

## SMALL ORB-WEAVERS OF THE GENUS *ARANEUS* NORTH OF MEXICO (ARANEAE: ARANEIDAE)

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**ABSTRACT.** The small species of *Araneus* include the genera and subgenera *Amamrotypus*, *Cambridgepeira*, *Conaranaea*, *Mimaranea* and *Conepeira* of Archer. There are altogether 31 species north of Mexico. Many of the species are rare in collections, presumably because they are forest species that make their webs in tree-crowns. Most larger collections come from mud dauber wasp nests. The distribution of the small species in general is eastern and southern North America, in contrast to the northern distribution of the larger species. Many species, as in theridiids, show a cline with the largest specimens in the North, the smallest in Florida. A correction is made to the previous study on the genus *Neoscona* and additional information presented on several large species of *Araneus*.

While meadows, "old field communities," shrubs, herbaceous layers of forests, and leaf litter have been well collected in many parts of North America, the spider fauna of the forest canopy remains largely unknown. Foliage of forest tree-crowns probably is the habitat of numerous small species of *Araneus*. Despite the possible economic importance of predators high up in trees, the scant knowledge we have of this habitat appears mostly in the European literature. This probably explains why the number of specimens available for this revision has been small.

I gratefully acknowledge the cooperation of my colleagues in entomology, Howard E. Evans and Robert W. Matthews, whose helpful wasps did most of the collecting, presumably high up, and delivered the spiders to the nest traps from which they were conveniently harvested. Without their

assistance, insufficient material would have been available to sort out the species. Other collections were made available by J. Beatty, D. Bixler, W. J. Gertsch, J. A. L. Cooke and V. D. Roth of the American Museum of Natural History (AMNH\*), Cornell University, and Utah University collections. J. E. Carico, R. E. Crabill of the U.S. National Museum, C. Dondale of the Canadian National Collections, Ottawa, R. Leech, B. J. Kaston, K. V. Krombein, F. E. Kurczewski, P. Miliotis, W. Wayne Moss of the Academy of Natural Sciences, Philadelphia, W. Peck of the Exline-Peck collection, Miss Susan Riechert, W. A. Shear, J. A. Sheals, D. Clark and F. R. Wanless of the British Museum (Natural History), Karl Stone, B. Vogel, H. K. Wallace (HKW) and H. W. Weems of the Florida State Collection of Arthropods (FSC). Next to the American Museum, the Museum of Comparative Zoology (MCZ) has the largest collections of these small *Araneus* species. Peter van Helsing and W. Shear contributed ideas throughout; E. Mayr advised on complicated nomenclatural matters. Also, I would like to thank Ann Moreton for living specimens and photographs. This investigation was supported in part by Public Health Service Research Grant AI-01944 and by a grant from the National Science Foundation GB-36161.

\* For rare species I have given the initials of the collection in the text.

## INTRODUCTION

Unlike most groups of spiders, this group of *Araneus* has been previously revised. Archer's work (1951b) is unsatisfactory at present, as mine may be 20 years hence. I cannot agree with Archer's establishment of numerous genera (further discussion below) and with his delimitation of species. Many of his generic names are unnecessary and obscure the relationship of the included species. I have found this group of spiders extremely difficult to study; it took me a year to figure out the species. Neither the descriptions nor the illustrations of Archer give useful diagnostic characters. But Archer was handicapped by having few specimens to work with; only 25 years ago types were not readily available, and museum curators thought it more important to protect these name-bearing specimens than to make them available for study. Archer assumed that collections he borrowed were correctly identified, and that the specimens in each vial belonged to a single species. On the contrary, most specimens of the difficult *A. juniperi* subgroup were collected by wasps, which do not differentiate the species. Also, Archer seemed unaware that many old localities of Marx were in error. Perhaps Archer's most serious mistake was his use of only one character to differentiate species, the median apophysis of the palpus (Figs. 440-474) and the outline of the epigynum. One-character taxonomy is not the best way to study animals, and as it turns out, the median apophysis alone is a poor character for separating males of different species (Levi, 1971), as is the outline of the epigynum for separating females. As second revisor, I have learned much from the mistakes of my predecessor, just as my successors will learn much from mine.

*The size of genera.* If I were to follow Archer and split this group of *Araneus* I would end up having to place each of the relatively few tropical American *Araneus* in its own genus. Although there are not many *Araneus* species in the American tropics,

they are quite distinct. Unnecessarily splitting genera just leads to further splitting, as new species found do not fit into the previously established genera. This eventually leads to having almost each species in its own genus. As most araneologists are aware, the large number of genera in the families Salticidae and Linyphiidae has not only impeded their study, but also has made it difficult for museum curators to file incoming collections and make specimens available. Worse, particularly in the Linyphiidae, the large number of genera has led to a most undesirable instability of names. The species, especially of Europe, are constantly being shifted from one genus to another. Instability and proliferation of names results in a nomenclature incomprehensible to anyone other than the specialist. Of course in small spiders, such as Linyphiidae, there is much greater diversity and many more species than in larger spiders (see below). When differentiating species one looks for consistent differences. It is thus easier to see differences than to see the similarities that are the basis for definition of a genus. If there is a choice, a large, monophyletic genus, though unwieldy, is preferable. The splitting of monophyletic groups into smaller and smaller units does not add to knowledge. While it is easy to make new generic names, synonymizing excess names (whose types are often unknown species) is one of the most difficult tasks for the taxonomist.

*Diversity and size of spiders.* It appears to be a general rule in spiders that the smaller the physical size, the larger the number of species within a group. Thus, in theridiids, the large-bodied genera *Steatoda* and *Latrodectus* have relatively fewer species in a given area than the small-bodied *Theridion* or still smaller *Thymoites* in the American tropics. The numerous generic name synonyms for *Thymoites* indicates, perhaps, a greater degree of diversity. Similarly, larger Linyphiidae have fewer species than the smaller Linyphiidae (Erigoninae). The majority of generic names in the Linyphiidae refer to the more diverse

small species. Again, in *Araneus* in North America, there are only about 20 species in the well-known, large-sized *diadematus* group, but over 30 poorly known small species.

The reason for the greater speciation and diversity in smaller spiders is not known. The ranges of small-sized spiders do not seem smaller than the ranges of large ones. But perhaps the distributions of small species are less continuous, permitting geographic speciation, and perhaps there is less gene exchange among populations. One might expect that small species balloon more effectively, but little is known of ballooning. Recent Dutch studies on two related species of *Pardosa* indicate that the young of the species with a specialized habitat balloon, the young of the species with a more generalized habitat do not (Richter, 1970). Unfortunately, we know little that is accurate of the geographic distribution of these *Pardosa* species. As in the well-studied Dutch *Pardosa* species there is reason to believe that many of the small *Araneus* are specialized in their habitats [e.g., *Araneus gadus* on pitch pine (*Pinus rigida*) in the Northeast].

European relatives of small-sized American species tend to be larger than their American relatives. I was made aware of this by P. van Helsdingen, who is studying the linyphiid spiders. The two European species *Araneus sturmi* and *A. triguttatus* are larger in size than their many American relatives. This size difference probably does not hold for the large-sized species. In North America there is often a cline in size, the largest individuals of a species in the North, the smallest in Florida, West Indies and Texas. This is true of the small species of *Araneus* as well as of many theridiid species. The reason for this and for the comparatively larger size of European relatives might be the competition of larger-sized species belonging to tropical genera that find it easier to spread north in the Americas but that might be blocked in Europe by the deserts of North Africa and the Mediterranean.

*Names.* Names of animals, including spiders, are not provided in order to be changed, anymore than are the names of chemicals, geological strata, or minerals. The object of the Code of Nomenclature (1961) is to "promote stability and universality in the scientific names of animals and to ensure that each name is unique and distinct. All its provisions are subservient to these ends. . . ." Unfortunately, some taxonomists take articles from the Code out of context, to rationalize their changing names, digging up older names, or finding better spellings. Such activities generally have an inverse correlation with the amount of research that has been done. Changes in names should only be made when biologically necessary, or when an older name is discovered for a recently established (or little-used name), and in cases of synonymy or homonymy.

Among the most complex nomenclatural problems is the treatment of homonyms of specific names, identical names applied to two species. I have been inconsistent from the point of nomenclatural rules in the discarding of junior homonyms of specific names (which are at present in different genera). However, I have been consistent from the point of view of spider names, making the least possible number of changes of names in use.

Among the working tools handed down through successive spider workers at the Museum of Comparative Zoology, there was included a list of about 30 common Latin adjectives to be used as new species names. Unfortunately, the use of common Latin adjectives in large families and in large genera such as *Araneus* results in name changes, when, in revision, the names are found to be homonyms. It is better to avoid trite Latin adjectives and use instead arbitrary combinations of letters, the names of American Indian tribes as nouns in apposition, or place names, even though they might be difficult to pronounce by Chinese or Greek colleagues. Also, I personally object to naming a new species after a living colleague (unless he collected the spec-



imen, or his homonym needs renaming), as it would ask for a return of such a "favor."

Abbot, in the latter part of the 18th century, made colored illustrations of Georgia spiders. He indicated that many of his *Araneus* specimens were harvested from wasp nests. In the 1830's, Walckenaer gave names to the illustrations of Abbot's manuscript. In the 19th century, on rediscovering the Abbot manuscript, McCook used those Walckenaer names that he could identify with the illustrations (Chamberlin and Ivie, 1944; Levi and Levi, 1961). Since these species have no other names (except some very recent ones by Archer) and can readily be recognized by color pattern of specimens freshly collected by wasps, it would be capricious to ignore these Walckenaer names of Abbot illustrations.

However, Chamberlin and Ivie (1944) took a black-and-white film of these Abbot illustrations, which are kept in the British Museum (Natural History), and on the basis of subjective interpretation, substituted many of these Walckenaer names in place of the accepted Hentz names that had been in use for common spiders for almost 100 years. The procedure is generally unacceptable and is not permitted by the present Code of Nomenclature. Chamberlin's film, to judge by his 1944 reproductions, was of poor quality (perhaps high contrast film) and numerous obvious errors were made (Levi and Levi, 1961), including substituting Walckenaer 1841 names for older names in use at the time [e.g., for *Peucetia viridans* (Hentz, 1832)]. Kodachrome and xerox copies of Abbot's pictures and accompanying notes are now available at the Museum of Comparative Zoology.

Chamberlin and Ivie's (1944) interpretation of Walckenaerian names and descriptions and Abbot's illustrations for the small species of *Araneus* are erroneous, despite the fact that the pattern on the abdomen in this group may be diagnostic. The Chamberlin collection, now kept in the American Museum of Natural History, was available

to me. Some published names in this paper were applied to juvenile specimens collected by W. Ivie (*Epeira juniperi*, *E. guttulata*) which I cannot place. Archer examined only one of these Georgia specimens in the Chamberlin collection, marked by Ivie *guttulata*, and left a note in the vial correctly indicating that this cannot be the correct name.

*Methods.* All drawings in this paper were made with an American Optical dissecting microscope, Greenough type, or a comparable Greenough-type Leitz microscope. A reticle in the eyepiece is divided, 20 by 20, into 400 squares. The drawings are made on tracing paper with a grid of squares underneath to match the grid of the reticle. The drawings are then traced on sculptured Coquille paper, drawn with Rapidograph pens and lithographic pencils nos. 3, 4, and 5, and touched up with opaque white paint. For drawing, the specimens are completely submerged in a dish of alcohol, the bottom of which has a layer of paraffin with various sized depressions and holes. Usually black paraffin is preferable; a white background causes reflections that make structures hard to see. However, to see some black peripheral structures, a white background may be useful. I have found it unsatisfactory to keep structures in place with petroleum jelly (Vaseline) as it is difficult to clean off. Placing the structure in sand may also cause disturbing reflections not present with a dark background. Lighting is provided by several microscope lights used together (American Optical Model 651), and a fiberglass light. Left palpi and sometimes epigyna have to be cut off for study. These are stored with the spider in a separate, tiny, cotton-plugged vial. If necessary, the palpi and the epigyna are cleaned with ultrasonic cleaner, an E/MC Corp. Model LP2 (Shear and Levi, 1970). Placing the whole spider in the ultrasonic cleaner is inadvisable as it disturbs the pigment pattern. For clearing to see internal structures, the alcohol is blotted off and the structure or the whole



spider is immersed in clove oil. The clove oil can be blotted off and the specimen returned to 80 percent ethanol (Levi, 1965).

An attempt was made to photograph species live (or recently preserved) on high-speed Ektachrome film to record the color pattern, which washes out in the alcohol preserving fluid. In the difficult *A. juniperi* subgroup the diagnostic color pattern may be helpful, especially for an amateur or an ecologist who is not a spider specialist.

*Procedure of study.* When I started the study of small species of the *A. juniperi* subgroup of *Araneus*, I followed Archer (1951b) and used his characters, the median apophysis and outline of the epigynum, to differentiate the species. As the median apophysis hooks into the scape in mating, I studied the scape. This led me completely astray, as I took for granted that Archer matched males and females correctly. Some specimens that Archer studied appeared lost. Archer's habit of sometimes taking off one palpus of a type and putting it into another vial with a paratype (often of a different species) adds to the confusion. Only later did I examine the heavily sclerotized structures, the embolus (partly hidden within the palpus), the tooth of the conductor, and the terminal apophysis of the palpus, and in the female, the openings of the epigynum as well as the coloration (washed out in old specimens). I made numerous drawings (unpublished). In the meanwhile, a statistical study was started trying to differentiate the species by proportions. It was a complete waste of time. All of the *A. juniperi* subgroup turned out to have similar proportions. Finally I had some success in sorting the specimens into species by structures. Matching males and females proved especially difficult. A clue came when recently collected specimens from Georgia revealed that different species have different patterns. But most old alcoholic collections had lost their color and patterns except for black pigment. Collections that presumably included *A. cingulatus* and *A. niveus* males were carefully

sorted out according to black pigment on the abdomen. Further study showed that *Araneus niveus* with a black patch on the abdomen also had the conductor spine at a different angle from that of *A. cingulatus*, but the embolus length was variable. New questions were raised when I examined old collections of nonpigmented *niveus*-like males from New Hampshire, an area from which I had no females of *A. niveus*. It occurred to me then that these might be the missing males of *A. guttulatus*. Later, a wasp trap in eastern Massachusetts yielded a female of *A. guttulatus* which had the same abdominal pattern as that of a male collected with it; the male had a palpus similar to that of males from New Hampshire. On reexamining males determined as *A. niveus*, I found that I had confused two species (*A. guttulatus* and *A. niveus*). *Araneus niveus* always has black pigment on the abdomen, *A. guttulatus* may or may not; but both have an otherwise unique character, the conductor spine behind or near the tegulum margin.

While to a nonsystematist taxonomic work appears mysterious and, if names are changed, annoying, the difficulties in sorting out populations by morphology are not appreciated. Published studies give only the final result in which all appears dogmatic, simple and obvious, without showing the numerous false leads and fumbling errors.

*The species concept.* While I cannot agree with what Archer (1951b) called a species in this group, I still consider that there are numerous poorly known species (rather than a single variable one) in the *A. juniperi* subgroup. The reason is that the shape of the scape of the epigynum, though somewhat variable, is correlated with a certain shape of the base of the epigynum, which has characteristic openings. In addition the shape and color pattern of the abdomen correspond to the character of the epigynum. The specimens thus segregated, though much alike, are quite distinct and without intermediates,

indicating sympatric populations. Nevertheless, the species are surprisingly similar and hardly any differences could be found in size and none in proportions. Those who work with measurements only may be misled into considering all to be one species.

My friend and mentor Willis Gertsch has at various times strongly disagreed with me on the definition of a species (in correspondence, and Gertsch, 1960). One of his strong objections (in correspondence) was to my figures 2 and 3, 5 and 6, of *Enoplognatha ovata* (Levi, 1957), which, according to Gertsch, could not possibly be one species. This species has now been reared, and the illustrated variation is found to occur within siblings from the same egg sac (V. Seligy in correspondence, and 1971).

I make the assumption, of course, that we can tell natural species readily by their morphology, an assumption that may not always be correct. I also assume that species are variable and might on occasion hybridize, as has recently been shown by den Hollander (1970, and 1973) in *Pardosa*. A further assumption is that sibling species do have biological differences other than morphology, e.g., the differences in habits of *Latrodectus mactans* and *L. variolus*. While I disagree with those who believe species should not be described on the basis of a single available specimen, I also disagree with those who consider every collection of specimens a different species without taking account of geographical or possible individual variation. After all, taxonomy is a branch of biology.

### *Neoscona* Correction

When we revised the genus *Neoscona* in North America (Berman and Levi, 1971) the type of *Neoscona naiba* Chamberlin and Gertsch could not be found. On the basis of measurements given by the authors, the name was synonymized with *N. arabesca* Walckenaer. When the collection of the University of Utah was recently transferred from the University of Utah to the Ameri-

can Museum, the type and paratypes were found. They had been overlooked because they were marked *Neoscona oaxacensis naiba* Chamberlin and Gertsch. The holotype is a poorly preserved specimen of *N. oaxacensis*. While the pattern could not be checked, the epigynum is characteristic for this species. The male and female paratypes are in worse condition. The male lacks all appendages, including most coxae; the female is also a specimen of *N. oaxacensis*. Perhaps the specimens were the remnants found in the web of another spider, or the prey of a wasp or other predator. The name is not a synonym of *N. arabesca*. It is, as Chamberlin already recognized (judging by the label and its place in the collection), a synonym of *N. oaxacensis*.

### *Araneus* Clerck, 1757

*Araneus* Clerck, 1757, Svenska Spindlar, p. 15.

Type species *A. angulatus* Clerck. (For details and additional synonymy see Levi, 1971, Bull. Mus. Comp. Zool., 141: 131-179.)

*Atea* C. L. Koch, 1837, Übersicht des Arachniden Systems 1: 3. Type species *Epeira sturmi* (Hahn) designated by Bonnet, 1955, Bibliographia Araneorum, 2: 769.\*

*Neosconella* F. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 474. Type species *Neosconella styliagera* F. P.-Cambridge 1904, by original designation.

*Amamrotypus* Archer, 1951, Amer. Mus. Novitates, No. 1487: 17. Type species *Amamrotypus mammatus* Archer 1951, by original designation. NEW SYNONYMY.

*Cambridgepeira* Archer, 1951, Amer. Mus. Novitates, No. 1502: 2. Type species *Epeira detri-mentosa* O. P.-Cambridge, by original designation. NEW SYNONYMY.

*Conaranea* Archer, 1951, Amer. Mus. Novitates, No. 1502: 5. Type species *Epeira excelsa* Banks [= *A. bispinosus* (Keyserling)], by original designation. NEW SYNONYMY.

*Mimaranea* Archer, 1951, Amer. Mus. Novitates, No. 1502: 7. Type species *Epeira triguttata* Fabricius, by original designation. Described as a subgenus. NEW SYNONYMY.

*Conepeira* Archer, 1951, Amer. Mus. Novitates,

\* Bonnet designated *Atea agalena* the type of the genus; this is not one of the three originally included names (*sturmi*, *vulpina*, *scolopetaria*); however, on the same page Bonnet gives a synonymy of *Atea agalena* = *Araneus sturmi*.

No. 1502: 12. Type species *Epeira miniata* Walckenaer, by original designation. NEW SYNONYMY.

*Note.* *Neosconella* was separated from *Araneus* by F. P.-Cambridge, who indicated that no species close to *Aranea diadema* [= *Araneus diadematus*] and *Epeira cornuta* are found in Central America. He described the female as lacking macrosetae, and the male "clavis [median apophysis] biforked." The lack of macrosetae is a characteristic of small *Araneus* species. Archer took the simple hook-shaped median apophysis of *A. pegnina* and *A. thaddeus* as a character to separate the genus. The type species *Neosconella styligera* F. P.-Cambridge, although close to *A. pegnina* and *A. thaddeus*, has quite a different median apophysis (Fig. 439). *Neosconella styligera* characters are intermediate between *A. thaddeus* and the other small species and illustrate well the difficulties of splitting up the genus *Araneus*.

It is difficult to make a key to the groups within the genus *Araneus*, since the divisions are somewhat arbitrary.

*Diagnosis.* I am forced to wait with a differential diagnosis of *Araneus* until I have studied species of related genera including *Metepeira*, *Araniella*, *Aculepeira* and the common widespread species "*Araneus*" *cornutus*, "*A.*" *patagiatus* and "*A.*" *sericatus*.

NATURAL KEY TO SPECIES  
GROUPS OF *Araneus*

- 1 First leg coxa of males with a hook on distal margin fitting into a groove on second femur ..... 2
- First leg coxa of males without a hook on distal margin ..... 3
- 2(1) Median apophysis almost circular in mesal view with 2 to 3 distally (on palpus) directed teeth (Figs. 422, 434) .....  
..... *A. pegnina* group
- Median apophysis longer than wide .... (Levi, 1971) ..... *A. diadematus* group,\* *A. diadematus* subgroup
- 3(1) Embolus with a cap covering only its tip (Levi, 1971), total length of males except *A. illaudatus* more than 5 mm .....  
*A. diadematus* group,\* *A. cavaticus* subgroup

- Embolus with a cap having a tail along length of embolus (Figs. 100, 102); total length of males less than 5 mm, except *A. mammatus* ..... *A. sturmi* group

KEY TO GROUPS OF *Araneus* FEMALES

- 1 Total length more than 8.5 mm; if less, then epigynum with sclerotized posterior lamellae (Levi, 1971, figs. 3, 78, 117, 125) ..... 2
- Total length less than 8.0 mm and without sclerotized posterior lamellae on epigynum ..... 3
- 2(1) With openings of epigynum anterodorsally (Figs. 77, 78); southwestern states ..... *mammatus*
- Openings ventral or posterior .....  
..... *A. diadematus* group\*
- 3(1) Epigynum with a long straight scape extending almost as much anteriorly of base as posteriorly (Levi, 1971, figs. 34-36); abdomen with dorsal folium and white spots arranged in shape of a cross (fig. 37); Newfoundland to Great Lakes, Pacific coast from British Columbia to Oregon ..... *diadematus*
- Epigynum and abdomen otherwise; most species less than 6 mm total length ....  
..... *detrimentosus*,  
*A. sturmi* group and *A. pegnina* group, p. 487.

KEY TO GROUPS OF *Araneus* MALES

- 1 First leg coxa with a hook on distal margin ..... 2
- First leg coxa without a hook on distal margin ..... 3
- 2(1) Terminal apophysis a sclerotized prong (Figs. 411, 412); median apophysis elongate with spines on both ends or one end (Fig. 412) ..... *diadematus* group\*
- Terminal apophysis a wide pointed piece (Figs. 422, 423, 434, 435); median apophysis short, rounded in mesal view with hooks or teeth directed to tip of bulb (Figs. 422, 434) .....  
..... *pegnina* group, p. 489.
- 3(1) Terminal apophysis a flat, wide hard sclerite (Figs. 13, 18, 68) .....  
..... *sturmi* group, p. 489.
- Terminal apophysis tip not sclerotized or if sclerotized, prong-shaped (*yukon*, *groenlandicola*, *iviei*, *cavaticus*, *gemmoides*, *gemma*, *pima*, *illaudatus*) .....  
..... *diadematus* group\*

\* Key, Levi, 1971: 139. Although *A. detrimentosus* is included in this paper and key with small *Araneus* it is probably closer to the *A. diadematus*



The *DIADEMATUS* Group

This group, except for one additional species, *A. detrimmentosus* (p. 00), has been revised (1971).

*Correction*, p. 140 (Levi, 1971). In the key 12b leads to 15 (not 14) and 13b to 14 (not 15).

The specific name has to be *Araneus groenlandicola* (not *groenlandicolus*).\*\*

*Araneus andrewsi* (Archer)

Plates 1, 2

A series collected in Monterey Peninsula, California, in pine and oak woods; all were found on the trunks of pine trees and except for two were greenish in color (R. Johnson, Jr., personal communication). The spiders were hard to find because of their protective coloration.

A female collected and sent to me from

group. In the key to my 1971 paper (p. 140) on the *diadematus* group, it would key out to 4a of the key to females, to 5b in the key to males.

\*\* B. J. Kaston and the late Father Chysanthus made me aware of the errors.

Santa Cruz, California, by Mr. Mark Stowe had "made a web from a lichen covered tree. Others made webs along the edge of pine forests." The color matched the lichens. Surprisingly, the specimen had a delicate velvety green background color on the dorsum of the abdomen and legs (Plate 2). The darker parts of the folium and posterior part of the humps were brown. In coloration and habits it is similar to the eastern *A. bicentenarius*. It readily built a web in the window frame of my study (Plate 1) and fed on moths.

*Araneus washingtoni* Levi

Plate 2

A female collected at the foot of Mt. Washington, New Hampshire, by Mr. Mark Stowe, was kept alive and photographed (Plate 2). Females can readily be recognized when alive by the shape of the abdomen and its pattern. The color is brown. An additional record, extending the distribution of this species, is from Lake Nipigon, Ontario.



Plate 1. *Araneus andrewsi* web made by adult female in window frame. The spider made its retreat in the begonias on right.



Plate 2. Top Fig. *Araneus andrewsi* female from California. The specimen was a soft velvety green with dark brown marks. Bottom Fig. *Araneus washingtoni* female from New Hampshire.

*Araneus gemma* (McCook)

Little was known of the habits of this Pacific coast species (Levi, 1971) except that

it was often found together with *A. gemmoides* on houses and that there is considerable evidence of crossing and introgression. Of interest are numerous individuals of this species which were recently collected from dense woods by Roy Johnson, Jr. in the Monterey Peninsula, California, and which have webs among shrubs close to the ground. Unlike specimens collected on houses with *A. gemmoides*, there was little variation in genitalia in a habitat excluding *A. gemmoides*.

*Araneus iviei* (Archer)

An additional record extending the range of the species is from Matanuska, Alaska.

Small ARANEUS: the STURMI  
and PEGNIA Groups

The *A. pegnica* group includes only two species north of Mexico, *A. pegnica* and *A. thaddeus*; others are Central American and Mexican. The remaining species described in this paper, except for *A. detrimentosus*, belong to the *A. sturmi* group. *Araneus detrimentosus* is closest to the *A. diadematus* group. The *sturmi* and *pegnica* groups include the smaller species of *Araneus*. Many species of the *A. sturmi* group have similar eye size and proportions, a similar palpus and epigynum. They differ from each other in the shape of the abdomen, the covering of setae, and the often bright color of the abdomen as well as in the details of the palpus and epigynum. The relatives of *A. juniperi* have especially bright colors, usually green to red, which unfortunately wash out in alcohol. Presumably the colors are ommochromes. There is little or no black on the venter; *A. pegnica* and *A. thaddeus* have transverse ventral bars (Figs. 420, 432). In all, the carapace is longer than wide without any thoracic mark in the female, or with a longitudinal line.

*Eyes.* The posterior median eyes are subequal in size to slightly larger than anterior medians, the laterals are of the same size or slightly smaller than the anterior median eyes. Only *Araneus miniatus* and

*A. niveus* may have the posterior median eyes slightly smaller than the anterior medians. Only *A. nashoba* may have the laterals very slightly larger than the anterior median eyes. The ocular quadrangle is about as long as wide in front, slightly narrower behind, slightly wider only in *A. pratensis*. The clypeus is equal to the diameter of the anterior median eyes or slightly higher.

The anterior median eyes are slightly more than their diameter to two and one-half diameters apart, the posterior median eyes are slightly less than one to slightly less than two diameters apart. The distance of median eyes from lateral eyes depends on size of the spider; it is least in the smallest. The anterior median eyes are from slightly more than one to three diameters from laterals; the posterior median eyes are two to four anterior median eye diameters from the posterior laterals. Only in *A. bispinosus* and *A. mariposa* females are the anterior median eyes three diameters apart, two in males. Only in the largest, *A. mammatus*, are the lateral eyes more than three anterior median eye diameters from the median eyes.

The eyes of some appear to have the lens slightly smaller than the eye. The eyes of *A. pratensis* have black rings (Fig. 29); the posterior median eyes of the *A. juniperi* subgroup have white pigment rings, which in living specimens may be colored yellow (Diagram 1). The eyes grow allometrically with other parts of the spider. In general small *Araneus* species, like early instars of large species, have relatively large eyes closely spaced. Also the smaller *Araneus* species have much less pigment in the eyes (as well as on their bodies) and there seem to be all intergradations in these characters. I do not think that they differ from those of the large species (Homann, 1952: 352) in gross structure, but there is some knowledge I lack especially in regard to early instars of large species. All have a canoe-shaped tapetum in the center only (Diagram 1), with grate-shaped arrangement of the rods on one side. The eye structure will be an

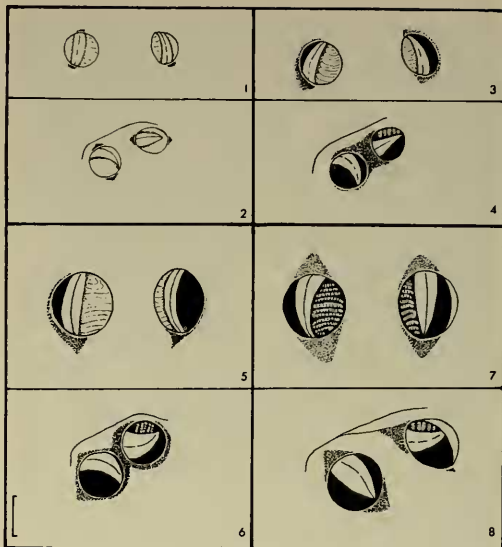


Diagram 1. Eyes showing canoe-shaped tapetum traversing center of eye only, reflecting light. 1-2. *Araneus miniatus*. 3-4. *Araneus detrimmentosus*. 5-6. *Araneus pegnia*. 7-8. *Araneus diadematus*. 1, 3, 5, 7. Posterior median eyes with the left eye in focus. 2, 4, 6, 8. Left lateral eyes.

(Size indicator 0.1 mm. All eyes in same proportion)

extremely useful character in *Meta* and *Leucauge*, which have the canoe-shaped together with the grate-shaped tapetum (Homann, 1971), despite genitalia closer to *Tetragnatha*.

*Chelicerae*. The chelicerae of all have four teeth on the anterior margin, the first and third usually large, the others small.

*Legs*. The leg length of all females is similar. The first patella and tibia of females are 1.2 to 1.5 times the carapace length. In the shortest, *A. pratensis* and *A. cochise*, they are equal to the length of the carapace. They are 1.7 times carapace length in *A. miniatus* and *A. carroll*. The second patella and tibia are 0.8 to 1.2 carapace length, or as long as to 1.5, in *A. mammatus*, *A. montereyensis*, *A. carroll*. The third, 0.5 to 1.2 and the fourth, 0.8 to 1.1 carapace length, 1.4 in *A. bivittatus*.

Males have the first patella and tibia 1.4 to 1.8 times the carapace length, 1.2 in *A. pratensis*, the second patella and tibia



1.2 to 1.7, the third 0.6 to 0.8 and the fourth 0.9 to 1.3.

**Setation.** As in juvenile stages of large species, the smaller species of *Araneus* have fewer setae and females may lack macrosetae.

**Males.** Males are generally the same size as females or slightly smaller. The color is also the same except that the legs may be banded with red. They have two patellar setae on the palpus; one may be stronger than the other. The carapace has a median thoracic line, a narrow depression. The palpal femur has a ventral tooth on the proximal end. From the *A. sturmi* group, none have the coxae modified. *Araneus pegnia* and *A. thaddeus* have a hook on the distal margin of the first coxae. The second tibia of males rarely has slightly stronger setae; however, in the two European species the first tibia is modified. There appear to be greater differences in the second leg length in males of different species than in the other legs. *Araneus pegnia* has strong macrosetae on the prolateral surface of the second tibia (Fig. 438); they are less pronounced in *A. thaddeus*, absent in related species from Central America.

The palpal structure (Figs. 1-6) is like that of the *A. diadematus* group. There are two macrosetae on the cymbium of *A. juniperi* subgroup (except *alboventris*, *tuscarora* and *texanus*). However, the cap of the embolus is of a different shape than in the *diadematus* group; it has a huge tail and barely covers the tip of the embolus if at all. It does break off in mating, and mated females have it hanging out of the epigynum. The cap is large in *A. detrimentosus* but relatively small in *A. pegnia* and *A. thaddeus*. Apparently the cap in most is intermediate between the *Hypsosinga* scale and the cap of *A. diadematus* group. I do not know whether *A. sturmi* and *A. triguttatus* have a cap on the embolus; too few specimens were available and the embolus is even more hidden than in other species. Also I do not know about the cap of *A. pratensis* as the embolus is completely hidden. After mating, the scape of the epigynum is

torn off in *A. pratensis* as in *A. corticarius*, *A. groenlandicola* and some *Eriophora* species.

It is impossible to say at present which cap is primitive and which is derived. But it is clear that those species having a cap, males as well as females, can mate only twice (Gerhardt, 1924-1933), once with each palpus in males, or once with each side of the epigynum in females.

The embolus in this group (as also in *A. bicentenarius*) is exceedingly difficult to study, most difficult in *A. pegnia* and *A. thaddeus*. It is partly hidden and its attachment on a soft sclerite makes it vary its position. In virgin males it is cloaked by the cap. In those that have mated, the cap may in part remain attached, giving the embolus a different profile.

**Variation.** In the Florida peninsula, all species have a much smaller size and less black pigment. There also are small differences in the genitalia such as a shorter scape. Unfortunately, no recently collected specimens of the *A. juniperi* subgroup were available from Florida. The largest specimens of widespread species generally come from Illinois, Missouri, and Arkansas. Perhaps the competition from generally larger-sized tropical species favors smaller sizes in widespread temperate ones.

The *A. juniperi* subgroup contains numerous closely related, brightly colored species. The color is lost in alcohol and the species are difficult to separate. The subgroup includes *alboventris*, *bivittatus*, *bonsallae*, *carroll*, *gadus*, *guttulatus*, *juniperi*, *nashoba*, *niweus*, *cingulatus*, *prunus*, *raui*, *texanus*, *tuscarora*.

**Diagnostic features.** Females of the difficult *A. juniperi* group differ in the dorsal pattern of the abdomen (Plates 6-10). Even though there is variation, absence or presence of paired red spots within a species (*juniperi*), there are generally characteristic markings, such as a white pigment spot in the center anteriorly with branches going posteriorly down the sides in *guttulatus*, while black pigment may be present or not (Plate 8). *Araneus bivittatus* has

stripes that are either red or green (Plate 6). But since both red and green color washes out, this is not a useful character in specimens that have been in alcohol for a century. The shape of the abdomen is useful. In *A. bivittatus* there is an anterior median hump; *A. juniperi* has a spherical abdomen.

The epigynum is the best character, especially in colorless females kept in alcohol. The epigynal scape is long and winding, or in some straight and short. The openings have a distinct border on the outside and often a still more diagnostic inner margin (*A. niveus*, *A. guttulatus*; Figs. 315, 318, 333, 335, 338, 339).

Males of the *A. juniperi* subgroup are unusually difficult to separate. The median apophysis, the single character used by Archer to separate males, cannot be used as the only diagnostic feature (Figs. 440–474). Even though different in different species, in most it is not very distinct. The conductor of the palpus has a tooth at the base which may be drawn out into a spine\* in *A. alboventris* (Fig. 201) or very small in *A. juniperi* (Figs. 258, 259) or parallel to the axis of the conductor near its base in *A. niveus* (Figs. 326–328). The tip of the terminal apophysis is relatively wide in *A. juniperi* (Fig. 257), quite narrow in *A. niveus* and *A. guttulatus* (Figs. 325, 355). The lobe of the unsclerotized median apophysis is variable in shape in all species (Figs. 447–474). The cymbium has two macrosetae, absent in males of *A. alboventris* and sometimes in individual males (a male *A. guttulatus* from Texas). But I have also examined a male of *A. cingulatus* from Florida having three macrosetae. No doubt the best genital character is in the embolus. However, the embolus is wrapped in its cap

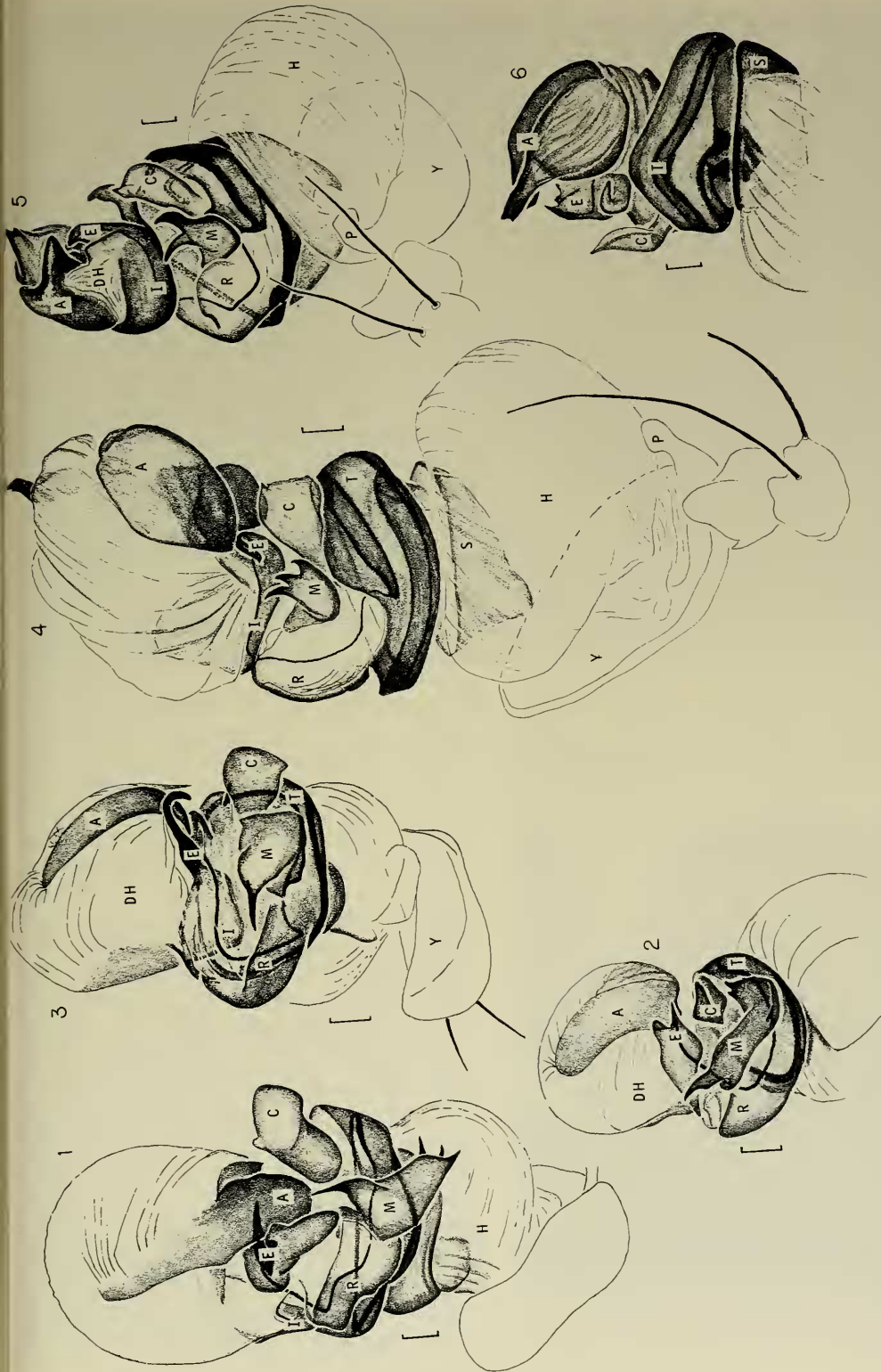
in virgin males. In mated males it has a different appearance (Figs. 261, 262) but there may be remnants of the cap. Only the pattern on the dorsum of the abdomen permits matching males with females. I could not use broken-off embolus tips, or embolus shape, and female ducts, or the median apophysis and scape to match sexes.

The next step in the studies would have been to decapitate the bulb, that is, cut the terminal apophysis off, and study the embolus in detail. This was not done because there were not enough specimens of most species.

*Natural history and collecting.* Collecting members of the *A. juniperi* group of species is difficult. Most of the *A. juniperi* relatives are forest foliage species and are believed to make their webs high up under the foliage of forest trees, and there is circumstantial evidence that they specialize in particular kinds of trees. For example, *Araneus gadus* seems to make its webs only in pitch pine (*Pinus rigida*) in New England and some other pines in the South, but not white pine (*Pinus strobus*); *A. juniperus* inhabits only coniferous trees. Certain sphecoid wasps, however, provision their nests with tree top spiders, and Abbot, being a good naturalist, made use of this source of specimens in the 18th century, and illustrated several species. Later collectors largely overlooked the possibility of harvesting spiders from wasp nests; despite enormous amounts of collecting in New England by Hentz, Emerton, Bryant, Banks and others, very few specimens from tree tops or wasp nests are in collections. (To judge from the labels in vials, Emerton appeared puzzled. The *A. juniperi* specimens were labelled correctly, others had *juniperi* written on the label at a later date or had a question mark connected with the determination.)

The European species *A. sturmi* and *A. triguttatus* are also often found in tree foliage, low as well as high up in trees, and there are several papers on tree top spiders [Wipfelspinnen] of Europe (Engelhardt, 1958). Engelhardt, to study spider predation on the tussock moth, *Lymantria mona-*

\* I am using spine here in its general sense: "a sharp rigid process on an animal" (Webster's Seventh New Collegiate Dictionary, 1967, G. and C. Merriam Co., Springfield); "sharp ridge or projection" (The Concise Oxford Dictionary of Current English, 1934, Clarendon Press, Oxford), not as in older spider literature for a heavy movable seta. The latter would better be called a macroseta or bristle. The older usage is confusing.



Figures 1-6. Structure of *Araneus* left palpus, expanded. 1. *A. sturmi* (Hahn), subventral. 2. *A. pratensis* (Emerton), subventral. 3. *A. guttulatus* (Wnlckenaer), subventral. 4. *A. thaddeus* (Walckenaer). 5-6. *A. pegnia* (Hentz). 5. Subventral. 6. Lateral. Abbreviations. A, terminal apophysis; C, conductor; DH, basal hematodocha; E, embolus; H, basal hematodocha; I, stipes; M, median apophysis; P, paracymbium; R, radix; S, subtegulum; T, tegulum; Y, cymbium. (Size indicators 0.1 mm)





Plate 3. *Araneus pratensis* female in web. The web was dusted with corn starch to increase its visibility.

*cha*, examined the crowns of 15 spruce trees and one pine, 35 to 80 years old. The trees were felled so that their crowns dropped on a previously spread tent cloth and the



Plate 4. Web of *Araneus nashoba* female in *Forsythia* bush.

spiders were collected by 8 to 10 assistants who separated branches from the trunk and beat them above the cloth. Engelhardt himself watched the edge of the cloth to prevent ground spiders from running onto it. Of the 2,000 spiders collected, 40 percent were thomisids. Among the araneids there were 71 specimens of *Araneus omoedus* (Thorell) and 36 of *Araneus sturmi* (Hahn); otherwise only *Cyclosa conica* (Pallas) was more abundant than *A. sturmi*.

To obtain collections of American species, one can make traps for the sphecid wasps of the genera *Trypoxylon* and *Trypargilum*. The traps are made by drilling a 3–4-mm diameter hole into a block of wood 20 × 20 × 150 mm. Straight-grained pine wood is preferable. The traps are placed near the edge of woods. As traps are capped with mud by a wasp, they are opened with a chisel (Plate 5). From 10 to 50 spiders can be found in the trap, the lumen of which the wasp will have divided by mud walls into cells. In each cell the wasp lays an egg on one of the spiders. The traps are inspected



Plate 5. Wasp traps opened with a chisel contain numerous specimens of several small *Araneus* species.

weekly. I did not attempt to fell trees or collect in tree crowns by other means.

The evidence for the tree-crown habitat is circumstantial, because these spiders are rarely collected other than by raiding wasp nests.

*Distribution.* While the large species of the *A. diadematus* group are mostly northern North American and Eurasian, with species even found in Alaska, Greenland and Siberia, the smaller species belong to the fauna of the southern United States and also Mexico and Central America. Large species of other genera of Araneidae (e.g., *Eriophora*) have taken their place in the tropical and subtropical Americas.

*Life history.* The smaller species of *Araneus* are mature in spring, an adaptation of small orb-weavers as a result of competition and availability of prey (Bristowe, 1958: 247), the larger species being mature in fall when larger insects are available as prey. The medium-sized *A. pegnia* and *A.*

*thaddeus* mature in late summer to early fall. An interesting discussion of this is in F. Enders (1972).

*Misplaced species.* *Neosconella devia* Gertsch and Mulaik, 1936, Amer. Mus. Novitates, No. 863: 16, fig. 38 ♀ belongs to *Eustala* (Gertsch, personal communication). The type is lost at the present time.

KEY TO FEMALES OF SMALL  
*Araneus* SPECIES

- 1 Abdomen oval, wider than long from above and without humps; either with dorsal transverse white marks framed by black lines (Fig. 433) or sides of dorsum with distinctly delineated (toward dorsum) black to brown marks (Figs. 408, 421) ..... 2
- Abdomen of various shapes, but with different dorsal pattern ..... 4
- 2(1) Venter of abdomen with transverse white mark behind epigynum followed by a transverse black mark in front of spinnerets (Figs. 420, 432) ..... 3
- Venter as in Fig. 409 without transverse white and black marks; epigy-

	num in posterior view with ventral concavity and dorsal notch (Figs. 401, 403, 405) . . . . .	<i>detrimentosus</i>	
3(2)	Dorsum of abdomen with transverse white patch framed by black, sometimes reddish or greenish (Fig. 433); epigynum in posterior view rounded on sides and with a dark curved mark on each side (Figs. 429, 431) . . . . .	<i>pegnia</i>	
—	Dorsum of abdomen framed by black sides (Fig. 421); epigynum in posterior view appearing as a transverse rectangle (Fig. 418) . . . . .	<i>thaddeus</i>	
4(1)	Eastern United States and Canada (Nebraska, Kansas, Texas to Atlantic) . . . . .		13
—	Western United States (Wyoming, Colorado, New Mexico to Pacific) . . . . .		5
5(4)	Scape of epigynum straight in ventral view or torn off (Figs. 32, 35, 73, 123, 139) . . . . .		6
—	Scape of epigynum coiled, or with lateral kinks in ventral view (Figs. 45, 56, 61, 87) . . . . .		9
6(5)	Opening of epigynum visible anteriorly (Fig. 139) . . . . .	<i>montereyensis</i>	
—	Openings of epigynum not visible in ventral view, or openings posterior on in base, on each side of scape (Fig. base (Figs. 38, 73, 123) . . . . .		7
7(6)	Base with a median posterior notch (Figs. 34, 35); scape much wider anteriorly than posteriorly (Figs. 35, 38) . . . . .	<i>allani</i>	
—	Base more or less evenly rounded posteriorly (Fig. 73); scape widest posteriorly or of equal width anteriorly and posteriorly (Figs. 73, 123) . . . . .		8
8(7)	Base with black on each side (Fig. 73); abdomen longer than wide (Fig. 79) . . . . .	<i>mammatus</i>	
—	Base without black marks along lateral edges (Fig. 123); abdomen much wider than long (Fig. 131) . . . . .	<i>mariposa</i>	
9(5)	Openings a slit on venter of base with a posterior lip, one on each side of scape (Fig. 45) . . . . .	<i>chiricahua</i>	
—	Openings otherwise . . . . .		10
10(9)	Openings on posterior part of base (Figs. 58, 63) . . . . .		11
—	Openings not visible in ventral view, placed anteriorly on base (Figs. 91, 115) . . . . .		12
11(10)	Openings in center of a subspherical lobe on each side of scape (Figs. 56, 58) . . . . .	<i>cochise</i>	
—	Openings in a posterior depression (Figs. 61, 63) . . . . .	<i>arizonensis</i>	
12(10)	Openings facing anteriorly in base (Figs. 87, 91) . . . . .	<i>bispinosus</i>	
—	Openings facing dorsally in base (Figs. 111, 115) . . . . .	<i>monica</i>	
13(4)	Scape of epigynum coiled (Figs. 302, 318, 333) . . . . .		14
—	Scape of epigynum straight or at most with one kink or angle, or torn off (Figs. 22, 161, 249, 381) . . . . .		17
14(13)	Lip of opening mesal (Fig. 376) . . . . .	<i>prunus</i>	
—	Lip of opening lateral (Figs. 315, 333) . . . . .		15
15(14)	Scape very long; base of epigynum appearing about three times as wide as long; secondary openings, curved oval and visible on each side below lip (Figs. 315, 318), abdomen 1.2 times as long as wide with dorsal black spot (Figs. 320, 321) . . . . .	<i>niveus</i>	
—	Scape shorter; base of epigynum at most 2.5 times as wide as long; secondary openings otherwise; abdomen almost as wide as long, sometimes with a black dorsal patch . . . . .		16
16(15)	Lateral lips of epigynum convex in slightly posterior view (Figs. 333, 336), or with very narrow lips in slightly anterior view (Fig. 339); in posterior view area under scape raised (Figs. 335, 338); abdomen often with black pigment . . . . .	<i>guttulatus</i>	
—	Lips otherwise (Figs. 302, 305); base underneath scape a depression as seen in posterior view (Figs. 304, 306); abdomen usually without black pigment . . . . .	<i>cingulatus</i>	
17(13)	Abdomen wider than long (Figs. 164, 183, 208), as wide as long and widest anteriorly or with humps (Fig. 157) . . . . .		18
—	Abdomen if as wide as long, subspherical (Fig. 252), usually longer than wide . . . . .		24
18(17)	Openings of epigynum on ventral face of base (Figs. 153, 363) . . . . .		19
—	Openings on anterior margin of base (Figs. 159, 179) . . . . .		23
19(18)	Lips toward median, openings toward scape (Figs. 153, 156) . . . . .	<i>calusa</i>	
—	Lips and openings otherwise (Fig. 363) . . . . .		20
20(19)	Openings with a lateral outer lip, and an anterior and median inner lip (Figs. 362, 363) . . . . .	<i>texanus</i>	
—	Openings otherwise . . . . .		21
21(20)	Openings large, more or less parallel to scape (Figs. 193, 205) . . . . .		22
—	Openings small, diagonal, posteriorly on base (Fig. 173) . . . . .	<i>miami</i>	
22(21)	Abdomen with a black spot on dorsum surrounded by red on golden yellow (Figs. 196, 197) . . . . .	<i>alboventris</i>	
—	Abdomen without black spot on dorsum (Fig. 208) . . . . .	<i>tuscarora</i>	
23(18)	Scape with a kink and having trans-		



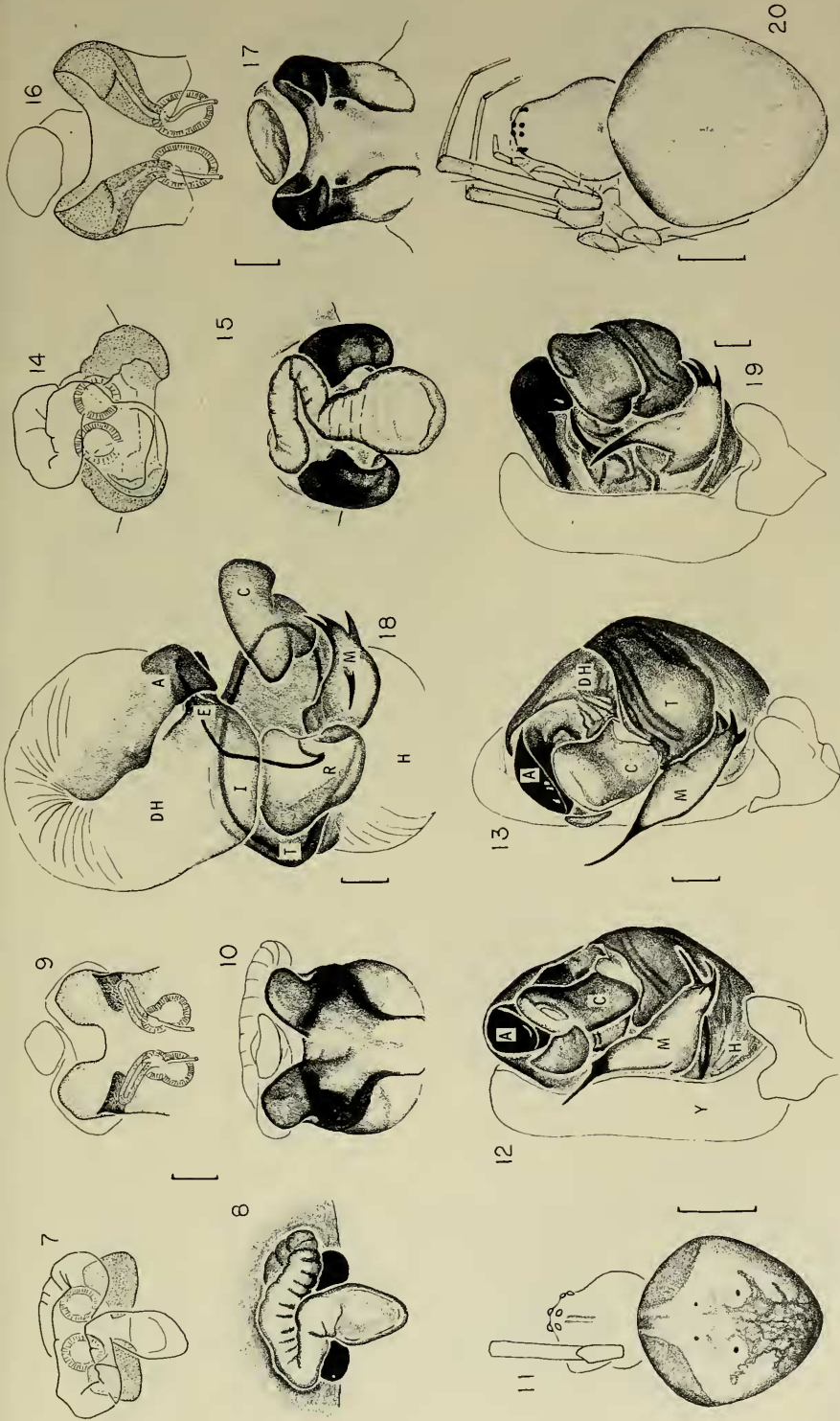
- verse grooves (Figs. 159, 161) . . . *miniatus*
- Scape very short, straight, attached to center of base, lacking transverse grooves (Figs. 179, 180) . . . . . *partitus*
- 24(17) Openings underneath scape (which may be torn off), base with a deep notch posteriorly (Figs. 22, 24, 27 28); eyes on black spots; abdomen widest in middle, smooth and glossy (Fig. 29) . . . . . *pratensis*
- Openings to side of scape; base without posterior notch; no black around eyes; abdomen if widest in middle then not smooth and glossy (Fig. 225) . . . . . 25
- 25(24) Openings with lip only mesally on each side of scape (Fig. 381); abdomen with indistinct anterior white spots on green . . . . . *nashoba*
- Openings with lip laterally, anteriorly or posteriorly (Fig. 222); abdomen marked otherwise . . . . . 26
- 26(25) Scape rather narrow, openings very large, about twice diameter of scape and distinctly bordered on three sides (Fig. 222); abdomen with two distinct crimson or green bands separated by white (Fig. 225) . . . . . *bivittatus*
- Epigynum otherwise, abdominal markings sometimes with green bands, rarely red . . . . . 27
- 27(26) Abdomen with a black patch surrounded by red on yellow (Fig. 197), scape rather short and wide (Fig. 193) . . . . . *alboventris*
- Abdomen and scape otherwise . . . . . 28
- 28(27) Openings longer than wide (Figs. 219, 296) . . . . . 29
- Openings as long as wide or wider than long, a posterior slit (Fig. 232) or a round depression (Fig. 277) . . . . . 31
- 29(28) Openings with narrow rims; secondary openings relatively small (Figs. 296, 297) . . . . . *raui*
- Openings with wide rims; secondary openings larger (Fig. 219) . . . . . 30
- 30(29) Epigynum as in Fig. 219; ducts short in ventral view, opening anteriorly (Fig. 215); abdomen narrow (Fig. 220) . . . . . *carroll*
- Epigynum as in Fig. 363; ducts long, opening laterally (Fig. 362); abdomen wide (Fig. 374) . . . . . *texanus*
- 31(28) Dorsum of abdomen with paired black spots surrounded by a light halo (Fig. 239); openings a posterior slit, slit most anterior toward median (Fig. 232) . . . . . *gadus*
- Abdomen without black pigment spots; if openings a posterior slit, then slit most anterior laterally (Fig. 249) . . . . . 32
- 32(31) Abdomen with indistinct longitudinal

- green bands, rarely red (Fig. 352); scape often with a slight kink, anterior lip of depression indistinct (Fig. 349) . . . . . *juniperi*
- Abdomen with transverse green or white markings in anterior half (Figs. 283, 286); scape without a kink, anterior rim of depression distinct (Figs. 266, 277) . . . . . *bonsallae*

KEY TO MALES OF SMALL *Araneus* SPECIES

- (Males of *calusa*, *carroll*, *cochise*, *miami*, *monica*, *prunus*, *raui* are unknown.)
- 1 Coxae of first legs with a hook on distal margin . . . . . 2
  - Coxae of first legs without hook on distal margin . . . . . 4
  - 2(1) Embolus large, curved and visible on mesal side as in Fig. 411 . . . *detrimentosus*
  - Embolus small and hidden behind conductor . . . . . 3
  - 3(2) Median apophysis with two apical prongs as in Fig. 434 . . . . . *pegnia*
  - Median apophysis with three apical teeth as in Fig. 422 . . . . . *thaddeus*
  - 4(1) Western United States (Wyoming, Colorado, New Mexico to Pacific coast) 5
  - Eastern United States and Canada (Nebraska, Kansas, Texas, Atlantic coast) . . . . . 11
  - 5(4) Median apophysis of palpus with two tips (Figs. 80, 81, 442); conductor very long with a distinctly swollen end and stalk (Fig. 81) . . . . . *mammatus*
  - Median apophysis with three tips (Fig. 66) or one tip and denticles on other end (Fig. 49, 96); conductor otherwise . . . . . 6
  - 6(5) Median apophysis with three tips, one "upper" one and a double "lower" one (Figs. 66, 67, 69) . . . . . *arizonensis*
  - Median apophysis with a tip on one end, denticles or numerous teeth on other (Figs. 49, 96) . . . . . 7
  - 7(6) Terminal apophysis about twice as long as wide (Figs. 96, 98); conductor with a sclerotized lateral edge bearing a short tooth as in Fig. 97; California . . . . . *bispinosus*
  - Terminal apophysis about as long as wide (Figs. 52, 134, 147) or if narrower, conductor otherwise . . . . . 8
  - 8(7) Conductor bottle-shaped, narrower distally with a constricted neck (Fig. 146); California . . . . . *montereyensis*
  - Conductor without constricted neck (Figs. 50, 133) . . . . . 9
  - 9(8) Conductor with a notch and tooth on middle of lateral side (Fig. 133); California . . . . . *mariposa*

- Conductor without notch and tooth on lateral side (Figs. 40, 50); Arizona . . . 10
- 10(9) Conductor with a notch on distal margin near lateral side (Fig. 40) . . . *allani*
- Conductor without such notch (Fig. 50) . . . . . *chiricahua*
- 11(4) Median apophysis positioned parallel to margin of cymbium (Fig. 30); eyes on black spots (Fig. 29) . . . . . *pratensis*
- Median apophysis never parallel to margin of cymbium (Figs. 185, 310); eyes not on black spots . . . . . 12
- 12(11) Embolus straight or slightly curved with a parallel lobe almost hiding it, in mesal view (Figs. 165, 189); abdomen subtriangular with two anterior humps (Fig. 191) . . . . . 13
- Embolus otherwise, no parallel lobe from its base in mesal view (Figs. 209, 309, 387); abdomen rarely subtriangular . . . . . 14
- 13(12) Embolus curved, pointed (Fig. 170); median apophysis with two tips (Fig. 168) . . . . . *miniatus*
- Embolus truncate (Figs. 189, 190); median apophysis with only one tip (Fig. 188) . . . . . *partitus*
- 14(12) Conductor spine longer than width of conductor (Figs. 199, 201); embolus a distinct coil (Figs. 202, 203); abdomen with a red-fringed black spot on yellow (Fig. 196) . . . . . *alboventris*
- Conductor spine shorter than width of conductor (Fig. 212); embolus otherwise (Fig. 209); abdomen if with black spot then spot not red-fringed . . 15
- 15(14) Abdomen with three pairs of black spots having a light halo (Fig. 239); embolus as in Figs. 244–246 . . . . . *gadus*
- Abdomen spots red or absent, never black . . . . . 16
- 16(15) Embolus a projection almost parallel to and above lamella as in Fig. 387; abdomen green with anterior white spots (Fig. 386) . . . . . *nashoba*
- Embolus not as in Fig. 387, and abdomen usually not as in Fig. 386 . . . . . 17
- 17(16) Abdomen with longitudinal green or red bands (Figs. 225, 252) . . . . . 18
- Abdomen not with longitudinal bands 19
- 18(17) Abdomen bands indistinct (Fig. 252); embolus very slender (Figs. 261–263), conductor tooth minute (Figs. 258, 259) . . . . . *juniperi*
- Abdomen bands distinct (Fig. 225); embolus heavier, though of same shape (Fig. 230); conductor tooth larger (Fig. 229) . . . . . *bivittatus*
- 19(17) Conductor tooth small, touching or underneath transparent tegulum margin (Figs. 326–328, 348–351) . . . . . 20
- Conductor tooth at some distance from tegulum margin . . . . . 21
- 20(19) Distal bent tip of embolus very short (Figs. 329–331); terminal apophysis wide (Fig. 325) . . . . . *niveus*
- Distal bent tip of embolus longer (Figs. 356–361); terminal apophysis noticeably narrow (Figs. 352–355) . . . . . *guttulatus*
- 21(19) Abdomen brownish, white along anterior margin, triangular, as wide as long (Fig. 208); end piece of terminal apophysis wider than long, short and blunt (Fig. 211); total length less than 3 mm . . . . . *tuscarora*
- Abdomen usually with at least some white pigment on dorsum, longer than wide; terminal apophysis longer than wide (Fig. 369) . . . . . 22
- 22(21) Embolus as in Fig. 370; tooth of conductor on a long sclerotized edge (Fig. 373) . . . . . *texasus*
- Embolus not as in Fig. 370 (Figs. 392, 313); tooth of conductor sometimes on sclerotized edge (Figs. 291, 312) . . . 23
- 23(22) Embolus as in Figs. 292–294; median apophysis with a notch (Figs. 453–454) . . . . . *bonsallae*
- Embolus as in Fig. 313 with a long tip; similar to *bivittatus*; median apophysis without notch (Figs. 455–458) . . . . . *cingulatus*
- Araneus sturmi* (Hahn)**  
**Figures 1, 7–13**
- Epeira sturmi* Hahn, 1831, *Die Arachniden*, 1: 12, pl. 3, fig. 8, ♀, ♂. The specimens came from Nürnberg, Germany, and are believed lost.
- Aranea sturmi*.—Wiehle, 1931, in Dahl, *Die Tierwelt Deutschlands*, 23(6): 113, figs. 177–182, ♀, ♂. Roewer, 1942, *Katalog der Araneae*, 1: 792.
- Araneus sturmi*.—Locket and Millidge, 1953, *British Spiders*, 2: 141, figs. 94 a,b; 95 a,b, ♀, ♂. Bonnet, 1955, *Bibliographia Araneorum*, 2: 605.
- Unlike most other species of *Araneus*, the first tibia of the male is slightly curved and has stronger spines than the second.
- Natural history.* According to Wiehle (1931) the species is found exclusively in pines, spruce and juniper, only rarely on deciduous trees nearby. The web is like that of other *Araneus* species. There are usually fewer than 20 radii in the small web.
- Distribution.* Europe.



Figures 7-13. *Araneus sturmi* (Hahn) of Europe. 7-10. Epigynum. 7. Ventral, cleared. 8. Ventral, cleared. 9. Posterior, cleared. 10. Posterior, cleared. 11. Female with first patella-tibia. 12-13. Left palpus. 12. Mesal. 13. Ventral.  
 Figures 14-20. *Araneus triguttatus* (Fabricius) of Europe. 14-17. Epigynum. 14. Ventral, cleared. 15. Ventral, cleared. 16. Posterior, cleared. 17. Posterior. 18-19. Palpus. 18. Expanded, submesal. 19. Mesal. 20. Female.  
 Abbreviations. A, terminal apophysis; C, conductor; DH, distal hematodocha; E, embalus; H, basal hematodocha; I, stipes; M, median apophysis; R, radix; T, tegulum; Y, cymbium.  
 (Size indicators 0.1 mm, except for females 1 mm)



*Araneus triguttatus* (Fabricius)

Figures 14–20

*Aranea triguttatus* Fabricius, 1793, Ent. Syst. 2: 419. Fabricius' collection was kept at Copenhagen and was destroyed. Wiehle, 1931, in Dahl, Die Tierwelt Deutschlands, 23(6): 115, figs. 183–187, ♀, ♂. Roewer, 1942, Katalog der Araneae, 1: 794.

*Epeira mayo* McCook, 1894, American Spiders, 3: 179, pl. 8, fig. 11, ♀. Female holotype labeled as coming from Biscayne Bay, Florida (G. Marx), in the U.S. National Museum, examined. But McCook published that he had specimens from Wisconsin and one in the Marx collection from Minnesota.\* NEW SYNONYMY.

*Araneus triguttatus*.—Locket and Millidge, 1953, British Spiders, 2: 143, figs. 94 c,d, 95 c, ♀, ♂. Bonnet, 1955, Bibliographia Araneorum, 2: 616.

The first legs of the male, rather than the second as in most *Araneus* species, are curved and have large setae.

*Note.* There is no evidence that this species occurs in America. The Marx specimen given a name by McCook appears to have had an error in locality, as do most Marx specimens. I have no doubt that McCook made his drawings from the Marx specimen examined.

\* McCook's next sentence is "The known patria is thus the Northwestern United States."

*Natural history.* According to Wiehle (1931) *A. triguttatus* is found on deciduous trees.

*Distribution.* Eurasia.

*Araneus pratensis* (Emerton)

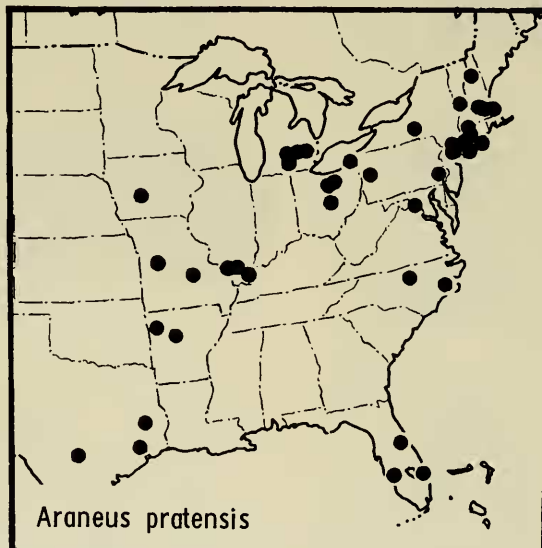
Plate 3; Figures 2, 21–31; Map 1

*Singa pratensis* Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 322, pl. 34, fig. 15, pl. 37, figs. 14–15, ♀, ♂. One male and three female syntypes from wet fields, New Haven, Connecticut, in the Museum of Comparative Zoology, examined. Comstock, 1912, Spider Book, p. 462, fig. 475, ♀; 1940, Spider Book, rev. ed., p. 476, fig. 475, ♀. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 240, figs. 745, 758–759, ♀, ♂.

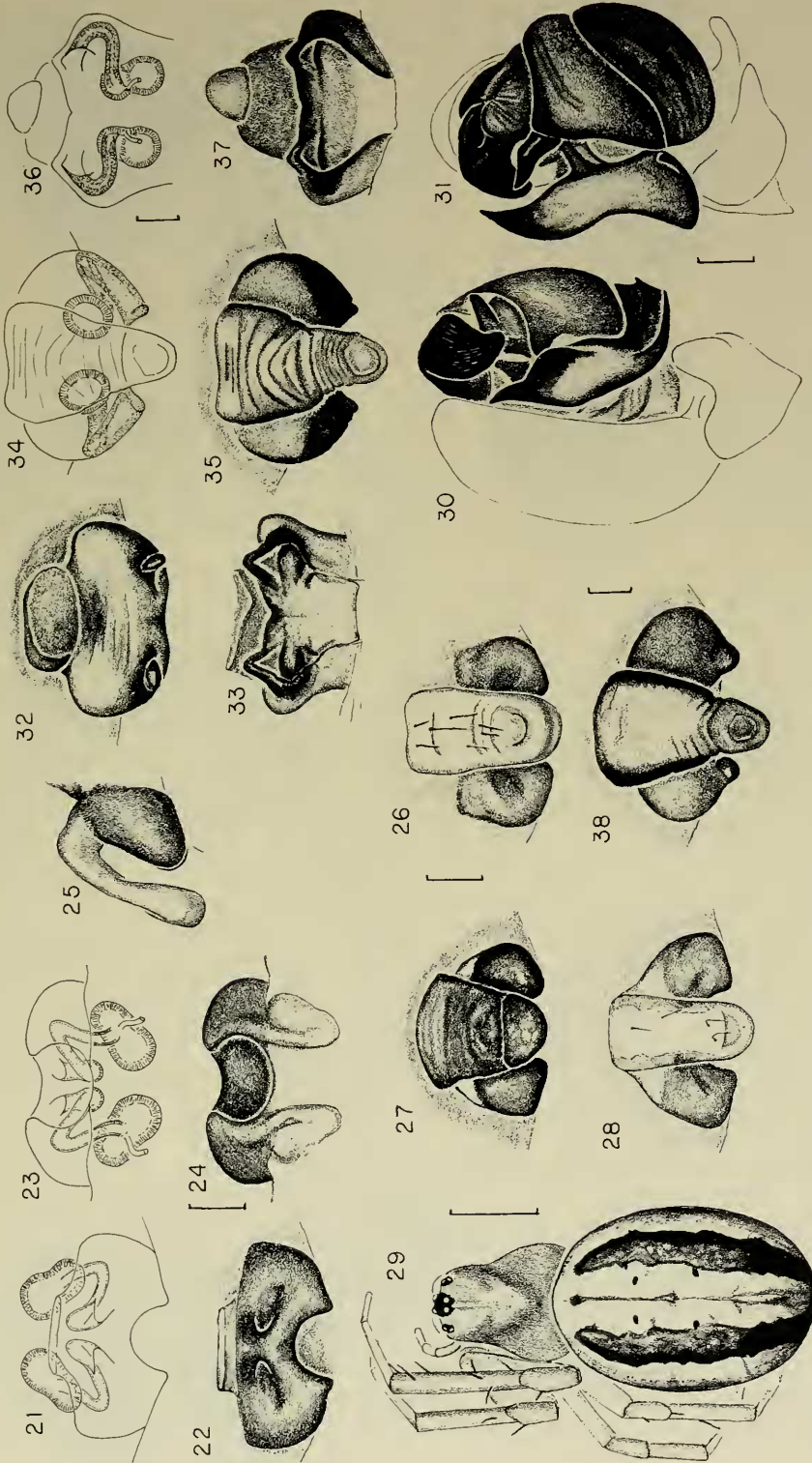
*Epeira reptilis* Keyserling, 1893, Spinnen Amerikas, 4: 244, pl. 12, fig. 182, ♂. Male holotype from Crescent City, Florida (Marx collection, locality in doubt), in the U.S. National Museum, examined. NEW SYNONYMY.

*Singa listerii* McCook, 1894, American Spiders 3: 231, pl. 19, figs. 3, 4, ♀, ♂. Two female, three male syntypes from Georgia in the Academy of Natural Sciences, Philadelphia, examined and labeled as type. Name first synonymized by Banks, 1910, Bull. U.S. Natl. Mus. 72: 40.

*Araneus praticola* Simon, 1895, Histoire Naturelle des Araignees, 1: 807. New name for *Singa pratensis* Emerton, because thought preoccupied by *Epeira pratensis* Hentz, 1847 (= *Neoscona pratensis*). Bonnet, 1955, Bibliographia Araneorum, 2: 568.



Map 1. Distributions of *Araneus pratensis* (Emerton).



Figures 21-31. *Araneus pratensis* (Emerton). 21-28. Epigynum. 21. Ventral, cleared. 22. Ventral, scape torn off. 23. Posterior, cleared. 24. Posterior. 25. Lateral. 26-28. Ventral with scape. 29. Female. 30-31. Left palpus. 30. Mesal. 31. Ventral.  
 Figures 32-38. *Araneus alloni*, new name, epigynum. 32. Ventral, scape torn off. 33. Posterior. 34. Ventral, cleared. 35, 38. Ventral. 36. Posterior, cleared. 37. Posterior.  
 (Size indicators 0.1 mm, for Fig. 29, 1 mm)

*Description.* Female. Carapace yellow-brown with median ocular quadrangle black, smooth; lateral eyes on black spots (Fig. 29). Sternum dark brown. Legs, including coxae, light yellowish. Dorsum of abdomen white with two longitudinal brown bands and a median dark line (Fig. 29); sides brownish; venter with a median square brown spot between epigynum and spinnerets bordered by a white line on each side; spinnerets dark brown. Abdomen without setae, smooth. Posterior median eyes 1.3 diameters of anterior medians, laterals same diameter as anterior medians. Anterior median eyes 1.5 diameters apart, 1.7 diameters from laterals. Posterior median eyes less than one diameter apart, two diameters from laterals. The abdomen is suboval, longer than wide, slightly overhanging spinnerets. Total length 4.3 mm. Carapace 2.0 mm long, 1.4 mm wide. First femur, 1.8 mm; patella and tibia, 2.1 mm; metatarsus, 1.4 mm; tarsus, 0.7 mm. Second patella and tibia, 1.8 mm; third, 1.2 mm; fourth, 1.9 mm.

Male. Coloration like that of female. Carapace with a short longitudinal line in thoracic region, also lacking setae. Eye sizes like those of female. Anterior median eyes 1.5 diameters apart, slightly more than one diameter from laterals. Posterior median eyes slightly less than one diameter apart, two diameters from laterals. Total length 3.6 mm. Carapace 1.7 mm long, 1.4 mm wide. First femur, 1.7 mm; patella and tibia, 2.1 mm; metatarsus, 1.5 mm; tarsus, 0.7 mm. Second patella and tibia, 1.9 mm; third, 1.2 mm; fourth, 1.8 mm.

*Variation.* *Araneus pratensis* varies little in color. No two median apophyses (Fig. 30) of the palpus are exactly alike. Also the scape of the epigynum when not torn off may be wide and wrinkled or narrow and smooth (Figs. 26-28). Females varied from 3.8 to 5.0 mm total length, 1.2 to 1.7 mm carapace width, males 3.0 to 3.5 mm total length, 1.2 to 1.4 mm carapace width.

*Diagnosis.* *Araneus pratensis* differs from other *Araneus* species by the *Hypsosinga*-like smooth carapace and smooth, long

oval abdomen having two longitudinal bands (Fig. 29). The openings of the epigynum are hidden in a posterior depression of the base behind the scape (Figs. 21, 22); the scape in mated specimens is torn off (Fig. 22). The shape and position of the median apophysis (Fig. 30), parallel to the cymbial margin, separates *A. pratensis* from other *Araneus*. (The epigynal scape and large median apophysis preclude placing the species in *Hypsosinga*.)

*Natural history.* Virgin males are believed to have a small cap over the embolus. But since the embolus of virgin males is well hidden between sclerotized terminal apophysis and conductor, I am not certain of this. Males are mature in May and June. Mature females are found until August, in Florida until September. The species is found in moist meadows in the open, on alfalfa, and has been swept from fields with mixed vegetation. The orb of the web is about 20 cm in diameter; one observed in Massachusetts lacked a retreat and the spider, hanging in the center, dropped when approached only to climb back minutes later (Plate 3).

*Distribution.* From the northernmost record, Woodstock, New Hampshire, the species ranges to Florida; and the westernmost record is San Antonio, Texas (Map 1).

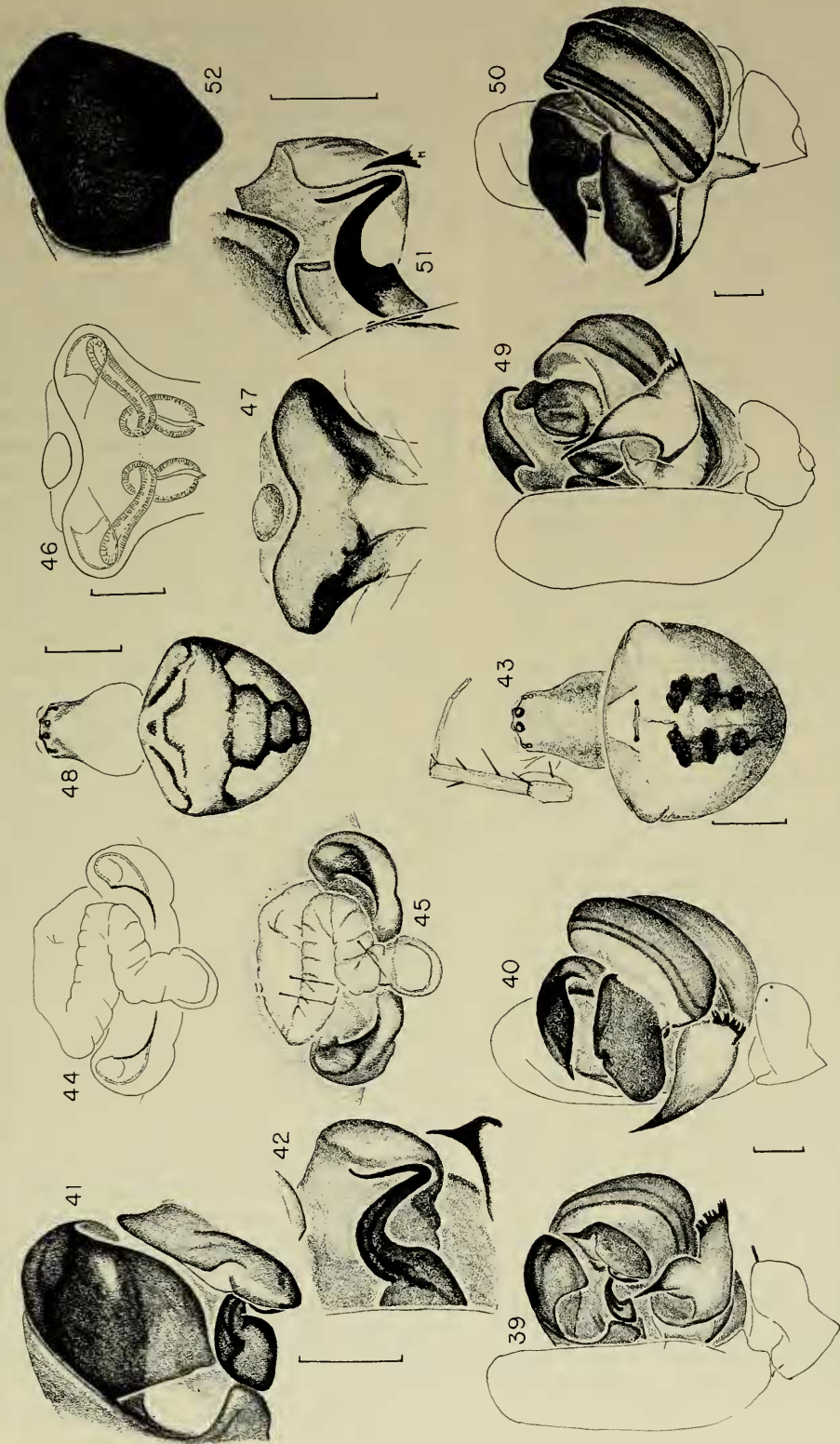
*Araneus allani*, new name

Figures 32-43, 440; Map 2

*Amamrotypus miniatus* Archer, 1951, Amer. Mus. Novitates, No. 1487: 18, fig. 23, ♀. Female holotype in poor condition from White House Canyon, Santa Rita Mountains, Arizona, in the American Museum of Natural History, examined. The specific name is preoccupied by *Araneus miniatus* (Walckenaer, 1841); it is now named after the original author, Allan Archer.

*Description.* Female. Carapace brown, much darker on sides, posterior median eyes on black spots. Sternum brown with some dark pigment. Legs brown with narrow bands. Dorsum of abdomen spotted brown with a pair of darker marks anteriorly (Fig. 43); most have folium less distinct than in illustration. Venter between epigynum and spinnerets white, enclosing a dark center. Carapace hairy, with a deep longitudinal





Figures 39-43. *Araneus allani*, new name. 39-42. Left palpus. 39 Mesal. 40. Ventral. 41. Terminal apophysis. 42. Embolus, mesal. 43. Female with first leg.  
 Figures 44-52. *Araneus chiricahua* n. sp. 44-47. Epigynum. 44. Ventral, cleared. 45. Ventral. 46. Posterior. 47. Posterior, cleared. 48. Female. 49-52. Palpus. 49. Mesal.  
 50. Ventral. 51. Embolus, mesal. 52. Terminal apophysis.  
 (Size indicators 0.1 mm, for females 1 mm)

thoracic groove. The abdomen has two large humps. Total length 3.5–4 mm. Carapace 1.7–1.8 mm long, 1.3–1.4 mm wide.

Male with carapace yellow-white with some white pigment in center of thorax; eyes on black pigment spots; sides slightly gray. Sternum, legs yellowish white. Dorsum of abdomen white with indistinct brown folium. Venter white; in the center the pigment is broken by a longitudinal pigmentless line; epigastric area and spinneret area with gray pigment. The abdomen is suboval, longer than wide, without humps. Total length 2.7 mm. Carapace 1.3 mm long, 1.2 mm wide.

*Diagnosis.* Female *Araneus allani* differ from other small western *Araneus* species whose epigynum does not show openings on the ventral face by having the openings posterior (Figs. 32–37) rather than anterior or dorsal, by having the base notched posteriorly, in the middle, and pointed on each side of the scape, and by having the scape much wider anteriorly than behind (Figs. 35, 38). There is a resemblance to the epigynum of *A. pratensis*, but the shape and color of the abdomen are different. Male *Araneus allani* have a wider terminal apophysis (Fig. 41) than the related California species, a longer embolus (Fig. 42), and a differently shaped conductor (Fig. 40). *Araneus allani* is much smaller than related sympatric species of *Araneus*.

*Records.* Arizona. Cochise Co.: Cave Creek Canyon, Chiricahua Mts., 15–31 August 1956, ♀, ♂ (A. F. Archer). Santa Cruz Co.: Madera Can., Big Rock Camp, "9–10–41," ♀ (W. Ivie) (Map 2).

*Araneus chiricahua* n. sp.

Figures 44–54, 441; Map 2

*Conaranaea pacifica*,—Archer, 1951, Amer. Mus. Novitates, No. 1502: 10, fig. 26, ♀. Not *Epeira pacifica* McCook.

*Conaranaea anguinifera*,—Archer, 1951, Amer. Mus. Novitates, No. 1502: 11, in part; not *Aranea anguinifera* F. O. P.-Cambridge.

*Type.* Female holotype, female and male paratypes from Southwestern Research Station, 5 mi. (8 km) west of Portal, Cochise County, Arizona, 5,600 ft. (1,800

m) elev., Chiricahua Mountains, 15 August 1972 (N. Platnick) in the Museum of Comparative Zoology. The name is a noun in apposition after the type locality.

*Note.* Specimens of this species have been labeled as *Atea gertschi*, *Conaranaea pacifica* and *Conaranaea anguinifera* by Archer.

*Description.* (Specimen 10 days in alcohol; the reddish color washes out in time.) Female carapace with central white patch, darker on each side, more so in head region, and margin gray; eyes on dark spots. Sternum gray, darker on margin. Legs yellowish. Dorsum of abdomen with an indistinct folium bordered by black marks. Anterior of folium a white A-shaped mark bordered red (Figs. 48, 53, 54). A red line passes down side from anterior of folium to venter. Venter with a median longitudinal reddish black band, on each side of which is a white band of equal width; spinnerets brown. Carapace quite narrow. Posterior median eyes 1.3 diameters of anterior. Anterior lateral eyes equal in diameter to anterior medians. Posterior laterals 0.9 diameters of anterior median eyes. The median ocular area is square. The abdomen is slightly longer than wide, widest in anterior half with humps almost always present. It barely covers the carapace. Total length 3 mm. Carapace 1.2 mm long, 1.0 mm wide. First femur, 1.4 mm; patella and tibia, 1.5 mm; metatarsus, 0.8 mm; tarsus, 0.5 mm. Second patella and tibia, 1.2 mm; third, 0.7 mm; fourth, 1.1 mm.

Male coloration like female, except for legs which are indistinctly banded. Total length 2.8 mm. Carapace 1.4 mm long, 1.2 mm wide. First femur, 1.8 mm; patella and tibia, 1.9 mm; metatarsus, 1.3 mm; tarsus, 0.5 mm. Second patella and tibia, 1.7 mm; third, 1.0 mm; fourth, 1.4 mm.

*Variation.* Mexican females have the abdomen with humps more distinct (Fig. 54). Females varied from 3.0 to 3.9 mm total length, carapace 1.2 to 2.0 mm long, 1.0 to 1.5 mm wide. Males varied from 2.8 to 3.5 mm total length, carapace 1.4 to 1.7 mm long, 1.2 to 1.5 mm wide.

**Diagnosis.** Unlike other western female *Araneus*, *A. chiricahua* has the openings of epigynum on the venter (Fig. 45) easily visible, bordered posteriorly and laterally. Like *A. arizonense* and *A. cochise*, but unlike *A. allani* and *A. mammatus*, in *A. chiricahua* the scape is long and coiled. But the base of the epigynum is wider than long (Figs. 45, 47); in the larger *A. arizonense* and *A. cochise* it is about as long as wide. The shape of the wide terminal apophysis (Fig. 52), the conductor (Fig. 50) and the long median apophysis (Fig. 441) separate males from related species.

**Natural history.** The holotypes and paratypes were collected by sweeping low vegetation and pines. Males are mature in late summer.

**Records.** Arizona. Cochise Co.: Southwestern Research Station, Portal, August 1956, 3 ♀ (A. F. Archer); Cienega Lake, 5 mi. north of Portal, 6 August 1968, ♀, ♂. Hidalgo. Apulco, 6 October 1947, ♀, ♂. Distrito Federal. Chapultepec, ♀ (Map 2).

*Araneus cochise* n. sp.

Figures 55–59; Map 2

**Type.** Female holotype from Southwest Research Station, 5,400 ft. (1,800 m), Chiricahua Mts., Cochise Co., Arizona, 1 July 1968 (V. Roth) in the American Museum of Natural History. The name is a noun in apposition after the type locality.

**Description.** Carapace yellow-white with a median white patch in thoracic region. Eyes on black spots. An indistinct brown patch on each side of head region, radiating posteriorly to a black mark on each side of a white thoracic patch. Thorax yellowish white on sides and posteriorly. Clypeus brown with black around margin. Sternum yellowish white, brown on sides. Coxae and proximal part of femora whitish. Distal segments with narrow rings. Abdomen with two humps, dorsum with an indistinct folium, darkest posteriorly, outlined by black marks, bordered laterally by white spots (Fig. 59). Anteriorly the abdomen is reddish; a white spot lies above spinnerets. There is a white patch on each side below

the hump, with black below and posteriorly on the side. Between epigynum and spinnerets, the venter is gray with a white patch on each side. Posterior median eyes 1.3 diameters of anterior medians, laterals 0.8 diameters of anterior median eyes. Anterior median eyes one diameter apart, 1.8 from laterals. Posterior median eyes 1.3 diameters apart, 2.5 from laterals. The height of the clypeus equals the diameter of the anterior median eyes. Total length 3.7 mm. Carapace 1.9 mm long, 1.5 mm wide. First femur, 1.6 mm; patella and tibia, 2.0 mm; metatarsus, 1.2 mm; tarsus, 0.6 mm. Second patella and tibia, 1.5 mm; third, 1.0 mm; fourth, 1.5 mm.

**Diagnosis.** The epigynum of this species (Fig. 56) is surprisingly similar to that of *A. sturmi*. Female *Araneus cochise* has a long folded scape (Fig. 56), unlike other small western *Araneus*, except *chiricahua*, *arizonensis*, and *bispinosus*; it differs from the three species and also from *A. sturmi* in having an indistinct opening at the tip of each posterior, lateral, spherical projection of the base (Figs. 55–57).

*Araneus arizonensis* (Banks)

Figures 60–71; Map 2

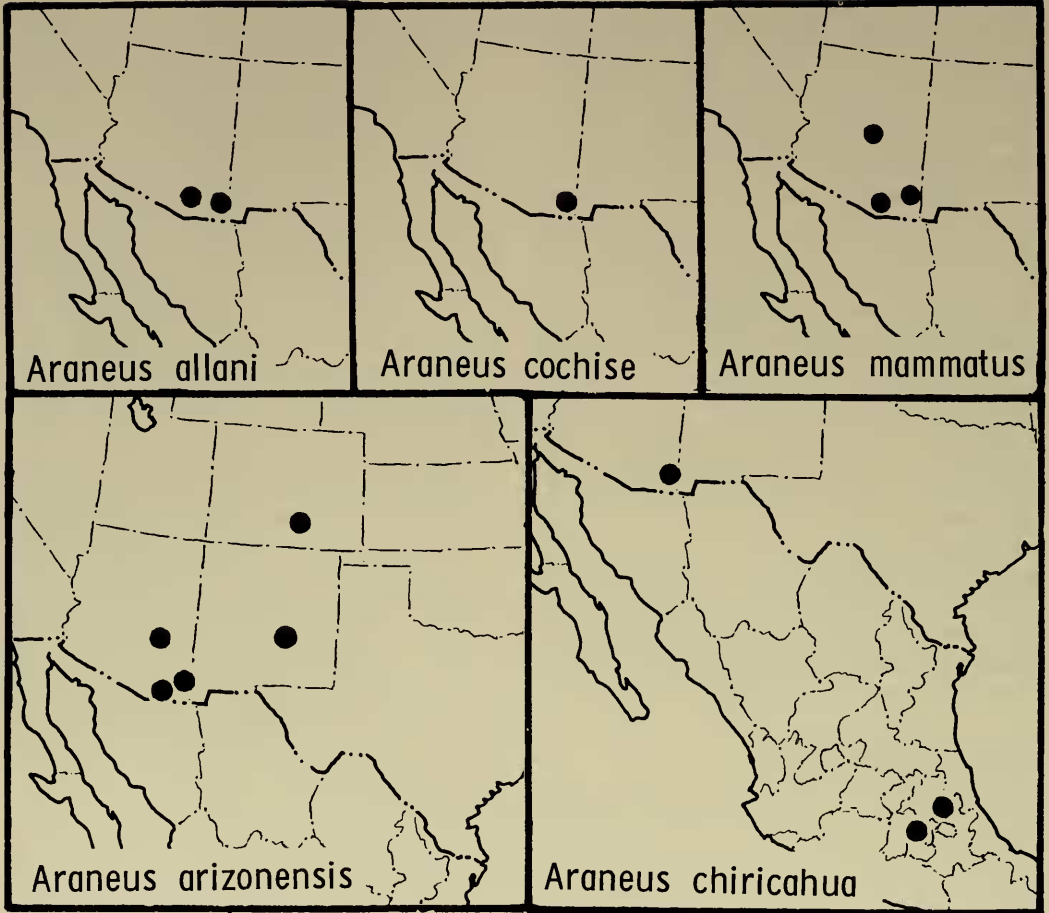
*Epeira arizonensis* Banks, 1900, Canadian Entomol., 32: 100. Female holotype from Arizona\* [no locality], Townsend collector, in the Museum of Comparative Zoology, examined. Banks, 1901, Proc. U.S. Natl. Mus., 23: 585, pl. 22, fig. 5, ♂. *Neosconella arizonensis*,—Archer, 1951, Amer. Mus. Novitates, No. 1487: 38.

*Conaranaea gertschi*,—Archer, 1951, Amer. Mus. Novitates, No. 1502: 7, figs. 17, 30, ♀. Not male holotype of *Conaranaea gertschi* Archer.

**Description.** Female. Carapace, sternum, legs yellow. Dorsum of abdomen white without any marks or some specimens

\* Nathan Banks traversed the country by railway. Wherever the train stopped in the west to take on water for the steam locomotive, Banks dashed out to collect and as soon as the train started, he jumped back on board. His localities thus may have the forgotten names of water storage tanks which have long since disappeared, or just the name of the state. This specimen, however, had a collector, probably C. H. T. Townsend, a wasp specialist.





Map 2. Distributions of small southwestern species of *Araneus*.

with a folium enclosing a field of fine black stipples (Fig. 65). Venter of abdomen white. The abdomen is suboval with two slight humps anterior dorsally (Fig. 65). Total length 4.2–6.1 mm. Carapace 2.0–2.4 mm long, 1.7–2.1 mm wide.

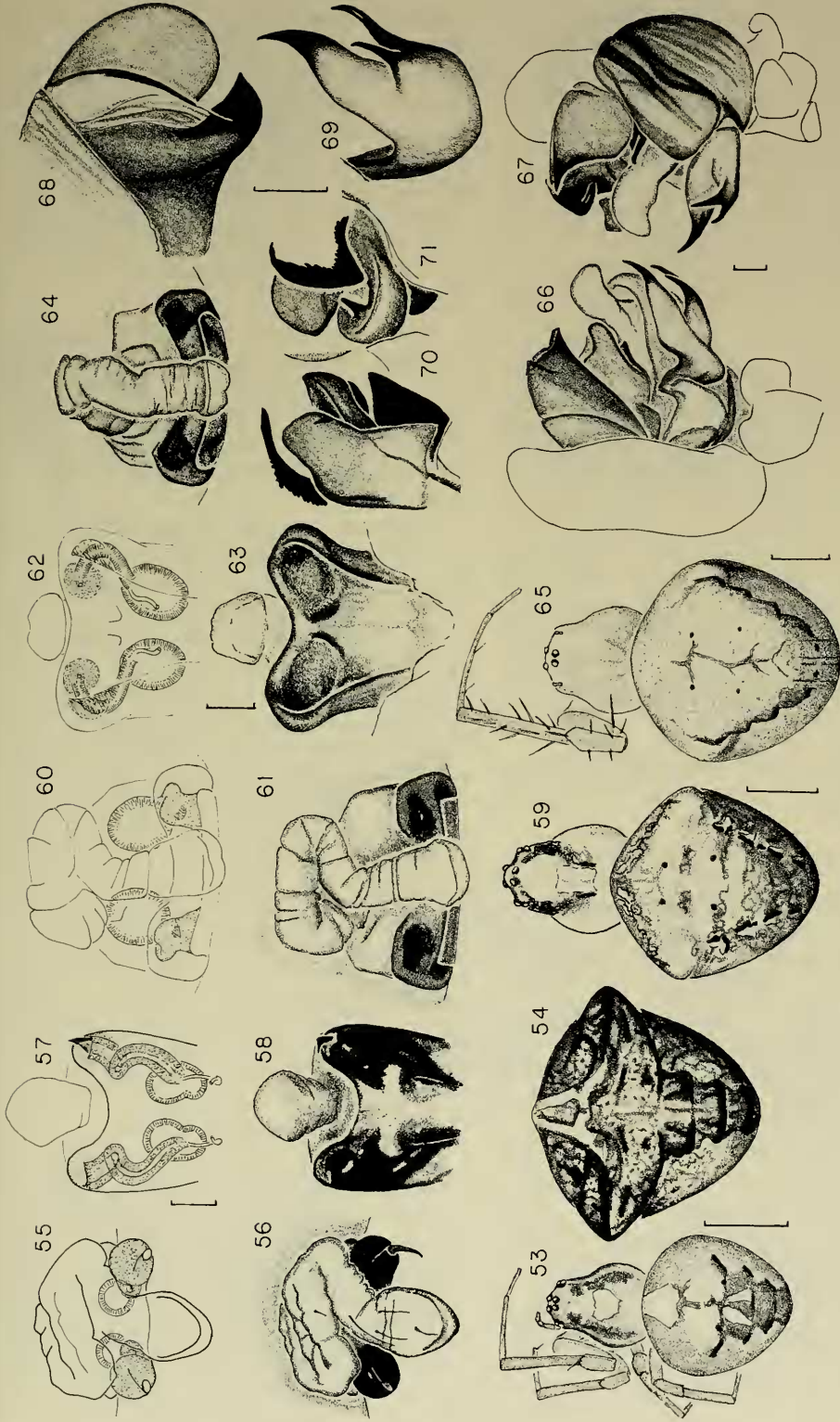
Male. Coloration like that of female, but legs indistinctly banded. Abdomen subtriangular with two slight humps anteriorly. Total length 4.3–4.8 mm. Carapace 2.2 mm long, 1.9 mm wide.

*Variation.* *Araneus arizonensis* seems more variable in genitalic structure than other species, perhaps because suitable habitats and populations are far apart and isolated. The holotype of *A. arizonensis* has

a shorter scape, specimens from the Huachuca Mountains have the lip on the epigynum shaped slightly differently (under the tip of the scape). Not enough males are in collections to permit study of the variation.

*Diagnosis.* *Araneus arizonensis* females, like those of *A. chiricahua*, *A. cochise* and *A. bispinosus*, have a long coiled scape, but differ by having the openings on each side of a posterior transverse groove on the base of the epigynum (Figs. 61, 63, 64). Unlike other species the median apophysis of the male palpus is tipped by three prongs facing the same direction (Fig. 69).

*Natural history.* One male was found as



Figures 53-54. *Araneus chiricahua* n. sp. 53. Female abdomen (Hidalgo). 54. Female abdomen (Hidalgo).  
 Figures 55-59. *Araneus cochise* n. sp. 55-58. Epigynum. 55. Ventral, cleared. 56. Ventral, cleared. 57. Posterior, cleared. 58. Posterior, cleared. 59. Female.  
 Figures 60-71. *Araneus orizonensis* (Banks). 60-64. Epigynum. 60. Ventral, cleared. 61. Ventral, cleared. 62. Posterior, cleared. 63. Posterior, cleared. 64. Ventral. 65. Female. 66-71.  
 Left palpus. 66. Mesal. 67. Ventral. 68. Terminal apophysis. 69. Median apophysis. 70-71. Embolus. 70. Mesal. 71. Apical.  
 (Size indicators 0.1 mm, for females 1 mm)

prey of the wasp *Stenopogon* at Portal, Arizona, another in a can trap in a recent lava bed in New Mexico. The species, according to S. Riechert, is moderately abundant on the lava flow, with webs in crevices.

*Records.* *Colorado.* Fremont Co.: Canon City, ♂. *New Mexico.* Lincoln Co.: T65, R102, sec. 36, ♂ (S. Riechert). *Arizona.* Cochise Co.: Chiricahua Mts. (numerous records). Gila Co.: Miami, ♀. Santa Cruz Co.: Huachuca Mts. ♀ ♀ (Map 2).

*Araneus mammatus* (Archer)

Figures 72–85, 442; Map 2

*Amamrotypus mammatus* Archer, 1951, Amer. Mus. Novitates, No. 1487: 17, figs. 23, 24, ♀ [1 March 1951]. Female holotype from White House Canyon, Santa Rita Mountains, Arizona, in the American Museum of Natural History, examined.

*Conaranaea gertschi* Archer, 1951, Amer. Mus. Novitates, No. 1502: 7, fig. 33, ♂ (not Figs. 17, 30, ♀) [5 April 1951]. Male holotype from Coconino Co. [General Springs, Mogollon Rim, 10 mi. east of Baker Butte, 12 mi. east of Pine, Giles Co.\*], Arizona, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* The female paratypes of *Conaranaea gertschi* are *Araneus arizonensis* (Banks).

*Description.* Female carapace brown with whitish hairs. Sternum light brown. Legs light brown, indistinctly banded with darker brown. Dorsum of abdomen brown with a pair of marks anterior to humps and a folium posteriorly (Figs. 79, 85). Venter with white pigment between epigynum and spinnerets and surrounding spinnerets. Center of pigment spot gray. Carapace hairy with a deep longitudinal groove. The legs are heavy, armed with macrosetae. The abdomen has large dorsal humps. Total length 8 mm. Carapace 4.0 mm long, 3.3 mm wide. First femur, 5.0 mm; patella and tibia, 5.8 mm; metatarsus, 3.0 mm; tarsus, 1.2 mm. Second patella and tibia, 5.5 mm; third, 3.0 mm; fourth, 4.3 mm.

Male is colored and marked like female. The abdomen is longer than wide, with large humps. Total length 5.8 mm. Carapace 3.3 mm long, 2.9 mm wide. First femur, 4.0 mm; patella and tibia, 4.5 mm; metatarsus, 3.0 mm; tarsus, 1.1 mm. Second patella and tibia, 3.9 mm; third, 2.2 mm; fourth, 3.6 mm.

*Variation.* Other females measured 7.8 mm total length, carapace 3.5 mm long, 2.7 mm wide.

*Note.* Males and females have not been collected together, but the massive scape of the female's epigynum is matched by a relatively large median apophysis. Also the abdominal color patterns of male and female match. I believe Archer's match to be incorrect.

*Diagnosis.* Female *Araneus mammatus* has the epigynal openings anterodorsal in the base and invisible in ventral view (Figs. 72, 73). It differs from the two California species (*A. bispinosus* and *A. montereyensis*) by having the base on each side with a longitudinal dark band (Figs. 73, 76) and having the abdomen longer than wide with distinct dorsal markings (Fig. 79). The abdomen of the California species is wider than long. Male *Araneus mammatus* differ from related species by the short embolus of the palpus (Figs. 83, 84), small terminal apophysis (Fig. 82), the single tip on the lower prong of the median apophysis (Figs. 80, 81), and the distinct conductor (Fig. 81).

*Records.* *Arizona.* Cochise Co.: Upper Cave Cr. and Southwestern Research Station, Chiricahua Mts., ♀ (Map 2).

*Araneus bispinosus* (Keyserling)

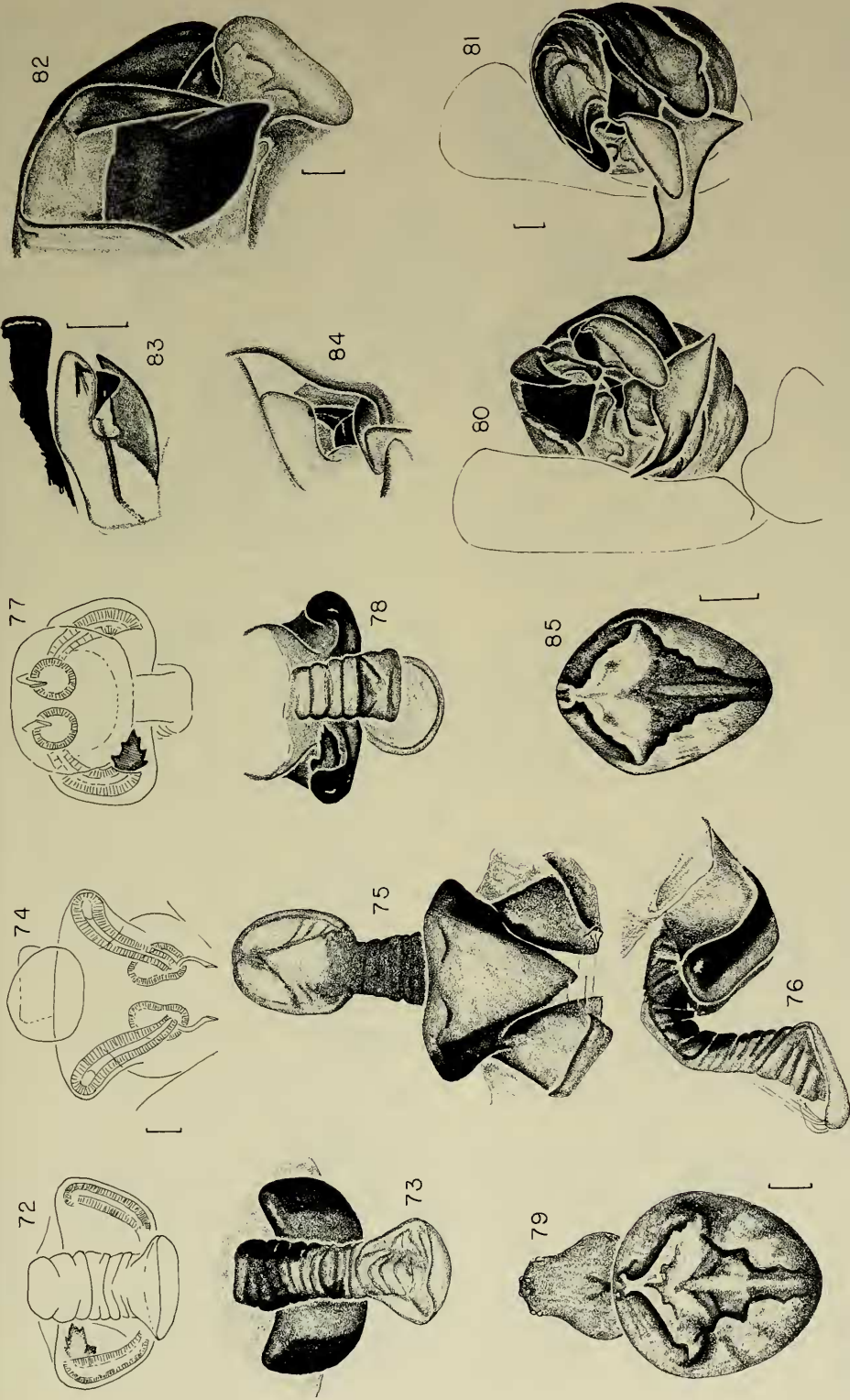
Figures 86–106; Map 3

*Epeira bispinosa* Keyserling, 1885, Verhandl. Zool. Bot. Ges. Wien, 34: 531, pl. 13, fig. 30, ♀. Female holotype from San Diego, California, in the Museum of Comparative Zoology, examined.

*Epeira pacifica* McCook, 1894, American Spiders, 3: 180, pl. 11, fig. 15, ♀. Female lectotype here designated, one female, one male, paralectotypes, in poor condition from San Diego, California, in the Academy of Natural Sciences, Philadelphia, examined; not male paralectotype. First

\* I. J. Cantrall, the collector, personal communication.





Figures 72-85. *Araneus mammatus* (Archer). 72-78. Epigynum. 72. Ventral, cleared. 73. Ventral, cleared. 74. Posterior, cleared. 75. Posterior. 76. Lateral. 77. Anterior, cleared. 78. Anterior. 79. Female. 80-84. Left palpus. 80. Mesal. 81. Ventral. 82. Terminal apophysis. 83-84. Embolus, mesal. 85. Male abdomen. (Size indicators 0.1 mm, for Figs. 79, 85, 1 mm)

synonymized by Banks, 1910, *Bull. U.S. Natl. Mus.* 72: 41.

*Epeira excelsa* Banks, 1896, *J. New York Entomol. Soc.*, 4: 90. Female holotype from Palo Alto, California, in the Museum of Comparative Zoology, examined. First synonymized by Banks, 1910, *Bull. U.S. Natl. Mus.* 72: 41.

*Note.* One specimen of the Chamberlin collection of this species was marked as *A. bonsallae*. Specimens of this collection marked *Araneus bispinosus* all belonged to *A. montereyensis*.

*Description.* Female. Carapace, sternum, legs brown. Dorsum of abdomen with a dark folium and anterior dark (Fig. 94). Venter black between epigynum and spinnerets, with a white longitudinal band on each side. Spinnerets dark. Anterior median eyes three diameters apart. Abdomen is triangular, wider than long with a slight hump anteriorly on each side (Figs. 94, 95). Total length 4.1–6.8 mm. Carapace 1.6–3.0 mm long, 1.5–2.5 mm wide.

Male coloration as in female. Abdomen with distinct lateral lobes. Total length 3.2–5.0 mm. Carapace 1.7–2.4 mm long, 1.5–2.1 mm wide.

*Variation.* The lobes of each side of the epigynum (Fig. 87) are quite variable, as is the length of the embolus.

*Diagnosis.* Female *Araneus bispinosus* is distinct from *A. montereyensis*, *A. mariposa* and *A. monica*, by having the openings of the epigynum toward the anterior, not visible from the venter (Figs. 86–93), and dark marks on their rim (Figs. 91, 92); *A. montereyensis* has the opening visible from the venter; in *A. mariposa* and *A. monica* the openings face dorsally. Also the female usually has a long, folded scape (Fig. 87); that of the other three species is short. Males of *A. bispinosus* differ from those of *A. montereyensis* by having a narrow terminal apophysis (Fig. 98) in the palpus and the conductor sclerotized laterally (Fig. 97), and from both *A. montereyensis* and *A. mariposa* by having a longer median apophysis (Figs. 96, 104–106).

*Natural history.* Numerous collections indicate that the animals were collected by

sweeping chaparral, coastal sage or coastal sage-oak woodland. Males are mature in March to June, females from February to July.

*Distribution.* Central to Southern California (Map 3).

*Araneus mariposa* n. sp.

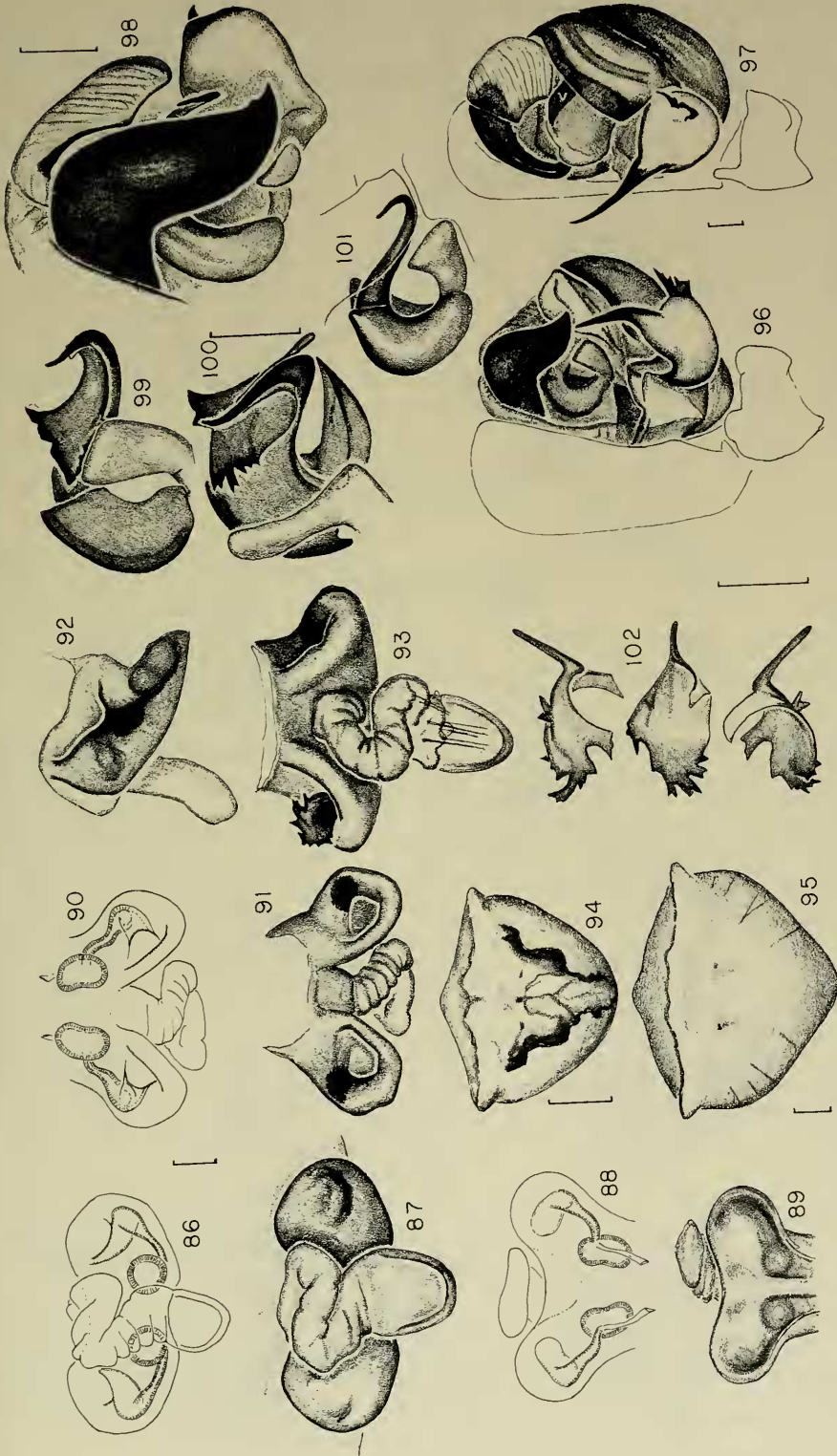
Figures 107, 122–137; Map 3

*Type.* Female holotype from Mt. Bullion, Mariposa County, California, in chaparral, 2 May 1959 (no. 187, R. X. Schick), is in the American Museum of Natural History. The specific name is a noun in apposition after the type locality.

*Description.* Carapace yellow with white setae in head region. Sternum orange, legs orange-yellow. Dorsum of abdomen white with some transverse marks (Fig. 131). White pigment more dense anteriorly toward the humps. Sides with brownish streaks radiating from spinnerets. The venter has gray pigment between epigynum and spinnerets with a white longitudinal line on each side. Spinnerets surrounded by brown anteriorly and on sides. Anterior median eyes three diameters apart, four from laterals. Posterior 1.5 diameters apart, four diameters from laterals. The legs are quite heavy and hairy. Abdomen is triangular with lateral humps and with many hairs. Total length 7.0 mm. Carapace 3.0 mm long, 2.5 mm wide. First femur, 3.0 mm; patella and tibia, 3.7 mm; metatarsus, 2.3 mm; tarsus, 0.9 mm. Second patella and tibia, 3.4 mm; third, 1.8 mm; fourth, 2.9 mm.

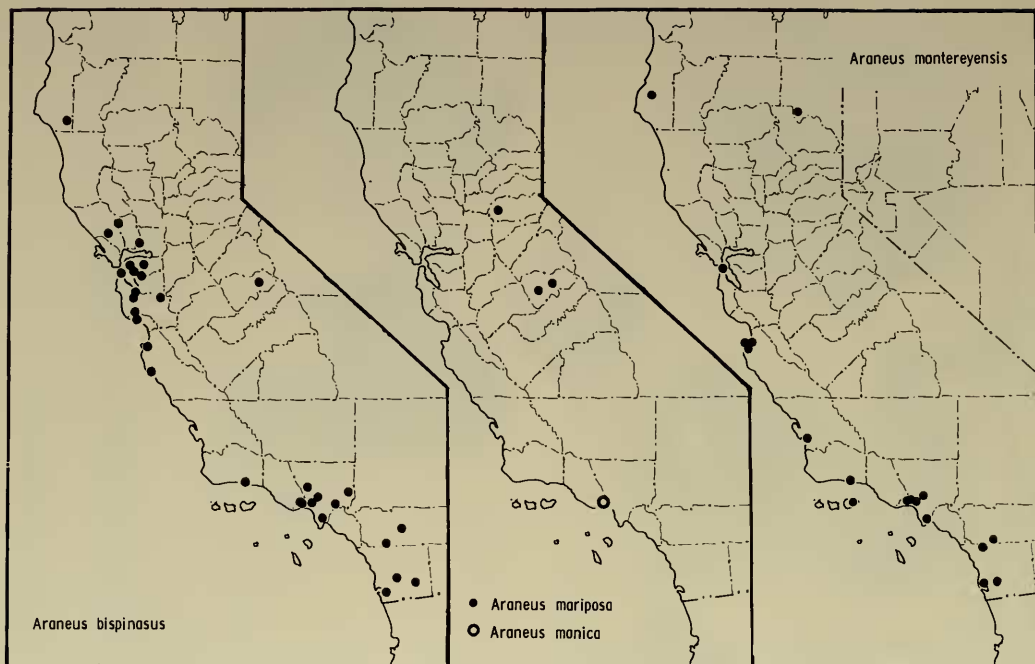
Male coloration as in female, with more black pigment. Legs banded. Narrow longitudinal thoracic line is dark. Anterior median eyes two diameters apart, two from laterals. Posterior median eyes are 1.5 diameters apart, three from laterals. Abdomen triangular with two anterior humps. Neither legs nor coxae modified. Total length, 5.0 mm. Carapace 2.5 mm long, 2.3 mm wide. First femur, 3.6 mm; patella and tibia, 4.3 mm; metatarsus, 3.0 mm; tarsus, 1.0 mm. Second patella and tibia, 3.9 mm; third, 1.8 mm; fourth, 2.2 mm.

*Diagnosis.* Female of *Araneus mariposa*



Figures 86-102. *Araneus bispinosus* (Keyserling). 86-93. Epigynum. 86. Ventral, cleared. 87. Ventral. 88. Posterior, cleared. 89. Posterior. 90. Anterior, cleared. 91. Anterior. 92. Lateral. 93. Anterior with embolus cap. 94, 95. Female abdomen. 96-102. Left palpus. 96. Mesal. 97. Ventral. 98. Terminal apophysis. 99, 100. Virgin embolus with tip. 101. Embolus. 102. Embolus cap.  
 (Size indicators 0.1 mm, for abdomen 1 mm)





Map 3. Distributions of small California species of *Araneus*.

differs from *A. bispinosus* and *A. montereyensis* female in having the epigynal openings face dorsally (Figs. 126, 129, 130), from *bispinosus* by the short, straight scape (Fig. 123), and from *A. monica* by having the openings larger and bordered all around (Fig. 126). The median apophysis of the male (Fig. 107) is much shorter than that of *A. bispinosus*.

**Records. California.** Eldorado Co.: near Nashville, 25 April 1958, ♂ paratype, 25 April 1958, in Berlese sample of clay loam (R. O. Schuster and Smith). Mariposa Co.: El Portal, 2 May 1959, 2 ♂ paratypes (R. X. Schick) (Map 3).

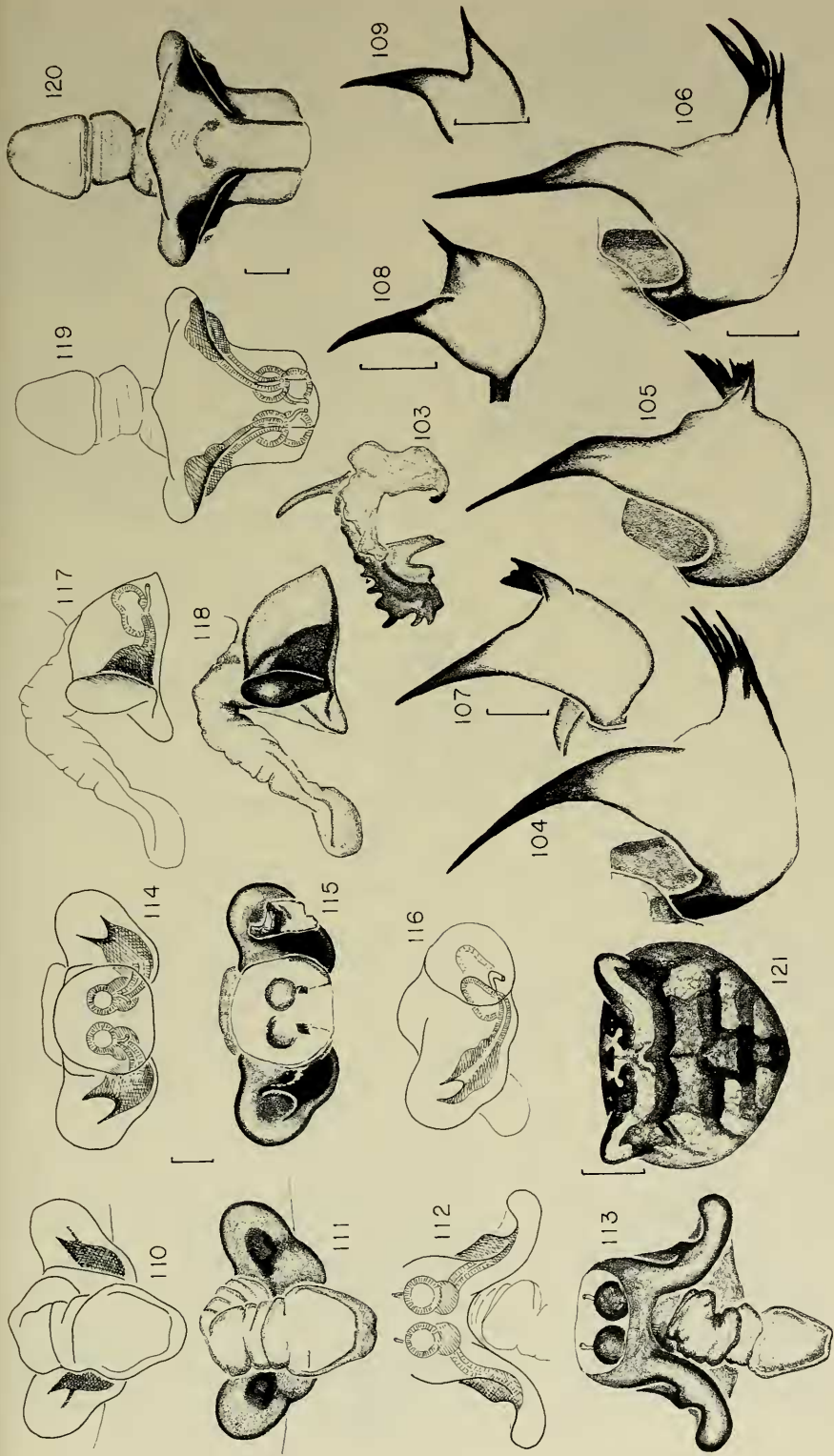
*Araneus monica* n. sp.

Figures 110–121; Map 3

**Type.** Female holotype from Santa Monica Mts., Los Angeles County, California, April 1953 (R. X. Schick) in the American Museum of Natural History. The name is a noun in apposition after the type locality.

**Description.** Female carapace yellowish brown with some gray. Posterior median eyes and lateral eyes on black spots. Sternum dark brown. Legs indistinctly banded. Dorsum of abdomen with transverse bars, which are shorter posteriorly with white on each side. Anterior of bars above pedicel is a white triangle, pointing to pedicel (Fig. 121). Black between epigynum and spinnerets, white on each side. Anterior median eyes 1.5 diameters apart, 1.5 from laterals. Posterior median eyes slightly more than one diameter apart, 2.5 from laterals. The abdomen is triangular with very distinct, long humps. Total length 5.5 mm. Carapace 2.3 mm long, 1.9 mm wide. First femur, 2.3 mm; patella and tibia, 2.7 mm; metatarsus, 1.8 mm; tarsus, 0.7 mm. Second patella and tibia, 2.6 mm; third, 1.6 mm; fourth, 2.2 mm.

**Diagnosis.** *Araneus monica* differs from the sympatric *A. bispinosus* and *A. montereyensis* by having the epigynal openings face dorsally (Figs. 114–118), and from *A.*



Figures 103-106. *Araneus bispinosus* (Keyserling), left palpus. 103. Embolus cap, different individual. 104-106. Median apophysis. Figure 107. *Araneus mariposa* n. sp., median apophysis. Figures 108-109. *Araneus montereyensis* (Archer), median apophysis. Figures 110-121. *Araneus monica* n. sp. 110. Ventral, cleared. 111. Ventral, cleared. 112. Anterior, cleared. 113. Anterior, cleared. 114. Dorsal, cleared. 115. Dorsal. 116. Dorsolateral, cleared. 117. Lateral, cleared. 118. Lateral, cleared. 119. Posterior, cleared. 120. Posterior, cleared. 121. Female abdomen. (Size indicators 0.1 mm, for abdomen 1 mm)

*bispinosus* by having a shorter scape (Fig. 111). *Araneus monica* is distinct from *A. mariposa* in having the openings smaller and bordered only posteriorly and toward the median (Fig. 115).

*Araneus montereyensis* (Archer)

Figures 108, 109, 138–151; Map 3

*Epeira pacifica*.—McCook, 1894, American Spiders, 3: 180, pl. 11, fig. 16, ♂. Male paralectotype from San Diego, California, here designated in the Academy of Natural Sciences, Philadelphia; not lectotype.

*Conaranea montereyensis* Archer, 1951, Amer. Mus. Novitates, No. 1502: 8, figs. 3, 24, 25, ♀, ♂. Female holotype from Monterey, California, in the American Museum of Natural History, examined.

*Note.* In the Chamberlin collection specimens of this species were marked *A. bispinosus*.

*Description.* Female carapace light brown, head region black; black area often going to the thoracic depression (Fig. 144) and with black border. Sternum dark brown. Coxae light brown. Legs light brown, with narrow dark brown bands. Dorsum of abdomen black anteriorly and with dark folium; sides black, clearly delineated toward dorsum (Figs. 143–144). Venter black between epigynum and spinnerets, with a longitudinal white band on each side. Anterior median eyes 1.5 diameters apart, two diameters from laterals; posterior median eyes are slightly more than one diameter apart, 2.5 diameters from laterals. The abdomen is subtriangular with indistinct humps. Total length 3.2–5.5 mm. Carapace 1.8–2.0 mm long, 1.4–1.9 mm wide.

Male coloration like that of female. Thoracic depression is a shallow longitudinal pit. Anterior median eyes 1.5 diameters apart, 1.5 from laterals. Posterior median eyes 1.2 diameters apart, slightly more than two from laterals. Total length 3.5–3.6 mm. Carapace 1.8–2.0 mm long, 1.5–1.7 mm wide.

*Variation.* There is considerable variation in color. Sometimes the thorax is lighter. The anterior abdominal band is

generally broken in middle. The distal branch of the median apophysis of the palpus may be a single tip (Fig. 109) or may have teeth (Fig. 108). This would place the specimens in different genera were we to follow Archer's system of generic classification.

*Diagnosis.* The females differ from those of *A. bispinosus* by having less distinct humps on the abdomen (Fig. 144), and from other *A. bispinosus* and other California species by having the opening of the epigynum show in ventral view. The scape is short (Figs. 138, 139) and not folded as in *A. bispinosus*. The wide terminal apophysis of the palpus (Fig. 147), the bottle-shaped conductor (Fig. 146), and the almost circular median apophysis (Figs. 108, 109, 145) readily separate *A. montereyensis* from other California species.

*Natural history.* Specimens have been collected on a eucalyptus tree, in upper branches of small trees (*Ceanothus* sp.) and in chaparral and coastal oak woodland. Males are mature from January to June, adult females have been collected until October. Some collections are with *A. bispinosus*.

*Distribution.* Central and Southern California (Map 3).

*Araneus miniatus* (Walckenaer)

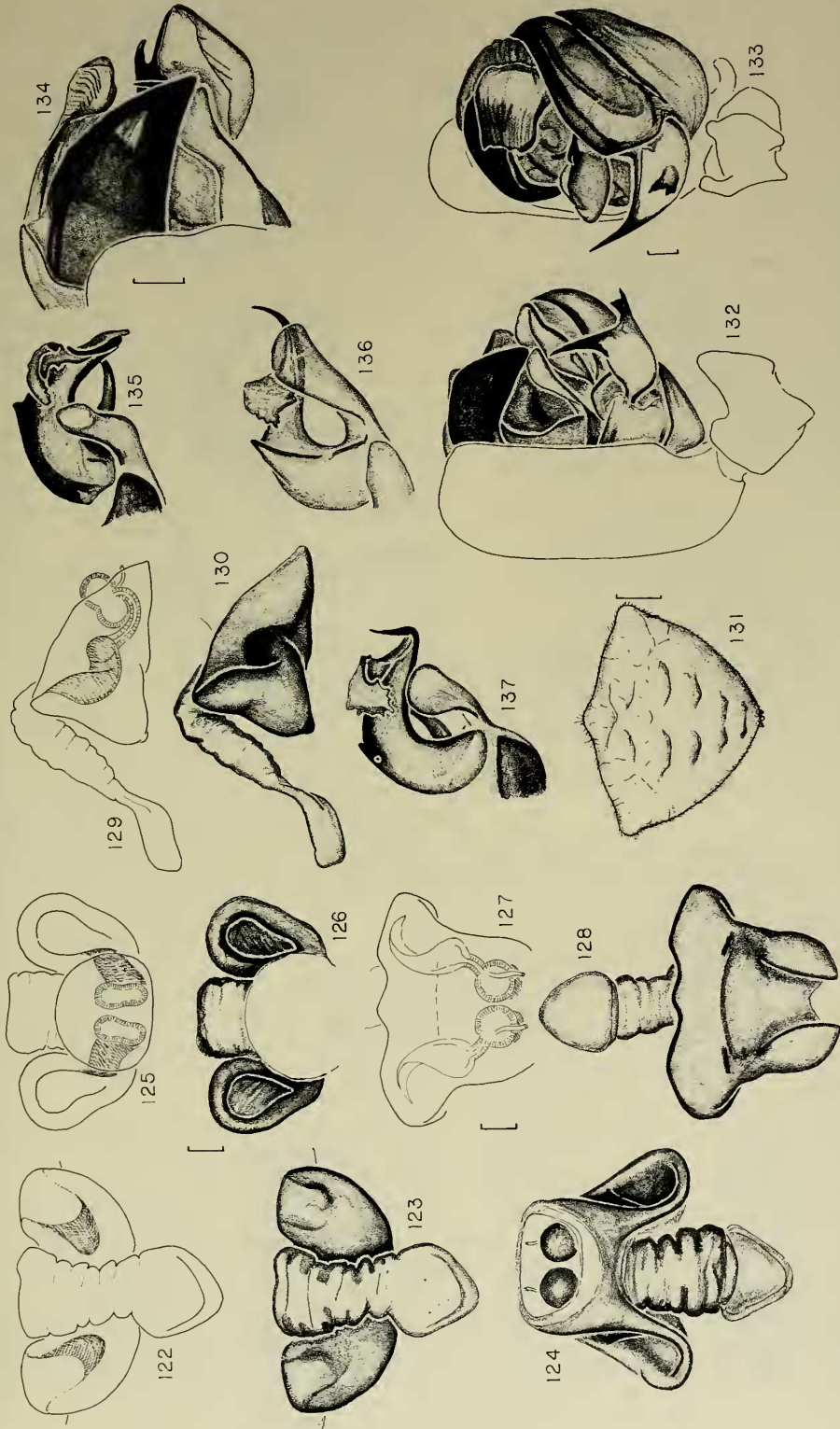
Figures 158–171; Map 4

*Epeira miniata* Walckenaer, 1841, Histoire Naturelles des Insectes. Aptères, 2: 39. The types are Abbot's manuscript Spiders of Georgia, figs. 228–230, of which I here choose fig. 228 lectotype, in the British Museum, Natural History. Copies in the Museum of Comparative Zoology, examined. McCook, 1894, American Spiders, 3: 177, pl. 8, figs. 8, 9 [pl. 10, figs. 7, 8 as *E. reticulata*], ♀, ♂.

*Epeira scutulata* Hentz, 1850, J. Boston Natur. Hist. Soc., 6: 19, pl. 3, fig. 3, ♂. Male type from Alabama, destroyed. Emerton, 1902, Common Spiders, p. 178, fig. 415, ♀. Name first synonymized by McCook, 1894.

*Larinia nigrofoliata* Keyserling, 1883, Verhandl. Zool. Bot. Ges. Wien, 32: 653, pl. 21, fig. 5, ♂. Male holotype from "Summit Canyon, Utah" (however, marked "Col." or "Cal." not Utah on label, G. Marx collection) in the United States National Museum, stored in the American Museum of Natural History, examined. Collecting





Figures 122-137. *Araneus mariposa* n. sp. 122-130. Epigynum. 122. Ventral, cleared. 123. Ventral. 124. Anterior. 125. Dorsal, cleared. 126. Dorsal. 127. Posterior, cleared. 128. Posterior. 129. Lateral, cleared. 130. Lateral. 131. Female abdomen. 132-137. Left palpus. 132. Mesal. 133. Ventral. 134. Terminal apophysis. 135-137. Virgin embolus.

(Size indicators 0.1 mm, for abdomen 1 mm)

localities in error. 1893, *Spinnen Amerikas*, 4: 291, pl. 15, fig. 215, ♂. Roewer, 1942, *Katalog der Araneae*, 1: 772. Bonnet, 1957, *Bibliographia Araneorum*, 2: 2350. NEW SYNONYMY. *Epeira floridensis* Banks, 1904, *Proc. Acad. Natur. Sci. Philadelphia*, 56: 129, pl. 7, fig. 5, ♀. Female holotype from Miami, Florida, in the Museum of Comparative Zoology, examined. NEW SYNONYMY.

*Araneus miniatus*.—Petrunkevitch, 1911, *Bull. Amer. Mus. Natur. Hist.*, 29: 303. Bonnet, 1955, *Bibliographia Araneorum*, 2: 544.

*Araneus floridensis*.—Petrunkevitch, 1911, *Bull. Amer. Mus. Natur. Hist.*, 29: 292. Bonnet, 1955, *Bibliographia Araneorum*, 2: 504.

*Aranea miniata*.—Comstock, 1912, *Spider Book*, p. 474, fig. 492, ♀. 1940, rev. ed., p. 488, fig. 492, ♀. Roewer, 1942, *Katalog der Araneae*, 1: 861. Kaston, 1948, *Connecticut Geol. Natur. Hist. Surv.*, 70: 252, fig. 790, ♀.

*Aranea floridensis*.—Roewer, 1942, *Katalog der Araneae*, 1: 842.

*Epeira guttulata*.—Chamberlin and Ivie, 1944, *Bull. Univ. Utah, biol. ser.*, 8(5): 99.

*Conepeira partita*.—Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 13, fig. 63, ♀ (not ♂).

*Conepeira floridensis*.—Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 14, figs. 38, 58, ♀, ♂.

*Conepeira miniata*.—Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 15, figs. 36, 37, 61, ♀, ♂.

*Conepeira dawsoni* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 16, figs. 13, 39, 53, 59, ♀, ♂. Male holotype from Centreville, Wilkinson Co., Mississippi, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* Since this species has been called *miniatus* from the time of McCook (more than 50 years), I will keep the name, although the Abbot illustrations are not convincing. I chose fig. 228 of Abbot lectotype since the others do not have lateral humps. There are no specimens marked *Epeira reticulata* in the McCook collection. While the type of *Larinia nigrofoliata* has the characteristic pattern, that of *E. floridensis* Banks is bleached white. Banks, however, described the pattern to be "like *E. scutulata*." The type locality of *L. nigrofoliata*, Marx collection, is almost certainly in error, regardless whether Utah, Colorado, or California. The two Chamberlin specimens from Georgia of this species had been misidentified as *Epeira guttulata* (Chamberlin and Ivie, 1944). Other specimens in the Chamberlin collection were marked *miniata*

in 1942, *Araneus* sp. B, in 1933. The Figures 159, 163, 164 were prepared from the paratype of *Conepeira dawsoni* Archer. In collections *A. miniatus* and *A. partitus* had both been labeled *miniatus* or *scutulata*.

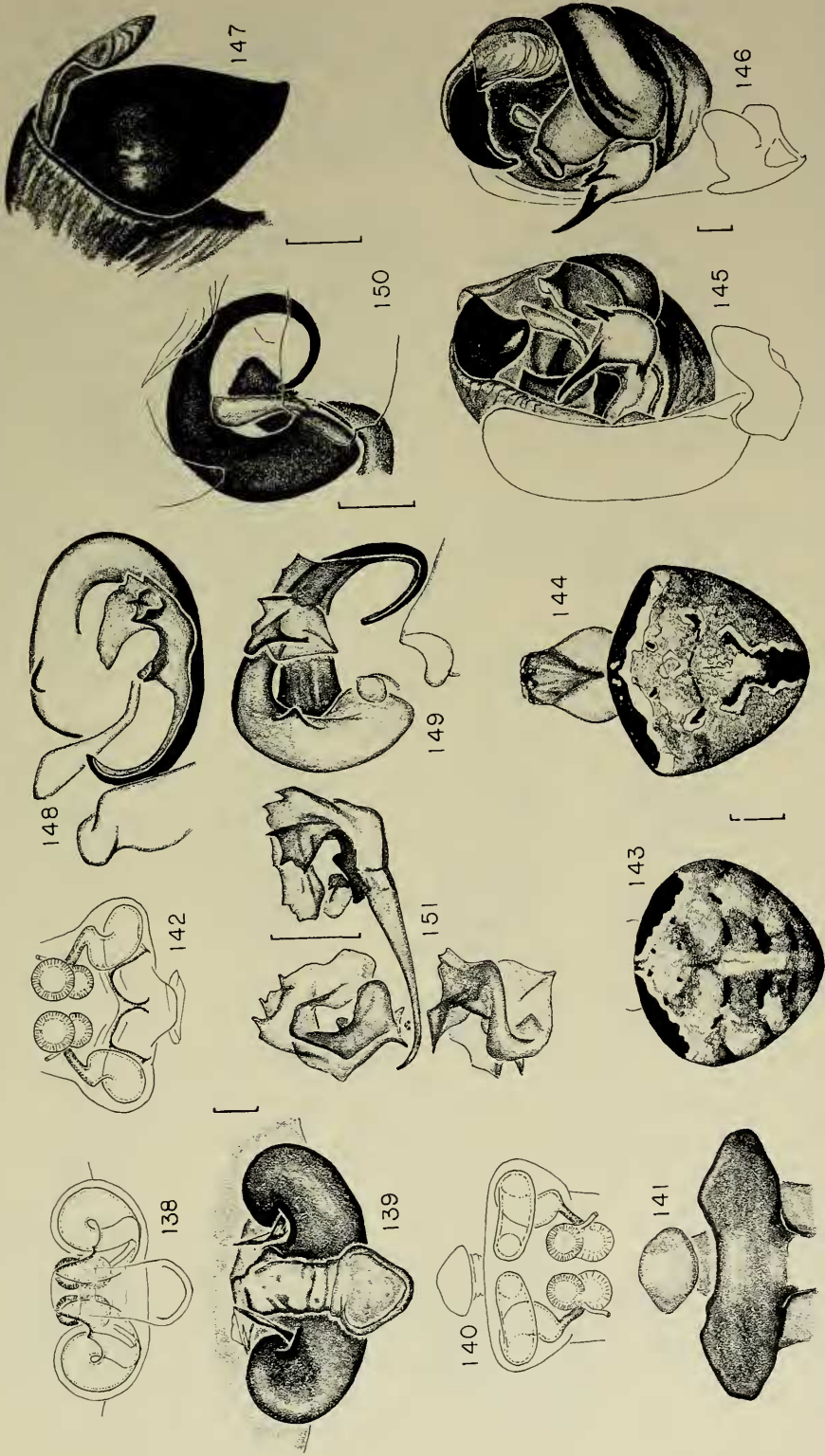
*Description.* Female carapace, sternum yellow. Legs yellowish, distal ends of articles darker. Dorsum of abdomen with transverse white band, three pairs of black spots posterior and between them a darker folium (Fig. 164). Anterior of white transverse band, the abdomen is darker spotted with some black spots around the outside. Sides of abdomen with some white pigment; venter with two pairs of white longitudinal pigment bands between epigynum and spinnerets, yellowish inbetween. The abdomen is wider than long (Fig. 164). Total length 3.0–4.7 mm. Carapace 1.4–1.9 mm long, 1.2–1.7 mm wide.

Male carapace, sternum, legs yellow. Dorsum of abdomen with pattern similar to that of female. Carapace with a shallow, longitudinal groove. The abdomen is triangular. Total length 2.5–3.7 mm. Carapace 1.4–1.9 mm long, 1.2–1.6 mm wide.

*Note.* The embolus cap that breaks off is heart-shaped (Figs. 161, 162, 171). The part hanging out of the epigynum is the part closest to the base of the embolus; the inserted part the one closest to the tip. The inserted part of the cap has a hook which fastens it into the epigynum and usually makes its removal difficult or impossible without breaking (Fig. 171). The hook on the cap is not visible in Figure 169 because the embolus was drawn through a cleared palpus. Normally in the contracted palpus the embolus is almost completely hidden (Figs. 165, 166).

*Variation.* Florida specimens are noticeably smaller and lighter than those from other parts of the range.

*Diagnosis.* *Araneus miniatus* and *A. partitus* differ from other eastern species of small *Araneus* by having the abdomen wider than long in the female (Fig. 164), as wide as long in the male, and dorsally marked with spots around the periphery. (*A. alboventris* has the abdomen wider than



Figures 138-151. *Araneus montereyensis* (Archer). 138-142. Epigynum. 138. Ventral, cleared. 139. Ventral, cleared. 140. Posterior, cleared. 141. Posterior, cleared. 142. Anterior, cleared. 143. Female abdomen. 144. Female. 145-150. Left palpus. 145. Mesal. 146. Ventral. 147. Terminal apophysis. 148-149. Virgin embolus. 150. Embolus. 151. Caps. (Size indicators, 0.1 mm, for Figs. 143, 144, 1 mm)



long, but with a central dorsal black patch.) The male, like those of *A. partitus* and *A. alboventris*, lacks two macrosetae on the cymbium. The female of *A. miniatus* differs from that of *A. partitus* by having a wrinkled scape (Figs. 159–162); the embolus of the *A. miniatus* male palpus is an evenly tapering pointed structure (Figs. 165, 169, 170), while that of *A. partitus* has almost parallel sides and is blunt at its tip, and that of *A. alboventris* is twisted.

*Natural history.* Specimens have been collected from citrus groves and water oak (*Quercus nigra*) forests in Florida. In Florida males are mature from January to August, and farther north, from March. Females are mature from March (Florida) to August.

*Distribution.* Eastern United States, from Woods Hole, Massachusetts, to north-eastern Texas and Florida (Map 4).

#### *Araneus partitus* (Walckenaer)

Figures 177–191; Map 4

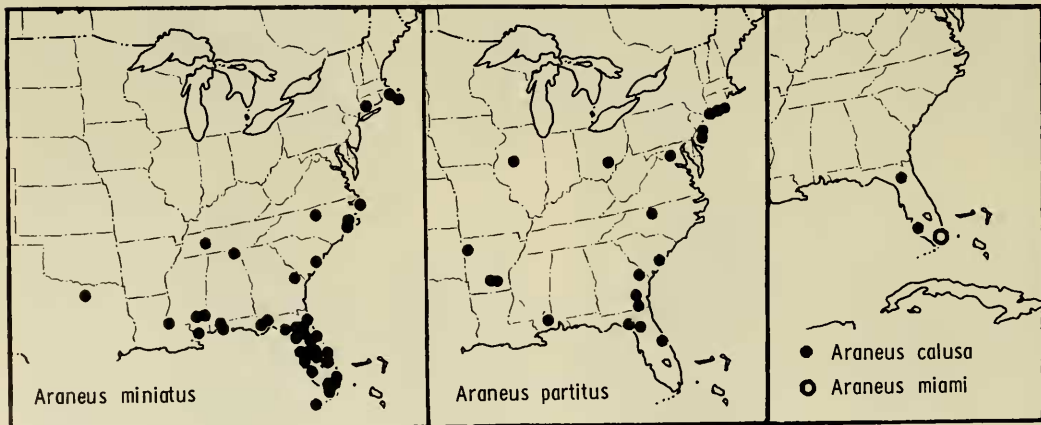
*Epeira partita* Walckenaer, 1841, *Histoire Naturelles des Insectes. Aptères*, 2: 46. The type is Abbot's manuscript *Spiders of Georgia*, fig. 40, in the British Museum, Natural History. Copies in the Museum of Comparative Zoology, examined.

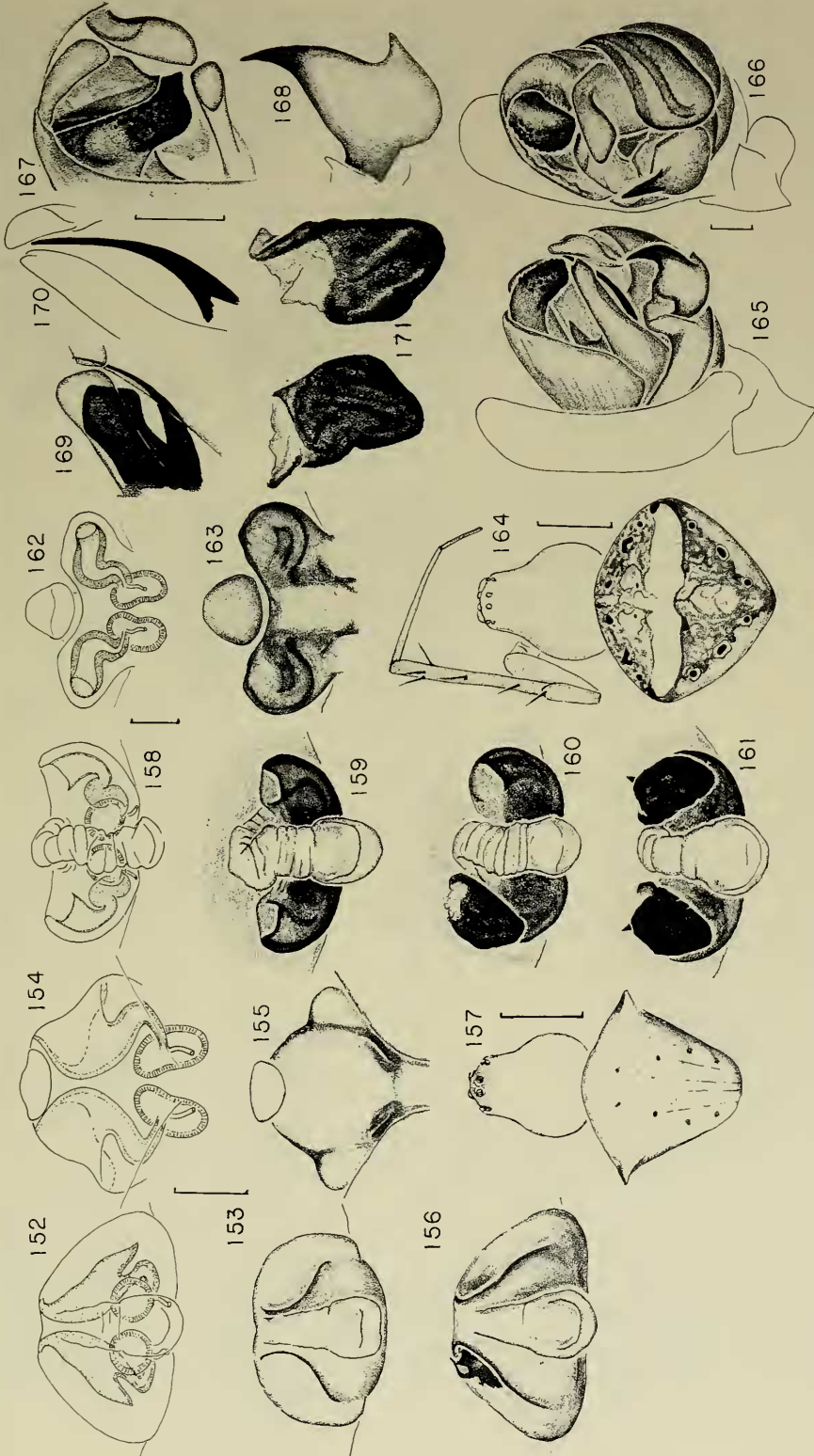
*Epeira punctillata* Keyserling, 1879, *Verhandl. Zool. Bot. Ges. Wien*, 29: 304, pl. 4, fig. 7, ♂. Male holotype from Peoria, Illinois, in the British Museum, Natural History, examined. NEW SYNONYMY.

*Conepeira partita*.—Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 13, fig. 34 [not 63, ♀].  
*Conepeira atlantis* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 13, figs. 32, 35, ♂ [not fig. 60, ♀]. Male fragment from Lakehurst, New Jersey, 1 May 1912 (J. H. Emerton), under leaves, in the Museum of Comparative Zoology, examined. NEW SYNONYMY.

*Note.* Archer as first reviser decided that *A. partita* is a different species from *miniatus*. Archer designated a neotype, which is invalid, according to the International Code on Zoological Nomenclature, because the original type, Abbot's illustration, is still in existence. But then Archer gave the new name *atlantis* to the same species; the holotype is a male. The female labeled *A. partita* by Archer is *A. miniatus*, the female *A. atlantis* is also *A. miniatus*. The use of the Walckenaerian name does not upset usage of names, although Chamberlin and Ivie (1944) labeled *partitus* specimens as *A. miniatus*; previously Chamberlin specimens had been labeled *Araneus* sp. A in 1933. Also a Barrows specimen from Ohio had been labeled *miniatus*.

*Description.* Female carapace, legs, sternum yellowish white. Posterior median eyes on small black tubercles. Dorsum of abdomen with four pairs of black spots posteriorly, bordered by small light pairs anteriorly; there are black marks on humps. The area between the humps is white, pos-





Figures 152-157. *Araneus calusa* n. sp. 152-156. Epigynum. 152. Ventral, cleared. 153. Ventral. 154. Posterior, cleared. 155. Posterior. 156. Ventral with cap of embolus. 157. Female.  
 Figures 158-171. *Araneus miniatus* (Walckenaer). 158-163. Epigynum. 158. Ventral, cleared. 159. Ventral. 160, 161. Ventral with embolus caps. 162. Posterior, cleared. 163. Posterior. 164. Female. 165-171. Left palpus. 165. Mesal. 166. Ventral. 167. Terminal apophysis. 168 Median apophysis. 169. Virgin embolus. 170. Embolus. 171. Embolus cap.  
 (Size indicators 0.1 mm, for females 1 mm)

terior to it gray, and anterior to it also irregularly gray. The sides and venter of the abdomen are covered by white pigment spots. The abdomen is wider than long with lateral humps (Fig. 183). Total length 3.3–4.3 mm. Carapace 1.5–1.7 mm long, 1.2–1.4 mm wide.

Male coloration more or less like that of female with pairs of black spots on the dorsum (Fig. 191). The abdomen has slight humps, and is pointed behind. Total length 2.7–3.3 mm. Carapace 1.5–1.6 mm long, 1.2–1.4 mm wide. First femur, 2.2 mm; patella and tibia, 2.5 mm; metatarsus, 1.8 mm; tarsus, 0.7 mm. Second patella and tibia, 1.9 mm; third, 1.0 mm; fourth, 1.5 mm.

*Diagnosis.* *Araneus miniatus*, *A. calusa* and *A. partitus* are the only eastern species of small *Araneus* that have the abdomen wider than long in the female and the periphery of the dorsum spotted. The female differs from that of *A. miniatus* and all other small *Araneus* species by having a short, smooth (not wrinkled) scape attached to the middle of the venter of the base (Figs. 177, 179, 180). The male differs from all related eastern species, except *A. miniatus* and *A. alboventris*, by lacking two macrosetae on the cymbium, and from those also by the truncate shape of its embolus (Figs. 185, 189) and by the median apophysis having only one tip (Fig. 188).

*Natural history.* Nothing on collecting labels suggests differences in habits that distinguish *A. partitus* from *A. miniatus*. The males are also mature in spring.

*Distribution.* Long Island to Arkansas and Florida (Map 4).

*Araneus calusa* n. sp.

Figures 152–157; Map 4

*Type.* Female holotype from Koreshan State Park, Lee County, Florida, 2 February 1971, in few strands of silk on underside of palm leaf, live oak stand, *Vitis*, collected by Susan Riechert, in the Museum of Comparative Zoology. The name is a noun in apposition after a Florida Indian tribe.

*Description.* Female carapace yellowish white with yellow rings around posterior

median eyes. Some black pigment behind lateral eyes. Red spots on first leg; second leg with few red spots on the base of macrosetae. Dorsum of abdomen with white pigment and indistinct, maculated orange lines and spots. A distinct red mark anterior on each lateral hump. A pair of red spots posteriorly on each side. Venter lacking white pigment. The abdomen is somewhat triangular with anterior lateral pointed humps (Fig. 157). Total length 2.9 mm. Carapace 1.4 mm long, 1.2 mm wide. First femur, 1.7 mm; patella and tibia, 2.0 mm; metatarsus, 1.4 mm; tarsus, 0.6 mm. Second patella and tibia, 1.5 mm; third, 0.5 mm; fourth, 1.3 mm.

*Variation.* Total length varies from 2.9 to 3.8 mm, carapace length from 1.8 to 1.4 mm, width from 1.4 to 1.2 mm.

*Diagnosis.* *Araneus calusa* differ from *A. miniatus* and *A. partitus* by having the openings of the epigynum behind a diagonal lip (Figs. 153, 156) rather than at the anterior of the base.

*Records. Florida.* Alachua Co., ♀ paratype, 24 June 1958 (H. A. Denmark, FSC); 6.2 mi. W of Newberry, 1941, ♀ paratype (H. K. Wallace, HKW) (Map 4).

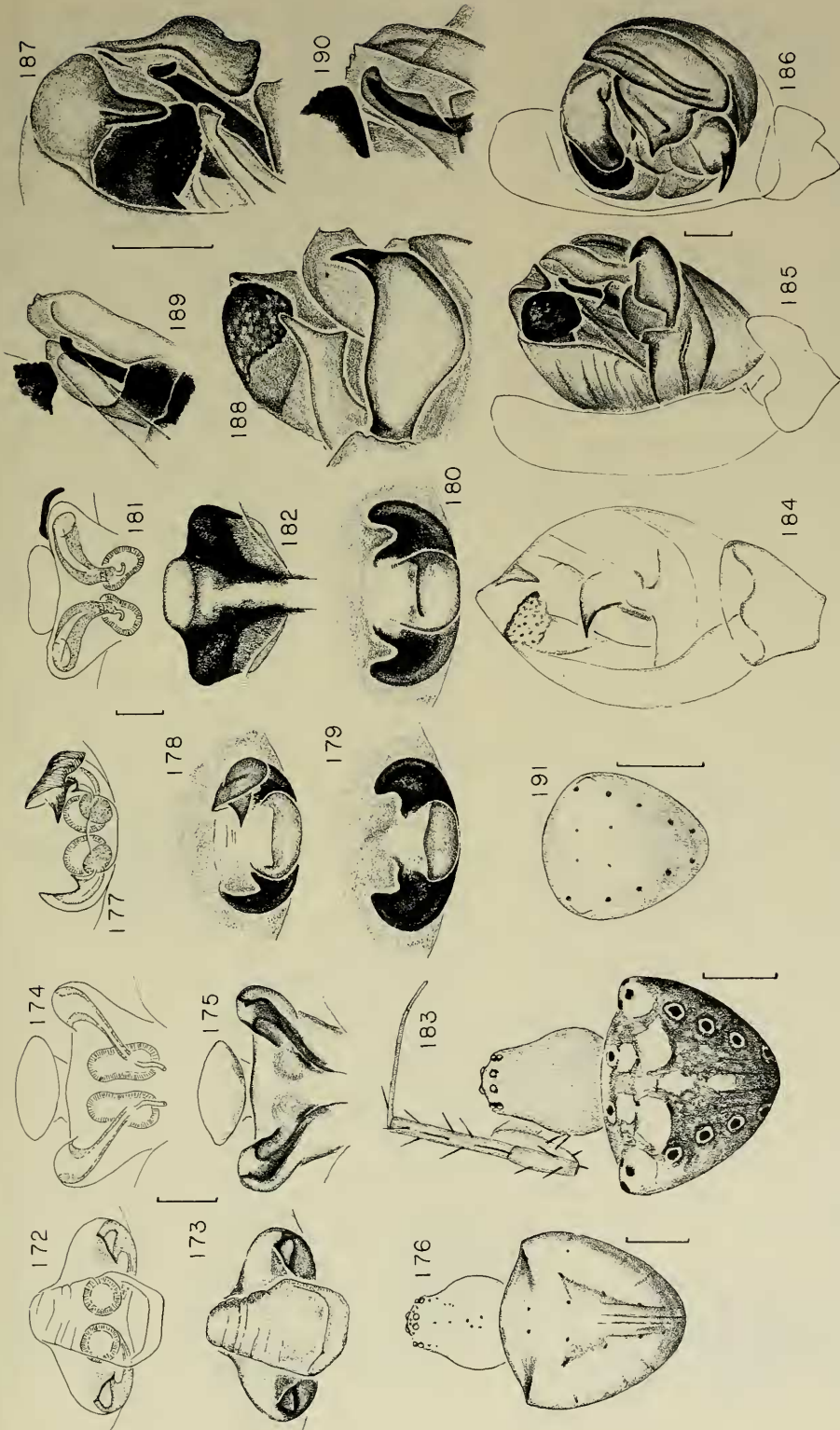
*Araneus miami* n. sp.

Figures 172–176; Map 4

*Type.* Female holotype from Biscayne Bay, Florida (N. Banks Collection) in the Museum of Comparative Zoology. The name is a noun in apposition after the type locality.

*Description.* Female carapace yellow with scattered black spots. Sternum with scattered black spots. Legs yellowish with scattered black spots. Dorsum of abdomen dark anteriorly between humps, with a dark spot on anterior of each hump, and a brown folium posteriorly on dorsum. Folium is narrower behind than in front, with sides concave (Fig. 176). Sides white. Venter with a white median quadrangular patch, slightly darker on sides. The abdomen is subspherical, shield-shaped in dorsal view, with anteriorly directed humps. Total length 4.5 mm. Carapace 1.6 mm long,





Figures 172-176. *Araneus miami* n. sp. 172. Ventral, cleared. 173. Ventral, cleared. 174. Posterior, cleared. 175. Posterior, cleared. 176. Female. Figures 177-191. *Araneus partitus* (Walckenaer). 177. Ventral, cleared. 178-180. Ventral, cleared. 181. Posterior, cleared. 182. Posterior, cleared. 183. Female. 184-190. Left palpus. 184. Before last molt. 185. Mesal. 186. Ventral. 187. Terminal apophysis. 188. Median apophysis. 189. Virgin embolus, cleared. 190. Embolus, cleared. 191. Male abdomen. (Size indicators 0.1 mm, for Figs. 176, 183, 191, 1 mm)

1.4 mm wide. First femur, 2.5 mm. All other leg segments broken off.

*Diagnosis.* *Araneus miami* differs from other species of the *A. juniperi* group by the shape of the abdomen (Fig. 176) and by the epigynum (Figs. 173, 175) having a short scape and openings far apart with a diagonal rim.

*Araneus alboventris* (Emerton)

Plate 6; Figures 192–203, 443; Map 5

*Epeira alboventris* Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 314, pl. 34, fig. 5, pl. 36, fig. 12, ♀. Female holotype from Peabody, Massachusetts, in the Museum of Comparative Zoology. Not *Epeira albiventer* Keyserling (= *Eustala albiventer*).

*Araneus attestor* Petrunkevitch, 1911, Bull. Amer. Mus. Natur. Hist., 29: 280. New name because *alboventris* erroneously thought preoccupied by Keyserling. Bonnet, 1955, Bibliographia Araneorum, 2: 440.

*Aranea alboventris*,—Roewer, 1941, Katalog der Araneae, 1: 859.

*Epeira attestor*,—Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 260, figs. 791–792, ♀.

*Conepeira alboventris*,—Archer, 1951, Amer. Mus. Novitates, No. 1502: 20, figs. 47, 71, ♀, ♂.

*Note.* According to the present International Code of Zoological Nomenclature (1961) *albiventer* and *alboventris* are not homonyms, and the original name for this species, *alboventris*, can be used.

*Description.* Female, when alive, with carapace, sternum, legs greenish yellow. Bright yellow rings around posterior median eyes. Abdomen dorsum with a black patch bordered by crimson red border on golden yellow background (Plate 6, Figs. 196, 197). Specimens in alcohol have prosoma yellowish, abdomen white with only a triangular dorsal black patch. The abdomen is subtriangular, as wide as long, almost circular. Total length 2.4–3.8 mm. Carapace 1.4–1.6 mm long, 1.1–1.3 mm wide.

Male coloration like that of female. Total length 1.5–2.5 mm. Carapace 1.3 mm long, 1.0 mm wide.

*Diagnosis.* Freshly collected *A. alboventris* can be recognized immediately by their unique red-bordered black patch on the golden yellow abdomen. Alcoholic speci-

mens of *A. alboventris*, like those of *A. niveus* and *A. glypticus*, have a median dorsal black patch on the abdomen, but differ by having the abdomen usually slightly wider than long or as wide as long. Females also differ by the short wide scape and the large lateral pocketlike openings in the base (Fig. 193). Males differ from almost all eastern species (except *A. tuscarora*, *A. miniatus* and *A. partitus*) by lacking the two macrosetae on the cymbium. They also differ from these two and from all other species by the coiled, tapering embolus (Figs. 202, 203), and very thin long basal tooth of the conductor (Figs. 199, 201). *Araneus alboventris* differs from *A. tuscarora* in having a black spot on the abdomen and in the position of the lateral openings of the epigynum, farther apart anteriorly than posteriorly (Fig. 193).

*Natural history.* One female was collected under leaf of a shrub in the center of a meadow in Vermont. No web was nearby. The female had probably oviposited.

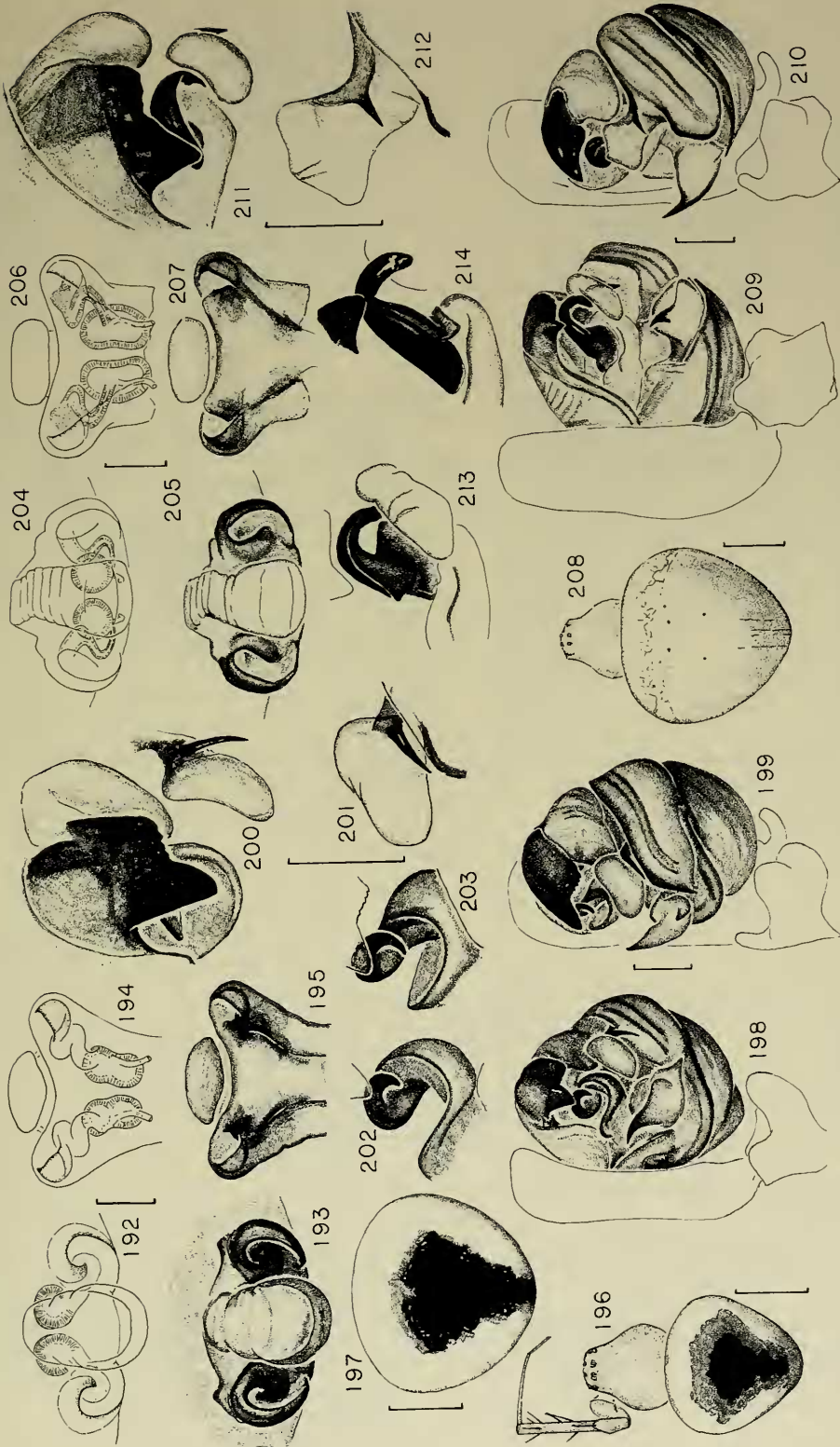
*Distribution.* New England to Georgia (Map 5). After completion of this paper a female was received from jack pine (*Pinus banksiana*) 1 mi. north of Oylen, Wadena Co., Minnesota, 25 June 1972 (B. Cutler) which lacked the black spot and had a narrower scape. It may belong to a different species.

*Araneus tuscarora* n. sp.

Figures 204–214, 444; Map 5

*Type.* Female holotype from broom-sedge field, 1.1 miles south of Durham on North Carolina route 55, Durham Co., North Carolina, 8 September 1964 (J. W. Berry), in the Museum of Comparative Zoology. The name is a noun in apposition after a Carolina Indian tribe.

*Description.* In alcohol, female carapace yellowish brown. Legs, sternum yellowish brown, legs with distal segments darker. Dorsum of abdomen yellowish brown with an anterior transverse band consisting of tiny white spots, posterior with some scattered tiny white spots (Fig. 208). Venter with white spots anterior to pedicel. Sec-



Figures 192-203. *Araneus alboventris* (Emerton). 192-195. Epigynum. 192. Ventral, cleared. 193. Ventral, cleared. 194. Posterior, cleared. 195. Posterior. 197. Female abdomen, color washed out. 198-203. Left palpus. 198. Mesal. 199. Ventral. 200. Terminal apophysis. 201. Conductor. 202, 203. Embolus. Figures 204-214. *Araneus tuscarrora* n. sp. 204-207. Epigynum. 204. Ventral, cleared. 205. Ventral, cleared. 206. Posterior, cleared. 207. Posterior. 208. Female. 209-214. Palpus. 209. Mesal. 210. Ventral. 211. Terminal apophysis. 212. Conductor. 213, 214. Virgin embolus. (Size indicators 0.1 mm, for Figs. 196, 197, 208, 1 mm)



ondary eyes 0.8 diameters of anterior median eyes. Anterior median eyes their diameter apart, their diameter from laterals. Posterior median eyes 1.5 diameters apart, 2.5 diameters from laterals. Abdomen is triangular with posterior overhanging spinnerets. Total length 3.7 mm. Carapace 1.36 mm long, 1.18 mm wide. First femur, 1.18 mm; patella and tibia, 1.46 mm; metatarsus, 1.01 mm; tarsus, 0.50 mm. Second patella and tibia, 1.25 mm; third, 0.82 mm; fourth, 1.20 mm.

Male carapace, sternum, legs yellowish orange-brown. Dorsum of abdomen orange-brown without white pigment. Secondary eyes 0.8 diameters of anterior medians. Anterior median eyes 1.5 diameters apart, 1.2 diameters from laterals. Posterior median eyes 1.2 diameters apart, 2 diameters from laterals. The abdomen is triangular but somewhat narrower than that of female. There are no setae on the cymbium of the palpus. Only one strong and one weak seta are on the palpal patella. Total length 2.9 mm. Carapace 1.32 mm long, 1.18 mm wide. First femur 1.37 mm; patella and tibia, 1.62 mm; metatarsus, 1.19 mm; tarsus, 0.52 mm. Second patella and tibia, 1.49 mm; third, 0.83 mm; fourth, 1.21 mm.

*Diagnosis.* *Araneus tuscarora* differs from *A. alboventris* by lacking a red-bordered black spot on the dorsum of the abdomen (Fig. 208). In ventral view the openings on each side of the scape of the epigynum are closer together anteriorly than posteriorly (Fig. 205), the reverse in *A. alboventris*. The internal ducts of the female differ (Figs. 204, 206) and the palpus has a different embolus (Figs. 213, 214).

*Records.* *North Carolina.* Durham Co.: Durham, Chapel Hill Blvd., east of county line; broomsedge field, sweeping, 7 June 1963, ♂ paratype (J. W. Berry, MCZ). Lee Co.: Sanford, 21 Aug. 1933, juv. (W. Ivie, AMNH). Montgomery Co.: 1.9 mi. W of Biscoe on route 27, 20 July 1953, ♂ paratype (R. Barnes, AMNH) (Map 5).

*Araneus carroll* n. sp.

Figures 215–220; Map 5

*Type.* Female holotype from Berryville, Carroll Co., Arkansas, June–October 1941 (O. C. Wilton) in the American Museum of Natural History. The specific name is a noun in apposition after the name of the type locality. Carroll County in turn is named after an early American patriot, Charles Carroll.

*Note.* This specimen had previously been labeled paratype of *Conepeira texana* Archer.

*Description.* Female holotype, carapace, sternum, legs yellowish. Dorsum of abdomen all white with indication of paired red spots and some pigment anteriorly in a transverse mark (Fig. 220). Sides and venter white. Total length 4.0 mm. Carapace 1.7 mm long, 1.5 mm wide. First femur, 2.3 mm; patella and tibia, 2.9 mm; metatarsus, 2.4 mm; tarsus, 0.8 mm. Second patella and tibia, 2.5 mm; third, 1.4 mm; fourth, 2.0 mm.

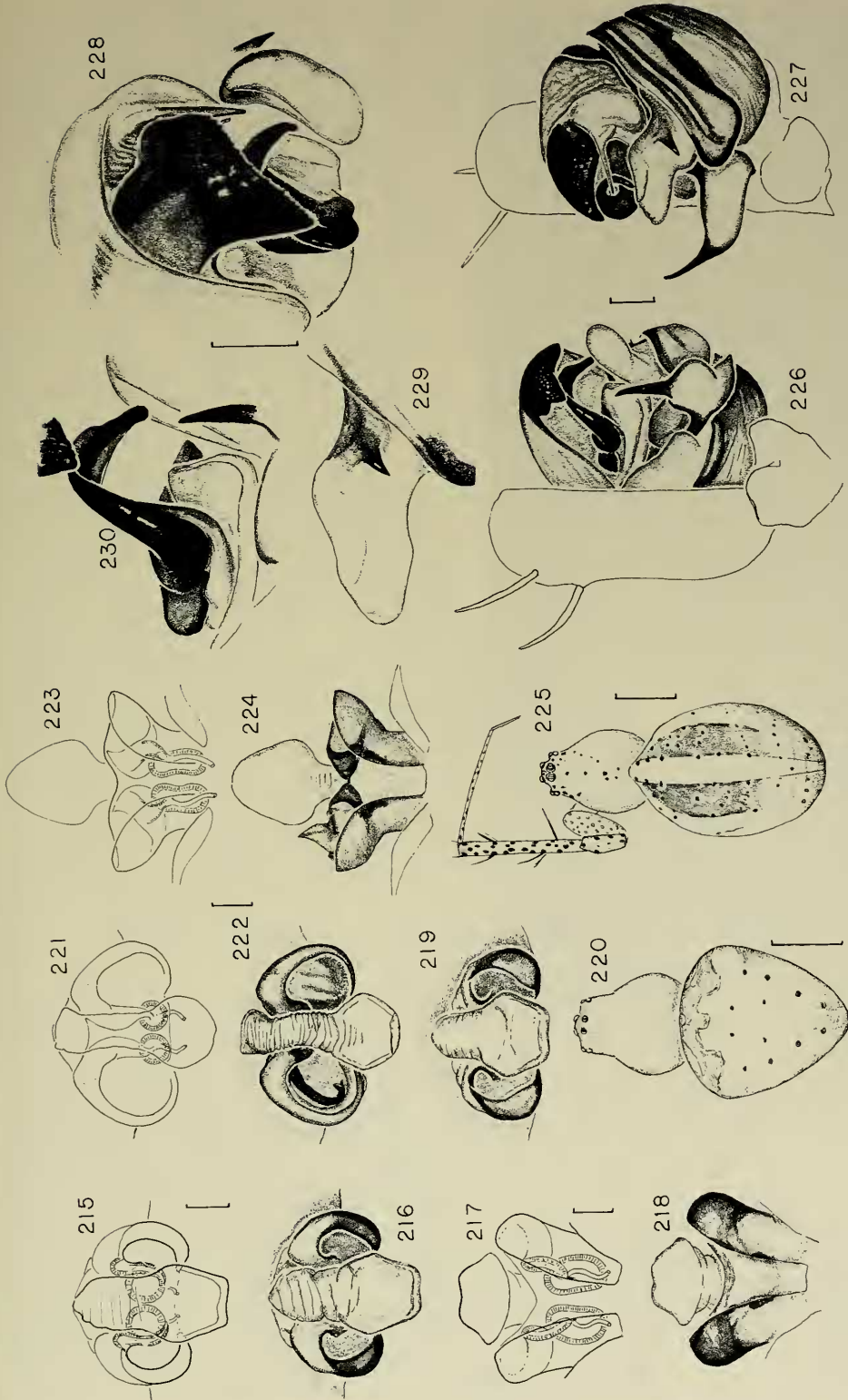
*Diagnosis.* The openings of the epigynum of *A. carroll* are most like those of *A. cingulatus* but the epigynum differs by having its base narrower and longer and having a much shorter scape (Fig. 216).

*Araneus raii* n. sp.

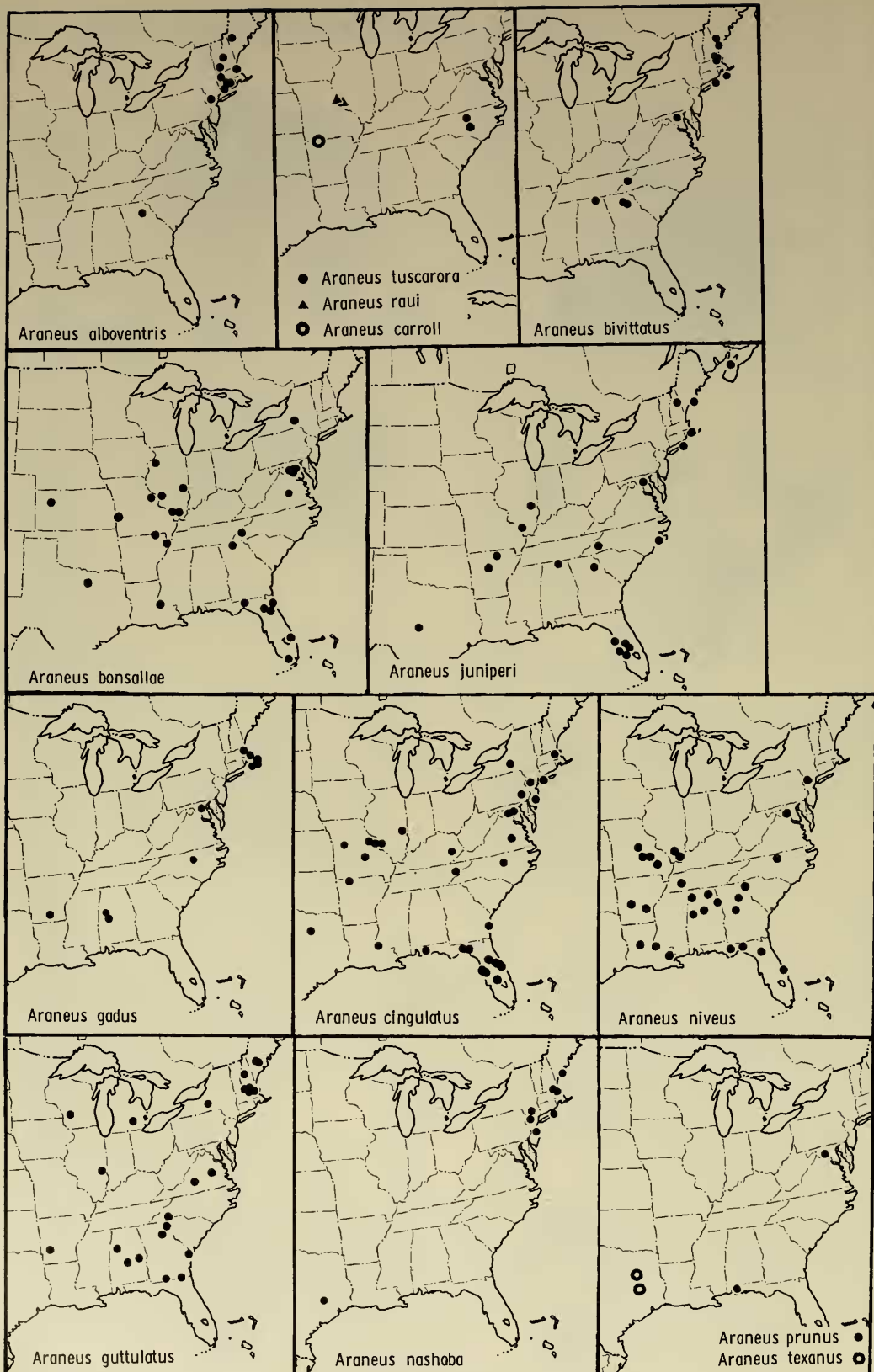
Figures 295–300; Map 5

*Type.* Female holotype from Wentzville, Saint Charles Co., Missouri, 9 July 1929 (P. Rau, no. 1617D), presumably from a wasp nest, in the Museum of Comparative Zoology. The species is named after the wasp specialist and collector, Philip Rau.

*Description.* Female, carapace, sternum, legs yellow. Dorsum of abdomen white. Venter with a distinct clear white patch. The dorsum probably had pairs of red spots but no pattern is visible on any of the specimens. Anterior and posterior median eyes subequal in size. Laterals 0.8 diameters of medians. Anterior median eyes 1.5 diameters apart, two diameters from laterals. Posterior median eyes slightly more than their diameter apart, slightly



Figures 215-220. *Araneus carroll* n. sp. 215. Ventral, cleared. 216. Ventral. 217. Posterior, cleared. 218. Posterior. 219. Subventral. 220. Female. Figures 221-230. *Araneus bivittatus* (Walckenaer). 221. Epigynum. 222. Ventral, cleared. 223. Posterior, cleared. 224. Posterior. 225. Female. 226-230. Left palpus. 226. Mesal. 227. Ventral. 228. Terminal apophysis. 229. Conductor. 230. Virgin embolus. (Size indicators 0.1 mm, for females 1 mm).



Map 5. Distributions of relatives of *Araneus juniperi* (Emerton).



more than two diameters from laterals. Total length 5.4 mm. Carapace 2.3 mm long, 1.9 mm wide. First femur, 2.9 mm; patella and tibia, 3.4 mm; metatarsus, 2.6 mm; tarsus, 0.8 mm. Second patella and tibia, 2.9 mm; third, 1.6 mm; fourth, lost.

*Diagnosis.* This species differs from *Araneus carroll* in having a shorter scape and different openings in the epigynum (Figs. 296, 297).

*Records.* *Missouri.* Saint Charles Co.: Wentzville, 9 July 1929, 4 ♀ paratypes (P. Rau, no. 1617A, MCZ). Saint Louis Co.: Kirkwood, mud dauber, ♀ paratype (P. Rau, MCZ) (Map 5).

*Araneus bivittatus* (Walckenaer)

Plate 6; Figures 221–230, 445; Map 5

*Epeira bivittata* Walckenaer, 1841, *Histoire Naturelle des Insectes. Aptères*, 2: 78. The type is Abbot manuscript illustration no. 234 of his *Drawings of the Insects of Georgia, in America*, vol. 14, 1792, in the British Museum, Natural History; copies in the Museum of Comparative Zoology, examined.

*Note.* Abbot's comment on No. 234 is "taken 17th May several of these kind in a Dirt daubers Nest. This beautyfull [sic] Species I never met with by any other means." Abbot illustrated the species with red dorsal stripes but arranged the spots symmetrically. Despite the symmetrical spots, there is no *Araneus* other than this that has two distinct red longitudinal dorsal bands grading into green on each end, except indistinct bands reported in some southern specimens of *A. juniperi*. Abbot's illustration shows the abdomen spherical, rather than elongate as it is in most specimens.

Some specimens of this species in collections had been labeled *Conepeira marilandica*, others *C. bivittatus* by Archer.

*Description.* Female from Athens, Georgia, about one year in alcohol: Carapace yellow with some dark red spots, no black eye pigment. Sternum yellow with dark red spots. Legs dark yellow with dark red spots. Dorsum of abdomen with a white lanceolate cardiac band on each side of which is a wide crimson band. The crimson



Plate 6. Top Fig. *Araneus alboventris* females from Massachusetts wasp trap. The abdomen has a crimson-bordered black patch on yellow. Bottom Fig. *Araneus bivittatus* female from Massachusetts. The abdomen has green bands separated by white. The bands are sometimes red.

bands turn both posteriorly and anteriorly into green. The posterior and sides of abdomen are green, the posterior very dark green. There are some dark red spots, but the spots are not symmetrical in pairs. The venter has white pigment between epigy-

num and spinnerets, but is greenish in color, darker green on sides. A female from Massachusetts had carapace and legs light reddish brown, the abdomen dorsum with two green longitudinal bands separated by a median brilliant white longitudinal band (Plate 6; Fig. 225). Toward the side, the green bands were also separated anteriorly by white from the greenish sides. The abdomen is oval, longer than wide, with a slight median hump anteriorly. Total length 3.6–5.0 mm. Carapace 1.7–2.2 mm long, 1.3–1.6 mm wide.

Male coloration like that of female. Total length 3.5–4.3 mm long. Carapace 1.6–2.0 mm long, 1.4–1.7 mm wide.

*Diagnosis.* *Araneus bivittatus* is the only species that has the abdomen longer than wide, widest in the middle, with a median anterior hump (Fig. 225) and two longitudinal dorsal red or green bands on the abdomen (Fig. 225). *Araneus juniperi* usually has the abdomen spherical. The large openings have a distinct rim (Fig. 222) similar to those of *A. guttulatus*, but the epigynum has a shorter scape. Unlike all other related species, *A. bivittatus* has the rim widest anteriorly. The male can be separated from that of *A. juniperi* by the heavier embolus (Fig. 230) and longer tooth on the conductor (Fig. 229), and from other species by the abdominal markings (Fig. 225).

*Natural history.* Most specimens came from wasp nests, but the species has also been found among oak leaves on Long Island and in pines on Martha's Vineyard, Massachusetts. All males and most females were collected in July.

In 1973, two female specimens were raised from penultimate instar to adult. One came from Dunstable, the other from Pepperell, Middlesex County, Massachusetts. When received, the spiders had green stripes on the abdomen which changed to red before molting to the adult. The adults had red stripes and also, unlike the Georgia specimens recently examined, paired red spots at the edge of the stripes.

*Distribution.* Maine to Mississippi (Map 5).

*Araneus gadus* n. sp.

Figures 231–247, 446; Map 5

*Conepeira marilandica*,—Archer, 1951, Amer. Mus. Novitates, No. 1502, figs. 11, 72, ♀. Not male holotype.

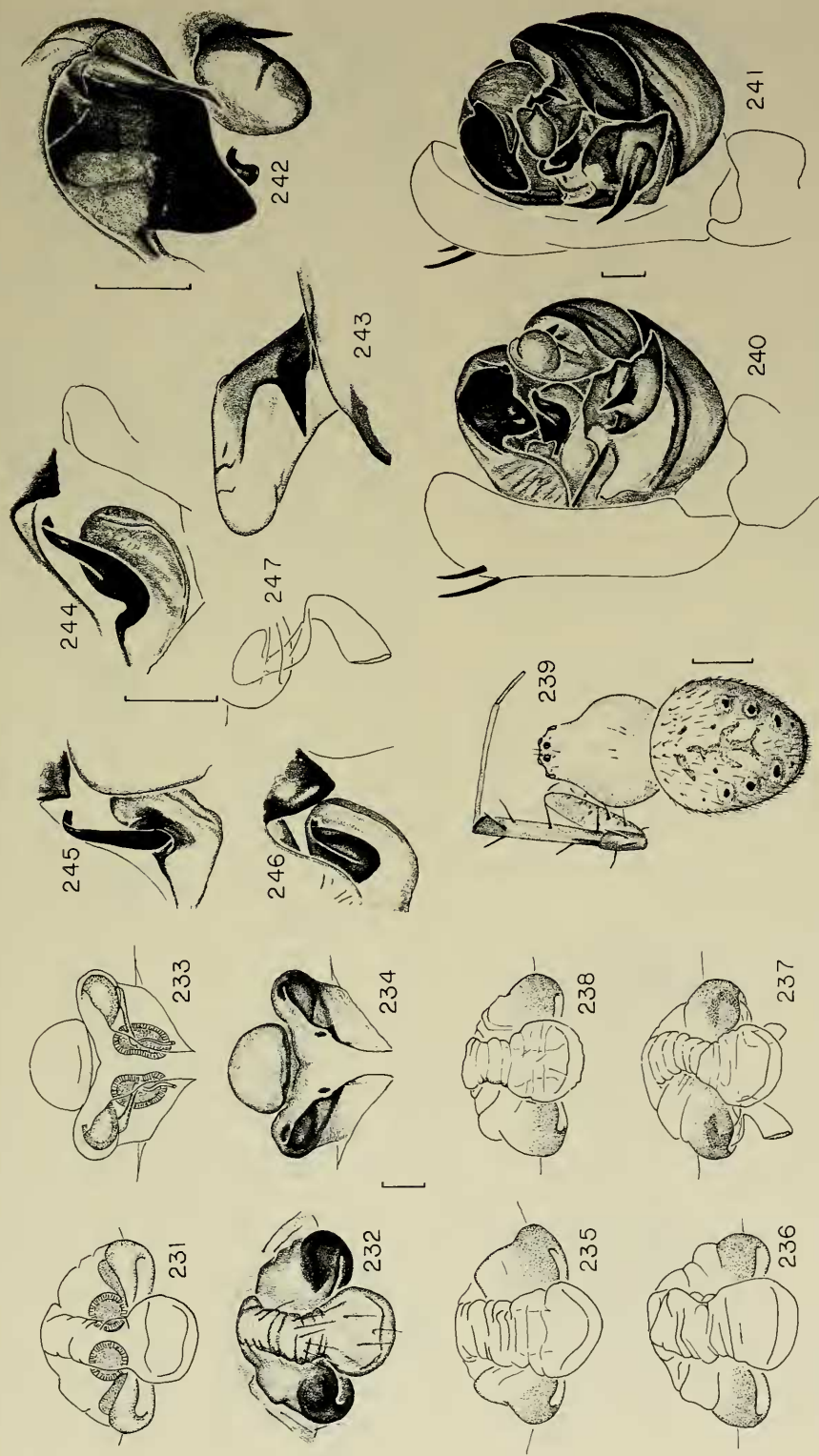
*Type.* Female holotype from South Chatham, Barnstable County, Cape Cod, Massachusetts, sweeping oak-pitch pine woods (*Pinus rigida*), 16 June 1971 (H. and F. Levi) in the Museum of Comparative Zoology.

*Note.* In collections specimens had been marked *Conepeira marilandica* and *Araniella displicata* by Archer. The female allotype of *Conepeira marilandica* is this species.

*Description.* Female a month in alcohol had carapace yellowish, sternum yellowish white. Legs yellowish with indistinct reddish rings. Dorsum of abdomen greenish white with a reddish cast posteriorly, some fine red dots anteriorly in light area, and four pairs of black spots posteriorly, each surrounded by a light ring (Fig. 239). Sides greenish, venter whitish. No depressions on carapace. The legs have strong macrosetae, some originating from red marks. Abdomen longer than wide, slightly pointed behind with many seta. Total length 4.2 mm. Carapace 2.0 mm long, 1.6 mm wide. First femur, 2.2 mm; patella and tibia, 2.9 mm; metatarsus, 2.1 mm; tarsus, 0.7 mm. Second patella and tibia, 2.3 mm; third, 1.2 mm.

Male coloration like that of female but legs not banded, distal ends of first and second legs reddish. Carapace with a median longitudinal thoracic line. The palpal patella has one strong and one weak seta. The abdomen is longer than wide, slightly pointed behind. Total length 4.2 mm. Carapace 2.0 mm long, 1.7 mm wide. First femur, 2.6 mm; patella and tibia, 2.9 mm; metatarsus, 2.3 mm; tarsus, 0.7 mm. Second patella and tibia, 2.6 mm; third, 1.5 mm; fourth, 2.1 mm.

*Variation.* Females vary in total length



Figures 231-247. *Araneus gadus* n. sp. 231-238. Epigynum. 231. Ventral, cleared. 232. Posterior, cleared. 233. Posterior, cleared. 234. Posterior, cleared. 235-238. Ventral (Cape Cod). 235. (Plymouth, Mass.). 236. (Martha's Vineyard). 237, 238. (Nantucket). 239. Female. 240-247. Left palpus. 240. Mesal. 241. Ventral. 242. Terminal apophysis. 243. Conductor. 244-246. Embolus. 247. Embolus cap in epigynum. (Size indicators 0.1 mm, for female 1 mm)



from 4.0–6.0 mm, carapace 1.9–2.6 mm long, 1.4–2.0 mm wide. The smallest specimens came from Massachusetts, the largest from Alabama.

*Diagnosis.* *Araneus gadus* differs from all other small *Araneus* species by the paired black spots on the abdomen, each spot having a light halo (Fig. 239). The black spots with their light area do not wash out in alcohol. In addition females differ from *A. juniperi* by having a thinner shorter scape in the epigynum and the most anterior part of the opening being towards the median (Figs. 231–237). Males differ from *A. juniperi* by having a shorter embolus (Figs. 244, 245), and a very large basal tooth on the conductor (Figs. 241, 243). Even juveniles of this species can be recognized by the pattern.

*Natural history.* Of eleven collections available, six indicate that the specimens were collected in pines; only two came from a wasp nest. In Massachusetts *A. gadus* is limited to pitch pine (*Pinus rigida*), apparently not found on white pine (*Pinus strobus*). A female from Alabama, out of the range of pitch pine, came from "pine tops"; a juvenile from Arkansas, also outside the range of pitch pine, was collected "on pine." Males were collected in June in Massachusetts, females in June and July, juveniles in April and October.

*Records. Massachusetts.* Barnstable Co.: South Chatham, 12–18 June 1971, ♂, juv. paratypes. Dukes Co.: Martha's Vineyard, 15 July 1913, ♀ paratype. Middlesex Co.: Belmont, juv. ♀. Nantucket Co.: Nantucket, 1913, ♀ ♀ paratypes, 19 June 1929, ♀, ♂, paratypes; 28 October 1929, juv. Plymouth Co.: Plymouth, 24 July 1915, ♀ paratype. *North Carolina.* Durham Co.: Durham. *Maryland.* Prince Georges Co.: Berwyn, 21 July 1942, ♀ paratype. *Alabama.* Hale Co.: near Havana, ♀ paratype. *Tuscaloosa Co.:* 30 April 1952. *Arkansas.* Calhoun Co., 11 April 1964, juv. (Map 5).

*Araneus juniperi* (Emerton)

Figures 248–264, 447–452; Map 5

*Epeira juniperi* Emerton, 1884, *Trans. Connecticut Acad. Sci.*, 6: 313, pl. 34, fig. 6, pl. 36, figs.

14–16, ♀, ♂. Female and male syntype from Peaks Island, Portland, Maine, in the Museum of Comparative Zoology, examined. Kaston, 1948, *Bull. Connecticut Natur. Hist. Surv.*, 70: 261, fig. 830, ♀ [not fig. 811, ♂].

*Singa floridana* Banks, 1896. *Trans. Amer. Entomol. Soc.*, 23: 69. Female holotype from Punta Gorda, Florida, in the Museum of Comparative Zoology, examined. NEW SYNONYMY.

*Conepeira bivittata*.—Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 21, figs. 12, 49, 70, ♀, ♂. Not *Epeira bivittata* Walckenaer. Archer designated specimens as neotypes which are invalid since Abbot's drawings, the types, still exist.

*Conepeira mumai* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 22, fig. 51, ♂. Male holotype from Berwyn, Maryland, in the American Museum of Natural History, examined. Not ♀, and not paratypes. NEW SYNONYMY.

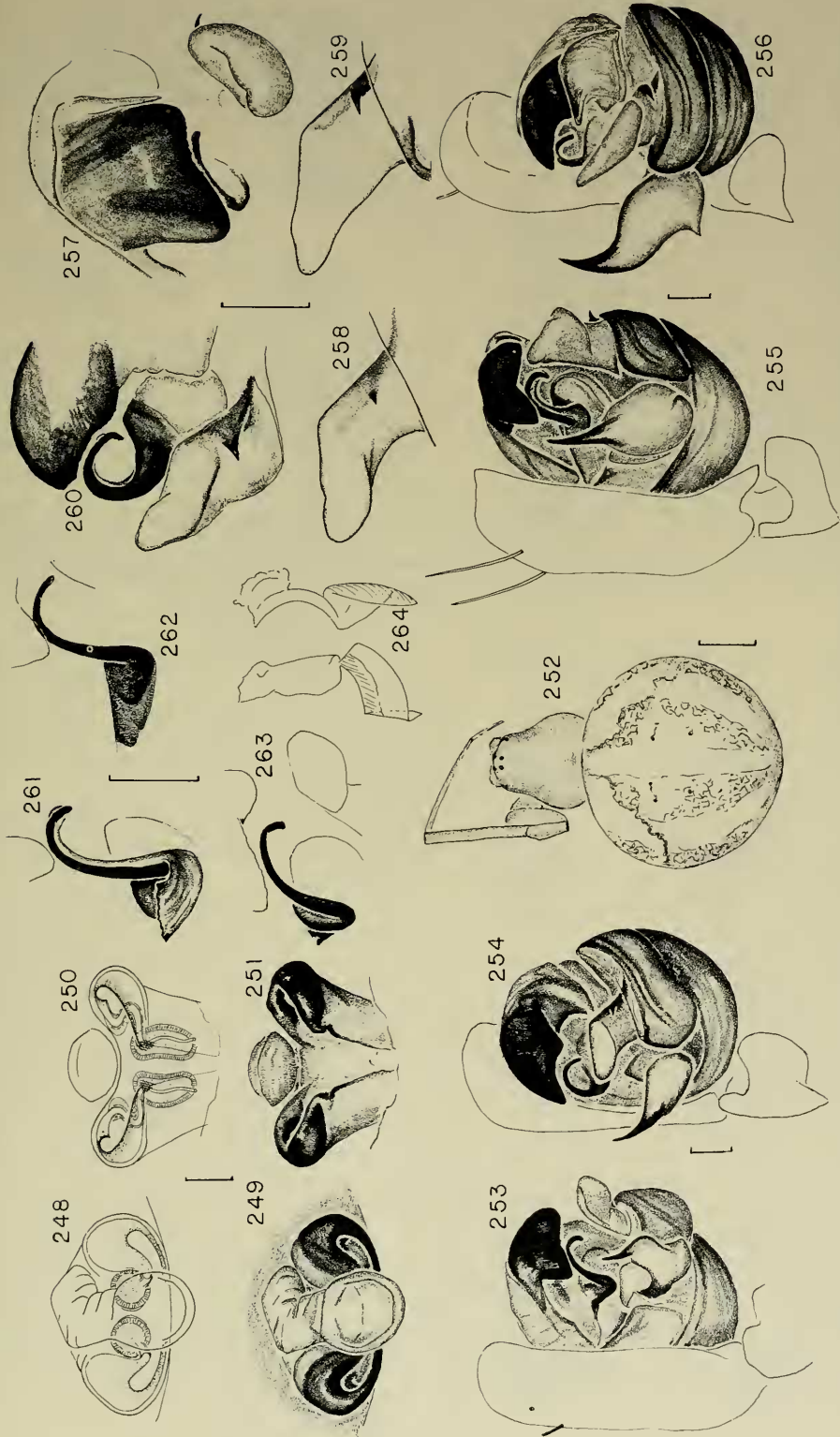
*Conepeira sarasota* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 23, fig. 74, ♀. Female holotype from south of Sarasota, Sarasota County, Florida, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Coneperia llano* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 24, figs. 52, 55, ♀, ♂. Male holotype from Llano, Llano Co., Texas, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* In collections specimens have been marked *Conepeira juniperi*, *C. marilandica*, *C. mumai*, *C. innominata*, *C. sarasota* and *C. bivittata* by Archer. In older collections all related species were labeled *A. juniperi*. The illustrations (Figs. 249–254) are made from syntypes of *A. juniperi*.

*Description.* Female syntype. Carapace, sternum, legs yellowish. No black eye pigment, but white pigment circles around posterior median eyes. Abdomen dorsum with three longitudinal bands of dense white pigment (Fig. 252). Posterior median eyes slightly larger, laterals slightly smaller than anterior medians. The median ocular quadrangle as long as wide behind; narrower behind than in front. Abdomen subspherical. Total length 5.2 mm. Carapace 1.9 mm long, 1.5 mm wide. First femur, 2.4 mm; patella and tibia, 2.7 mm; metatarsus, 2.2 mm; tarsus, 0.7 mm. Second patella and tibia, 2.4 mm; third, 1.4 mm; fourth, 2.0 mm.

Male syntype with coloration as in female. Abdomen oval, longer than wide. Total length 3.8 mm. Carapace 1.8 mm



Figures 248-264. *Araneus juniperi* (Emerton). 248-251. Epigynum. 248. Ventral, cleared. 249. Ventral, cleared. 250. Posterior, cleared. 251. Posterior, cleared. 252. Posterior, cleared. 253, 254. Female. 253, 254. Left palpus (Maine). 255, 256. Virgin palpus (Maryland). 253, 255. Mesal. 254, 256. Ventral. 257. Terminal apophysis. 258, 259. Conductor. 260, 261. Virgin embolus. 262, 263. Embolus. 264. Embolus cap. (Size indicators 0.1 mm, for female 1 mm)

long, 1.5 mm wide. First femur, 2.6 mm; patella and tibia, 2.9 mm; metatarsus, 2.6 mm; tarsus, 0.9 mm. Second patella and tibia, 2.7 mm; third, 1.4 mm; fourth, 2.2 mm.

*Variation.* Living specimens have two longitudinal green bands on the abdomen, but specimens may or may not have paired red spots on the abdomen (Fig. 252). To judge from Bank's description of *A. floridanus*, the bands may be red in the southern part of the range: "Cephalothorax greenish yellow, pars cephalica reddish, darkest on sides; mandibles with red lines. Legs greenish yellow; patellae, tibiae and metatarsus of anterior pairs with elongate red spots, less distinct on hind pairs; sternum and coxae greenish yellow. Abdomen greenish yellow with two prominent submedian red stripes reaching from base to tip, broadest at base and converging toward tip where they surround the spinnerets; three white stripes, one between the red and one on each side."

Total length of females 2.5–5.2 mm. Carapace 1.3–1.9 mm long, 1.1–1.8 mm wide. Total length of males 3.2–4.6 mm. Carapace 1.7–2.2 mm long, 1.4–1.8 mm wide. The smallest specimens come from the northern part of the range and Florida.

*Diagnosis.* *Araneus juniperi* differs from *A. bivittatus* by having the abdomen sub-spherical rather than oval, and the bands much less distinct, separated probably by lighter green rather than white (Fig. 252). *Araneus juniperi* differs from *A. gadus* and other small *Araneus* species by having slit-like openings on the posterior of the base of the epigynum (Fig. 249), the lateral edges of the slit extending most anteriorly. It differs from *A. cingulatus* by having a shorter scape and a median anterior extension of the base behind the scape. The male differs from other species by having a long, thin, curved embolus (Figs. 260–263), and the tooth on the base of the conductor is unusually small, hidden in the slightly sclerotized edge (Figs. 258–259).

*Natural history.* Most collections come from wasp nests. The types of *A. juniperi* were collected in junipers (*Juniperus* sp.).

The only other females with a note on their collecting site came from a "cedar glade" in Arkansas. Since no cedars are found in Arkansas I assume that this is the local name for eastern red cedar (*Juniperus virginiana*).

Males are mature in February in Florida, in June in Arkansas, in August in New England.

*Distribution.* From Nova Scotia to Florida, west to Arkansas and Texas (Map 5).

#### *Araneus bonsallae* (McCook)

Figures 265–294, 453–454; Map 5

*Epeira bonsallae* McCook, 1894, *American Spiders*, 3: 179, pl. 8, fig. 10, ♀. Female holotype from California [sic] in very poor condition in the Academy of Natural Sciences, Philadelphia, examined and labeled as type.

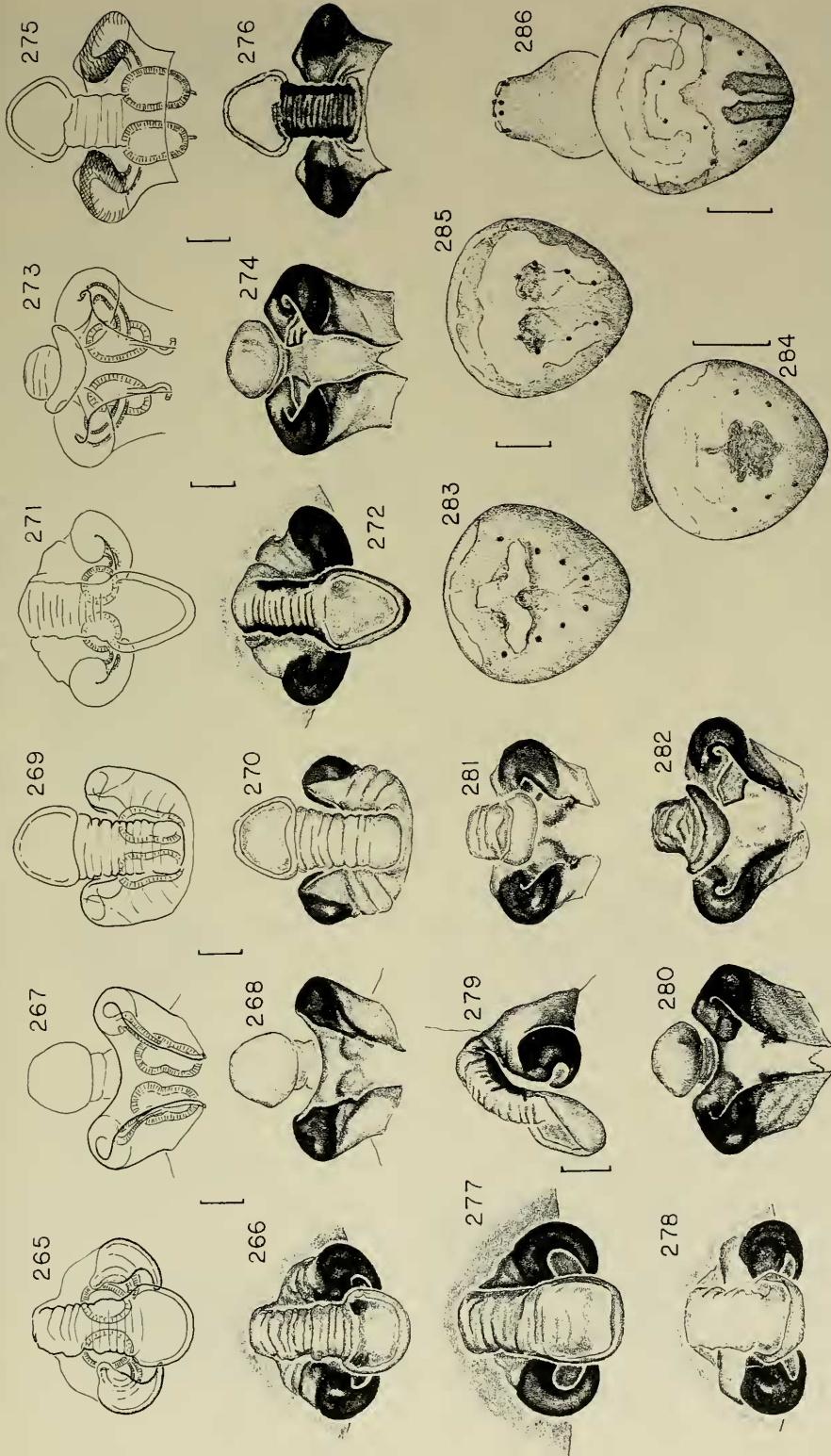
*Conepeira unica* Archer, 1951. *Amer. Mus. Novitates*, No. 1502: 23, fig. 75, ♀. Female holotype from Centreville, Wilkinson Co., Mississippi, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* The statement on the label of *Epeira bonsallae* is "Ep. Bonsallae DC or Cala," District of Columbia or California. No doubt the published locality is in error and the locality of the type is District of Columbia.

Archer labeled specimens of this species *Conepeira innominata*, *mumai* (paratypes) and *C. unica*.

*Description.* Living female from Virginia has carapace, sternum a transparent green, rings around secondary eyes yellow. Legs green, distal articles reddish. Dorsum of abdomen green with paired red spots, a central black patch of irregular outline, anterior of black patch a transverse white mark having paired anterior median extensions covered in part by yellowish pigment. Between black patch and white mark is reddish and orange pigment; red in median, orange toward sides. Venter of abdomen green, underlain by white pigment, posterior to epigynum mostly white. The illustrations (Figs. 283–286) were made from specimens preserved in alcohol for at least one year. Total length 4.2–5.8 mm. Carapace 1.7–2.4 mm long, 1.5–1.8 mm wide.





Figures 265-286. *Araneus bonsallae* (McCook). 265-282. Epigynum. 265, 271. Ventral, cleared. 266, 272, 277. Ventral. 267, 273. Posterior, cleared. 268, 274, 280-282. Posterior and posteroventral. 269, 275. Anterior, cleared. 270, 276. Anterior. 279. Lateral. 265-270. (Illinois). 271-276, 279. Holotype of *Epeira bonsallae*. 277. (Mississippi). 278. (Kansas). 283-285. Female abdomen. 286. Female carapace and abdomen. (Size indicators 0.1 mm, for Figs. 283-286, 1 mm)

Male coloration as in female. Total length 3.3–3.8 mm. Carapace 1.8–2.1 mm long, 1.5–1.7 mm wide.

*Diagnosis.* *Araneus bonsallae* has transverse markings on the anterior of the dorsum of the abdomen (Figs. 283–286) while the markings on *A. juniperi* are indistinct longitudinal bands. Females have the scape shorter and the openings of the epigynum smaller (Figs. 265–276) than in *A. juniperi*. While the openings of *A. bonsallae* are less than half the width of the base visible on each side of the scape, those of *A. juniperi* are more than half, and the lateral lip is narrower than the opening. The conductor tooth of the palpus of *A. bonsallae* is longer (Figs. 288, 291) than that of *A. juniperi*, and the median apophysis is smaller and has a distinct notch on the outside (Figs. 290, 453, 454).

*Natural history.* Most collections were made by wasps, other comments are “tree sweepings” in Texas and “under tree” in Illinois and in a car after driving through woods in Virginia.

*Distribution.* From New York State to Florida and west to Kansas and Texas (Map 5).

*Araneus cingulatus* (Walckenaer)

Plate 7; Figures 301–313, 455–462; Map 5

*Epeira cingulata* Walckenaer, 1841, *Histoire Naturelles des Insectes*. Aptères, 2: 40. The types are Abbot's manuscript Spiders of Georgia, figs. 232 and 365. I have chosen fig. 232 as lectotype since Walckenaer indicated that fig. 365 is probably only a variety of *E. cingulata*. Copies in the Museum of Comparative Zoology, examined. [Not *Aranea cingulata* Panzer, 1797 = *Salticus cingulata*].

*Conepeira marilandica* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 21; figs. 40, 50, ♂. Male holotype from Berwyn, Maryland, in the American Museum of Natural History, examined. Not ♀, not paratypes. NEW SYNONYMY.

*Conepeira mumai*,—Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 22, fig. 73, ♀. Not male holotype, not paratypes.

*Conepeira innominata* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 24, fig. 62, ♂. Male holotype from MacDill Field, Tampa, Florida, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Conepeira ozarkensis* Archer, 1951, *Amer. Mus.*

*Novitates*, No. 1502: 25, fig. 76, ♀. Female holotype from Berryville, Carroll County, Arkansas, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* Abbot's figure 232 shows the characteristic color pattern. The use of Walckenaer's old name does not upset the use of any other name.

Archer labeled specimens of this species *mumai*, *ozarkensis*, *innominata* and *marilandica*.

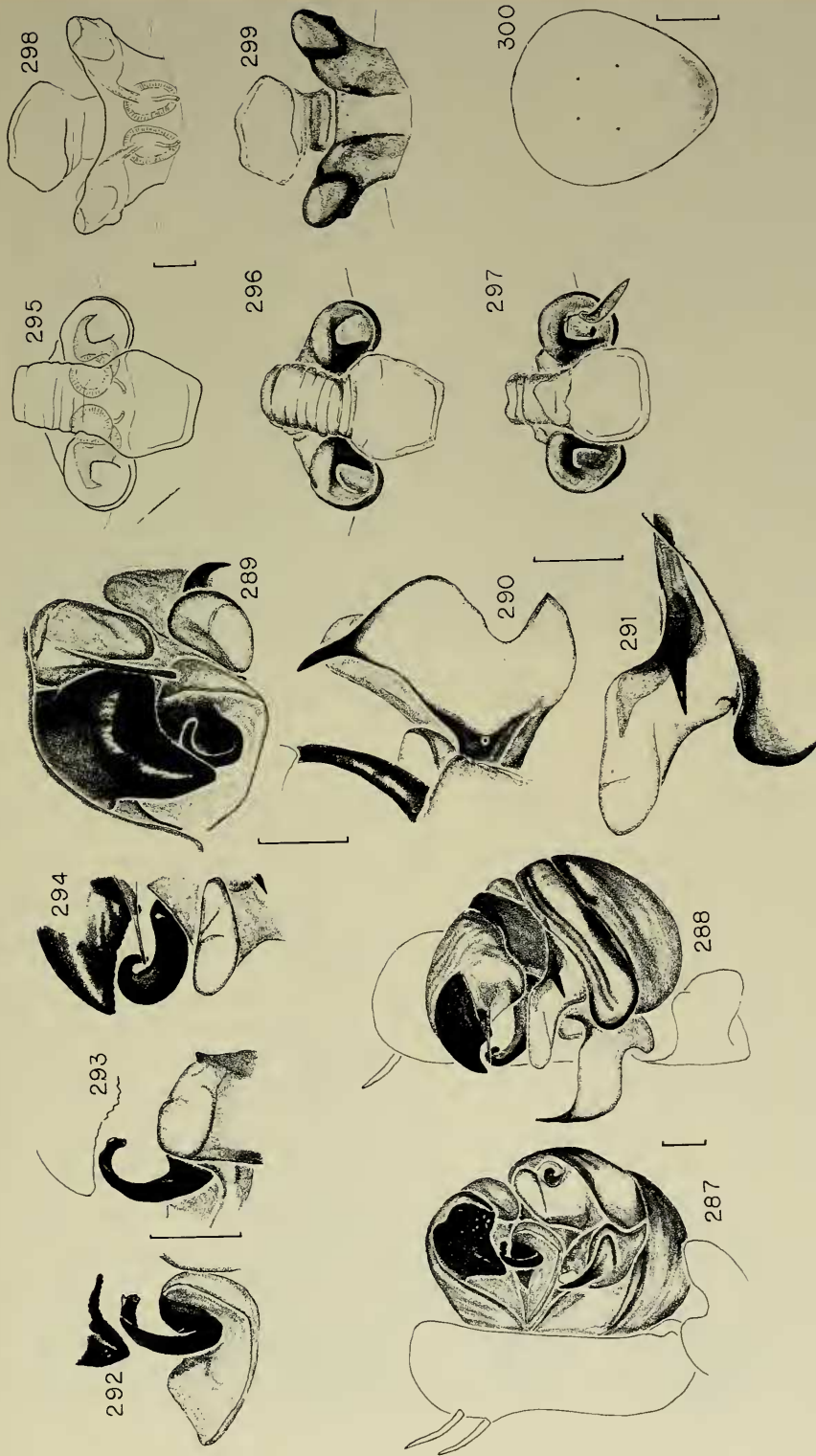
*Description.* Living female from Massachusetts has carapace, sternum, legs light yellowish green with distal ends of first legs brownish. Dorsum of abdomen rich green, with pairs of relatively large dark red spots. The spots may have a yellowish halo and are in a longitudinal band of lighter green (or white)\*; transverse area between anterior four red spots reddish (or white), anteriorly green enclosing some lighter green (or white) areas (Plate 7; Figs. 307, 308). There is no black pigment on the abdomen in any specimens examined. Total length 4.6–6.0 mm. Carapace 2.0–2.2 mm long, 1.6–1.8 mm wide.

Male coloration like that of female. Total length 2.7–3.5 mm. Carapace 1.3–1.9 mm long, 1.2–1.5 mm wide.

*Variation.* Florida specimens are noticeably smaller than others.

*Diagnosis.* *Araneus cingulatus* lacks the abdominal black patch of the related *A. niveus*. Fresh specimens from both Massachusetts and Virginia may have a transverse anterior brown patch enclosing two white spots side by side (Figs. 307, 308). The epigynum has a relatively long scape (Figs. 302, 305). The openings to the side of the scape have a diameter about equal to that of the lateral rim (Figs. 301–302, 305). The lateral rim has a distinct carina toward the anterior, making the opening appear larger than it is. The base to which the scape is attached has no median anterior extension. The terminal apophysis is pointed (Fig. 311), as in *A. niveus* males. The embolus in

\* Colors in brackets are of specimens in alcohol for a short period of time.



Figures 287-294. *Araneus bonsalliae* (McCook). Left palp. 287. Mesal. 288. Ventral. 289. Terminal apophysis. 290. Median apophysis. 291. Conductor. 292-294. Embolus.  
 Figures 295-300. *Araneus raiji* n. sp. 295-299. Epigynum. 295. Ventral, cleared. 296, 297. Ventral. 297. With embolus cap. 298. Posterior, cleared. 299. Posterior. 300. Bleached abdomen.  
 (Size indicators 0.1 mm, for abdomen 1 mm)





Plate 7. *Araneus cingulatus* female from Massachusetts wasp trap. The abdomen has crimson paired spots on green background; the area surrounding the anterior four white patches is reddish brown. The area surrounding the red spots is lighter green.

*A. cingulatus* is shorter than in *A. juniperi*, but longer than in *A. niveus* (Fig. 313).

*Natural history.* Most collections come from wasp nests; others are from an orange tree in Florida, tree sweepings in Texas, tall grass and low brush, one from upside down aluminum pot on the ground in Virginia, hanging on silk (determination from a color photograph only). Males are mature in September, March, and April in Florida, from May until July farther north. Females are found from May until September.

*Distribution.* From Massachusetts to Florida, west to Missouri and Texas (Map 5).

*Araneus niveus* (Hentz)

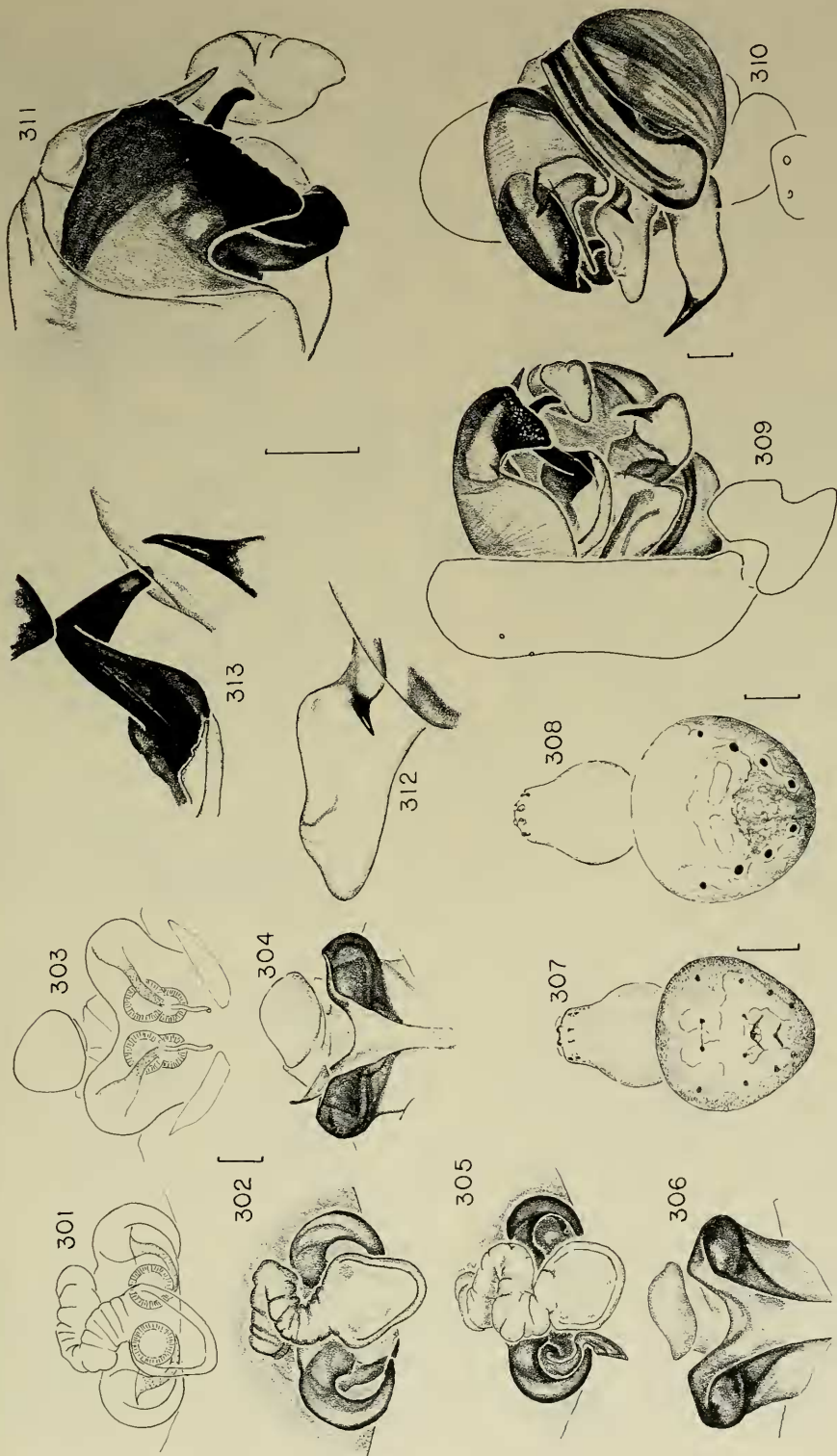
Figures 314–331, 463–469; Map 5

*Epeira nivea* Hentz, 1847, J. Boston Soc. Natur. Hist., 5: 474, pl. 31, fig. 9, ♀. Female holotype from Alabama destroyed (Hentz, 1875, The Spiders of the United States, Occ. Papers Boston Soc. Natur. Hist., 2: VII). I here desig-

nate the female holotype of *Conepeira nivea* as neotype to stabilize the name (Art. 75, Intern. Code Zool. Nomencl.).

*Conepeira nivea* Archer, 1951, Amer. Mus. Novitates, No. 1502: 18, figs. 45, 57, 68, ♀, ♂. Female holotype from Centreville, Wilkinson Co., Mississippi, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* Although Archer synonymized the name *Epeira nivea* with *Epeira guttulata*, it is probably better to apply the old name *nivea* to this widespread species, common in Alabama and with abdominal markings that match Hentz's illustration. However, *A. guttulatus* and *A. niveus* cannot readily be separated on color alone unless the specimens are fresh. In both species the large black patch on the dorsum is usually broken into an anterior transverse and a posterior triangular spot, but sometimes it is fused (Figs. 320–322). Hentz writes that the spider has a black spot on white. He pinned his specimens, so the color was not



Figures 301-313. *Araneus cingulatus* (Walckenaer). 301-306. Epigynum. 301. Ventral, cleared. 302. Ventral, cleared. 303. Posterior, cleared. 304. Posterior, cleared. 305. Ventral. 306. Posterior. 307, 308. Female. 307. Some color washed out in alcohol. 308. Freshly preserved individual. 309-313. Left palpus. 309. Mesal. 310. Ventral. 311. Terminal apophysis. 312. Conductor. 313. Embolus.  
 (Size indicators 0.1 mm, for females 1 mm)

washed out. This species has less color (green or red) on the abdomen than *guttulatus*. But I realize one can argue until doomsday the application of some of the old names whose types have disappeared. This adds neither to scientific knowledge nor to the stability of names.

Females in collections have been labeled by Archer *Conepeira nivosa*, *C. nivea*, *C. guttulata* and *C. alboventris*; males *C. nivosa*, *C. forata* and *C. guttulata*.

*Description.* Females that had been in alcohol for several months had carapace, sternum, and legs yellowish. The abdomen was white dorsally, green all around on the sides. Anteriorly was a transverse black band with its anterior edge reddish, posteriorly a triangular black mark and pairs of red spots (Fig. 320). The black marks do not fade in alcohol (Figs. 321–322). Total length of females 3.2–5.0 mm. Carapace 1.8–2.2 mm long, 1.4–1.8 mm wide.

Male coloration like that of female. Total length 2.9–4.3 mm. Carapace 1.4–2.0 mm long, 1.3–1.7 mm wide.

*Diagnosis.* *Araneus niveus*, unlike some related species, almost always has a median dorsal black patch on the abdomen (Figs. 320–321). Females differ from *A. guttulatus* by having narrower lateral margins of the depression of the epigynum; the margins cover small curved oval openings below. The shape of the openings is diagnostic (left in Figs. 315, 318). Also the scape of the epigynum is longer and the outline of the epigynum is square, while in *A. guttulatus* it is wider than long. The male would be difficult to separate from others were it not for the black abdominal patch almost always present. Although the palpus is much like that of the male of *A. niveus*, unlike all other males of this group (except *A. guttulatus*) it has the tooth of the conductor underneath or near the margin of the tegulum (Figs. 326–328). The long axis of the relatively small tooth is parallel to the long axis of the conductor. The palpus differs from that of *A. guttulatus* (which also has a black patch on the abdo-

men) in having the embolus at a 90° angle to the lamella and with a short tip (Figs. 329–331); that of *A. guttulatus* is about a 45° angle and has a longer tip.

*Natural history.* Specimens of this species came from bottomland pine and hardwood in North Carolina, from foliage of pecan trees in South Carolina and woods in Illinois as well as from wasp nests. Males are mature in June and July, females from June until September.

*Distribution.* New Jersey to Florida, west to Missouri and Arkansas (Map 5).

#### *Araneus guttulatus* (Walckenaer)

Plate 8; Figures 332–361, 470–474; Map 5

*Epeira guttulata* Walckenaer, 1841, *Histoire Naturelles des Insectes. Aptères*, 2: 78. The type is Abbot's manuscript drawing, fig. 233 in *Drawings of the Insects of Georgia in America*, vol. 14, 1792, in the British Museum, *Natural History*; copy in the Museum of Comparative Zoology, examined.

*Epeira sanguinalis* Hentz, 1847, *J. Natur. Hist. Soc. Boston*, 5: 476, pl. 31, fig. 15. Male holotype from Alabama destroyed. NEW SYNONYMY.

*Epeira juniperi*.—Emerton, 1909, *Trans. Connecticut Acad. Sci.*, 14: 200, pl. 5, fig. 1, ♂.

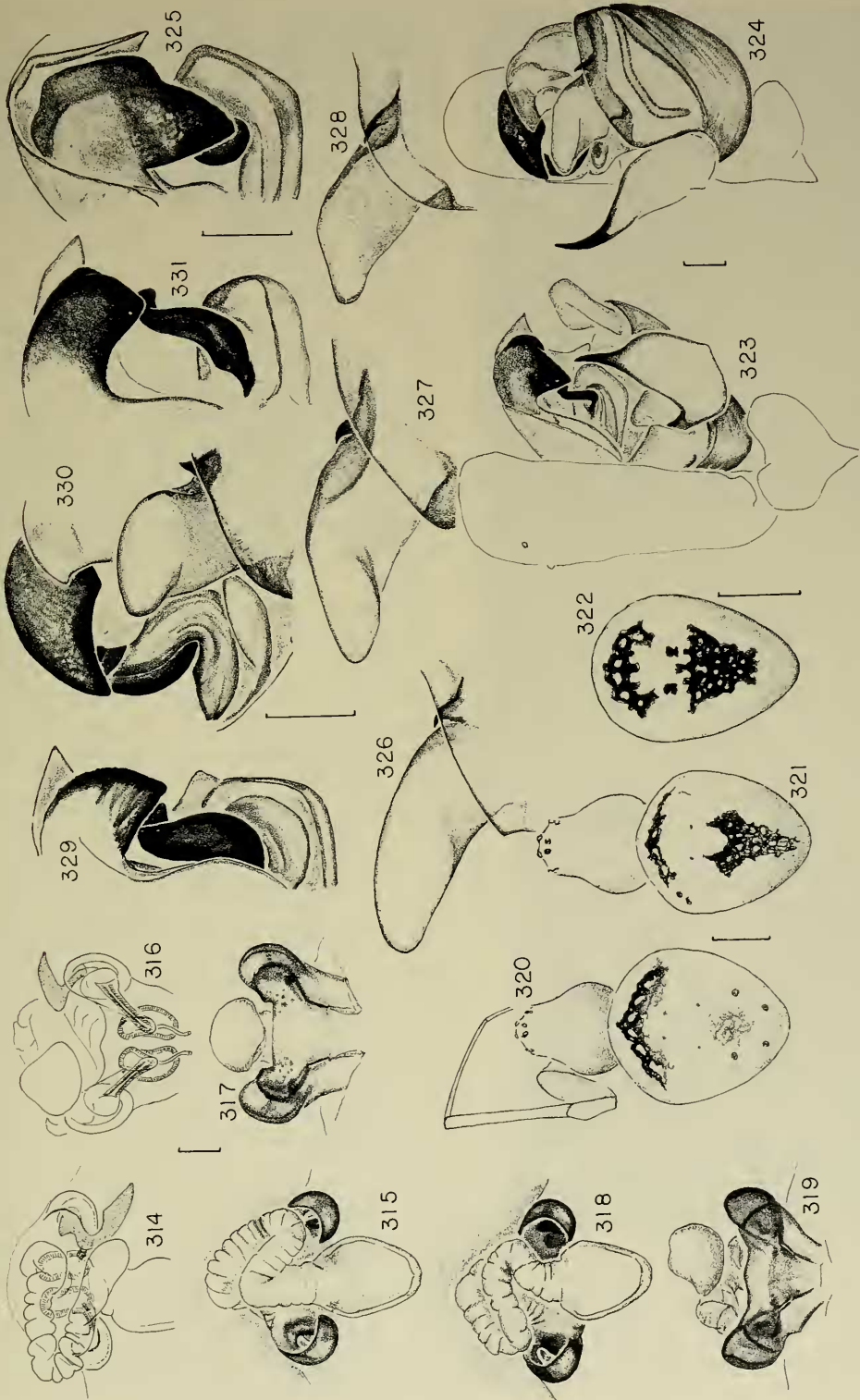
*Conepeira glyphica* Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 17, fig. 56, ♀. Female holotype from woods on Wildcat Mountain, Vernon Co., Wisconsin, in the American Museum of Natural History, examined. Levi, 1954, *Amer. Midland Natur.*, 51: 450, figs. 33, 34, ♀. NEW SYNONYMY.

*Note.* Abbot's comment on fig. 233 is "Taken 20th May in a Dirt Daubers Nest. Very rare." The distribution of the spots on the abdomen of fig. 233 leaves little doubt that this is the species on hand.

Specimens in collections were labeled *Conepeira guttulata* and *C. marilandica* by Archer. Chamberlin and Ivie (1944) used the name *Epeira guttulata* for specimens of *A. miniatus*.

*Description.* Living female from Massachusetts: Carapace yellow-white, legs greenish yellow. Dorsum of abdomen with discrete pairs of crimson spots, and white patches surrounded by a red line that grades into orange areas; yellow around anterior of abdomen. Venter greenish yellow.





Figures 314-331. *Araneus niveus* (Hentz). 314-319. Epigynum. 314. Ventral, cleared. 315. Ventral. 316. Posterior, cleared. 317. Posterior. 318. Ventral. 319. Posterior. 320, 321. Female. 322. Male. 323-331. Left palpus. 323. Mesal. 324. Ventral. 325. Terminal apophysis. 326-328. Conductor. 329, 330. Virgin embolus. 331. Embolus. (Size indicators 0.1 mm, for Figs. 320-322, 1 mm)



Plate 8. *Araneus guttulatus*. Top female specimens from Massachusetts wasp trap. Middle female from Virginia (photo A. Moreton). Bottom male from Massachusetts. The abdomen has white patches, paired red spots and between reddish to green areas, darkest red near border of white. The reddish area may enclose a black median patch posteriorly.

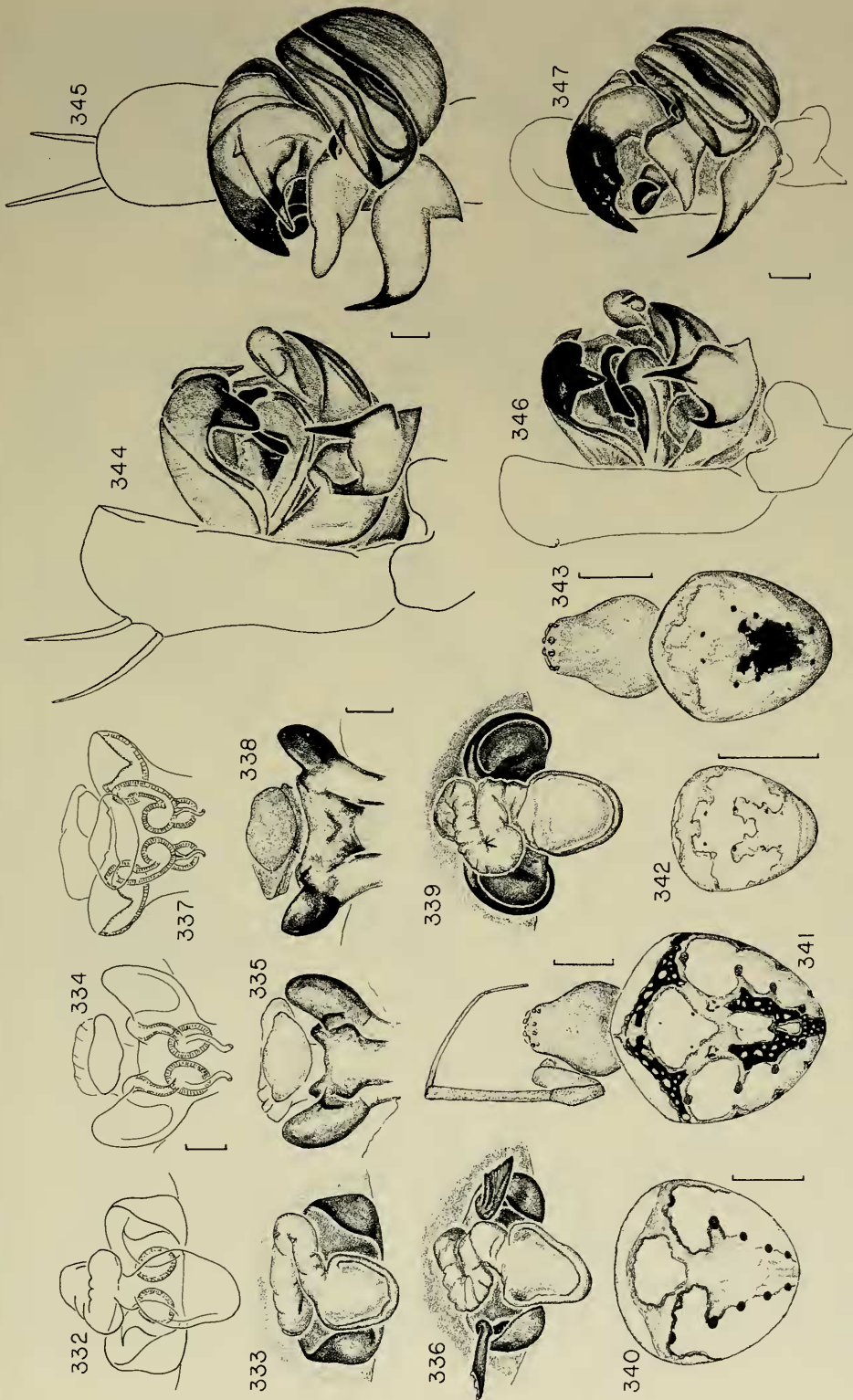
low. Recently collected females from Georgia have a triangular black patch posteriorly, a transverse anterior black band, white down each side to the side of paired red spots (Fig. 341), and a series of white spots in a median line, the most anterior largest, the most posterior smallest, the areas between green. The venter is whitish. Total length 3.8–6.0 mm. Carapace 1.3–2.3 mm long, 1.2–1.8 mm wide.

Male coloration like that of females. While New Hampshire males had no black mark on the abdomen, one from Massachusetts did. Total length 3.9–4.8 mm. Carapace 1.9–2.2 mm long, 1.7–1.9 mm wide.

*Variation.* Northern specimens have a narrower rim on the epigynum (Fig. 339). This and a slightly more different viewing angle (more anterior) made Archer believe the Wisconsin specimen to present a new species.

*Diagnosis.* Southeastern, heavily pigmented *Araneus guttulatus* can readily be recognized by their dorsal abdominal markings; others may have just a single median black patch, or just a white transverse band anteriorly, or a median longitudinal row of white spots, the most anterior largest, and two lateral white bands. The lateral bands have each lobe with a red spot; between these may be black pigment (Figs. 340–341). The openings of the epigynum are on each side of the long scape, the lips on each side are convex, projecting toward the scape (Figs. 333, 336), unlike those of *A. niveus*. The median margins of the large opening are below the scape (Figs. 332, 334, 337). The epigynum is wider than long. The male of *A. guttulatus*, unlike all other males of this group (except *A. niveus*), has the tooth of the conductor underneath or near the margin of the tegulum (Figs. 348–351). The palpus differs from that of *A. niveus* in having the embolus at a 45° angle to the lamella and in having a longer tip (Figs. 352–361); that of *A. niveus* is at a 90° angle and has a short tip.

*Natural history.* Most specimens in collections came from wasp nests, but individual females were found in Okefenokee



Figures 332-347. *Araneus guffulatus* (Walckenaer). 332-339. Epigynum. 332-336. (Georgia). 337-339. (Wisconsin). 332. Ventral, cleared. 333, 339. Ventral. 334, 337. Posterior, cleared. 335, 338. Posterior. 336. Ventral with embolus caps. 340. Female abdomen (Massachusetts). 341. Female (Georgia). 342. Male abdomen (New Hampshire). 343. Female (Wisconsin). 344-347. Left palpus. 344, 345. (Georgia). 346, 347 (New Hampshire). 344, 346. Mesal. 345, 347. Ventral. (Size indicators 0.1 mm, for Figs. 340-343, 1 mm)



Swamp, Georgia, and in nest of fall web worm (*Hyphantria cunea*, Arctiidae) in Maine. Wallace's collection from Michigan came from woods along edge of swamp, sweeping birch-maple swamp, along edge of swamp, and sweeping bog. A female collected in Virginia came from underside of an oak leaf. A male was collected from foliage of pecan trees in South Carolina.

*Distribution.* New England to Wisconsin, south to southern Georgia and Arkansas. The northernmost locality is "Labrador, Oct. 1900, Britcher coll. 3222." This may refer either to Labrador Pond, a collecting site in Onondago Co., New York, or to the Canadian province (Map 5).

*Araneus texanus* (Archer)

Figures 362–374; Map 5

*Conepeira texana* Archer, 1951, Amer. Mus. Novitates, No. 1502: 20. Male holotype from Mexia, Texas, in the American Museum of Natural History, examined.

*Note.* The holotype was first thought to be the male of *A. guttulatus*. When the male of *A. guttulatus* was found together with the female, doubt was thrown on the match based on coloration. Subsequently a female was found, also from northern Texas, with *A. guttulatus* coloration but a different epigynum. It is likely but not certain that male and female belong together.

*Description.* Female in alcohol: Carapace, sternum, legs yellowish white. Dorsum of abdomen white but with faint pigment as in *A. guttulatus* (Fig. 374). Sides and venter white. Total length 4.5 mm. Carapace 1.9 mm long, 1.4 mm wide. First femur, 2.3 mm; patella and tibia, 2.9 mm; metatarsus, 2.2 mm; tarsus, 0.7 mm. Second patella and tibia, 2.4 mm; third, 1.2 mm; fourth, 1.8 mm.

Male holotype. Carapace, sternum, legs yellowish white. Dorsum of abdomen with white pigment, indications of a semicircular anterior gray patch, and a posterior median round black patch. The venter is not marked. The abdomen is triangular, much narrower than wide. Total length 3.8 mm. Carapace 1.9 mm long, 1.7 mm wide.

First femur, 2.7 mm; patella and tibia, 3.2 mm; metatarsus, 2.6 mm; tarsus, 0.7 mm. Second patella and tibia, 2.7 mm; third, 1.2 mm; fourth, 1.9 mm.

*Diagnosis.* The embolus (Fig. 370), conductor spine (Fig. 373) and median apophysis (Fig. 372) of the palpus differ in shape from those of *A. guttulatus*. In *A. texanus*, the epigynum has a short scape (Fig. 363), in *A. guttulatus*, a long one; the openings in the base are shaped differently than in *A. guttulatus*.

*Record.* Texas. Brazos Co. ♀ (N. Banks, MCZ) (Map 5).

*Araneus nashoba* n. sp.

Plates 4, 9; Figures 380–397; Map 5

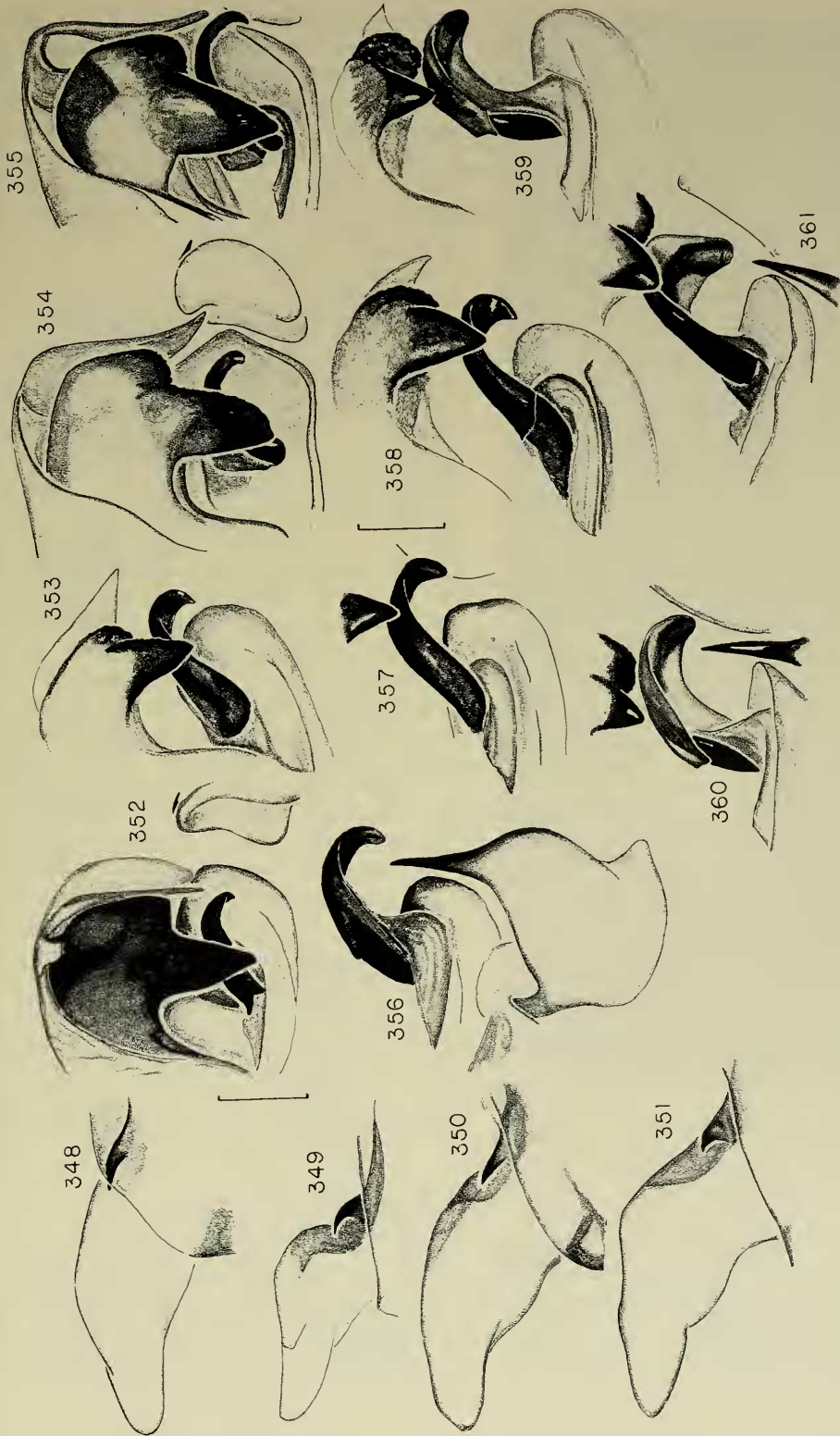
*Conepeira juniperi*,—Archer, 1951, Amer. Mus. Novitates, 1502: 25, figs. 54, 78, ♀, ♂. Not *Araneus juniperi* (Emerton).

*Type.* Male holotype and female paratype, June 1971, from Pepperell, Middlesex County, Massachusetts, in the Museum of Comparative Zoology. The specific name is a noun in apposition, after the Nashoba region of Massachusetts.

*Description.* Living female from Massachusetts: Carapace, sternum, legs green. Abdomen yellow-green, enclosing some white spots anteriorly. Posteriorly with four pairs of dark red spots (Plate 9; Fig. 386). The abdomen is almost circular, slightly wider anteriorly. Total length 3.6 mm. Carapace 1.8 mm long, 1.4 mm wide. First femur, 2.2 mm; patella and tibia, 2.5 mm; metatarsus, 1.8 mm; tarsus, 0.7 mm. Second patella and tibia, 2.2 mm; third, 1.0 mm; fourth, 1.7 mm.

Male from Massachusetts: Coloration like that of female but legs with wide red bands (Plate 9). The palpus has a patella with one weak and one strong macroseta. The abdomen is egg-shaped, longer than wide. Total length 3.0 mm. Carapace 1.3 mm long, 1.2 mm wide. First femur, 2.1 mm; patella and tibia, 2.3 mm; metatarsus, 2.0 mm; tarsus, 0.7 mm. Second patella and tibia, 2.0 mm; third, 1.1 mm; fourth, 1.6 mm.

*Diagnosis.* *Araneus nashoba* females differ from *A. juniperi* females by having a



Figures 348-361. *Araneus guttularis* (Walckenaer), left palpus. 348-351. Conductor. 348. (Alabama). 349. (New Hampshire). 350, 351. (Georgia). 352-355. Terminal apophysis. 352. (New Hampshire). 353, 354. (Alabama). 355. (Georgia). 356-361. Embolus, some virgin. 356, 357. (New Hampshire). 358. (Arkansas). 359, 360. (Georgia). 361. (Alabama).  
 (Size indicators 0.1 mm)

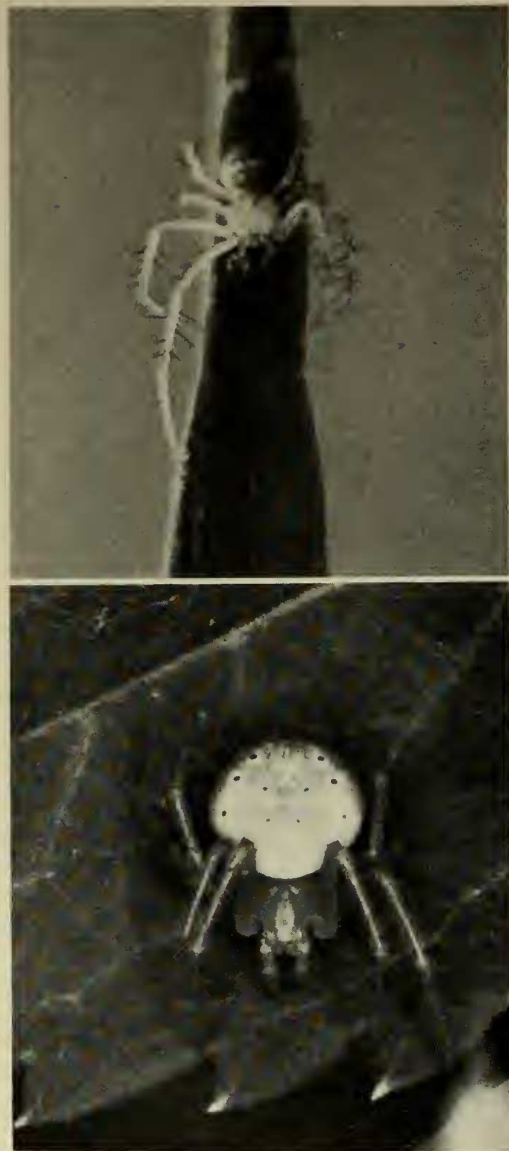


Plate 9. *Araneus nashoba* from Massachusetts. Top, male. Bottom, female. The abdomen has paired red spots on light green background; there are four indistinct anterior white patches.

slightly longer scape (Figs. 381–384) and by having the openings large and flaring, bordered only medially (Figs. 380–385). The males differ by having a distinct short projecting embolus, curved at the tip, paral-

leling the embolus lamella (Figs. 391–394). The conductor's basal tooth is longer than that of *A. juniperi* (Fig. 390) and the abdominal coloration differs by having some dorsal white pigment spots (Fig. 386) and paired red spots; freshly preserved *A. juniperi* tend to have indistinct longitudinal bands of darker green. The epigynum of *A. nashoba* has proportions different from those of *A. prunus*.

*Natural history.* Female paratypes were collected in a web under leaves of staghorn sumac (*Rhus typhina*) about 1.7 m above the ground on the edge of woods, and under *Forsythia* leaves (Plate 4). The male holotype was collected traversing a car, parked in the shade. Another female was collected on shrubs in a clearing for power lines in woods. Others were collected by wasps. Males have been collected in June and July, females until August. An eggsac was made out of yellow-green woolly silk, about 8 mm in diameter and contained about 25 agglutinated light green eggs.

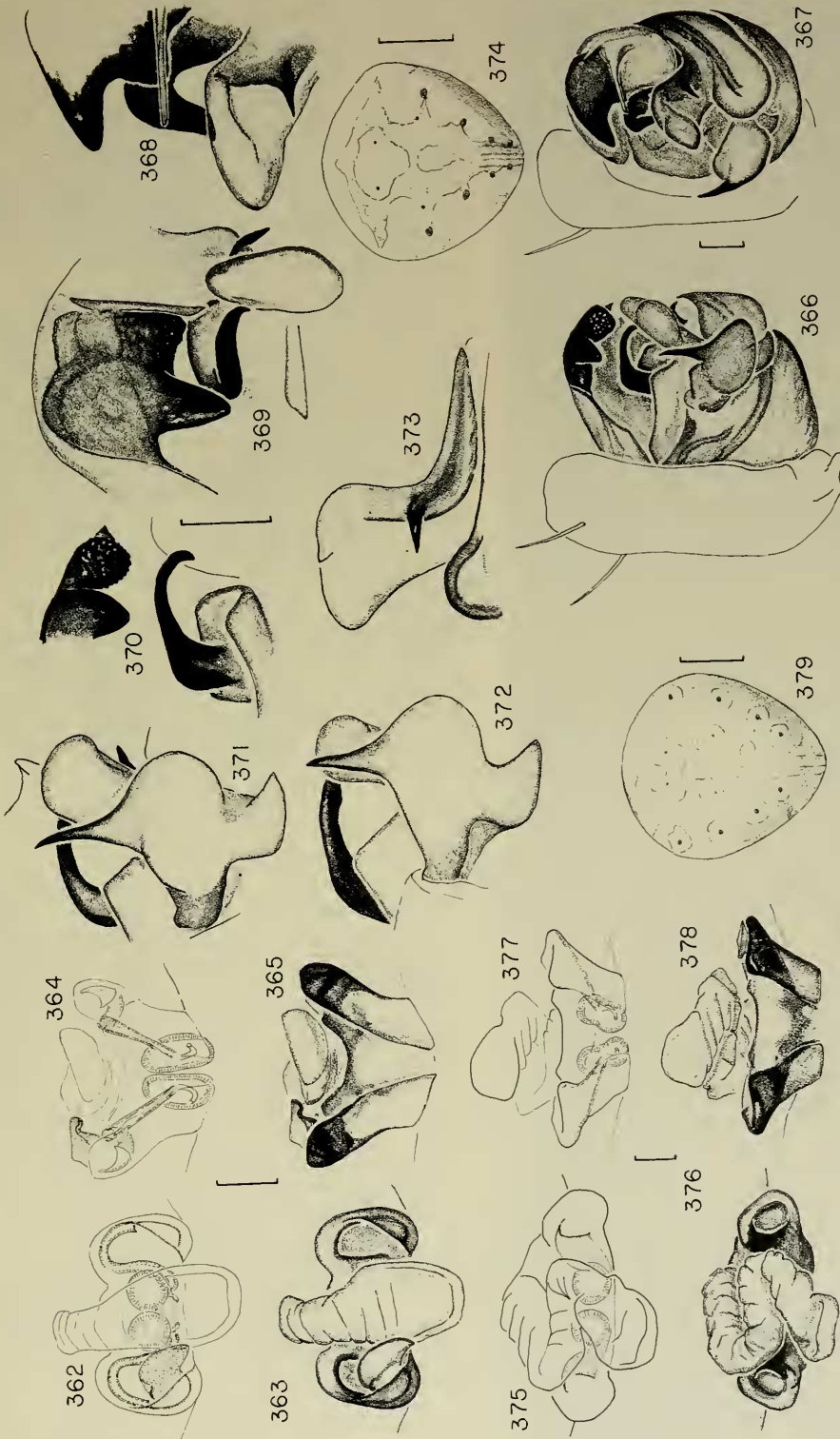
*Records.* *Maine.* Cumberland Co.: Peaks Island, Portland, 12 July 1909, ♂ paratype (J. H. Emerton). *Massachusetts.* Middlesex Co.: Dunstable, 7 June 1971, juv., mature ♂ in July, paratype (P. Milotis); Concord Field Station, Bedford, Aug. 1972, ♀ paratype (H. E. Evans); Pepperell, July 1967, ♀ paratype; August 1970, ♀ paratype; June 1971, ♂ paratype; July 1972, ♂ paratype (all H., L., and F. Levi). *New York.* Orange Co.: Cuddebackville, 10 July 1967, ♂ paratype. *Suffolk Co.:* Riverhead, 26 July 1950, ♂ paratype (R. Latham). *New Jersey.* Bergen Co.: Ramsey, July 1944, ♀ paratype (W. J. Gertsch). *Ocean Co.:* Lakehurst, ♀ ♀ paratypes. *Texas.* Fayette Co.: Carmine, 7 April 1966, ♀ (L. Pinter) (Map 5).

*Araneus prunus* n. sp.

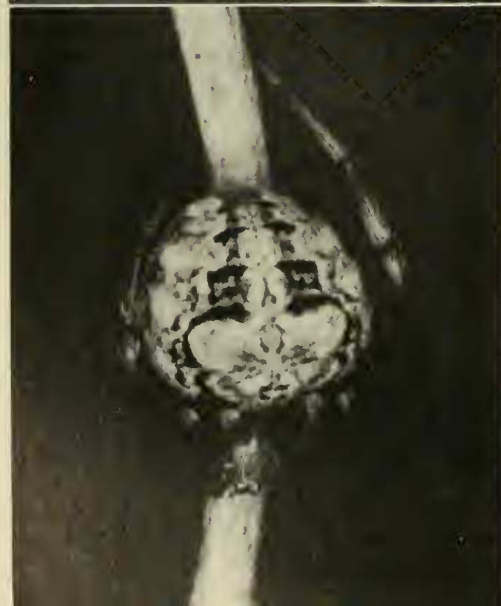
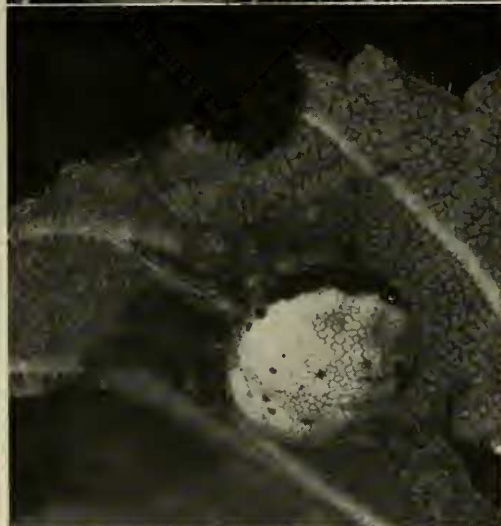
Figures 375–379; Map 5

*Type.* Female holotype from Plummers Island in Potomac River, Montgomery County, Maryland, few miles northwest of Washington, D.C., in wasp nest (K. V. Krombein), 23 July 1956; in the American





Figures 362-374. *Araneus texanus* (Archer). 362-365. Epigynum. 362. Ventral, cleared. 363. Posterior, cleared. 364. Posterior, cleared. 365. Posterior. 366-373. Left palpus. 366. Mesal. 367. Ventral. 368. Terminal apophysis, embolus and conductor, sublateral. 369. Terminal apophysis. 370. Embolus. 371, 372. Median apophysis. 373. Conductor. 374. Female abdomen.  
 Figures 375-379. *Araneus prunus* n. sp. 375-378. Epigynum. 375. Ventral, cleared. 376. Ventral, cleared. 377. Posterior, cleared. 378. Posterior. 379. Female abdomen.  
 (Size indicators 0.1 mm, for abdomens 1 mm)



Museum of Natural History. The specific name is a noun in apposition after the genus of plum trees.

*Note.* Specimens of this species had been labeled *Conepeira marilandica* by Archer.

*Description.* Carapace, sternum, legs yellowish white. Dorsum of abdomen with faint indication of green with white spots, and of paired red spots (Fig. 379). Anterior and posterior median eyes subequal in size, lateral eyes 0.8 diameters of medians. Anterior median eyes 1.5 diameters apart, two diameters from laterals. Posterior median eyes slightly more than a diameter apart, three diameters from laterals. Total length 5.3 mm. Carapace 2.2 mm long, 1.8 mm wide. First femur, 2.6 mm; patella and tibia, 3.0 mm; metatarsus, 2.3 mm; tarsus, 0.8 mm. Second patella and tibia, 2.6 mm; third, 1.4 mm; fourth, 2.2 mm.

*Diagnosis.* The epigynum differs from that of *Araneus nashoba* in having a much longer scape and in having the openings of the epigynum wider apart (Figs. 375-378).

*Record.* *Alabama.* Baldwin Co.: Silverhill, July 1945, 7 ♀ paratypes (G. Nelson, MCZ).

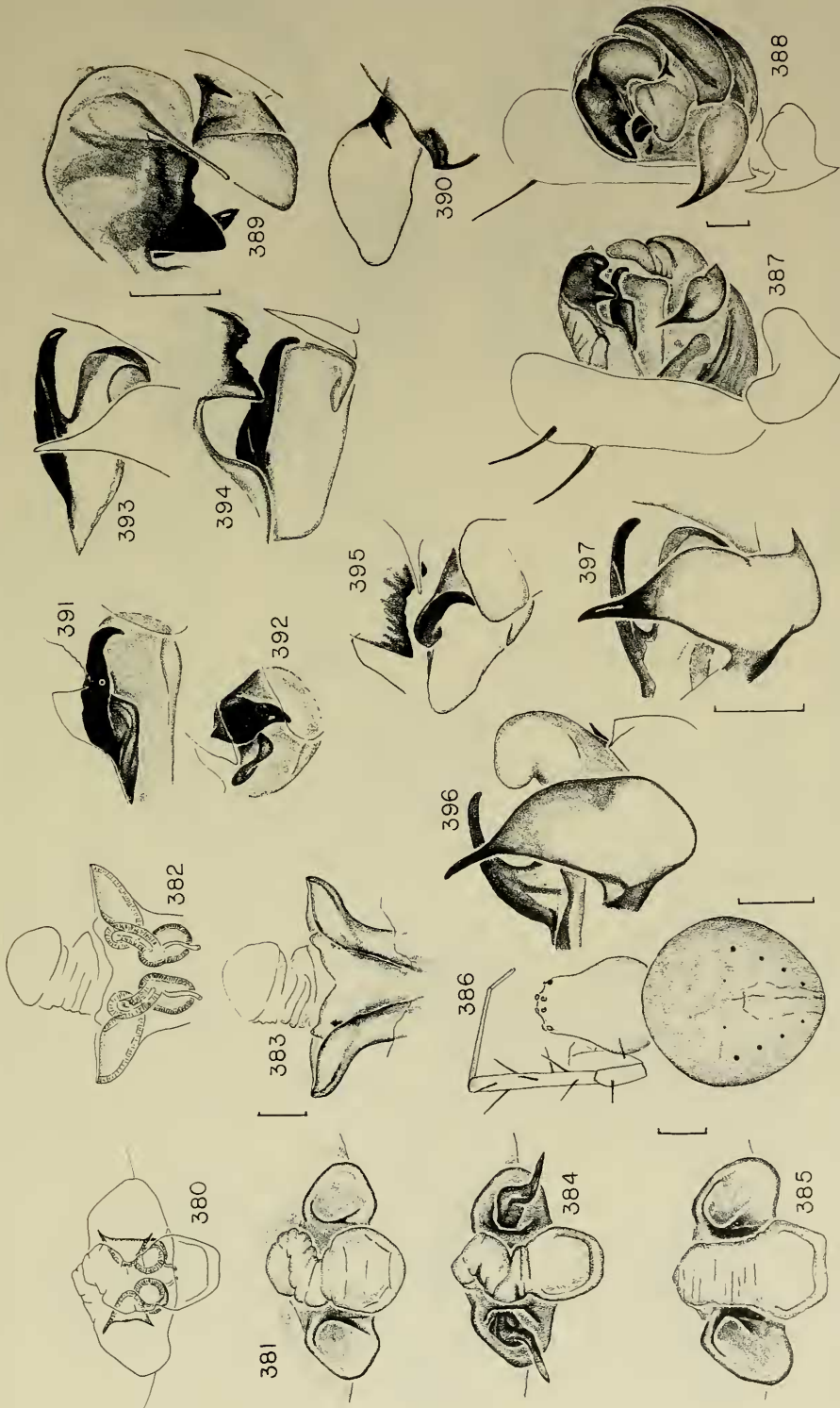
#### *Araneus detrimentosus* (O. P.-Cambridge)

Plate 10; Figures 398-414; Map 6

*Epeira detrimentosa* O. P.-Cambridge, 1889. *Biologia Centrali-Americana, Araneidea*, 1: 26, pl. 6, fig. 8, ♀. Female lectotype here designated from between Petab and Chicoyoito and Chilasco, Guatemala, in the British Museum, Natural History, examined. Keyserling, 1892, *Spinnen Amerikas*, 4: 137, pl. 7, fig. 101, ♀. Banks, 1898, *Proc. California Acad. Sci.*, (3) 1(7): 253, pl. 15, fig. 7, ♀. Banks, 1910, *Bull. U.S. Natl. Mus.*, 72: 41.

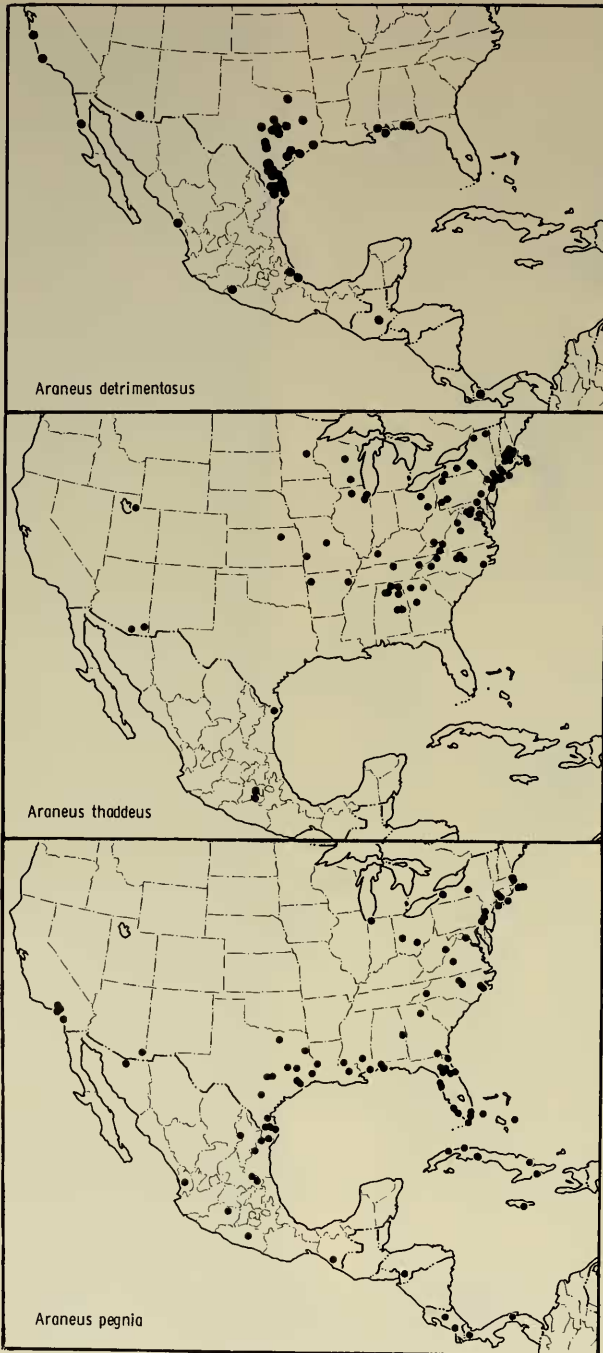
*Epeira nigrohumeralis* O. P.-Cambridge, 1893, *Biologia Centrali-Americana, Araneidea*, 1: 111, pl. 15, fig. 3, ♀. Female holotype from Venta de Zopilote, 2800 ft., Mexico, in the British Museum, Natural History, examined. First synonymized by F. O. P.-Cambridge, 1904.

*Epeira tranquilla* Keyserling, 1893, *Spinnen Amerikas*, 4: 224, pl. 11, fig. 166, ♀. Female holotype from Washington, D.C., Marx collection, probably erroneous locality, in the U.S. National Museum, examined. First synonymized by Banks, 1898.

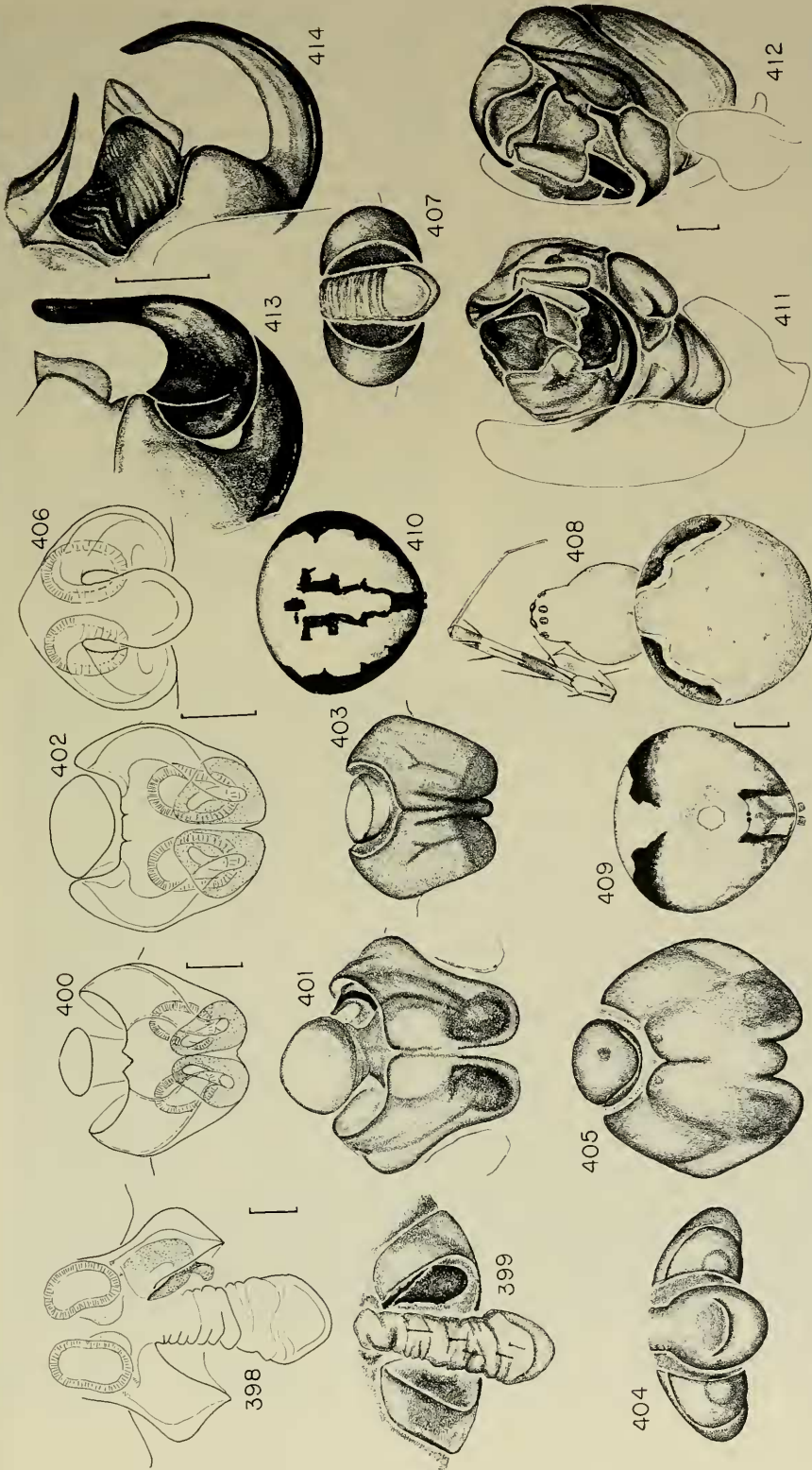


Figures 380-397. *Araneus nashoba* n. sp. 380-385. Epigynum. 380. Ventral, cleared. 381. Ventral. 382. Posterior, cleared. 383. Posterior. 384. Ventral, with embolus caps. 385. Ventral (Texas). 386. Female with first leg. 387-397. Left palpus. 387. Mesal. 388. Ventral. 389. Terminal apophysis. 390. Conductor. 391-392. Virgin embolus. 393-395. Embolus. 396, 397. Median apophysis. 396. (Ramsey, New Jersey). 397. (Lakehurst, New Jersey).  
 (Size indicators 0.1 mm, for female 1 mm)





Map 6. Distributions of *Araneus detrimmentosus* (O.P.-Cambridge), *A. thaddeus* (Hentz), and *A. pegnia* (Walckenaer).



Figures 398-414. *Araneus detrimitosus* (O.P.-Cambridge). 398-407. Epigynum. 398. Anterior, cleared. 399, 404, 407. Ventral. 400, 402. Posterior, cleared. 401, 403, 405. Posterior. 406. Ventral, cleared. 398, 401. (Texas). 402, 406. (Mazatlan). 403, 407. Holotype of *Epeira lineata*. 404-405. Syntype of *Epeira detrimitosus* (Guatemala). 408. Female with left first leg only. 409, 410. Female abdomen of holotype of *Epeira lineata*. 409. Ventral. 410. Posterior. 411-414. Left palpus. 411. Mesal. 412. Ventral. 413. Virgin embolus. 414. Embolus.

(Size indicators 0.1 mm, for Figs. 408-410, 1 mm)

*Epeira tranquilla* McCook, 1894, *American Spiders*, 3: 162, pl. 6, fig. 3, ♀. Female holotype from Bladensburg, D.C., Marx collections, probably erroneous locality. First synonymized by Banks, 1910.

*Epeira linteata* McCook, 1894, *American Spiders*, 3: 176, pl. 8, figs. 5, 6, ♀, ♂. Female syntype from North Carolina, in the Academy of Natural Sciences, Philadelphia, examined. NEW SYN-ONYMY.

*Aranea detrimentosa*.—F. O. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 515, pl. 49, fig. 18, ♀. Roewer, 1942, *Katalog der Araneae*, 1: 858.

*Cambridgepeira detrimentosa*.—Archer, 1951, *Amer. Mus. Novitates*, No. 1502: 2, figs. 8, 9, 10, ♀, ♂.

*Araneus detrimentosus*.—Bonnet, 1955, *Bibliographia Araneorum*, 2: 486.

*Note.* I am not sure if the specimens from Texas and southern United States are the same species as the type specimens of O. P.-Cambridge (Figs. 404, 405) even though I have examined the types on three different occasions. The male described by O. P.-Cambridge may be mismatched. But since it belongs to the same species group there is a possibility that I am confusing females of two species. No consistent differences could be found between Central American females and those from Texas other than size. The Guatemalan males have a short, straight embolus and spines on both ends of the median apophysis. No other males could be found in collections from Mexico and Central America. Figures 403, 407, 410 were prepared from the type of *Epeira linteata*.

*Description.* Female from Texas: Carapace, sternum light brown. Legs with dark bands. Dorsum of abdomen bright green in fresh specimen, underlain by white, a white band anteriorly on each side, and a reddish brown anterior lateral border (Plate 10; Figs. 408–410). Sides light brown. Venter light brown with four white, indistinct patches. Carapace with some white setae. The abdomen is wider than long. Total length 5.3 mm. Carapace 2.3 mm long, 2.0 mm wide. First femur, 2.9 mm; patella and tibia, 3.3 mm; metatarsus, 2.1 mm; tarsus, 1.0 mm. Second patella and tibia, 2.7 mm;

third, 1.5 mm; fourth, 2.2 mm. Females range from 4.0–6.0 mm total length, carapace 1.9–2.7 mm long, 1.6–2.2 mm wide.

Male from Texas: Coloration like that of female. The palpus has two patellar setae. The first coxa has a hook on its edge. The first and second tibiae have strong macrosetae but are not noticeably modified. Total length 3.8 mm. Carapace 2.0 mm long, 1.7 mm wide. First femur, 2.7 mm; patella and tibia, 3.2 mm; metatarsus, 1.8 mm; tarsus, 1.0 mm. Second patella and tibia, 2.3 mm; third, 1.3 mm; fourth, 1.7 mm. Males vary from 2.5 to 4.2 mm total length, carapace 1.6 to 1.9 mm long, 1.3 to 1.6 mm wide.

*Variation.* Female specimens are usually bright green; sometimes the abdomen is white, sometimes with brown marks (from notes in vials and color photographs). Some have more black pigment on dorsum of abdomen than others.

*Diagnosis.* This species has been confused with *A. thaddeus*. The posterior view of the epigynum has a ventral concavity, the dorsum a notch (Figs. 400–403); the embolus is large and readily seen in mesal view (Figs. 411, 413, 414), very different from that of *A. thaddeus*.

*Note.* This species is related to *Araneus marmoreus* and *A. diadematus*, but differs by the abdominal markings (Figs. 408, 409).

Archer (1951) made the species the type of his new genus *Cambridgepeira*. Besides this species, Archer placed in *Cambridgepeira* the species *Epeira lathyrina* Holmberg and *E. uniformis* Keyserling. I have not seen specimens of *E. lathyrina*. The type of *E. uniformis* is a larger species of *Araneus*, not closely related to *A. detrimentosus*.

*Natural history.* Females have been collected from March until October, males July until October, in May from Baja California. Males are uncommon in collections. Specimens have been collected in mustard field, Lompoc, Santa Barbara County, California; shrubs on beach Destin, Florida. B. Vogel collected Texas specimens having "webs on mesquite [*Prosopis juliflora*], most on defo-



liated bushes, Travis County," "On juniper [*Juniperus*] or rock elm [*Ulmus* sp.]. Spins small flat shelter," Williamson County. Another collection came from under reeds along lagoon; hillsides at El Rosario, Baja California (W. J. Gertsch and V. Roth).

"It spins an orb web, about the size you would expect for a small spider, no bigger than your hand in all and the actual area covered by the spiral [is] probably around 3". The shelter is small, hardly bigger than the huddled up spider, and slightly concave, a small plate set at a 45 degree angle to horizontal. I have usually found the green [*Araneus detrimentosus*] in a rock elm or juniper. They are only found in small-leaved bushes and trees about eye level." (personal communication, B. Vogel).

*Distribution.* Along the Gulf coast of northern Florida, Texas to Panama; Pacific Coast from Big Sur, California, to Boquete, Panama. A record from Trelease Woods,

Urbana, Illinois, is probably mislabeled by a collector who also collected near Dallas, Texas, and so probably are various old specimens in the Marx and McCook collections, but not a female from Huachuca Mts., Arizona, 19 July 1936 (Knull, AMNH) (Map 6).

*Araneus thaddeus* (Hentz) Lattice Spider

Plates 10, 11; Figures 4, 415-425; Map 6

*Epeira thaddeus* Hentz, 1847, J. Boston Natur. Hist. Soc., 5: 473, pl. 31, fig. 6, ♀. Female type from Alabama, destroyed. Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 309, pl. 33, fig. 9, ♀. McCook, 1889, 1890, American Spiders, 1: 348, 303-305; 2: 90, 331. McCook, 1894, American Spiders, 3: 169, pl. 7, figs. 3-5, ♀, ♂. Emerton, 1902, Common Spiders, p. 170, fig. 401, ♀. Emerton, 1909, Trans. Connecticut Acad. Sci., 14: 200, pl. 5, fig. 2, ♂. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 259, figs. 807-809; 826-827, ♀, ♂.

*Epeira meropes* Keyserling, 1865, Verh. Zool. Bot. Gesell. Wien, 15: 825, pl. 19, figs. 6, 7, ♂. Male holotype from the Spanish Colony, New Granada



Plate 11. Web of a penultimate instar of *Araneus thaddeus* male from Massachusetts in high-bush blueberries (*Vaccinium* sp.) about 1.8 m above ground. Retreat in curled-up leaf outside of photograph. The web was dusted with corn starch.

[Colombia, Panama], in the British Museum, *Natural History*. Keyserling, 1892, *Spinnen Amerikas*, 4: 139, pl. 7, fig. 102, ♂. NEW SYNONYMY.

*Epeira baltimorensis* Keyserling, 1879, *Verhandl. Zool. Bot. Gesell. Wien*, 29: 305, pl. 4, fig. 8, ♀.

Female holotype from Baltimore, Maryland, in the British Museum, *Natural History*, examined. First synonymized by McCook, 1894.

*Araneus thaddeus*,—Petrunkevitch, 1911, *Bull. Amer. Mus. Natur. Hist.*, 29: 319. Bonnet, 1955, *Bibliographia Araneorum*, 2: 610.

*Aranea thaddeus*,—Comstock, 1912, *Spider Book*, p. 490, figs. 519–522, ♀, web. Comstock, 1940, *Spider Book*, rev. ed., p. 504, figs. 519–523, ♀, web. Roewer, 1942, *Katalog der Araneae*, vol. 1, p. 863.

*Neosconella thaddeus*,—Archer, 1951, *Amer. Mus. Novitates*, No. 1487: 38.

*Neosconella montana* Archer, 1951, *Amer. Mus. Novitates*, No. 1487: 39, fig. 41, ♂. Male holotype from Santa Rita Mountains, Arizona, in the American Museum of Natural History, examined. NEW SYNONYMY. (Not *Epeira montana*, *Aranea montana* and *Araneus montanus* of other authors.)

*Description*. Female from Georgia: Carapace, sternum, legs golden yellow. Distal articles of legs with some bands. Dorsum of abdomen whitish with five pairs of dark brown spots, which are farther apart anteriorly than posteriorly. Sides of abdomen blackish brown with a distinct border toward dorsum, fading toward venter (Figs. 420, 421). Venter with a transverse white mark behind epigynum; in front of spinnerets, a transverse brown mark which is extended anteriorly on each side (Fig. 420). Sides of venter white. The abdomen is wider than long as seen from above. Total length 6.2 mm. Carapace 2.5 mm long, 2.2 mm wide. First femur, 3.0 mm; patella and tibia, 3.8 mm; metatarsus, 2.7 mm; tarsus, 1.0 mm. Second patella and tibia, 3.0 mm; third, 1.7 mm; fourth, 2.2 mm.

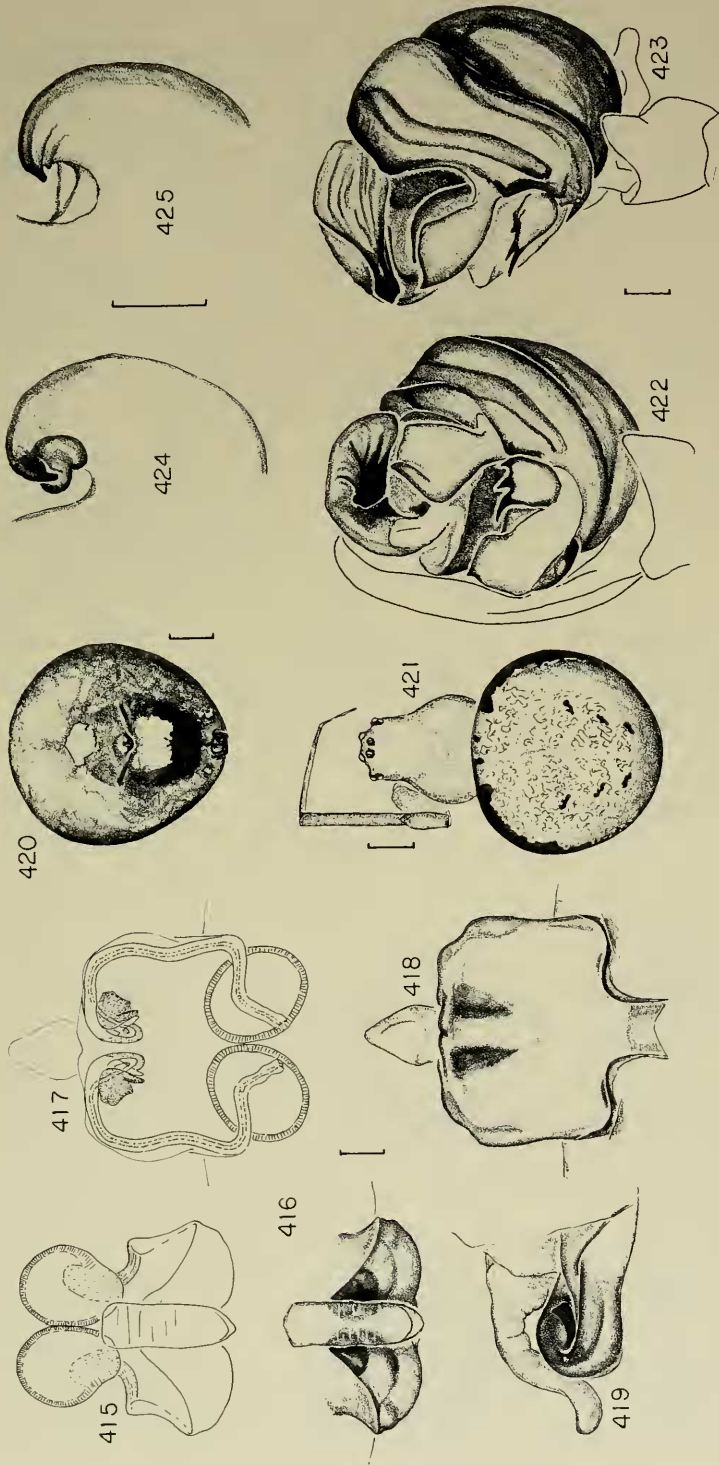
Male from Georgia: Coloration like that of female, except carapace slightly darker in the mid-line and almost no dark pigment on abdomen; the lateral bands are indistinct. There is a hook on the first coxa and a groove on the second femur. The second tibia is slightly curved and is armed with macrosetae. The abdomen seems longer than wide. Total length 4.7 mm. Carapace

2.9 mm long, 2.2 mm wide. First femur, 4.3 mm; patella and tibia, 5.4 mm; metatarsus, 4.1 mm; tarsus, 1.2 mm. Second patella and tibia, 3.7 mm; third, 2.0 mm; fourth, 2.9 mm.

*Variation*. Females vary from 5.9 to 8.0 mm total length, carapace from 2.4 to 3.0 mm long, 2.1 to 2.8 mm wide. Males vary from 3.7 to 5.7 mm total length, carapace 2.2 to 2.9 mm long, 1.8 to 2.2 mm wide. Sometimes females lack black pigment; males usually do. According to the literature (Comstock, 1912, 1940) the abdomen varies from yellowish to purple and pink in color. Males collected had a green spot under each femur.

*Diagnosis*. Females of *A. thaddeus* have been confused with those of *A. detrimentosus*; males with *A. pegnica*, judging by labels in vials. *Araneus thaddeus* differs by having, on the venter of the abdomen, a white transverse bar anteriorly and a black transverse bar posteriorly (Fig. 420). Females of *A. thaddeus* differ from those of *A. pegnica* by the dorsal pattern (Fig. 421) and by the rectangular posterior view of the epigynum (Fig. 418). The coloration of males of *A. thaddeus* and *A. pegnica* is similar, but *A. pegnica* has a median apophysis with two apically directed teeth; *A. thaddeus* has three teeth of variable size. Males cannot be separated by color pattern.

*Natural history*. The retreat of the spider has lattice-like walls with smaller and larger openings, giving the spider the common name lattice spider. Sometimes there are free sectors in the web as in *Zygiella* (Comstock, 1912, 1940). I have never seen this. Comstock pictured the orb web. There is a signal line from the center to the retreat. The webs are small, the catching area probably less than 15–20 cm in diameter. The species is common along the edge of woods in New England among abundant foliage such as high-bush blueberry (*Vaccinium* sp.), at the height of about 1.7 m above the ground. Males are mature from late summer to early fall, females from late summer to early winter.



Figures 415-425. *Araneus thoddeus* (Hentz). 415-419. Epigynum. 415. Ventral, cleared. 416. Ventral, cleared, with two embolus caps. 418. Posterior. 419. Lateral, with embolus cap. 420. Female abdomen, ventral. 421. Female with first left leg. 422-425. Left palpus. 422. Mesal. 423. Ventral. 424. Virgin embolus, with conductor hiding embolus removed. 425. Embolus, with conductor hiding embolus removed.  
 (Size indicators 0.1 mm, for Figs. 420, 421, 1 mm)



The eggs are found in a curled-up leaf, covered by a lattice-like webbing; probably they are not usually suspended on a thread as shown by McCook (1890). Some specimens come from mud dauber nests of *Trypargilum* sp. in Georgia. Life history information is found in McCook, 1889, 1890.

*Distribution.* A Japanese record of this species (Peelle and Saito, 1932, J. Fac. Sci. Hokkaido Univ. Zool., (6) 2(2): 93, fig. 6), is not *A. thaddeus*, judging by the illustration. *Araneus thaddeus* is common in the eastern United States, but it has not been collected in Florida and is rare on the Gulf coast. In the west it is much less common, but has been found in Mill Creek Canyon, Salt Lake City, two males from the Southwest Research Station at Chihuahua Mountains, Arizona, a male from Santa Rita Mountains, Arizona. There is a specimen from N25: W97 (W. Ivie), others from Distrito Federal, Mexico, Cuernavaca, Morelos and from the former Spanish Colony of New Grenada in the Keyserling Collection. The distribution is complementary to that of the similar *A. detrimentosus* (Map 6).

*Araneus pegnia* (Walckenaer)

Plate 10; Figures 5, 426–438; Map 6

*Epeira pegnia* Walckenaer, 1841, Histoire Naturelle des Insectes. Aptères, 2: 80. Type is Abbot, Georgia Spiders manuscript, figs. 484, 375, 389, of which I here designate fig. 484 lectotype, in the British Museum, Natural History, copy in the Museum of Comparative Zoology, examined. McCook, 1894, American Spiders, 3: 170, pl. 7, figs. 8, 9, ♀, ♂. Kaston, 1948, Connecticut Geol. Natur. Hist. Surv., 70: 260, figs. 810, 828–829, 2050, ♀, ♂, web.

*Epeira tytera* Walckenaer, 1841, Histoire Naturelle des Insectes. Aptères, 2: 81. The type is Abbot, Georgia spiders manuscript, fig. 374, in the British Museum, Natural History, copy in Museum of Comparative Zoology, examined. First synonymized by McCook, 1894.

*Epeira globosa* Keyserling, 1865, Verh. Zool. Bot. Ges. Wien, 15: 820, pl. 18, figs. 19–21, ♀. Two female syntypes from the Spanish Colony New Grenada [Colombia and Panama] in the British Museum, Natural History, examined. McCook, 1878, Proc. Acad. Natur. Sci. Philadelphia, p. 134, fig. 4, 5, ♀, web. Keyserling, 1892, Spinnen Amerikas, 4: 159, pl. 8, fig. 117, ♀. Emerton, 1902, Common Spiders, p. 173, figs. 406,

407, ♀, web. First synonymized by McCook, 1894.

*Epeira triaranea* McCook, 1876, Proc. Acad. Natur. Sci. Philadelphia, p. 200. Eight female syntypes from Mt. Pleasant, New Jersey, in the Academy of Natural Sciences, Philadelphia, examined. McCook, 1889, American Spiders, 1: 136–142, 305, 340. McCook, 1890 American Spiders, 2: 89–90, 195, 208, 222, 231–239. Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 315, pl. 34, fig. 9, pl. 36, figs. 6, 7, ♀, ♂. First synonymized by McCook, 1894.

*Epeira solersioides* O. P.-Cambridge, 1889, Biologia Centrali-Americana, Araneidea, 1: 25, pl. 7, fig. 15, ♂. Male holotype from Bugaba, Panama, in the British Museum, Natural History, examined. NEW SYNONYMY.

*Neosconella solersioides*.—F. O. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 475, pl. 44, fig. 4, ♂.

*Araneus pegnia*.—Petrunkevitch, 1911, Bull. Amer. Mus. Natur. Hist., 29: 308. Bonnet, 1955, Bibliographia Araneorum, 2: 564.

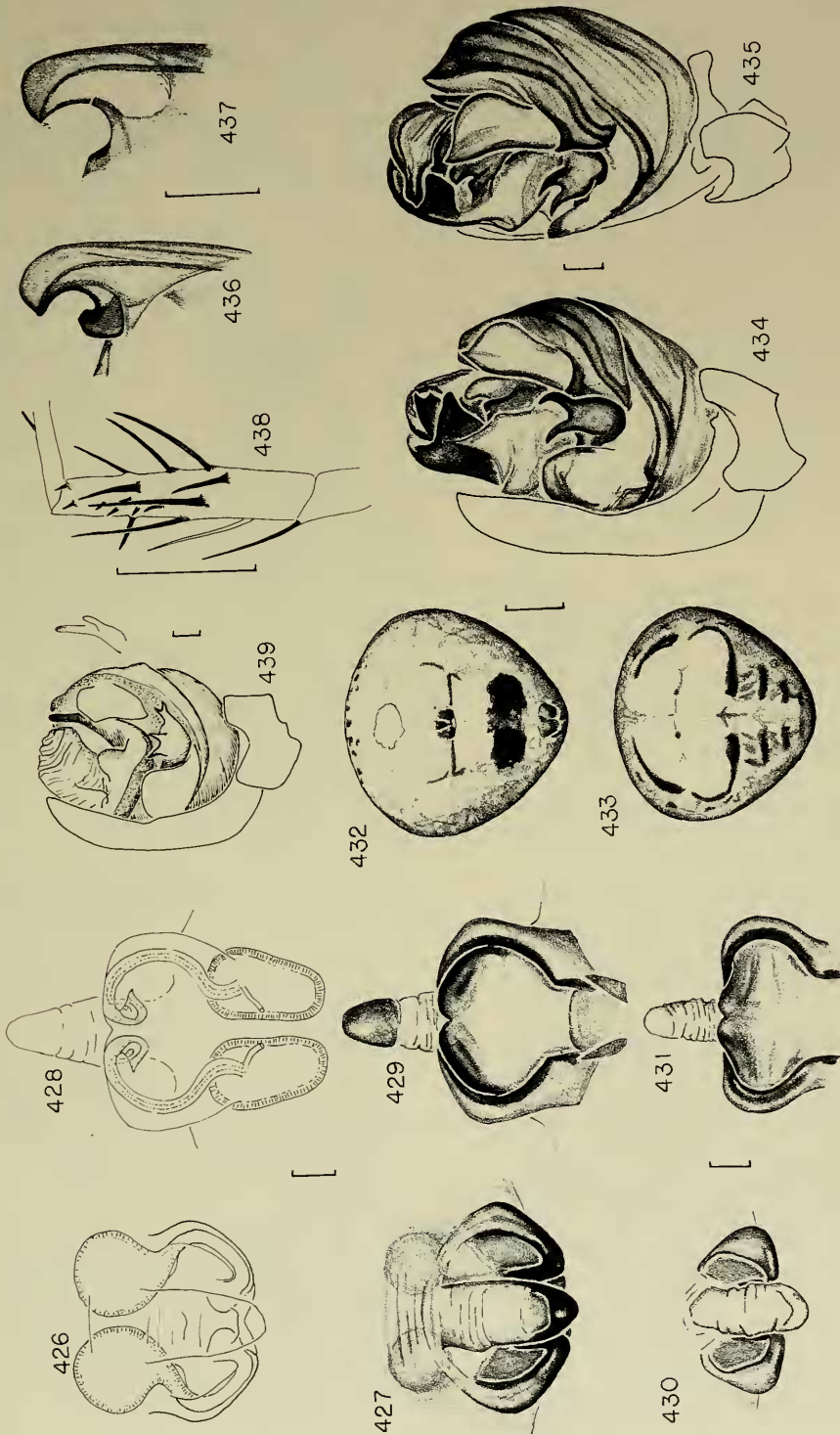
*Araneus solersioides*.—Petrunkevitch, 1911, Bull. Amer. Mus. Natur. Hist., 29: 316.

*Aranea pegnia*.—Comstock, 1912, Spider Book, p. 494, fig. 526, ♀; 1940, Spider Book, rev. ed., p. 508, fig. 526, ♀. Roewer, 1942, Katalog der Araneae, 1: 858.

*Neosconella pegnia*.—Archer, 1951, Amer. Mus. Novitates, No. 1487: 38, fig. 42, ♂.

*Neosconella sollersioides*.—Bonnet, 1955, Bibliographia Araneorum, 2: 3062.

*Description.* Female from North Carolina: Carapace yellow-brown. Sternum, legs yellow-brown. Legs sometimes banded. Dorsum of abdomen with anterior dorsal white mark, wider than long, framed by black lines that are widest at their posterior transverse borders (Plate 10; Fig. 433). Behind the transverse black lines are three to four pairs of black transverse lines, the posterior ones just round spots (Fig. 433). Black streaks on the sides run from anterior toward the spinnerets. Venter has a white transverse mark behind epigynum, and a black transverse mark near spinnerets. Living specimens have some red pigment above the dorsal white mark and some green on sides and posteriorly on dorsum. The abdomen is oval, wider than long as seen from the dorsum. Total length 6.1 mm. Carapace 2.7 mm long, 2.2 mm wide. First femur, 3.2 mm; patella and tibia, 3.6 mm; metatarsus, 2.6; tarsus, 1.0 mm. Second pa-



Figures 426-438. *Araneus pagnia* (Walckenaer). 426-431. Epigynum. 426. Ventral, cleared. 427. Ventral, cleared. 428. Posterior, cleared. 429. Posterior. 430. Ventral. 431. Posterior. 432. Female abdomen, ventral. 433. Female abdomen, dorsal. 434-437. Left palpus. 434. Mesal. 435. Ventral. 436. Virgin embolus, conductor pulled aside. 437. Embolus, conductor pulled aside. 438. Left second tibia, prolateral. Figure 439. *Neosconella styligera* O. P.-Cambridge, palpus, mesal. (Size indicators 0.1 mm, for Figs. 432, 433, 438, 1 mm)

tella and tibia, 2.9 mm; third, 1.6 mm; fourth, 2.5 mm.

Male from North Carolina: Coloration as in female, but abdominal black spots much less distinct or absent, and only three pairs of tiny black spots remaining on the posterior of the abdomen. Thoracic depression a longitudinal line. The height of the clypeus equals the radius of the anterior median eyes. The first coxa has a hook on its distal margin. All legs are armed with macrosetae. The second tibia is thicker than other tibiae its entire length and armed with strong macrosetae, particularly on the anterior side (Fig. 438). Abdomen is wider than long. Total length 5.3 mm. Carapace 2.7 mm long, 2.3 mm wide. First femur, 3.8 mm; patella and tibia, 4.7 mm; metatarsus, 3.0 mm; tarsus, 0.9 mm. Second patella and tibia, 2.9 mm; third, 1.7 mm; fourth, 2.5 mm.

*Variation.* Females vary from 3.5 to 8.2 mm total length, carapace 1.6 to 3.0 mm long, 1.4 to 2.5 mm wide. Males vary from 2.5 to 4.9 mm total length, carapace 1.5 to 3.3 mm long, 1.3 to 2.2 mm wide. The smallest individuals all came from Jamaica. Some females lack black pigment, most males do. The amount of red pigment on the dorsum of the abdomen is variable, but washes out rapidly in alcohol.

*Diagnosis.* The pattern of the female abdomen is diagnostic (Fig. 433). *Araneus pagnia* females differ from *A. thaddeus* females by having the epigynum in posterior view rounded on each side, containing curved dark sclerotization (Figs. 428–431). The male median apophysis has only two apically directed prongs (Fig. 434), while *A. thaddeus* has three variable teeth. Males cannot be separated by color pattern. There are several similar species in Mexico and Central America, with the males having the median apophysis similar, but the embolus different and few macrosetae on the second tibia.

*Natural history.* The species has been found in bogs in New England and river bottom in Costa Rica, wetter sites than for *A.*

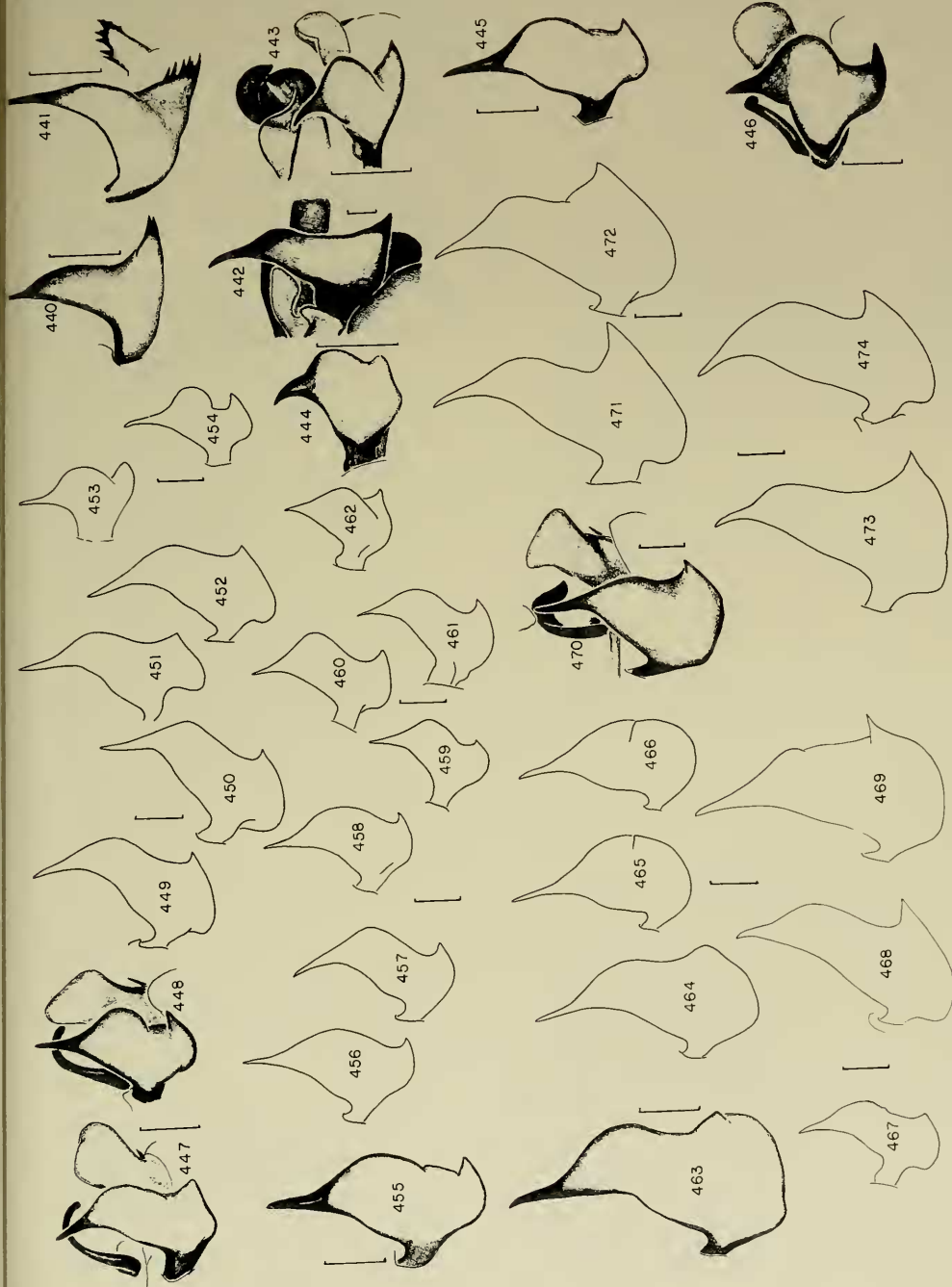
*thaddeus*. Many specimens came from mud dauber wasp nests. The web is pictured by Emerton (1902). Additional life history information and illustrations are found in McCook, 1889, 1890.

*Distribution.* From Massachusetts to Porter County, Indiana, common in the southeastern United States; in the southern United States, west to the Los Angeles area, south to Panama; Bahamas, Cuba and Jamaica (Map 6).

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 (Size indicators 0.1 mm)

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