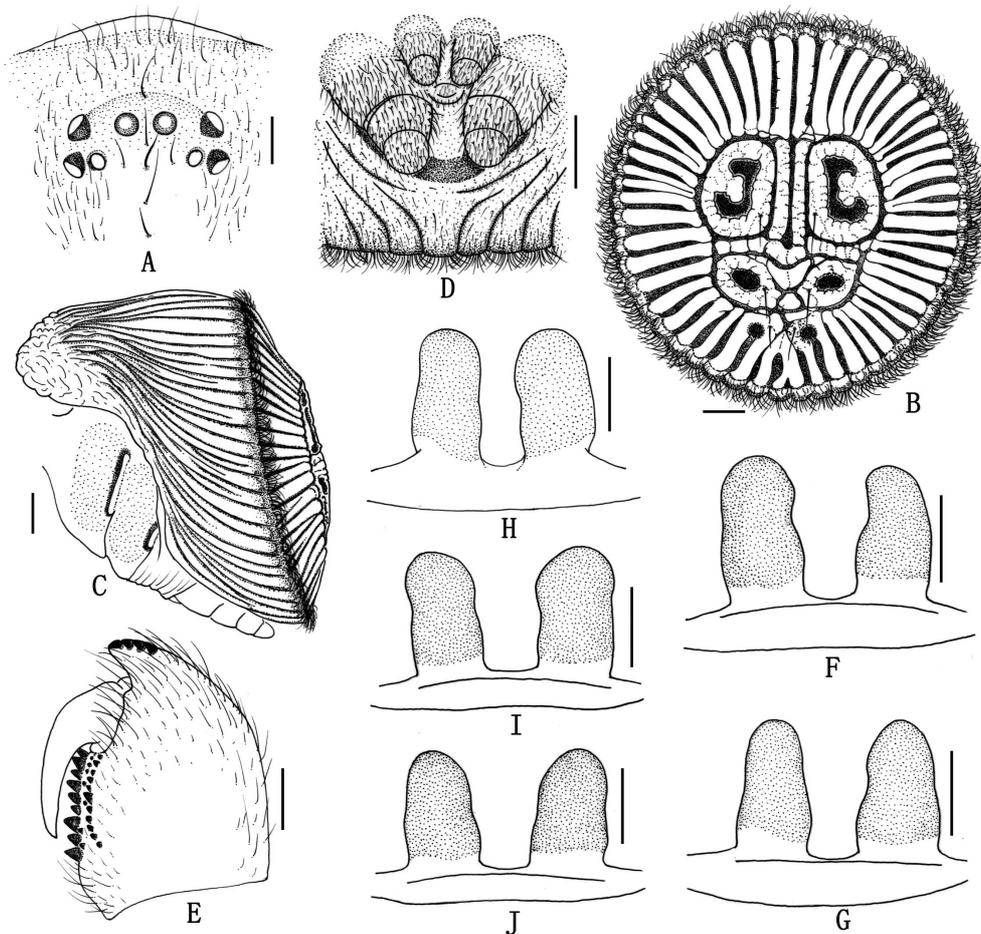


Fig. 6. *Cyclocosmia latusicosta*, new species. A, ocular area, dorsal view, holotype; B, abdomen, caudal view, holotype; C, same, lateral view, holotype; D, posterior portion of opisthosoma, ventral view, holotype; E, left chelicera, prolateral view, holotype; F-J, spermathecae, dorsal view: F, holotype; G-J, paratypes. Scale bars: A, F-J = 1.0 mm, B-E = 2.0 mm.