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A REVISION OF THE AMERICAN SPECIES OF THE ANTLIKE JUMPING SPIDER GENUS *SYNAGELES* (ARANEAE, SALTICIDAE)

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ABSTRACT

The American members of the antlike salticid genus *Synageles* are revised. *Synageles* species may be distinguished from other antlike salticids by the unique configuration of the genitalia. Other distinguishing characteristics are the spination of the tibia of the first legs, small size, flat appearance, waving of the second pair of legs, and the ultrastructure of the white body scales. In the New World this genus ranges from Canada to southern Mexico and the Bahamas. It is the only genus of antlike salticids restricted to the holarctic. The status of *Gertschia* is changed to that of a subgenus. The seven New World species are: *Synageles* (*Gertschia*) *bishopi* new species, *S.* (*G.*) *mexicanus* new species, *S.* (*G.*) *noxiosa* (Hentz). *Synageles* (*Synageles*) *canadensis* new species, *S.* (*S.*) *idahoanus* (Gertsch), *S.* (*S.*) *leechi* new species, and *S.* (*S.*) *occidentalis* new species.

INTRODUCTION

The genus *Synageles* was established by Simon for the Palearctic *Attus venator* Lucas (Simon 1876). Various American antlike salticids have been placed in the genus at various times and in 1945 Kaston established *Gertschia* for Hentz's *Synemosyna noxiosa*. Cutler (1970) further compounded the confusion in an unpublished doctoral thesis by lumping *Synageles* with *Peckhamia* in the genus *Consingis*. Since that time I have seen more specimens from North America and Europe. Thaler (1983) published a review of middle European *Synageles* with excellent illustrations, which helped clear up ambiguities concerning some European species not available to me.

The relationships of *Synageles* to other salticid genera are obscure. This is a recurring problem in the Salticidae. It is clear that the genus *Synagelides* bears at best only a superficial resemblance to *Synageles*, as judged by the illustrations in Bohdanowicz (1978, 1979), Bohdanowicz and Heciak (1980) and Proszynski (1979). Possible candidates for related genera are the New World antlike salticids *Peckhamia, Semora* and *Semorina* based on morphological and behavioral characteristics, but a firm relationship is premature at this time.

In the search for additional characters for use in inferring relationships among salticids, several authors (Cutler 1981b, 1982; Galiano 1975; Wanless 1978a,c) have examined the ultrastructure of the modified setae called scales. The most comprehensive study of salticid scales was done by Hill (1979), but only one species of antlike salticid was included in his study. The scales in *Synageles*, as in all antlike salticids I have examined (12+ genera), are pale colored in life or in

alcohol, and confined to three body areas. They occur as a band or patches between the row three eyes, as a narrow band or patch below the row three eyes on the side of the prosoma, and as paired patches on the anterior portion of the opisthosoma (rarely as a continuous band) where the opisthosoma is narrowed. Not all species examined have these scales, but in the genera examined, scales are present in at least one member of each genus. In this regard, the scales may become a useful character for comparative analysis. The presumed function of the scales is to act as an accentuating feature of the illusion in creating a narrow "wasp waist" (more exactly an "ant waist"), contributing to the antlike appearance of the spider.

I examined the scales of both sexes of *Synageles*; (*G.*) *bishopi*, *S.* (*G.*) *mexicanus*, *S.* (*G.*) *noxiosus*, *S.* (*S.*) *occidentalis* and *S.* (*S.*) *venator*. Scales of *S.* (*G.*) *mexicanus* are illustrated; prosomal (Fig. 2) and opisthosomal (Fig. 3). Similar scale morphology occurs in the American antlike salticid genera *Erica, Peckhamia* and *Synemosyna* (Cutler 1985). *Maevia* and *Marpissa* have scales which resemble these (Hill 1979, fig. 15), but the genitalia in these two genera are very different from those of the antlike salticids mentioned.

BEHAVIOR

Most antlike salticids elevate the first pair of legs in a convincing imitation of ant antennae (Reiskind 1977), but *Synageles* and *Peckhamia* utilize the second pair for this purpose. I have observed this in *S. (G.) noxiosus* and *S. (S.) occidentalis* in both sexes, and Engelhardt (1970) observed it in *S. (S.) venator*. Second leg elevation has been observed in species of other antlike salticid genera, but is rare. It occurs in a species of *Sarinda* (Jackson and Drummond III 1974), and E. Peckham (1889) noted the same for *Synemosyna formica* (Hentz). However, I have watched many *Synemosyna formica* of both sexes from Minnesota, New Jersey and New York, and in all cases the first pair of legs was used. Thus, except for sporadic occurrences in other genera, this behavior appears to be characteristic of *Synageles* and *Peckhamia*. Mating behavior has been noted in a few species of both subgenera and is similar in all species (Crane 1949; Cutler 1970; Engelhardt 1970; Richman 1982). Males display before females by lowering the front legs to the side or in front of the body, and the opisthosoma is lowered and elevated, or elevated and waved from side to side.

ANT RESEMBLANCE

There are many species of ants that occur in the same habitat as *Synageles*. However, the greatest similarities in size and coloration between adult *Synageles* appear to be with worker ants of the genera *Crematogaster* (G. B. Edwards *in litt.*), *Lasius* (Engelhardt 1970) and *Myrmica* (Cutler 1970). Ants are well known as unpalatable prey for many predators and have many supposed mimics (Wickler 1968). Few of these supposed spider—ant mimicry associations have been tested. I found that *S. (S.) occidentalis* appears to be protected to a certain extent from predation (Cutler 1970, to be published elsewhere), and Reiskind (1977) gives detailed behavioral and morphological reasons for considering certain antlike spiders in Panama as being mimics. It should be noted that there are

specialized ant predators among both the vertebrates and the invertebrates, so ant mimesis is not completely protective. *Synageles* have very small egg sacs, three or four eggs per sac (Cutler 1970; Engelhardt 1970). This has been generally cited as a result of the protective nature of ant mimesis. However, Wayne Maddison (*in litt.*) noted serial egg sacs in *S. (G.) noxiosus* from Ontario. One female made seven sacs, and the other possibly eight, certainly seven. I have observed in the small salticid *Talavera minuta* (Banks) egg sacs with two or three eggs, and this species is not antlike. The small number of eggs per sac probably results from the small size of the spider, and the necessity for the egg to be a certain size. The number of serial egg sacs functions to increase the total egg numbers per female.

GENITALIC MORPHOLOGY

The Salticidae are notorious for having simplified male external genitalia, and male *Synageles* have a simple palpus compared to most other members of the family. As may be seen by the illustrations in this paper and those of Thaler (1983), the only clear characteristics are the form of the tube-like embolus, and the shape of the tibial apophysis. The internal embolic tubes of the bulb are not visible, as they are in many salticids.

Females have a typical epigynal structure for the family. Distinguishing North American species of the genus ultimately depends on the shape of the internal ducts, although the posterior margin of the epigynum and the position of the external openings provide important clues.

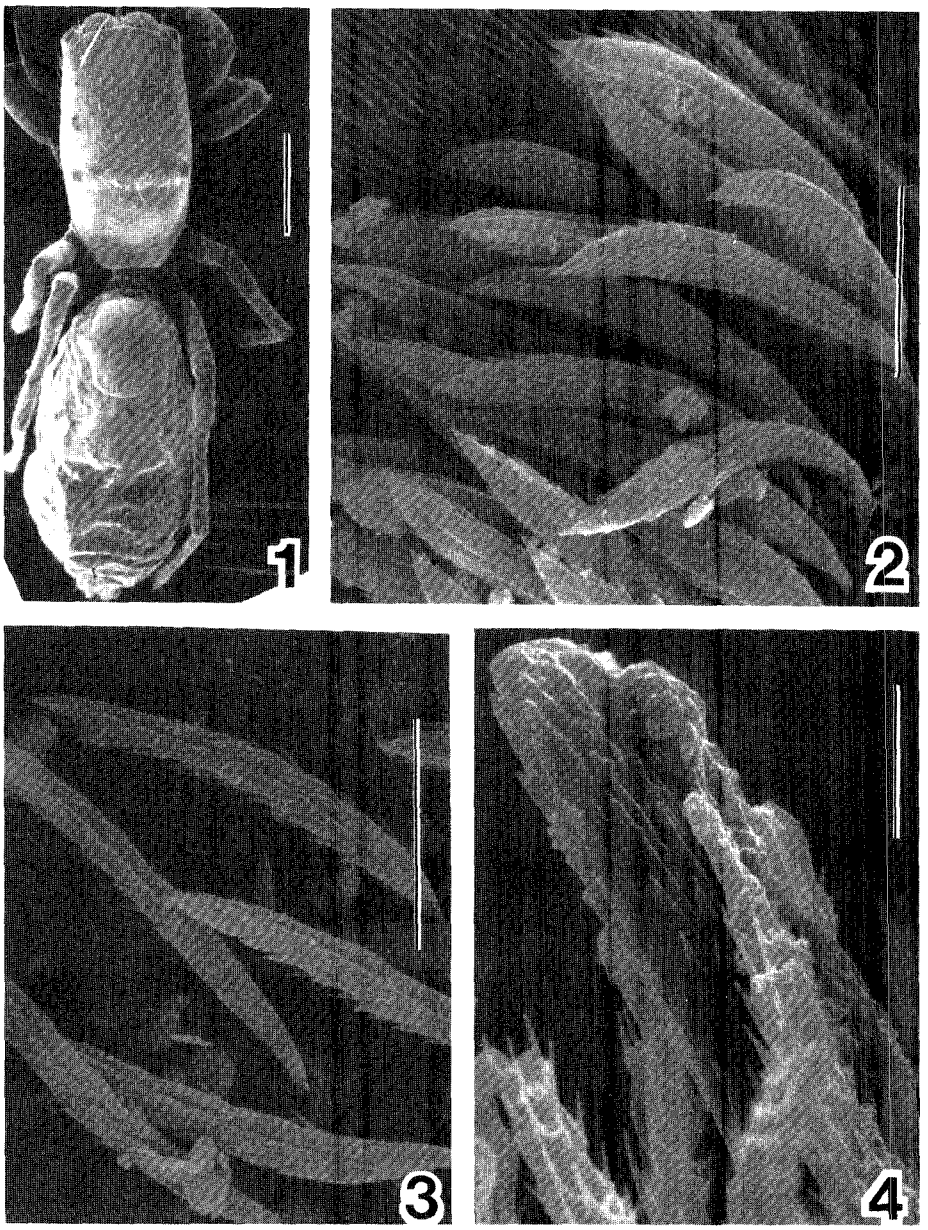
Male *Synageles* have a large modified seta at the distal end of the cymbium (Fig. 4). Similar setae are found in other salticid genera, and the function is not known.

SUBGENERA

Three New World species form a compact group, *S. bishopi, S. mexicanus* and *S. noxiosus*. While they are clearly *Synageles*, they are obviously closely related and differ from the other members of the genus in genitalic features. There exists the name *Gertschia* for this group, and two subgenera are erected in this paper, *Gertschia* for these species, and *Synageles* for all other species. Details are given later in this paper.

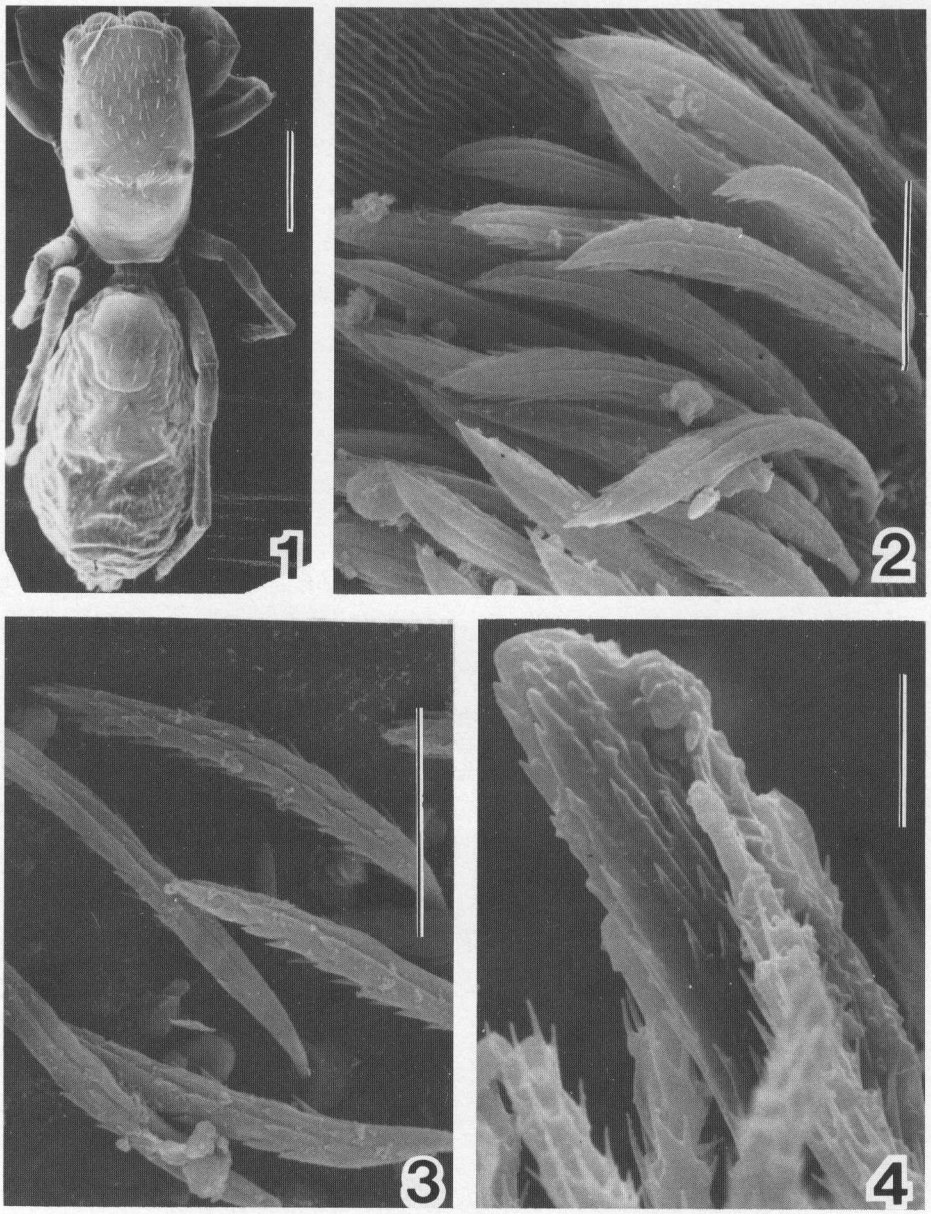
POSSIBLE ALLOMETRIC CHARACTERS

One of the classic criteria used by Simon (1901) in his higher classification of salticids was the number and type of retromarginal cheliceral teeth. Many authors have subsequently commented on the variability of this feature in genera and species. Kaston (1945) discussed this in regard to *Synageles* (as *Gertschia*). In the American members of the subgenus *Synageles* this retromarginal tooth is most often single and simple, but sometimes single and bicuspid (fissident). However, in the subgenus *Gertschia* there may be one, one bicuspid, or two or three teeth. Smaller specimens of *S. (G.) noxiosus* including most males, usually have a single simple tooth on each chelicera, females often have a single bicuspid tooth. In *S. (G.) bishopi* both sexes usually have a single bicuspid tooth. The largest species of



Figs. 1-4.—*Synageles* dorsal view and seta morphology: 1, dorsal view, female *S. (S.) noxiosus* 2-4; 2, *S. (G.). mexicanus* prosomal white scales, female; 3, opisthosomal white scales, female; 4, enlarged seta at distal tip of cymbium (large dark seta in center of micrograph), male. Scale lines: fig. 1=500 μm; figs. 2,3 = 25 μm; fig. 4 = 5 μm.

the genus *S. (G.) mexicanus*, often has two or three teeth on each chelicera. Another size trend in *Gertschia* concerns features of the male palpus. In small male *S. (G.) noxiosus* the embolus is relatively short and moderately curved and the cusps of the tibial apophysis are relatively short (Figs. 20 & 21). In the large male *S. (G.) mexicanus* the embolus is relatively longer with a sweeping curve, and the cusps of the tibial apophysis are long (Figs. 14 & 15). Also *S. (G.)*



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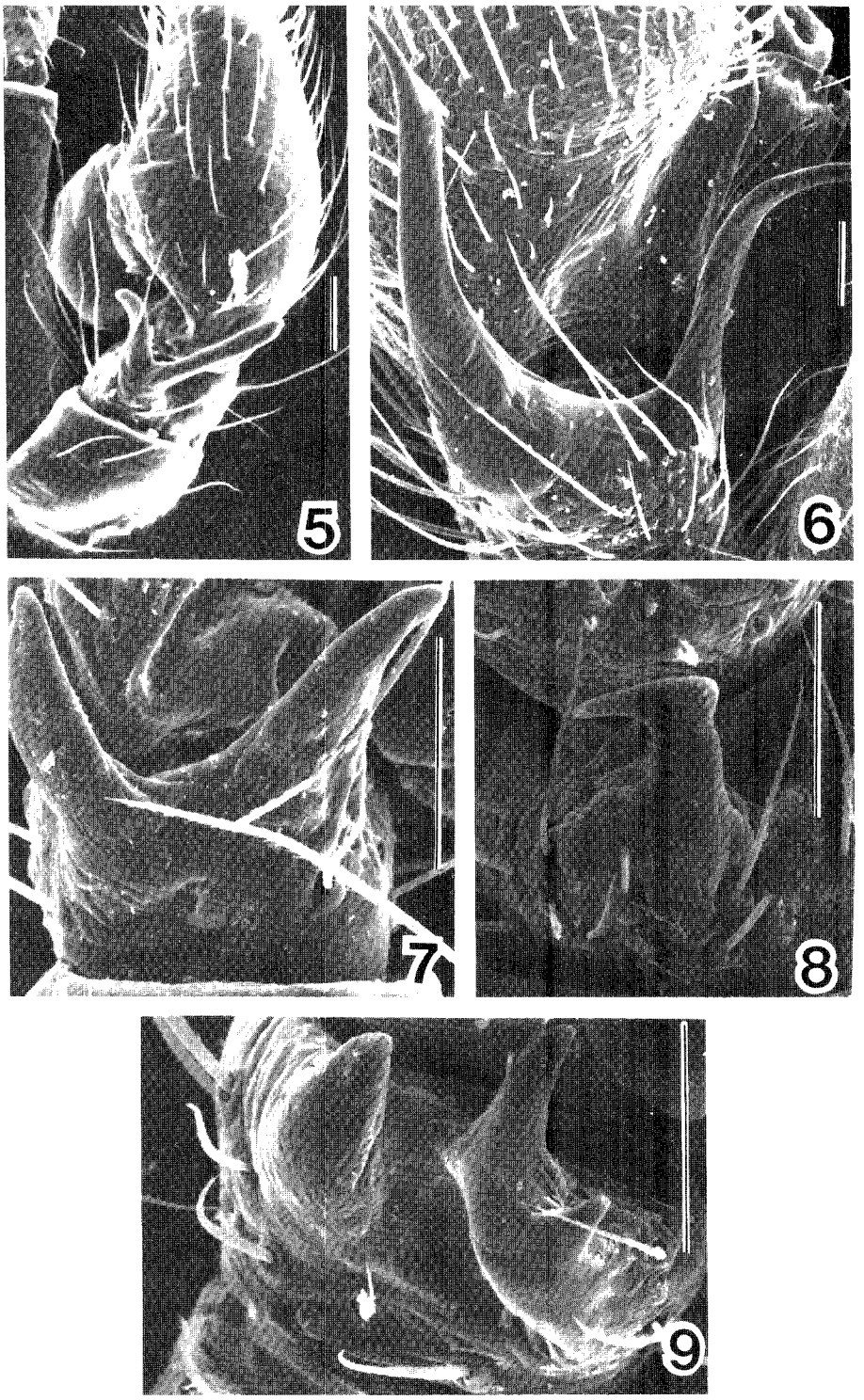
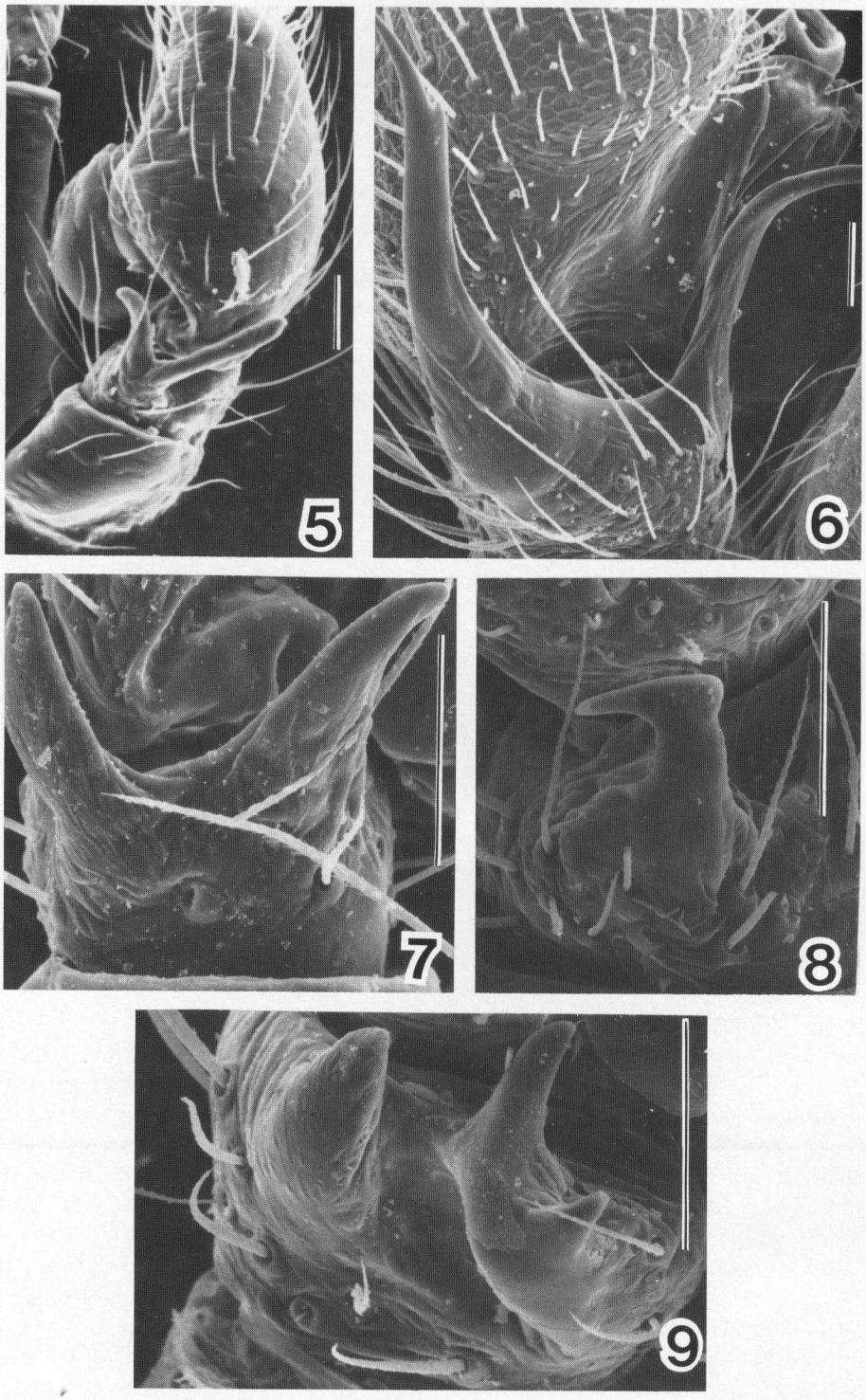


Figs. 5-9. Male palpal tibial apophyses: 5, *S. (G.) bishopi*; 6, *S. (G.) mexicanus*; 7, *S. (G.) noxiosus*; 8, *S. (S.) venator*; 9, *S. (S.) occidentalis*. Scale = 50 μm.



Figs. 5-9.—Male palpal tibial apophyses: 5, *S. (G.) bishopi*; 6, *S. (G.) mexicanus*; 7, *S. (G.) noxiosus*; 8, *S. (S.) venator*; 9, *S. (S.) occidentalis*. Scale = 50 μm.

mexicanus have three pairs of tibial spines on leg I, all other members of the genus have two pairs. In the southwestern United States where *S. (G.) mexicanus* occurs, the few *S. (G.) noxiosus* known are small for the species. It is possible that character displacement in regard to size is taking place, but to establish this requires more specimen material.

NATURAL HISTORY

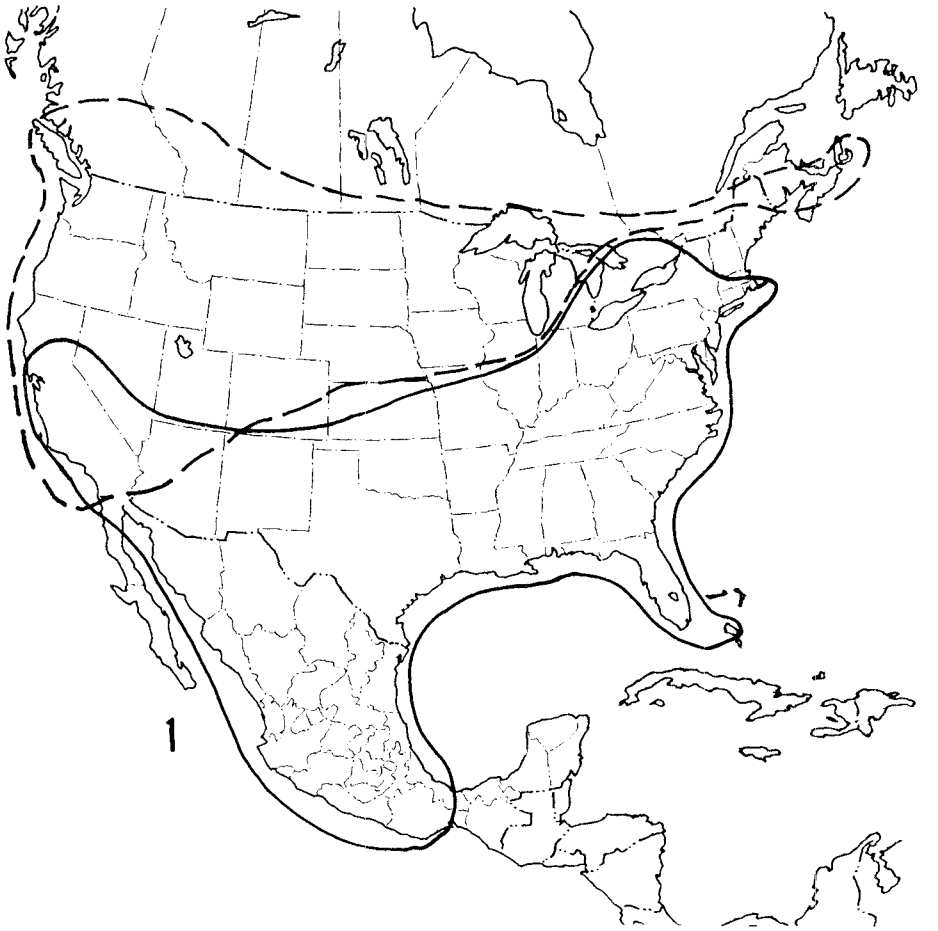
Synageles are most often collected sweeping grasses and herbaceous vegetation, although they are known from other habitats as well; see the species descriptions for details. The European species occur in the same environment (Bristowe 1958; Engelhardt 1970), although some reports indicate a ground living habitus (Brignoli 1984; Thaler 1983). Life histories have been investigated only sketchily in a few American species; Cutler (1970) provides general details. The primary difficulty in doing life history studies on small salticids is in finding suitable small food items for the young instars. Wayne Maddison (*in litt.*) did have some success in rearing *Synageles* by using Collembola, but it is a very time-consuming process. The most thorough life and natural history was done by Engelhardt (1970) using the European *S. (S.) venator*. Field studies on *Synageles* are even fewer. Abraham (1983) collected numbers of *Synageles* sp. immatures in Utah from the herb, shrub and ground layers in a sagebrush steppe community. Three quarters of the specimens were from the shrub layer, one quarter were from the herb layer, and none were found on the ground.

GENERAL DISTRIBUTION

Synageles contains species which have the most northerly distribution of any antlike salticid. In the Palearctic, *Synageles* reaches the British Isles, southern Scandinavia, and extends through Siberia. The southern range is from the Mediterranean Coast of Africa, through the Middle East and the Central Asian Provinces of the USSR to the Vladivostok area (Proszynski 1976). The northernmost record is from 68°N at Plachino, Yenisey area, Siberia for *S. (S.) venator* (Holm 1973).

In the Americas *Synageles* ranges between southern Canada and southern Mexico. The northernmost record is for *S. (S.) canadensis* at 54°N in British Columbia. The southernmost records are from 17°N in Oaxaca where both *S. (G.) mexicanus* and *S. (G.) noxiosus* occur. Thus the genus has essentially a Holarctic distribution. What is most striking is the distribution of the two subgenera. *Synageles (Synageles)* is found in southern Canada and in the northern Midwest, Rocky Mountain, Great Basin and Pacific Northwest states. *Synageles (Gertschia)* is found in Ontario, the United States exclusive of the areas listed for the nominate subgenus, the Bahamas (Andros), and Mexico. Very little overlap occurs, although both subgenera occur in Ontario, Michigan, and the central and southern part of California. Other possible contact areas are in the central part of the United States westward from Indiana to Nevada, although no joint records are currently available.

There are four species of *Synageles* known from Canada. Only three other species of antlike salticids are known from Canada, *Paradamoetas fontana* (Levi),



Map 1. General distribution of New World subgenera of *Synageles*. *Synageles (Gertschia)*—solid line; *Synageles (Synageles)*—broken line.

Peckhamia picata (Hentz) and *Synemosyna formica* Hentz. *Paradamoetas* and *Synemosyna* occur only in southern Ontario. *Synageles* not only occurs further north than other genera of antlike salticids, but has a greater diversity in the north than other genera of antlike salticids.

All the other genera of antlike salticids are subtropical or tropical, with or without outliers in the north, eg.: *Myrmarachne*—none in the Nearctic, 10 in Central and South America (Cutler 1981a; Galiano 1969a, 1974), one in Europe, 56 in Africa (Wanless 1978a); *Sarinda*—three in the Nearctic, 14 in Central and South America (Galiano 1965, 1969b); *Synemosyna*—three in the Nearctic, 18 in Central and South America (Cutler 1985; Galiano 1966, 1967).

Genus *Synageles* Simon

Attus Lucas 1836:1.
Salticus C. L. Koch 1837:31 (in part).
Synemosyna Hentz 1850:288 (in part).

Synageles Simon 1876:14; Peckham and Peckham 1889:95 (in part), 1892:59 (in part); Richman and Cutler 1979:100; Kaston 1978:248, 1981:952.
Peckhamia Simon 1900:404; Peckham and Peckham 1909:370 (in part); Emerton 1909:233 (in part); Gertsch 1934:11.
Gertschia Kaston 1945:16, 1948:450.

Type species.—*Attus venator* Lucas 1836 by subsequent designation (Simon 1876); of *Gertschia, Synemosyna noxiosa* Hentz by subsequent designation (Kaston 1945).

Description.—Antlike salticids of small size, 2.2-4.8 mm total length. Carapace flat and low, height from 30-40% length. Ocular quadrangle occupies 65-80% length of carapace. Eye rows I and III subequal in width. Length of eye field usually longer than width of widest eye row. Carapace in dorsal view without constriction, in lateral view with at most a slight declevity behind row III eyes. Opisthosoma with constriction on anterior part. Male palpus: embolus a spike or tube, embolic ducts obscure at best in uncleared specimens, with a single retrolateral tibial apophysis which may be bifid, sometimes with two distinct apophyses. Epigynum: with two openings leading to convoluted irregular internal ducts and spermathecae, see illustrations for characteristic shapes and discussions of subgenera. White scales present in region of row III eyes, and on the opisthosoma at the sides of the constriction. Scales as viewed by scanning electron microscopy are: convex and relatively smooth dorsally, sometimes with a few scattered teeth; a median dorsal groove may be present (shrinkage artifact?). Color is uniformly dark to light brown, and is not noted in specific descriptions unless it differs. Legs are pale with pro- and retrolateral dark stripes and infuscations.

Diagnosis.—There is no single non-genitalic feature that distinguishes *Synageles* from other salticids. The Peckhams (1892) noted that of all the antlike salticids only *Synageles* has the ocular quadrangle longer than wide. Their concept of *Synageles* at this time included *Peckhamia*. This ratio holds true of most, but not all, specimens of *Synageles* I have seen. It is also true of most *Peckhamia*. The only other antlike genus with this ratio is *Sobasina* from the southwest Pacific (Wanless 1978b). It may also occur in other genera of the Diolenieae (Simon 1901). Ultimately the discrimination of *Synageles* from other antlike salticid genera depends on the form of the genitalia. In addition, in North America, the non-genitalic characters of small size, low flat carapace, usually the length of ocular quadrangle greater than width, and two pairs of ventral spines on leg I tibia (*S. (G.) mexicanus* has three pair) provide important clues. *Peckhamia* may be easily confused with *Synageles*, but in *Peckhamia*, the carapace is not as flat, being more convex in the cephalic area, and has a sharp declevity behind the row III eyes. Most *Peckhamia* have three pairs of ventral spines on leg I tibia, and the genitalia are different.

KEY TO NEW WORLD SUBGENERA AND SPECIES OF *SYNAGELES*

1. Males.....2
   Females.....8

2. Single bifid palpal tibial apophysis (subgenus *Gertschia*)..... 3
   Single non-bifid palpal tibial apophysis, or two separate apophyses (subgenus *Synageles*)..... 5
3. Three pairs of ventral spines on tibia I, two or more retromarginal cheliceral teeth..... *mexicanus*
   Two pairs of ventral spines on tibia I, a single retromarginal cheliceral tooth..... 4
4. Dorsal cusp of tibial apophysis 1.5-2 times length of ventral horn..... *bishopi*
   Cusps subequal in length..... *noxiosus*
5. Two tibial apophyses, one is bifid..... *occidentalis*
   Single palpal tibial apophysis..... 6
6. Embolus points distally, base of embolus not swollen..... *canadensis*
   Embolus points to side at about a 30° angle to the wide axis of the cymbium..... 7
7. Base of embolus bulges convexly above long axis of embolus (Fig. 33)..... *idahoanus*
   Base of embolus while enlarged, does not protrude above long axis of embolus (Fig. 37)..... *leechi*
8. Epigynal openings medial, leading to laterally directed ducts, at the end of ducts are compact coiled spermathecae (subgenus *Gertschia*)..... 9
   Epigynal openings not medial (subgenus *Synageles*)..... 11
9. Three pairs of ventral spines on tibia I, two or more retromarginal cheliceral teeth..... *mexicanus*
   Two pairs of ventral spines on tibia I, a single retromarginal cheliceral tooth..... 10
10. Posterior margin of epigynum with a broad single notch; internal details as in Fig. 13..... *bishopi*
    Posterior margin of epigynum smooth, or with two small notches; internal details as in Fig. 24..... *noxiosus*
11. Posterior margin of epigynum with a single medial notch; internal details as in Figs. 42, 44..... *occidentalis*
    Epigynum without a medial notch..... 12
12. Epigynum with posterior margin a flap overhanging epigastric furrow, flap with two ovoid lunules; internal details as in Fig. 32..... *canadensis*
    Posterior margin of epigynum with two shallow lobes, internal details as in Fig. 36..... *idahoanus*

Where series were available the minimum distance between the row III eyes was taken for comparison. The reason for choosing this distance is that it is easy to determine and to measure using an ocular micrometer. The more familiar prosomal length measurement in *Synageles* requires special manipulation, because the opisthosoma usually overhangs the prosoma. The spination notation used refers to the ventral spines of the metatarsus and tibia. The numbers separated by dashes refer to prolateral and retrolateral pairs, with the most proximal listed

first, eg.: 1,0-0,1 means a proximal prolateral spine and a distal retrolateral spine; 1,1-1,1 means proximal prolateral and retrolateral spines with distal prolateral and retrolateral spines. All measurements are in millimeters.

Synageles (Gertschia), new subgeneric status

Gertschia was proposed as a new genus by Kaston (1945). Richman and Cutler (1978) considered *Gertschia* as a synonym of *Synageles.* It is proposed here that *Gertschia* be retained as a subgenus of *Synageles* to define a small group of three closely related Nearctic species derived from *Synageles (Synageles).* Speculatively, it may be derived from some *Synageles (Synageles)* species which was isolated in the southwestern United States—northwestern Mexico during some Pleistocene glacial episode.

Diagnosis.—*Gertschia* includes those species of *Synageles* which in the males have a distal bifurcate palpal tibial apophysis, with the cusps extending distally and the greatest width in a dorso-ventral plane. The embolus is thin and distinctly curved, with a length-width ratio 10:1 or more (Figs. 10, 14, 18). Females have a distinctive epigynum with the two openings situated medially, and opening to short tubes extending laterally to compact coiled spermathecae, the spermathecae being well removed from the posterior margin of the epigynum (Figs. 13, 17, 24).

Type species.—*Synageles (Gertschia) noxiosus* (Hentz).

Included species.—*S. (G.) bishopi* n. sp., and *S. (G.) mexicanus* n. sp..

Geographic range.—Mexico: Oaxaca to the southern U.S., north along the west coast of the U.S. to the San Francisco Bay area, and in the Mississippi River region from Kansas northeast to Ontario and Massachusetts, and in the Bahamas.

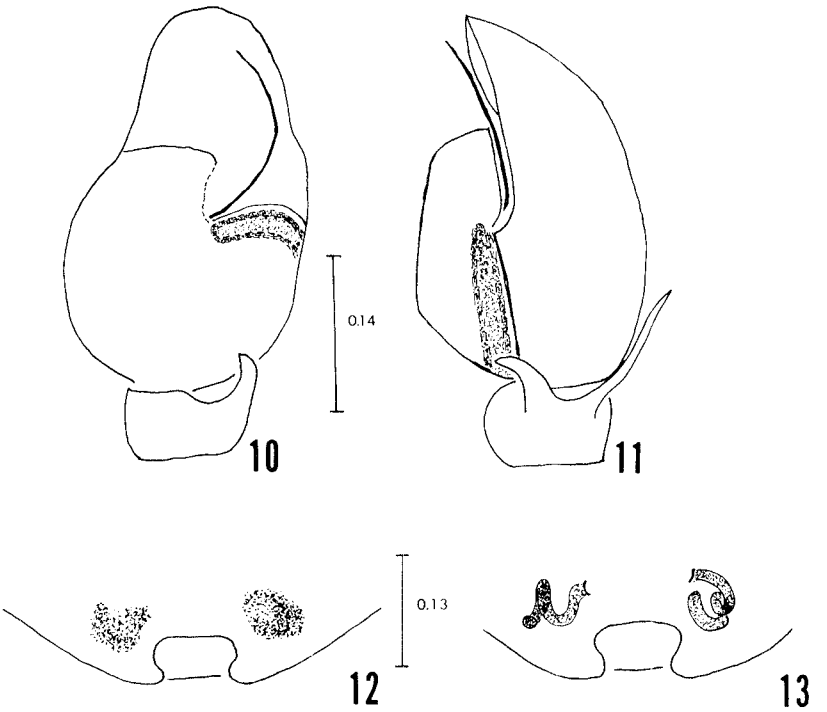
Synageles (Gertschia) bishopi, new species
Figs. 5, 10-13; Map 2

Synageles scorpiona [lapsus for *scorpionia*]: Peckham and Peckham 1889, 95-96, pl. 6, fig. 72, female; Peckham and Peckham 1892:63, pl. 5, fig. 1d, female [not *Synemosyna scorpionia* Hentz 1845].
Peckhamia scorpiona: Peckham and Peckham 1909, 370-371, pl. 50, fig. 3, female only.
?*Peckhamia scorpionia* Emerton 1909, pl. 12, figs. 6-6a [genitalia not illustrated].

Etymology.—Named after Sherman C. Bishop, arachnologist (and herpetologist) from the eastern United States in the first half of the twentieth century.

Diagnosis.—Sympatric with *S. (G.) noxiosus* in the eastern half of the United States. Males may be distinguished from *S. (G.) noxiosus* by the long, dorsal retrolateral cusp of the palpal tibial apophysis, which is from 1.5-2 times the length of the ventral retrolateral cusp. In *S. (G.) noxiosus* the cusps are subequal in length. Females have a broad single notch on the posterior margin of the epigynum, and the orientation of the internal epigynal tubes is different from that in *S. (G.) noxiosus.*

Description.—*Male holotype:* Total length 2.6. Prosoma 1.19 long, 0.75 wide. Eye field 0.84 long, eye row I 0.58 wide, eye row III 0.57 wide, distance between row III eyes 0.47. Distance eye row II from eye row I 0.18, eye row II from eye row III 0.40. Diameter AME 0.20, ALE 0.10, row II eye 0.03, row III eye 0.10. Femur length leg I 0.72, II 0.53, III 0.50, IV 0.73. Leg order 4123. Leg spination,



Figs. 10-13. *S. (G.) bishopi*: 10-11, male palpus; 10, ventral; 11, retrolateral; 12-13, female epigynum; 12, external; 13, internal. Scale in mm.

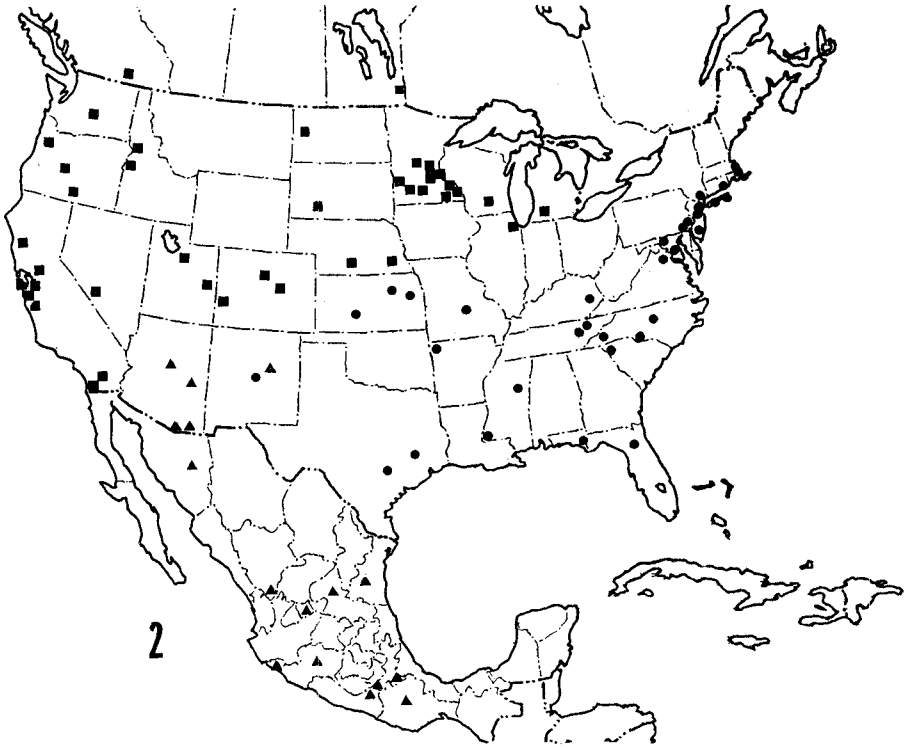
I metatarsus 1,1-1,1 tibia 1,0-1,1: II metatarsus 1,1-1,1 tibia 0,0-0,1. Fissident bicuspid retromarginal cheliceral teeth. Opisthosoma 1.4 long, 0.8 wide. Color typical for genus.

Distance between row III eyes in 17 males, mean 0.43, SD 0.06, range 0.39-0.55.

Female from Tennessee: Roane Co., Kingston, 3 June 1966 (B. Moulder), on carport (BM). Total length 3.21. Prosoma 1.36 long, 0.80 wide. Eye field 0.88 long, eye row I 0.69 wide, eye row III 0.69 wide, distance between row III eyes 0.60. Distance eye row II from eye row I 0.24, eye row II from eye row III 0.52. Diameter AME 0.22, ALE 0.11, row II eye 0.02, row III eye 0.11. Femur length leg I 0.53, II 0.50, III 0.50, IV 0.71. Leg order 4312. Leg spination, I metatarsus 1,1-1,1 tibia 1,1-1,0; II metatarsus 1,1-1,1 tibia 1,0-0,0. Fissident bicuspid retromarginal cheliceral teeth. Opisthosoma 1.8 long, 1.0 wide. Color typical for genus.

Distance between row III eyes in 16 females, mean 0.50, SD 0.04, range 0.39-0.57.

Discussion.—This species is both sympatric and synchronic with *S. (G.) noxiosus* from the Plains States east to the Atlantic Seaboard. Both species are essentially the same size, and occupy what appears to be similar habitats based on label data. Habitats are: on bark of ponderosa pine, on elm tree, on fence and bushes by stream in forest, in grass and litter of old yard, under logs on gravel, in house, and on side of house. Adults have been collected from March to July, October and December. Most were collected from May to July.



Map 2.—Distribution of *S. (G.) bishopi*—circle; *S. (G.) mexicanus*—triangle; *S. (S.) occidentalis*—square.

Distribution.—*Holotype locality:* **U.S.A.:** PENNSYLVANIA; *Bucks Co.*, Horseshoe Bend, Neshaminy Creek, NE of Jamison June 1956 (W. Ivie), male (AMNH).

Paratype localities: **U.S.A.:** FLORIDA; *Alachua Co.*, Gainesville, December 1952 (VIC), fencepost, female (AMNH): KENTUCKY; *Breathitt Co.*, Quicksand, 27 June 1925 (S. C. Bishop), female (AMNH): MARYLAND; *Washington Co.*, Hagerstown, 9 June 1914 (J. A. Hyslop), female (MCZ): MASSACHUSETTS; *Barnstable Co.*, Woods Hole, 13 July 1901 (H. W. Britcher), male (AMNH): MISSISSIPPI; *Wilkinson Co.*, Centreville, January-July 1944 (A. F. Archer), male (AMNH): NEW JERSEY; *Bergen Co.*, Englewood, 15 June 1939, female (AMNH), Ramsey, 17 June 1934, (W. J. Gertsch), female (AMNH); *Essex Co.*, W. Caldwell, 25 May 1935 (W. A. Strever), male (AMNH); *Ocean Co.*, Lakehurst and Absecon, male (AMNH): NEW YORK; *Nassau Co.*, Seacliff (N. Banks) (155), males, females (MCZ); *Suffolk Co.*, Cold Spring Harbor, 25 June 1903, male, female (AMNH), 8 July 1907 (E. B. Bryant), female (MCZ), Riverhead, 12 July 1949 (R. Latham), male (AMNH); *Westchester Co.*, Yonkers, 20 March 1935 (Woodbury), male (AMNH): NORTH CAROLINA; *Guilford Co.*, Greenshore, 2 June 1949 (E. E. Brown) (130), male (AMNH); *Mecklinburg Co.*, Davidson, 3 May 1949 (E. E. Brown) (253), male (AMNH): PENNSYLVANIA; same data as holotype, male (AMNH): SOUTH CAROLINA; *Oconee Co.*, Clemson, W 82.50 N 34.41, June 1961 (J. A. Payne), male (AMNH): VIRGINIA; *Falls Church Co.*, Falls Church, (N. Banks) (154), female (MCZ).

Other localities: **U.S.A.:** ARKANSAS; *Benton Co.*: CONNECTICUT; *New London Co.*: FLORIDA; *Liberty Co.*: KANSAS; *Douglas Co.*; *Pawnee Co.*; *Riley Co.*: MARYLAND; *Prince Georges Co.*: MASSACHUSETTS; *Plymouth Co.*; *Suffolk Co.*: MISSISSIPPI; *Okitebbeha Co.*: MISSOURI; *Phelps Co.*: NEW MEXICO; *Bernalillo Co.*: NORTH CAROLINA; *Buncombe Co.*: PENNSYLVANIA; *Philadelphia Co.*: TEXAS; *Bastrop Co.*; *Walker Co.*: TENNESSEE; *Claiborne Co.*

Synageles (Gertschia) mexicanus, new species
Figs. 2-4, 6, 14-17; Map 2

Etymology.– Named after Mexico, the country of origin of the holotype.

Diagnosis.—The largest species of the genus in the New World, has three pairs of ventral spines on tibia I, and pleurident retromarginal cheliceral teeth. Males have long palpal tibial apophyses, the length of the ventral, retrolateral cusp of the apophysis is at least 50% (usually 60%) of the cymbium length. In the other two species of *Synageles (Gertschia)*, this ratio is rarely 40%, usually around 33% or less. Females have large epigynal openings, densely sclerotized internal epigynal tubes, and a broad shallow flap overhanging the epigastric furrow.

Description.– *Male holotype*: Total length 3.5. Prosoma 1.68 long, 1.23 wide. Eye field 1.04 long, eye row I 0.84 wide, eye row III 0.95 wide, distance between row III eyes 0.80. Distance eye row II from eye row I 0.34, eye row II from eye row III 0.56. Diameter AME 0.28, ALE 0.18, row II eye 0.05, row III eye 0.15. Femur length leg I 1.02, II 0.74, III 0.73, IV 0.98. Leg order 4123. Leg spination I metatarsus 1,1-1,1 tibia 1,1,1-1,1,1; II metatarsus 1,0-1,1 tibia 1,1,0-1,1,1. Two retromarginal cheliceral teeth. Opisthosoma 1.9 long, 1.0 wide. The overall appearance is that of an orange spider, not the usual brown typical of the genus.

Distance between row III eyes in 23 males, mean 0.78, SD 0.10, range 0.57-1.07.

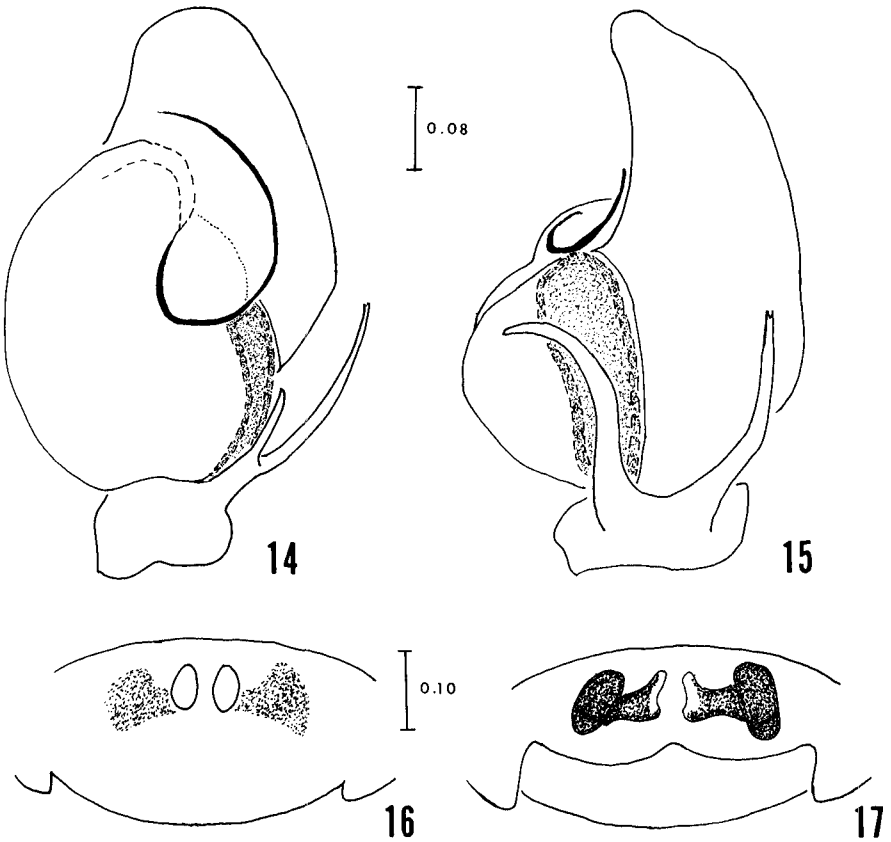
Female paratype from MEXICO: MORELOS; Palo Bolero (AMNH). Total length 4.7. Prosoma 1.9 long, 1.25 wide. Eye field 1.18 long, eye row I 1.02 wide, eye row III 1.18 wide, distance between row III eyes 0.98. Distance eye row II from eye row I 0.36, eye row II from eye row III 0.64. Diameter AME 0.34, ALE 0.20, row II eye 0.05, row III eye 0.20. Femur length leg I 0.99, II 1.01, III 0.87, IV 1.35. Leg order 4213. Leg spination I metatarsus 1,1-1,1 tibia 1,1,1-1,1,1; II metatarsus 1,0-1,0 tibia none. Three retromarginal cheliceral teeth. Opisthosoma 2.9 long, 1.4 wide. Color as in male.

Distance between row III eyes in 15 females, mean 0.77, SD 0.10, range 0.53-0.98.

Discussion.—As the largest New World species, certain allometric trends become evident in *S. (G.) mexicanus*. This species has pluricident retromarginal cheliceral teeth, as opposed to the usual bicuspid fissident teeth in the subgenus, and some specimens have three teeth. This is the only species with three pairs of ventral tibial spines on leg I, the usual number is two pairs. In the male the tibial apophysis is proportionately longer than in other species, and the sclerotized portion of the embolus is also proportionately longer. The tips of the male palpal tibial apophyses are often broken, but no broken tips were observed in the female epigynal openings, or along the posterior margin of the epigynum.

Distribution. –*Male holotype locality:* **MEXICO:** DURANGO; 40 miles NE of El Salto, 11 August 1957 (W. J. Gertsch), male, (AMNH).

Paratype localities: **MEXICO**: AGUASCALIENTES; 7.5 miles N of Tepezala, W 102 N 22, 30 August 1965 (Gertsch and Hastings), 3 males, 3 females (AMNH); COLIMA; 5 miles N of Colima, 3 August 1956 (V. Roth and W. J. Gertsch), male (AMNH), 7 miles S of Colima, 2 August 1956 (V. Roth and W. J. Gertsch), female (AMNH); MICHOACAN; 3 miles NE of Patzcuaro, W 101.35 N 19.33, 5 September 1966 (J. and W. Ivie), 13 males (AMNH); MORELOS; Alpoyeca, 28 July 1956 (W. J. Gertsch and V. Roth), female (AMNH), Cuernevaca, 27 July 1956 (V. Roth and W. J. Gertsch), male, 3 females (AMNH); PUEBLA; Tehuacan, 24 July 1956 (W. J. Gertsch and V. Roth), 3 females



Figs. 14-17.—*S. (G.) mexicanus*: 14-15, male palpus; 14, ventral; 15, retrolateral; 16-17, female epigynum; 16, external; 17, internal. Scale in mm.

(AMNH). **U.S.A.:** ARIZONA; *Cochise Co.*, Garden Canyon, Huachuca Mts., 22 July 1950 (W. S. Creighton), male (AMNH).

Other localities: **MEXICO:** GUERRERO; Taxco, 15 August 1943 (Boliva, Pelaez, Osorio), female (AMNH): MORELOS; Acatlipa, 10 August 1946 (Goodnight, Bolivar, Bonet), female (AMNH): OAXACA; El Catrin, W 96.57 N 17.21, 3 September 1964 (J. and W. Ivie), male (AMNH): SAN LUIS POTOSI; Charcas, July 1934 (Chickering ?), male (MCZ), 7 July 1934 (Chickering ?) male (MCZ): SONORA; Baviacora, 15-20 km E, 110°05'W 20°43'N, 6 August 1983 (V. and B. Roth), male (AMNH): TAMAULIPAS; Victoria, 17 May 1957 (M. Cazier, W. J. Gertsch, R. Schrammel), 3 females (AMNH). **U.S.A.:** ARIZONA; *Coconino Co.*, Lakeview Campground, Lake Mary (7200 feet), 15 June 1974 (C. E. Griswold and R. Jackson), female (CB); *Gila Co.*, 6 miles SW of Whiteriver [Whiteriver is in *Navajo Co.*] (5300 feet), 2 August 1936 (H. H. Poor and F. G. Watson), male (AMNH); *Santa Cruz Co.*, San Rafael Valley, 2 miles E of Patagonia, 22 August 1971 (D. Richman), male (BC): NEW MEXICO; *San Miguel Co.*, Moctezuma Hot Springs, 13 August 1974 (V. Roth), female (AMNH).

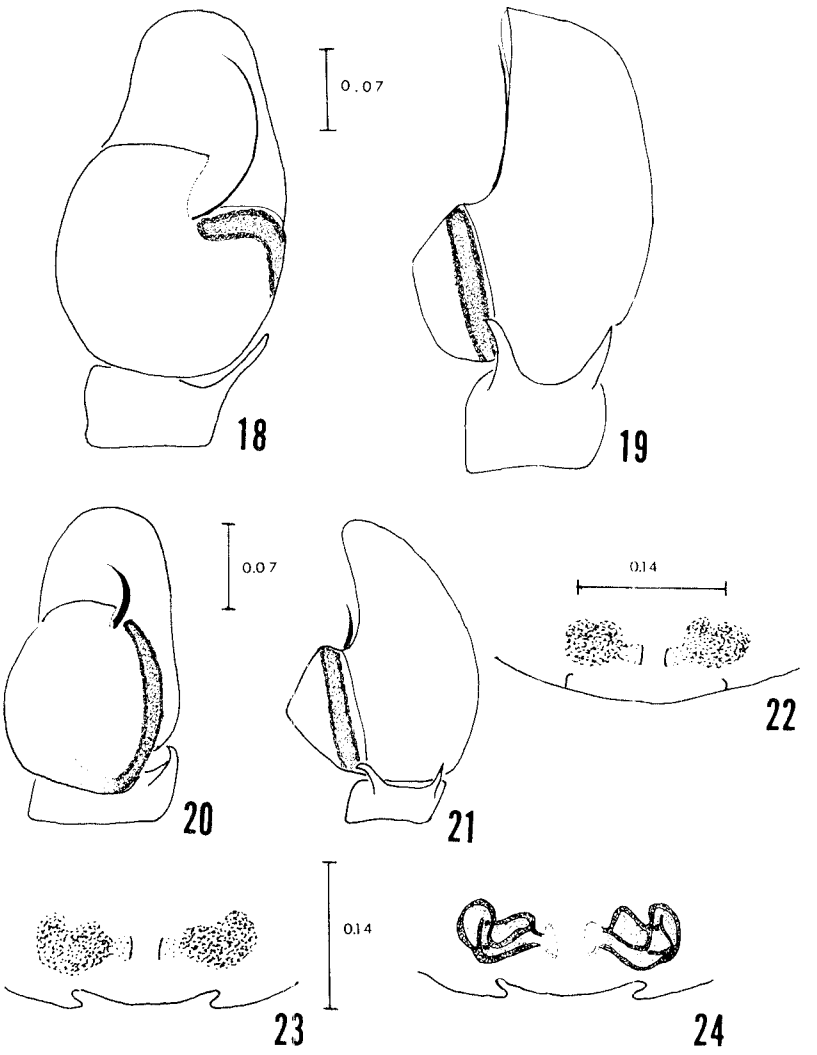
Synageles (Gertschia) noxiosus (Hentz)
Figs. 1, 7, 18-24; Map 3

Synemosyna noxiosa Hentz, 1850:288.

Synageles scorpiona [lapsus for *scorpionia*]: Peckham and Peckham 1889:95-96, pl. 6, fig. 72a, male only [not *Synemosyna scorpionia* Hentz, 1845].

Peckhamia scorpiona: Peckham and Peckham 1909:370-371, pl. 51, fig. 72, male only.

?*Peckhamia scorpionia*: Emerton 1909, pl. 12, figs. 6-6a [genitalia not illustrated].



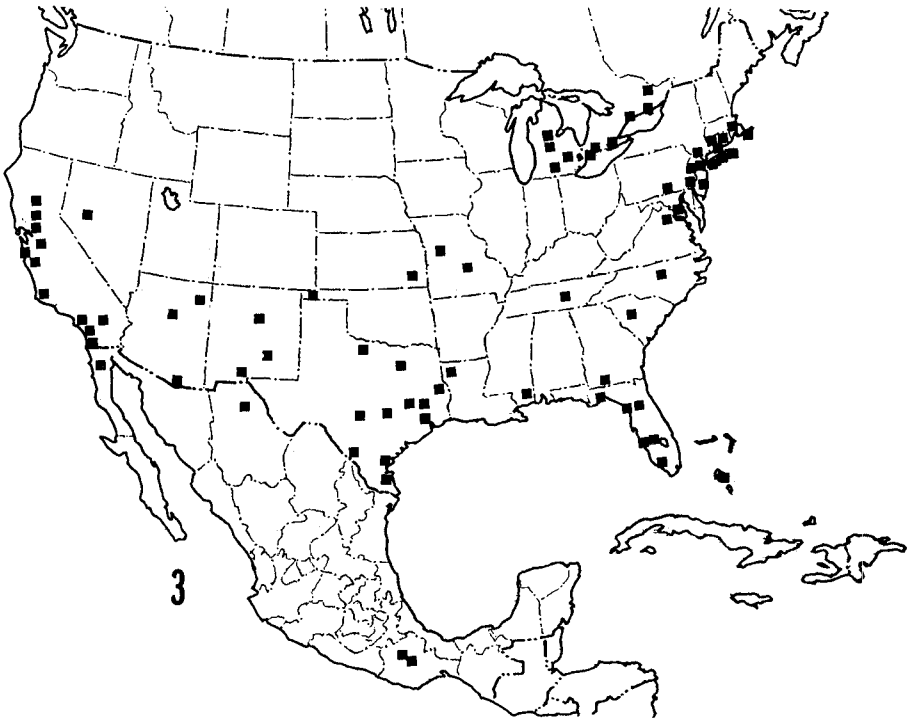
Figs. 18-24. *S. (G.) noxiosus*: 18-19, male palpus, Tennessee; 18, ventral; 19, retrolateral; 20-21, male palpus, Chihuahua; 20, ventral; 21, retrolateral; 22-24, female epigynum; 22, external, posterior notches absent, New York; 23, external, posterior notches present, Arizona; 24, internal. Scale in mm.

Gertschia noxiosa: Kaston 1945:16-18, figs. 74-76; Kaston 1948:450-451, pl. 88, figs. 1632-1633, pl. 89, figs. 1648-1649, pl. 144, fig. 2137.

Synageles noxiosa [lapsus for *noxiosus*]: Kaston 1978:248, 632-633, female; Richman and Cutler 1978:100.

Diagnosis.—Males have a bicuspid tibial apophysis, both cusps are subequal in length, and the length of the tibial apophysis is 40% or less (usually 33% or less) of the cymbium length. Females have a smooth posterior epigynal margin, or the margin has two small notches. Details of the epigynal tubes are further distinguishing characteristics.

Description.—*Male from CANADA:* ONTARIO; *York Co.*, Toronto, 6 June 1937, (ROM). Total length 2.8. Prosoma 1.18 long, 0.70 wide. Eye field 0.76 long, eye row I 0.57 wide, eye row III 0.56 wide, distance between row III eyes 0.44. Distance eye row II from eye row I 0.18, eye row II from eye row III 0.48.



Map 3.—Distribution of *S. (G.) noxiosus.*

Diameter AME 0.16, ALE 0.08, row II eye 0.03, row III eye 0.08. Femur length leg I 0.63, II 0.53, III 0.42, IV 0.63. Leg order 4123. Leg spination I metatarsus 1,1-1,1 tibia 1,1-1,0; II metatarsus 1,1-1,0 tibia 0,0-1,0. Single retromarginal cheliceral tooth. Opisthosoma 1.4 long, 0.6 wide. Color orange overall, markings typical for genus.

Distance between row III eyes in 35 males from U.S.A.: PENNSYLVANIA; Bucks Co., Horseshoe Bend, Neshaminy Creek, NE of Jamison (W. Ivie), (AMNH), mean 0.39, SD 0.02, range 0.37-0.43; in 55 males from other localities, mean 0.43, SD 0.05, range 0.32-0.58.

Female from U.S.A.: NEW YORK; *Bronx Co.*, Pelham Bay Park, 5 June 1963 (B. Cutler), (FSCA). Total length 2.4. Prosoma 1.17 long, 0.70 wide. Eye field 0.77 long, eye row I 0.63 wide, eye row III 0.63 wide, distance between row III eyes 0.53. Distance eye row II from eye row I 0.22, eye row II from eye row III 0.49. Diameter AME 0.24, ALE 0.10, row II eye 0.02, row III eye 0.10. Femur length leg I 0.49, II 0.53, III 0.42, IV 0.70. Leg order 4123. Leg spination I metatarsus 1,1-1,1 tibia 1,1-1,1; II metatarsus 1,1-0,0 tibia 1,1-0,0. Fissident bicuspid retromarginal cheliceral tooth. Opisthosoma 1.2 long, 0.6 wide. Color typical for genus.

Distance between row III eyes in 58 females from U.S.A.: PENNSYLVANIA; *Bucks Co.*, Horseshoe Bend, Neshaminy Creek, NE of Jamison (W. Ivie), (AMNH), mean 0.45, SD 0.03, range 0.40-0.55; in 37 females from other localities, mean 0.51, SD 0.06, range 0.40-0.62.

Discussion.—With the greatest range of any nearctic species, it is of little surprise that it is sympatric with other species in the genus. Its distribution overlaps that of the other two species in *Synageles (Gertschia)*, and also contacts

the range of *Synageles (Synageles) canadensis* and *S. (S.) occidentalis*. The extensive sympatry with *S. (G.) bishopi* is the most puzzling aspect of its distribution. It would be most instructive to determine the parameters of niche overlap in these two species. Unfortunately, the small size of these spiders with attendant difficulties in rearing and distinguishing immatures, means that our understanding of sympatry in this genus will remain unfulfilled. Certainly data from collecting labels do not indicate any habitat differences, and adults appear to mature at the same time in similar localities. Habitats based on label data are: coastal scrub; fence; on ravine bank; sphagnum bog; on wood on shore by marshy pond; elm bark; dead grass (D-Vac); oak woodland; on sandy soil in grassy area; galls on *Solidago*; mesophytic understory of chaparral; woodland climax chaparral; on *Oenothera* on sand dune; on *Baccharis* bushes; low bushes and shrubs; bushes and grasses on hillside; riparian vegetation; snakeweed; crucifers on mesquite dunes; mixed meadow, mostly forbs, little grass. Adults have been taken all months of the year, mostly in May and June.

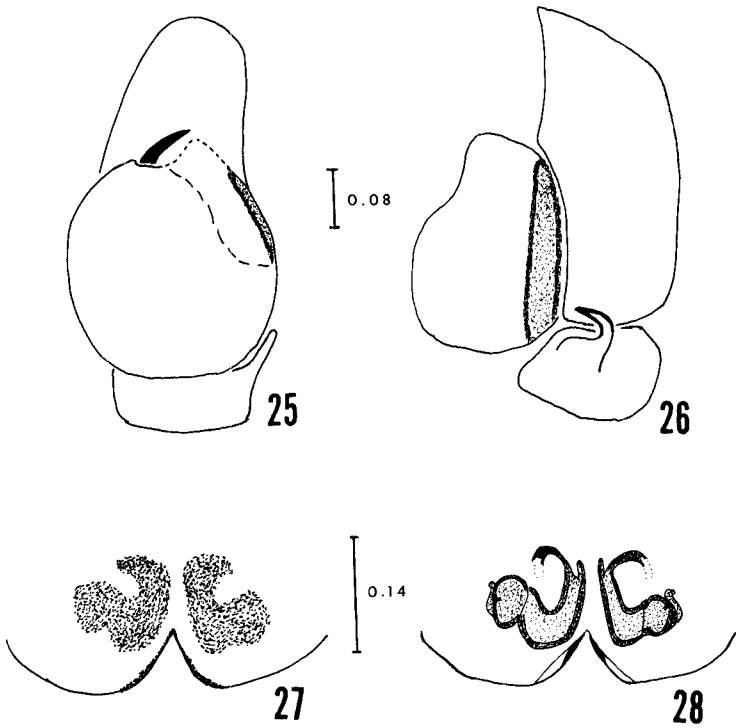
Hentz's type came from Alabama. The small antlike Nearctic salticids bearing Hentz's specific epithets *noxiosa* and *scorpionia* (and its variant *scorpiona*) have been thoroughly confused since the 1880's. It has been generally accepted since the 1940's (Chickering 1944; Kaston 1945) that *noxiosa* refers to this species, and *scorpionia* refers to a species of *Peckhamia*. Since the types of both are unavailable, and are almost certainly destroyed, it is unlikely that this opinion will be challanged.

Distribution. *Peripheral localities:* **BAHAMAS:** ANDROS ISLAND; Mangrove Cay, 26 April 1953 (E. Hayden), female (AMNH). **CANADA:** ONTARIO; Ottawa—Carleton Mun., E of Ottawa, Mer Bleue, 14 May to 9 June 1975 (C. D. Dondale and J. Redner), sphagnum bog, female (CNC). **MEXICO:** BAJA CALIFORNIA NORTE; Sierra San Pedro Martir, Melings Ranch (1800 feet), 24 May 1952 (W. S. Creighton), female (AMNH); OAXACA: Monte Albans Ruins, 96°47′ W 17°02′ N, 5 August 1983 (W. Maddison), beating small herbs and bushes near ground on hillside (83-141), female (MCZ). **U.S.A.:** CALIFORNIA; Lake Co., Clear Lake Highlands, 20 May 1959 (R. X. Schick), foothill woodland climax chaparral, female (AMNH).

Other localities: **CANADA:** ONTARIO; *Essex Co.*; Haldimond-Norfolk Mun.; *Kent Co.*; *Leeds Co.*, *Northumberland Co.*. **MEXICO:** CHIHUAHUA; 17.2 miles S of El Sueco, San Jose Barbicora; OAXACA; 39 km NW of Oaxaca. **U.S.A:** ARIZONA; *Apache Co.*; *Coconino Co.*; *Santa Cruz Co.*; CALIFORNIA; *Contra Costa Co.*; *Lake Co.*; *Los Angeles Co.*; *Monterey Co.*; *Napa Co.*; *Orange Co.*; *San Bernardino Co.*; *San Diego Co.*; *Santa Barbara Co.*; *Santa Clara Co.*; *Santa Cruz Co.*; CONNECTICUT; *Hartford Co.*; *Litchfield Co.*; *New Haven Co.*; *Tolland Co.*; DISTRICT OF COLOMBIA; FLORIDA; *Alachua Co.*; *Collier Co.*; *Dixie Co.*; *Hillsborough Co.*; *Polk Co.*; *Wakulla Co.*; GEORGIA; *Thomas Co.*; KANSAS; *Woodson Co.*; LOUISIANA; *Caddo Parish*; MASSACHUSETTS; *Barnstable Co.*; *Middlesex Co.*; *Suffolk Co.*; MICHIGAN; *Calhoun Co.*; *Gladwin Co.*; *Livingston Co.*; *Midland Co.*; MISSISSIPPI; *George Co.*; MISSOURI; *Johnson Co.*; *Phelps Co.*; NEVADA; *Churchill Co.*; NEW JERSEY; *Bergen Co.*; *Hunterdon Co.*; *Ocean Co.*; NEW MEXICO; *Dona Ana Co.*; *Lincoln Co.*; *Santa Fe Co.*; NEW YORK; *Nassau Co.*; *New York Co.*; *Queens Co.*; *Rockland Co.*; *Suffolk Co.*; NORTH CAROLINA; *Durham Co.*; OKLAHOMA; *Cimarron Co.*; PENNSYLVANIA; *Adams Co.*; SOUTH CAROLINA; *Lexington Co.*; TENNESSEE; *Warren Co.*; TEXAS; *Bastrop Co.*; *Brazos Co.*; *Dallas Co.*; *Harris Co.*; *Kerr Co.*; *Kleberg Co.*; *San Patricio Co.*; *Shelby Co.*; *Walker Co.*; *Wichita Co.*; *Zavala Co.*; VIRGINIA; *Falls Church Co.*

Synageles (Synageles), new subgenus

This subgenus consists of classic *Synageles* in the sense of European authors (Simon 1876; Thaler 1983).



Figs. 25-28.—*S. (S.) venator*: 25-26, male palpus; 25, ventral; 26, retrolateral; 27-28, female epigynum; 27, external; 28, internal. Scale in mm.

Diagnosis.—*Synageles (Synageles)* includes those species which in males have a combination of a non-bifurcate palpal tibial apophysis (Figs. 8, 26, 30, 38), or if bifurcate with an additional distal palpal tibial apophysis (Figs. 9, 40), and an embolus whose length to greatest width ratio is 6:1 or less. Females have a variety of epigynal structures, often with the openings directed laterally or posteriorly. If directed medially, the opening does not lead to short tubes extending laterally to the spermathecae (Figs. 28, 32, 36).

Type species.—*Synageles (Synageles) venator* (Lucas).

Included New World species.—*S. (S.) canadensis* n. sp., *S. (S.) idahoanus* (Gertsch), *S. (S.) leechi* n. sp., *S. (S.) occidentalis* n. sp..

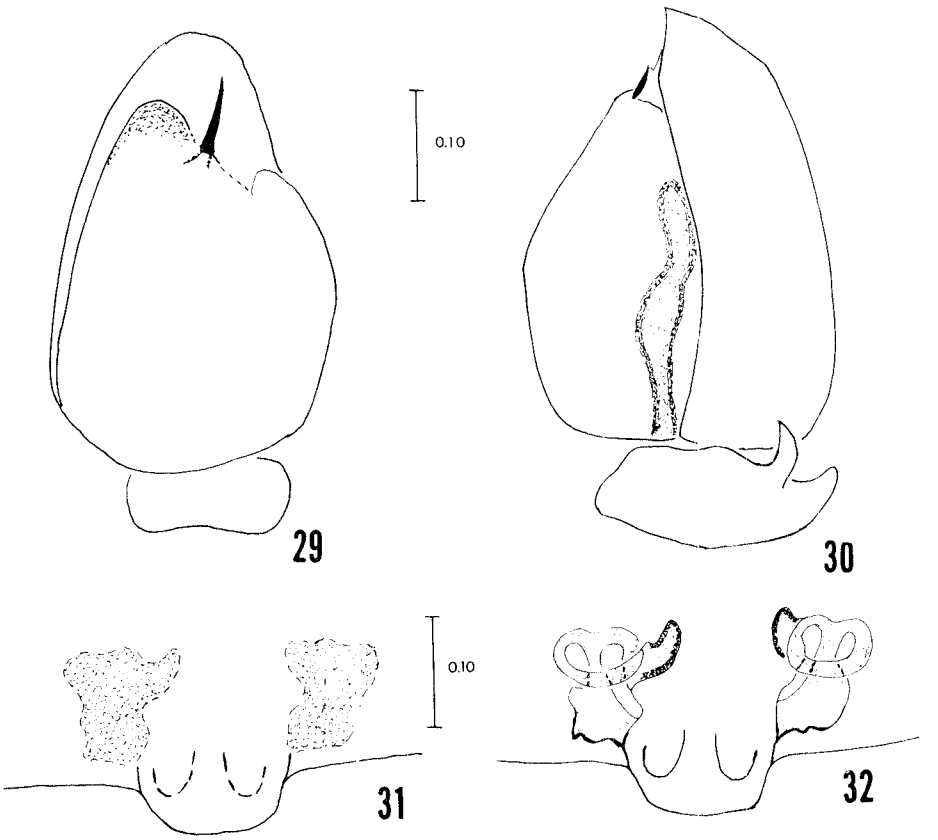
Geographic range.—Includes all of the Old World species known to the author, in the New World from British Columbia to Nova Scotia in Canada, south in the United States to Michigan, the northern prairie and plains states, the Rocky Mountain region, the Great Basin and to Riverside Co. in California.

I have refrained from assigning Old World species other than the type to the subgenus, as that should be left to the revisor of those species.

Synageles (Synageles) canadensis, new species
Figs. 29-32; Map 4

Etymology.—Named after Canada, the country of origin.

Diagnosis.—Males of this species may be distinguished from other members of the genus by the distally pointing embolus, and the configuration of the tibial

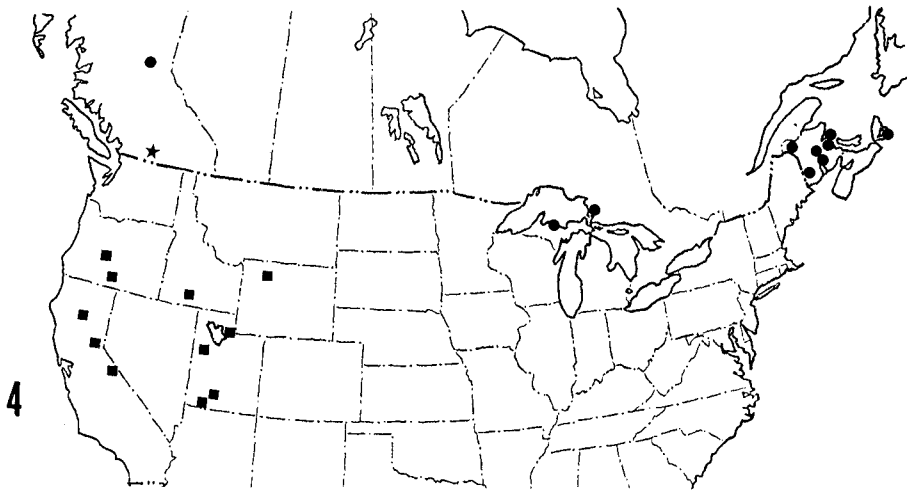


Figs. 29-32. *S. (S.) canadensis*: 29-30, male palpus; 29, ventral; 30, retrolateral; 31-32, female epigynum; 31, external; 32, internal. Scale in mm.

apophysis. Females have a distinct posteriorly projecting flap of the epigynum with two ovoid lunules, and have a unique configuration of the epigynal tubes. The male palpus of *S. (S.) canadensis* is most similar to that of the palearctic *S. dalmaticus* (Keyserling), but has a different tibial apophysis. The epigynum of female *S. (S.) canadensis* resembles that of the palearctic *S. hilarulus* (C. L. Koch), but there are differences in the details of the epigynal tubes, distance of the tubes to the epigastric furrow, and in the former species the posterior margin of the epigynum is a flap not a notch.

Description.—*Male holotype*: Total length 3.0. Prosoma 1.34 long, 0.78 wide. Eye field 0.84 long, eye row I 0.73 wide, eye row III 0.75 wide, distance between row III eyes 0.67. Distance eye row II from eye row I 0.22, eye row II from eye row III 0.32. Diameter AME 0.20, ALE 0.13, row II eye 0.03, row III eye 0.08. Femur length leg I 0.58, II 0.55, III 0.65, IV 0.97. Leg order 4312. Leg spination I metatarsus 1,1-1,1 tibia 0,1-0,1; II metatarsus 1,0-1,0 tibia 1,0-0,0. Single retromarginal cheliceral tooth. Opisthosoma 1.6 long, 0.7 wide. Color typical for genus.

Female paratype from CANADA: NEW BRUNSWICK; York Co., Fredricton, 20 August 1967 (T. Renault), fall webworm nest, (ROM). Total length 3.3. Prosoma 1.51 long, 1.06 wide. Eye field 0.85 long, eye row I 0.83, eye row III 0.90, distance between row III eyes 0.80. Distance eye row II from eye row I 0.26,



Map 4.—Distribution of *S. (S.) canadensis*—circle; *S. (S.) idahoanus*—square; *S. (S.) leechi*—star.

eye row II from eye row III 0.50. Diameter AME 0.28, ALE 0.13, row II eyes 0.03, row III eye 0.11. Femur length leg I 0.74, II 0.70, III 0.63, IV 0.98. Leg order 4231. Leg spination I metatarsus 1,1-1,1 tibia 1,1-1,1; II metatarsus 0,1-0,0 tibia 0,1-0,0. Single retromarginal cheliceral tooth. Opisthosoma 1.7 long, 1.1 wide. Color typical for genus.

Distance between row III eyes in 5 females, mean 0.75, range 0.60-0.80.

Discussion.—This species occurs across Canada in the boreal and boreo-nemoral forest. The few habitat records suggest that it is an arboreal species. Most records are from the Maritime provinces.

Distribution.—*Holotype locality:* **CANADA:** NEW BRUNSWICK; *Kent Co.*, Kouchibouguac National Park, 14 June 1977 (S. J. Miller), male (CNC).

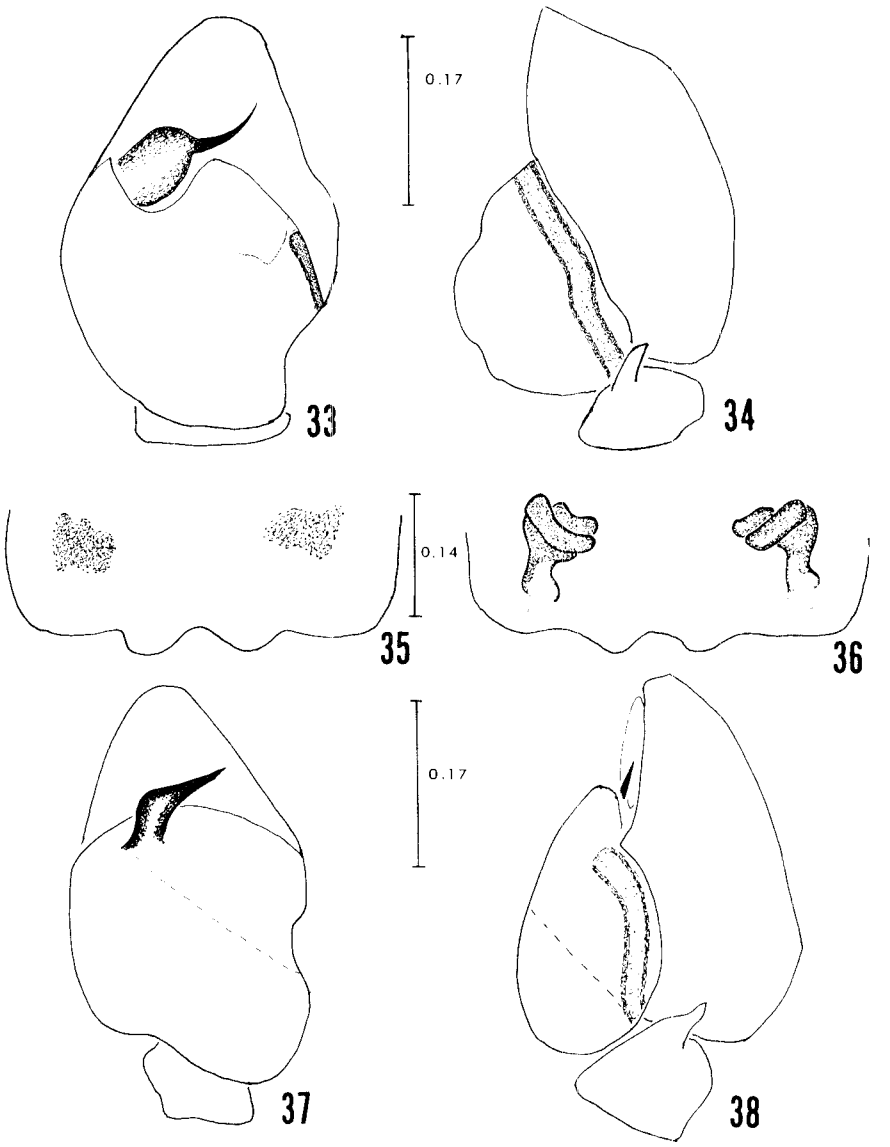
Paratype localities (all female): **CANADA:** BRITISH COLUMBIA; Prince George, 16 July 1954 (H. R. McCarthy, R. Leech) (RL): NEW BRUNSWICK; *Madawaska Co.*, Green River Field Station, 31 July 1962 (T. Renault), white spruce (TR); *Kings Co.*, Penobsquis, 4 July 1927 (C. A. Frost) (CNC): NOVA SCOTIA; *Cape Breton Co.*, North Sydney, July 1906 (E. B. Bryant): ONTARIO; *Algoma District*, Laird, 3 July 1931 (ROM).

Other localities: **CANADA:** NEW BRUNSWICK; *Kent Co.*, Point Escuminac (47 N, 64.50 W), 17 June 1979 (Wayne and David Maddison), sweeping bog vegetation between road and beach, 2 females (WM): **U.S.A.**: MICHIGAN; Marquette Co., Marquette, 11 June 1973 (W. Maddison), under paper on grass on top of slope to Lake Superior on E side of town, male (WM).

Synageles (Synageles) idahoanus (Gertsch)
Figs. 33-36; Map 4

Peckhamia idahoana Gertsch 1934:11-12, figs. 11-12.
Gertschia idahoana Kaston 1945:17.
Synageles idahoana [lapsus for *idahoanus*] Richman and Cutler 1978:100.

Diagnosis.—The swollen rounded base of the embolus of the male palpus distinguishes this species. *S. (S.) leechi* is similar, but the enlarged base of the embolus has a straight edge. The posterior edge of the epigynum has two shallow lobes, without any lunules. The male palpus of *S. (S.) idahoanus* does not closely resemble that of any of the European species. The female epigynum is similar to



Figs. 33-36. *S. (S.) idahoanus*: 33-34, male palpus; 33, ventral; 34, retrolateral; 35-36, female epigynum; 35, external; 36, internal. 37-38. *S. (S.) leechi*: male palpus; 37, ventral; 38, retrolateral. Scale in mm.

that of the palearctic *S. albovimaculatus gallicus* (Simon) and *S. hilarulus*, but the posterior margin of the epigynum in *S. (S.) idahoanus* has a different shape (as described above). There are also numerous differences in the details of the internal epigynal tubes.

Description.—*Male holotype*: Total length 3.0. Prosoma 1.43 long, 0.88 wide. Eye field 0.77 long, eye row I 0.70 wide, eye row III 0.77 wide, distance between row III eyes 0.65. Distance eye row II from eye row I 0.25, eye row II from eye row III 0.49. Diameter AME 0.21, ALE 0.11, row II eye 0.03, row III eye 0.11. Femur length leg I 0.59, II 0.63, III? IV 0.77. Leg order (leg III missing) 41=2.

Leg spination I metatarsus 1,1-1,1 tibia 1,1-0,0; II metatarsus 1,1-0,0 tibia none. Single retromarginal cheliceral tooth. Opisthosoma 1.5 long, 0.8 wide. Color typical for genus.

Distance between row III eyes in two males, 0.52 and 0.65.

Female from U.S.A.: UTAH; *Kane Co.*, Mt. Carmel, 26 June 1947 (Borys Malkin) (AMNH). Total length 3.1. Prosoma 1.39 long, 0.84 wide. Eye field length 0.80, eye row I 0.73 wide, eye row III 0.80 wide, distance between row III eyes 0.70. Distance eye row II from eye row I 0.24, eye row II from eye row III 0.45. Diameter AME 0.22, ALE 0.13, row II eye 0.03, row III eye 0.10. Femur length leg I 0.60, II 0.57, III 0.52, IV 0.76. Leg order 4123. Leg spination I metatarsus 1,1-1,1 tibia 1,1-1,1; II metatarsus 1,1-1,0 tibia 0,1-0,0. Single retromarginal tooth. Opisthosoma 1.6 long, 1.0 wide. Color typical for genus.

Distance between row III eyes in 10 females, mean 0.70, range 0.47-0.77.

Discussion.—The allotype is an immature specimen, probably a female.

Distribution.—*Holotype, allotype and male paratype locality:* **U.S.A.:** IDAHO; *Twin Falls Co.*, Hollister, 20 May 1931 (D. E. Fox) (AMNH).

Other localities: **U.S.A.:** CALIFORNIA; *Mono Co.*, 10 mi W of Bridgeport, Robinson Creek Campground (7000 feet), 10 July 1975 (C. Griswold), beating *Artemesia/Purshia*, female, 6 small spiderlings (CB); *Placer Co.*, 5 mi W of Emigrant Creek, 9 July 1952 (W. J. Gertsch), female (AMNH); *Tehama Co.*, Deer Creek, 6 July 1952 (W. J. Gertsch), female (AMNH), Mineral, 6 July 1952, female (AMNH): COLORADO—UTAH BORDER; N 41 W 108, 33 fh, female (AMNH): OREGON; *Deschutes Co.*, Redmond, 1 June 1939 (K. Gray and J. Schuh), female (AMNH); *Lake Co.*, Lakeview, 27 June 1951 (Borys Malkin), female (AMNH): UTAH; *Garfield Co.*, Bryce Canyon vicinity, 11 July 1952, female (AMNH); *Morgan Co.*, East Canyon, Wasatch Mountains, W 111.48 N 40.50, 14 June 1942 (W. Ivie), 2 females (AMNH); *Tooele Co.*, Government Creek, 12 June 1946 (Lowell Miller), female (AMNH): WYOMING; *Park Co.*, near Cody, Buffalo Bill State Park, May 1977 (W. Maddison), female (WM): WYOMING?; N 41.73, 33gg, 332, female (AMNH).

Synageles (Synageles) leechi, new species
Figs. 37, 38; Map 4

Etymology.—Named after the arachnologist and collector of the type specimen, Robin E. Leech.

Diagnosis.—In all respects very similar to *S. (S.) idahoanus*, but the base of the embolus is not rounded and has a straight edge. There is no indication that this portion of the embolus is broken, and both right and left palpi have the same form. The shape of the tibial apophysis of *S. (S.) leechi* is closest to that of *S. lepidus*, but the embolus resembles that of *S. (S.) idahoanus*.

Description.—*Male holotype*: Total length 2.6. Prosoma 1.18 long, 0.70 wide. Eye field 0.70 long, eye row I 0.59 wide, eye row III 0.63 wide, distance between row III eyes 0.52. Distance eye row II from eye row I 0.20, eye row II from eye row III 0.39. Diameter AME 0.18, ALE 0.10, row II eye 0.04, row III eye 0.10. Femur length leg I 0.59, II 0.52, III 0.45, IV 0.67. Leg order 4123. Leg spination I metatarsus 1,1-1,1 tibia 1,1-0,0; II meatatrsus 0,1-0,0 tibia none. Single retromarginal cheliceral tooth. Opisthosoma 1.4 long, 0.7 wide. Color typical for the genus.

Discussion.—*S. (S.) leechi* is very similar to *S. (S.) idahoanus*, and may be only a variant form of that species. However, since the few males of *S. (S.) idahoanus* known have essentially identical genitalia, and this specimen is readily distinghished from them, it is best to erect a new species based on it. Unlike in many other genera of salticids, there seems to be a general reluctance to name

new species in the New World *Synageles*, resulting in "overlumping", rather than "oversplitting".

Holotype locality. **CANADA:** BRITISH COLUMBIA; Oliver, 5 June 1959 (R. F. Leech) (CNC).

Synageles (Synageles) occidentalis, new species
Figs. 9, 39-46; Map 2

Etymology. An adjective from the Latin meaning western, referring to the distribution of this species in western North America.

Diagnosis. Males are the only New World species of *Synageles* with two distinctly separated tibial apophyses. The posterior margin of the epigynum has two shallow lobes overhanging the epigastric furrow as in *S. (S.) idahoanus*, but in addition there is a single medial notch which may be long and narrow, triangular, or shorter and squared off anteriorly. The male palpus overall resembles that of *S. dalmaticus*, but the shape of the tibial apophyses is different. The epigynum of female *S. (S.) occidentalis* is similar to the epigynum of *S. dalmaticus*, but has shorter epigynal tubes which are closer to the median, and to the posterior of the epigynum.

Description.—*Male holotype:* Total length 2.7. Prosoma 1.16 long, 0.70 wide. Eye field 0.60 long, eye row I 0.59 wide, eye row III 0.60 wide, distance between row III eyes 0.52. Distance eye row II from eye row I 0.20, eye row II from eye row III 0.36. Diameter AME 0.18, ALE 0.08, row II eye 0.03, row III eye 0.08. Femur length leg I 0.56, II 0.50, III 0.45, IV 0.69. Leg order 4123. Leg spination I metatarsus 1,1-1,1 tibia 0,0-0,1; II metatarsus 0,0-0,1 tibia none. Fissident bicuspid retromarginal cheliceral tooth. Opisthosoma 1.4 long, 0.7 wide. Color of prosoma dark orange, rest typical for genus.

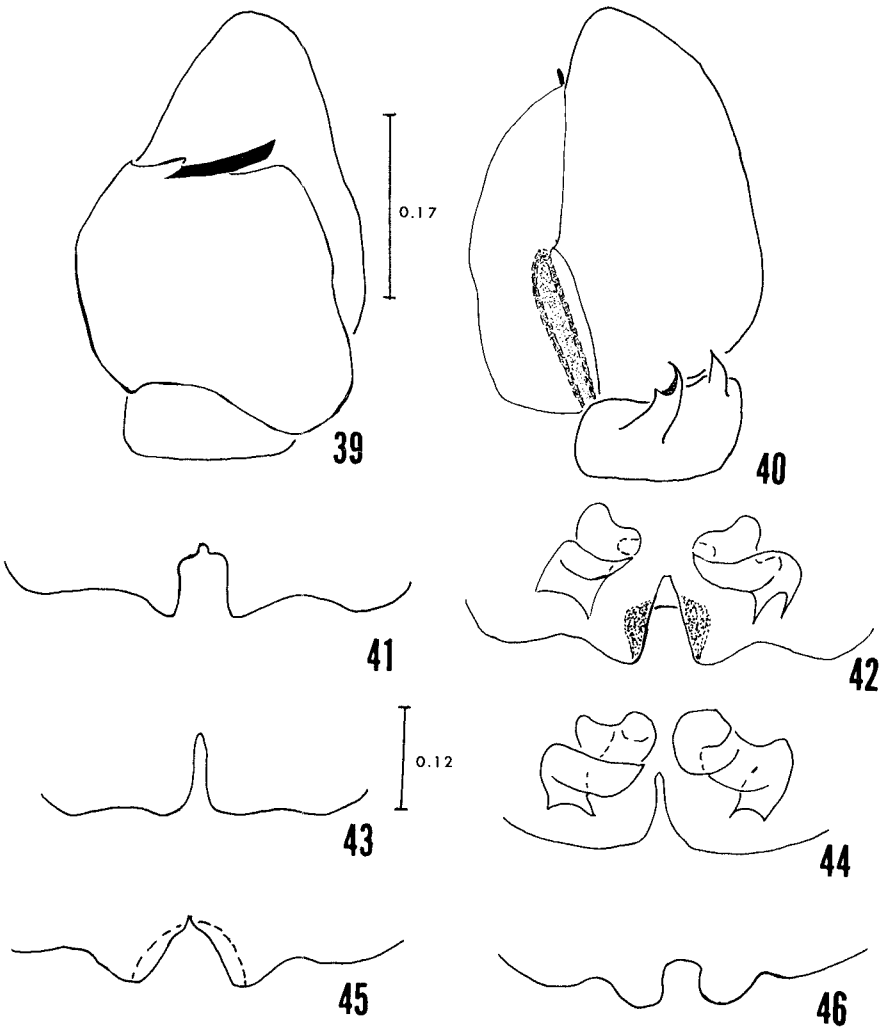
Distance between row III eyes in 21 males, mean 0.55, SD 0.04, range 0.47-0.58.

Female paratype from U.S.A.: MINNESOTA; *Ramsey Co.*, Lauderdale, Luther Seminary Grounds, 12 June 1966 (B. Cutler), sweeping *Solidago* (AMNH). Total length 3.1. Prosoma 1.37 long, 0.84 wide. Eye field 0.76 long, eye row I 0.67 wide, eye row III 0.71 wide, distance between row III eyes 0.63. Distance eye row II from eye row I 0.20, eye row II from eye row III 0.42. Diameter AME 0.24, ALE 0.10, row II eye 0.03, row III eye 0.08. Femur length leg I 0.70, II 0.63, III 0.56, IV 0.98. Leg order 4132. Leg spination I metatarsus 1,1-1,1 tibia 1,1-1,1; II metatarsus 1,1-0,0 tibia none. Single retromarginal cheliceral tooth. Opisthosoma 1.7 long, 1.1 wide. Color typical for genus.

Distance between row III eyes in 37 females, mean 0.58, SD 0.06, range 0.47-0.75.

Discussion.—This species has often been confused with *S. (G.) noxiosus* despite its very different genitalia. The ranges of both species meet in Michigan, and there may be additional areas of contact in the north central states. This species and *S. (S.) idahoanus* overlap in the intermontane western United States.

In Washington Co., Minnesota, *S. (S.) occidentalis* is associated with the following species of ants of similar size, on forbs: *Crematogaster lineolata* (Say), *Lasius alienus* Emery, *Prenolepis imparis* (Say) and *Tapinoma sessile* Say. In Minnesota the most consistent ant associate is some species of *Lasius*. Most records are from grassland habitats, often associated with grassland forbs.



Figs. 39-46.—*S. (S.) occidentalis*: 39-40, male palpus; 39, ventral; 40, retrolateral; 41-46, female epigynum; 41-42, Minnesota; 41, external; 42, internal; 43-44, Utah; 43, external; 44, internal; 45, Idaho, external; 46, California, external. Scale in mm.

Specific habitats recorded are: herbs, sage and shrubs at base of cliff, sand prairie, oak savanna, mixed meadow, *Solidago* stand, *Juncus* swale, swale in dunes area, coastal oak woodland, oak meadow, dry mesic prairie, *Bromus inermis*, and in year old seed pods of *Penstemon grandiflorus*. In Fillmore Co., Minnesota I have taken this species in year-old galls of *Eurosta solidaginis* (Fitch) that were opened by woodpeckers during the previous winter. The spiders constructed retreats in these galls. Both Judd (1964) and Miller (1966) reported *S. (G.) noxiosus* using stem galls originally made by moths on *Solidago* in the same manner. I have not seen the specimens involved, but based on the localities involved (Ontario and Ohio respectively), the determinations were probably correct. Adults have been collected in all months of the year except January and December; most records are from May through July.

Distribution. -*Holotype locality:* **U.S.A.:** NORTH DAKOTA; *McKenzie Co.*, North Unit Theodore Roosevelt Memorial Park, 26 June 1965 (R. J. Sauer), beating willow along Little Missouri River (AMNH).

Paratype localities: **U.S.A.:** CALIFORNIA; *Alameda Co.*, Berkeley, hills back of campus, 7 May 1973 (W. M. Middlekauf), female (CB); *San Francisco Co.*, San Francisco, Forest Hill, 27 May 1934, female (CAS); *San Mateo Co.*, near Crystal Springs Reservoir, 21 March 1976 (C. E. Griswold), tall grass near road, male (CB); COLORADO; *Boulder Co.*, Boulder, Flagstaff Canyon (5800 feet), (J. R. Stainer), female (CNC); IDAHO; *Payette Co.*, Payette (north side of town), 20 June 1953 (W. Ivie), female (AMNH); *Washington Co.*, 6 mi W of Weiser, W 117° 04′ N 44° 15′, 3 May 1962 (W. Ivie), males, females (AMNH); ILLINOIS; *Cook Co.*, Chicago, Palos Park, 11 May 1911 (A. B. Walcott), female (FMN); MINNESOTA; *Ramsey Co.*, Lauderdale, Luther Seminary Grounds, May and June 1966 and 1967, sweeping various meadow habitats, males, females (AMNH, BC, MCZ, UMN); SOUTH DAKOTA; *Jackson Co.*, Badlands National Monument, U.S. Highway 12, 28 June 1966 (L. Pinter), female (MCZ); UTAH; *Lake Co.*, Lake City, Jordan River at 11th South Street, W 111° 54′ N40°44′, 4 May 1946 (W. Ivie), female (AMNH); *San Juan Co.*, Bluff, 5 September 1937 (G. F. Knowlton), female (AMNH); WISCONSIN; *Walworth Co.*, Sugar Creek Township, 18 July 1938 (D. C. Lowrie), sweeping from auto, 2 females (FMN).

Other localities: **CANADA:** BRITISH COLUMBIA; Christiana (118.14W 49.01N), 25 July 1980 (W. Maddison), sweeping herbs along railroad, female (WM); MANITOBA; Telford, W95°23′ N49°51′, 10 June 1964, female (CNC); **U.S.A.:** ARIZONA; No locality; CALIFORNIA; *Contra Costa Co.; Mendocino Co.; Monterey Co.; Riverside Co.; San Diego Co.; Santa Cruz Co.*; COLORADO; *Lincoln Co.*; MICHIGAN; *Kalamazoo Co.*; MINNESOTA; *Anoka Co.; Fillmore Co.; Hennepin Co.; Lac Qui Parle Co.; Le Sueur Co.; Renville Co.; Sherburne Co.; Wabasha Co.; Washington Co.; Winona Co.*; NEBRASKA; *Dawson Co.; Lancaster Co.*; NEVADA; Esmeralda Co.; OREGON; *Deschutes Co.; Lake Co.; Yamhill Co.*; UTAH; *Grand Co.*; WASHINGTON; *Kittitas Co.*; WISCONSIN; *Dane Co.*

UNPUBLISHED SPECIES NAMES

In my unpublished thesis of 1970, a number of names were created which have no taxonomic status. However, for the sake of completeness, the following list gives the current taxonomic placement of specimens under the thesis names:

This Paper		Thesis Names
S. (G.) bishopi	=	bishopi
S. (G.) mexicanus	=	mexicana
S. (G.) noxiosus	=	canadense males, chaparralicola, creightoni, noxiosa, orarius males, perminima
S. (S.) canadensis	=	canadense females
S. (S.) idahoanus	=	idahoana, ivei, oregonensis
S. (S.) occidentalis	=	araecharactae, colubra, dakota, orarius females

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Acronyms for collections cited in text are:

CB = University of California, Berkeley
BC = Bruce Cutler
CNC = Canadian National Collections
AMNH = The American Museum of Natural History
RL = Robin Leech
BM = Bennet Moulder
ROM = Royal Ontario Museum
UMN = University of Minnesota, Department of Entomology
WM = Wayne Maddison
TR = Thaddee Renault

CAS = California Academy of Sciences
MCZ = Museum of Comparative Zoology, Harvard University

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LITERATURE CITED

Abraham, B. J. 1983. Spatial and temporal patterns in a sagebrush steppe community (Arachnida, Araneae). J. Arachnol., 11:31-50.

Bohdanowicz, A. 1978. Ergebnisse der Butan -Expedition 1972 des Naturhistorischen Museums in Basel. Araneae: Fam. Salticidae Genus *Synagelides*. Entomol. Basiliensia, 3:21-30.

Bohdanowicz, A. 1979. Descriptions of new spiders of the genus *Synagelides* (Araneae: Salticidae) from Japan and Nepal., Acta Arachnol. 28:53-62.

Bohdanowicz, A. and S. Heciak. 1980. Redescription of two species of Salticidae (Araneae) from China. Ann. Zool., (Warsaw) 35(18):1-10.

Brignoli, P. M. 1984. Some remarks on myrmecomorph spiders. Newsletter British Arachnol. Soc., 41:3-4.

Bristowe, W. S. 1958. The World of Spiders. Collins, London. 304 pp.

Chickering, A. M. 1944. The Salticidae (Jumping Spiders) of Michigan. Papers Michigan Acad. Sci. for 1943, 29:139-222.

Crane, J. 1949. Comparative biology of salticid spiders at Rancho Grande, Venezuela. Part IV. An analysis of display. Zoologica (New York), 34:159-214, 1 pl.

Cutler, B. 1970. A taxonomic revision of the genus *Consingis* Simon, 1900 (Salticidae, Araneae). Unpubl. doctoral thesis, Univ. Minnesota. 214 pp.

Cutler, B. 1981a. On a collection of antlike jumping spiders from Bolivia (Araneae: Salticidae). Stud. Neotropical Fauna and Environment, 16:51-55.

Cutler, B. 1981b. A revision of the spider genus *Paradamoetas* (Araneae, Salticidae). Bull. Amer. Mus. Nat. Hist., 170:207-215.

Cutler, B. 1982. Description of a new species of *Paradamoetas* (Araneae: Salticidae), with a revised key to the genus. The Great Lakes Entomol., 15:219-222.

Cutler, B. 1985. Taxonomic notes on neotropical species in the genus *Synemosyna* (Araneae: Salticidae). Stud. Neotropical Fauna und Environment, 20:83-91.

Emerton, J. H. 1909. Supplement to the New England spiders. Trans. Connecticut Acad. Arts and Sci., 14:171-236.

Engelhardt, W. 1970. Gestalt und Lebensweise der "Ameisenspinne" *Synageles venator* (Lucas) zugleich ein Beitrag zur Ameisenmimikryforschung. Zool. Anzeiger, 185:317-334.

Galiano, M. E. 1965. Salticidae (Araneae) Formiciformes IV. Revision del genero *Sarinda* Peckham, 1892. Rev. Mus. Argentino Ciencias Nat. "Bernardino Rivadavia", Entomologia, 1:267-311.

Galiano, M. E. 1966. Salticidae (Araneae) Formiciformes V. Revision del genero *Synemosyna* Hentz, 1846. Rev. Mus. Argentino Ciencias Nat. "Bernardino Rivadavia", Entomologia, 1:339-380.

Galiano, M. E. 1967. Salticidae (Araneae) Formiciformes VI. Nuevas descripciones. Physis (Buenos Aires), 27:27-39.

Galiano, M. E. 1969a. Salticidae (Araneae) Formiciformes. VII. El genero *Myrmarachne* MacLeay, 1839, en America. Rev. Mus. Argentino Ciencias Nat. "Bernardino Rivadavia", Entomologia, 3:107-148.

Galiano, M. E. 1969b. Salticidae (Araneae) Formiciformes. IX. Adicion a las revisiones de los generos *Martella* y *Sarinda*. Physis (Buenos Aires), 28:247-255.

Galiano, M. E. 1974. Salticidae (Araneae) Formiciformes. XIV. Descripcion de dos neuvas especies del genero *Myrmarachne* MacLeay, 1839. Physis C (Buenos Aires), 33:221-230.

Galiano, M. E. 1975. Nota sobre los pelos escamosos de Salticidae (Araneae). Physis C (Buenos Aires), 34:215-217.

Gertsch, W. J. 1934. Further notes on American spiders. Amer. Mus. Novitates, 726, 26 pp.

Hentz, N. M. 1850. Descriptions and figures of the Araneides of the United States. Part VII. J. Boston Soc. Nat. Hist., 6:271-295.

Hill, D. E. 1979. The scales of salticid spiders. Zool. J. Linnean Soc., 65:193-218.

Holm, A. 1973. On the spiders collected during the Swedish expeditions to Novaya Zemlya and Yenisey in 1875 and 1876. Zool. Scripta, 2:71-110.

Jackson, J. F. and B. A. Drummond III. 1974. A Batesian ant-mimicry complex from the Mountain Pine Ridge of British Honduras, with an example of transformational mimicry. Amer. Midland Nat., 91:248-251.

Judd, W. W. 1964. Insects and spiders from goldenrod galls of *Gnorismoschema gallaesolidaginis* Riley (Gelechiidae). Canadian Entomol., 96:987-990.

Kaston, B. J. 1945. New spiders in the group Dionychia with notes on other species. Amer. Mus. Novitates, 1290, 25 pp.

Kaston, B. J. 1948. Spiders of Connecticut. Connecticut Geol. Nat. Hist. Surv. Bull. 70, 874 pp.

Kaston, B. J. 1978. How to Know the Spiders, 3rd ed. Wm. C. Brown Co., Dubuque, Iowa. 272 pp.

Kaston, B. J. 1981. Spiders of Connecticut, revised ed. Connecticut Geol. Nat. Hist. Surv. Bull. 70, 1020 pp.

Koch, C. L. 1837. Uebersicht des Arachnidensystems. Heft 1. Nürnberg 1837, 39 pp., 6 pl.

Lucas, H. 1836. Description de l'*Attus venator*. Mag. Zool. Guerin, 6 (VIII):1-4, pl. xv.

Miller, W. E. 1966. Spiders in old insect galls on goldenrod. Ohio J. Sci., 66:618-619.

Peckham, E. G. 1889. Protective resemblances in spiders. Occ. Papers Wisconsin Nat. Hist. Soc., 1:61-113, pl. 3 and 4.

Peckham, G. W. and E. G. Peckham. 1889. Attidae of North America. Trans. Wisconsin Acad. Sci., 7:1-104.

Peckham, G. W. and E. G. Peckham. 1892. Antlike spiders of the family Attidae. Occ. Papers Wisconsin Nat. Hist. Soc., 2:3-83, 7 pl.

Peckham, G. W. and E. G. Peckham. 1909. Revision of the Attidae of North America. Trans. Wisc. Acad. Sci., 16:355-646, pl. xxix-li.

Proszynski, J. 1976. Studium systematyczno—zoogeograficzne nad rodzina Salticidae (Aranei). Regionow Palearktycznego i Nearktycznego. Wyzsza Szkola Pedagogiczna w Siedlcach (Siedlce, Poland) Rozprawy, 6, 260 pp.

Proszynski, J. 1979. Systematic studies on East Palearctic Salticidae. III. Remarks on Salticidae of the USSR. Ann. Zool. (Warsaw), 34(11):299-364.

Reiskind, J. 1977. Ant-mimicry in Panamanian clubionid and salticid spiders (Araneae: Clubionidae, Salticidae). Biotropica, 9:1-8.

Richman, D. B. 1982. Epigamic display in jumping spiders (Araneae: Salticidae) and its use in systematics. J. Arachnol., 10:47-67.

Richman, D. B. and B. Cutler. 1978. A list of the jumping spiders (Araneae: Salticidae) of the United States and Canada. Peckhamia, 1:82-109.

Simon, E. 1876. Arachnides de France v. 3. Paris, 360 pp., pl. viii-xi.

Simon, E. 1900. Description d'Arachnides nouveaux de la famille des Attidae. Ann. Soc. Entomol. Belgique, 44:381-407.

Simon, E. 1901. Histoire Naturelle des Araignees, 2(3):381-668, Paris.

Thaler, K. 1983. *Salticus unciger* (Simon) und *Synageles lepidus* Kulczynski, zwei für die Schweiz neue Springspinnen (Arachnida: Araneae, Salticidae). Bull. Soc. Entomol. Suisse, 56:295-301.

Wanless, F. R. 1978a. A revision of the spider genera *Belippo* and *Myrmarachne* (Araneae: Salticidae) in the Ethiopian region. Bull. British Mus. (Nat. Hist.), Zool. Ser., 33:1-139.

Wanless, F. R. 1978b. A revision of the spider genus *Sobasina* (Araneae: Salticidae). Bull. British Mus. (Nat. Hist.), Zool. Ser., 33:231-296.

Wanless, F. R. 1978c. A revision of the spider genus *Portia* (Araneae: Salticidae). Bull. British Mus. (Nat. Hist.), Zool. Ser., 34:83-124.

Wickler, W. 1968. Mimicry in Plants and Animals, R. D. Martin transl. McGraw-Hill Book Co., New York. 255 pp.

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