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A Revision of the Trapdoor Spider Genus *Cyclocosmia* (Araneae, Ctenizidae)

WILLIS J. GERTSCH[1] AND NORMAN I. PLATNICK[2]

ABSTRACT

The four known species of *Cyclocosmia* are diagnosed and described; all are characterized by a caudally truncate abdomen terminating in a heavily sclerotized disc that functions as a false bottom when the spider retreats headfirst to the base of its burrow. The species have similar genitalia but can be distinguished by details of the abdominal sculpturing and setation. *Cyclocosmia truncata* (Hentz) is redescribed for the first time on the basis of topotypical specimens of both sexes, and is recorded from Tennessee, northern Alabama, and northwestern Georgia. Specimens from southwestern Georgia and northern Florida formerly placed as *truncata* are assigned to *C. torreya*, new species. The Mexican genus *Chorizops* Ausserer is placed as a junior synonym of *Cyclocosmia*, and the male of its type species, *Cyclocosmia loricata* (C. L. Koch), described for the first time. The Chinese species *Cyclocosmia ricketti* (Pocock) is newly recorded from Thailand.

INTRODUCTION

The genus *Cyclocosmia* includes some of the most fascinating of all spiders. Like all trapdoor spiders, they lead an extremely sedentary existence, seldom venturing out of their permanent burrows (Buchli, 1969). They are thus particularly vulnerable to any predator or parasite that succeeds in locating and entering a burrow. In addition to camouflaging the trapdoor by incorporating bits of the surrounding leaf litter into its outer surface, most trapdoor spiders have developed behavioral defenses to cope with intruders: some keep a tight grip on the trapdoor; others dig a side chamber off the main burrow and close the side chamber with a second trapdoor (Gertsch and Wallace, 1936). *Cyclocosmia*, however, have developed a morphological defense; their abdomen is abruptly truncated (figs. 1-4) and ends in a hard, heavily sclerotized disc (fig. 5) strengthened by a series of raised ribs separated by narrow grooves and converging toward six muscle impressions (figs. 15-20). 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 (figs. 6-8).

Two other genera of trapdoor spiders have similarly phragmotic abdomens. In the African genus *Galeosoma* the abdomen is also abruptly

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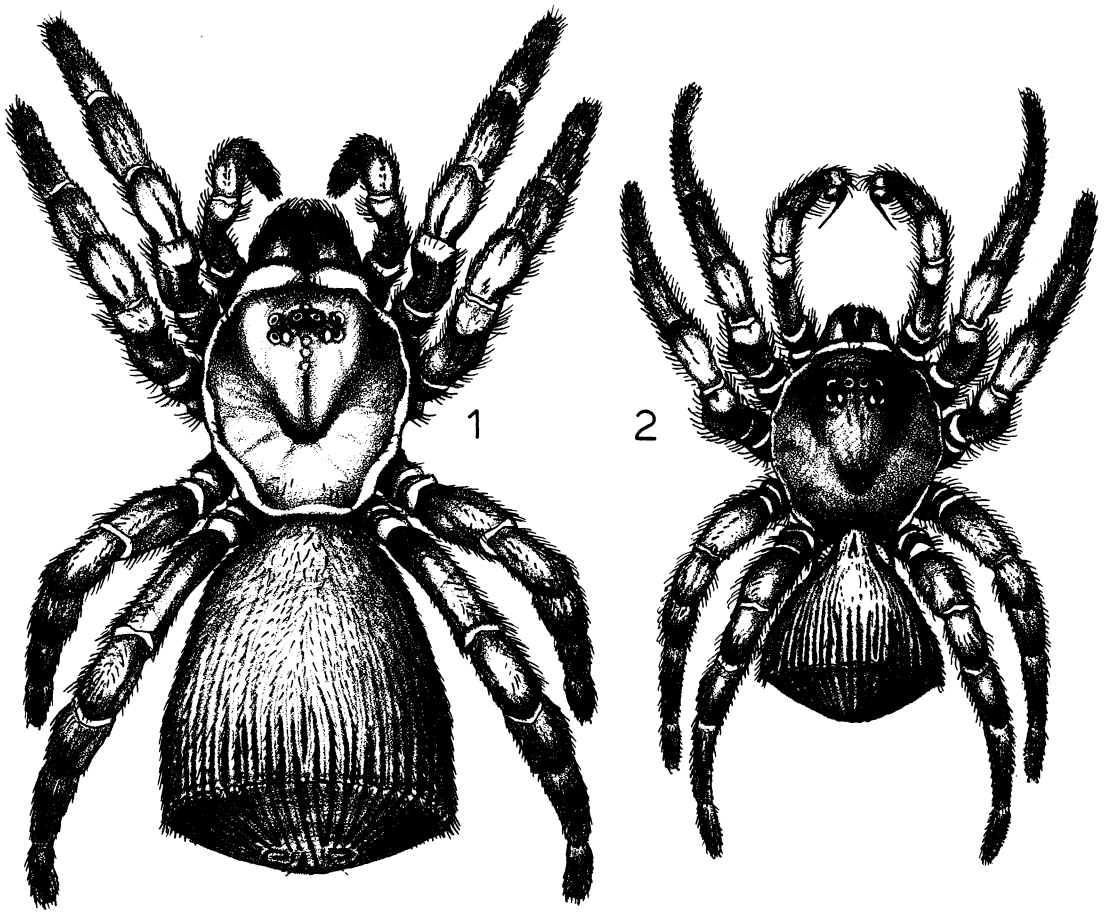
truncated, but bears no ribs or grooves; Hewitt (1913) illustrated *G. schreineri* in defensive position at both the top and middle of its burrow, and described the success of the abdominal disc in warding off an attack by a pompilid wasp. In the Australian genus *Idiosoma* the abdomen is only subtruncate, but does bear ribs and grooves; Main (1957) photographed *I. nigrum* upside down in its burrow with the abdomen forming a false bottom, but she also found a wasp pupa in one burrow. Main (1952) noted that when burrows of *I. nigrum* are opened some spiders assume the phragmotic position and some an aggressive position with their fangs open. Thus it may be that the parasite is successful when the spider attempts to deal aggressively with it instead of retreating and utilizing its morphological defense. Neither *Galeosoma* nor *Idiosoma* is closely related to *Cyclocosmia*, however; in the former genera the eyes are in three rows rather than two (a character given great weight in ctenizid classification), and the caudally truncate abdomen has apparently evolved independently in each case. *Cyclocosmia*, found in southern North America and eastern Asia, seem to be related instead to *Ummidia* and other American forms with unmodified abdomens.

Cyclocosmia are also of interest because of their relative rarity. In the United States specimens were seldom if ever collected between the time of the initial description of *C. truncata* in 1841 and the discovery of a population in Torreya Ravine, Liberty County, Florida, in 1933. As a result, *Cyclocosmia* have often been regarded as the rarest of North American spiders. Recent collections indicate that this supposed rarity is due to both the rather narrow ecological tolerances of the spider and to the extremely effective camouflage of the trapdoor. In the southeastern United States *Cyclocosmia* seem to be restricted to steeply sloped banks of sandy clay soil covered with moist leaf litter. Most specimens have been taken from 7-15 cm. deep vertical burrows in stream and river banks. Like many mygalomorphs, *Cyclocosmia* are very long-lived; specimens have survived more than 12 years in captivity (R. E. Wheeler, *in litt.*). As a result of this longevity and their apparently rather limited dispersal capabilities, many spiders are often found together in very small but ecologically suitable areas, and enough specimens have now accumulated in collections to make the present study feasible.

Cyclocosmia were formerly known only from females, and the descriptions below of the males of three species provide several significant details. Males resemble females in having caudally truncated abdomens, although in most cases the disc is convex rather than flat (fig. 10); this convexity may not arise until the males mature, at which time they apparently abandon their burrows and search for females. It should be pointed out, however, that very young spiderlings collected from the burrows of female *C. truncata*, and presumably belonging to that species, have normal, rounded abdomens lacking ribs and grooves; thus a study of the postembryonic development of the caudal truncature would be of great interest. Although female *Cyclocosmia* have no leg scopulae, and the absence of scopulae has been used to identify the genus in keys (Kaston, 1972), males have dense scopulae on all their tarsi. Males also have a series of ridges on their carapace not found in females, as well as far fewer denticles between the promarginal and retromarginal rows of cheliceral teeth.

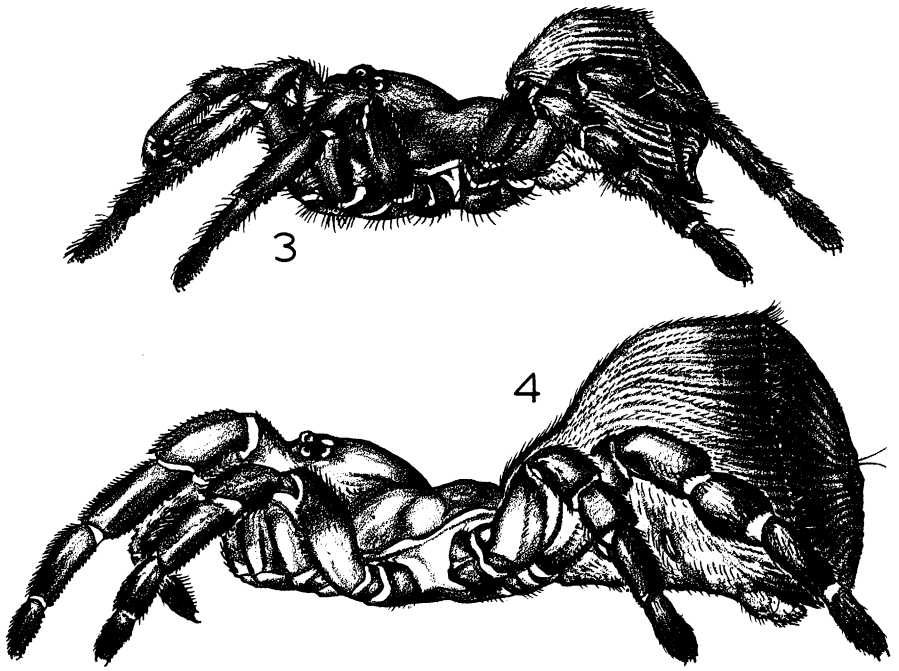
As is frequently the case in mygalomorph spiders, the relatively simple genitalia offer few characters of value for species discrimination. No significant differences were found among the palpi of the three species in which males are known. The spermathecae do show some interspecific differences (figs. 25-28), but it would be difficult to distinguish *C. truncata* and *C. torreya*, for example, on genitalic characters alone. Fortunately both the sculpturing and setation of the abdomen provide reliable characters. Each abdominal rib bears at the seam of the disc a characteristic number of long stiff setae; the number varies from as few as one (male *truncata*) to more than 25 (female *ricketti*). The number of abdominal ribs is also a useful character, although two sources of variation make obtaining a standard count difficult. Some of the ribs bifurcate at various points, so that counts taken from the side of the abdomen, at the seam of the abdominal disc, or at the center of the disc will not agree. Further, the ribs have a tendency to converge and coalesce near the bottom of the disc. To eliminate this variation, all rib counts



FIGS. 1, 2. *Cyclocosmia truncata* (Hentz), dorsal views. 1. Female. 2. Male.

used below were taken at the seam of the abdominal disc in the following manner. There are always two ribs running dorsoventrally on both sides of the midline between the four most dorsal muscle impressions, as well as a few ribs running transversely between the four most ventral muscle impressions (figs. 9, 12). Our counts include only the ribs on one side between (and including) the first rib not directly bordering on the dorsoventral midline and the last rib which connects transversely across the disc. This rib count varies from as few as 18 (male *loricata*) to as many as 33 (female *ricketti*) on each side. It should also be pointed out that the descriptions of eye patterns are based on the dimensions and arrangement of the complete eye tubercles, not of the light-colored portions of the lenses only (figs. 33-36).

Some information on the relationships of the known *Cyclocosmia* is provided by the spermathecae; those of the Oriental species *ricketti* seem to be the most primitive, and those of *loricata* intermediate between the simple, smooth-sided form of *ricketti* and the more complex T-shaped structures of *truncata* and *torreya*. If *ricketti* is the most primitive of the four species, there have been decided trends toward reduction in both the number of abdominal ribs (lowest in *loricata*) and the number of setae on each rib angle (lowest in *truncata*). The expanded



FIGS. 3, 4. *Cyclocosmia truncata* (Hentz), lateral views. 3. Male. 4. Female.

eye pattern and the emargination on the third tibia in *loricata* indicate that the Mexican population has been isolated for a relatively long period, whereas the absence of conspicuous rib angles in *truncata* is apparently a derived character of more recent origin. The distribution of the genus is not unique among mygalomorph spiders; *Antrodiaetus* (Antrodiaetidae) is similarly distributed in North America and eastern Asia (Coyle, 1971).

We must acknowledge first the numerous individuals who have sought for, collected, and donated specimens of *Cyclocosmia* over a period of many years; their names are cited in the material examined sections below. We are indebted to the late Alma W. Froederstrom and to Dr. Mohammad U. Shadab of the American Museum of Natural History for providing illustrations, and to Drs. H. K. Wallace and R. E. Wheeler for the use of their photographs. We thank especially Mr. F. R. Wanless of the British Museum (Natural History) and Dr. M. Moritz of the Zoologisches Museum an der Humboldt-Universität zu Berlin for the loan of types from those institutions. The scanning electron micrographs were obtained with the help of Mr. R. J. Koestler of the American Museum of Natural History on a Cambridge Scientific Instruments Model S-4 purchased with the aid of a grant from the National Science Foundation.

ABBREVIATIONS

AMNH, the American Museum of Natural History
BMNH, British Museum (Natural History), Mr. F. R. Wanless
CARB, personal collection, Dr. A. R. Brady
CHKW, personal collection, Dr. H. K. Wallace
CRHH, personal collection, Dr. R. H. Hunt
CWAS, personal collection, Dr. W. A. Shear
FSCA, Florida State Collection of Arthropods, Dr. H. V. Weems, Jr.
MCZ, Museum of Comparative Zoology, Dr. H. W. Levi
MNHN, Muséum National d'Histoire Naturelle, Dr. M. Hubert
USNM, National Museum of Natural History, Smithsonian Institution, Dr. R. E. Crabill, Jr.

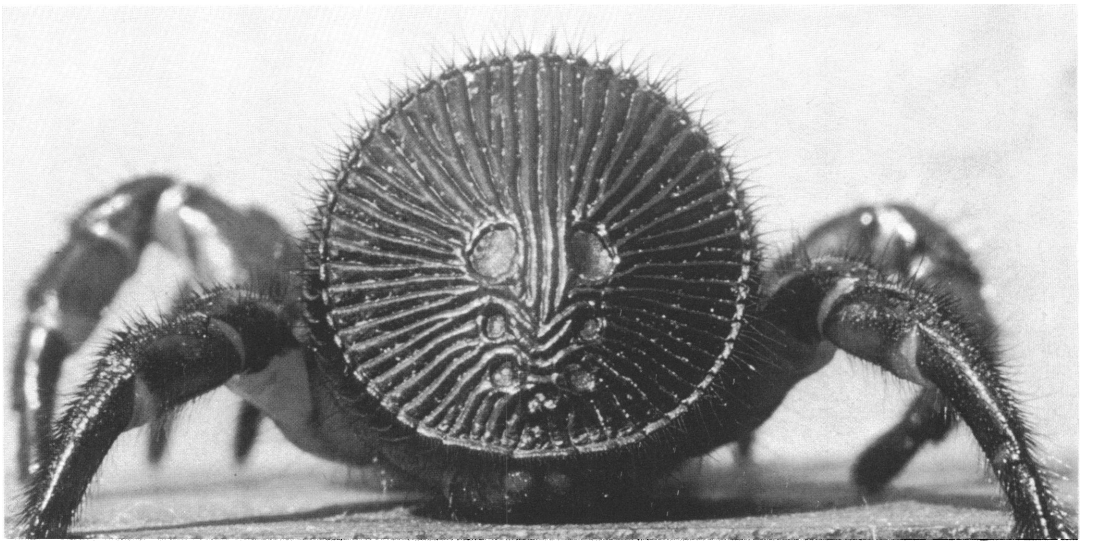


FIG. 5. *Cyclocosmia torreya*, new species, posterior view. Photograph by H. K. Wallace.

ZMB, Zoologisches Museum an der Humboldt-Universität zu Berlin, Dr. M. Moritz

CYCLOCOSMIA AUSSERER

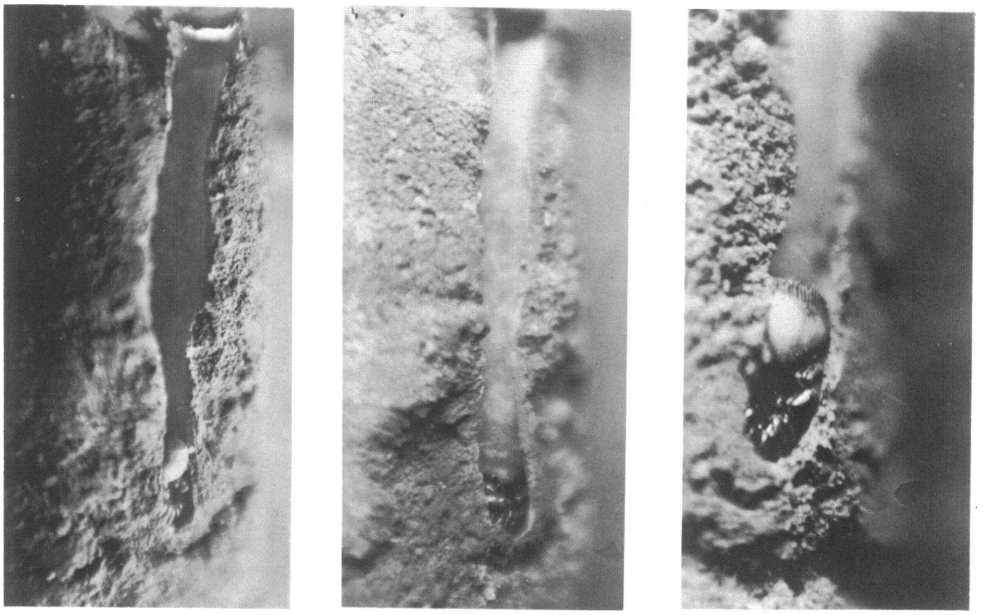
Cyclocosmia Ausserer, 1871, p. 144 (type species by monotypy *Mygale truncata* Hentz). Roewer, 1942, p. 146. Bonnet, 1956, p. 1305.

Chorizops Ausserer, 1871, p. 144 (type species by monotypy *Actinopus loricatus* C. L. Koch). Roewer, 1942, p. 146. Bonnet, 1956, p. 1078. [First synonymized by Banks (1910) but removed from synonymy by Petrunkevitch (1911) and all subsequent authors.] NEW SYNONYMY.

Halonoproctus Pocock, 1901, p. 209 (type species by monotypy *Halonoproctus ricketti* Pocock; first synonymized by Simon, 1903).

Diagnosis. Cyclocosmia may be distinguished from all other ctenizids by the combined presence of two eye rows (figs. 33-36) and a caudally truncated abdomen bearing ribs and grooves (figs. 1-4). Comparisons with the genera *Galeosoma* and *Idiosoma* can be found above.

Description. Carapace of females smooth, shining, of males reticulated, with dull luster, clothed sparsely with hairs and weak setae; thoracic groove deep, procurved, U-shaped, situated behind middle of length; clypeus broad, flat, equal in width to at least length of ocular tubercle. Eye tubercle low, nearly twice as broad as long; anterior eye row straight to moderately recurved, with eyes subequidistantly spaced; posterior eye row gently recurved, with median eyes widely separated, nearly touching lateral eyes. Sternum with six sigilla; small round sigilla opposite first and second coxae distinct; large median pair of sigilla evident but indistinct. Labium with few spinules at tip. Maxilla of female with heavy basal spinules and smaller ones along prolateral margin below, of male with few weak spinules at base. Chelicerae robust, with conspicuous, spinose rastellum and subequal series of teeth on both margins. Leg formula of females 4123, of males 4123 or 1423. Legs of female short, stout, heavily spinose; all legs lacking scopulae; tibia of third leg sometimes with dorsal emargination; pedipalp and first two pairs of legs armed on lateral surfaces of distal segments with series of rasping spinules. Legs of male longer, less spinose; tarsi with scopulae; tibia of third leg sometimes with dorsal emargination; first and second legs smooth, with few spines on lateral surfaces, without accessory spines or coupling spurs. Abdomen large, subcylindrical, abruptly truncated behind, coriaceous, provided with numerous sclerotized ribs



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FIGS. 6-8. *Cyclocosmia truncata* (Hentz) in defensive position at base of exposed burrows; note trapdoor at top of burrow (fig. 6) and close fitting of the abdominal disc against the burrow walls (figs. 7, 8). Photographs by R. E. Wheeler.

and narrow grooves; caudal truncature circular or suboval, with interrupted margins set with setae.

Synonymy. Although *loricata* has a slight dorsal emargination on the third tibia not found in *truncata* or *torreya*, as well as a slightly more expanded eye arrangement, the synapomorphies in the shape, sculpturing, and setation of the abdomen indicate that maintenance of a separate genus for *loricata* is unwarranted. Although *Chorizops* has page priority over *Cyclocosmia*, Banks (as first reviser) chose the latter name.

KEY TO SPECIES OF *CYCLOCOSMIA*

1. Abdomen with 33 ribs on each side (fig. 29; see Introduction for method of counting); upper abdominal rib angles each bearing 25 or more setae forming a dense fringe (fig. 32); Asia . . . . . *ricketti*
   Abdomen with 24 or fewer ribs on each side; upper abdominal rib angles each bearing 18 or fewer setae; North America 2
2. Abdominal rib angles not protruding from seam of abdominal disc (figs. 16, 17); abdomen with 24 ribs on each side (fig. 9) . . . . . *truncata*
   Abdominal rib angles protruding from seam of abdominal disc (figs. 18, 19); abdomen with 22 or fewer ribs on each side 3
3. Abdomen with 22 ribs on each side (fig. 12); upper abdominal rib angles of females each bearing seven or fewer setae; southeastern United States . . . . . *torreya*
   Abdomen with 18 to 20 ribs on each side (fig. 31); upper abdominal rib angles of females each bearing 10 or more setae; eastern Mexico . . . . . *loricata*

Cyclocosmia truncata (Hentz)

Figures 1-4, 6-10, 13-17, 21, 25, 33

Mygale truncata Hentz, 1841, p. 41 (female holotype from Alabama, no specific locality, in Boston Society of Natural History, destroyed); 1842, p. 55, pl. 7, fig. 1.

Cyclocosmia truncata: Ausserer, 1871, p. 145. Roewer, 1942, p. 146. Bonnet, 1956, p. 1305.

Note. Gertsch and Wallace (1936, pp. 6-12)

described and in several places (pp. 6, 10; legend to fig. 11) referred to a female neotype of this species. Ten specimens from two localities in Florida were available to them; as they nowhere indicated which specimen was to serve as the neotype, this designation must be regarded as invalid. This is fortunate, as it is now apparent that the Florida specimens do not belong to *truncata*.

Diagnosis. *Cyclocosmia truncata* may be distinguished from the other known *Cyclocosmia* by the abdominal rib angles not protruding from the seam of the abdominal disc (figs. 15-17) and by the presence of 24 ribs on each side of the abdomen (fig. 9).

Female (Nashville, Tennessee). Total length, including chelicerae, 30 mm. Carapace dark mahogany brown, shining, with dusky bands defining pars cephalica and dusky streaks radiating from thoracic groove; eye tubercles black; conjunctival membranes pearly white, margining entire carapace. Chelicerae dark mahogany brown, grading to black at apex; fangs black. Underside of cephalothorax light mahogany brown, with sclerotized elements set in pearly white conjunctival membranes. Legs mahogany brown, darkest dorsally. Abdomen brown at base, with caudal truncature black; venter and spinnerets light brown.

Carapace 8.5 mm. long, 8.0 mm. wide, smooth, with few fine black hairs around margins, median row of black setae in ocular area, and three curved setae at center of clypeal margin. Carapace only gently curved in front, broadly rounded at sides, widest at coxae II, straight behind; pars cephalica highest at eye group, quite evenly convex; thoracic groove deep, procurved U-shaped fissure, equaling at greatest width two-sevenths of carapace width at that point, situated back about five-eighths of carapace length.

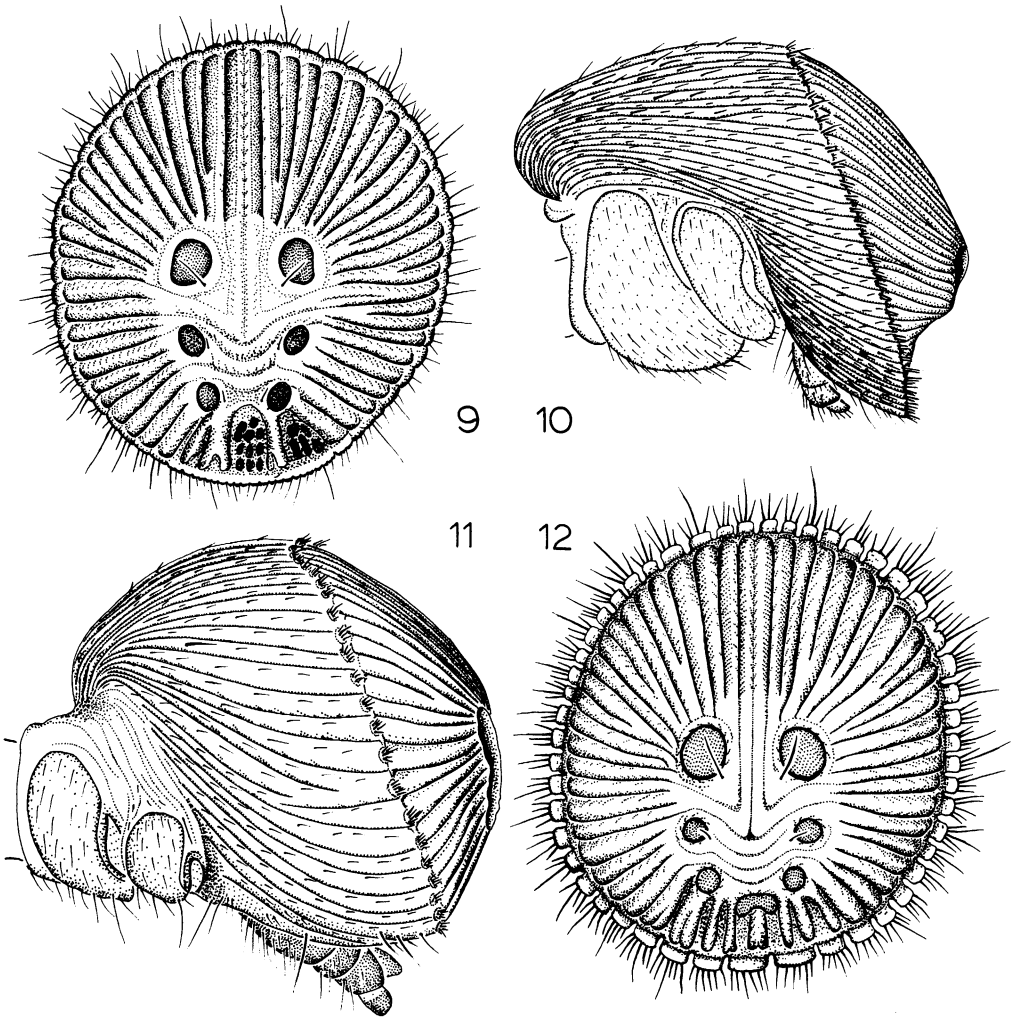
Eyes (fig. 33) set on low tubercle about twice as wide as long. Clypeus broad, nearly flat, equal in width to lateral span of anterior median eyes or lateral eyes of one side. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median=50: 45: 35: 30. Anterior eye row only slightly wider than posterior row, gently recurved, a line along front edges of lateral eyes cutting thin slice of median eyes; median eyes nearly round, separated by about two-thirds their diameter, by nearly their diameter from anterior laterals. Lateral eyes of each side separated by less than one-third of anterior lateral eye diameter. Posterior eye row gently recurved; oval median eyes separated by more than three times their long diameter (105/30), almost touching laterals. Median ocular quadrangle much wider than long (160/90), narrowed in front (160/100).

Sternum 5.8 mm. long, 5.3 mm. wide, smooth, shining, with numerous black hairs and longer setae margining large sigillar area; pairs of small, round sigilla near margin opposite first and second coxae; large median sigilla indistinct. Labium 1.5 mm. long, 2.1 mm. wide, thickly set with black hairs, with three heavy, black spinules at apex. Maxilla 4.2 mm. long, 2.2 mm. wide, covered below with fine black hairs, numerous long, fine pale hairs forming brush along inside margin, armed at base with curved row of 13 or 14 heavy spinules, covered evenly with smaller spinules concentrated along prolateral side of ventral surface. Chelicerae robust, projecting forward distance equal to one-half of carapace length, smooth at base dorsally, rougher apically, set with rows of short setae; rastellum consisting of numerous short, black teeth set on prominent, angled projection. Margins of chelicerae with eight or nine principal teeth in each row; those on retromargin subequal; those on promargin varied in size and accompanied by about 20 small denticles along inside margin.

Leg formula 4123. Legs short, stout, clothed with erect hairs and setae and armed with heavy cuspular spines. All legs without scopulae. Pedipalps and all legs provided above with longitudinal bands of black hairs and setae, leaving smooth areas between (two on basal segments, one on metatarsi, and none on tarsi), provided below with mostly soft, long, black hairs; tibiae, metatarsi, and tarsi of pedipalps and first and second legs with lateral series of heavy, black, rasping spinules of which few attain ventral position; terminal segments of posterior legs with few scattered lateral spines. Tibia I about twice as long as greatest width. Leg III short, with thick segments; tibia as wide as long, without smooth dorsal emargination. Leg IV of medium length; patella with single smooth dorsal band, flanked on retrolateral side with erect, black

setae, on prolateral side with heavy series of short cusps; tibia with smaller series of cusps on prolateral surface. Paired claws of legs with single large tooth near base and occasional denticle below; retroclaw of leg IV with longer tooth below principal tooth. Pedipalp with single large claw bearing one denticle below. Measurements in mm.:

	I	II	III	IV	Palp
Femur	6.0	4.8	4.3	5.2	5.2
Patella	3.6	3.4	3.6	4.0	3.2
Tibia	3.5	2.5	2.2	2.7	3.4
Metatarsus	2.9	2.7	2.5	3.7	–
Tarsus	1.7	1.7	2.1	2.6	3.5
Total	17.7	15.1	14.7	18.2	15.3



FIGS. 9-12. *Cyclocosmia* abdomens. 9, 10. *C. truncata* (Hentz). 9. Female, posterior view. 10. Male, lateral view. 11, 12. *C. torreya*, new species. 11. Male, lateral view. 12. Female, posterior view.

Abdomen 15.5 mm. long, 14.5 mm. wide, subcylindrical, broadly rounded on sides in basal half but quite abruptly truncated behind (figs. 1, 4). Caudal truncature inclined forward at about 20- to 30-degree angle from vertical, forming behind circular or suboval disc (figs. 9, 15). Whole abdomen coriaceous, strongly sclerotized behind, with numerous narrow, longitudinal ribs and grooves; grooves becoming slightly deeper at caudal truncature but rib angles not protruding from seam; upper rib angles bearing three to five setae, of which central ones are longest (figs. 16, 17). Caudal truncature with two ribs running dorsoventrally and 24 radiating ribs on each side. Abdominal disc with six well-marked circular muscle impressions, lightly convex, without setae except for three pairs at inner edges of muscle impressions. Four spinnerets; inner pair small, one-segmented; outer pair much longer, three-segmented.

Spermathecae paired, T-shaped, with lobes of horizontal bar relatively uniform in width; surface with small pores (fig. 25).

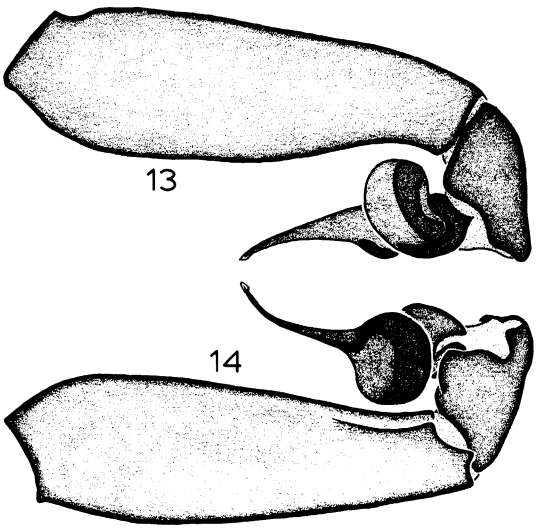
Male (Cleburne County, Alabama). Total length, including chelicerae, 19 mm. Carapace and chelicerae uniformly black with little sheen; white conjunctival membranes plainly evident only in front of clypeus. Underside of cephalothorax dusky mahogany brown, with narrow, white conjunctival membranes margining sternum. Legs darker mahogany brown, paler distally and on ventral surfaces. Abdomen dull orange brown, with circular impressions on abdominal disc dark brown.

Carapace 7.1 mm. long, 6.7 mm. wide, evenly roughened, with deep reticulations over most of dorsum and with thin, transverse grooves crossing clypeal area. Carapace more evenly rounded on all sides than that of female; thoracic groove a deep pit excavated behind, with narrowly rounded U-shaped fissure, equaling at greatest width about one-fifth of carapace width at that point, situated back four-sevenths of carapace length.

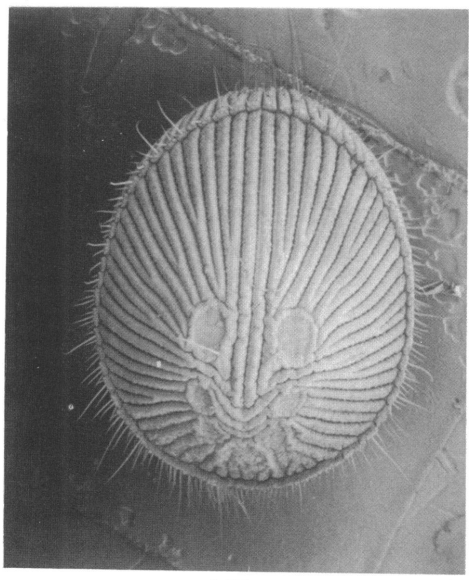
Eyes essentially like those of female, set on low tubercle far back from clypeal margin. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median=32: 38: 30: 28. Anterior eye row gently recurved; median eyes round, separated by one-third their diameter, twice as far from laterals. Lateral eyes of each side separated by two-thirds of anterior lateral eye diameter. Posterior eye row gently recurved; oval median eyes separated by nearly three times their long diameter (74/28), by their long diameter from laterals. Median ocular quadrangle much wider than long (110/80), narrowed in front (110/82).

Sternum 4.5 mm. long, 4.2 mm. wide, as in female. Labium 1.0 mm. long, 1.6 mm. wide, with three tiny spinules at apex. Maxilla 3.2 mm. long, 1.6 mm. wide, essentially bare of spinules except for few at base on inside. Chelicerae with seven or eight teeth on retromargin, six or seven principal teeth on promargin, and six to eight additional denticles.

Leg formula 1423. Legs longer and thinner than in female, clothed with erect black hairs and stout black spines. All tarsi with scopulae covering ventral surfaces. Spines of leg I: patella, two prolateral; tibia, two or three prolateral, about 15 retrolateral (some very short, others nearly ventral in position), and two to four ventral near apex; metatarsus, four or five prolateral, nine or 10 retrolateral; tarsus, three or four prolateral, three retrolateral, all very small. Spines of leg II: tibia, three prolateral, 14 retrolateral or subventral, and four to six truly ventral; metatarsus,



FIGS. 13, 14. *Cyclocosmia truncata* (Hentz), male palpus. 13. Retrolateral view. 14. Prolateral view.



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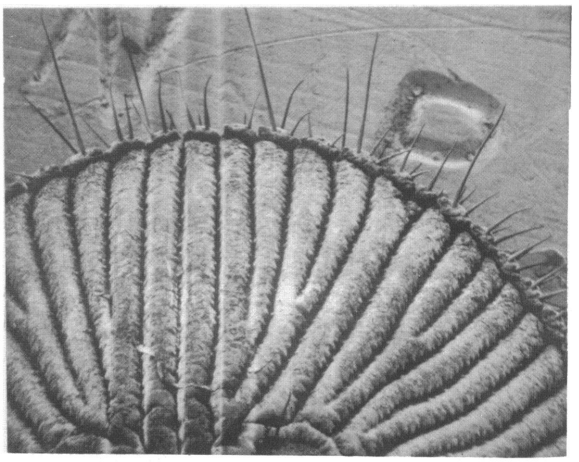

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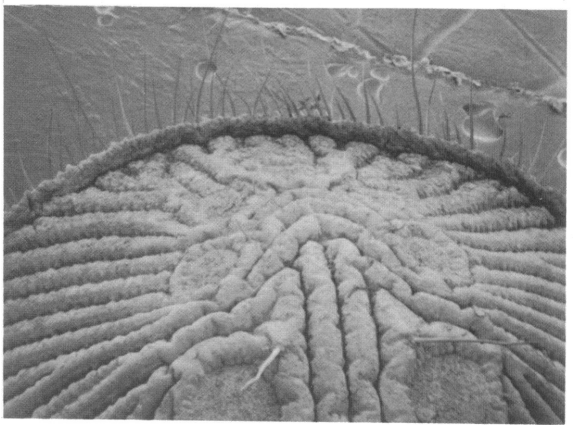

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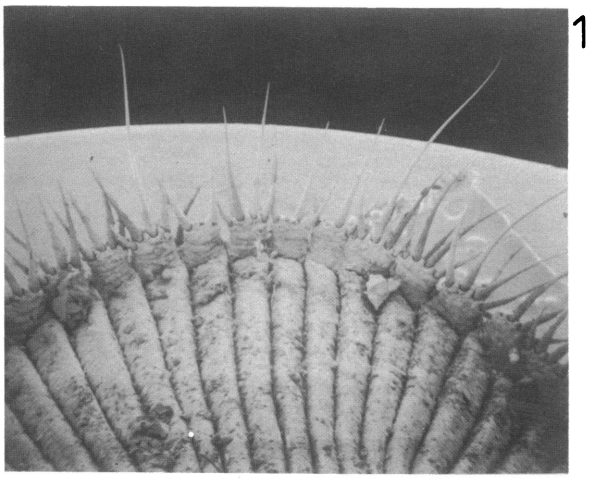
FIGS. 15-17. *Cyclocosmia truncata* (Hentz), abdomen, scanning electron micrographs. 15. Posterior view, 15X. 16. Dorsal rim of abdominal disc, 35X. 17. Ventral rim of abdominal disc, 35X.

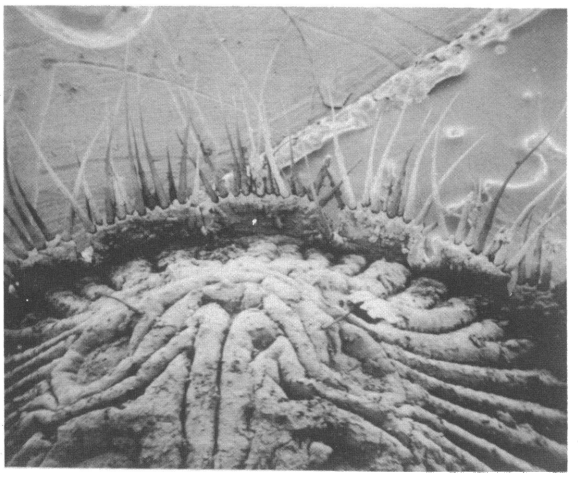
five or six prolateral, nine or 10 retrolateral; tarsus, five prolateral, six or seven retrolateral. Legs III and IV with few distinct dorsal spines but with numerous spines on other surfaces. Paired claws of tarsi with principal stout tooth at base and occasional denticle below. Measurements in mm.:

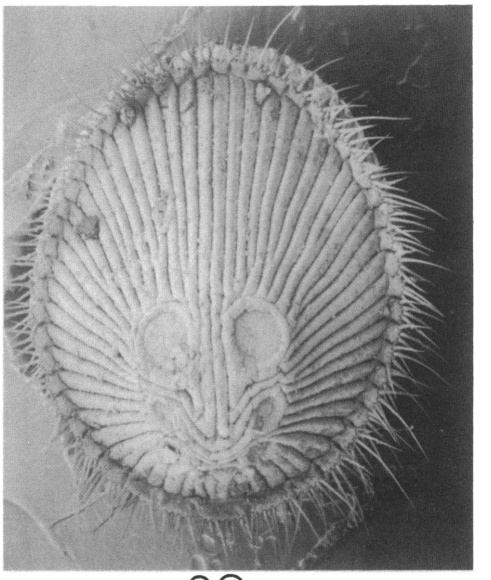
	I	II	III	IV	Palp
Femur	7.0	6.0	5.3	6.2	5.8
Patella	3.3	3.0	2.9	3.3	2.8
Tibia	4.7	3.8	3.1	4.0	4.2
Metatarsus	5.2	4.7	4.4	5.9	–
Tarsus	2.6	2.5	2.8	3.2	1.5
Total	22.8	20.0	18.5	22.6	14.3

Abdomen 8.8 mm. long, 6.5 mm. wide, with longitudinal dark ribs and pale grooves as in female (figs. 2, 3); caudal truncature rounded; margins of abdominal seam inconspicuous, with small rib angles each bearing one to three (usually two) setae (fig. 10).

Palp clothed sparsely with short black hairs; hairs longer below tibia. Femur four and one-half times as long as apical width, cylindrical, marked with numerous thin striations. Patella more than twice as long as apical width, with short, smooth retrolateral emargination continuous with white conjunctiva. Tibia cylindrical, nearly three times as long as width at center; basal half inflated, narrowing distally. Tarsus short, emarginated at







FIGS. 18-20. *Cyclocosmia torreya*, new species, abdomen, scanning electron micrographs. 18. Dorsal rim of abdominal disc, 25×. 19. Ventral rim of abdominal disc, 25×. 20. Posterior view, 10×.

apex. Bulb of medium size, with thin embolus one and one-half times as long as bulb, slightly expanded at tip; palpal duct sharply bent at base of embolus (figs. 13, 14).

Variation. The eyes vary only slightly in size and position; occasionally they are all subequal in size. The clypeus is proportionally wider in some specimens. The labium may bear from two to five spinules at its apex, and the maxilla as few as eight heavy spinules at its base in some females. The claw of the female pedipalp sometimes has two or three teeth rather than one.

Material Examined. **United States**: *Alabama*: Cleburne Co.: no specific locality, Sept. 9, 1946 (H. K. Wallace, CHKW), 1♂. De Kalb Co.: main park area, De Soto State Park, 5 mi. S De Soto Falls, Sept. 5, 1966, shaded stream bank (F. Coyle, AMNH), 2♀, 1 juvenile; De Soto Falls, Sept. 5, 1966, very wet bank (F. Coyle, AMNH), 1 juvenile. Hale Co.: University of Alabama Farm, May 13, 1950 (G. Ball, AMNH), 1 juvenile. Jackson Co.: JE 130 (mound in Tennessee River near Scottsboro), 1931-1939 (A. F. Archer, AMNH), 7♀, 3 juveniles. Limestone Co.:

Elk River, 1938 (P. Bryan, AMNH), 1♀. Madison Co.: Monte Sano, 1939 (A. F. Archer, AMNH), 1♂. Marshall Co.: Little Mountain State Park, July 28, 1966, ravine bank (F. Coyle, AMNH), 1♀; 0.8 mi. N Grant, July 26, 1966, stream bank (F. Coyle, AMNH), 1 juvenile. Shelby Co.: Oak Mountain State Park, May 9-10, 1947 (A. F. Archer, AMNH), 1 molted abdomen. Talladega Co.: Talladega National Forest, July 20, 1950 (A. F. Archer, G. Ball, AMNH), 1♀. Tuscaloosa Co.: Hurricane Creek, Oct. 16, 1950 (F. Brunson, AMNH), 1 juvenile. *Georgia*: Dade Co.: Johnson Crook, Lookout Mountain, Sept. 15, 1974, in 6.4 m. deep pit (R. H. Hunt, AMNH), 1♂; June 22, 1974, matured Aug. 22, 1974 (R. H. Hunt, CRHH), 1♂; found dead Sept. 22, 1974 (R. H. Hunt, CRHH), 1♂. *Tennessee*: Davidson Co.: Nashville, July 19, 1955 (A. R. Laskey, AMNH), 1♀; July-Aug., 1942 (R. E. Wheeler, AMNH), 3♀, 3 juveniles; July 27-Sept., 1942 (R. E. Wheeler, MCZ), 4♀, 1 juvenile. Lawrence Co.: David Crockett State Park, Sept. 8, 1966, steep river bank (F. Coyle, AMNH), 1 juvenile.

Distribution. Tennessee, northern Alabama, and northwestern Georgia (fig. 21). Comstock (1912) reported that Banks had informed him that a single female *Cyclocosmia* from Louisiana was in the Banks collection; this hearsay record has been repeated in subsequent literature (Gertsch and Wallace, 1936; Kaston, 1972). No such specimen is now in the Museum of Comparative Zoology, where Banks's material is deposited, nor are there any other known specimens from Louisiana. As the nearest point in that state would be a 200-mile range extension for either *C. truncata* or *C. torreya*, this record must be regarded as erroneous. If a population of *Cyclocosmia* does exist in Louisiana it probably represents an undescribed species.

Cyclocosmia torreya, new species
Figures 5, 11, 12, 18-24, 26, 34

Cyclocosmia truncata (misidentification): Gertsch and Wallace, 1936, pp. 6-12, figs. 1, 2, 6-12.

Types. Female holotype from Torreya Ravine, Torreya State Park, Liberty County, Florida (April 16, 1938; W. J. Gertsch) and male paratype from 14 miles west of Marianna, Jackson County, Florida (October 27, 1962; R. Derbonne), deposited in AMNH.

Etymology. The specific name is a noun in apposition taken from Torreya Ravine, where the species was first collected.

Diagnosis. Cyclocosmia torreya may be distinguished from the other known *Cyclocosmia* by the presence of 22 ribs on each side of the abdomen. Specimens (including juveniles) may be easily distinguished from *C. truncata* by the abdominal rib angles protruding from the seam of the abdominal disc (figs. 18-20).

Female (Torreya Ravine, Florida). Total length, including chelicerae, 33 mm. Coloration and structure in close agreement with that of female *truncata*. Carapace 10.5 mm. long, 10.2 mm. wide.

Eyes (fig. 34) set on low tubercle half as long as wide, equal to one-third of carapace width at that point. Clypeus broad, equal to four times the anterior lateral eye diameter. Ratio of eyes, anterior lateral: anterior median: posterior lat-

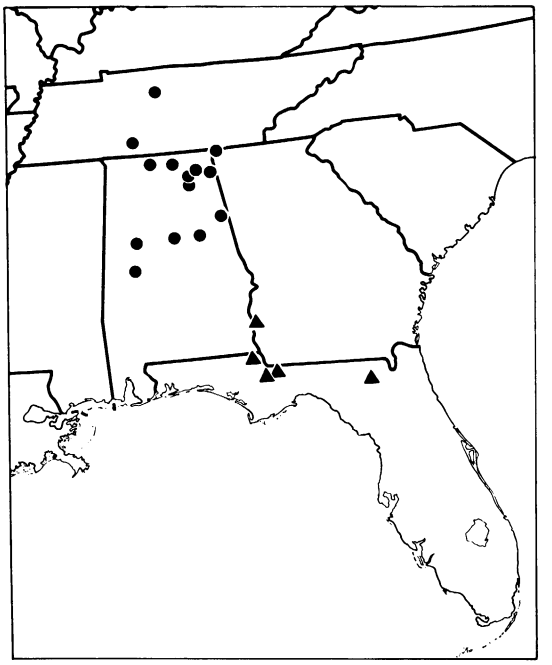


FIG. 21. Map of southeastern United States, showing distribution of *Cyclocosmia truncata* (circles) and *C. torreya* (triangles).

eral: posterior median=55: 55: 45: 35. Anterior eye row straight; median eyes suboval to round, separated by one-fifth their diameter, by their diameter from laterals. Lateral eyes of each side separated by radius of anterior lateral eye. Posterior eye row gently recurved; oval median eyes separated by nearly four times their long diameter (122/35), nearly touching laterals. Median ocular quadrangle much wider than long (170/110), narrowed in front (170/105).

Sternum 7.2 mm. long, 6.2 mm. wide. Labium 1.7 mm. long, 2.3 mm. wide. Maxilla 4.5 mm. long, 2.5 mm. wide. Leg formula 4123. Leg proportions and spination as in female *truncata*. Measurements in mm.:

	I	II	III	IV	Palp
Femur	7.5	6.3	6.0	6.5	6.8
Patella	4.5	4.3	4.5	4.7	4.0
Tibia	4.7	3.6	3.0	3.7	4.4
Metatarsus	4.2	3.4	3.6	5.2	–
Tarsus	2.3	2.3	2.7	3.5	4.4
Total	23.2	19.9	19.8	23.6	19.6

Abdomen 15.5 mm. long, 14.5 mm. wide, like that of *truncata* (figs. 22, 23) but with caudal truncature inclined forward at about 40-degree angle from vertical (fig. 29). Two abdominal ribs running dorsoventrally through center and 22 ribs on each side (fig. 12). Abdominal seam margined all around with protruding rib angles (fig. 20), each bearing three to six stout, curved setae (figs. 18, 19).

Spermathecae T-shaped, with horizontal bars widest at their tips (fig. 26).

Male (West of Marianna, Florida). Total length, including chelicerae, 18 mm. Coloration and structure in close agreement with that of male *truncata*. Carapace 7.0 mm. long, 6.4 mm. wide.

Eye group occupying one-third of carapace width at that point. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median=39: 40: 33: 30. Anterior eye row gently recurved; median eyes suboval, separated by slightly less than one-third their diameter, by about as far from laterals. Lateral eyes of each side separated by about one-third of anterior lateral eye diameter. Posterior eye row gently recurved; oval median eyes separated by more than two times their long diameter (70/30), nearly touching laterals. Median ocular quadrangle wider than long (110/73), narrowed in front (110/80).

Sternum 4.0 mm. long, 3.7 mm. wide. Labium 0.8 mm. long, 1.5 mm. wide. Maxilla 3.0 mm. long, 1.6 mm. wide, with series of eight small cusps near base on inner side. Chelicerae somewhat thinner than those of *truncata*, with eight or nine teeth on retromargin and seven teeth on promargin. Leg formula 4123; spination like that of male *truncata*. Measurements in mm.:

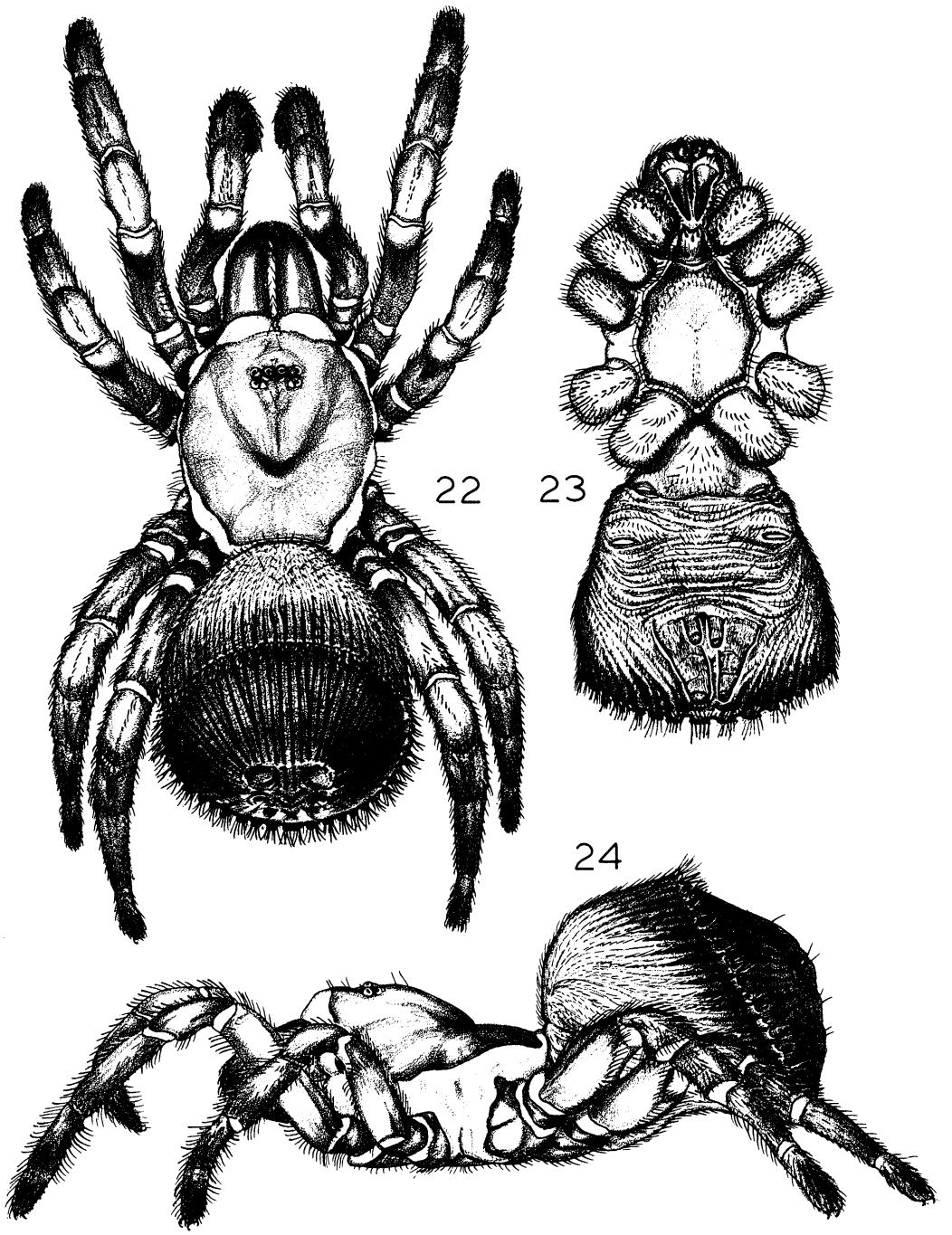
	I	II	III	IV	Palp
Femur	6.5	5.5	4.7	5.8	5.5
Patella	2.7	2.6	2.7	3.0	2.6
Tibia	4.3	3.5	2.8	3.7	4.0
Metatarsus	4.3	3.5	3.8	5.2	–
Tarsus	2.4	2.2	2.7	3.1	1.5
Total	20.2	17.3	16.7	20.8	13.6

Abdomen like that of male *truncata* except as follows: abdominal disc with 22 ribs on each side; abdominal seam with rib angles protruding and each bearing three to seven (usually five) stout setae (fig. 11).

Palp showing no significant differences from that of *truncata*.

Variation. In some females the anterior eye row is slightly procurved rather than straight.

Material Examined. **United States**: *Florida*: Columbia Co.: Ichetucknee Springs, Apr. 4, 1967 (F. J. Moore, FSCA), 1♀. Gadsden Co.: no specific locality, Apr. 19, 1936 (R. E. Bellamy, H. K. Wallace, AMNH), 1♀. Jackson Co.: cave area, Florida Caverns State Park, July 18, 1973 (W. A. Shear, CWAS), 1 juvenile; N end, Waddell's Mill Pond, 11 mi. NNW Marianna, Aug. 4, 1963 (F. J. Moore, AMNH), 1♀. Liberty Co.: Torreya Ravine, Torreya State Park, May 5, 1933 (H. K. Wallace, CHKW), 1 juvenile; Apr. 17, 1936 (R. E. Bellamy, H. K. Wallace), 2♀ (AMNH), 1♀ (MCZ), 1♀, 1 juvenile (CHKW); Apr. 18, 1936 (H. K. Wallace, MCZ), 1♀; Apr. 16, 1938 (W. J. Gertsch, AMNH), 4♀; Nov. 4, 1938 (H. K. Wallace, AMNH), 2♀, 1 juvenile; Apr. 8, 1941 (H. K. Wallace, CHKW), 5♀, 1 juvenile; Apr. 14, 1951 (AMNH), 1 juvenile; Aug. 18-20, 1960 (MCZ), 3♀, 2 juveniles; Mar. 10, 1963 (AMNH), 1♀; dug from moss-covered bank,



FIGS. 22-24. *Cyclocosmia torreya*, new species, female. 22. Dorsal view. 23. Ventral view. 24. Lateral view.

Apr. 2, 1965 (♂ matured July, A. R. Brady, CARB), 1♂, 1♀; June 22-23, 1966 (J. A. Beatty, I. Braun, AMNH), 5♀; Mar. 23, 1968 (J. A. Beatty, AMNH), 1♀, 1 juvenile. *Georgia*: Clay Co.: 1.6 mi. E bridge over Chattahoochie River, July 23, 1950, in ravine along river (AMNH), 1 juvenile.

Distribution. Southwestern Georgia and northern Florida (fig. 21).

Cyclocosmia loricata (C. L. Koch)
new combination
Figures 27, 30, 31, 35

Actinopus loricatus C. L. Koch, 1842, p. 99, fig. 752 (female holotype [presumably mature, but pinned dry and too fragile to dissect] from Mexico, no specific locality, in ZMB, examined).
Sphodros loricatus: Simon, 1864, p. 89.
Chorizops loricatus: Ausserer, 1871, p. 144. Roewer, 1942, p. 146. Bonnet, 1956, p. 1078.

Note. Gertsch and Wallace (1936, p. 14) designated the juvenile from Veracruz listed below as the neotype of this species, but as they gave no reasons for believing the original type material to be destroyed, this designation must be regarded as invalid. As is indicated above, the holotype is still in existence.

Diagnosis. Cyclocosmia loricata may be distinguished from the other known *Cyclocosmia* by the presence of 18 to 20 ribs on each side of the abdomen (fig. 31), the more expanded eye pattern (fig. 35), the rounded horizontal bars of the spermathecae (fig. 27), and the presence of a slight dorsal emargination on the third tibia similar to that found in *Ummidia.*

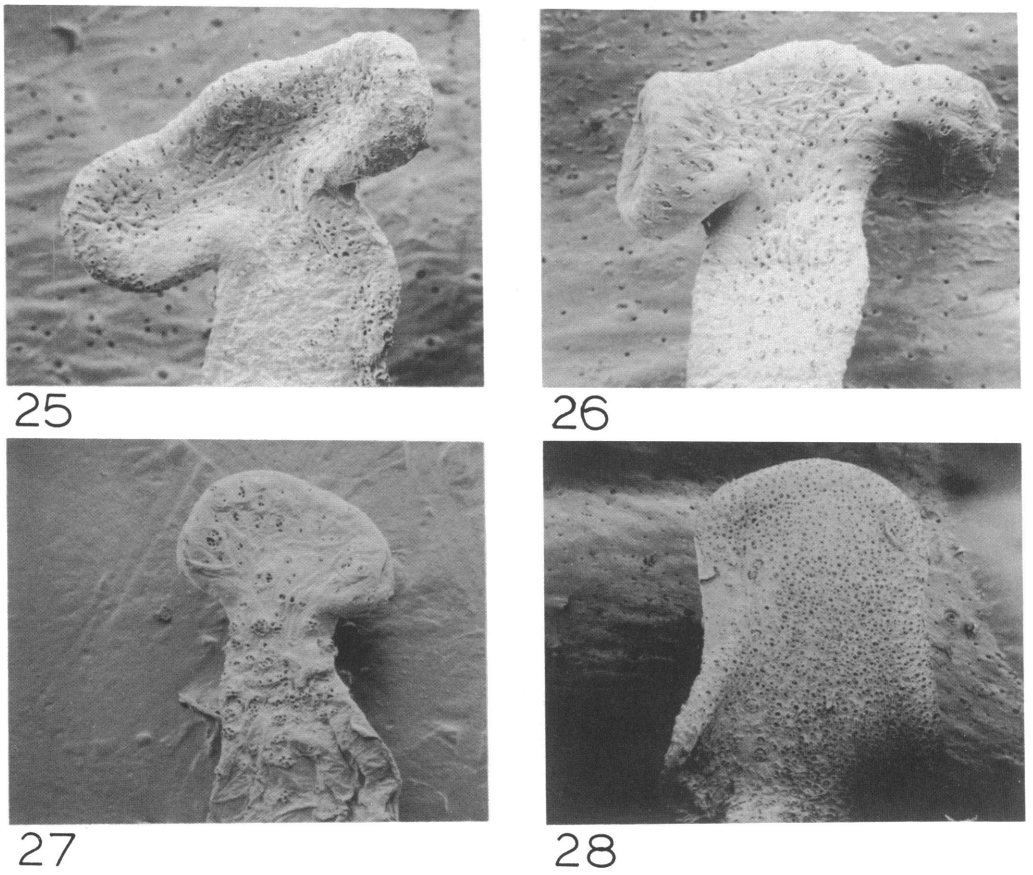
Female (San Luis Potosí, Mexico). Total length, including chelicerae, 28 mm. Coloration as in female *C. truncata*, with conjunctival membranes of carapace visible only at front and at posterolateral corners, where inset with sclerotized bars. Carapace 8.9 mm. long, 6.9 mm. wide, with eight posterior and one anterior ocular setae and single long clypeal seta. Anterior margin of carapace sinuous, posterior margin greatly narrowed. Thoracic groove equaling at greatest width slightly more than one-fourth of carapace width at that point, situated back about two-thirds of carapace length.

Eyes (fig. 35) set on very low tubercle more than twice as wide as long. Clypeal width equal to four times the lateral eye interdistance. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median=43: 38: 37: 32. Anterior eye row slightly longer than posterior row, very slightly recurved, median eyes round, separated by almost their diameter, by slightly more than twice their diameter from oval laterals. Lateral eyes of each side separated by slightly more than half of anterior lateral eye diameter. Posterior eye row recurved, irregularly shaped light median eyes separated by more than six times their long diameter (195/32), almost touching laterals. Median ocular quadrangle much wider than long (125/55), narrowed in front (125/50).

Sternum 6.0 mm. long, 4.8 mm. wide. Labium 1.1 mm. long, 1.8 mm. wide. Maxilla 3.4 mm. long, 1.8 mm. wide, with curved row of nine to 14 spinules at base and numerous smaller spinules on prolateroventral surface. Chelicerae robust, projecting forward distance equal to slightly less than one-fourth of carapace length, with about seven principal teeth on each margin and about 15 smaller denticles scattered between teeth. Leg formula 1423. Legs with setae and spination as in female *truncata.* Tibia III with slight dorsal emargination. Retroclaw of legs III and IV with two teeth, other claws with single tooth. Palpal claw with two teeth. Measurements in mm.:

	I	II	III	IV	Palp
Femur	5.5	4.8	4.4	4.8	4.7
Patella	3.0	3.0	3.4	3.1	2.8
Tibia	3.0	2.6	2.0	2.5	2.6
Metatarsus	2.6	2.3	2.3	3.2	–
Tarsus	1.4	1.4	1.8	1.8	3.0
Total	15.5	14.1	13.9	15.4	13.1

Abdomen 10.8 mm. long, 11.5 mm. wide. Caudal truncature inclined forward at about 25-degree angle from vertical, with two central ribs and 19 or 20 ribs on each side; rib angles protruding from seam of abdominal disc; upper rib angles each bearing 10 to 16 (usually 13) setae (fig. 31).



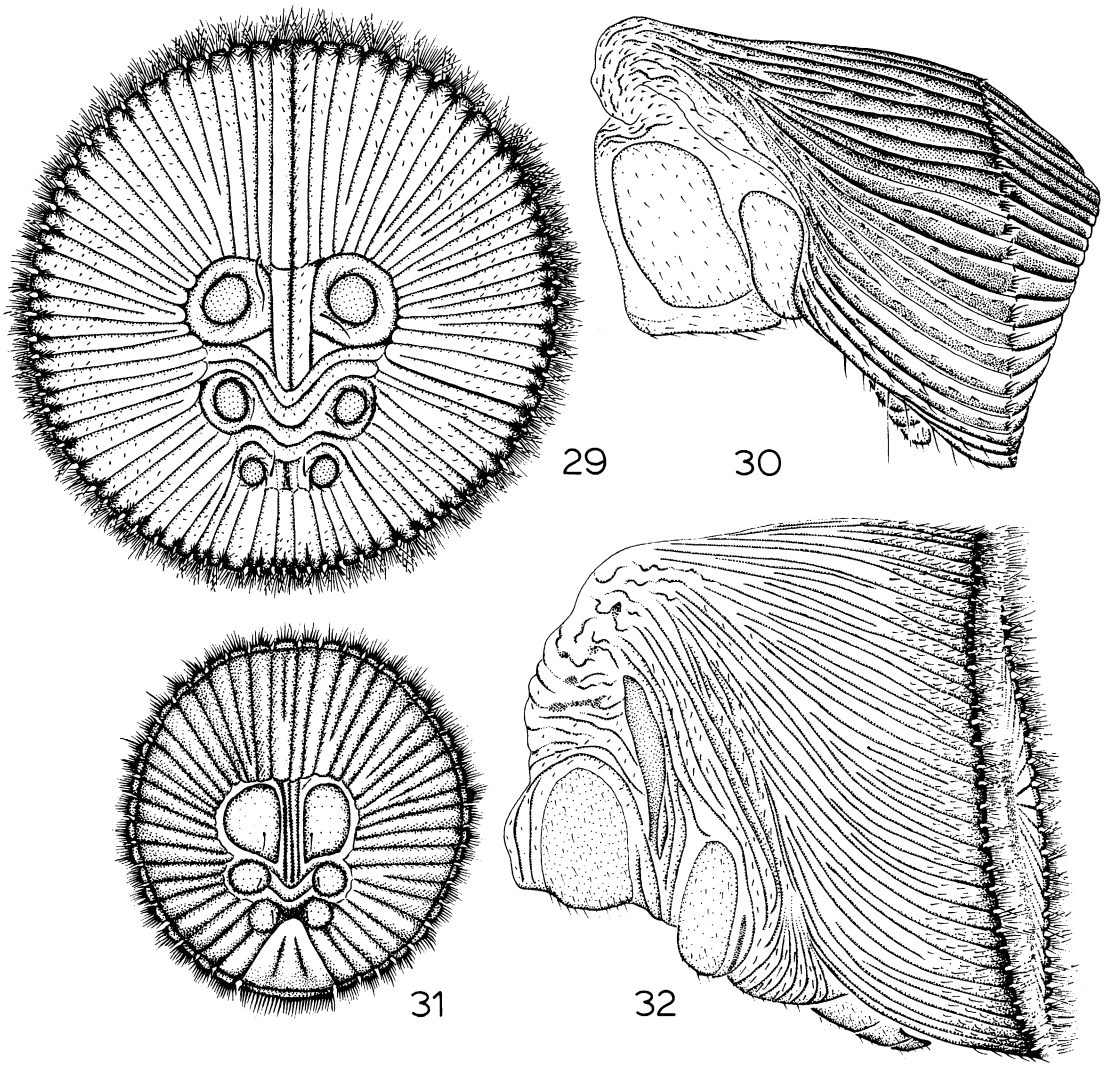
FIGS. 25-28. *Cyclocosmia* spermathecae, dorsal views, scanning electron micrographs. 25. *C. truncata* (Hentz), 130×. 26. *C. torreya*, new species, 130×. 27. *C. loricata* (C. L. Koch), 120×. 28. *C. ricketti* (Pocock), 50×.

Spermathecae with horizontal bars slightly (fig. 27) or not at all produced.

Male (Tamaulipas, Mexico). Total length, including chelicerae, 22 mm. Coloration and structure in close agreement with that of male *truncata*. Carapace 8.4 mm. long, 6.6 mm. wide, with three posterior and single anterior ocular setae and one or two short clypeal setae. Anterior margin of carapace convex, slightly invaginated at midpoint; posterior margin narrowed and truncated. Thoracic groove equaling at greatest width between one-fifth and one-sixth of carapace width at that point, situated back about seven-twelfths of carapace length.

Eyes set on raised tubercle more than twice as wide as long. Clypeal width slightly greater than posterior median eye interdistance. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median=60: 41: 25: 24. Eye rows subequal in length, anterior row slightly procurved, median eyes round, separated by almost two-thirds their diameter, by their diameter from oval laterals. Lateral eyes of each side separated by about half of anterior lateral eye diameter. Posterior eye row straight, irregularly shaped median eyes separated by more than seven times their long diameter (183/24), almost touching laterals. Median ocular quadrangle much wider than long (103/47), narrowed in front (103/48).

Sternum 5.2 mm. long, 3.9 mm. wide. Labium 0.8 mm. long, 1.2 mm. wide, with four spinules



FIGS. 29-32. *Cyclocosmia* abdomens. 29, 32. *C. ricketti* (Pocock), some setae omitted. 30, 31. *C. loricata* (C. L. Koch). 29. Female, posterior view. 30. Male, lateral view. 31. Female, posterior view. 32. Female, lateral view.

at apex. Maxilla 3.2 mm. long, 1.5 mm. wide, with eight or nine small spinules at base. Chelicerae projecting forward distance equal to about one-fourth of carapace length, with seven large retromarginal teeth and 11 or 12 smaller promarginal teeth. Leg formula 4123; setation and spination as in male *truncata.* Tibia III with slight dorsal emargination at base. Leg III with two teeth on both claws; retroclaw of leg IV with two teeth; other claws with single tooth. Measurements in mm.:

	I	II	III	IV	Palp
Femur	7.4	6.8	5.3	6.9	6.2
Patella	3.3	3.2	3.1	3.6	2.9
Tibia	5.0	4.1	3.5	4.6	4.4
Metatarsus	5.0	4.6	4.6	6.7	–
Tarsus	1.6	1.6	3.2	4.0	1.5
Total	22.3	20.3	19.7	25.8	15.0

Abdomen 9.3 mm. long, 6.4 mm. wide. Caudal truncature inclined forward at about 35-degree angle from vertical, with two central ribs and 18 or 19 ribs on each side; rib angles rounded, protruding slightly from seam of abdominal disc; upper rib angles each bearing one long and two to five short setae (fig. 30).

Palp showing no significant differences from that of *C. truncata.*

Variation. The few known females seem to vary clinally in several characters. The conjunctival membranes are visible all around the carapace except at the anterolateral corners in the female from Veracruz, and are visible all around the carapace in the female from Oaxaca. The triads of the lateral and posterior median eyes are closest in the Oaxaca specimen and farther apart in the Veracruz female. Southern specimens have more setae on the upper rib angles (15-17, Veracruz; 14-18, Oaxaca) and more abdominal ribs (18 on each side or 18 on one side and 19 on the other in northern specimens, 19 on each side in the Oaxaca female). In view of the small number of specimens available, it is of course possible that the observed variation is individual rather than clinal, but the fact that several characters vary together makes the latter hypothesis more tenable. The holotype of *C. loricata* probably came from the northern part of the species range, as it resembles the San Luis Potosí specimen closely in abdominal details.

Material Examined. **Mexico**: *Oaxaca*: Juguila Mixes, 1968 (W. Miller, AMNH), 1♀. *San Luis Potosí*: 10-15 mi. W Ciudad de Valles, June, 1969, foothills (B. Weston, AMNH), 1♂; Sotano del Tigre, 10 mi. NE Ciudad de Valles, Feb. 1, 1968 (J. Reddell, R. Mitchell, AMNH), 1♀. *Tamaulipas*: El Tinieblo, Mar. 12, 1972, by roadside (J. A. L. Cooke, AMNH), 1♂; Sotano del Refugio, 14 mi. NE Ocampo, July 14, 1967 (J. Fish, AMNH), 2 very young ♀, 1 juvenile. *Veracruz*: no specific locality (A. Dugès, MNHN), 1♀; La Buena Ventura, Istmo de Tehuantepec, Aug., 1909 (A. Petrunkevitch, AMNH), 1 juvenile.

Distribution. Eastern Mexico.

Cyclocosmia ricketti (Pocock)

Figures 28, 29, 32, 36

Halonoproctus ricketti Pocock, 1901, p. 209, figs. 1, 1a-1d (female holotype from Kuatun, Fukien, China, in BMNH, examined).

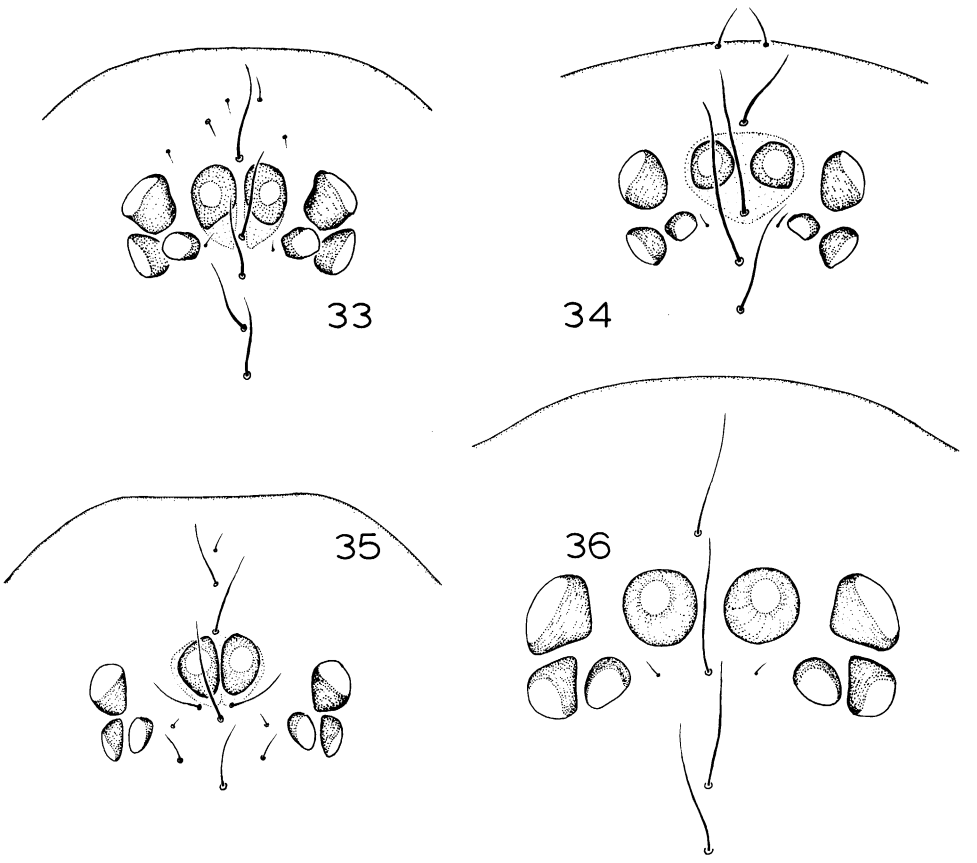
Cyclocosmia ricketti: Simon, 1903, p. 887, figs. 1044-1047. Roewer, 1942, p. 146. Bonnet, 1956, p. 1305.

Diagnosis. Cyclocosmia ricketti may be distinguished from the other known *Cyclocosmia* by the presence of 33 abdominal ribs on each side (fig. 29), 25 or more setae on each upper rib angle (fig. 32), and the smooth-sided spermathecae (fig. 28).

Female (Ban Khok, Thailand). Total length, including chelicerae, 39 mm. Coloration as in female *truncata*, with thin dark median longitudinal band from thoracic groove to ocular area. Conjunctival membranes margining entire carapace widely except around anterior lateral corners where narrow; posterior lateral areas of membranes inset with sclerotized bars. Carapace 13.2 mm. long, 11.5 mm. wide, with five posterior and two anterior ocular setae and numerous short clypeal setae. Margin of clypeus directly anterior of ocular tubercle slightly produced anteriorly. Carapace broadly rounded anteriorly, obliquely narrowed posteriorly. Thoracic groove equaling at greatest width one-fourth of carapace width at that point, situated back about two-thirds of carapace length.

Eyes (fig. 36) set on low tubercle more than twice as wide as long. Clypeal width equal to posterior median eye interdistance. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median=38: 35: 26: 23. Eye rows subequal in length; anterior row straight, median eyes round, separated by about two-thirds their diameter, by almost their diameter from oval laterals. Lateral eyes of each side separated by less than one-fourth of anterior lateral eye diameter. Posterior eye row slightly recurved, oval median eyes separated by more than three times their long diameter (79/23), almost touching laterals. Median ocular quadrangle much wider than long (123/70), narrowed in front (123/78).

Sternum 8.6 mm. long, 7.8 mm. wide. Labium 1.9 mm. long, 2.7 mm. wide, with five spinules at apex. Maxilla 4.9 mm. long, 2.7 mm. wide, with curved row of nine or 10 heavy spinules at base and numerous smaller spinules on prolateroventral surface. Chelicerae short, wide, projecting forward distance equal to one-fourth of carapace length, with about 10 principal teeth on each margin and about 20 smaller denticles scattered



FIGS. 33-36. Eye patterns of female *Cyclocosmia*, dorsal views. 33. *C. truncata* (Hentz). 34. *C. torreya*, new species. 35. *C. loricata* (C. L. Koch). 36. *C. ricketti* (Pocock).

between teeth. Leg formula 1423. Legs provided with fewer setae than in female *truncata*. Palpal claw with a single triple-pointed tooth. Measurements in mm.:

	I	II	III	IV	Palp
Femur	7.8	7.5	5.7	6.6	8.0
Patella	5.0	4.6	4.5	5.5	3.7
Tibia	5.2	3.8	3.4	3.7	4.5
Metatarsus	4.5	3.8	3.7	5.0	–
Tarsus	1.7	2.3	2.2	2.7	5.2
Total	24.2	22.0	19.5	23.5	21.4

Abdomen 15.0 mm. long, 15.3 mm. wide. Caudal truncature inclined forward at about 10-degree angle from vertical, with two central ribs and 33 ribs on each side; rib angles prominent at seam of abdominal disc; upper rib angles each bearing 25 or more setae forming a dense fringe (figs. 29, 32).

Spermathecae wide, smooth-sided sacs, slightly narrowed below tip, without horizontal bars (fig. 27).

Male. Unknown.

Variation. No significant differences were detected between the specimen from Thailand and the holotype from China.

Material Examined. **China**: *Fukien*: Kuatun, autumn, 1896 (J. de La Touche, C. B. Rickett, BMNH), 1♀ (holotype). **Thailand**: *Loei*: Ban Khok, Dan Sai, June 2, 1955 (R. E. Elbel, USNM), 1♀.

Distribution. Southeastern China and Thailand.

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