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metatarsus, 3.7; tarsus, 1.4. Second patella and tibia, 4.8 mm; third, 2.7; fourth, 4.3.

*Diagnosis.* Unlike other *Metazygia* species, *M. carolinensis* lacks a ventral knob (Fig. 112) on the epigynum.

*Note.* The placement of this species in *Metazygia* is doubtful. Archer thought *M. carolinensis* close to *Nuctenea cornuta* and placed it with *cornuta* in *Epeira*. He may have been right. But the following facts speak against this placement. *Nuctenea* is mainly a Palearctic genus with a few species in North America having a holarctic distribution. One of the main characters of *Nuctenea* females is the black venter with the comma-shaped white marks on each side. This is not present in *M. carolinensis*. The placement of the species will remain uncertain until the male is found.

*Natural History.* The flattened shape of the spiders, especially the low carapace, suggests that the spider has its retreat in crevices, probably under bark.

*Records.* *North Carolina:* Bladen Co., ♀ paratypes, Sept. 1929 (J. C. Beakley); Craven Co.: New Bern, May 1900, 2 ♀, 1 juv. (J. H. Emerton) (Map 3).

### *Eustala* Simon

*Eustala* Simon, 1895, *Histoire Naturelle des Araignées*, 1: 795. Type species *Epeira anastera* Walckenaer by original designation. The name is feminine.

*Diagnosis.* *Eustala* differs from other Araneidae, especially from *Araneus*, by the epigynum, which has its scape projecting anteriorly (Figs. 118, 138, 140) instead of posteriorly as in all other genera, and by the male palpus, which has only one patellar macroseta, and has the median apophysis, a white cone-shaped structure, hanging down the venter of the palpus (Figs. 126, 147, m in Fig. 232).

The carapace has a deep longitudinal cleft in the thoracic region (Figs. 163, 183, 197). The abdomen is usually triangular, pointed above the spinnerets (Figs. 142–144, 209–210). Like *Larinia* and *Metepeira*,

but unlike many other Araneidae genera, *Eustala* has a central, ventral white patch on the abdomen (Figs. 155, 173, 185, 211). The white patch is absent in those tropical *Eustala* that have the abdomen elongate, like that of *Larinia*. Juvenile *Eriophora*, which look like *Eustala*, lack the white patch and have a dark trapezoid on the venter.

The related *Metazygia* has the scape of the epigynum projecting ventrally (Figs. 90, 91) and the median apophysis is a soft knob (Figs. 101–103, 110, 111). The carapace is smooth (Figs. 96, 108), and the abdomen is oval, slightly flattened dorsoventrally, with indistinct ventral markings (Figs. 96, 98, 99, 108, 109).

*Description.* The carapace is shaped as in *Araneus*, but with a deep longitudinal thoracic cleft (Figs. 163, 183, 197). The carapace is covered with setae and the thoracic area is high in some species (Figs. 133, 154, 172). The posterior median eyes are slightly smaller than the anterior medians, sometimes equal, rarely slightly larger. The laterals are always smaller than the medians. Anterior medians are their diameter apart, or 1.5 diameters at most; the posterior medians are separated by about the same distance. The laterals (except in the smallest species) are two to several diameters from medians. The clypeus height equals the diameter of the anterior median eyes (Fig. 225) except in *E. clavispina* where it is about one and one-half the diameter of the anterior median eyes as a result of the projection of the eye area. There often is a dark transverse band between anterior median and anterior lateral eyes (Figs. 163, 210, 225). The legs are more or less banded. The abdomen is generally triangular with a posterior hump (Figs. 209, 210), but this may be absent (Figs. 122, 123, 257, 258) or there may be several humps (Figs. 163, 164, 196, 197, 223, 224). Most species are variable in coloration with dark and light individuals, but most have a folium pattern on the dorsum,

exceptions being some specimens of *E. anastera* that are contrastingly colored with black patches on white in alcohol (Figs. 219, 222). In most *Eustala* species, unlike most species of *Araneus*, the venter has a more or less distinct median ventral white patch (Figs. 185, 198). In a few species this white patch is as distinct and contrasting (Fig. 173) as in *Metepeira*. Living specimens of *E. anastera* from central Florida have a greenish abdomen, but the green washes out of alcohol-preserved specimens.

Males are smaller than females, slightly darker in color, their abdominal humps are less distinct than in females (Figs. 199, 212). The distal margin of the first coxa has a hook (Fig. 201) which fits into a groove on the second femur. Except for being longer and having stronger macrosetae, especially on the second tibia, the legs of *Eustala* are not modified. Some species have a ventral row of macrosetae on one or more femora (Figs. 125, 156, 189, 214). This is a species characteristic and has been illustrated. The males are exceedingly difficult to match with females: species with the (seemingly) most specialized palpi do not necessarily have the most specialized epigyna (e.g. *E. californiensis*, Figs. 138–148).

*Genitalia.* The epigynum has an unusual, anteriorly projecting scape, annulate in most species but smooth in *E. devia* (Fig. 118) and *E. cazieri* (Fig. 128). The three plates in posterior view of the epigynum are of diagnostic importance; the median and two laterals, varying in shape. The seminal receptacles are usually spherical; between the openings is another smaller spherical structure which appears to contain a winding duct (Figs. 208, 256).

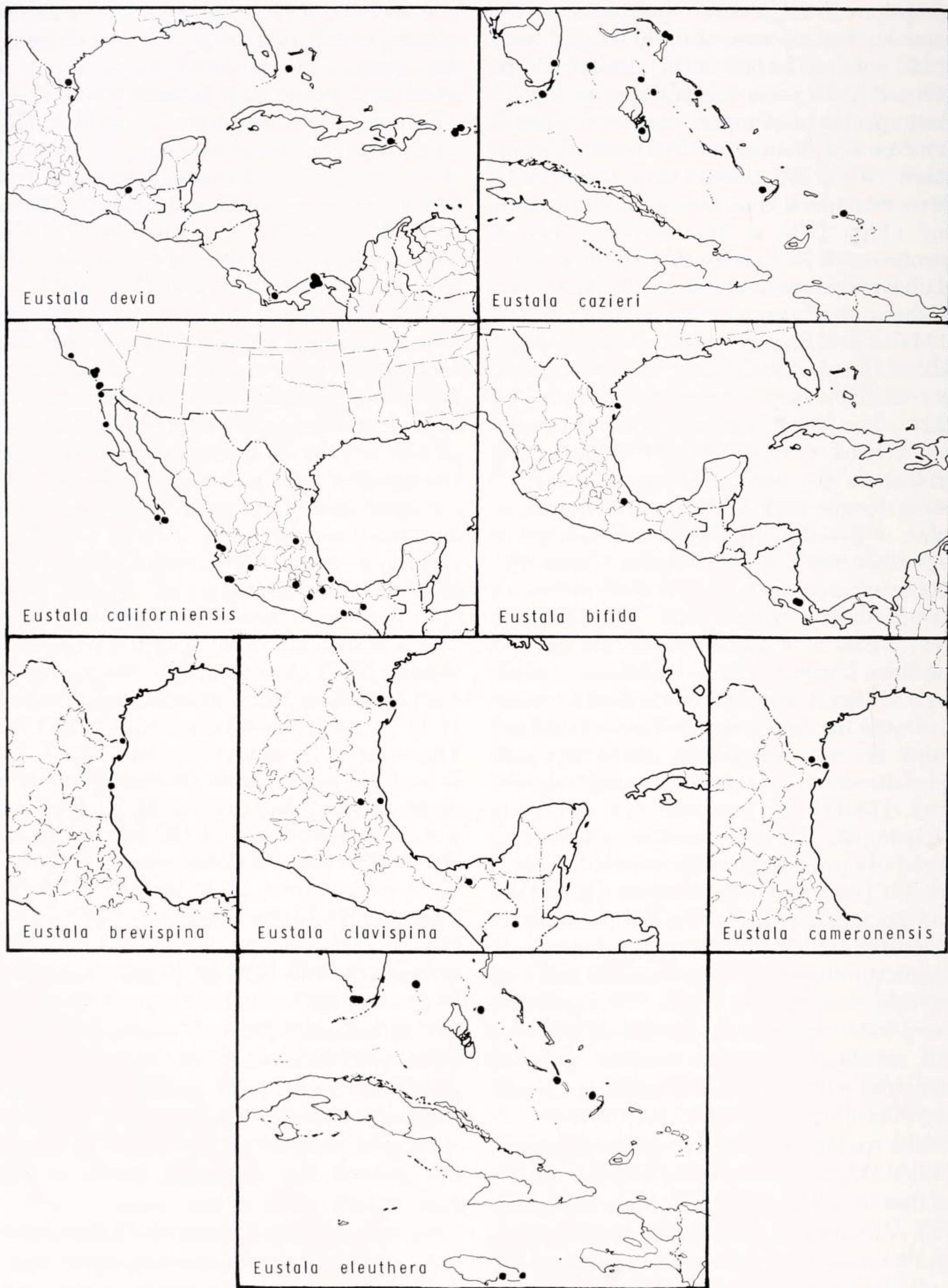
The palpal patella has one macroseta (Figs. 217, 252). The bulb, which is similar to that of *Metazygia*, has a huge conductor (c), variously shaped in different species, and a white, soft, conical median apophysis (m), which hangs down on the venter of the bulb in all *Eustala* species (Fig. 232).

The embolus (e) is a hook, similar in all species, and has a large sclerotized base, the stipes. The terminal apophysis is a sclerotized prong (a), slightly different in different species, resting on a bubble-like, transparent, spherical subterminal apophysis (a in Fig. 232). In some species the terminal apophysis is different in shape (Figs. 126, 136, 147, 157). The mesal side of the palpus faces ventrally, the ventral side laterally in resting position (Fig. 231).

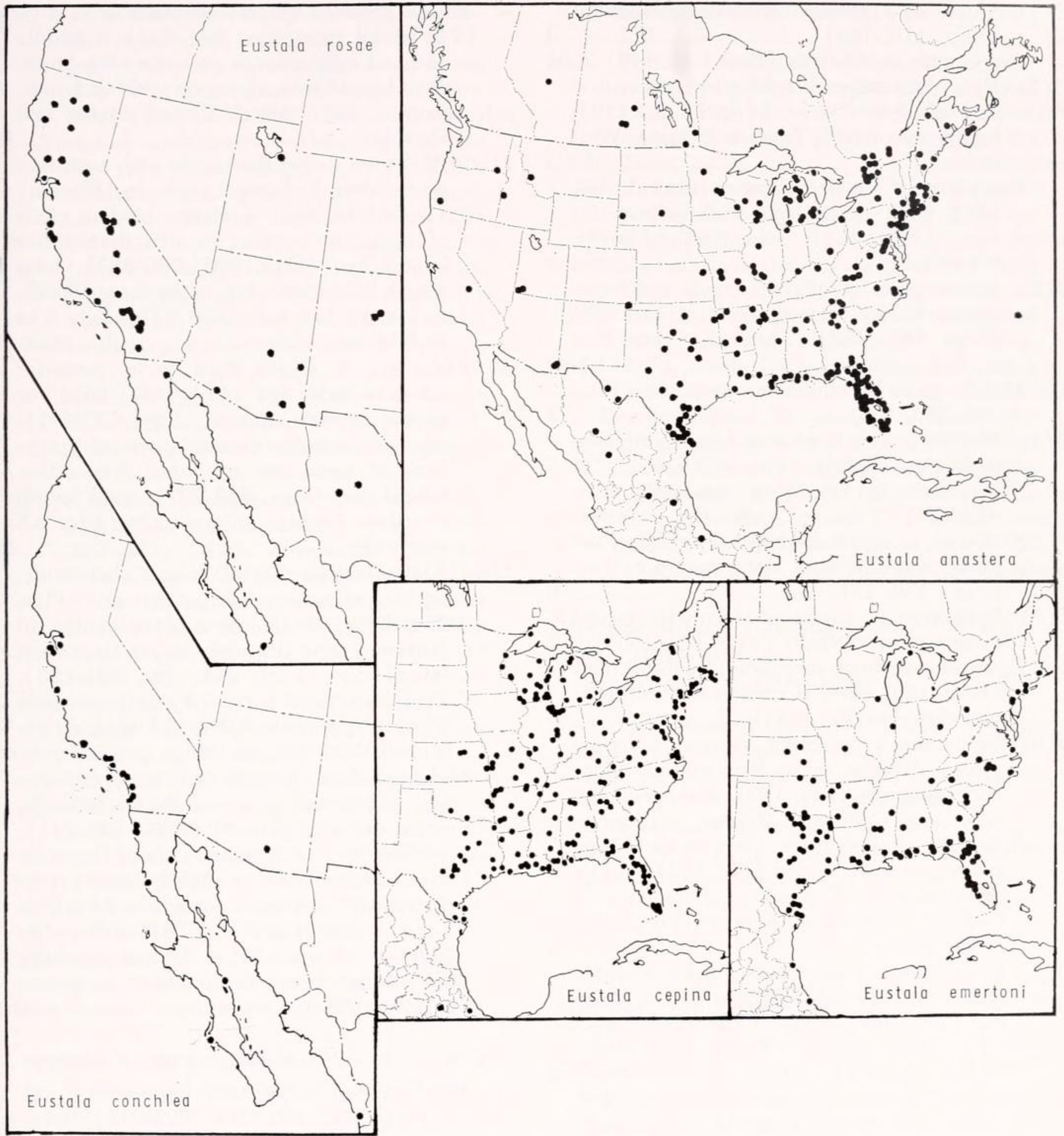
*Natural History.* Considering the common occurrence of many *Eustala* species, surprisingly little was known about them. *Eustala* apparently is nocturnal and removes its web at daytime. During the day it rests on a dead branch; there is no retreat. *Eustala* species are commonly collected by sweeping and are found also as prey in mud-dauber wasp nests.

*Eustala anastera* observed at the Archbold Biological Station, Lake Placid, Florida made webs every evening after dark. The webs usually had disappeared by the morning, but once in awhile the webs are not taken down. The webs of juveniles had 17 to 25 radii, that of an adult, 18 and 21. The webs of these juveniles had 28, 37, 41, 31 and 15 viscid threads below the hub and above the hub had 36, 38, 39, 28, 32. The web of an adult had 30, 33 below, 31, 28 above. The horizontal diameter of juveniles' webs ranged from 12 to 25 cm; of adults' webs 19 and 30 cm. There were few frame threads, the hub was solid (Plate 7). The webs were built in dead branches, usually away from leaves and within a wire fence, having vertical wires 15.5 cm apart. *Eustala* has no retreat; when not in the center of the web, it sits appressed to branches. Most webs are vertical but a horizontal web was seen. The lowest webs are 3 to 4 feet above the ground; the maximum height is not known.

*Eustala anastera* in central Florida feeds on a wide variety of medium-sized prey, and when resting in the web usually keeps its legs slightly spread like *Eriophora ravilla*,



Map 4. Distribution of *Eustala devia* (Gertsch and Mulaik), *E. cazieri* n. sp., *E. californiensis* (Keyserling), *E. bifida* F.P.-Cambridge, *E. brevispina* Gertsch and Davis, *E. clavispina* (O.P.-Cambridge), *E. cameronensis* Gertsch and Davis and *E. eleuthera* n. sp.



Map 5. Distribution of *Eustala rosae* Chamberlin and Ivie, *E. anastera* (Walckenaer), *E. cepina* (Walckenaer), *E. emertoni* (Banks), *E. conchlea* (McCook).

but unlike many other genera (M. Stowe, personal communication).

*Species and Distribution.* *Eustala* is only known from the Americas. Most species are tropical, and only five species are found in temperate North America. Another eight tropical species have been collected in southern Florida, southern Texas or south-

ern California. The many species in the American tropics are probably very difficult to separate by morphological characters alone.

KEY TO *EUSTALA* FEMALES NORTH OF MEXICO

- 1. Tropical species, southern California, southern Texas, southern Florida (Map 4) ..... 2
- Temperate species (Map 5) ..... 9

- 2(1) Scape of epigynum without annulations (Figs. 118, 128) ..... 3  
 - Scape with annulations (Figs. 138, 149) .... 4  
 3(2) Epigynum wider than long in both ventral and posterior view (Figs. 118, 119); lightly sclerotized; Texas to Panama, West Indies ..... *devia*  
 - Epigynum as wide as long in ventral view (Fig. 128), longer than wide in posterior view (Fig. 129); sclerotized; Florida, West Indies ..... *cazieri*  
 4(2) Middle piece of epigynum wide and large, almost hiding framing parts to the sides (Figs. 167, 168); Texas to Costa Rica ..... *bifida*  
 - Middle piece of epigynum narrower (Figs. 139, 150, 160) ..... 5  
 5(4) Abdomen setae dilated at base; eye region projecting slightly (Fig. 163); scape of epigynum in side view unusually deep (Fig. 161); Texas to Guatemala .... *clavispina*  
 - Abdomen setae not modified, eye region not projecting; scape of epigynum not deep (Figs. 140, 151) ..... 6  
 6(5) Epigynum in posterior view with lateral constrictions ventrally (Figs. 139, 150) .... 7  
 - Epigynum without such lateral constrictions (Figs. 180, 206); if constricted, constriction dorsally (Fig. 193) ..... 8  
 7(6) Epigynum in posterior view with lateral pieces dorsally expanded, middle piece wide ventrally (Fig. 139); abdomen with one hump; California, Mexico .. *californiensis*  
 - Epigynum in posterior view with lateral pieces not so expanded (Fig. 150), middle piece narrow (Fig. 149); abdomen with two or three large humps (Figs. 153, 154); Texas ..... *brevispina*  
 8(6) Scape thick, finger-shaped with rounded tip (Figs. 179, 181); epigynum in posterior view long and middle piece small (Fig. 180); tropical Florida, West Indies ..... *eleuthera*  
 - Scape tapering to a point (Figs. 192, 205, 228); epigynum in posterior view more or less square in outline with middle piece larger (Figs. 193, 206, 234, 254); whole region ..... 9  
 9(1) Epigynum in posterior view with dorsal, lateral lobes (Fig. 193); abdomen with three humps in a row (Figs. 196, 197); California to New Mexico ..... *rosae*  
 - Epigynum in posterior view without the dorsal lobes (Figs. 206, 234, 254) ..... 10  
 10(9) Middle piece of epigynum in posterior view larger than each lateral area (Fig. 270) and abdomen with a distinct hump (Figs. 273, 274); California, Arizona, northwestern Mexico ..... *conchlea*  
 - Middle piece of epigynum smaller or as large as lateral area (Figs. 206, 244); if middle piece of epigynum in posterior view larger than lateral area, abdomen without hump; eastern and central United States and Canada ..... 11  
 11(10) Abdomen longer than wide with a distinct posterodorsal hump (not in Florida) (Figs. 209, 210); posterior median piece of epigynum smaller in area than either lateral one (Figs. 206, 280-285); total length 5.7 to 10.0 mm, of southern Florida specimens 5.4 mm, 0.36 (Florida), 0.44 to 0.58 mm wide ..... *anastera*  
 - Abdomen, if longer than wide, posterior tubercle indistinct (Figs. 257, 258), or almost as wide as long (Figs. 237-241); area of posterior median piece of epigynum of same size or larger than either lateral one (Figs. 286-295); total length less than 7.6 mm, epigynum less than 0.5 mm wide ..... 12  
 12(11) Abdomen egg-shaped, longer than wide, without tubercle, with pattern as in Figs. 258, 260; middle piece of epigynum in posterior view distinctly larger than each lateral one (Figs. 254, 262, 291-295). Total length 3.4 to 7.6 mm; southern Florida specimens 5.0 to 6.1 mm; epigynum 0.35 to 0.5 mm wide ..... *emertoni*  
 - Abdomen almost as wide as long, subtriangular, with small posterior dorsal tubercle, with variable pattern (Figs. 237-241); middle piece of epigynum about the same area as lateral ones or slightly larger; epigynum with a minute posterodorsal sclerotized scale (Figs. 234, 244-247, 286-290); total length 3.4 to 7.9 mm; southern Florida specimens the smallest; epigynum 0.28 to 0.38 mm wide ..... *cepina*
- KEY TO *EUSTALA* MALES NORTH OF MEXICO
1. Conductor of palpus very large with a tail (Figs. 232, 250, 266, 297-312); temperate and tropical ..... 2
  - Conductor of palpus without a tail and usually small (Figs. 126-127, 136-137, 147-148, 157-158, 165, 174, 187, 190); subtropical (southern Florida, southern Texas, southern California only, Map 1) 7
  - 2(1) Second femur with a ventral row of macrosetae or at least one macroseta (Fig. 214); whole region ..... *anastera*
  - Second femur never with a ventral macroseta (Figs. 201, 249, 265) ..... 3
  - 3(2) Pacific states and southwestern states (Map 5) ..... 4
  - Eastern states and central states (Map 5) .. 5

- 4(3) Terminal apophysis shorter than bubble-like subterminal apophysis (Fig. 277), conductor very large with a tail more than twice as long as visible part of embolus (Figs. 277, 312, 318) ----- *conchlea*
- Terminal apophysis overhanging bubble-like subterminal apophysis (Fig. 202); conductor small with tail, equal in length to visible part of embolus (Figs. 202, 297, 313) ----- *rosae*
- 5(3) Conductor with tail shorter than embolus height (Figs. 215, 298-302, 314-315); total length 3.9 to 9.5 mm, Florida males smallest; palpus 0.9 to 1.6 mm wide ----- *anastera*
- Conductor with its tail as long or longer than embolus height (Figs. 303-311). Total length less than 5.0 mm; palpus less than 1.2 mm wide ----- 6
- 6(5) Terminal apophysis shorter than bubble-like subterminal apophysis (Figs. 266, 309-311, 317); conductor bulging "above" embolus and with a tail about 5 times as long as wide and much longer than embolus is high (Figs. 309-311). Total length 3.8 to 5.0 mm; palpus 0.8 to 1.2 mm wide ----- *emertoni*
- Terminal apophysis as long or longer than bubble-like subterminal apophysis, overhanging it (Figs. 250, 303-308, 316); conductor not bulging "above" embolus, with a tail less than 4 times as long as wide (Figs. 303-308), equal in length or slightly longer than embolus height (Figs. 303-308). Total length 2.5 to 4.3 mm; southern Florida specimens smallest; palpus 0.65 to 0.72 mm wide ----- *cepina*
- 7(1) Palpus with bubble-like semitransparent subterminal apophysis below stylet-shaped terminal apophysis (Figs. 165, 174, 187, 190) ----- 11
- Palpus lacking bubble-like semitransparent subterminal apophysis or if present, distal to ("above") stylet-shaped terminal apophysis (Figs. 126, 136, 147, 157) ----- 8
- 8(7) Second femur without ventral row of macrosetae (Fig. 146); palpus as in Figures 147, 148; southern California, Mexico ----- *californiensis*
- Second femur with a ventral row of macrosetae (Figs. 125, 135, 156); palpus not as in Fig. 147; southern Texas and Florida ----- 9
- 9(8) Terminal apophysis covering embolus, subterminal apophysis distal in palpus (Figs. 126, 127); Texas to Panama and West Indies ----- *devia*
- Subterminal apophysis not distal and terminal apophysis not hiding embolus (Figs. 136, 157) ----- 10
- 10(9) Terminal apophysis of palpus a non-transparent lobe overhanging embolus (Fig. 136); Florida, West Indies ----- *cazieri*
- Terminal division of palpus as in Fig. 157; Texas ----- *brevispina*
- 11(7) Embolus twisted with embolus base extending beyond tip (Fig. 174); Texas to Costa Rica ----- *bifida*
- Embolus hook-shaped (Figs. 165, 187, 190) ----- 12
- 12(11) Terminal apophysis with a constricted neck, and knife-blade-shaped tip (Fig. 165); conductor large (Figs. 165, 166); Texas to Guatemala ----- *clavispina*
- Terminal apophysis otherwise (Figs. 187, 190); conductor small (Figs. 187, 190) ----- 13
- 13(12) Embolus partly hidden by bubble-like subterminal apophysis (Fig. 190); Texas ----- *cameronensis*
- Embolus below bubble-like subterminal apophysis (Fig. 187); Florida ----- *eleuthera*

*Eustala devia* (Gertsch and Mulaik),  
new combination

Figures 118-127, Map 4

*Neosconella devia* Gertsch and Mulaik, 1936, Amer. Mus. Novitates, no. 863: 16, fig. 38, ♀. Female holotype from Edinburg, Texas, in the American Museum of Natural History, examined.

*Eustala minima* Chickering, 1955, Bull. Mus. Comp. Zool. 112: 471, figs. 94-96, ♀. Female holotype from Barro Colorado Island, Panama Canal Zone, in the Museum of Comparative Zoology, examined. NEW SYNONYMY.

*Note.* The epigynum of specimens of *E. minima* from Panama differs some from that of specimens from the Bahama Islands and the holotype of *E. devia* (Figs. 118, 119).

*Description.* Female holotype: Carapace yellowish with some black patches. Posterior median eye area black and lateral eyes on black spots. Sternum yellow, legs yellow with black patches and rings. Dorsum of abdomen light and with folium. Venter of abdomen with white pigment spots behind epigynum and a gray trapezoid and a gray transverse band in front of spinnerets (Fig. 124). The abdomen is almost as wide as long and without humps. Female from South Bimini: Total length 3.6 mm. Carapace 1.5 mm long, 1.2 wide. First femur,



2.0 mm; patella and tibia, 2.3; metatarsus, 1.5; tarsus, 0.6. Second patella and tibia, 1.9; third, 1.1; fourth, 1.6.

Male from South Bimini: Total length 2.8 mm. Carapace 1.4 mm long, 1.2 wide. First femur, 2.1 mm; patella and tibia, 2.4; metatarsus, 1.6; tarsus, 0.7. Second patella and tibia, 1.8; third, 0.8; fourth, 1.5.

The illustrations were made from the female holotype and from a South Bimini male.

*Diagnosis.* The abdomen of the female lacks a distinct hump (Figs. 122, 123). As in *E. cazieri*, the epigynum has a smooth scape without annuli, but unlike that of *E. cazieri*, the scape is tipped by a knob (Figs. 118, 120). The male differs from other species of *Eustala* in having the terminal apophysis covering the embolus in mesal view (Fig. 126), and the subterminal apophysis apical. The similar West Indian *E. perdita* Bryant has a differently shaped terminal apophysis.

*Distribution.* Southern Texas to Panama, Bahamas, Hispaniola, Puerto Rico (Map 4).

*Records.* *Mexico.* Tabasco. 2 mi. NE of Comalcalco, ♂. *Panama.* Boquete; Arraijan; El Valle; Porto Bello; all ♀♀. *Canal Zone.* Barro Colorado Island; Ft. Randolph; Chilibre; Madden Dam; Forest Reserve; all ♀♀. *Bahamas.* South Bimini, ♀, ♂. *Haiti.* Kenskoff, ♀. *Puerto Rico.* Mayagüez; Cambalche Forest east of Arecibo.

### *Eustala cazieri* new species

Figures 128–137, Map 4

*Holotype.* Female from Plantation Key, Monroe County, 4 miles south of Tavernier, Florida, 11 March 1963 (H. and L. Levi), edge of hardwood forest, in the Museum of Comparative Zoology. The species is named

after Prof. M. A. Cazier, collector of many specimens of this species in South Bimini.

*Description.* Female from Bimini: Carapace orange-brown with paired black patches and white down. Legs orange-brown, indistinctly banded. Dorsum of abdomen with lines outlining the folium and sometimes with a black longitudinal band (Fig. 132). Venter with little black pigment (Fig. 134). Thoracic depression a median longitudinal line. Posterior median eyes 0.9 diameter of anterior, laterals 0.8 diameter. Anterior median eyes 1.5 diameters apart, posterior median eyes 1.5 diameters apart. The abdomen is triangular, pointed above spinnerets. Total length 5.4 mm. Carapace 2.2 mm long, 1.9 wide. First femur, 2.5 mm; patella and tibia, 3.0; metatarsus, 1.9; tarsus, 0.7. Second patella and tibia, 3.0 mm; third, 1.4; fourth, 2.5.

Male from Miami: Coloration like that of female. Eye sizes about as in female, anterior median eyes slightly larger. Anterior median eyes their diameter apart, posterior median eyes slightly more than their diameter apart. First coxa with a hook. Total length 4.7 mm. Carapace 2.4 mm long, 1.9 wide. First femur, 3.6 mm; patella and tibia, 4.3; metatarsus, 2.8; tarsus, 1.1. Second patella and tibia, 3.0 mm; third, 1.5; fourth, 2.4.

Female illustrated came from South Bimini, male from Miami.

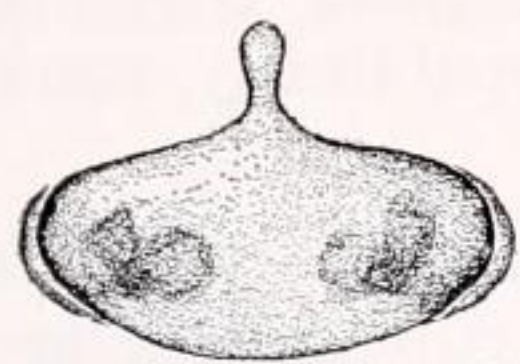
*Variation.* Females may lack a pattern on the dorsum of the abdomen, and some have a median longitudinal dark band. Total length of Florida females, 5.2 to 6.8 mm, carapace 2.0 to 2.5 long, 1.8 to 2.0 wide. Males vary in total length 3.3 to 4.7 mm, carapace 2.1 to 2.4 long, 1.7 to 1.9 wide.

*Diagnosis.* Females differ from other

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Figures 118–127. *Eustala devia* (Gertsch and Mulaik): 118–121. Epigynum: 118. Ventral. 119. Posterior. 120. Lateral. 121. Posterior, cleared. 122. Female carapace and abdomen, dorsal. 123. Female, legs removed, lateral. 124. Female abdomen, ventral. 125. Male, ventral macrosetae on left femora. 126, 127. Left male palpus: 126. Mesal. 127. Ventral.

Figures 128–137. *Eustala cazieri* n. sp.: 128–131. Epigynum: 128. Ventral. 129. Posterior. 130. Lateral. 131. Posterior, cleared. 132. Female, dorsal. 133. Female, legs removed, lateral. 134. Female abdomen, ventral. 135. Male, ventral macrosetae of left femora. 136, 137. Male palpus: 136. Mesal. 137. Ventral.



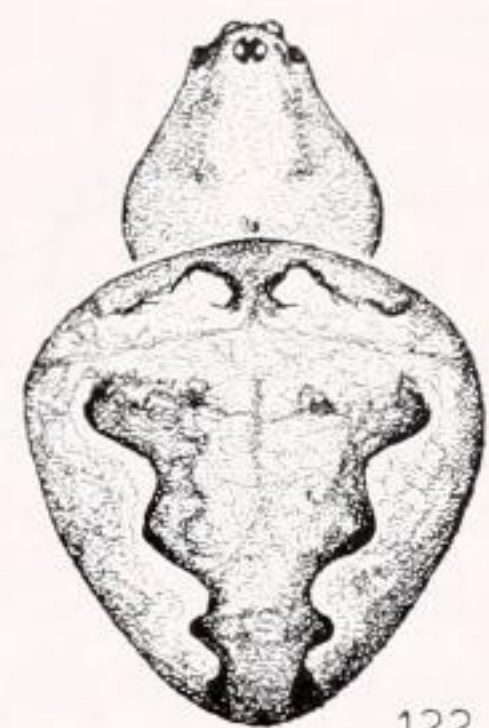
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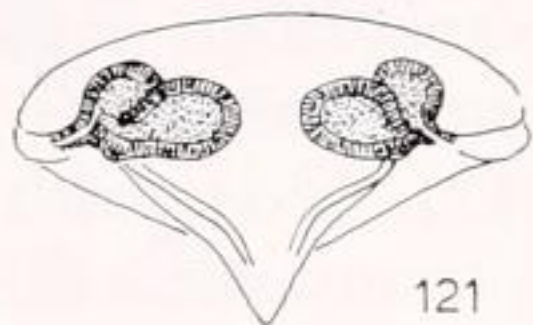
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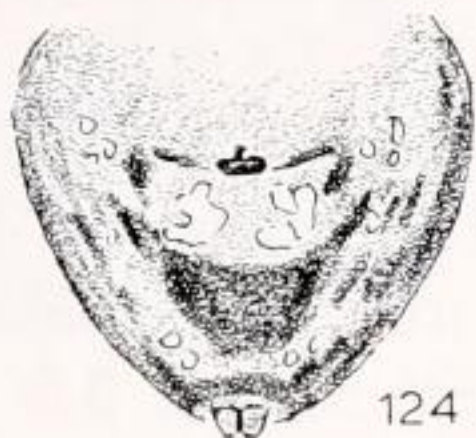
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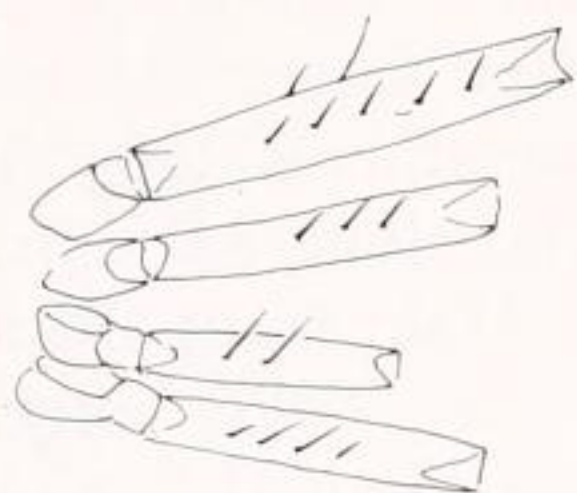
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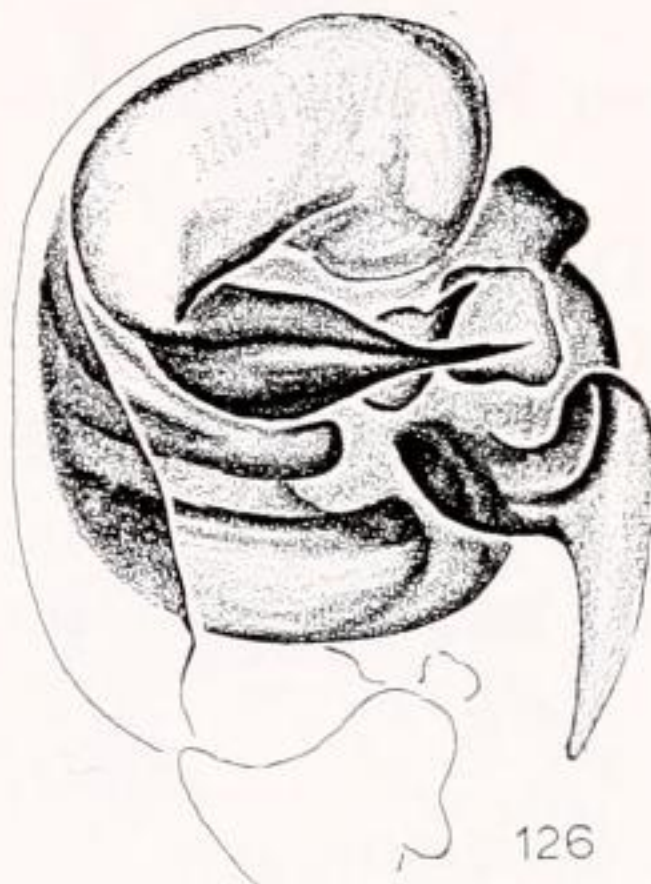
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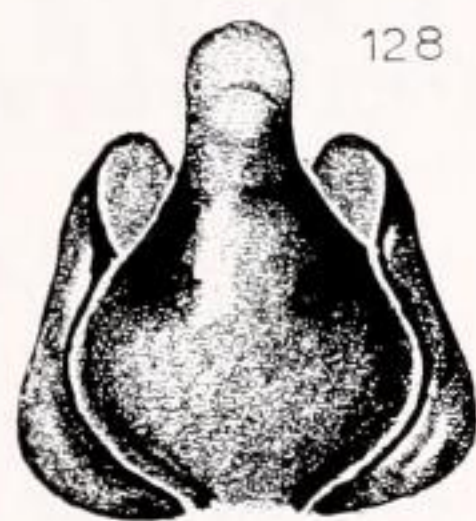
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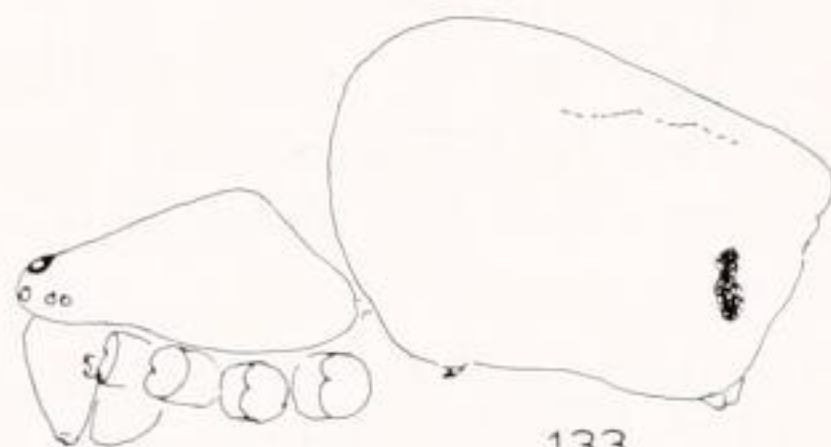
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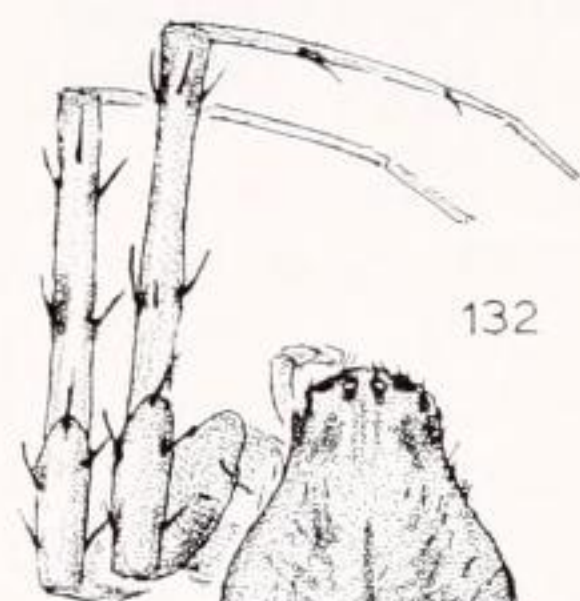
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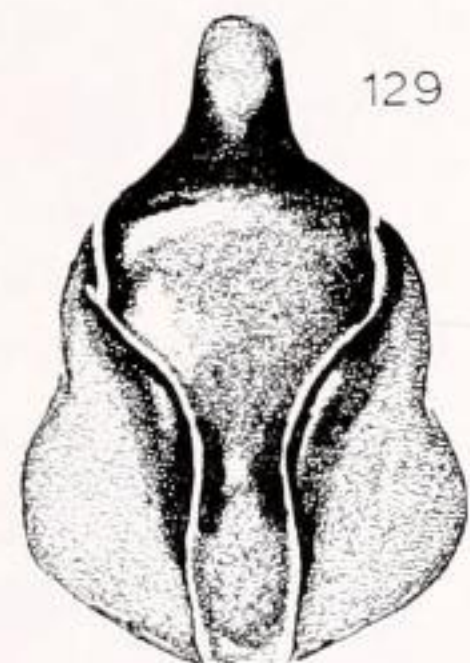
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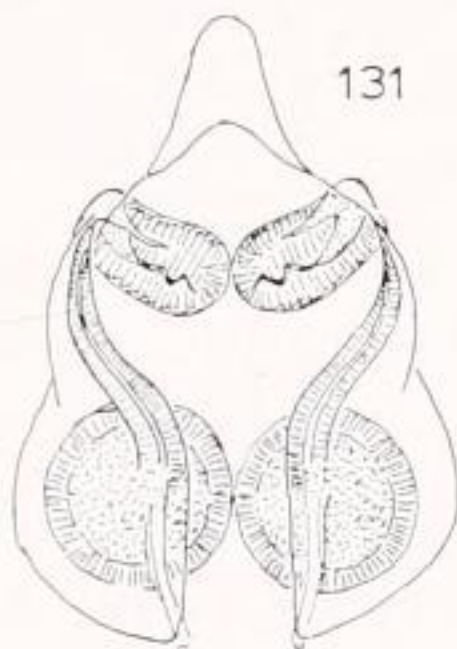
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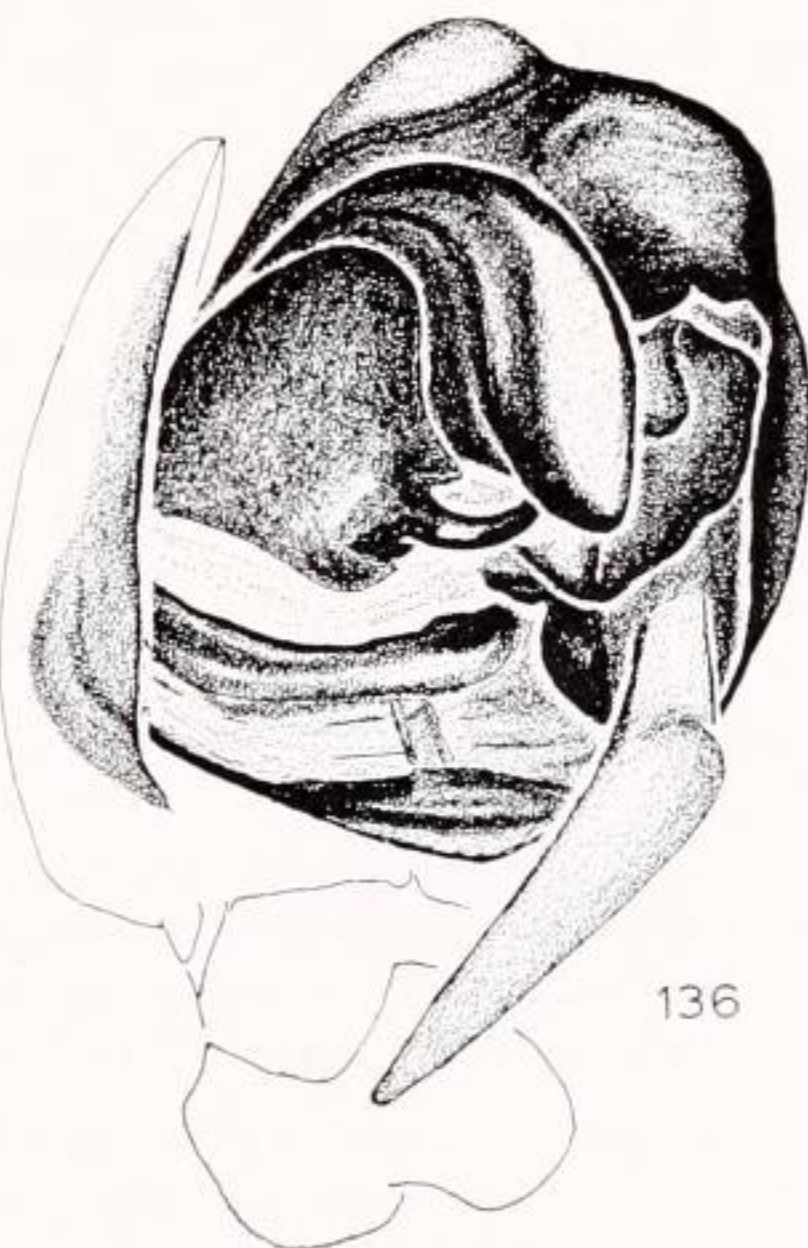
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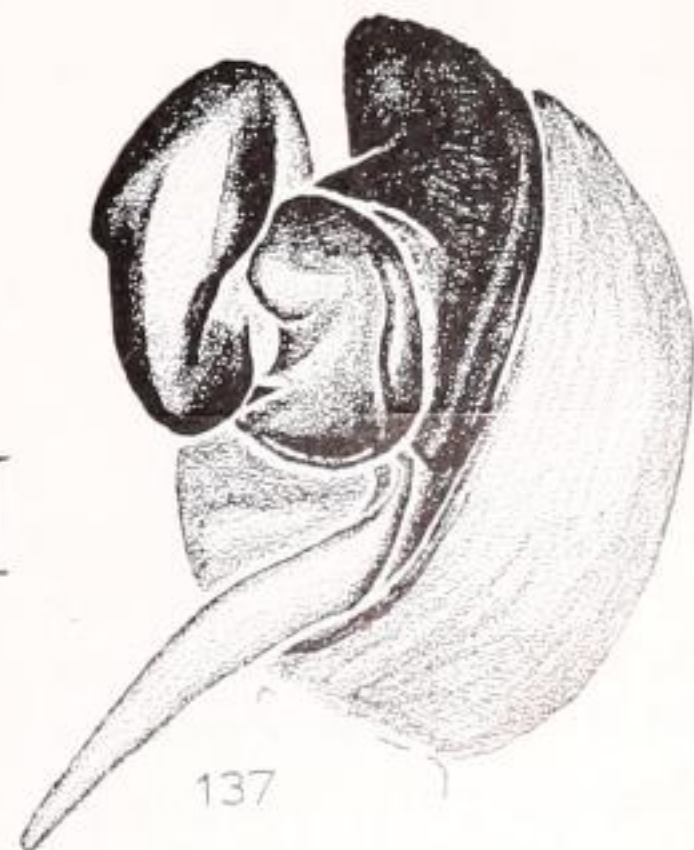
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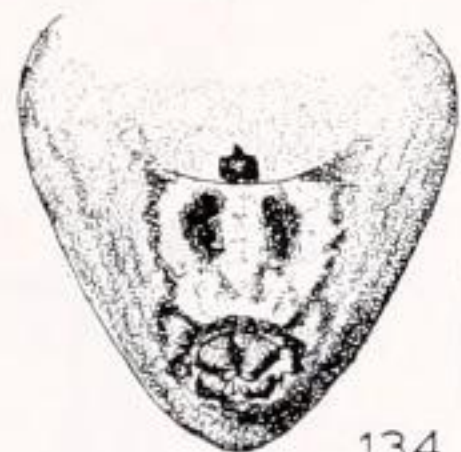
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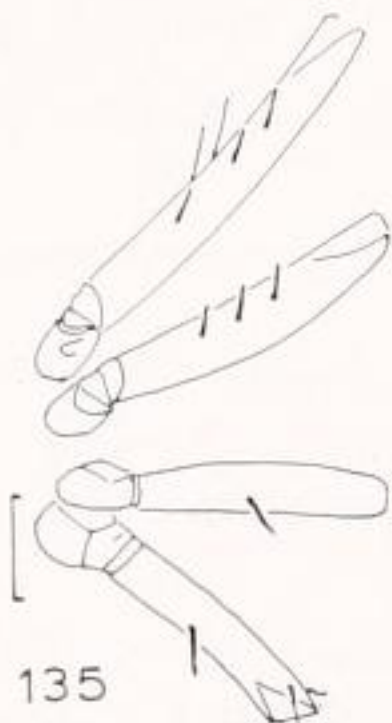
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134



135

Florida species by the angular abdomen (Figs. 132, 133) and by lacking annuli on the smooth, anteriorly directed scape of the epigynum (Figs. 128–130). The scape lacks the knob present in *E. devia*. Unlike males of most *Eustala* species, those of *E. cazieri* have no bubble-like transparent subterminal apophysis (Fig. 136); they have an ovoid terminal apophysis overhanging the embolus (Figs. 136, 137).

*Distribution.* Southern Florida and Bahama Islands (Map 4).

*Records.* *Florida.* Dade Co.: Miami; Miami Beach. Monroe Co.: Tavernier. *Bahama Islands.* North Bimini; South Bimini; Crooked Isl.; Eleuthera; Great Abaco Isl.; North Caicos Isl.; Berry Isl.; Andros Isl.; New Providence.

### *Eustala californiensis* (Keyserling), new combination

Figures 138–148, Map 4

*Cyrtophora californiensis* Keyserling, 1885, Verhandl. Zool. Bot. Ges. Wien, 34: 525, pl. 13, fig. 24, ♀. Female holotype from "California" in the Museum of Comparative Zoology, examined. Keyserling, 1893, Spinnen Amerikas, 4: 263, pl. 13, fig. 196, ♀. Roewer, 1942, Katalog der Araneae, 1: 751. Bonnet, 1956, Bibliographia Araneorum, 2(2): 1361.

*Araneus diegensis* Schenkel, 1950, Verh. Naturf. Gesell., Basel, 61: 67, fig. 23, ♀. Female holotype from Missions Bay, San Diego, California, in the Natural History Museum, Basel, examined. NEW SYNONYMY.

*Eustala abdita* Chickering, 1955, Bull. Mus. Comp. Zool., 112: 410, figs. 19–23, ♂. Male holotype from Huajuapán, Oaxaca, Mexico in the American Museum of Natural History, examined. NEW SYNONYMY.

*Eustala mexicana* Chickering, 1955, Bull. Mus. Comp. Zool., 112: 465, figs. 88–89, ♀. Female

holotype from Lo Bajo, Guerrero, Mexico in the American Museum of Natural History, examined. NEW SYNONYMY.

*Description.* Female from Oaxaca: Carapace light brown with paired dark brown patches and dark longitudinal mark in thoracic cleft. Legs light brown with some black rings, more distinct ventrally. Dorsum of abdomen whitish with folium (Fig. 142). Sides with gray lines. The abdomen is triangular, narrow with a dorsal posterior hump (Figs. 142–144). Total length 5.4 mm. Carapace 2.2 mm long, 2.0 wide. First femur, 3.2 mm; patella and tibia, 3.7; metatarsus, 2.0; tarsus, 0.9. Second patella and tibia, 3.0 mm; third, 1.5; fourth, 2.6.

Male from Oaxaca: Coloration as in female. Total length 3.6 mm. Carapace 1.8 mm long, 1.5 wide. First femur, 2.9 mm; patella and tibia, 3.0; metatarsus, 1.9; tarsus, 0.9. Second patella and tibia, 2.0 mm; third, 1.1; fourth, 1.9.

Female illustrated was from Oaxaca and males from Colima and Veracruz.

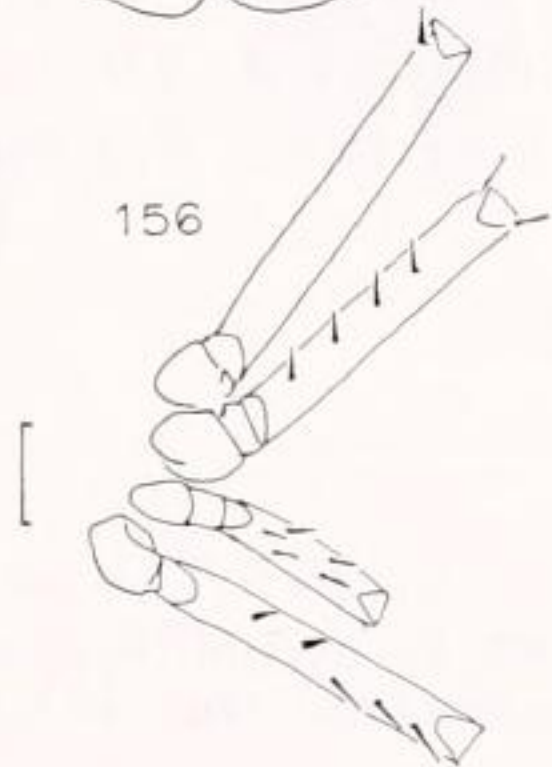
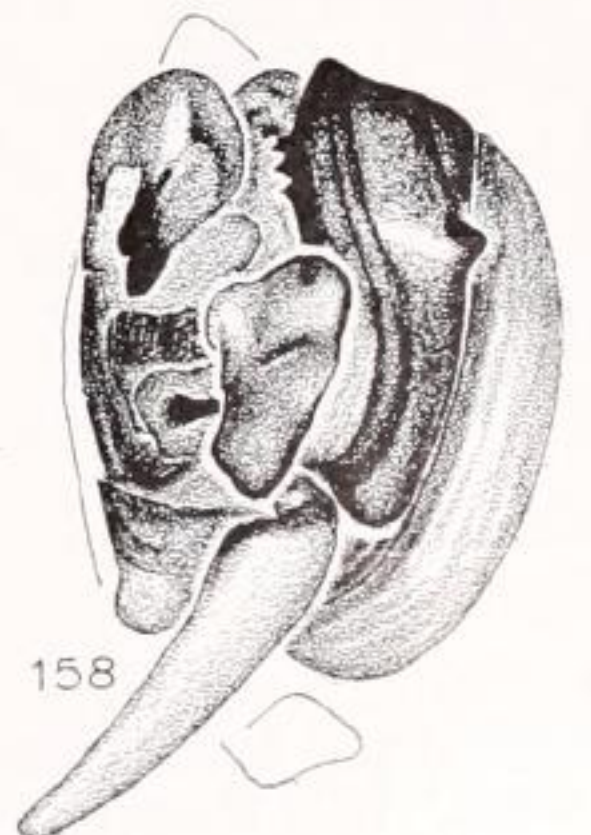
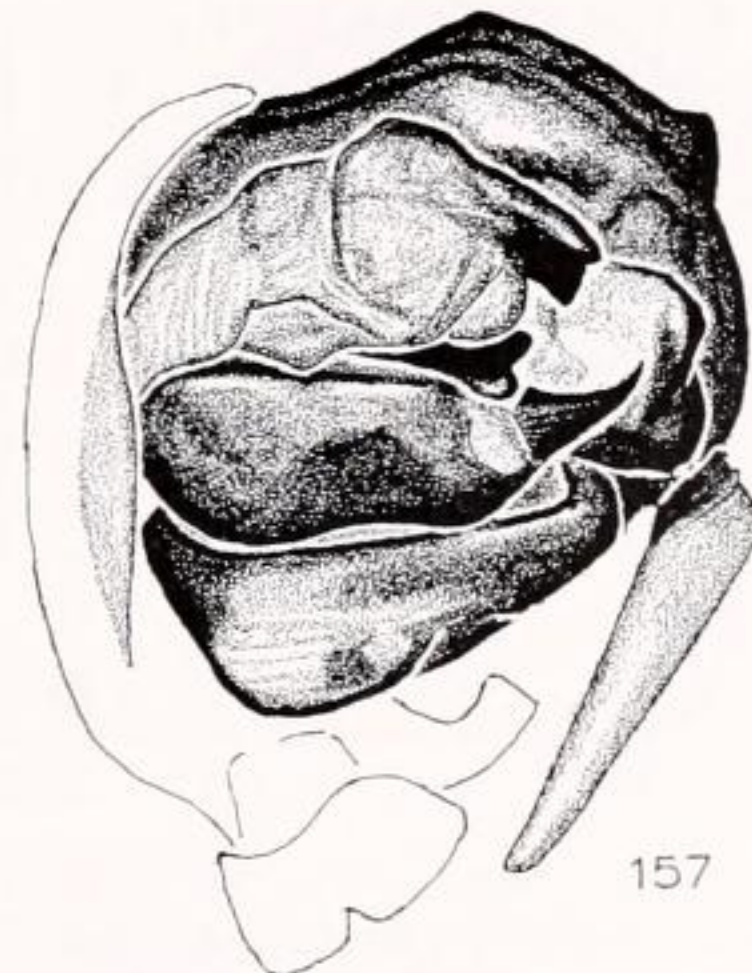
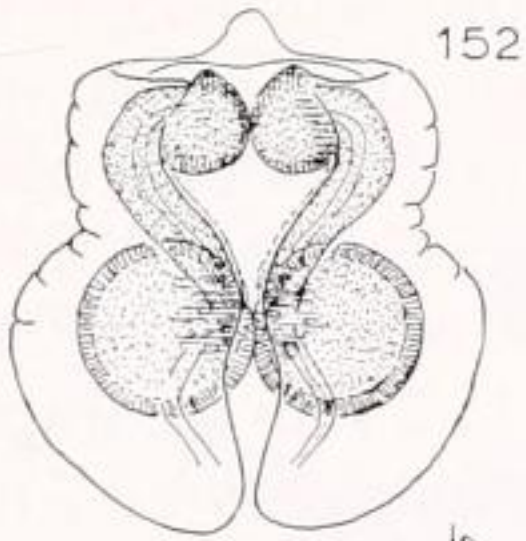
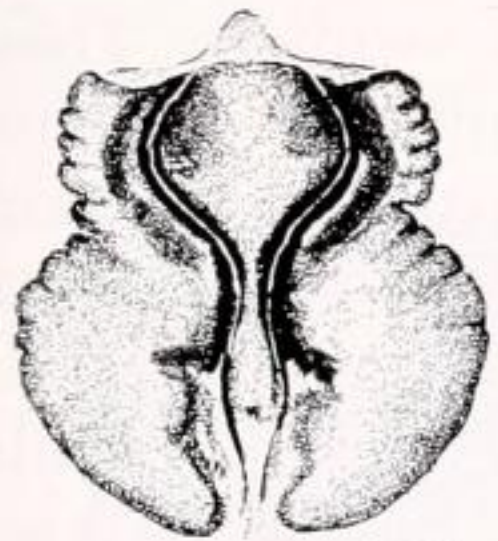
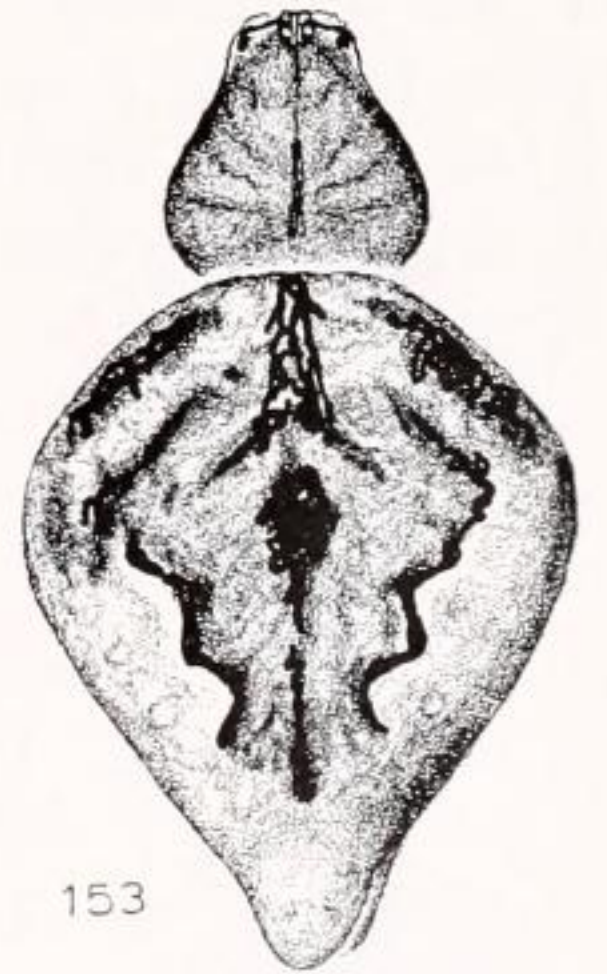
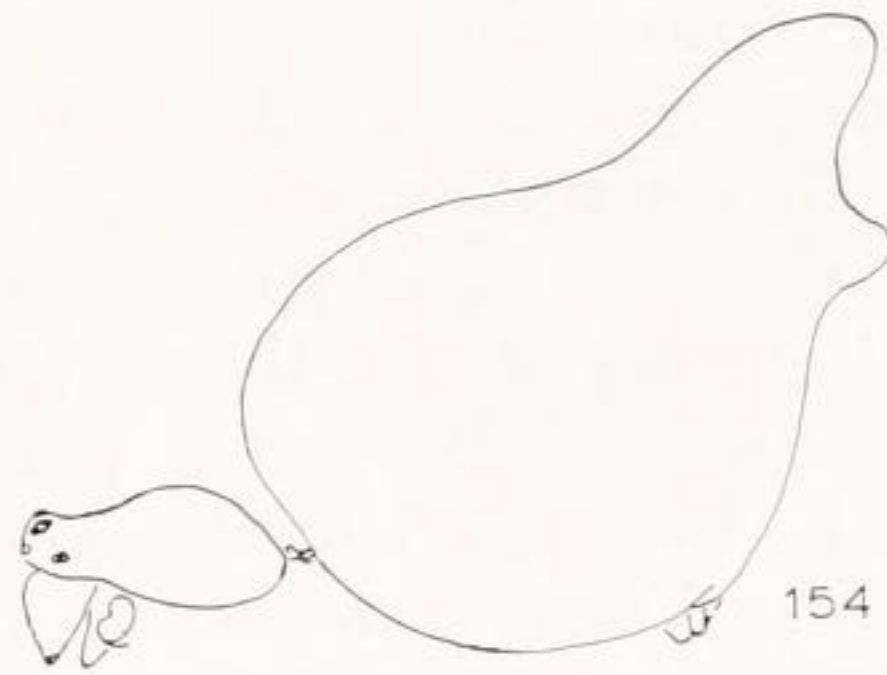
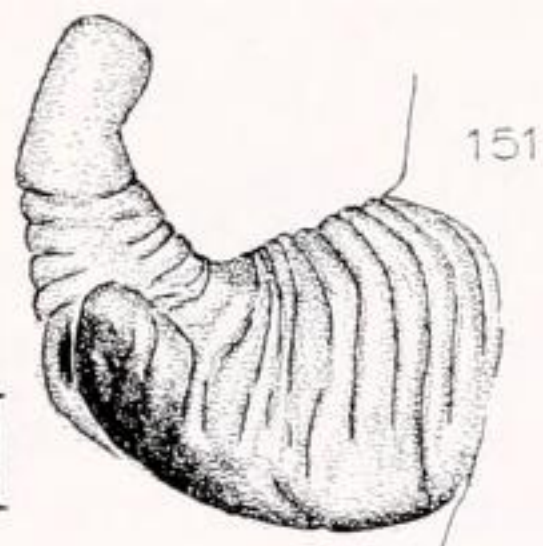
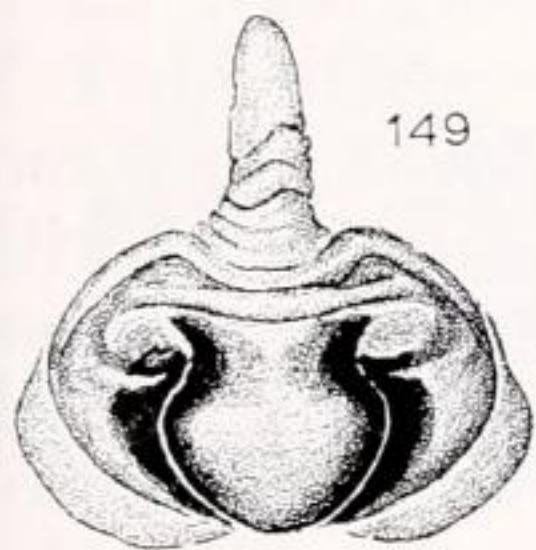
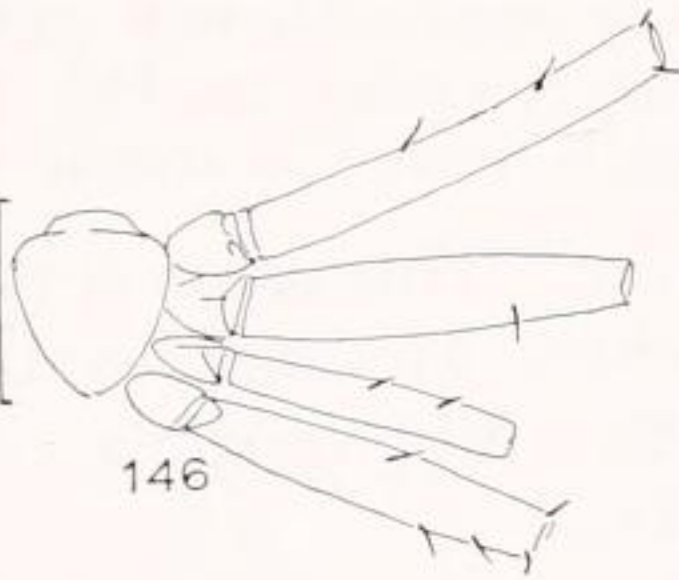
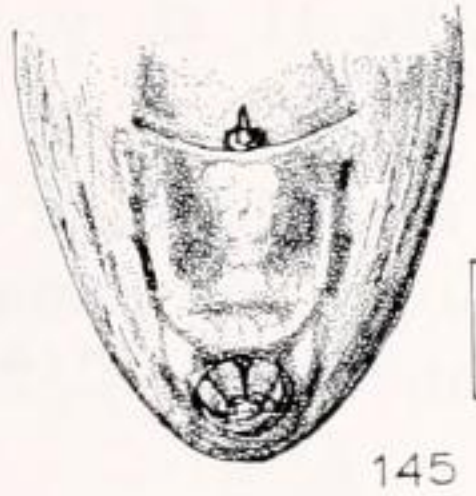
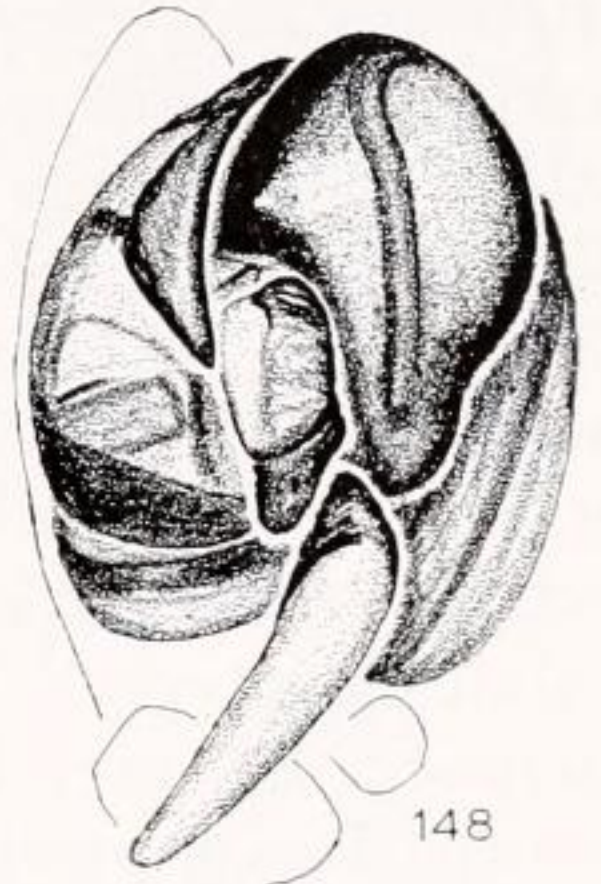
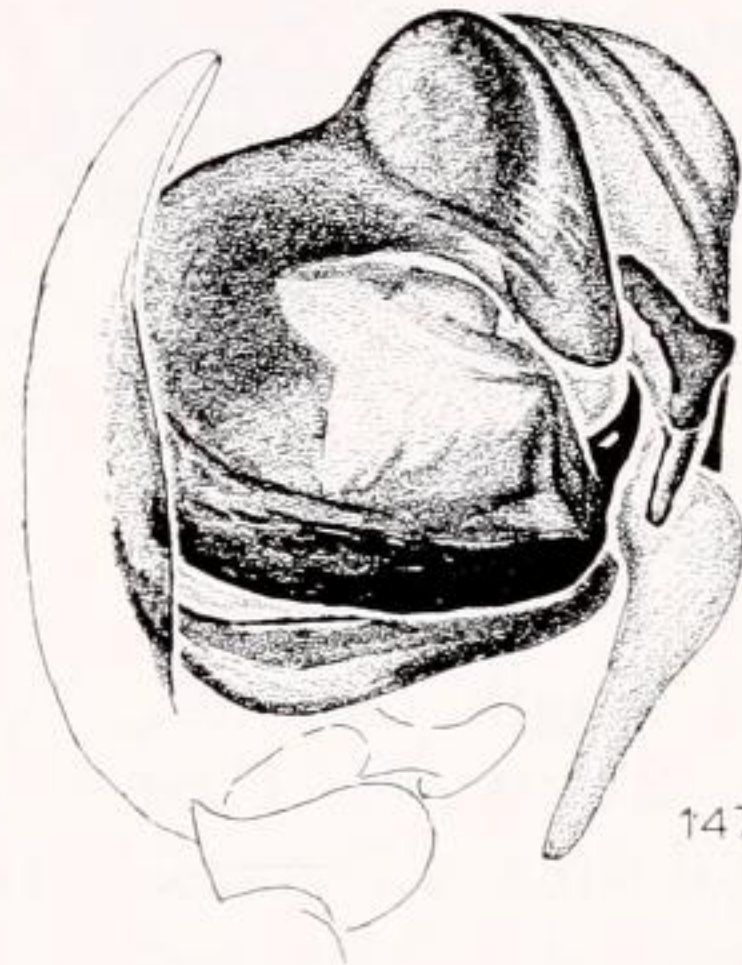
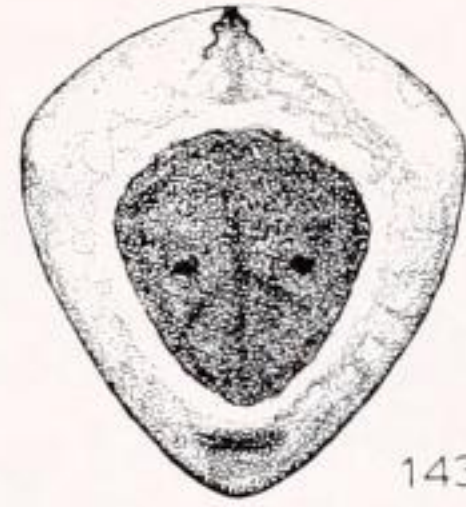
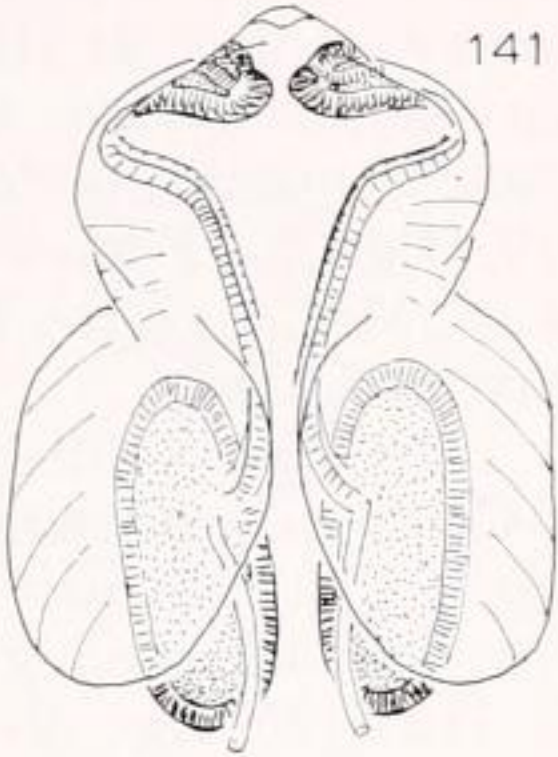
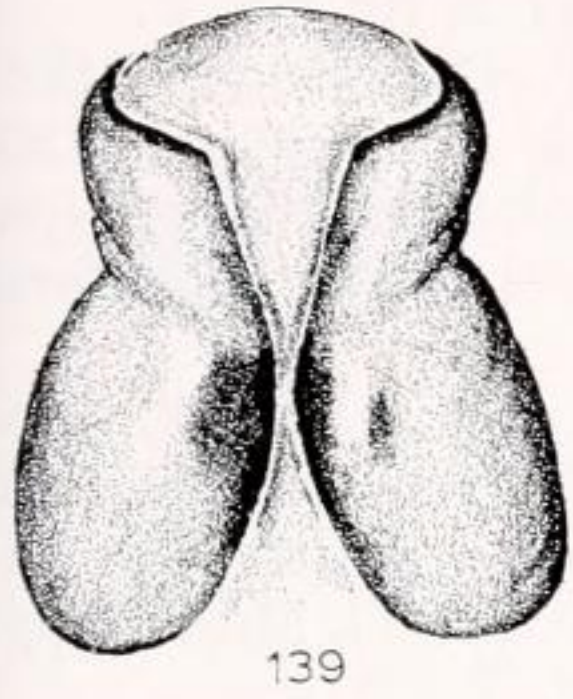
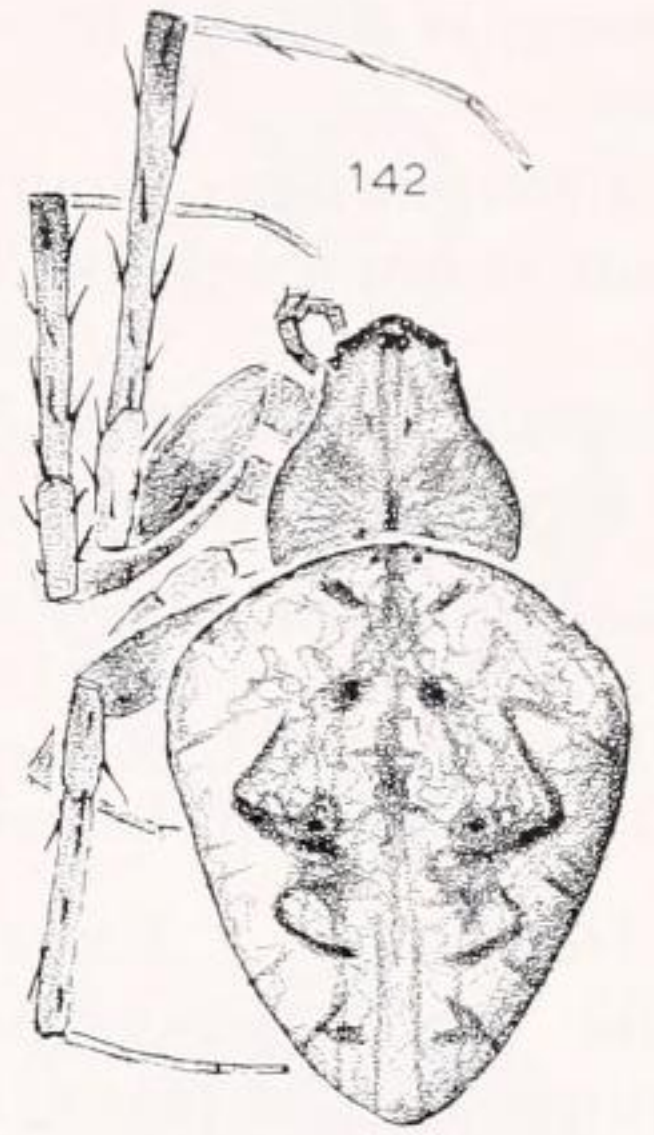
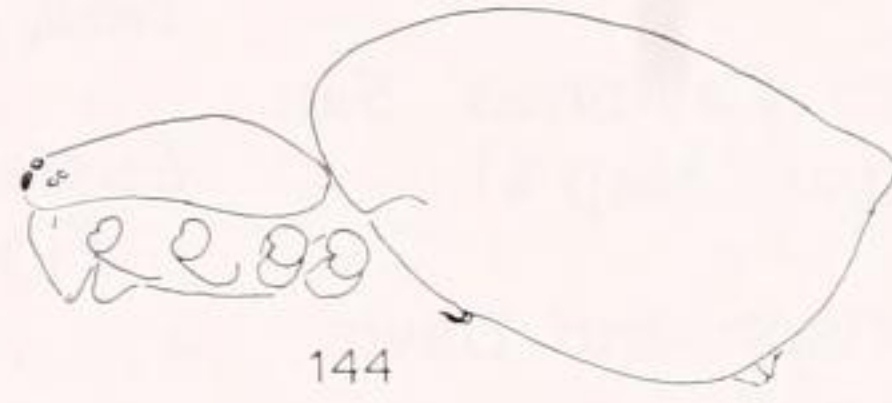
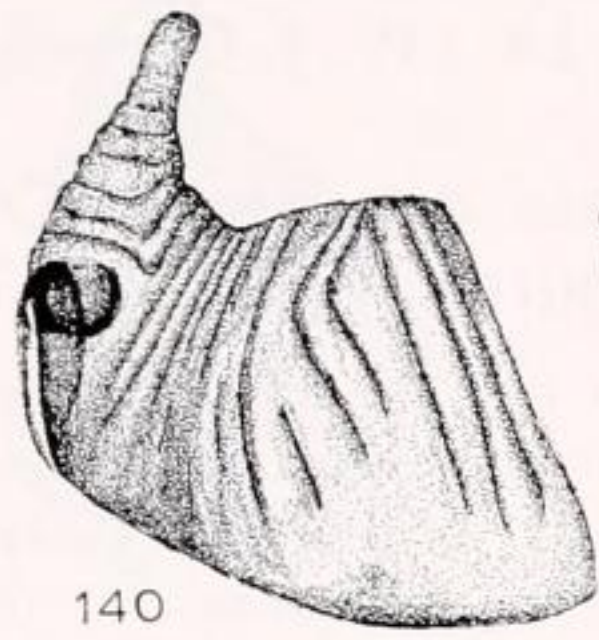
*Variation.* Females usually have the abdomen narrow (Fig. 142), but it may be wider and may have a dorsal triangular dark mark (Fig. 143). Total length of females is 3.9 to 7.0 mm, carapace 1.6 to 2.6 long, 1.4 to 2.1 wide. Total length of males 3.0 to 4.3 mm, carapace 1.6 to 2.3 long, 1.3 to 1.9 wide.

*Diagnosis.* Females can be separated from all related species by the posterior view of the epigynum, which shows a ventral constriction with laterally expanded dorsolateral lobes on each side (Fig. 139). The terminal apophysis of the palpus (Figs. 147, 148), lacking the usual sclerotized

Figures 138–148. *Eustala californiensis* (Keyserling): 138–141. Epigynum: 138. Ventral. 139, 141. Posterior. 140. Lateral. 141. Cleared. 142. Female, dorsal (Mexico). 143. Female abdomen, dorsal (California). 144. Female, legs removed, lateral. 145. Female abdomen, ventral. 146. Male, ventral macrosetae on left femora. 147, 148. Male left palpus: 147. Mesal. 148. Ventral.

Figures 149–158. *Eustala brevispina* Gertsch and Davis: 149–152. Epigynum: 149. Ventral. 150. Posterior. 151. Lateral. 152. Posterior, cleared. 153. Female carapace and abdomen. 154. Female, legs removed, lateral. 155. Female abdomen, ventral. 156. Male, ventral macrosetae of left femora. 157, 158. Male palpus: 157. Mesal. 158. Ventral.

Scale lines. 0.1 mm except Figs. 142–146, 153–156, 1.0 mm



prong, is distinct from that of related species.

*Distribution.* Southern California, San Luis Potosí south to Chiapas (Map 4).

*Eustala brevispina* Gertsch and Davis  
Figures 149–158, Map 4

*Eustala brevispina* Gertsch and Davis, 1936, Amer. Mus. Novitates, 881: 12, figs. 9, 10, ♀, ♂. Male holotype from Cameron Co., Texas in the American Museum of Natural History, examined.

*Description.* Female: Carapace brown with black marks and white setae. Legs brown with narrow black bands on distal articles. First, second and fourth femora mostly black. The abdomen is contrastingly marked and has two posterior humps (Figs. 153, 154). Total length 8.5 mm. Carapace 2.7 mm long, 2.4 wide. First femur, 3.2 mm; patella and tibia, 3.9; metatarsus, 2.5; tarsus, 1.0. Second patella and tibia, 3.5 mm; third, 1.7; fourth, 2.9.

Male holotype: Total length 5.8 mm. Carapace 3.0 mm long, 2.6 wide. First femur, 4.1 mm; patella and tibia, 4.7; metatarsus, 3.0; tarsus, 1.2. Second patella and tibia, 4.0 mm; third, 2.1; fourth, 3.6.

*Diagnosis.* This large species can be told from related species by the large abdominal humps (Figs. 153, 154) not present in *E. californiensis*. Like *E. californiensis* the epigynum in posterior view has a diagnostic constriction (Fig. 150), but the lateral pieces are differently shaped from those of *E. californiensis*. Unlike most *Eustala* species the male lacks the transparent subterminal apophysis. The shape of the terminal apophysis of the palpus (Figs. 157, 158) is unlike that of related species.

*Distribution.* Texas. Cameron Co.: Brownsville, 25 May 1934, ♀ allotype; 1 June 1934, 3 ♀; 8 June 1934, 3 ♀ (J. N.

Knull). Tamaulipas. La Pesca, 17 May 1952, 1 ♀ (W. J. Gertsch).

*Eustala clavispina* (O.P.–Cambridge)  
Figures 159–166, 176–177, Map 4

*Epeira clavispina* O.P.–Cambridge, 1889, Biologia Centrali-Americana, Araneidea, 1: 37, pl. 7, fig. 11, ♀. Two female syntypes from Cubilguitz in Vera Paz, Guatemala, in the British Museum, Natural History, examined. Keyserling, 1892, Spinnen Amerikas, 4: 102, pl. 5, fig. 75, ♀.

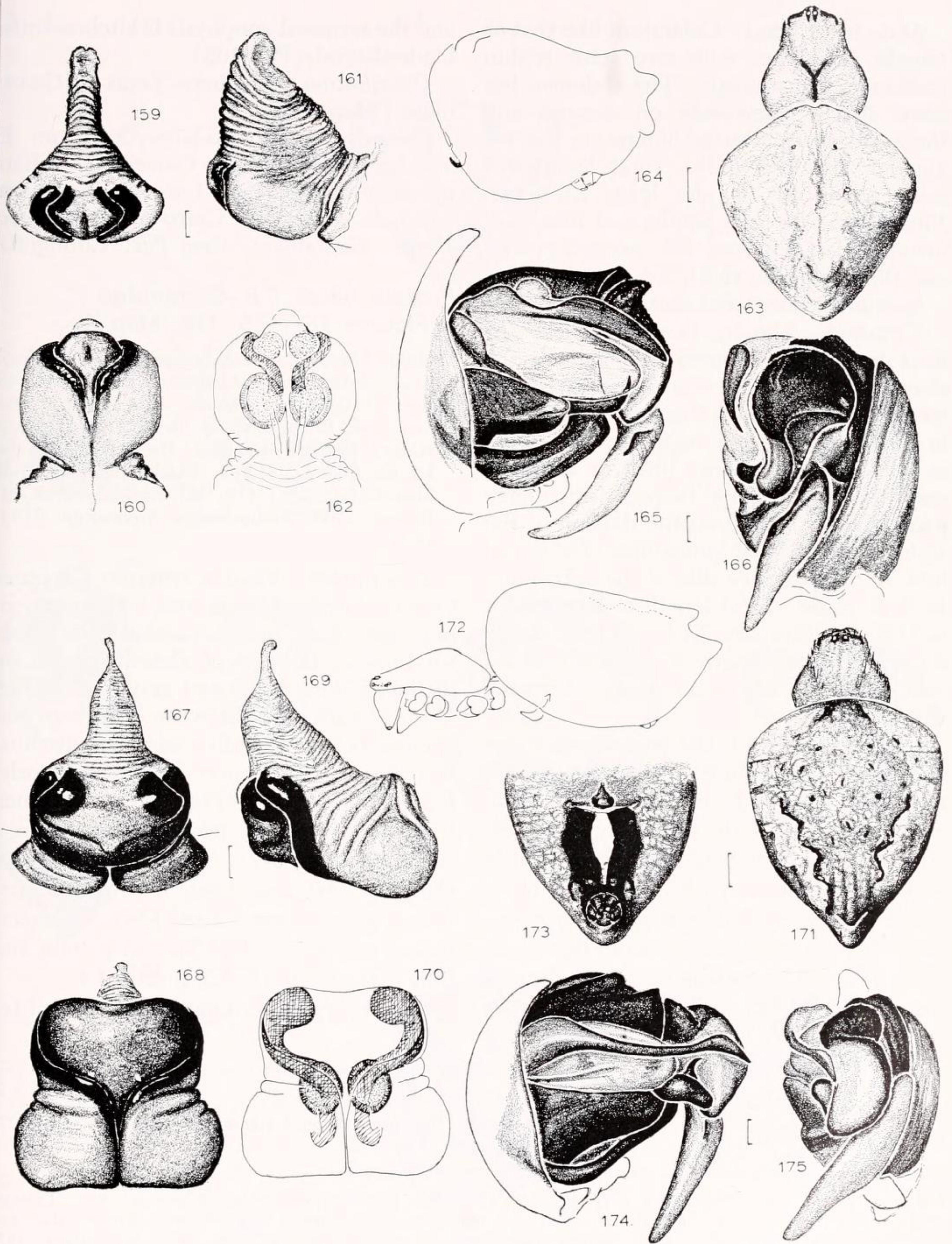
*Amamra nigromaculata* O.P.–Cambridge, 1895, Biologia Centrali-Americana, Araneidea, 1: 155, pl. 19, fig. 5. Female holotype from Teapa, Tabasco, Mexico in the British Museum, Natural History, examined.

*Eustala clavispina*,—F.P.–Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 509, pl. 48, fig. 19, ♀. Roewer, 1942, Katalog der Araneae, 1: 764. Chickering, 1955, Bull. Mus. Comp. Zool., 112: 428, figs. 45–48, ♀.

*Eustala rosae*,—Gertsch and Davis, 1936, Amer. Mus. Novitates, no. 881: 14, fig. 11, 12, ♀, ♂. Not *E. rosae* Chamberlin and Ivie.

*Note.* This name is not a synonym of *E. conchlea* McCook as thought by Bonnet (1955, Bibliographia Araneorum, 2(2): 1839).

*Description.* Female from Texas: Carapace brown with dark brownish black Y (Fig. 163). Posterior median eyes surrounded by black. Sternum maculated with black and white pigment. Legs with contrasting bands on femora, spots and dark patches on distal articles. Dorsum of abdomen with indistinct folium (Fig. 163). Median eye area of carapace swollen. There are lateral abdominal humps, the second pair indistinct, and three pairs of posterior humps in a row (Figs. 163–164). Total length 11.5 mm. Carapace 4.0 mm long, 3.0 wide. First femur, 4.7 mm; patella and tibia, 6.0; metatarsus, 3.9; tarsus, 1.3. Second patella and tibia, 5.3 mm; third, 2.6; fourth, 4.6.



Figures 167-175. *Eustala bifida* F.P.-Cambridge: 167-170. Epigynum: 167. Ventral. 168. Posterior. 169. Lateral. 170. Posterior, cleared. 171. Female carapace and abdomen. 172. Female, legs removed, lateral. 173. Female abdomen, ventral. 174, 175. Male palpus: 174. Mesal. 175. Ventral.

Scale lines. 0.1 mm except Figs. 163, 164, 171-173, 1.0 mm.

Male from Texas: Coloration like that of female. Carapace with two setae within median eye quadrangle. The abdomen has some strong macrosetae on dorsum and there are two posterior humps on the triangular abdomen only. Total length 6.7 mm. Carapace 3.1 mm long, 2.5 wide. First femur, 4.4 mm; patella and tibia, 5.8; metatarsus, 4.0; tarsus, 1.4. Second patella and tibia, 4.3 mm; third, 2.2; fourth, 4.0.

Specimens illustrated came from Texas.

*Variation.* The leg banding is less distinct in some specimens. Some lack the characteristic basally dilate macrosetae on the abdomen; perhaps they were broken off in collecting. The eye region projects more in southern specimens, little in northern ones. Specimens from Teapa, Mexico have paired black patches on the dorsum of the abdomen, and have indications of a dorsal fold on the posterior side of the epigynum, as in *E. rosae*. Total length of females 8.4 to 11.5 mm, carapace 3.4 to 4.0 long, 2.6 to 3.1 wide. Total length of males 6.7 to 7.3 mm, carapace 3.1 to 3.7 long, 2.5 to 2.7 wide.

*Diagnosis.* This is the only *Eustala* species of the area having a projecting eye region (Fig. 163) and basally expanded setae on the abdomen. (The setae may be broken off and the eye region projects only little in northern specimens.) Unlike all other species, the scape of the epigynum appears laterally compressed, thus deeper than wide (Fig. 161). The embolus of the palpus is partly hidden by the subterminal apophysis

and the terminal apophysis is kitchen-knife-blade-shaped (Fig. 165).

*Distribution.* Southern Texas to Guatemala (Map 4).

*Records.* Texas. Hidalgo Co.: 7 mi. E. of Edinburg; Edinburg. Cameron Co.: Rangelville. Mexico. San Luis Potosí. Tamazunchale. Veracruz. Cerro Azul. Tabasco. Teapa. Guatemala. Vera Paz. Cubilguitz.

*Eustala bifida* F.P.—Cambridge  
Figures 167–175, 178, Map 4

*Eustala bifida* F.P.—Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 507, pl. 48, figs. 9, 10, ♀, ♂. Female, male syntypes from San José, Costa Rica in the British Museum, Natural History, examined. Roewer, 1942, *Katalog der Araneae*, 1: 764. Chickering, 1955, *Bull. Mus. Comp. Zool.*, 112: 421, figs. 35–40, ♀, ♂. Bonnet, 1956, *Bibliographia Araneorum*, 2(2): 1839.

*Description.* Female syntype: Carapace brown, sternum brown with white pigment in center. Legs brown, banded with blackish brown. Dorsum of abdomen with indistinct folium, black and gray marks (Fig. 171). Venter black between epigynum and spinnerets with a median white longitudinal line through the center, widest anteriorly, fading out behind (Fig. 173). Abdomen triangular with two posterior humps in a row (Figs. 171, 172). Total length 9.0 mm. Carapace 4.0 mm long, 3.1 wide. First femur, 4.2 mm; patella and tibia, 5.8; metatarsus, 3.6; tarsus, 1.3. Second patella and tibia, 5.0 mm; third, 2.5; fourth, 4.4.

Male syntype: Coloration like that of fe-

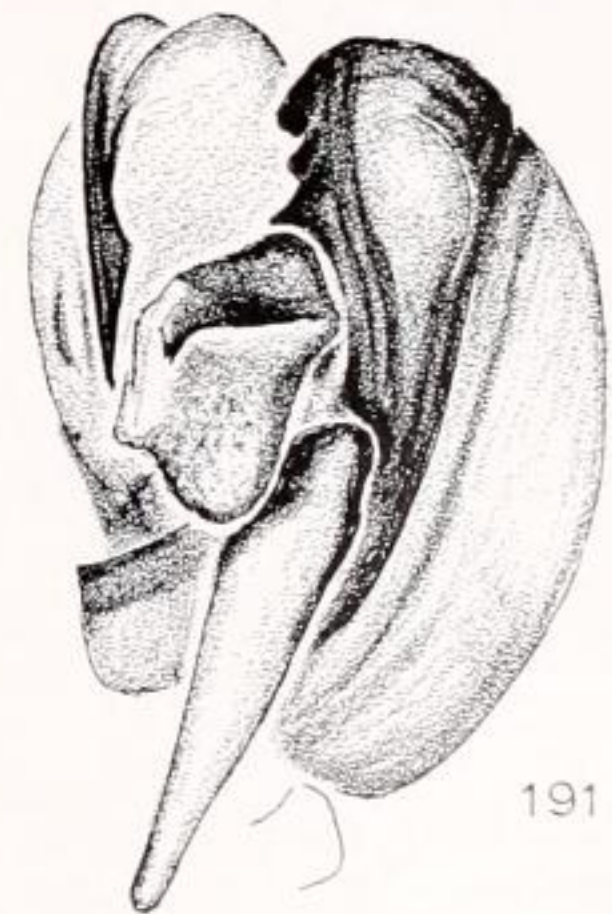
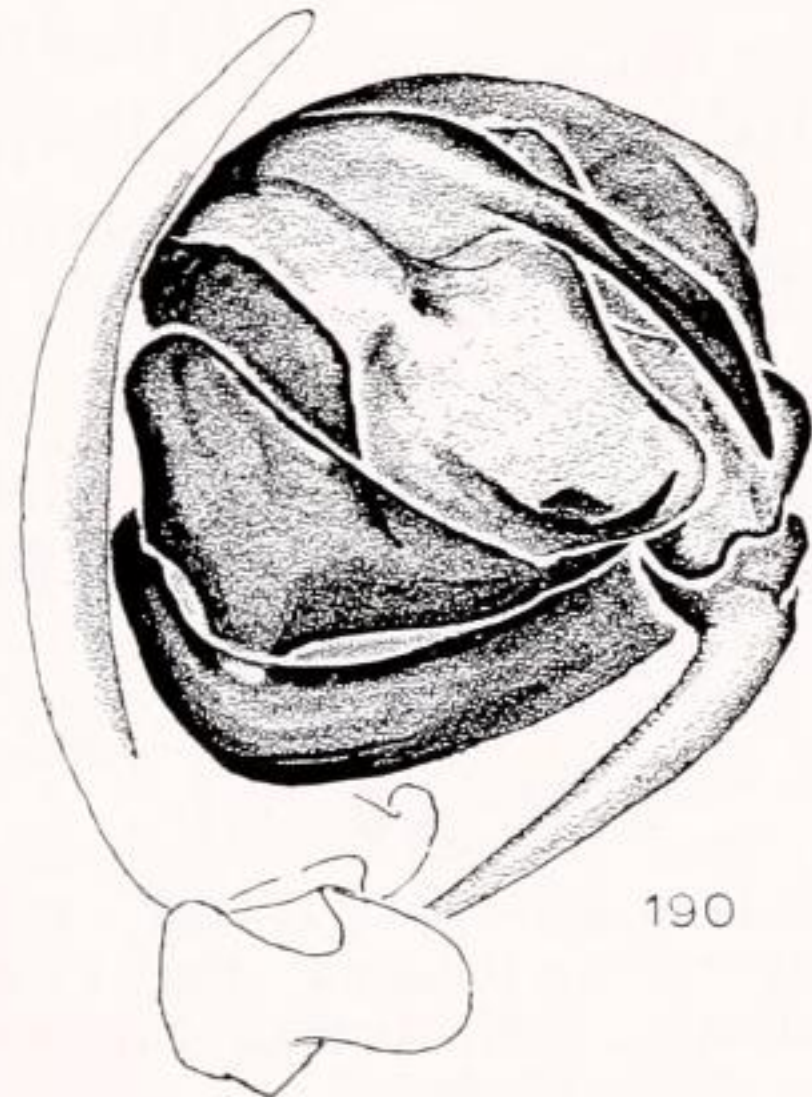
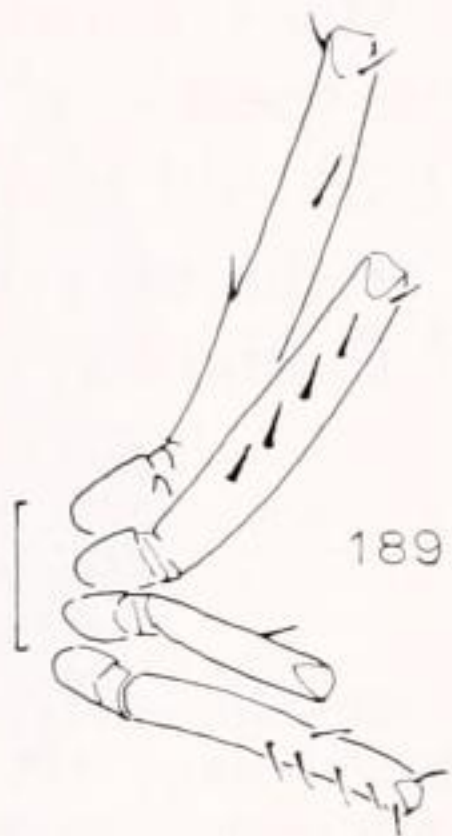
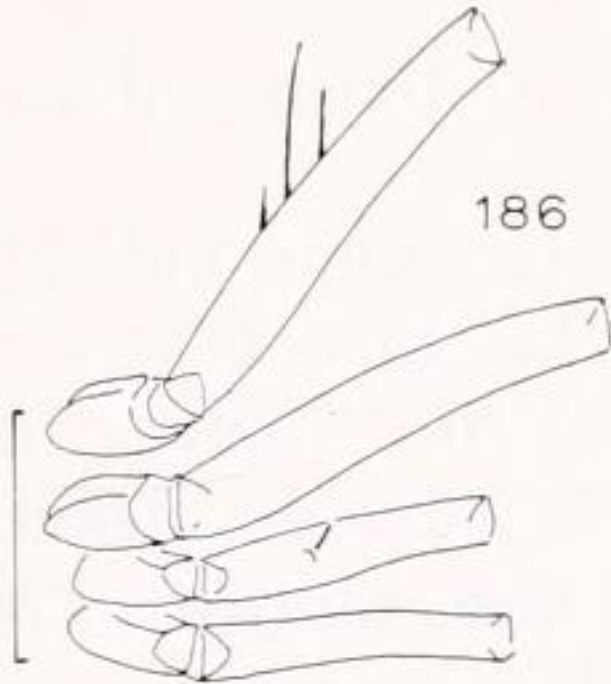
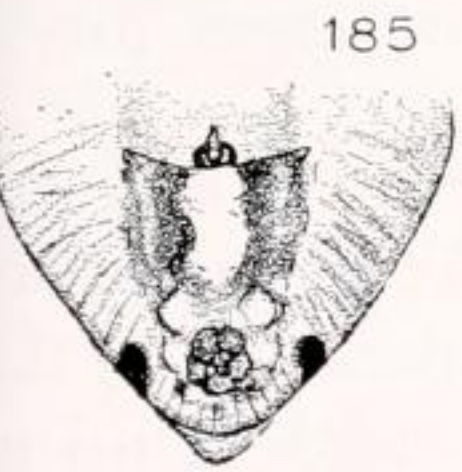
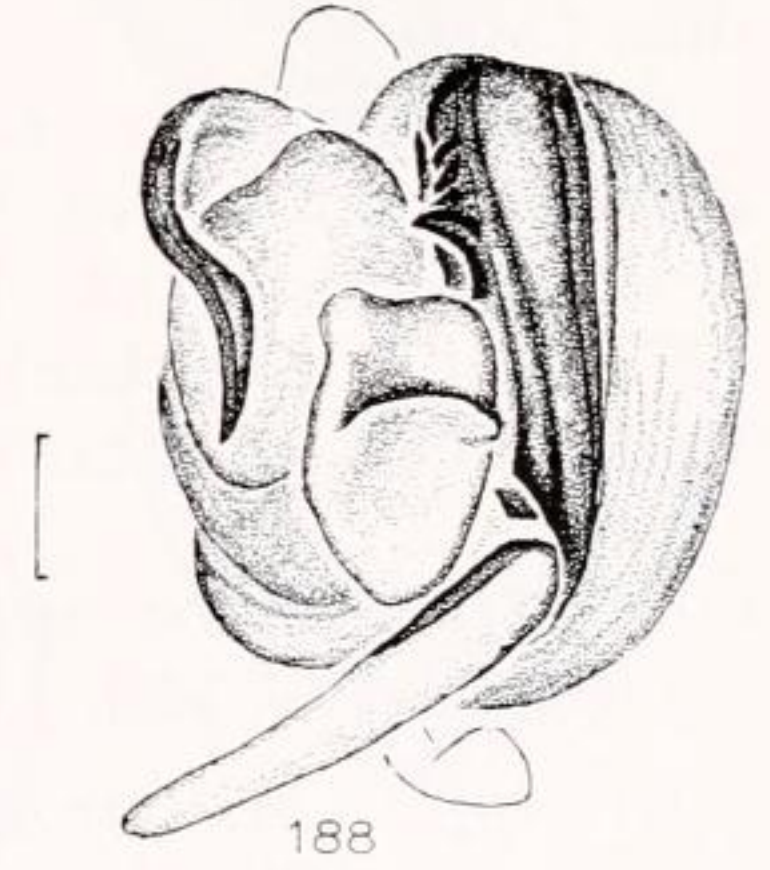
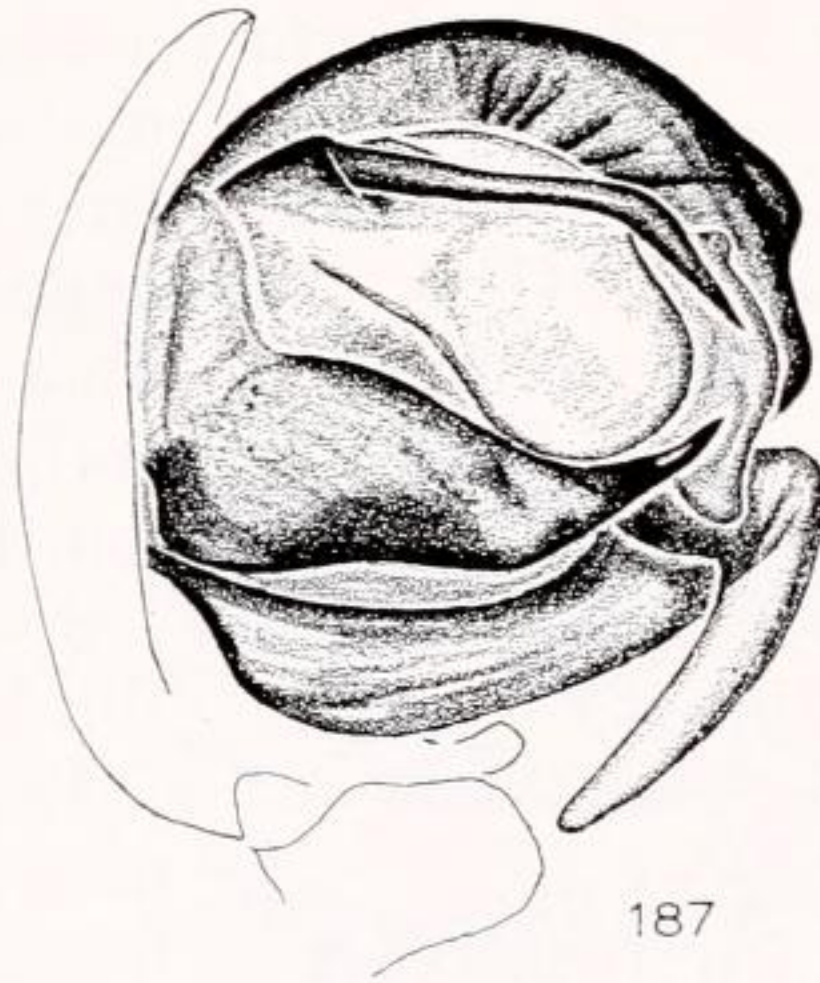
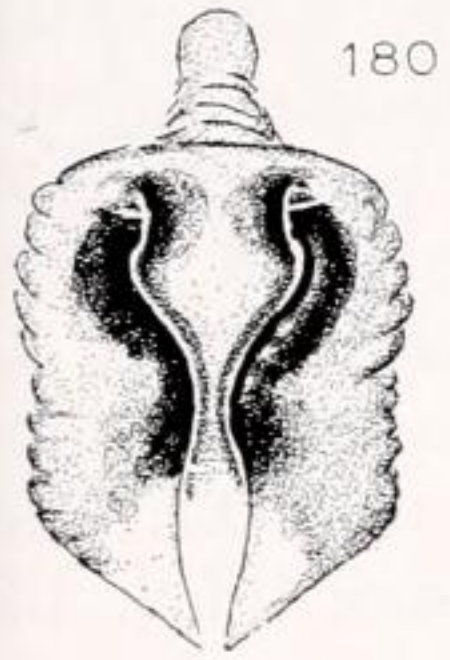
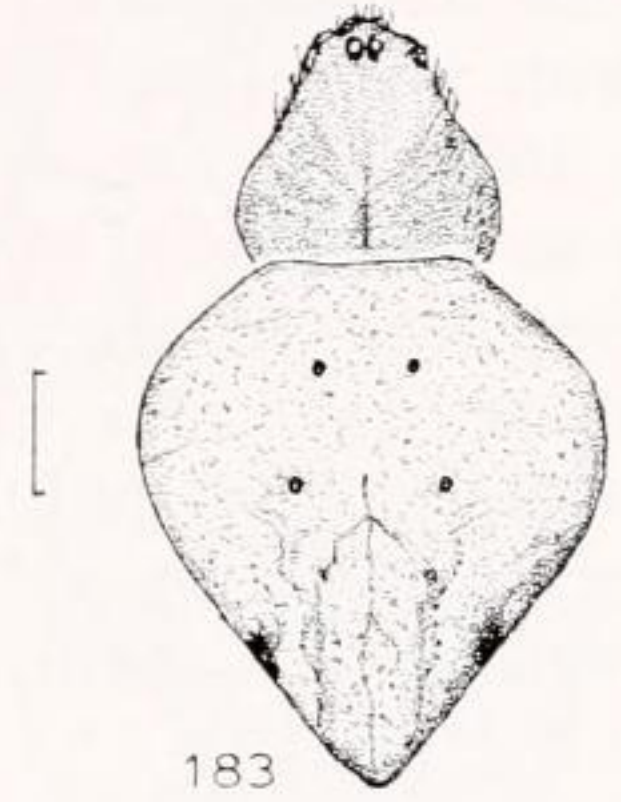
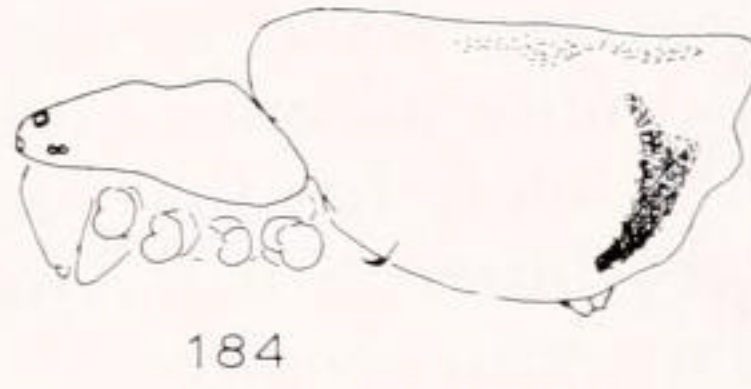
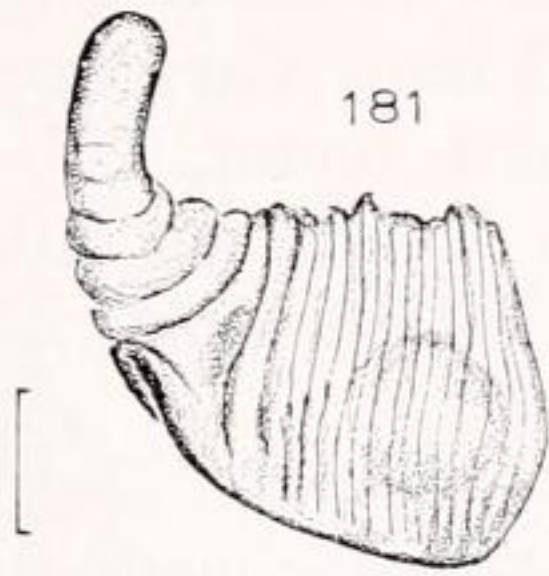
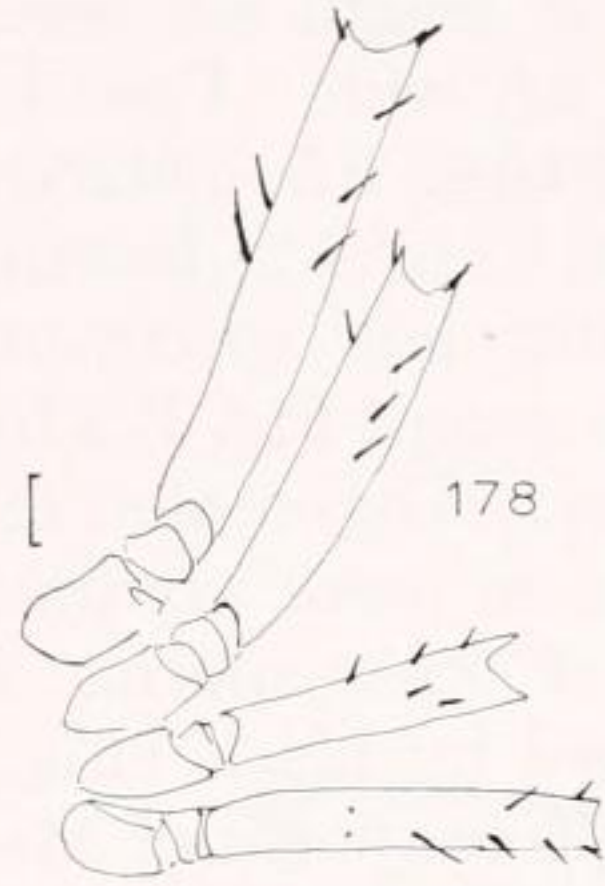
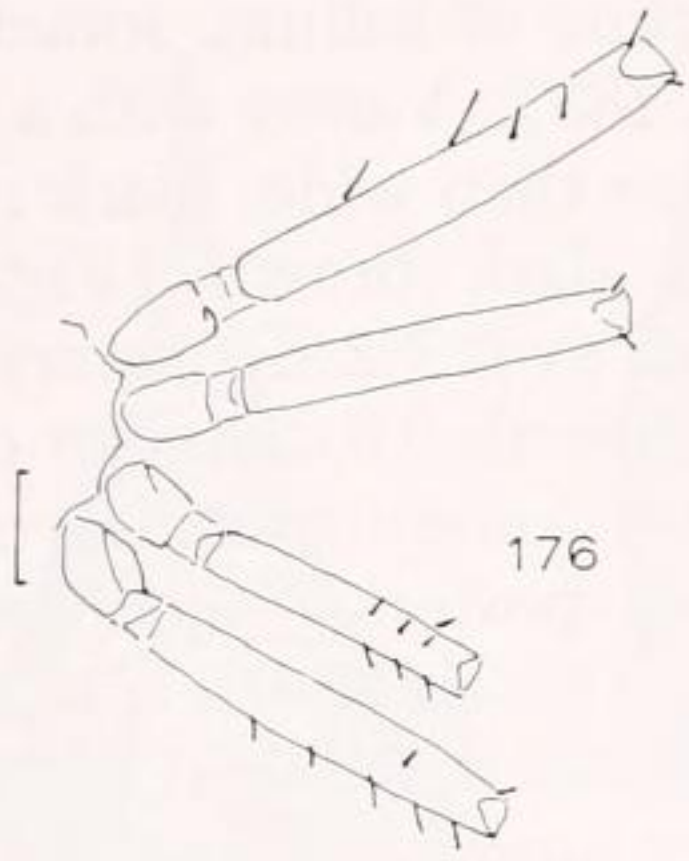
Figures 176, 177. *Eustala clavispina* (O.P.—Cambridge): 176. Male, ventral macrosetae of left femora. 177. Female abdomen, ventral.

Figure 178. *Eustala bifida* F.P.—Cambridge. Male ventral macrosetae.

Figures 179–188. *Eustala eleuthera* n. sp. 179–182: Epigynum: 179. Ventral. 180. Posterior. 181. Lateral. 182. Posterior, cleared. 183. Female carapace and abdomen. 184. Female, legs removed, lateral. 185. Female abdomen, ventral. 186. Male, ventral macrosetae of left femora. 187, 188. Male left palpus: 187. Mesal. 188. Ventral.

Figures 189–191. *Eustala cameronensis* Gertsch and Davis, male: 189. Ventral macrosetae of left femora. 190, 191. Palpus: 190. Mesal. 191. Ventral.

Scale lines. 0.1 mm except Figs. 176–178, 183–186, 189, 1.0 mm.





male. Total length 6.3 mm. Carapace 3.4 mm long, 2.8 wide. First femur, 4.5 mm; patella and tibia, 5.5; metatarsus, 3.7. Third patella and tibia, 2.2; fourth, 3.9.

The illustrated specimens came from Costa Rica except Fig. 175 from Panama.

*Diagnosis.* The venter of the abdomen of females is more contrastingly colored than that of other species; it has a white mark framed by black (Fig. 173). Unlike all other species north of Mexico, *E. bifida* has the middle piece of epigynum bulging in both ventral and posterior view (Figs. 167, 168); the lateral areas are about as long as wide (Fig. 168). Unlike all other species north of Mexico, *E. bifida* has the embolus of the male palpus different; it is twisted (Fig. 174) and the terminal apophysis is a long prong widest near the tip and extending to the outer edge of the conductor (Fig. 174).

*Distribution.* Southern Texas to Costa Rica (Map 4).

*Records.* Texas. Cameron Co.: most southern Palm Grove, 16 Feb. 1941, ♀ (L. I. Davis). Veracruz. Río Blanco, 6 Nov. 1957, ♀ (R. Dreisbach). Costa Rica. La Verbena, ♀♀ (Tristan).

### *Eustala eleuthera* new species

Figures 179–188, Map 4

*Holotype.* Male from Cape Sable, Monroe County, Florida, 4 April 1958, H. V. Weems, collector, in the Museum of Comparative Zoology. The specific name is a noun in apposition after the Bahamian Island Eleuthera.

*Description.* Female from South Bimini: Carapace yellow with white hairs in cephalic region. Sternum, legs yellow. Dorsum of abdomen speckled with black marks.

There is an outline of folium, sometimes a black line (Fig. 183). Venter with a central white spot, longer than wide, black on each side; spinnerets dark brown (Fig. 185). Posterior median eyes 1.2 diameters of anterior medians, laterals 0.6 diameter of anterior median eyes. Anterior median eyes 1.8 diameters apart, posterior medians their diameter apart. The abdomen is triangular with a pointed posterior dorsal hump, and a second smaller hump between the dorsal hump and spinnerets (Figs. 183, 184). Total length 6.3 mm. Carapace 2.2 mm long, 2.0 wide. First femur, 2.7 mm; patella and tibia, 3.4; metatarsus, 2.0; tarsus, 0.9. Second patella and tibia, 2.7 mm; third, 1.5; fourth, 2.5.

Male: Coloration slightly darker than in female. Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 0.7, posterior laterals 0.6 diameters. Anterior median eyes 1.3 diameters apart, posterior median eyes their diameter apart. Total length 3.4 mm. Carapace 1.9 mm long, 1.6 wide. First femur, 2.5 mm; patella and tibia, 3.0; metatarsus, 2.0; tarsus, 0.7. Second patella and tibia, 2.2 mm; third, 1.2; fourth, 1.9.

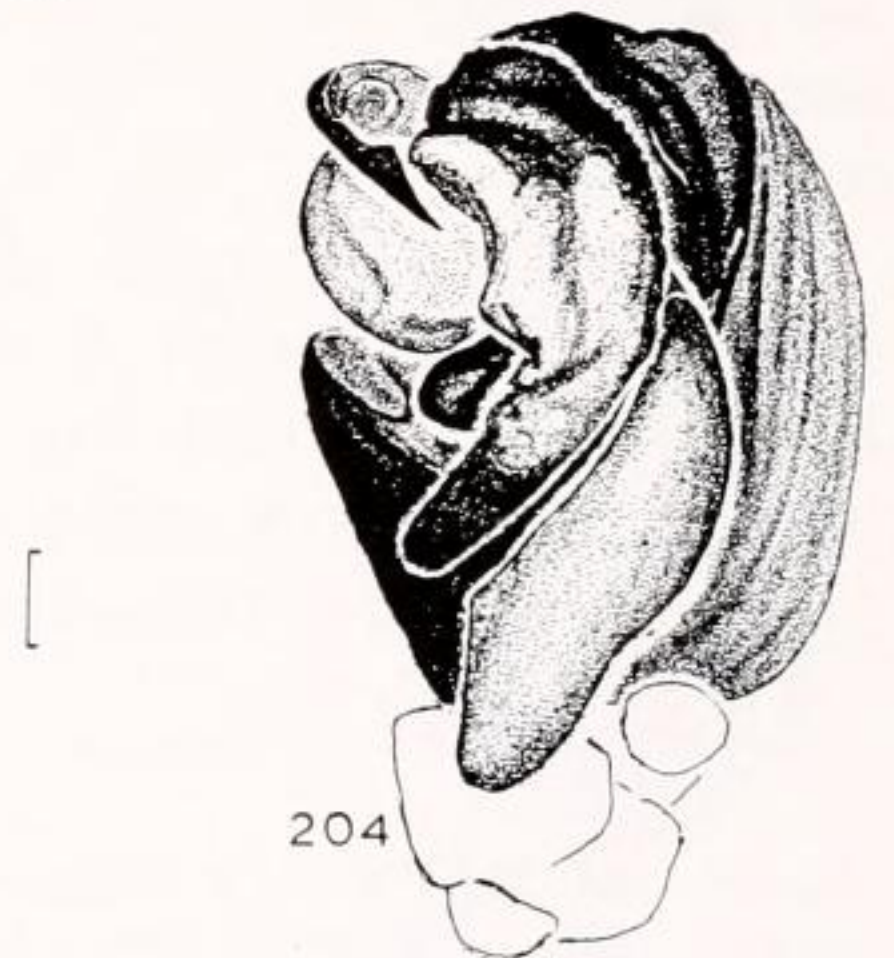
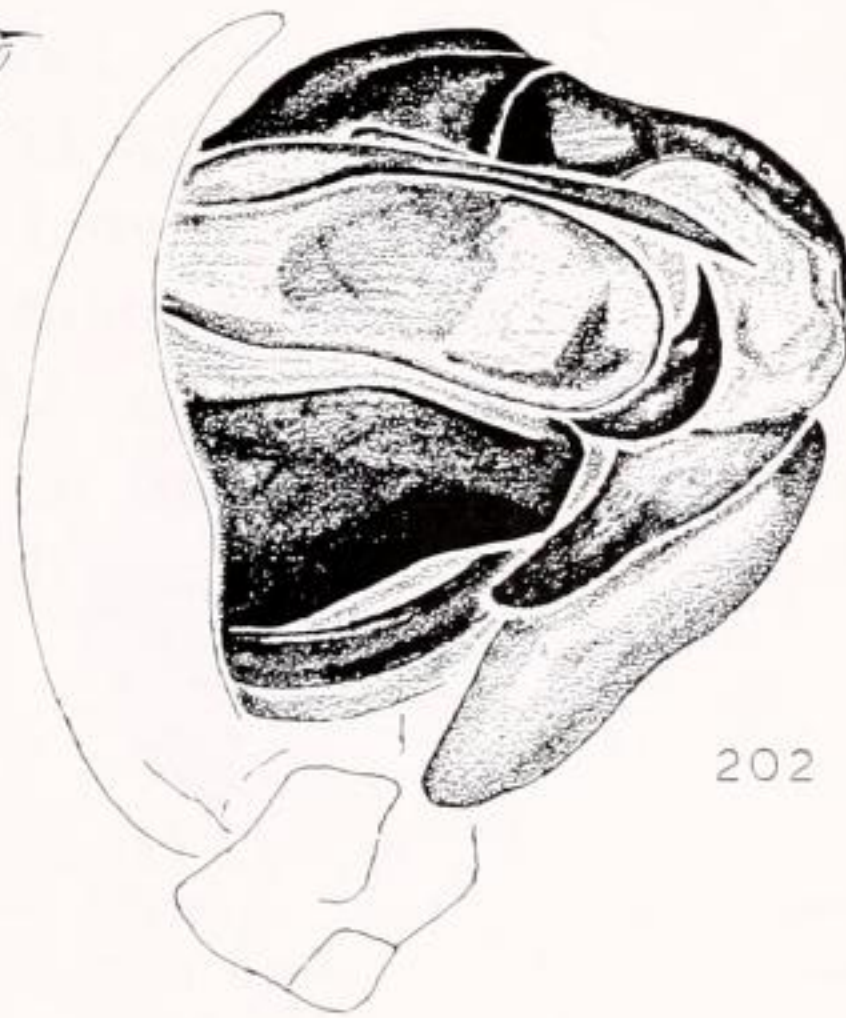
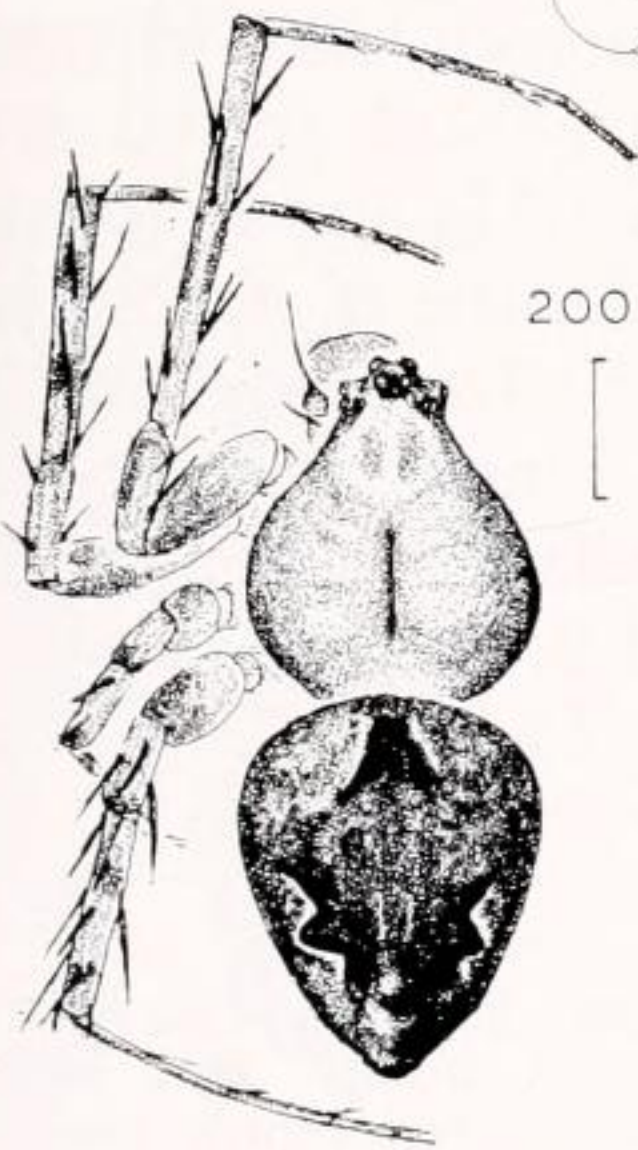
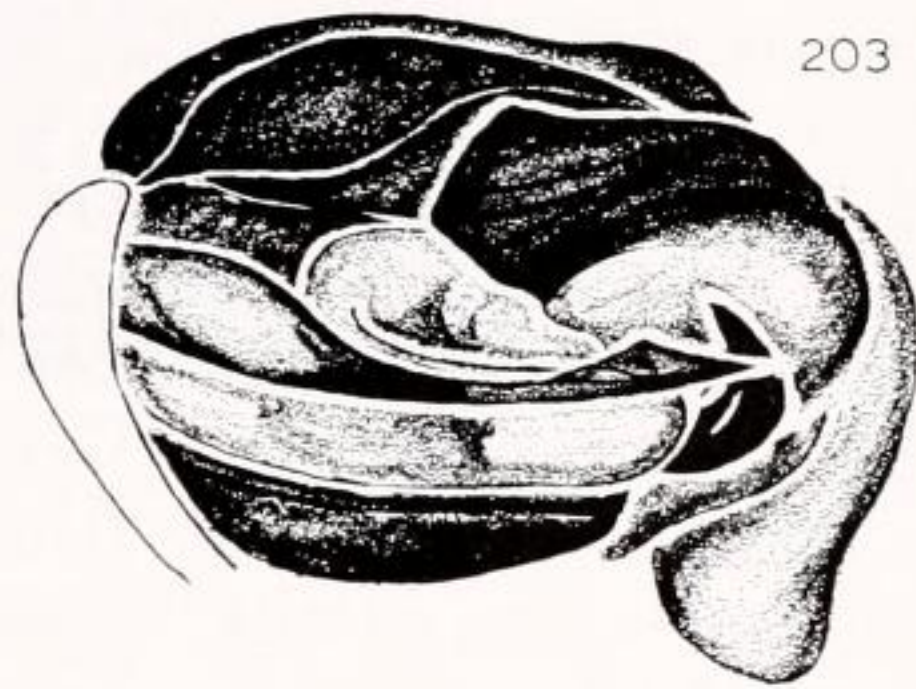
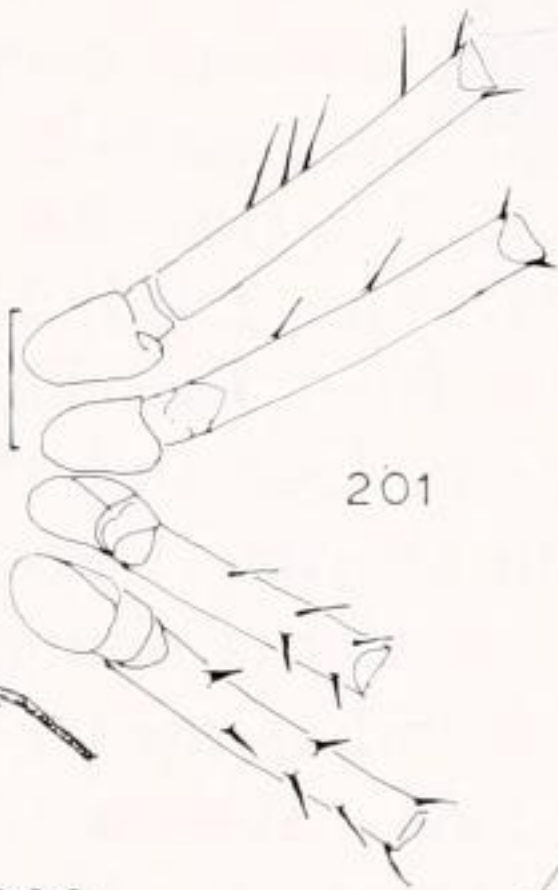
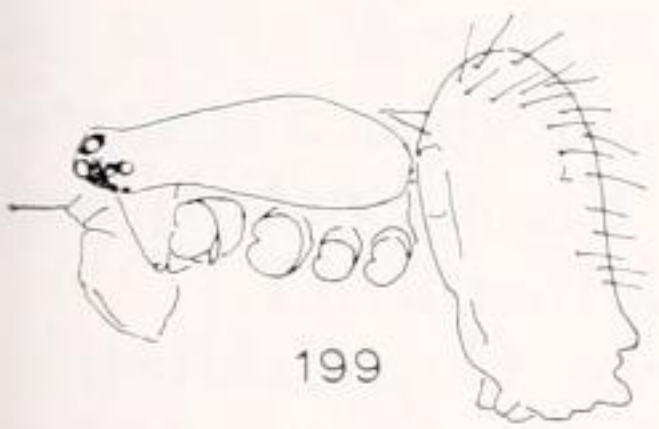
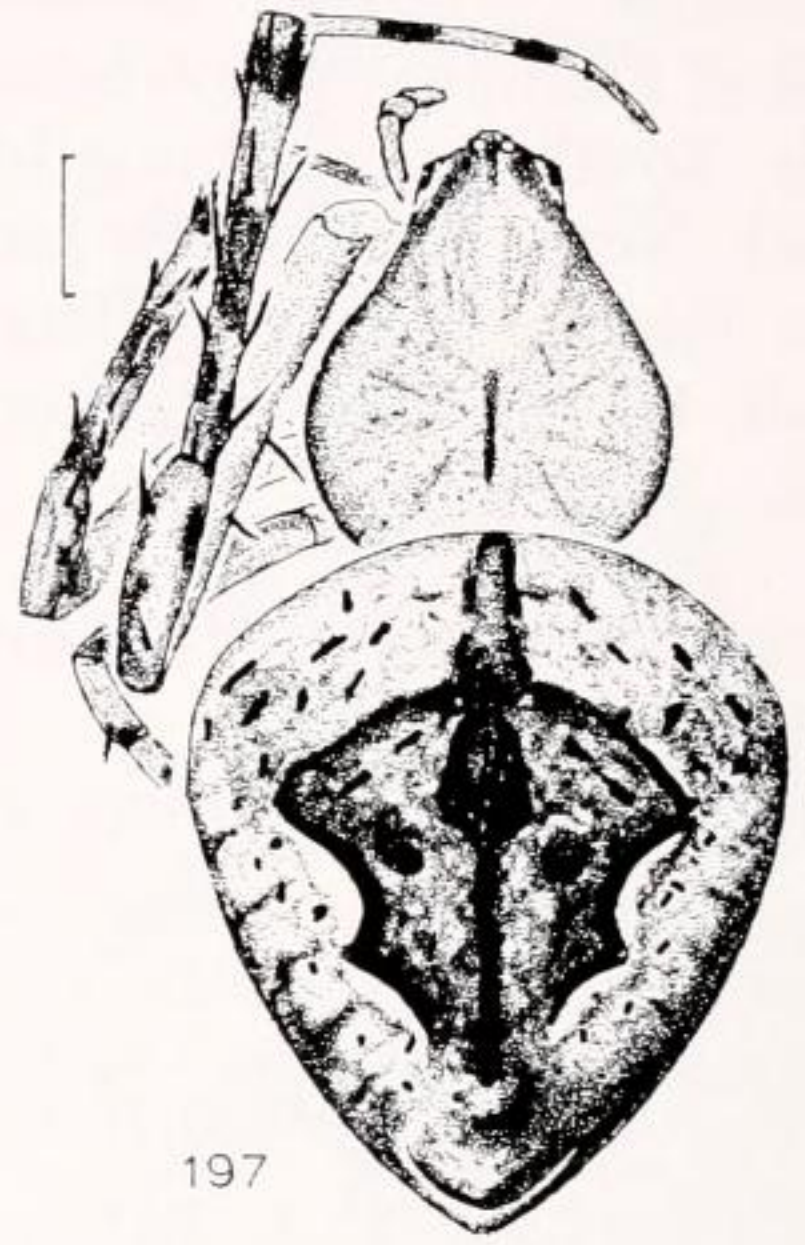
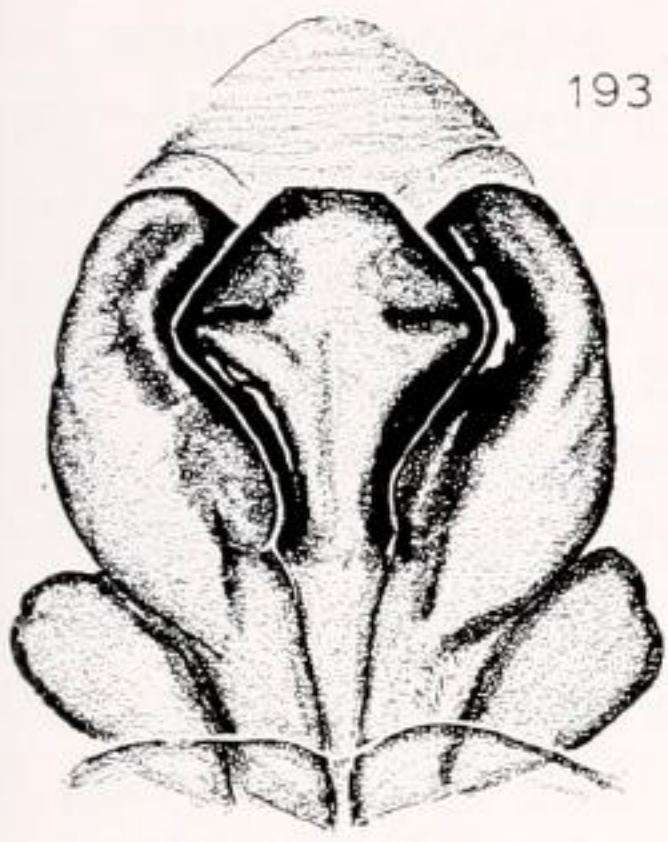
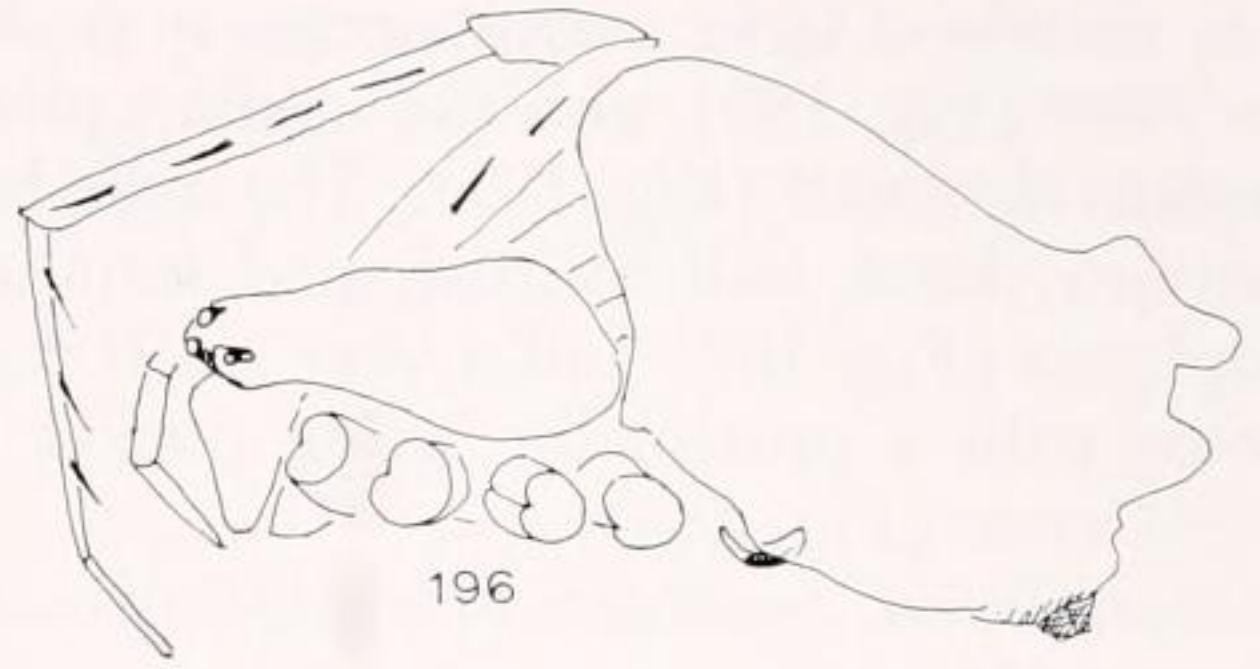
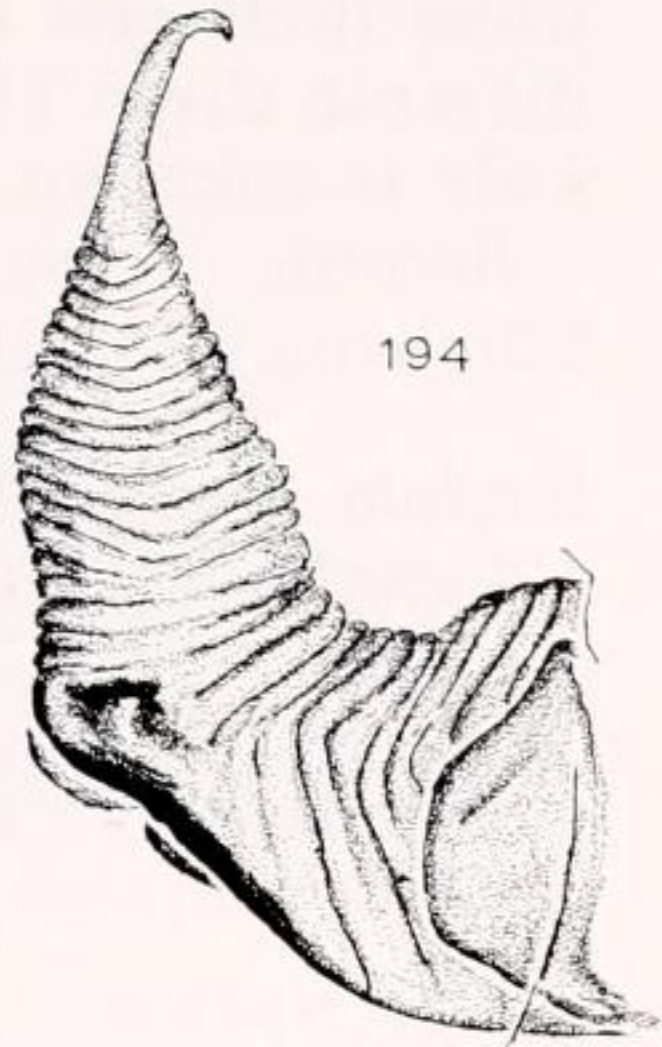
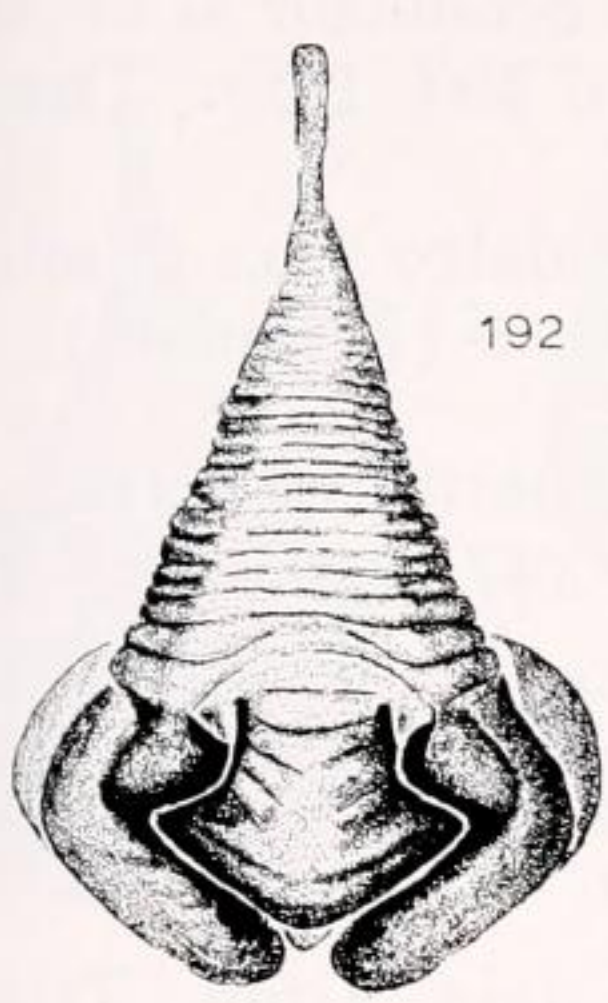
Specimens illustrated came from South Bimini.

*Variation.* Some individual females are much darker than others. Total length of females 4.1 to 6.3 mm, carapace 1.7 to 2.2 long, 1.5 to 2.0 wide. Total length of males 2.7 to 4.0 mm, carapace 1.5 to 2.1 long, 1.2 to 1.6 wide.

*Diagnosis.* Many females can be separated from other species by the speckled abdomen (Fig. 183) and by the short, finger-shaped scape of the epigynum (Fig. 179). Unlike that of *E. brevispina*, the epigynum

Figures 192–204. *Eustala rosae* Chamberlin and Ivie: 192–198. Female: 192–195. Epigynum: 192. Ventral. 193. Posterior. 194. Lateral. 195. Posterior, cleared. 196. Lateral. 197. Dorsal. 198. Abdomen, ventral. 199–204. Male: 199. Lateral, legs removed. 200. Dorsal. 201. Ventral macrosetae on left femora. 202–204. Left palpus: 202. Mesal. 203. Apical. 204. Ventral.

Scale lines. 0.1 mm except Figs. 196–201, 1.0 mm.



of *E. eleuthera* lacks a constriction in posterior view (Fig. 180), and the median piece is relatively small (Fig. 180). The male has a unique, bent, half-spear-shaped terminal apophysis (Fig. 187) and a very small conductor with a proximally facing pocket in lateral view (Fig. 188).

*Distribution.* Southern Florida, Bahamas, Jamaica (Map 4).

*Records.* *Florida.* Monroe Co.: 2 mi. north of Flamingo; Cape Sable. *Bahama Islands.* South Bimini; Long Island; Crooked Island; New Providence. *Jamaica.* St. Andrew Parish: Hope Gardens. St. Thomas Parish: Holland Bay. St. Ann Parish: Claremont.

### *Eustala cameronensis* Gertsch and Davis

Figures 189–191, Map 4

*Eustala cameronensis* Gertsch and Davis, 1936, *Amer. Mus. Novitates*, 881: 13, fig. 13, ♂. Male holotype from Cameron Co., Texas in the American Museum of Natural History, examined.

*Description.* Male holotype: Carapace yellow-brown with dark patches and some tiny black pigment spots posteriorly. Sternum with black pigment spots. Legs yellow-brown. Third and fourth legs banded, the first two unbanded. Dorsum of abdomen with a black-bordered folium. Abdomen is oval with posterior hump indistinct. Total length 4.0 mm. Carapace 2.0 mm long, 1.7 wide. First femur, 3.4 mm; patella and tibia, 3.6; metatarsus, 2.1; tarsus, 0.8. Second patella and tibia, 2.4; third, 1.2; fourth, 2.1.

*Diagnosis.* The male palpus (Figs. 190, 191) resembles that of *E. clavispina*. As in *E. clavispina* the embolus is partly hidden by the transparent subterminal apophysis (Fig. 190), the terminal apophysis has a

wider neck, and the conductor is of very different shape (Figs. 190, 191). The female is unknown.

*Record.* *Texas.* Hidalgo Co.: 7 mi. E. Edinburg, 3 Sept. 1953, ♂ (S. Mulaik).

### *Eustala rosae* Chamberlin and Ivie Figures 192–204, 297, 313, Map 5

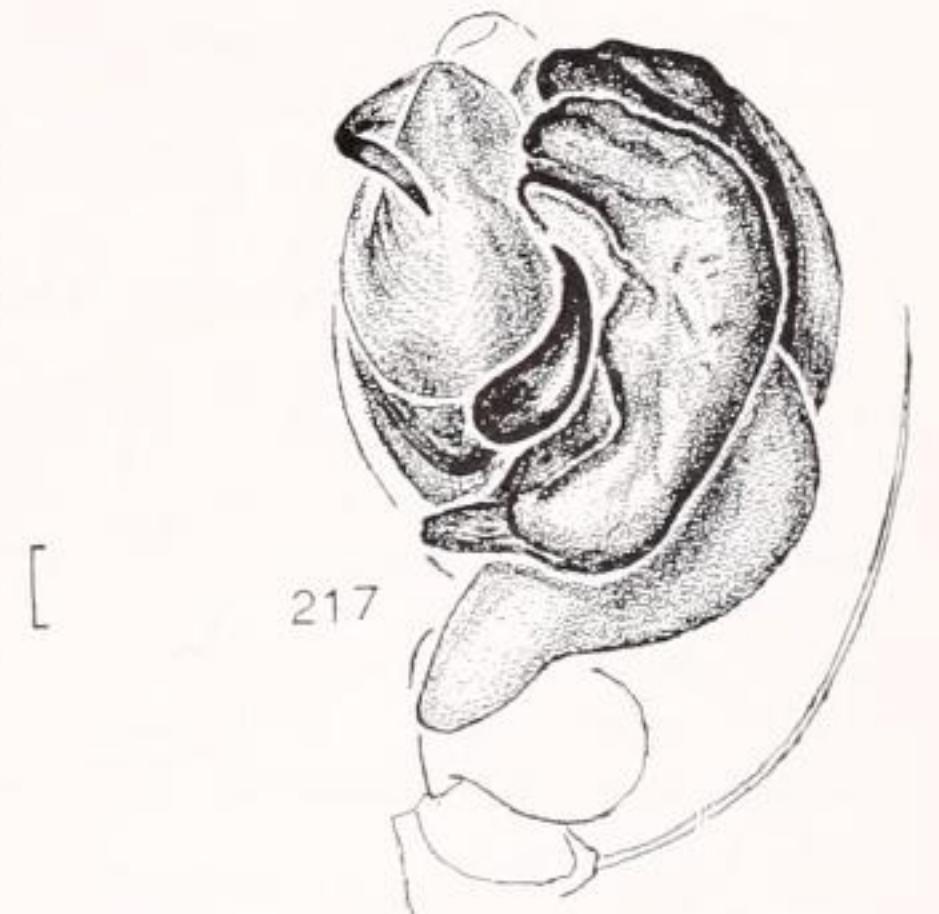
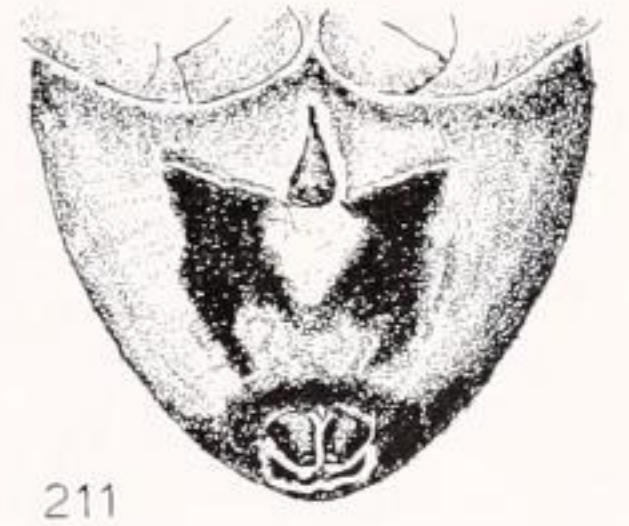
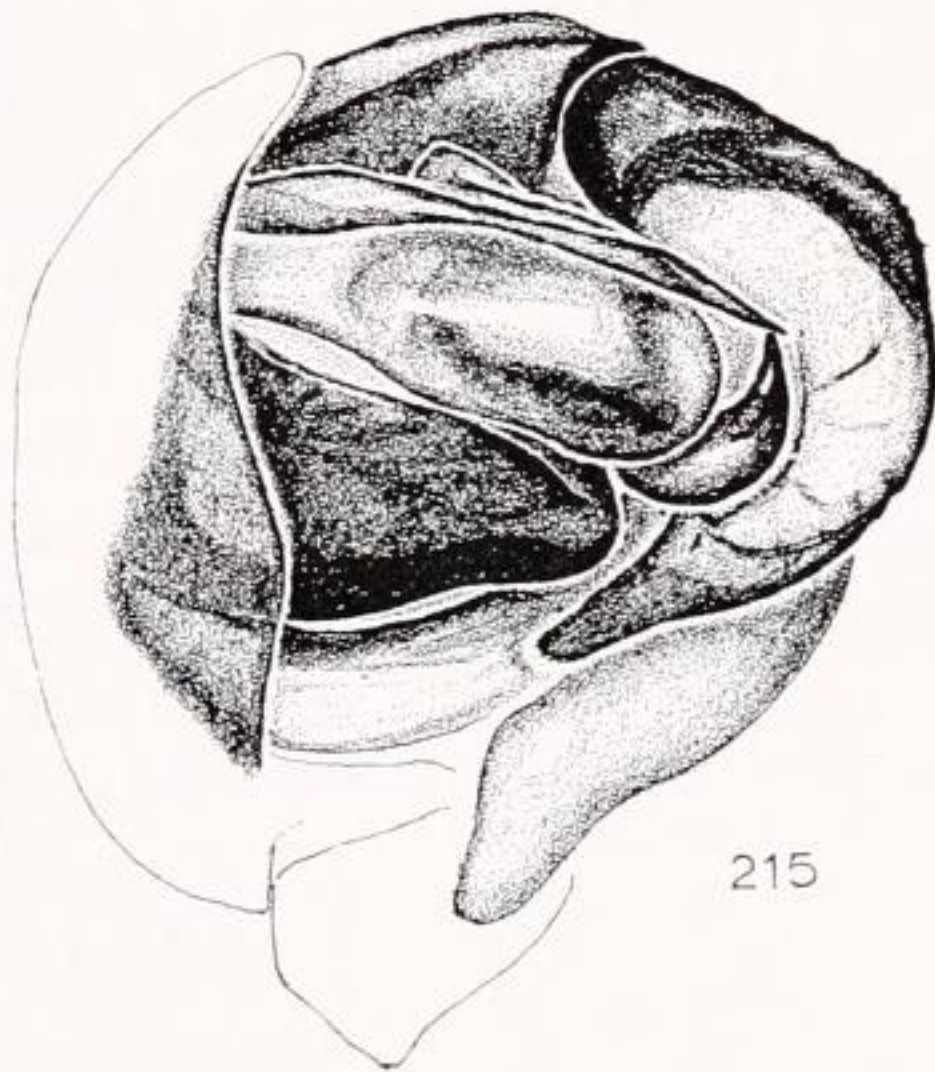
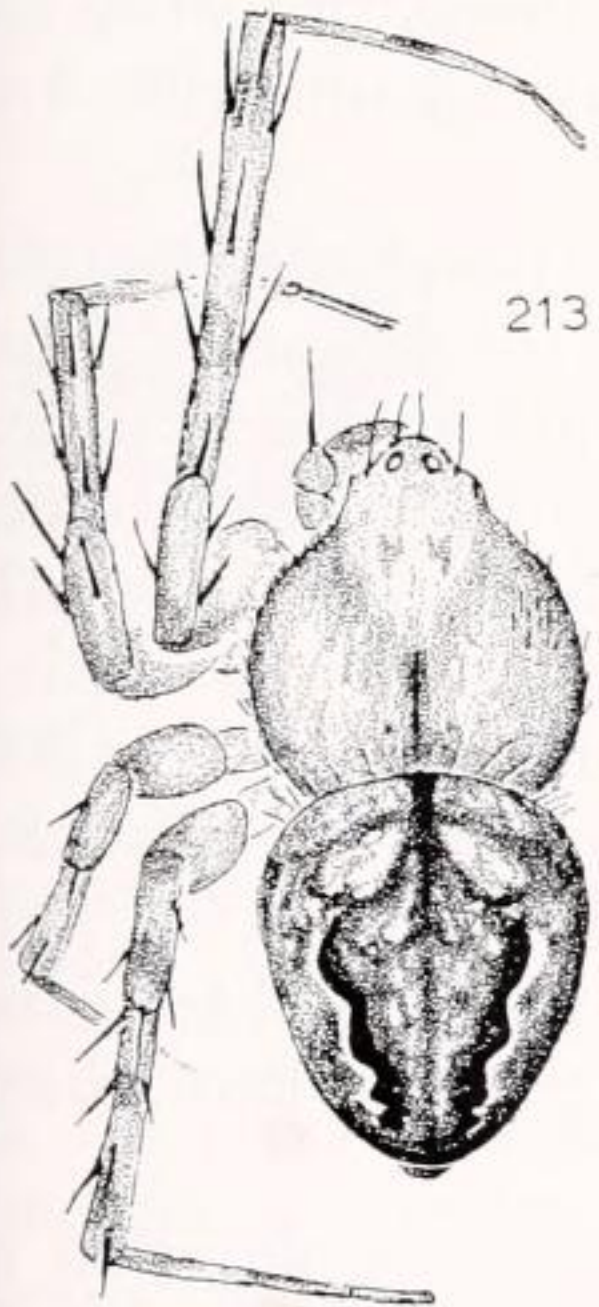
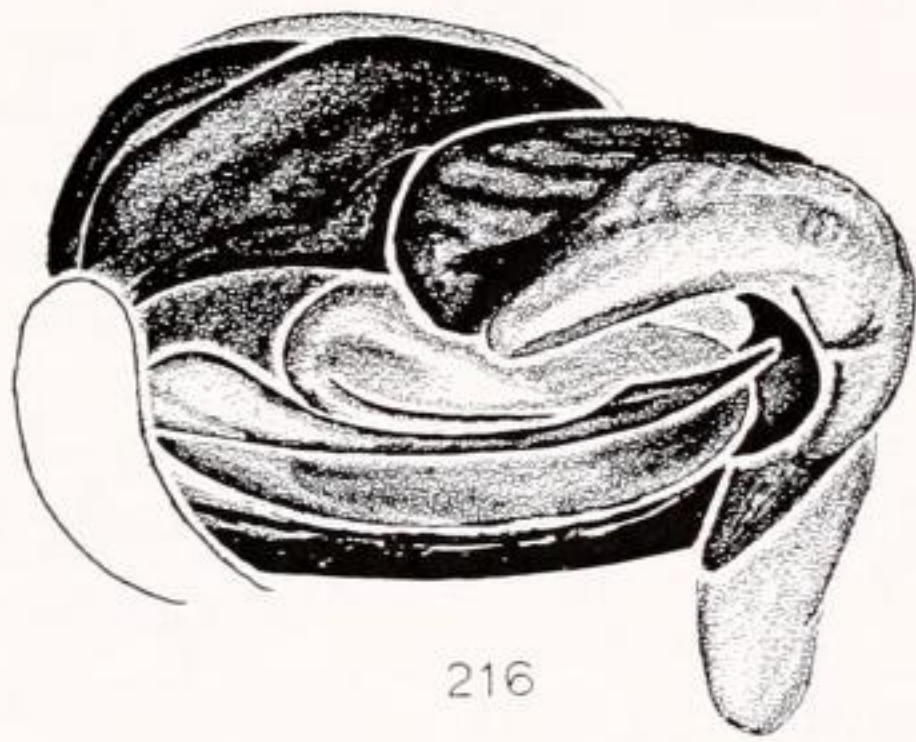
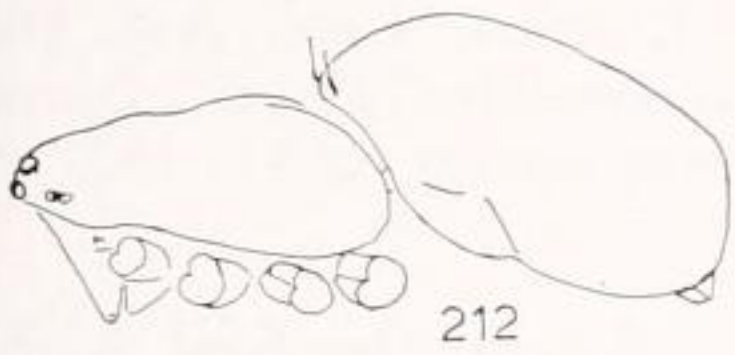
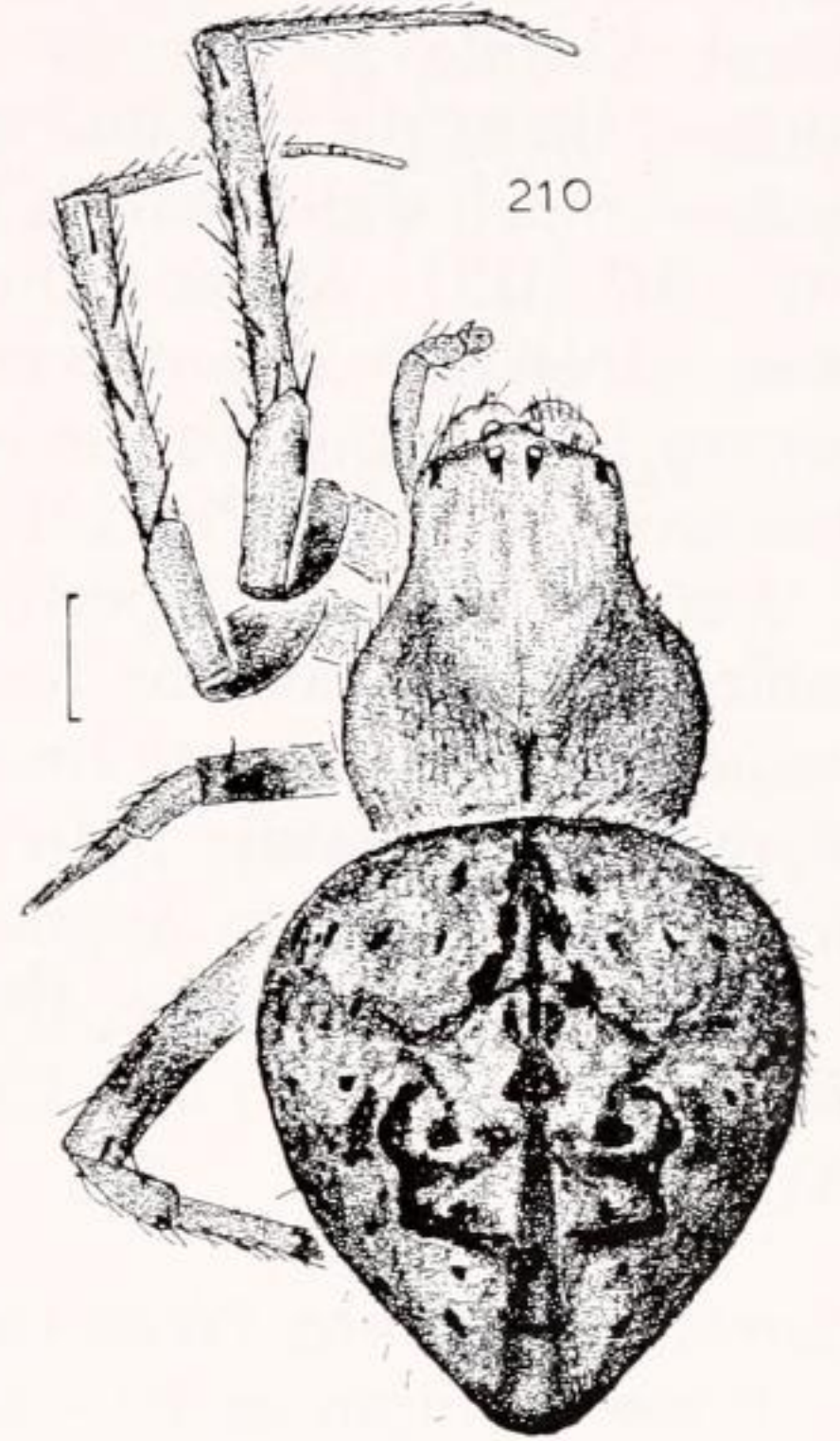
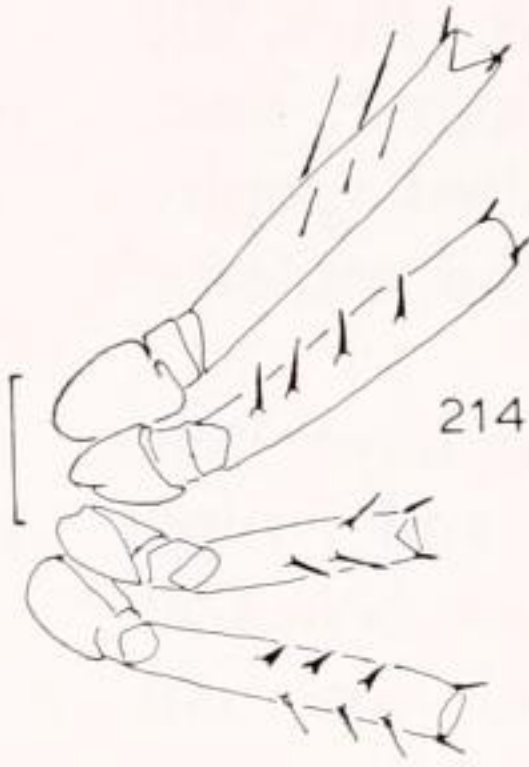
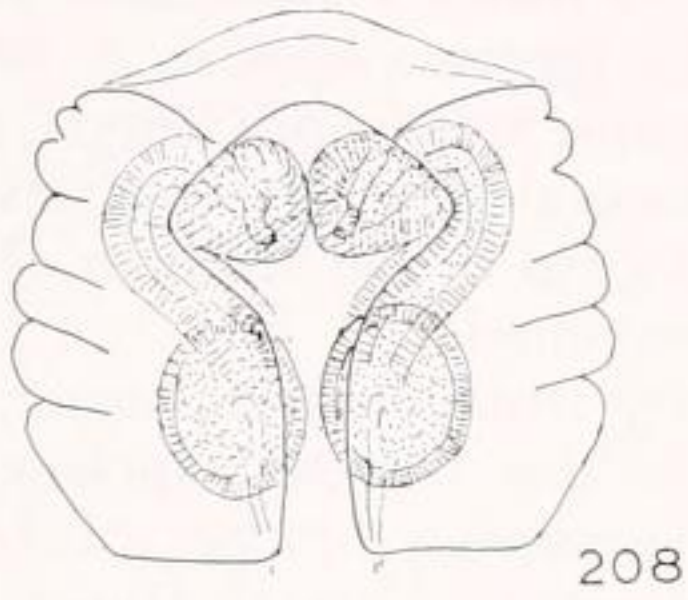
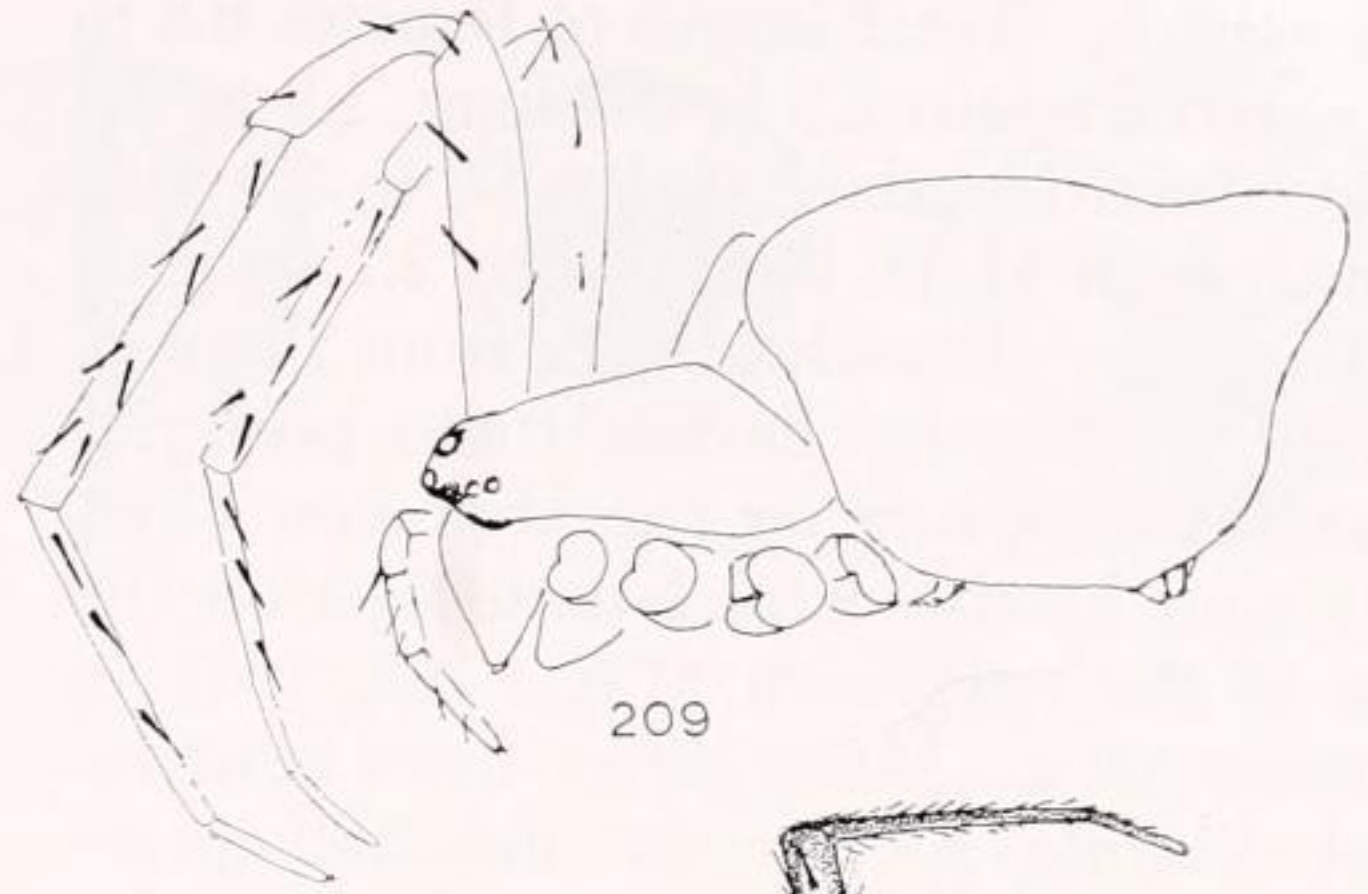
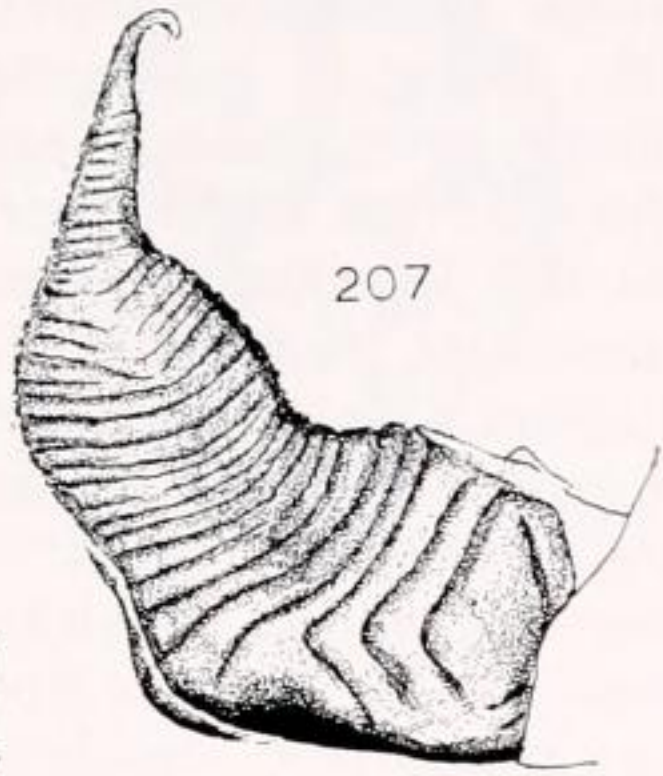
*Eustala rosae* Chamberlin and Ivie, 1935, *Bull. Univ. Utah, biol. ser.*, 2(8): 22, fig. 124, abdomen. Juvenile female holotype from Roosevelt Dam, Arizona, lost.

*Description.* Female from Trinity County, California: Carapace yellow-brown with tiny dark dots. Sternum brown with black spots and some irregular white spots. Legs contrastingly banded, black on brown. Dorsum of abdomen white, brown and black with a distinct folium and a median longitudinal dark line from anterior to posterior (Fig. 197). Sides with thin longitudinal black lines. The abdomen is triangular, pointed behind, with a hump in front of the point and a hump halfway between the point and spinnerets; three humps in a row (Figs. 196, 197). Total length 7.5 mm. Carapace 3.2 mm long, 2.7 wide. First femur, 4.5 mm; patella and tibia, 5.2; metatarsus, 3.2; tarsus, 1.4. Second patella and tibia, 4.5 mm; third, 2.5; fourth, 3.7.

Male from San Diego Co., California: Carapace, legs and sternum much darker than in female. Legs with indistinct light spots. Venter of abdomen black with transverse colorless area behind genital groove (Fig. 198). Abdominal humps as in female (Figs. 199, 200). Dorsum of abdomen has scattered macrosetae. Total length 4.3 mm. Carapace 2.5 mm long, 1.9 wide. First femur, 3.4 mm; patella and tibia, 4.0; metatarsus, 2.6; tarsus, 1.0. Second patella and tibia, 3.0; third, 1.7; fourth, 2.7.

Figures 205–217. *Eustala anastera* (Walckenaer): 205–211. Female (Pennsylvania): 205–208. Epigynum: 205. Ventral. 206. Posterior. 207. Lateral. 208. Posterior, cleared. 209. Lateral. 210. Dorsal. 211. Abdomen, ventral. 212–217. Male (Pennsylvania): 212. Lateral, legs removed. 213. Dorsal. 214. Ventral macrosetae on left femora. 215–217. Left palpus: 215. Mesal. 216. Apical. 217. Ventral.

Scale lines. 0.1 mm except Figs. 209–214, 1.0 mm.



*Variation.* Total length of females 6.8 to 9.0 mm, carapace 2.3 to 3.6 long, 1.9 to 3.1 wide. Total length of males 5.0 to 5.9 mm, carapace 2.6 to 3.0 long, 2.2 to 2.7 wide.

*Diagnosis.* Females differ from those of related species by having three posterior tubercles in a row on the abdomen (Fig. 196), and by the extra lateral lobe on the base of the epigynum (Figs. 193, 195) in posterior view. Males differ from most related *Eustala* species by the half-spear-shaped tip of the terminal apophysis of the palpus, much wider than its stalk (Figs. 202, 203, 297, 313). Males differ from *E. anastera*, which have a similar terminal apophysis, by lacking macrosetae on the venter of the second femur (Fig. 201).

*Natural History.* Specimens have been collected from montane forest and juniper woodland, and creosote brush scrub in California. Most mature individuals were collected from April to August.

*Distribution.* Oregon, Utah to Baja California, New Mexico and Chihuahua (Map 5).

### *Eustala anastera* (Walckenaer)

Plate 7, Figures 205–232, 280–285, 298–302, 314, 315, Map 5

*Epeira anastera* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 33. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, drawing no. 381. Copy of manuscript in the Museum of Comparative Zoology, examined.<sup>1</sup> McCook, 1893, American Spiders, 3: 172, pl. 8, figs. 1–4, ♀, ♂.

*Epeira eustala* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 37. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, drawing no. 119. Copy of manuscript in the Museum of Comparative Zoology, examined.

*Epeira apotroga* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 43. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, drawing no. 371. Copy of manuscript in the Museum of Comparative Zoology, examined.

*Epeira spatulata* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 44. Type,

Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, drawing no. 366. Copy of manuscript in the Museum of Comparative Zoology, examined.

*Epeira illustrata* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 45. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, drawing no. 186. Copy of manuscript in the Museum of Comparative Zoology, examined.

*Epeira decolorata* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 49. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, drawing no. 345. Copy of manuscript in the Museum of Comparative Zoology, examined.

*Epeira triflex* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 60. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, illustration no. 112. Copy of original in the Museum of Comparative Zoology, examined.

*Epeira trinotata* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 75. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, illustration no. 272. Copy of original in the Museum of Comparative Zoology, examined.

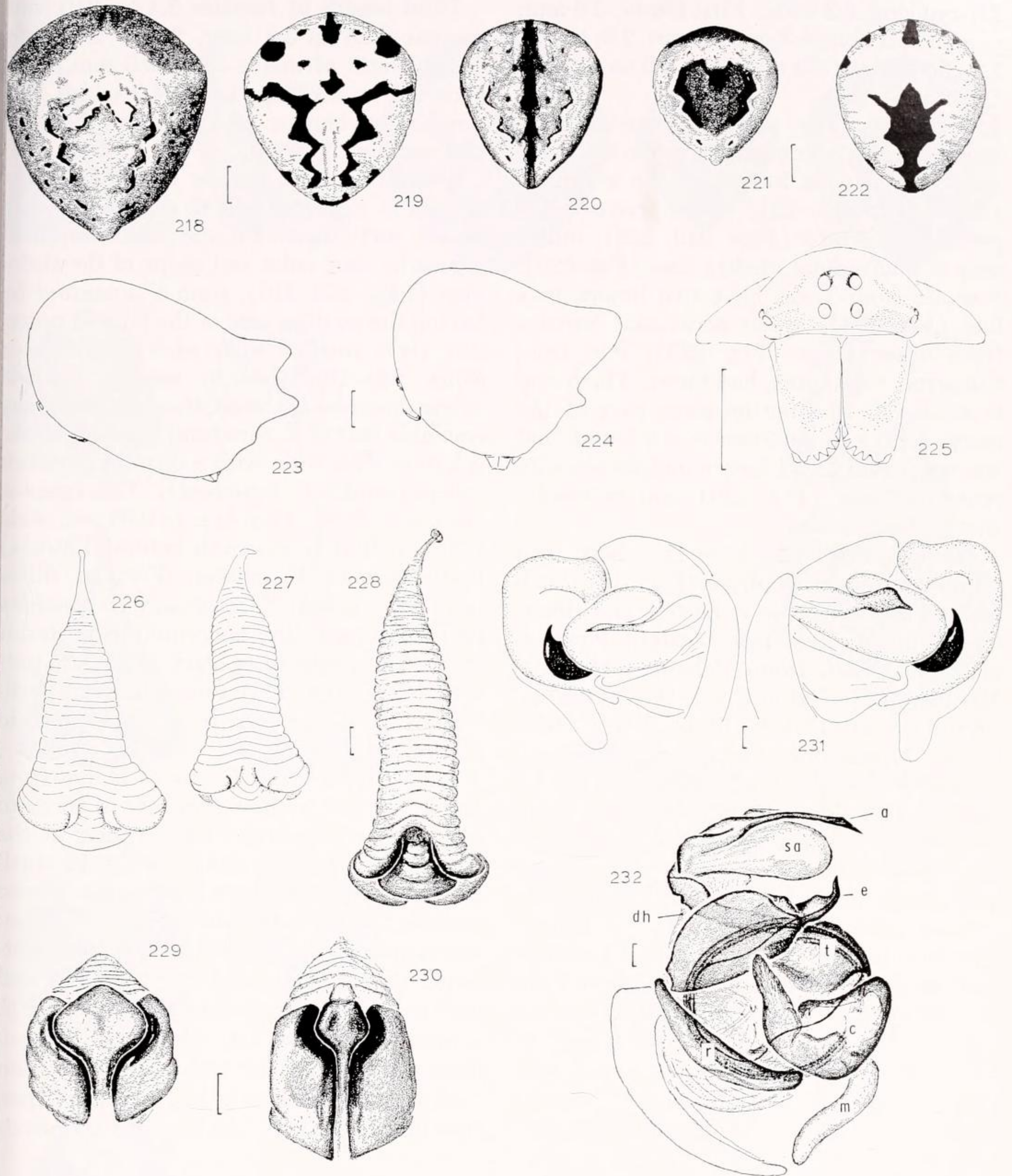
*Eustala anastera*.—Chamberlin and Ivie, 1944, Bull. Univ. Utah, biol. ser., 7(5): 102, fig. 4. Kaston, 1948, Bull. Connect. Geol. Nat. Hist. Surv., 70: 233, figs. 706–709, 727, ♀. Bonnet, 1956, Bibliographia Araneorum, 2(2): 1837 (in part only).

*Note.* I have listed only the first Abbot figure cited by Walckenaer for each name. *Epeira circulata* Walckenaer, 1841, p. 79, may have been an *Eriophora*, probably not *Eustala* as indicated by Chamberlin and Ivie (1944).

*Description.* Female from Pennsylvania: Carapace brown, sides of thorax darker. Thorax covered with white hairs and down. Legs dark, banded. Dorsum of abdomen with folium or longitudinal dark line. Abdomen triangular, longer than wide with a distinct posterior dorsal hump (Figs. 209, 210). Total length 7.5 mm, carapace 2.7 mm long, 2.4 wide. First femur, 3.4 mm; patella and tibia, 4.2; metatarsus, 2.4; tarsus, 0.9. Second patella and tibia, 3.6 mm; third, 1.7; fourth, 3.2.

Male from Pennsylvania: Coloration as in female. Total length 4.8 mm. Carapace

<sup>1</sup> See footnote under *Cyclosa turbinata*.



Figures 218-232. *Eustala anastera* (Walckenaer): 218-222. Dorsal patterns of female abdomen. 218. (Pennsylvania). 219. (West Virginia). 220. (Michigan). 221, 222. (Florida). 223, 224. Female abdomen, lateral. 223. (Georgia). 224. (southern Texas). 225. Female eye region and chelicerae. 226-230. Epigynum. 226-228: Ventral. 229, 230. Posterior. 226, 227. (Kerr Co., Texas). 228. (Goliad Co., Texas). 229. (Nova Scotia, Canada). 230. (Cimarron Co., Oklahoma). 231. Left and right palpi from same individual (Grant Par., Louisiana). 232. Left palpus expanded.

Scale lines. 0.1 mm except Figs. 218-225, 1.0 mm.

Abbreviations. a, terminal apophysis; c, conductor; dh, distal hematodocha; e, embolus; m, median apophysis; r, radix; sa, subterminal apophysis; t, tegulum.

2.5 mm long, 2.2 wide. First femur, 3.6 mm; patella and tibia, 4.3; metatarsus, 2.9; tarsus, 1.2. Second patella and tibia, 3.0 mm; third, 1.8; fourth, 2.8.

*Variation.* The pattern is variable although most specimens are dark. Some specimens have a folium on the abdomen (Figs. 210, 218, 221), some have black patches on white (Figs. 219, 222), others only a longitudinal median line (Fig. 220). Females from Texas have two humps in a line (Fig. 224), as do occasional females from other areas (Fig. 223); one from Cimarron, Oklahoma, had three. The hump is smaller in the northeastern part of the range, where *E. emertoni* is not found, and the epigynum has a larger middle piece in posterior view (Fig. 229) and resembles that of *E. emertoni*.

Males sometimes have a short and pointed terminal apophysis (Fig. 315). Such males included those collected and determined by W. Ivie from eastern Pennsylvania, one each from Alabama (Mobile), Mississippi (Jefferson City), West Virginia, Virginia, South Dakota, Idaho, Texas, Oklahoma, Mississippi, Ontario, Connecticut (New Canaan), and all males from Michigan. The smaller males in Florida may have only one macroseta on the second femur, sometimes only on one side. But several very large males lacked these macrosetae entirely: one from Calhoun Co., Arkansas, one from Boston, Mass., one from Lebanon State Forest, New Jersey and one from Center Harbor, New York. Most males from the northeastern part of the range, where *E. emertoni* and *E. cepina* are not found, lack these macrosetae and the outer, "upper," bulge of the conductor is smaller (Fig. 298).

Total length of females 5.4 to 10.0 mm, carapace 2.5 to 3.3 long, 2.3 to 2.6 wide. Total length of males 3.9 to 9.5 mm, carapace 2.2 to 4.8 long, 1.8 to 4.0 wide. The smallest specimens all came from central and southern Florida.

*Diagnosis.* The species differs from the related *E. emertoni* and *E. cepina* by being darker and larger. Females differ from *E. cepina* by size, color and shape of the abdomen (Figs. 209, 210), from *E. emertoni* by having the median area of the base in posterior view smaller than each lateral area (Figs. 280–285) (but in eastern Canada where *emertoni* is absent, the epigynum may resemble that of *E. emertoni*). The abdomen is longer than wide with a distinct posterior hump (unlike *E. emertoni*). The epigyna are larger, 0.36 (Florida), to 0.58 mm wide (the smallest from south central Florida) than those of *E. cepina*. Females differ from the western *E. rosae* and *E. conchlea* by the shape of the epigynum in posterior view. The contrasting black and white pattern (Figs. 219, 222) found in some individuals is diagnostic; it is not found in related species.

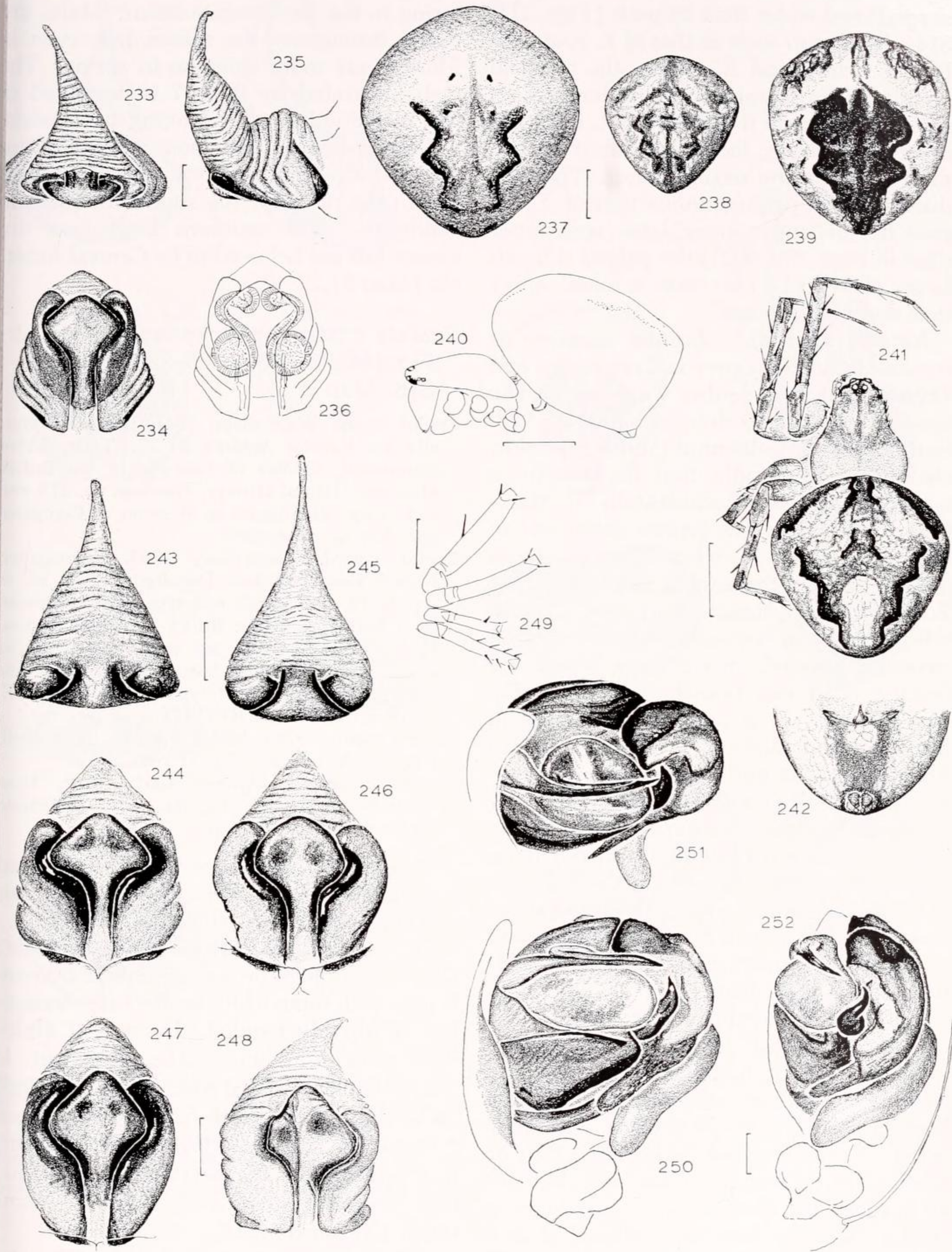
Males differ from *E. rosae*, *E. emertoni* and *E. cepina* by having a row of three to five short macrosetae on the venter of the second femur (Fig. 214); rarely, in small Florida specimens, there is only one. (These macrosetae may be absent in individual males and always absent in those from eastern Canada.) The conductor is smaller and its tail shorter than that of *E. triflex* and *E. cepina* (Figs. 298–302). Most of the conductor is "above" the embolus, the portion "below" the embolus is less in length than the embolus height. The terminal apophysis

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Figures 233–252. *Eustala cepina* (Walckenaer): 233–236. Epigynum. (Pennsylvania): 233. Ventral. 234. Posterior. 235. Lateral. 236. Posterior, cleared. 237–239. Dorsal patterns of female abdomen (all Texas): 240–242. Female (Pennsylvania): 240. Lateral, legs removed. 241. Dorsal. 242. Abdomen, ventral. 243–248. Epigynum: 243, 245. Ventral. 244–248. Posterior. 243, 244. (New Jersey). 245, 246. (Missouri). 247. (Kansas). 248. (Emmet Co., Michigan). 249–252. Male (Pennsylvania): 249. Ventral macrosetae of left femora. 250–252. Left palpus: 250. Mesal. 251. Apical. 252. Ventral.

Scale lines. 0.1 mm except Figs. 237–242, 249, 1.0 mm.





tip is usually (but not always) "half-spear-shaped" and wider than its neck (Figs. 215, 314), but not so wide as that of *E. rosae*. In both *E. triflex* and *E. cepina*, the terminal apophysis tip is only rarely wider than its neck. In *E. rosae* it is wider but, as in the other two species, lacks the line of ventral macrosetae on the second femur. The conductor of the palpus, unlike that of *E. cepina*, has an "upper, outer" lobe (seen upper right in Figs. 299, 302); the palpus is much larger (0.91 to 1.6 mm wide in mesal view) than that of *E. cepina*.

*Natural History.* *Eustala anastera* is commonly found as prey in *Trypoxylon* and *Trypargilum* mud-dauber wasp nests. The species is found in diverse habitats. Collecting sites are goldenrod (*Solidago*) fields, chokeberry, an apple tree in Ontario, a tamarack bog (*Larix occidentalis*) in Manitoba, a balsam fir tree (*Abies balsamea*) in New Brunswick, a white spruce (*Picea glauca*) in New Brunswick, maple woods in Wisconsin, and tamarack (*Larix occidentalis*). Specimens have also been collected by sweeping a marsh, in xeromesic woods, by beating dead oak branches, by sweeping *Poa pratense*, in a web in dead twig in Michigan, in loblolly pine (*Pinus taeda*) in Arkansas; in oak-pine flatwoods, by sweeping turkey oak (*Quercus laevis*) scrub, by sweeping cypress (*Taxodium*) swamp edge, in palm-cypress (*Taxodium*), in red mangrove (*Rhizophora*) hammock, along a road, in a web in Spanish moss (*Tillandsia usneoides*), on *Pinus clausa*, and near scrub oak in Florida. I think one requirement for *Eustala anastera* is dead branches in a relatively open wooded area or along wood borders. Comstock (1940) reports vertical webs from low bushes. The spider does not make a retreat but sits on bark or dead branches to the side of the web, "the spider closely resembling the bark of the tree or other plant on which it rests; and they act as if conscious of this protection, running only a short distance when disturbed and then crouching down close to the bark." Kaston (1948) reports *Eustala anastera* as

being one of the few orb-weavers overwintering in the penultimate instar. Males are found throughout the season but, even in Florida, are more common in spring. The web illustrated by Plate 7 is described in the introduction as belonging to *Eustala*.

*Distribution.* Throughout southern Canada and the United States, except perhaps within the range of the similar *E. rosae* in California. The southern limits are unknown but are believed to be Central America (Map 5).

### *Eustala cepina* (Walckenaer)

Figures 233–252, 286–290, 303–308, 316, Map 5

*Epeira cepina* Walckenaer, 1841, *Histoire Naturelle des Insectes Aptères*, 2: 37. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, drawings no. 173 and 175. Copy of original in Museum of Comparative Zoology, examined.

*Epeira parvula* Keyserling, 1863, *Sitzungsber. Naturf. Gesellsch. Isis, Dresden*, p. 131, pl. 6, figs. 9, 10, ♀. Female lectotype here designated from Baltimore in the British Museum, Natural History. One female, one male paralectotypes are *E. cepina*, another female *E. anastera*; one juvenile female paralectotype from Peoria is *E. anastera*. NEW SYNONYMY.

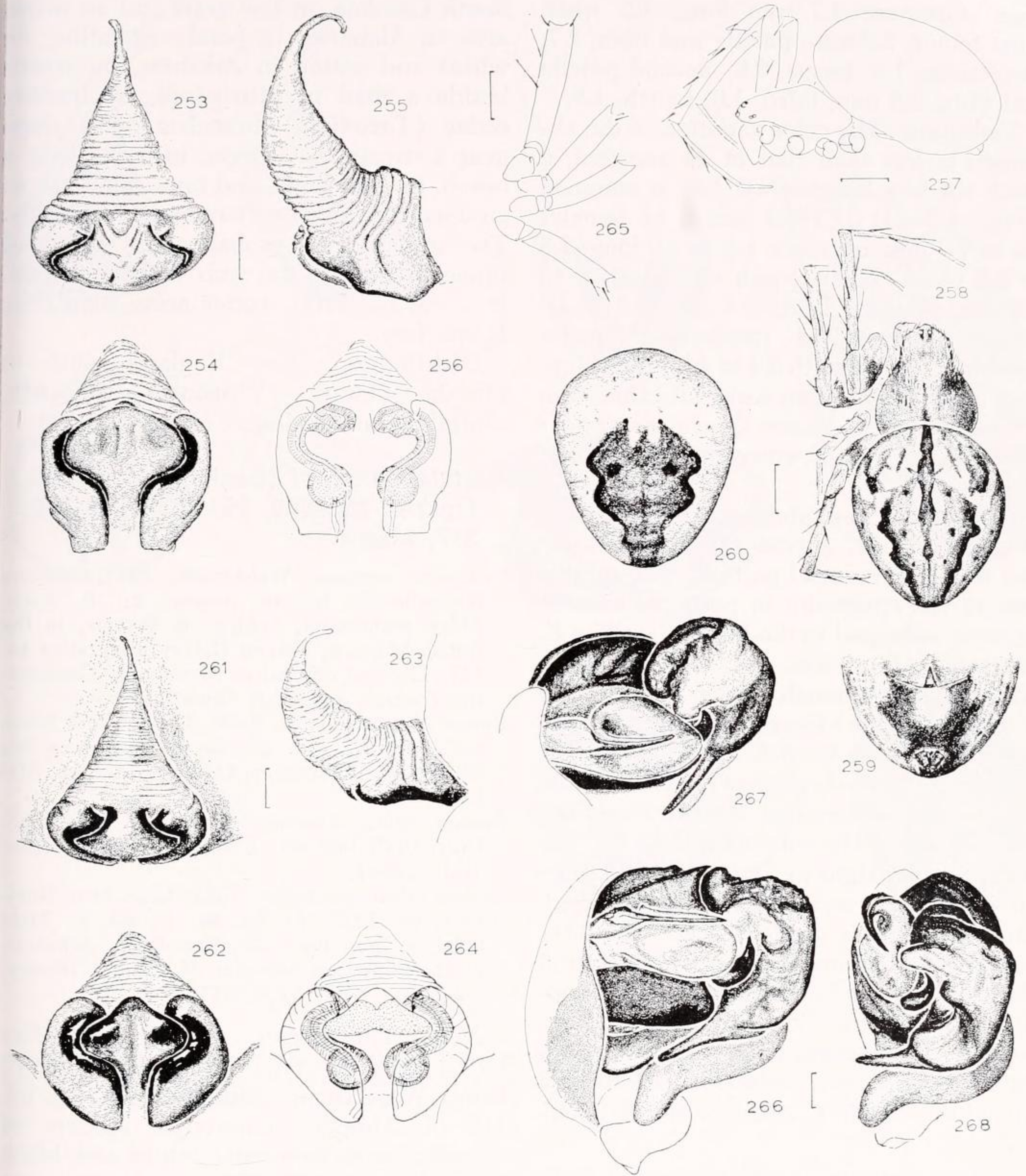
*Eustala cepina*,—Chamberlin and Ivie, 1944, *Bull. Univ. Utah, biol. ser.*, 7(5): 103.

*Eustala arkansana*,—Archer, 1951, *Amer. Mus. Novitates*, no. 1487: 19, fig. 47, ♀. Female allotype not male holotype.

*Note.* Most specimens in collections had been labeled *E. anastera*, but A. F. Archer called this species *A. triflex*.

*Description.* Female from Pennsylvania: Carapace orange-brown. Sternum orange-brown with some white spots. Legs orange-brown, slightly banded. Dorsum of abdomen with a folium. The abdomen is triangular, almost as wide as long (Figs. 237–241). Total length 5.5 mm. Carapace 2.3 mm long, 1.7 wide. First femur, 3.2 mm; patella and tibia, 3.6; metatarsus, 1.9; tarsus, 0.8. Second patella and tibia, 2.6 mm; third, 1.4; fourth, 2.2.

Male: Coloration as in female. The abdomen is oval, triangular. Total length 3.3



Figures 253-268. *Eustala emertoni* (Banks): 253-259. Female (Pennsylvania): 253-256. Epigynum: 253. Ventral. 254. Posterior. 255. Lateral. 256. Posterior, cleared. 257. Lateral. 258. Dorsal. 259. Female abdomen, ventral. 260. Dorsal pattern of female abdomen (Texas). 261-264. Epigynum (Connecticut): 261. Ventral. 262. Posterior. 263. Lateral. 264. Posterior, cleared. 265-268. Male (Pennsylvania): 265. Ventral macrosetae of left femora. 266-268. Left palpus: 266. Mesal. 267. Apical. 268. Ventral.

Scale lines. 0.1 mm except Figs. 257-260, 265, 1.0 mm.

mm. Carapace 1.7 mm long, 1.5 wide. First femur, 2.2 mm; patella and tibia, 2.7; metatarsus, 1.8; tarsus, 0.8. Second patella and tibia, 2.3 mm; third, 1.0; fourth, 1.8.

*Variation.* The color variation of the abdomen is less than that of *E. anastera*, a black median longitudinal line is common (Figs. 237–241). Total length of females 3.4 to 7.9 mm, carapace 1.4 to 2.9 long, 1.3 to 2.2 wide. Total length of males 2.5 to 4.3 mm, carapace 1.5 to 2.4 long, 1.2 to 2.0 wide. The smallest specimens, females measuring total length 3.4 to 4.5 mm, epigynum less than 0.38 mm wide, all came from southern Florida. Some specimens appear intermediate with *E. emertoni* and perhaps *E. anastera*.

*Diagnosis.* The abdomen is triangular (Figs. 237–241), almost as wide as long, and may lack a dorsal pattern. The middle area of the epigynum in posterior view is larger or subequal to the lateral (unlike *E. emertoni*) (Figs. 236, 244, 247, 286–290). The epigynum is much smaller in size (0.28 to 0.38 mm wide) than that of *E. anastera*. The male differs from *E. emertoni* in that the longer terminal apophysis overhangs the bubble-like subterminal apophysis (Figs. 303–308, 316). The conductor lacks the lobe (to the upper right in Figs. 303–308) present in both *E. anastera* and *E. emertoni*. The conductor is smaller (Figs. 303–308) than that of *E. emertoni* and *E. anastera*. The embolus sits in the middle of the conductor, not in the “lower” half as is common in *E. anastera*. The palpus is also always smaller in size (about 0.65 to 0.72 mm wide) than in *E. anastera* and *E. emertoni*.

*Natural History.* *Eustala cepina* is commonly found as prey in mud-dauber wasp nests, of *Chalybina* wasps in Oklahoma. It has been found on lake shores in Michigan and Wisconsin, in dune grass and mixed forest in Wisconsin, by sweeping weeds in Illinois, in pine dunes in Indiana, by sweeping around a pond in Pennsylvania, in a garden in North Carolina, on pecan trees in

South Carolina, in low grass and an urban area in Alabama, in pond vegetation, on wheat and cotton in Arkansas, on weeds beside a road in Mississippi, by beating cedar (*Taxodium*) branches on a slope near a stream in Georgia; in oaks along a beach, in grasslands, and on a small oak in an open area in mesic hammock in Florida. The spiders also probably rest on dead branches next to the web without retreat. It seems to prefer wetter areas than does *E. anastera*.

*Distribution.* New England south to Florida, Ontario, Wisconsin, Colorado, central Texas to Mexico (Map 5).

#### *Eustala emertoni* (Banks)

Figures 253–268, 291–295, 309–311, 317, Map 5

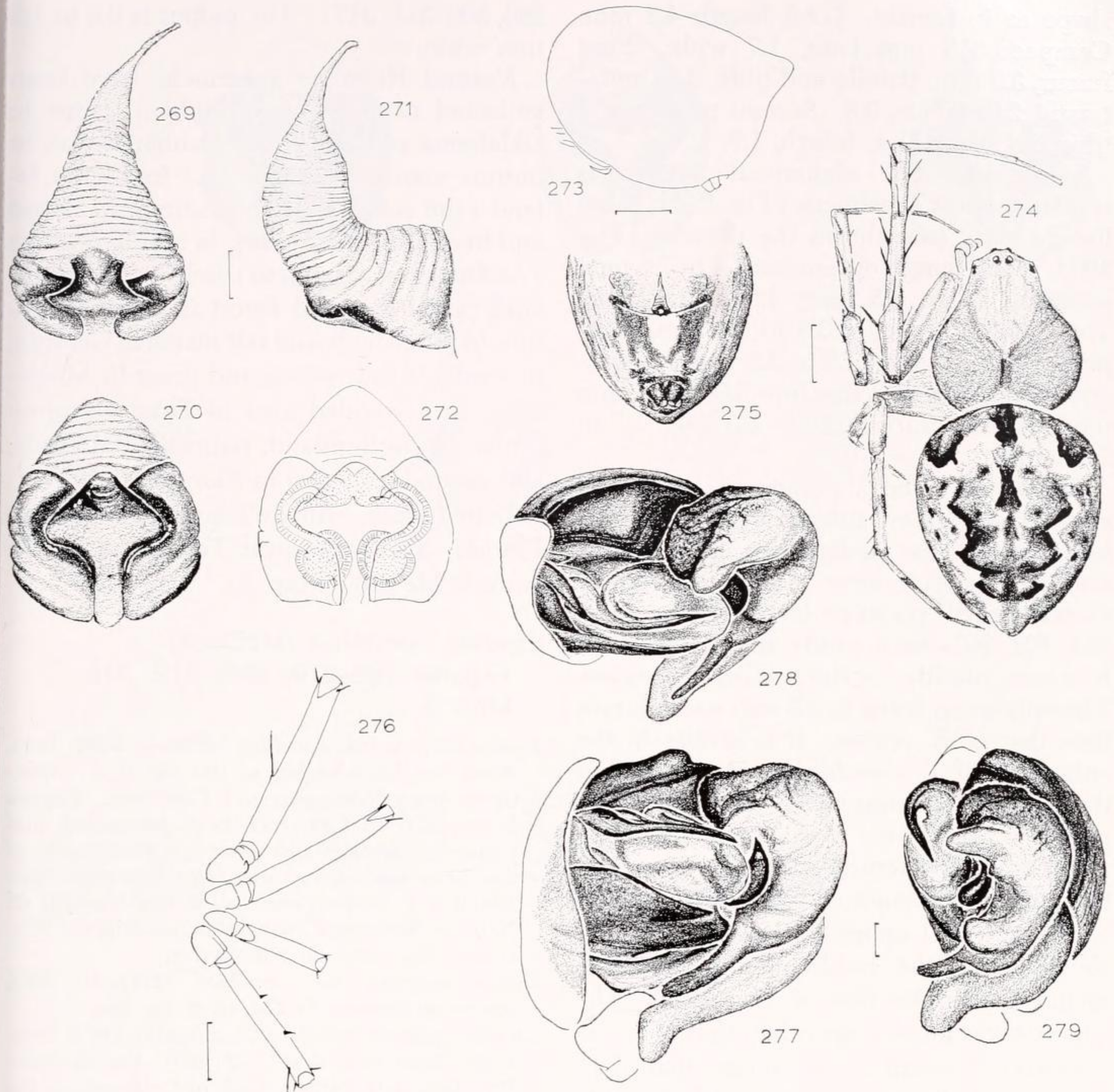
? *Epeira petasata* Walckenaer, 1841, *Histoire Naturelle des Insectes Aptères*, 2: 70. Type, Abbot manuscript, Spiders of Georgia, in the British Museum, Natural History, illustration no. 135. Copy of original in Museum of Comparative Zoology, examined. Doubtful name.

*Epeira emertoni* Banks, 1904, *J. New York Entomol. Soc.*, 12: 111. Female syntypes from Sea Cliff, N.Y., Washington, D.C., and Auburn, Alabama, lost.

*Eustala triflex*,—Chamberlin and Ivie, 1944, *Bull. Univ. Utah, biol. ser.*, 8(5): 103 (not *E. triflex* Walckenaer).

*Eustala arkansana* Archer, 1951, *Amer. Mus. Novitates*, no. 1487: 19, fig. 44, ♂, not ♀. Male holotype from Berryville, Carroll Co., Arkansas, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* This species, called *Eustala triflex* by Chamberlin and Ivie (1944), is not *E. triflex* Walckenaer. *Eustala triflex*, fig. no. 112 of Abbot’s manuscript, Spiders of Georgia, is contrastingly white and black as in Figures 219, 222, a coloration not found in this species. The same comment applies to the name *E. trinotata* Walckenaer, Abbot’s fig. no. 272. Chamberlin and Ivie believed Hentz’s *bombycinaria* to be this species. The light shoulder spots of *bombycinaria* Hentz are found, as in fig. 16, plate 31, but they are not white as shown by Hentz in the figures and in a colored manu-



Figures 269-279. *Eustala conchlea* (McCook): 269-275. Female: 269-272. Epigynum: 269. Ventral. 270. Posterior. 271. Lateral. 272. Posterior, cleared. 273. Abdomen, lateral. 274. Dorsal. 275. Abdomen, ventral. 276. Male ventral macrosetae on left femora. 277-279. Male left palpus: 277. Mesal. 278. Apical. 279. Ventral.

Scale lines. 0.1 mm, except Figs. 273-276, 1.0 mm.

script illustration at Harvard University. Banks was the first to describe the species and give diagnostic characters.

**Description.** Female from Pennsylvania: Head region much lighter than sides of thorax. Carapace with white down. Sternum with some black pigment marks. Legs with only femora banded. Dorsum of ab-

domen with very distinct contrasting folium (Fig. 258). The abdomen is oval without hump (Figs. 257, 258). Total length 5.6 mm. Carapace 2.3 mm long, 2.0 wide. First femur, 3.0 mm; patella and tibia, 3.6; metatarsus, 1.9; tarsus, 0.7. Second patella and tibia, 2.9 mm; third, 1.5; fourth, 2.5.

Male from Pennsylvania: Coloration and

shape as in female. Total length 4.3 mm. Carapace 2.3 mm long, 1.7 wide. First femur, 3.0 mm; patella and tibia, 3.4; metatarsus, 2.0; tarsus, 0.8. Second patella and tibia, 2.4; third, 1.4; fourth, 1.9.

*Variation.* The abdominal pattern is similar in most specimens (Fig. 258), some have a dark triangle on the dorsum (Fig. 260). Total length of females 3.4 to 7.6 mm, carapace 1.7 to 3.5 long, 1.5 to 2.9 wide. Total length of males 3.8 to 5.0 mm, carapace 2.4 to 2.6 long, 1.8 to 2.2 wide. Southern Florida females measure 5.0 to 6.1 mm total length, carapace 2.0 to 2.3 long, 1.7 to 2.0 wide.

*Diagnosis.* The abdomen of females is egg-shaped, widest anteriorly, the posterior hump absent; the median area of the epigynum in posterior view is distinctly larger than the small posterior lateral areas (Figs. 254, 262, 291–295), unlike that of *E. anastera* and, usually, of the smaller *E. cepina*. The epigynum is 0.4 to 0.5 mm wide, larger than that of *E. cepina*. It is similar to the epigynum of *E. conchlea* in the west, but the abdominal hump of *E. conchlea* is lacking in *E. emertoni*.

Males lack macrosetae on the venter of the second leg femora (Fig. 265). The tip of the terminal apophysis of the palpus is shorter than the bubble-like subterminal apophysis, unlike that of *E. cepina*. The conductor is much larger than that of *E. cepina* and *E. anastera* and, unlike that of *E. cepina*, is bulging "on top" and has a thin tail, about five times as long as wide (Figs.

266, 309–311, 317). The palpus is 0.8 to 1.2 mm wide.

*Natural History.* Specimens have been collected as prey by *Chalybion* wasps in Oklahoma and other mud-dauber wasps, in button woods (*Platanus* sp.) in Rhode Island (the northernmost locality), in wheat and in alfalfa in Arkansas, in a broom-sedge (*Andropogon virginicus*) field and bottomland pine-hardwood forest in North Carolina, in pinewoods and salt marsh in Georgia, in roadside low weeds and grass in Mississippi, in a wooded area in Texas, in pine-flatwoods, bottomland, palmetto flatwoods, and around a swamp in Florida.

*Distribution.* Rhode Island, Michigan to Florida, Kansas, central Texas and north-eastern Mexico (Map 5).

#### *Eustala conchlea* (McCook)

Figures 269–279, 296, 312, 318,  
Map 5

*Epeira parvula* var. *conchlea* McCook, 1888, Proc. Acad. Sci. Philadelphia, p. 199, fig. 6, ♀. Specimens from Wisconsin and California. Female lectotype from California, here designated, and numerous female and male paralectotypes of the same species and one female paralectotype which is *E. californiensis*, all in the Academy of Natural Sciences, Philadelphia, examined. Wisconsin specimens do not survive.

*Epeira anastera* var. *conchlea* McCook, 1893, American Spiders, 3: 174, pl. 8, fig. 1n.

*Eustala anastera buliafera* Chamberlin, 1924, Proc. Calif. Acad. Sci., 4 ser., 12: 650. Female holotype from Isla Partida, Gulf of California in the California Academy of Sciences, examined. NEW SYNONYMY.

Figures 280–296. Epigyna of the *E. anastera* group.

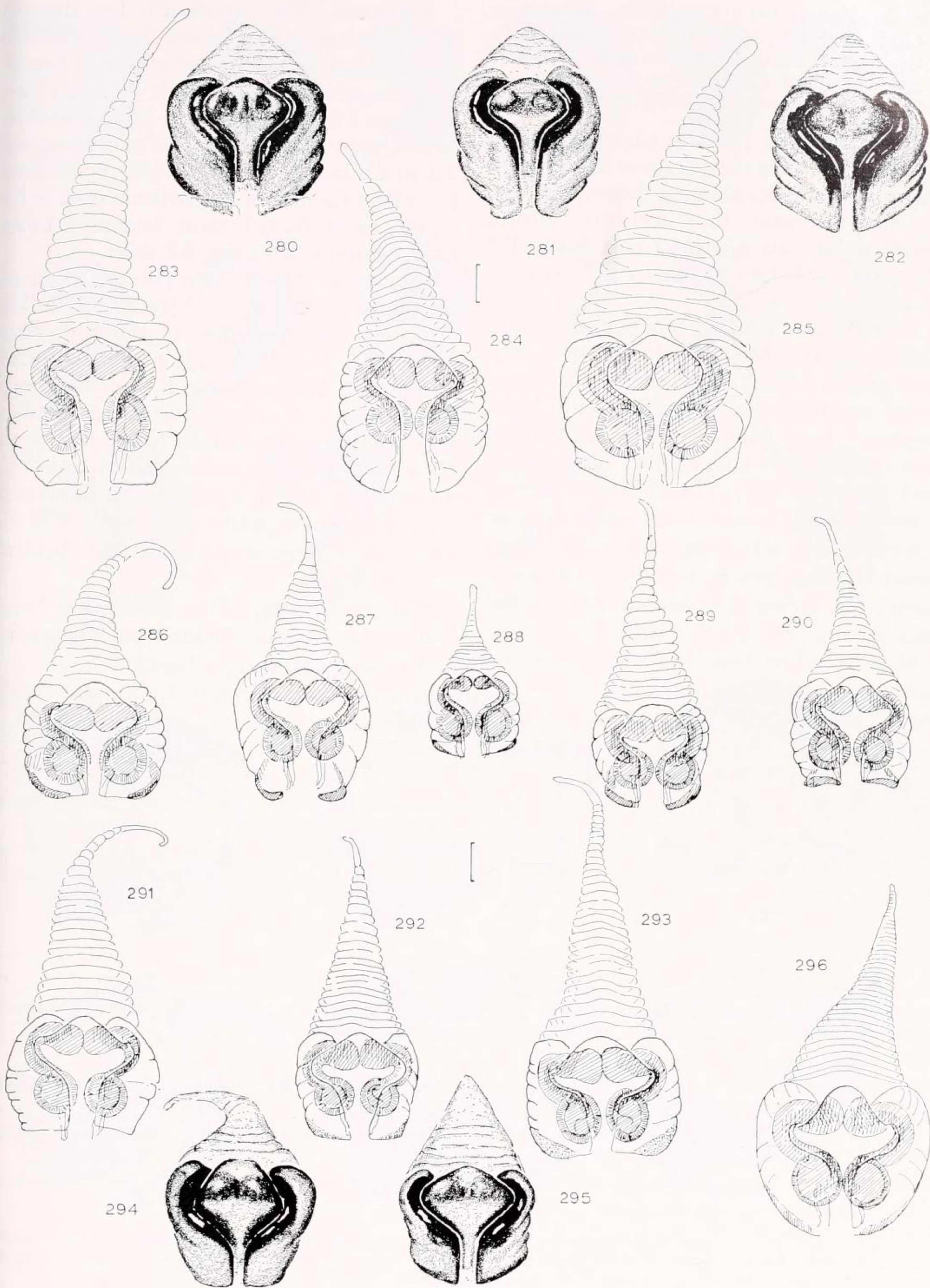
Figures 280–285. *Eustala anastera* (Walckenaer): 280–282. Posterior: 283–285. Mounted and cleared on a microscope slide: 280. (Michigan). 281. (northern Florida). 282. (Texas). 283. (Pennsylvania). 284. (Highland Co., Florida). 285. (Texas).

Figures 286–290. *Eustala cepina* (Walckenaer) mounted and cleared: 286. (New Jersey). 287. (Pennsylvania). 288. (Florida). 289. (Missouri). 290. (Kansas).

Figures 291–295. *Eustala emertoni* (Banks): 291–293. Mounted and cleared: 291. (Pennsylvania). 292. (Florida). 293. (Texas). 294, 295. Posterior: 294. (Florida). 295. (Texas).

Figure 296. *Eustala conchlea* (McCook).

Scale line. 0.1 mm.



*Eustala anastera leuca* Chamberlin, 1924, Proc. Calif. Acad. Sci., 4 ser., 12: 650. Female holotype in poor physical condition from Santa Inez Island, Gulf of California in the Academy of Sciences, examined, NEW SYNONYMY.

*Note.* In 1935 (p. 22), Chamberlin and Ivie compared the new *E. rosae* to *E. conchlea*, presumably considering them sympatric. In 1944, however, they consider "*Epeira anastera* var. *conchlea* McCook, Ibid., 173 (in part, including type)" a synonym of *E. anastera*.

*Description.* Female from Laguna Beach, California: Head region yellow-brown, thoracic region darker. Black rings around posterior median eyes. Sternum with black pigment. Legs banded. Dorsum of abdomen with folium and median longitudinal dark line (Fig. 274). The abdomen has one posterior dorsal hump. Total length 5.3 mm. Carapace 2.4 mm long, 1.9 wide. First femur, 3.3 mm; patella and tibia, 3.9; metatarsus, 1.9; tarsus, 0.9. Second patella and tibia, 3.0 mm; third, 1.6; fourth, 2.6.

Male from Los Angeles, California: Carapace more evenly brown than in female and legs less banded. The posterior dorsal tubercle of the abdomen is distinct. Total length 5.2 mm. Carapace 2.7 mm long, 2.2 wide. First femur, 4.1 mm; patella and tibia, 4.5; metatarsus, 2.9; tarsus, 1.1. Second patella and tibia, 3.5 mm; third, 1.9; fourth, 3.0.

*Variation.* The variation is less than in other species. One female had a second tubercle below the posterior dorsal hump. Females measure total length 4.6 to 7.9 mm, carapace 2.2 to 3.2 mm long, 1.8 to 2.6 wide. Males, total length 4.3 to 5.0 mm, carapace 2.2 to 2.6 long, 1.9 to 2.2 wide. Specimens from Baja California and Arizona tend to be larger; a male from Tucson, Arizona, 6.4 mm long, carapace 3.4 long, 2.7 wide.

*Diagnosis.* The shorter, pointed terminal apophysis of the palpus (Figs. 277, 278, 312, 318), the posterior view of the epigynum (Fig. 270), and the single posterior dorsal hump (Fig. 273) separate *E. conchlea* from the sympatric *E. rosae*. *Eustala conchlea* is very similar to the eastern North American *E. emertoni*. Specimens differ from *E. emertoni* by having a posterior dorsal hump on the abdomen, while the abdomen of *E. emertoni* is egg-shaped, narrow behind without hump.

*Natural History.* This species has been collected from grassy fields, from tall weeds, and from reeds along a lagoon.

*Distribution.* Central California coast, Arizona, Baja California and Sinaloa.

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Figures 297-312. Conductor (stippled), embolus and terminal apophysis tip (black) and median apophysis (white) of left palpus of *E. anastera* group. (Note different enlargements.)

Figure 297. *Eustala rosae* Chamberlin and Ivie.

Figures 298-302. *Eustala anastera* (Walckenaer): 298. (Nova Scotia, Canada). 299. (Michigan). 300. (Missouri). 301. (Florida). 302. (southern Texas).

Figures 303-308. *Eustala cepina* (Walckenaer): 303. (Massachusetts). 304. (Wisconsin). 305. (Missouri). 306. (southern Florida). 307. (Alabama). 308. (southern Texas).

Figures 309-311. *Eustala emertoni* (Banks): 309. (Georgia). 310. (northeastern Texas). 311. (southern Texas).

Figure 312. *Eustala conchlea* (McCook).

Figures 313-318. Distal parts of palpus of the *E. anastera* group. (Note different enlargements.) 313. *Eustala rosae*. 314, 315. *Eustala anastera*. 314. (New Jersey). 315. (Pennsylvania). 316. *Eustala cepina* (Pennsylvania). 317. *Eustala emertoni* (Florida). 318. *Eustala conchlea*.

Scale lines. 0.1 mm.





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