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## The *fulva* Group of the Spider Genus *Steatoda* (Araneae, Theridiidae)

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In a recent revisional study by Herbert Levi (1957, Bull. Mus. Comp. Zoöl., vol. 117, pp. 367-424), the spider genus *Steatoda* was redefined and enlarged to include a series of theridiid spiders heretofore placed in several distinct genera. As now conceived, *Steatoda* comprehends a number of allied species groups, becomes more easily identifiable, and probably more closely approximates in its size and makeup such other genera in the family as *Theridion* and *Achaearanea*. Levi has recognized 23 species of *Steatoda* from continental North America and the adjacent West Indies. The present paper is concerned only with the three species placed by him in the *Steatoda fulva* group.

The author has had at his disposal the collections of the American Museum of Natural History on which the 1957 study by Levi was based. In addition, I would like to acknowledge with my sincere thanks the loan of additional material from the following individuals and institutions: Dr. Ralph V. Chamberlin, University of Utah, Salt Lake City, Utah; Dr. Herbert Levi, Museum of Comparative Zoölogy, Cambridge, Massachusetts; Mr. Wilton Ivie, Furlong, Pennsylvania; Mr. Vincent Roth, United States Department of Agriculture, Yuma, Arizona. To Mr. Vincent Roth I further proffer thanks for his interest and cooperation in this project. At my request he made a preliminary study of the material involved in this paper and arrived at essentially

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the same conclusions as my own regarding the number of valid species represented in the *fulva* group. During the writing of this paper I have also been constantly in touch with Dr. Herbert Levi, with whom I have exchanged materials and ideas to our mutual advantage. The drawings for the illustrations were prepared by Miss Marjorie Statham from sketches provided by the author. The types of the several new species described in the following pages are in the collection of the American Museum of Natural History.

#### THE *fulva* GROUP

The rock weavers of the *fulva* group are handsome ground spiders with white-spotted abdomens and quite brightly colored appendages. They live almost exclusively on the ground, where they spin inconspicuous webs in shaded situations under stones, boards, and diverse ground objects or in holes and recesses in the soil. When disturbed, they run with speed and agility quite in the manner of some of the running spiders. Males and females are found together frequently beneath the same stone, but until maturity the male lives in his own retreat. Most of the species occur in quite dry situations in open foothill country, often on dry hillsides but also in mesic situations, and the group is largely confined to the southwestern United States and Mexico. Differences in the ecological preferences of species of this group are still little understood. Several species live close together in almost any southwestern locality. On the rolling east bench just behind the University of Utah campus in Salt Lake City live three reddish, sibling species (*washona*, *variata*, and *fulva*) so similar in appearance that they probably are indistinguishable in the field. In the dry foothill country near Tucson, Arizona, occur five mostly darker species (*variata*, *punctulata*, *medialis*, *fulva*, and *apacheana*), all of similar size and general appearance. Most exact information will undoubtedly show distinct habitat preferences for each of these species.

The *fulva* group consists of a complex of closely allied populations that undoubtedly stem from a single precursor stock. Close relationship is evident from the similarity of general appearance and color pattern, from close correspondence of morphological details, and especially from similarity of genitalic features of both sexes. It is a closely knit series, presumably of North American origin, and has its greatest development in the arid border states of the United States and Mexico. The group is separated from adjacent species of *Steatoda* by a morphological hiatus far greater than that between any of the populations within the *fulva* group itself. Although a closely related

assemblage, the *fulva* group obviously has had a long developmental history with shifting distribution of the elements, inasmuch as many of the populations now present sympatric distributional patterns. At least one series of populations can be characterized as "difficult" or "complex."

Levi's characterization of the species of the *fulva* group, as part of his larger work on the whole genus *Steatoda*, was brief, undetailed, and quite diagrammatic. The problem was resolved in simple fashion. His principal conclusions were as follows: Three similar species, sympatric over most of their ranges, were represented. The first of these, *Steatoda medialis*, was conceived to be one showing variation in coloration of abdomen and appendages, in eye relations, and in the epigynum and male palpus. The second species, *Steatoda fulva*, was abundant and widespread, and showed small variation in the genitalia. The third species, *Steatoda pulcher*, comprising four allopatric populations, was credited with variation in coloration and epigynum and a surprising amount of variation in the male palpus. Illustrations were given of typical color patterns and several types of male palpi, but only a few of the epigynal types were represented by figures. In this work, and more particularly in a subsequent paper by the same author awaiting publication and dealing only with *medialis*, the conclusion was reached that there was little geographical stability to be seen in the characters and that there was gross discordance in most or all of the taxonomic features. This conclusion, although not prompted by the thesis, would seem to be in accord with the views of Wilson and Brown, that in a widespread, variable species such as *medialis* geographical populations, or subspecies, could not be accurately defined and that nothing would be gained by defining or naming them.

The aim of the present study is to show that Levi's treatment of the *fulva* group represents an oversimplification of what is clearly a more complex picture and that nine distinct populations, all of which are adjudged to be full species, are represented. The ranges of these species cut across two or more biotic provinces, and most occur through a considerable altitudinal range. Some of the species are broadly sympatric, others narrowly sympatric, and still others narrowly or widely disjunct. Whereas it is admitted that there is considerable variation within each population, it is possible to separate them readily on the basis of the principal features of the genitalia, on differences in leg lengths and eye relations in some species, and even with surprising accuracy when using only the admittedly variable color-pattern features of the abdomen. No specimens have been noted that are inter-

gradient in genitalic features. Finally, these discrete populations live in definitive areas, show typical distribution patterns, and are actually quite homogeneous in their appearance and makeup once they are understood.

The principles that have guided the modern arachnologist in arriving at concepts of what represents the objective species are exactly those of the modern biologist of any group. He has at his service a more or less bountiful material on which he is limited to one principal, rewarding avenue of approach, that of comparative morphology. After that he has at his disposal a small number of biological studies dealing with living spiders in the field and laboratory and also the various principles available to systematists of all groups. Without benefit of exact knowledge on the reproductive isolation of his populations, he places considerable reliance on the distribution principles of sympatry and allopatry. He is no better off, or in much worse position than the entomological or invertebrate systematist, and has at his disposal the works and concepts of a multitudinous field.

The species of the arachnologist would seem to be quite as well founded and objective as that of other invertebrate groups. It is fortunate that for the most part it is based on deep, basic, intensive morphological study, which is still the backbone of all good systematics. Furthermore, his concepts are usually strengthened by objective studies of the animals themselves and their relationship to one another in the natural habitats of at least one major biotic province.

It is not surprising that great reliance (and this for more than a hundred years) has been placed on structural features of the male and female genitalia, inasmuch as these unique copulatory organs offer a wealth of characters and are amazingly simple to study. Some of these differences are of great magnitude, but in others seemingly trivial differences have proved remarkably constant for separation of closely related species. In a few acres of eastern woodland the systematist finds living close together four distinct species of *Agelenopsis* which, except for the clues provided by the genitalia, would be regarded as a single, variable species. He sees this not as an isolated example but as a conventional situation common to many genera and families of spiders and invertebrates. It is his firm belief that such genitalic differences have great meaning. At the same time he is able to see something of the same kind of variation in them that he sees in other morphological characters. Furthermore, in wide-ranging species he is able to see changes in detail, often expressed in clinal fashion, but these differences rarely attain what he regards as a specific grade. His morpho-

logical "yardstick" is tested and used in conjunction with practical field experience and sound species concepts.

The excellent revisions of American theridiid genera by Herbert Levi are based almost exclusively on genitalic characters, and these most effectively characterize both the genera and the species. It should be noted, however, that in these studies almost every species is widely separated from the next by a broad morphological hiatus. At intervals there is given under single species rank a review of populations that have very wide range and require several drawings of male and female genitalia to express adequately the degrees of difference. These are variously called variable, polymorphic, and, occasionally, polytypic species by the author. Some examples of these complexes are the following: *Chryso albomaculata* O. P.-Cambridge, with three types of male palpus; *Tidarren fordum* Keyserling, with three distinctive epigyna and palpi; *Achaeearanea florens* O. P.-Cambridge, with two distinctive palpi; *Achaeearanea canionis* Chamberlin and Gertsch, with three distinctive palpi and epigyna; *Enoplognatha ovata* Clerck, with two very distinctive palpi and epigyna; *Enoplognatha joshua* Chamberlin and Ivie, with four different palpi; *Paidisca unimaculata* Emerton, with three distinctive palpi and two epigyna; *Steatoda grandis* Banks and *S. mexicana* Levi, with 10 different types of epigynum and several palpi. There are many more examples of this type, and they all testify to a very wide interpretation of what is a species in this spider family.

This broad species concept, which admits few sibling or closely allied species, is at variance with the work and interpretation of most modern arachnologists, who still instinctively regard the morphological approach as the one most likely to be proved correct. Nature does not always express itself in a simple way, as can easily be verified by a study of the comparable picture in better-known groups. In many of them can be found complexes that are difficult of interpretation, in which siblings and seemingly recently emerged species present trivial morphological differences. In some cases only one sex, usually the male, is identified with any high degree of certainty. Spiders present the same problem groups. The highly variable, morphologically diverse, and geographically atypical population is usually proved to be a composite of several species when the basic morphological units are properly sorted out.

Levi, in his recent paper on the genus *Latrodectus* (1959, Trans. Amer. Micros. Soc., vol. 78, p. 12), states: "My own studies of the theridiid genera *Theridion*, *Achaeearanea* and *Steatoda* have shown that many species are polytypic." In the present paper I show that

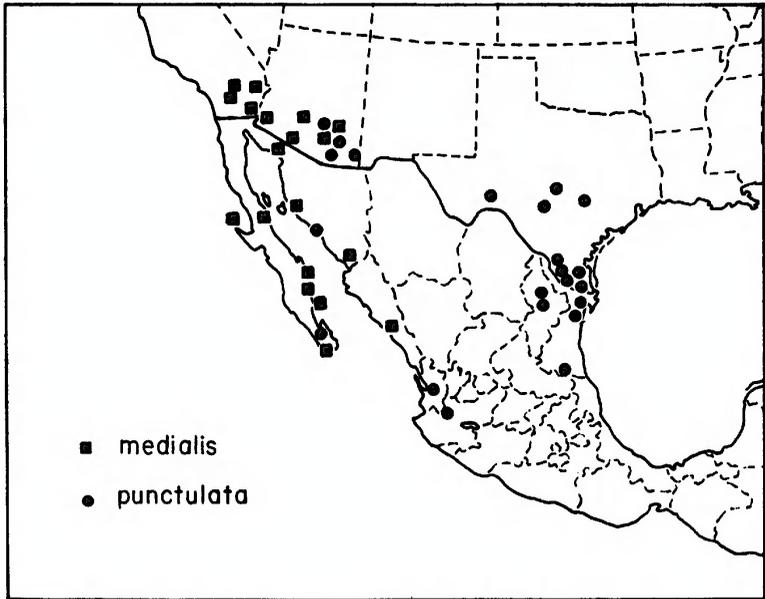


FIG. 1. Distribution of *Steatoda punctulata* and *medialis*.

Levi's species *Steatoda medialis* is composed of four quite distinct, mostly sympatric species and that his *Steatoda pulcher* includes four species so distinctive that, even though allopatric in distribution pattern, they should be regarded as full species. Levi suggests that *Enoplognatha joshua*, mentioned above, is a species with marked variation, and the four palpal types occur mostly in a single biotic region. The two kinds of *Enoplognatha ovata* occur in collections from the same localities. Some of the forms of *Paidisca unimaculata* come from the same or near localities. Some of the other groups are at present known to be allopatric. I am suggesting here that a great many of these discretely morphological populations are full species and that this can be proved by more intensive study. Further, it seems quite likely that some now regarded as allopatric will be shown, after more adequate collecting has been done, to live in the same biotic areas with their relatives as distinct species. In this connection it can be mentioned that *Achaearanea florens* is now definitely known to be two species, which occur together in Panama; the second one is being described by Levi. It is becoming more and more clear that these complexes are composite in their species makeup and are not merely variant or polytypic populations.

The genitalia of the *fulva* group offer excellent features for the sepa-

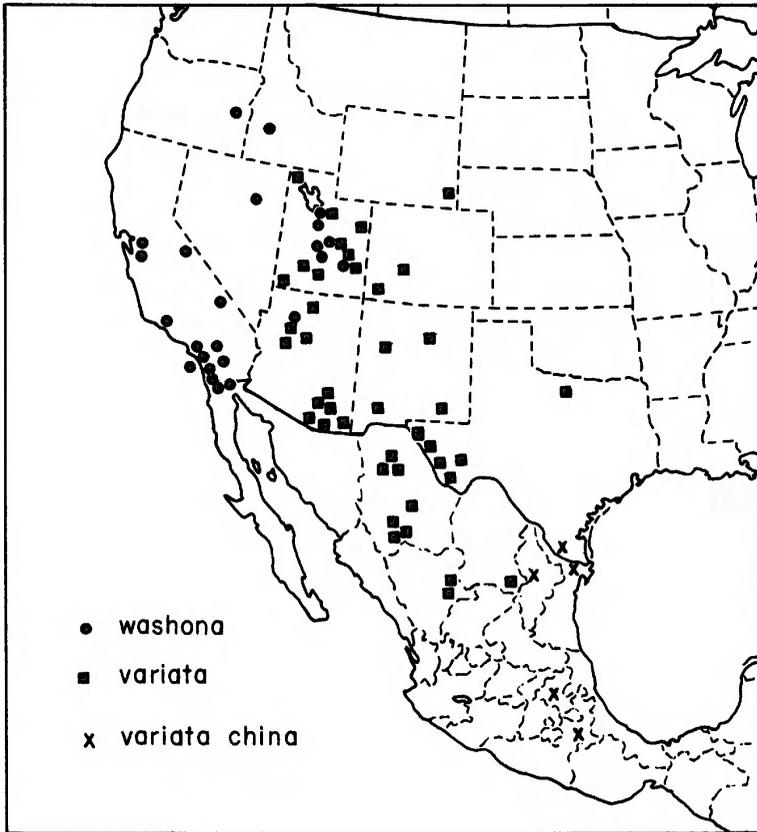


FIG. 2. Distribution of *Steatoda washona* and *variata*.

ration of the species. The external epigynum presents a moderately elevated, transverse bridge which assumes various forms. Immediately in front is a shallow atrium which is indistinctly margined by a slight carina. On each side of the bridge is an inconspicuous atriobursal orifice which leads into the bursa copulatrix. The caudal edge of the bridge is variously emarginated, is well vaulted beneath, and presents a pair of lateral foveae into which, it is presumed, the median apophysis of the male palpus is socketed during mating.

The internal features are fundamentally the same as in most of the higher spiders, with good development of an expanded bursa copulatrix and seminal receptacle on each side. The unit of each side represents a modified tube which has responded to conform to the length

and form of the embolus. The bursa copulatrix is a thin-walled, flattened sac, more strongly sclerotized in the contact and juncture areas, which sheathes most of the embolus during the mating. The presumed course of the embolus is shown by the series of arrows in figures 21 and 64. The tip of the embolus finally enters the sclerotized, convoluted tube at the caudal edge of the seminal receptacles and penetrates that organ. The oval or round seminal receptacles are of medium size, are strongly sclerotized, and are dark brown in color. The receptacles are rather uniform in appearance, but the bursae copulatrix vary considerably in size, being much more voluminous in those species with long emboli. It should be noted that the bursa copulatrix is not shown in the diagrams provided by Levi.

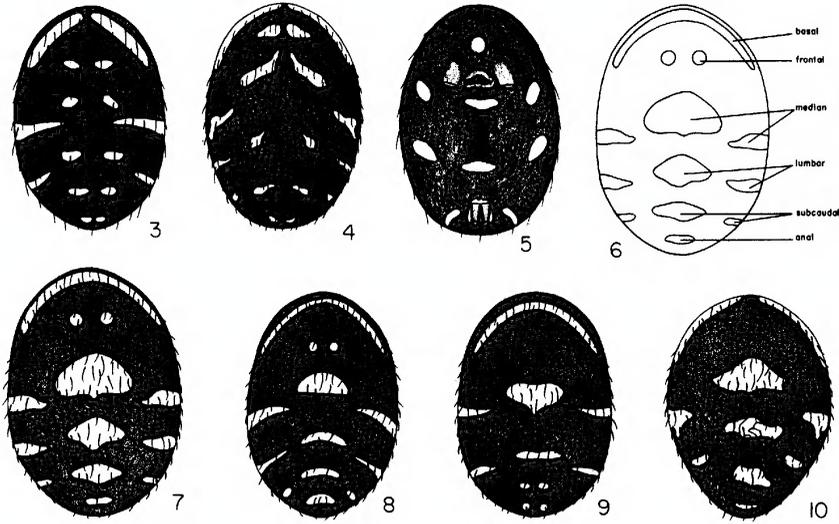
The male palpi are quite similar in design but present distinctive differences for each species. The embolus originates at various points on the bulbal margin, forms a narrow to broad coil, depending on its length, and comes to rest in a pointed conductor at the apex of the bulb. The median apophysis is located on the prolateral side of the bulb and is distinctive in form in all the species.

The members of the *fulva* group are conveniently divided into two closely allied series, and each is discussed separately herein.

#### THE *medialis* SERIES

This series of four species was regarded as a single, variable species by Levi. The forward curvature of the frontal edge of the transverse bridge of the epigynum to form a rounded or pointed lobe features the group. The median apophysis of the male palpus presents the form shown in the illustrations.

The distinctive abdominal patterns of the *medialis* series present interesting variations. The base color of the abdomen varies from reddish to nearly black, and superimposed upon it are series of whitish spots and bands. These spots are quite fixed in number and arrangement, and they can be presumed to represent remnants of more complete whitish rings or chevrons once largely encircling the abdomen. A median development of this spotting is represented by *Steatoda medialis*, in which the dorsum has a single median series. As shown in figure 6, names are given to the series of spots for easier reference. When the median row of spots decreases in size by invasion of the dark base color, these quite wide spots are pinched at the middle to form twin spots. In *Steatoda punctulata* all the median spots are twinned, and the small spots are quite widely separated. Twinning of one or more of the median spots also occurs occasionally in other spe-



FIGS. 3-10. Abdominal patterns of females of *Steatoda*. 3-5. *S. punctulata* Marx. 3. Edinburg, Texas, dorsal view. 4. Laredo, Texas, dorsal view. 5. Edinburg, Texas, ventral view. 6-10. *S. medialis* Banks, dorsal views. 6. Diagram of typical pattern. 7. Palm Springs, California. 8. Carmen Island, Baja California. 9. Navajoa, Sonora. 10. Agiabampo, Sonora.

cies. In some males, when the median spots are thin transverse bands set close together, the whitish pigment may form thin bands, may form twin spots, or be largely absent.

The abdominal patterns have tended to move in several directions, to result in diminution to final obliteration of the spots on the one hand and enlargement and fusion on the other. In the *medialis* series the largest number of discrete spots is found in *punctulata* (fig. 3). A median number is present in *medialis* (figs. 7-10), but there are sporadic loss of the frontal pair and rare twinning of the lumbar, subcaudal, and anal spots. In *washona* the frontal and lumbar spots are usually missing. In the fourth species, *variata*, all intergrades (figs. 37-44) between generous dorsal spotting to complete loss of spots are represented. In addition, enlargement of the spots to form median and lateral bands often occurs.

The abundant material of this group was readily separated into four well-marked populations on the basis of distinctions in eye size and relations, comparative leg measurements, and male and female genitalia. *Steatoda punctulata* and *medialis* form a pair closely allied in size and genitalic features. In both, the eyes are subequal in size,

and the median quadrangle is essentially square. The legs of *medialis* are distinctly longer in both sexes. In both species the embolus of the male palpus is quite long, and the median apophysis is broad and evenly curved. The bursa copulatrix is a voluminous sac forming in outline, with the seminal receptacles, a figure much wider in front than behind. *Steatoda punctulata* was found to be remarkably uniform in color features and to be readily separable from *medialis* on that character alone. The problem involved in this instance was the exact status of these seemingly discrete populations in their relations to each other. Are they distinct species or merely geographical representatives of the same species? In spite of the handicap of sparse material from critical areas, the following points deserve mention. *Steatoda medialis* lives in Baja California, along the west coast of Mexico in Sonora, and ranges northward into the hot desert country of southern Arizona and California and eastward to the Tucson region of Arizona. *Steatoda punctulata* is common in southern Texas, eastern Mexico, and in the southwestern states of Sinaloa and Jalisco. In addition, it presses westward with typical color pattern, shorter legs, and distinctive genitalia into the territory of *medialis* at Guaymas, Sonora, Las Palmas, in the Cape Region of Baja California, and into the Tucson region of Arizona. Three females of *medialis* from Agiabampo and Navajoa, Sonora, and the Organ Pipe National Monument, Arizona, have shorter legs than are typical of their species. They can be regarded as intergrades in this feature to *punctulata*. In their genitalic features and dominant color traits they are closely allied to *medialis*. It seems quite certain that here we are dealing with two distinct species, with just possibly some hybridization in the zone of sympatry.

The second pair of species of this series is also closely allied to each other. The first of these, *washona*, has the eyes subequal in size (in some cases the anterior median eyes are somewhat smaller), and the median ocular quadrangle forms a figure as wide behind as in front. The anterior median eyes of *variata* are enlarged and form, with the posterior median eyes, a figure obviously narrower behind than in front in both sexes. In both species the legs are of moderate length, as are those of *punctulata*. *Steatoda washona* and *variata* have shorter emboli on the male palpi, and the bursae copulatrix of the female epigyna are of small size, at most equaling the seminal receptacles in size, and forming with them a figure not much wider in front than behind. *Steatoda washona* and *variata* live close together in a broad zone from northern Utah to northern Arizona. *Steatoda variata* occurs with both *medialis* and *punctulata* in the Tucson area of Arizona and is

broadly sympatric with the latter from southeastern Arizona deep into eastern Mexico.

*Steatoda washona* probably lives outside the range of *medialis* in California and is presumed to be limited to the cooler foothill country of that state. Although it resembles *medialis* in appearance, it is readily distinguished by its shorter legs and by good differences in the genitalia.

*Steatoda punctulata* Marx

Figures 1, 3-5, 11-13, 26, 27

*Lithyphantes punctulatus* MARX, 1898, in Banks, Proc. California Acad. Sci., ser. 3, vol. 1, p. 239, pl. 14, fig. 4. PETRUNKEVITCH, 1911, Bull. Amer. Mus. Nat. Hist., vol. 29, p. 183. CHAMBERLIN, 1924, Proc. California Acad. Sci., ser. 4, vol. 12, p. 640 (part; not *medialis*). ROEWER, 1942, Katalog der Araneae, vol. 1, p. 408. BONNET, 1957, Bibliographia araneorum, vol. 2, pt. 3, p. 2560.

*Steatoda medialis* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 388 (part: figs. 34, 45, 55).

DIAGNOSIS: This is an average-sized species, with very uniform color pattern. The blackish abdomen presents five pairs of small white spots on the middle part of the dorsum. The basal, median, and lumbar side spots are, in some specimens, elongated. All the spots are typically small, and the full complement is usually present. The eyes are subequal in size. The legs are stouter and somewhat shorter than in the other species, as follows: the first leg of the female is only 3.4 times as long as the carapace, and the first femur only equals it in length; the first leg of the male is 4.3 times as long as the carapace, and the first tibia equals it in length. The epigynum is of very constant form, as shown in the figures, and has the bursa copulatrix a very large sac far exceeding the receptacle in size. The stout male palpus features a quite flat, widely rounded, median apophysis of the bulb, as in *medialis*, but the embolus is longer and broader. *Steatoda punctulata* is sympatric with *medialis* in southeastern Arizona, along the coast of Sonora, and in the Cape Region of Baja California.

COLORATION: The golden orange to dusky brown carapace is lightly to strongly darkened on the side margins, and the eye tubercles are black. The base color of the legs is the same as the carapace, but the femora are darker reddish brown, longitudinally striped, and the other segments may show brownish rings. The sternum, coxae, and mouth parts are light to dull orange. The carapace and appendages are rather sparsely set with inconspicuous dark hairs. The abdomen varies from purplish brown to black and is variously marked with white dorsal spots as shown in figures 3 to 5. The five pairs of small

dorsal spots are usually all present and show little size variation except for the median pair which may be elongated. The lateral spots on the dorsum are in some specimens elongated, and the median one is typically larger. The lower side spots are usually three on each side, as shown in figure 5. On the midline of the venter are two spots, one behind the genital furrow and another in front of the spinnerets, but these may be joined to form a more or less distinct median band. The abdomen is evenly covered with inconspicuous dark hairs.

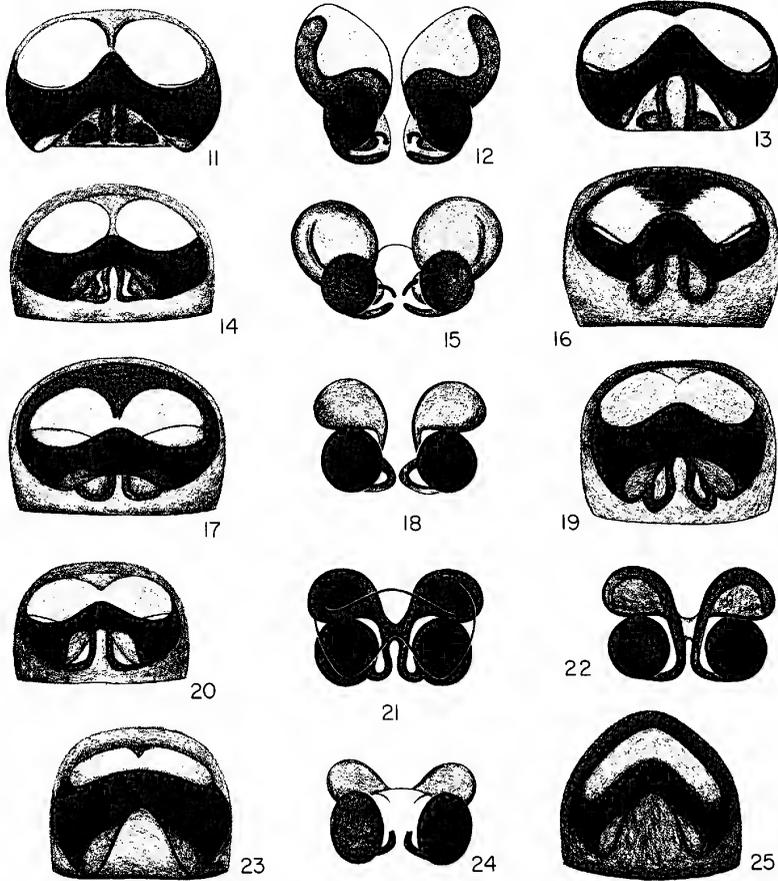
Males resemble the females closely in coloration, and those with large abdomens have the white spotting exactly as in the females. In more masculine males with narrow, reduced abdomens the size of the white spots is greatly reduced, and some may be missing. The twinned condition is usually evident by paler patches, even though the white flecks may be gone.

STRUCTURE: Females vary from about 3.5 mm. to 5 mm. in total length. Males are smaller because of the smaller abdomen. The eyes in both sexes are subequal in size. The moderately procurved front eye row has the dark median eyes separated by their radius and are half as far from the lateral eyes. The eyes of the straight posterior eye row are separated by two-thirds of the diameter. The median ocular quadrangle forms an essentially square figure only a trifle wider behind, and the eyes are about equal in size. The nearly vertical clypeus, which is grooved below the front eye row, is equal in height to about two diameters of an anterior median or lateral eye. The eyes are quite constant in size and relationship throughout the range of the species. The median ocular quadrangle is occasionally slightly narrower behind.

FEMALE FROM EDINBURG, TEXAS: Total length, 3.7 mm.; carapace, 1.5 mm. long, 1.2 mm. wide; abdomen, 2.3 mm. long, 1.5 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	1.50	1.25	1.00	1.50
Patella	0.63	0.55	0.50	0.70
Tibia	1.15	0.80	0.61	1.05
Metatarsus	1.21	0.93	0.77	1.17
Tarsus	0.65	0.58	0.53	0.65
Total	5.14	4.11	3.41	5.07

The legs are a little stouter and shorter than in *medialis* and *variata*. No spines are present, but the legs are clothed with inconspicuous dark hairs. The first leg is only 3.4 times as long as the carapace; the first



FIGS. 11-25. Epigyna of females of *Steatoda medialis* series. 11-13. *S. punctulata* Marx. 11. Guaymas, Sonora. 12. Guaymas, Sonora, dorsal view of internal structure. 13. San Juan, Texas. 14-17. *S. medialis* Banks. 14. Agiabampo, Sonora. 15. Isla Pelicano, Sonora, dorsal view of internal structure. 16. Isla Pelicano, Sonora. 17. Whitewater Canyon, California. 18-22. *S. washona*, new species. 18. Tanbark Flats, California, dorsal view of internal structure. 19. Tanbark Flats, California. 20. Ferron, Utah. 21. Ferron, Utah, ventral view of internal structure. 22. Ferron, Utah, dorsal view of internal structure. 22-25. *S. variata*, new species. 23. The Gap, Arizona. 24. The Gap, Arizona, dorsal view of internal structure. 25. The Gap, Arizona.

femur is as long as the carapace; the first tibia is three-fourths (76%) as long as the carapace.

Length measurements of females of *punctulata*:

	Total Length	Carapace	First Tibia
Edinburg, Texas	3.7 mm.	1.5 mm.	1.15 mm.
Edinburg, Texas	4.4	1.7	1.4
La Quemada, Jalisco	4.7	1.7	1.35
La Gloria, Coahuila	4.5	1.6	1.3
General Bravo, Nuevo Leon	3.7	1.25	1.1
Sabino Canyon, Arizona	4.7	2.0	1.8
Patagonia, Arizona	4.0	1.6	1.3
Culiacan, Sinaloa	5.0	1.8	1.5
Culiacan, Sinaloa	4.6	1.7	1.4
Culiacan, Sinaloa	4.5	1.7	1.42
Las Palmas, Baja California	4.7	2.0	1.7
Guaymas, Sonora	4.5	1.9	1.65
Guaymas, Sonora	5.0	1.9	1.62
Average	4.46 mm.	1.71 mm.	1.44 mm.

The suboval abdomen, which from above is seen to be a little narrowed behind, slightly overhangs the carapace in front and is about three-fourths as high as broad. The colulus is a quite long finger set with hairs. The posterior spiracle is located immediately in front of the spinnerets.

The epigynum is illustrated in figures 11 to 13. The broad transverse bridge is produced forward into a heavy, blunt angle and is broadly excavated behind. The lateral foveae are well separated. The internal epigynum presents on each side a very large, thin-walled bursa copulatrix, which shrinks somewhat in polyvinyl alcohol preparations, and a small, well-sclerotized seminal receptacle.

MALE FROM LLANO, TEXAS: Total length, 3.4 mm.; carapace, 1.6 mm. long, 1.2 mm. wide; abdomen, 2 mm. long, 1.2 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	1.90	1.65	1.33	1.90
Patella	0.65	0.60	0.50	0.70
Tibia	1.65	1.30	0.90	1.40
Metatarsus	1.80	1.40	1.03	1.75
Tarsus	0.82	0.65	0.58	0.80
Total	6.82	5.60	4.34	6.55

The legs are proportionately longer than in the female as follows: the first leg is 4.3 times as long as the carapace; the first femur is longer than the carapace; the first tibia is as long as the carapace. The leg proportions are quite constant throughout the range of the species.

Length measurements of males of *punctulata*:

	Carapace	First Femur	First Tibia
Edinburg, Texas	1.7 mm.	2.0 mm.	1.7 mm.
Edinburg, Texas	1.5	1.8	1.5
Llano, Texas	1.6	1.9	1.65
Portal, Arizona	1.65	2.0	1.7
Sabino Canyon, Arizona	1.55	1.9	1.6
Culiacan, Sinaloa	2.00	2.3	1.9
Jesús María, Nayarit	1.95	2.2	1.9
	—	—	—
Average	1.7 mm.	2.0 mm.	1.7 mm.

The male palpus is illustrated in figures 26 and 27 and presents the following differences from that of *medialis*: the tibia is considerably shorter and broader; the embolus is longer, forms a much wider coil, and has the basal teeth a little higher up on the cymbial edge.

TYPE LOCALITY: Female type of *Lithyphantes punctulatus* from Las Palmas, the Cape Region, Baja California, originally in the California Academy of Sciences, now destroyed. Female cotype, or paratype, in the Museum of Comparative Zoölogy. Levi considered the above type locality to be doubtful and thought the specimens probably came from a more eastern locality. However, the presence of *punctulata* along the west coast of Mexico immediately adjacent to Baja California suggests that the type locality is authentic.

DISTRIBUTION: Southwestern United States from mostly southern Texas to southeastern Arizona; widespread in Mexico from Tamaulipas to Sonora (Guaymas), Sinaloa, Nayarit, and the Cape Region of Baja California. (See fig. 1.)

*Steatoda punctulata* is sympatric with the western *medialis* in a band from southeastern Arizona to the coastal area of western Mexico. The two species occur in the Santa Catalina Mountains and the foothill country near Tucson, Arizona, where the species *variata* is also found. The type of *punctulata* came from an area in Baja California where typical *medialis* is common.

KNOWN RECORDS: Texas: Northwest of Edinburg, November 3, 1934 (S. Mulaik), three males, females. Thirty miles west of Edinburg, July 4, 1935 (S. Mulaik), males, females. Edinburg, February 5, 1938 (S. Mulaik), female; September–December, 1934 (S. Mulaik), females. North of McCook, November 20, 1937 (D. Mulaik), penultimate male, females. La Joya, October 30, 1938 (L. I. Davis), female. Austin, August, 1909 (A. Petrunkevitch), female. Four miles west of Arroyo Tigre, Zapata County, November 1, 1934 (S. Mulaik), females. Five miles southeast of Rio Grande City, April 10, 1936 (S. Mulaik), female,

immature; May 1, 1937 (W. A. Green), females. Rio Grande City, October 2, female; March 28, 1936, females; May 1, 1937 (S. Mulaik), female. San Juan, Rio Grande Flood Plain, March 29, 1936, male, females. Llano, August 29, 1940 (L. I. Davis), male, females; December, 1934 (L. I. Davis), females. Raven Ranch, Kerr County, June, 1944 (R. Scott), female; August, 1939 (S. Mulaik), female. Enchanted Rock, 10 miles north of Fredericksburg, Llano County, August 23, 1951 (T. Cohn), female, Zapata County, June, female. Thirty-two miles southwest of Laredo, March 10, 1936 (S. Mulaik), females; April 10, 1936 (S. Mulaik), male. Thirty-two miles east of Laredo, November 11, 1934 (S. Mulaik), females. *Arizona*: Patagonia, August 9, 1940 (E. S. Ross), female. Sabino Canyon, near Tucson, February 15, 1957 (V. Roth), male, female; June 5, 6, 1952 (W. J. Gertsch), male, three females. Southwestern Research Station, 5 miles west of Portal, July 6-20, 1955 (W. J. Gertsch), male. Santa Catalina Mountains, April, 1937 (M. D. Porter), male; 7800 feet, June 24, 1940 (O. Bryant), male. *Sonora*: Guaymas, July 13, 1945 (M. Cardinas), female from beneath stone; April 14, 1941 (J. C. Chamberlin), female. *Baja California*: Las Palmas, cotype of *punctulata*. *Sinaloa*: Six miles south of Culiacán, July 22, 1954 (W. J. Gertsch), male, females. *Nayarit*: Jesús María, July 12, 1955 (B. Malkin), male. *Coahuila*: Gloria, August 24, 1947 (W. J. Gertsch), female. *Nuevo Leon*: Near Monterrey, Kilometer 1171, August 20, 1947 (C. and M. Goodnight), male. Thirty miles east of General Bravo, November 28, 1937 (L. I. Davis), female. *Tamaulipas*: Arroyo La Chorera, March 28, 1957 (A. M. and L. I. Davis), females.

#### *Steatoda medialis* Banks

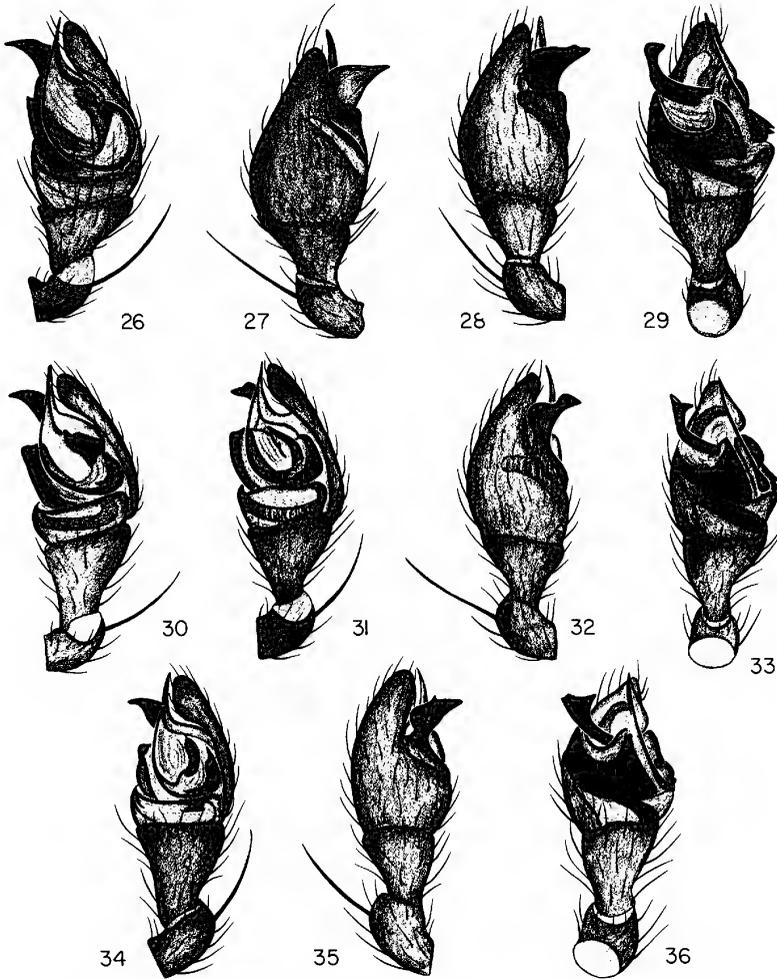
Figures 1, 6-10, 14-17, 28-30

*Lithyphantes medialis* BANKS, 1898, Proc. California Acad. Sci., ser. 3, vol. 1, p. 240, pl. 14, fig. 3; 1910, Bull. U. S. Natl. Mus., no. 72, p. 21 (part). BONNET, 1957, Bibliographia araneorum, vol. 2, pt. 3, p. 2557.

*Lithyphantes punctulatus* CHAMBERLIN, 1924, Proc. California Acad. Sci., ser. 4, vol. 12, p. 640 (part; not *punctulata*).

*Steatoda medialis* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 388 (part: fig. 43).

**DIAGNOSIS:** This is a very near ally of *Steatoda punctulata*, but it is readily differentiated by differences of color pattern, morphology, and genitalic features. The typical and quite uniform color pattern is illustrated in figure 7. The presence of a single median row of large dorsal spots, of which the small frontal ones are typically paired and are often absent, immediately separates this species from *punctulata*.



FIGS. 26-36. Left male palpi of *Steatoda medialis* series. 26, 27. *S. punctulata* Marx. 26. Retrolateral view. 27. Prolateral view. 28-30. *S. medialis* Banks. 28. Prolateral view. 29. Ventral view. 30. Retrolateral view. 31-33. *S. washona*, new species. 31. Retrolateral view. 32. Prolateral view. 33. Ventral view. 34-36. *S. variata*, new species. 34. Retrolateral view. 35. Prolateral view. 36. Ventral view.

The lumbar side spot is always present, and the anal and subcaudal dorsal spots are occasionally paired. The large median spot on the dorsum is always present and distinct. The males resemble the females, but the spotting on the abdomen becomes indistinct in masculine males. The legs are proportionately longer in both sexes than in

*punctulata* as follows: the first leg of the female is 4.4 times as long as the carapace, the first femur considerably exceeds it, and the first tibia equals it in length; the first leg of the male is 5.7 times as long as the carapace and the first femur and tibia very considerably exceed it in length. The epigynum is narrower, has the frontal edge of the bridge more rounded, and has the caudal excavation smaller. The male palpus is more slender, has the tibia proportionately longer, and has an obviously shorter embolus forming a narrower loop.

**COLORATION:** The golden orange carapace and appendages are lightly dusted with dusky, and the eye tubercles are black. The abdomen is blackish above and much paler below and is variously marked above with a pattern of white spots as shown in figures 7 to 10. The small pair of spots in front of the large median eyes are missing in some specimens, and only one may be present. Some of the posterior spots may be twinned, but the large median spot is invariably distinct. Females from Navojoa and Agiabampo, Sonora, show some coloration intermediacy to *punctulata*, as can be seen in figures 9 and 10. Coloration of specimens from Baja California and from the Imperial Valley of California and adjacent Arizona is very uniform. The males have the dorsal pattern of the females, with the median spot on the dorsum large and those behind usually as thin transverse bands with or without white color.

**STRUCTURE:** Females vary from about 4.3 mm. to 5.5 mm. in total length. Males are smaller, 3 mm. to 4 mm., but few are known. The eye relations and general structure are in good agreement with those of *punctulata*, but the legs are longer.

**FEMALE FROM CORONADOS ISLAND, BAJA CALIFORNIA:** Total length, 4.3 mm.; carapace, 1.65 mm. long, 1.25 mm. wide; abdomen, 2.4 mm. long, 1.7 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	2.05	1.65	1.30	2.00
Patella	0.75	0.65	0.60	0.86
Tibia	1.70	1.12	0.80	1.50
Metatarsus	1.95	1.38	1.03	1.70
Tarsus	0.85	0.70	0.60	0.72
Total	7.30	5.50	4.33	6.78

The legs are longer than those of *punctulata*. The first leg of the female is 4.4 times as long as the carapace; the first femur is longer and the first tibia about as long as the carapace.

Length measurements of females of *medialis*:

	Total Length	Carapace	First Tibia
Cedros Island, Baja California	5.0 mm.	1.65 mm.	1.8 mm.
Agua Caliente, Baja California	5.5	1.8	1.8
San José del Cabo, Baja California	5.0	2.0	2.05
La Paz, Baja California	5.0	1.9	2.0
Sal Si Puedes, Baja California	4.3	1.8	1.8
Smith's Island, Baja California	5.5	2.2	2.2
Carmen Island, Baja California	4.5	1.7	1.8
Picacho, Arizona	5.3	1.9	2.07
Fortuna Mine, Arizona	5.0	1.8	2.1
Whitewater Canyon, California	5.5	1.9	2.0
Mule Canyon, California	4.5	1.7	2.0
Navojoa, Sonora	4.3	1.6	1.4
Agiabampo, Sonora	4.6	1.7	1.6
Average	4.9 mm.	1.81 mm.	1.89 mm.

The length of the first tibia equals or exceeds the carapace in all but two of the females measured above and also in an equal number not here listed. The two females from Sonora have shorter legs and in this feature can be regarded as intergrades to *punctulata*. However, in epigynal features these species are quickly assignable to *medialis*, and their coloration features also belong with that species.

The epigynum (figs. 14-17) is smaller than that of *punctulata* and presents the following differences: the front, curved margin of the bridge is rounded and only rarely angled; the caudal edge of the bridge is vaulted and provided with a smaller emargination than that of *punctulata* and the lateral foveae are somewhat nearer together; the bursa copulatrix is not so large as that of *punctulata*.

MALE FROM MULE CANYON, CALIFORNIA: Total length, 3.1 mm.; carapace, 1.53 mm. long, 1.16 mm. wide; abdomen, 1.8 mm. long, 0.95 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	2.50	2.00	1.65	2.55
Patella	0.71	0.60	0.55	0.74
Tibia	2.25	1.70	1.23	2.10
Metatarsus	2.30	1.80	1.50	0.90
Tarsus	0.90	0.80	0.65	2.30
Total	8.66	6.90	5.58	8.59

The legs are longer than in the female and much longer than those

of *punctulata*, as follows: the first leg is 5.7 times as long as the carapace; the first femur and the first tibia far exceed the carapace in length. The leg proportions are quite constant throughout the range of the species as is indicated below.

Length measurements of males of *medialis*:

	Carapace	First Femur	First Tibia
Tucson, Arizona	1.25 mm.	1.65 mm.	1.43 mm.
Phoenix, Arizona	1.60	2.20	—
Picacho, Arizona	1.65	2.65	2.50
Muggins Mountains, Arizona	1.75	2.75	2.50
Mule Canyon, California	1.53	2.50	2.25
Average	1.55 mm.	2.35 mm.	2.17 mm.

The male palpus (figs. 28–30) closely resembles that of *punctulata*, with which it agrees in having the median apophysis a flattened, well-rounded lobe. The tibia and other elements are somewhat longer and thinner, and the smaller embolus has the basal teeth in a different position, as illustrated.

**TYPE LOCALITY:** Female type of *Lithyphantes medialis* from San José del Cabo, Baja California, originally in the California Academy of Sciences, now destroyed. Two female cotypes, or paratypes, in the Museum of Comparative Zoölogy.

**DISTRIBUTION:** Southern California eastward to Tucson, Arizona, southward along the coast of Mexico and throughout Baja California. (See fig. 1.) This is a species of the hot, low, desert country where it lives under stones on the ground.

**KNOWN RECORDS:** *Arizona:* Phoenix (R. H. Crandall), male. Tucson, March 15, 1940 (O. Bryant), male. Tucson Mountains, January 1, 1936 (O. Bryant), male. Organ Pipe National Monument, June 10, 1952 (W. J. Gertsch), female. Yuma County: April 13, 1958 (V. Roth), male. Cibola, March 10, 1957 (V. Roth), female. Fortuna Mine, May 10, 1957 (V. Roth), females; March 31, 1947 (V. Roth), male, two females. Palm Canyon, September 17, 1956 (V. Roth), female. Near Sierra Pinta, February 21, 1958 (J. C. Chamberlin), penultimate male, female. *California:* Picacho, Imperial County, June 15, 1958 (W. J. Gertsch), three females; June 15, 1958 (V. Roth), male, two females. Thirteen miles west of Winterhaven, June 13, 1958 (V. Roth), male. Mule Canyon, Calico Mountains, March 17, 1955 (J. W. MacSwain), male, female. Palm Springs, April 20, 1951 (E. I. Schlinger), female. Whitewater

Canyon, near Palm Springs, July 12, 1958 (W. J. Gertsch and V. Roth), seven females. *Sonora*: Thirty miles southwest of Sonoyta, March 31, 1949 (G. M. Bradt). Isla Pelicano, April 30, 1944 (B. Osorio), females. Fifteen miles west of Agiabampo, April 28, 1949 (G. M. Bradt), female. Navajoa, August 6, 1956 (V. Roth and W. J. Gertsch), female. *Baja California*: Chamberlin (1924) recorded this species (as *punctulata*) from about 20 localities in Baja California, many from islands in the Gulf of California; some of these specimens have been studied. The following are new records: Isla Habana, May 16, 1944 (B. Osorio), female. Isla Cedros, February 22, 1945, female. San José Del Cabo, March 17, 1945 (M. Correa), two females. *Nayarit*: Arroyo Santiago, 3 miles northwest of Jesús María, July 4-6, 1955 (B. Malkin), male.

#### *Steatoda washona*, new species

Figures 2, 18-22, 31-33

*Steatoda medialis* LEVI, 1957, Bull. Mus. Comp. Zool., vol. 117, p. 388 (part: fig. 36).

**DIAGNOSIS:** This species is a close relative of *Steatoda medialis* and can easily be mistaken for it. The small pair of frontal spots and the lumbar side spots are almost always lacking. The eyes are subequal in size, and the median ocular quadrangle is typically a square, or slightly narrowed in front, with the front eyes often a trifle smaller. The legs are distinctly shorter than those of *medialis* as follows: the first leg of the female is about 3.6 times as long as the carapace, and the first femur about equals it in length; the first leg of the male is 4.5 times as long as the carapace and the first tibia does not fully equal it in length. The leg proportions are similar to those of *punctulata*. The epigynum is quite constant in form but occasionally may be mistaken externally for that of *medialis*. The bursa copulatrix is much smaller and about equals the receptacles in size. The distinct notch in the median apophysis of the male palpus readily separates it from that of *medialis* and that of *punctulata*.

**COLORATION:** This species agrees closely in coloration with *medialis* but is somewhat more variable. The cephalothorax and legs are golden orange, especially in specimens from southern California, and the blackish abdomen bears clear white spots. In northern and coastal specimens the carapace and legs are often quite dusky. The pair of small frontal spots and the lumbar side spots are almost always missing. In a few specimens the median row of dorsal spots are enlarged and may be joined to form a dentate band. Males agree closely in coloration with the female.

STRUCTURE: Females vary from about 3.5 mm. to 6 mm. in total length. The eyes in both sexes are subequal in size. The moderately procurved front eye row has the median eyes separated by the radius or a little more and distinctly separated from the laterals by about half of the radius. The eyes of the straight posterior eye row are separated by almost two-thirds of their diameter. The median ocular quadrangle is nearly square to slightly narrowed in front, and the anterior median eyes may be slightly smaller, especially in Utah specimens.

FEMALE FROM TANBARK FLATS, CALIFORNIA: Total length, 4.7 mm.; carapace, 1.9 mm. long, 1.45 mm. wide; abdomen, 3 mm. long, 2 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	2.00	1.65	1.40	2.00
Patella	0.80	0.72—	0.60	0.86
Tibia	1.50	1.15	0.90	1.45
Metatarsus	1.70	1.35	1.10	1.65
Tarsus	0.85	0.70	0.65	0.82
Total	6.85	5.57	4.65	6.78

The legs are shorter than in *medialis*. The first leg is 3.6 times as long as the carapace; the first femur is as long as the carapace; the first tibia is about three-fourths as long as the carapace.

Length measurements of females of *washona*:

	Total Length	Carapace	First Tibia
Tecata, Baja California	4.0 mm.	1.5 mm.	1.3 mm.
Santa Barbara, California	4.5	1.7	1.4
Clayton, California	5.5	2.0	1.6
Berkeley, California	4.5	1.85	1.4
Silver Canyon, California	5.7	2.2	2.0
Midvale, Idaho	4.0	1.45	1.3
Salt Lake City, Utah	4.5	1.7	1.5
Ferron, Utah	3.7	1.35	1.25
Sedona, Arizona	4.7	1.7	1.54
Average	4.6 mm.	1.71 mm.	1.47 mm.

The epigynum is illustrated in figures 18 to 22. The transverse bridge is broadly to bluntly rounded in front and presents behind a triangular opening of medium size. The bursa copulatrix is of medium size, scarcely equal in size to the receptacle. The bursae and receptacles form a rectangular figure not much wider in front than behind.

MALE FROM TANBARK FLATS, CALIFORNIA: Total length, 3-7 mm.; carapace, 1.65 mm. long, 1.2 mm. wide; abdomen, 2 mm. long, 1 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	1.85	1.60	1.37	2.00
Patella	0.65	0.60	0.48	0.75
Tibia	1.55	1.20	0.95	1.60
Metatarsus	1.65	1.40	1.15	1.65
Tarsus	0.75	0.70	0.60	0.78
	<hr/>	<hr/>	<hr/>	<hr/>
Total	6.40	5.50	4.55	6.78

The legs are proportionately longer than in the female, as follows: the first leg is 4.5 times as long as the carapace; the first femur is slightly longer than the carapace; the first tibia is slightly shorter than the carapace. The fourth leg is distinctly longer than the first.

The palpus of the male from Tanbark Flats, California, is illustrated in figures 31 to 33. The tibia is broader than long and equals about half of the cymbial length. The median apophysis is similar to that of *medialis* but has a distinct notch at the apical edge. The embolus is about as long as that of *medialis*, but the basal teeth are in a different position, as shown in the illustration.

TYPE LOCALITY: Male holotype from Tanbark Flats, San Gabriel Mountains, Los Angeles County, California, June 20, 1952 (W. J. Gertsch).

DISTRIBUTION: Oregon and California, southward in the mountains into northern Baja California and eastward into Idaho and Utah and northern Arizona. (See fig. 2.)

*Steatoda washona* is widespread in the foothill and mountain country of California but is replaced in the hot deserts by *medialis* and probably does not live in any areas occupied by the latter. In Utah *washona* occurs in the same regions as *variata* and closely resembles it in size and appearance.

KNOWN RECORDS: *Baja California*: Eleven miles south of Tecate, November 10, 1957 (V. Roth), female. Forty-five miles east of Tecate, November 17, 1952 (W. Creighton), female. *California*: Lake County, (J. C. Chamberlin), female. Silver Canyon, Inyo County, June 27, 1941 (W. M. Pearce), male, three females. Montgomery Canyon, Mono County, July 13, 1941 (W. M. Pearce), male. Hammil Station, Mono County, May 27, 1941 (W. M. Pearce), male, four females. Fontana, San Bernardino County, July 16, 1942 (E. I. Schlinger), female. Santa

Barbara, September 5, 1947 (A. Bacon), four females. Clayton, Contra Costa County, August 4, 1939 (E. S. Ross), three females. Berkeley, September, 1919 (H. Dietrich), two females. San Nicolas Island, July, 1938 (T. D. A. Cockerell), female. Los Angeles, June, female. Tanbark Flats, Los Angeles County, June 20, 1952 (W. J. Gertsch), male, six females. San Antonio Canyon, near Claremont, July 1, 1956 (V. Roth and W. J. Gertsch), three females. Pine Valley, San Diego County, July 10, 1953 (W. J. and J. W. Gertsch), female. Laguna Beach, July 6, 1931 (W. Ivie), females. Santa Cruz Island, April, 1913 (R. V. Chamberlin), male, immature females. *Oregon*: Malheur River Canyon, September 10, 1949 (V. Roth), female. *Idaho*: Four miles north of Midvale, August 5, 1943 (W. Ivie), two females. *Utah*: Salt Lake City, June (W. J. Gertsch), two males, females. Richfield, July–August, 1930 (W. J. Gertsch), female. Fish Lake, Sevier County, June 22, 1930 (W. J. Gertsch), females. Two miles east of Glenwood, June 30, 1940 (W. J. Gertsch), females. Ferron, June 23, 1934 (W. Ivie), six females. Moab, June 18, 1934 (W. Ivie), female. Loa, August, 1934 (W. Ivie), female. *Arizona*: Oak Creek Canyon, 5 miles north of Sedona, August 9, 1948 (C. and P. Vaurie), female. *Nevada*: Twenty miles west of Elko, September 5, 1935 (R. V. Chamberlin and W. Ivie), female.

#### *Steatoda variata*, new species

Figures 2, 22–25, 34–44

*Steatoda distincta* THORELL, 1877, Bull. U. S. Geol. Surv., vol. 3, p. 385. BANKS, 1893, Jour. New York Ent. Soc., vol. 1, p. 124; 1895, Ann. New York Acad. Sci., vol. 8, p. 423; 1910, Bull. U. S. Natl. Mus., no. 72, p. 21 (part). PETRUNKEVITCH, 1911, Bull. Amer. Mus. Nat. Hist., vol. 29, p. 188. Not *Steatoda distincta* (Blackwall).

*Lithyphantes medialis* BANKS, 1902, Proc. U. S. Natl. Mus., vol. 25, p. 214.

*Lithyphantes distinctus* CHAMBERLIN AND IVIE, 1933, Bull. Univ. Utah, biol. ser., vol. 2, p. 8, pl. 1, fig. 9.

*Steatoda medialis* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 388 (part: fig. 35).

**DIAGNOSIS:** This variable species is readily separated from the others on the basis of the distinctive color pattern, which only rarely is the same as those of the other species. The anterior median eyes are slightly to considerably larger than the others and with the posterior median eyes form a figure somewhat narrowed behind. The epigynum features a very small bursa copulatrix and externally presents a caudal triangular cleft which is larger than in *washona*. The median apophysis of the male palpus is distinctive in shape, as shown in the figures, and the embolus is very short.

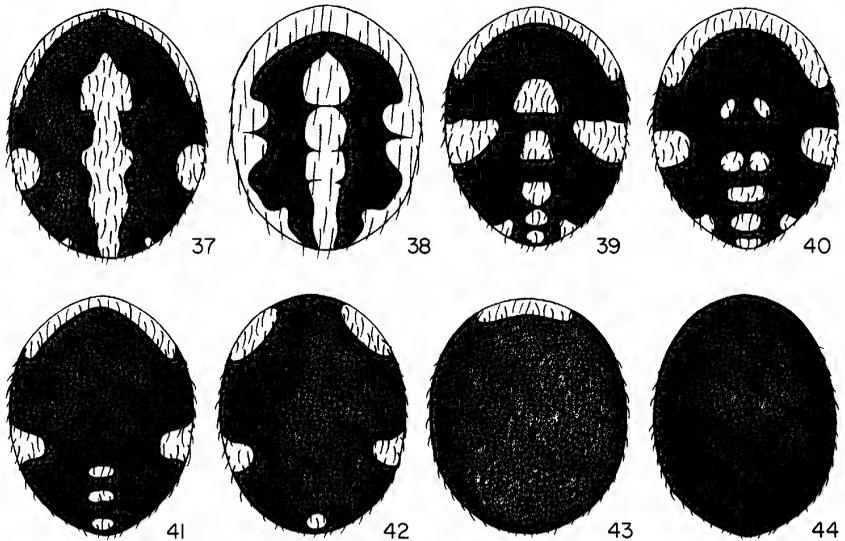
**COLORATION:** This species has a broad range from northern Utah to southern Mexico and exhibits wide variability in coloration. Over most of Utah it is a reddish spider, with golden orange cephalothorax and appendages and a reddish abdomen with white spotting. In Arizona and southward it is usually a blackish spider, with dark reddish brown, duskily streaked carapace and legs, and a black abdomen marked with white spots. The abdominal pattern is extremely variable, as can be seen from a study of figures 37 to 44. Some specimens have a dorsal pattern quite similar to that of *washona*, as is seen in an example from Hope, New Mexico (fig. 39). Twinning of the median spots is not uncommon (fig. 40) for either sex. Two males from Primavera, Chihuahua, have most of the dorsal spots twinned. In this species the lumbar side spots are usually missing, as are the small pair of frontal spots of other species. The spots of the median band are often enlarged to the extent that they fuse to a toothed median band. Similarly the side spots fuse to form solid, dentate bands, as shown in figure 38. On the other hand there may be reduction of the spotting to a single basal band (fig. 43) or even complete obliteration of all spots (fig. 44).

**STRUCTURE:** Females vary from about 2 mm. to 6 mm. in total length. The anterior median eyes are slightly to considerably larger than the others in this species. The moderately procurved front eye row has the dark median eyes separated by two-thirds of the diameter and by about half as far from the lateral eyes. The eyes of the essentially straight posterior eye row are separated by three-fourths of, to nearly the full, diameter. The median ocular quadrangle is about as long as broad, is slightly to considerably wider in front, and has the front eyes usually clearly larger. The anterior median eyes of the males are usually proportionately larger than those of the females.

**FEMALE FROM TUCSON, ARIZONA:** Total length, 5 mm.; carapace, 2.25 mm. long, 1.75 mm. wide; abdomen, 3 mm. long, 2 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	2.30	1.90	1.70	2.25
Patella	0.95	0.85	0.72	1.05
Tibia	1.78	1.27	1.05	1.65
Metatarsus	2.00	1.55	1.30	1.95
Tarsus	0.80	0.75	0.72	0.82
	—	—	—	—
Total	7.83	6.32	5.47	7.72

The legs are of about the same length and stoutness as those of



FIGS. 37-44. Dorsal abdominal patterns of females of *Steatoda variata*, new species. 37, 38. The Gap, Arizona. 39. Hope, New Mexico. 40. Sierra Blanca, Texas. 41, 42. The Gap, Arizona. 43. Hawk Springs, Wyoming. 44. Portal, Arizona.

*punctulata*. The first leg is only 3.5 as long as the carapace; the first femur is about as long as the carapace; the first tibia is about three-fourths as long as the carapace.

Length measurements of females of *variata*:

	Carapace	Femur	First Tibia
Hawk Springs, Wyoming	1.7 mm.	1.85 mm.	1.35 mm.
Bernalillo County, New Mexico	1.6	1.6	1.22
Green River, Utah	1.7	1.9	1.55
The Gap, Arizona	2.0	2.15	1.7
Jerome, Arizona	1.6	1.65	1.32
Portal, Arizona	1.7	1.75	1.4
Fort Hancock, Texas	1.8	1.85	1.4
Primavera, Chihuahua	2.2	2.2	1.7
San Juan del Río, Durango	1.7	1.75	1.35
Saltillo, Coahuila	1.4	1.5	1.15
Monterrey, Nuevo Leon	1.2	1.25	0.98
Average	1.7 mm.	1.77 mm.	1.37 mm.

The epigynum is illustrated in figures 34 to 36. It is smaller than the epigyna of the other species and has the atrium reduced to a shal-

low, transverse, or caudally curved depression. The caudal edge of the bridge is deeply cleft to form a large triangular opening, at each side of which lie the large foveae. The seminal receptacles are of average size but are far larger than the bursae copulatrix.

MALE FROM TUCSON, ARIZONA: Total length, 4 mm.; carapace, 2 mm. long, 1.5 mm. wide; abdomen, 2.4 mm. long, 1.3 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	2.40	2.00	1.65	2.45
Patella	0.92	0.80	0.65	0.83
Tibia	2.10	1.55	1.25	2.00
Metatarsus	2.30	1.80	1.55	2.37
Tarsus	0.93	0.80	0.67	0.95
Total	8.65	6.85	5.77	8.60

The legs are proportionately longer than those of the female, as follows: the first leg is 4.3 times as long as the carapace; the first femur is longer than the carapace; the first tibia is slightly longer than the carapace.

Length measurements of males of *variata*:

	Carapace	First Femur	First Tibia
Salt Lake City, Utah	1.5 mm.	1.6 mm.	1.4 mm.
Ferron, Utah	1.25	1.4	1.2
Sweetwater, Arizona	1.37	1.6	1.4
Portal, Arizona	1.25	1.43	1.2
Salaices, Chihuahua	1.8	1.9	1.65
Primavera, Chihuahua	1.5	1.7	1.45
San Juan del Rio, Durango	1.8	1.87	1.6
Average	1.5 mm.	1.64 mm.	1.41 mm.

The palpus of a male from The Gap, Arizona, is illustrated in figures 34 to 36. The form of the median apophysis is distinctive, and it appears quite broad in ventral view. The embolus is short and has the basal teeth in the same position as those of *washona*.

TYPE LOCALITY: Male holotype from 25 miles north of The Gap, Navajo Indian Reservation, Arizona, July 21, 1949 (W. J. and J. W. Gertsch).

DISTRIBUTION: Utah and Wyoming, southward through Arizona and western Texas into Mexico, as shown in the map (fig. 2).

*Steatado variata* is sympatric with *washona* in Utah and northern Arizona, with *medialis* in the Tucson, Arizona, region, and with *punctulata* in southern Arizona and southward in a broad band to

Durango in the west and from Tamaulipas to Hidalgo in eastern Mexico. Specimens of *washona* and *variata* occur together in the same collections and live close together in the field.

KNOWN RECORDS: *Utah*: Salt Lake City, east bench, June, 1930 (W. J. Gertsch), two males. Four miles south of White River on Evacuation Creek, July 29, 1934 (F. M. Carpenter), female. Three miles south of Green River, September 6, 1943 (H. E. Vokes), female. Fruita, July 2, 1940 (W. J. Gertsch and L. Hook), females. Five miles from Moab, June 18, 1934 (W. Ivie), four females. Virgin Narrows, June 11, 1934 (W. Ivie), female. Grouse Creek, Raft River Mountains, September 8, 1932 (W. Ivie), female. Moab, 5 miles up river, June 18, 1934 (W. Ivie), penultimate male, two females. Ferron, June 23, 1934 (W. Ivie), males, females. *Wyoming*: Hawk Springs, Goshen County, August 15, 1952, female. *Colorado*: One mile east of Salida, 7000 feet, August 4, 1956 (H. and L. Levi), female under stone. Ten miles north of Cortez, June 17, 1934 (W. Ivie), female, two immatures. *New Mexico*: Grants, August 6, 1932, female. Pecos (N. Banks), two females. Florida Mountains, 17 miles southeast of Deming, September 4, 1951 (T. Cohn), female. Hope, July 5, 1934 (S. Mulaik), female. Bernalillo County (mixed grassland), (C. C. Hoff), two females. Suwanee, September 6, 1930, three females; September 5, 1941 (W. Ivie), female. *Arizona*: Twenty-five miles north of The Gap, July 21, 1949 (W. J. and J. W. Gertsch), male, many females. South slope of Mingus Mountain, south of Jerome, June 17, 1958 (W. J. and J. W. Gertsch), female. Prescott (Barber and Schwarz), female. Duncan, September 7, 1939 (D. and S. Mulaik), male, two females. Miami, May 12, 1939 (R. H. Crandall), female. Tucson, June 30, 1947 (B. Malkin), female; March 7, 1935 (O. Bryant), male. Fifteen miles east of Tucson, June 6, 1952, two females. Ten miles south of Oracle, Santa Catalina Mountains, July 16, 1940 (W. J. Gertsch and L. Hook), female. Three miles east of Portal, September 11, 1950 (W. J. Gertsch), female. Eight miles northeast of Portal, May 18, 1956 (M. Statham), female. Five miles west of Portal, August 5-15 (W. J. Gertsch), male, females. Sweetwater, Santa Rita Mountains, June 25, (W. S. Creighton), male. Seven miles southeast of Ruby, September 5, 1950 (W. J. Gertsch), females. *Texas*: Fort Hancock, Hudspeth County, June 1, 1941 (S. and D. Mulaik), female. Sierra Vieja, 11 miles west of Valentine, Presidio County (W. W. Milstead), two females. Eight miles west of Sierra Blanca, Hudspeth County, September 6, 1951 (T. Cohn), female. El Paso, August 6, 1954 (W. J. Gertsch), females; May 29, 1952 (W. J. Gertsch), females. La Mota Mountain, 63 miles south of Marfa

(W. W. Milstead), female. Davis Mountains, 4 miles south of Toyahvale, September 26, 1950 (W. J. Gertsch), two females. Decatur, August 10, 1940 (O. Sanders), two females. *Chihuahua*: Primavera, 5500–6000 feet, June 29, 1947 (W. J. Gertsch), two males, two females. Valle de Olivos, 5500 feet, July 20, 1947 (W. J. Gertsch), male. Salaiques, 5200 feet, August 31, 1947 (G. M. Bradt), male. Five miles south of Chihuahua, July 11, 1947 (W. J. Gertsch), two females. One mile east of La Sauceda, 7000 feet, July 21, 1947 (W. J. Gertsch), males, females. Huejotitlán, July 20, 1947 (W. J. Gertsch), four females. Fifty miles south of Ahumada, June 11, 1939 (A. M. and L. I. Davis), female. Six miles south of Gallego, 5100 feet, May 6, 1953 (W. S. Creighton), two females. *Durango*: San Juan del Río, August 1, 1947 (W. J. Gertsch), male, two females. La Loma, August 20, 1947 (W. J. Gertsch), female. *Nuevo Leon*: Near Monterrey, Kilometer 1171, August 20, 1947 (C. and M. Goodnight), female. *Coahuila*: Five miles west of Saltillo, July 5, 1936 (L. I. Davis), female.

#### *Steatoda variata china*, new subspecies

**DIAGNOSIS:** The population of *Steatoda variata* from eastern Mexico presents various distinctive features that make it desirable to designate it as a subspecies. The important morphological features agree closely with those of typical *variata*, but the size is much smaller. The anterior median eyes are larger than the lateral eyes and, with the posterior median eyes, form a figure broader in front than behind. The male palpus is stouter than typical *variata*, and the median apophysis is broader in subventral view. The epigynum agrees closely with that of typical *variata*. The color pattern resembles that of the population in Utah, the general impression being of a reddish spider, and the dorsal white spots are all present.

Length measurements of males of *variata china*:

	Carapace	First Femur	First Tibia
Ixmiquilpán, Hidalgo	1.2 mm.	1.3 mm.	1.12 mm.
Villa Juárez, Tamaulipas	1.1	1.12	1.0
China, Nuevo Leon	1.1	1.2	1.0
Rio Grande City, Texas	1.21	1.27	1.1
Average	1.15 mm.	1.22 mm.	1.05 mm.

**TYPE LOCALITY:** Male holotype from China, Nuevo Leon, Mexico, November 28, 1937 (L. I. Davis and B. Brown).

**DISTRIBUTION:** Southern Texas and eastern Mexico. (See fig. 2.)

**KNOWN RECORDS:** *Texas*: Five miles west of Rio Grande City, April

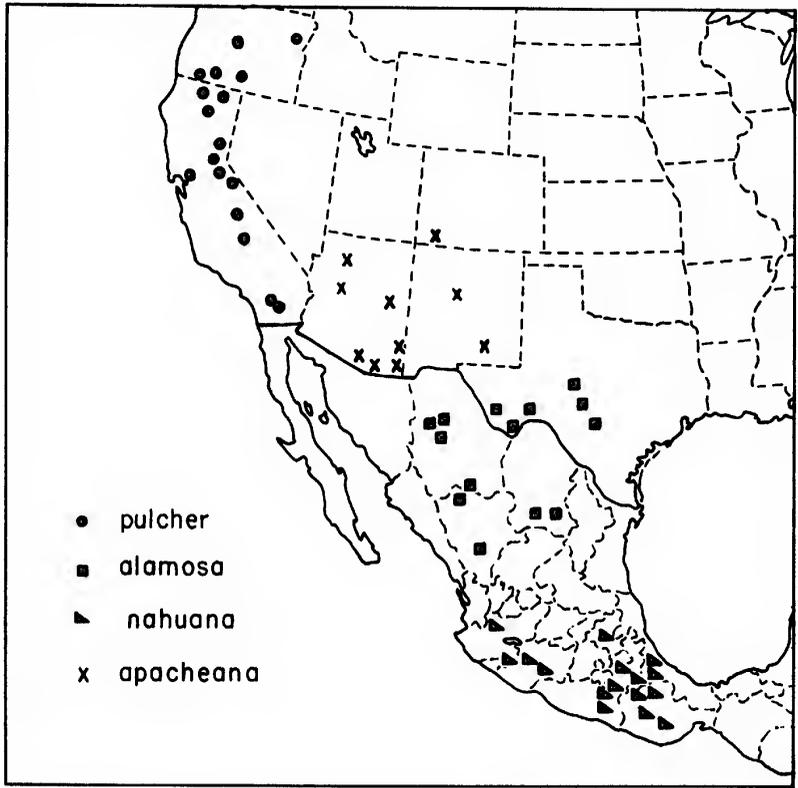


FIG. 45. Distribution of species of *Steatoda*.

10, 1936 (S. Mulaik), one male. *Tamaulipas*: Twenty miles east of Villa Juárez, November 28, 1941 (L. I. Davis), male, female. *Nuevo Leon*: China, November 28, 1937 (L. I. Davis and B. Brown), male, immature female. *Hidalgo*: Ixmiquilpán, July 5, 1944 (L. I. Davis), male. *Distrito Federal*: Teotihuacán, August 20, 1940 (C. and M. Good-night), one female.

#### THE *fulva* SERIES

This series of five species was considered by Levi to represent only two, *fulva* and *pulcher*, and the latter was found to be made up of four allopatric elements. The frontal edge of the epigynal ridge is essentially straight or variously emarginated. To the species *pulcher*, Levi attributed wide discordance in the characters, found little agreement in the direction of the various clines, and detected a "surprising amount of variation" in the male palpus.

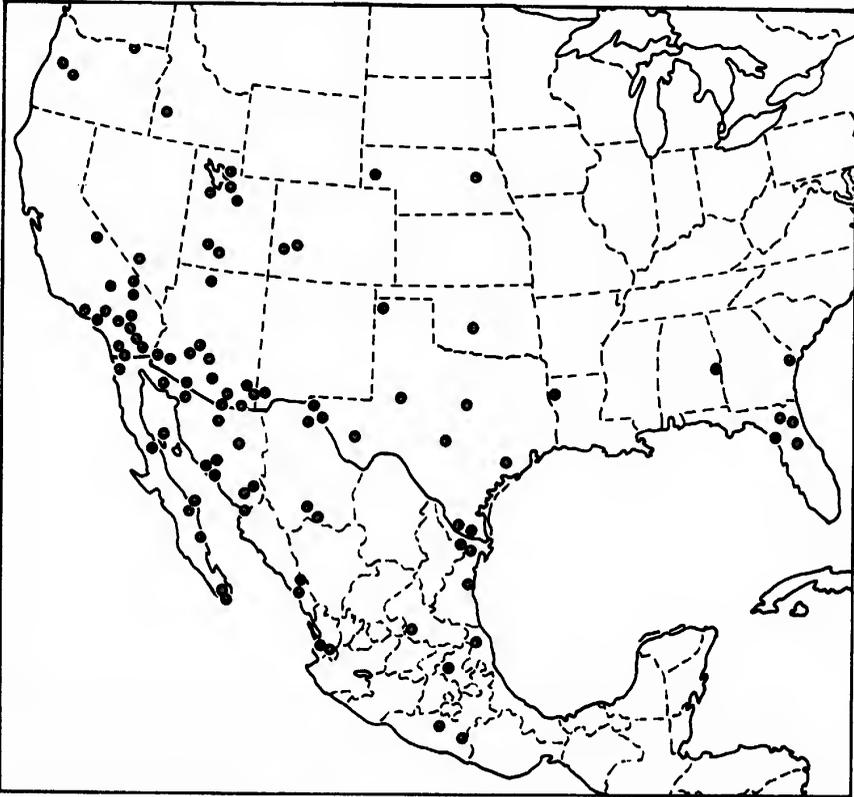


FIG. 46. Distribution of *Steatoda fulva*.

The abdominal color patterns of this series are similar to those of the *medialis* series, but some different emphasis is represented. In *pulcher* (fig. 38) the relatively large spots of the middle line form a distinct band in average examples. The encroachment of the white pattern often proceeds to the extent that the whole dorsum may be essentially whitish (fig. 49), with mere traces of the darker pattern. In the other direction, the black base color more rarely dominates the pattern (fig. 48), with reduction of the white spots in size and number. In *nahuana* (figs. 51, 52) the spots are smaller, usually well separated, and the basal band is narrower. The tendency to double the spots of the central row is frequently to be seen in *alamosa* (fig. 53). Only occasionally are the lumbar side spots present in this series, but the frontal spot frequently occurs, in no case twinned.

This group includes the nominate species, *fulva*, which ranges widely over the southern and western United States and also penetrates

deeply into Mexico. It occurs over most of the range of all the eight other species of the *fulva* group, so that its status as a species is unquestioned. In palpal features it most closely resembles *pulcher*.

The four remaining populations present differences of such magnitude that they are adjudged to be species on that basis alone, and three are described as new. The four species are relatively uniform in characters of leg length, eye relations, and general appearance. Their genitalic features, however, set each species widely apart. Most resemblance is seen in the epigyna, which are similar in type and indicate the close relationship of the group. Each epigynum, however, is readily separable and maintains its differences throughout the range of the species. Whereas the male palpi are also similar in type, they present gross differences in details. In two species, *pulcher* and *nahuana*, the palpi are relatively slender appendages, with the bulbs and emboli correspondingly developed. The median apophyses are strikingly different in form, and are equally widely different in the second pair of species, *alamosa* and *apacheana*. In these latter the whole palpus is broadly developed in transverse direction, so that the bulb is a greatly inflated organ margined by a very long embolus.

If these species lived together in any part of their range, there would be no question at all of their specificity. Unfortunately, the disjunct distributions makes it impossible to be completely certain as to what is their status. Levi considered them to represent an extremely variable species. He sees in the palpal differences merely a clinal expression of the same morphological type. He suggests that at some point between the California *pulcher* and the Arizona *apacheana* there will be found intergrades, in spite of the fact that these adjacent populations possess the most divergent palpi of the series. There is a stepped clinal picture in *nahuana*, *alamosa*, and *apacheana* from southern Mexico to northern Arizona, but the three steps are high plateaus separated by grand canyons.

Disjunct distribution of animals seemingly poses no taxonomic problems, unless the separated populations happen to be closely related. The measure of what is close relationship is often a subjective matter, with the result that one worker's opinion may differ widely from that of another. In the present instance, *pulcher* and its relatives are regarded as a very closely related group, to be placed in a single variable species, by Levi, and as a related but morphologically very distinct series of four species by me.

When allopatric populations separated by wide distribution gaps are dealt with, there are certain suggestive inferences that can be

drawn from the material itself. These were well outlined by Mayr, Linsley, and Usinger in their book on "Methods and principles of systematic zoology" (1953, New York, McGraw-Hill Book Co.). What is the degree of difference between the sympatric species of the *fulva* group? The differences between the four largely sympatric species grouped about *medialis* are far less than are those of the *pulcher* complex. Minor differences in the emboli and median apophyses of the male palpi mark the four distinct species, whereas in *pulcher* and its relatives these features show wide differences. Similarly, *Steatoda fulva* presents smaller palpal differences from *pulcher* than those between the other members of the series. The differences are so weighty that the only conclusion to be drawn is that we are here dealing with four distinct species.

*Steatoda pulcher* Keyserling

Figures 45, 47-50, 55, 56, 72, 73

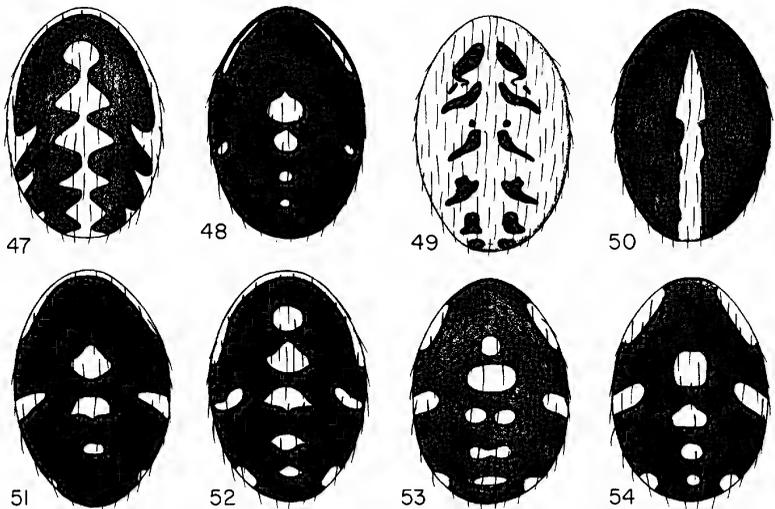
*Lithyphantes pulcher* KEYSERLING, 1882, Die Spinnen Amerikas, Theridiidae, vol. 2, pt. 1, p. 137, pl. 6, fig. 85. MARX, 1898, Proc. U. S. Natl. Mus., no. 72, p. 21 (part). PETRUNKEVITCH, 1911, Bull. Amer. Mus. Nat. Hist., vol. 29, p. 183 (part). ROEWER, 1942, Katalog der Araneae, vol. 1, p. 408 (part). BONNET, 1957, Bibliographia araneorum, vol. 2, pt. 3, p. 2560.

*Steatoda pulcher* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 39 (part: figs. 37, 38, 49).

**DIAGNOSIS:** This species is readily separated from its nearest relative, *Steatoda nahuana*, by features of the genitalia. The male palpus is more slender, has the coil of the embolus longitudinal in position, and presents a heavy median apophysis bluntly rounded at the apex. The epigynum is like that of *nahuana* in general design, but the caudal emargination is narrower and deeper, and the lateral foveae are larger.

**COLORATION:** The bright orange to dark brown carapace is marked with dusky radiating lines, and the eye tubercles are black. The legs have the same variable base color and often show dusky bands on the femora and narrow, indistinct, dusky rings at the ends of some of the segments. The sternum, coxae, and mouth parts are dusky orange to brown. The abdomen varies from reddish to black and presents a characteristic but extremely variable pattern of whitish spots. What is essentially the typical pattern is shown in figure 38. A single row of pale spots on the midline of the dorsum is usually present, and most often they are all joined to form a dentate band. The frontal spot is present but never twinned as in *medialis*. The basal band is broad

and typically passes around the side to join the large median side spot, although occasionally it falls short. The median, lumbar, subcaudal, and even additional side spots are usually present. The white spotting may be so extensive as to cover the whole dorsum except for a series of dusky spots (fig. 49). On the other hand, the abdomen may be black, with the spots reduced in size and number, as shown in figure 48. Males usually have a dusky to black abdomen, with a distinct, narrow, dentate band running back to the caudal end, but the side spots are usually reduced in size or missing. In females from



FIGS. 47-54. Dorsal abdominal patterns of *Steatoda* females. 47-50. *S. pulcher* Keyserling. 47. Canby, California. 48. Cajon Pass, California. 49. River-ton, California. 50. Benton, California. 51, 52. *S. nahuana*, new species. 51. Perote, Veracruz. 52. Tehuacan, Puebla. 53. *S. alamosa*, new species, The Basin, Texas. 54. *S. apacheana*, new species, Paradise, Arizona.

Mono County, California, the abdomen bears a quite regular median stripe (fig. 50), and the lateral spotting is nearly obsolete.

STRUCTURE: Females vary from about 4 mm. to 8 mm. in total length, and the males are about the same size. The eyes are subequal in size. The moderately procurved front eye row has the dark median eyes separated by two-thirds of the diameter of, and about half as far from, the slightly smaller lateral eyes. The eyes of the essentially straight posterior row are separated by three-fourths of the diameter of the median eyes. The median ocular quadrangle forms an essentially square figure, with the front eyes a trifle wider apart than are

those behind and also a trifle larger. The clypeus is equal in height to two diameters of an anterior median eye. The eyes of the males in some specimens are more widely spaced than those of the females. In some the anterior median eyes are separated by about the full diameter and are half as far from the lateral eyes; the posterior eyes are the full diameter apart.

FEMALE FROM CANBY, CALIFORNIA: Total length, 6 mm.; carapace, 2.2 mm. long, 1.8 mm. wide; abdomen, 4 mm. long, 2.7 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	2.60	2.05	1.80	2.55
Patella	1.05	0.90	0.75	1.10
Tibia	2.00	1.45	1.15	1.80
Metatarsus	2.30	1.80	1.50	2.10
Tarsus	0.97	0.80	0.75	0.90
Total	8.92	6.10	5.95	8.45

The first leg is about four times as long as the carapace; the first femur is longer than the carapace; the first tibia is only slightly shorter than the carapace.

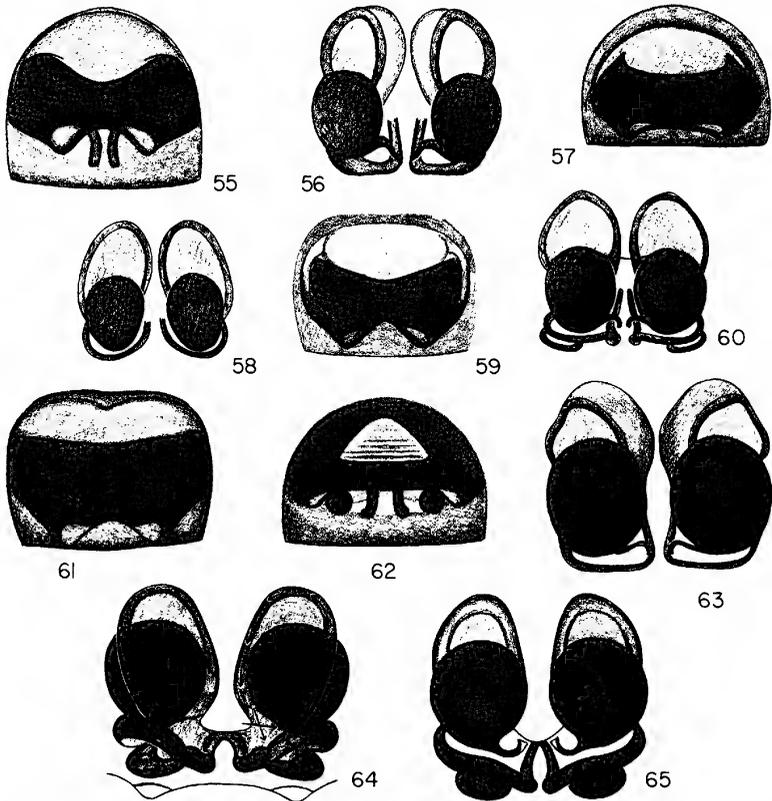
The epigynum is illustrated in figures 55 and 56. The broad, transverse bridge is slightly to moderately emarginated in front and presents behind two large foveae close together on the sides of a rather small, rounded emargination. The large oval receptacles are about equal in size to the suboval bursae copulatrix.

MALE FROM RIVERTON, CALIFORNIA: Total length, 5.8 mm.; carapace, 2.6 mm. long, 2 mm. wide; abdomen, 3.3 mm. long, 2.1 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	2.75	2.35	2.00	2.80
Patella	1.20	1.00	0.85	1.15
Tibia	2.20	1.75	1.50	2.25
Metatarsus	2.50	2.20	1.85	2.60
Tarsus	1.20	0.80	0.80	1.15
Total	9.85	8.10	6.95	9.95

The first leg is nearly four times as long as the carapace; the first femur is only slightly longer and the first tibia is slightly shorter than the carapace.

The male palpus is illustrated in figures 72 and 73. The palpus is relatively slender and has the tibia somewhat longer than broad. The



FIGS. 55-65. Epigyna of females of *Steatoda fulva* series. 55, 56. *S. pulcher* Keyserling. 55. Portola, California. 56. Portola, California, dorsal view of internal structure. 57, 58. *S. nahuana*, new species. 57. Tehuacan, Puebla. 58. Tehuacan, Puebla, dorsal view of internal structure. 59, 60. *S. alamosa*, new species. 59. The Basin, Texas. 60. The Basin, Texas, dorsal view of internal structure. 61. *S. apacheana*, new species, Paradise, Arizona. 62. *S. fulva* Keyserling, Salton Sea, California. 63. *S. apacheana*, new species, Paradise, Arizona, dorsal view of internal structure. 64, 65. *S. fulva* Keyserling, Salton Sea, California. 64. Ventral view of internal structure. 65. Dorsal view of internal structure.

embolus forms a rather narrow coil, and the median apophysis is a heavy, apically broad spur.

TYPE LOCALITY: "Washington Territory," female type in the Muséum d'Histoire Naturelle in Paris.

DISTRIBUTION: California and Oregon. (See fig. 45.)

KNOWN RECORDS: *California*: Dorris, Siskiyou County, July 3, 1952 (W. J. Gertsch), male, female. Fall River Mills, Shasta County, July 16,

1941 (W. M. Pearce), six females, two males. Riverton, Eldorado County, July 11, 1952 (W. J. Gertsch), three males, female. Peavine Ridge, July 29, 1944 (W. M. Pearce), two females, immature. Twenty miles north of Canby, Modoc County, June 29, 1944 (W. M. Pearce), male; July 12, 1944 (W. M. Pearce), male; July 25, 1944 (W. M. Pearce), male, four females; July 1, 1944 (W. M. Pearce), two males. Portola, July 7, 1940 (W. M. Pearce), six females. Clayton, Contra Costa County, August 9, 1940 (W. M. Pearce), four females. Benton, Mono County, February 11, 1949 (W. M. Pearce), female. Montgomery Canyon, Mono County, July 13, 1940 (W. M. Pearce), female. McGee Creek, Mono County, June 26, 1941 (W. M. Pearce), penultimate male, female. Cajon Summit, San Bernardino County, July 20, 1936 (W. M. Pearce), females. Idyllwild, San Jacinto Mountains, June 18, 1952 (W. J. Gertsch), female. Roads End, Kern River, July 3, 1956 (V. Roth and W. J. Gertsch), male. Cedar Grove, Kings Canyon, July 5, 1956 (W. J. Gertsch and V. Roth), female. *Oregon*: Albert Lake, Lake County, June 23, 1952 (B. Malkin), two males. Baker, 4200 feet, August 12, 1958 (J. Baker), female in timber. Lake of the Woods, June 1-4, 1934 (F. Lawrence), male. Siskiyou, Jackson County, July 5, 1956 (B. Malkin), female.

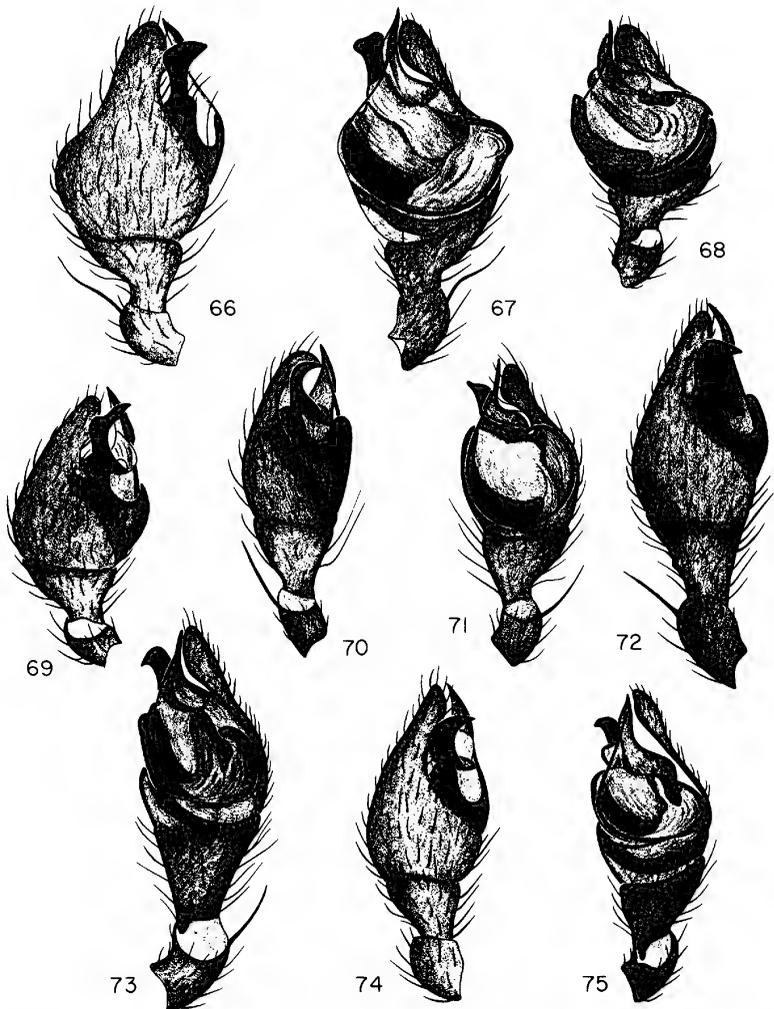
***Steatoda nahuana*, new species**

Figures 45, 51, 52, 74, 75

*Steatoda pulcher* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 39 (part: fig. 41).

**DIAGNOSIS:** This species is somewhat smaller and darker than *Steatoda pulcher* and has the white spots on the abdomen smaller and usually distinctly separated. The legs are proportionately shorter in both sexes. The features of the genitalia readily distinguish *nahuana* from *pulcher* as follows: the palpus is a little heavier, has the basal coil of the embolus much wider, and presents a sharply pointed, semi-lunar, median apophysis; the caudal emargination of the epigynum is shallow and broader, and the lateral foveae are more widely separated.

**COLORATION:** This species resembles *Steatoda pulcher* in its general color pattern but differs in a number of features. The reddish carapace and legs are typically darker, and the latter usually have the femora dusky or even blackened. The abdomen is also darker, most often black, and the whitish spots are smaller. In the average specimen the median spots on the dorsum of the abdomen are usually discretely separated (fig. 52) and only rarely form a continuous band.



FIGS. 66-75. Left male palpi of *Steatoda fulva* series. 66, 67. *S. apacheana*, new species. 66. Prolateral view. 67. Retrolateral view. 68, 69. *S. alamosa*, new species. 68. Retrolateral view. 69. Prolateral view. 70, 71. *S. fulva* Keyserling. 70. Prolateral view. 71. Retrolateral view. 72, 73. *S. pulcher* Keyserling. 72. Prolateral view. 73. Retrolateral view. 74, 75. *S. nahuana*, new species. 74. Prolateral view. 75. Retrolateral view.

The basal band rarely passes far enough around the side to join the median side spot. The whole complement of dorsal and side spots may be present as in *pulcher*, but the frontal spot and those behind the median side spot are often missing (fig. 51). Quite a number of

females are very dark, with scarcely any indication of the white spotting. Males are quite dark, and the pale spots on the abdomen are narrowed and in some specimens are without white pigment.

**STRUCTURE:** Females vary from about 4 mm. to 6 mm. in total length, and the males are slightly smaller. The eyes are subequal in size and are somewhat closer together than those of *pulcher*. The anterior median eyes are separated by about three-fifths of the diameter and are half as far from the slightly smaller lateral eyes. The median ocular quadrangle is essentially square, only a trifle narrower behind. The posterior eyes are separated by about two-thirds of the diameter or less.

**FEMALE FROM AJIJIC, JALISCO:** Total length, 5.2 mm.; carapace, 1.8 mm. long, 1.4 mm. wide; abdomen, 3.6 mm. long, 2.4 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	1.85	1.43	1.28	1.75
Patella	0.72	0.67	0.60	0.80
Tibia	1.30	0.92	0.77	1.25
Metatarsus	1.46	1.03	0.92	1.40
Tarsus	0.80	0.66	0.60	0.75
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Total	6.13	4.71	4.17	5.90

The first leg is about 3.4 times as long as the carapace; the first femur is as long as, and the first tibia is considerably shorter than, the carapace.

The epigynum is illustrated in figures 57 and 58. The bridge is broad, only slightly emarginated in front, and the lateral foveae of the caudal margin are more widely separated than those of *pulcher*.

**MALE FROM AJIJIC, JALISCO:** Total length, 4.5 mm.; carapace, 2.1 mm. long, 1.5 mm. wide; abdomen, 2.4 mm. long, 1.5 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	2.10	1.70	1.55	2.25
Patella	0.86	0.85	0.65	0.90
Tibia	1.65	1.33	1.12	1.80
Metatarsus	1.80	1.59	1.30	2.10
Tarsus	0.90	0.75	0.64	0.90
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Total	7.31	6.13	5.26	7.95

The first leg is 3.5 times as long as the carapace; the first femur is

equal to, and the first tibia is distinctly shorter than, the carapace. The fourth leg is thinner and longer than the first.

The male palpus is illustrated in figures 74 and 75. It is somewhat heavier than that of *pulcher*, has the embolus forming a transversely broader loop, and has a broadly rounded, apically pointed, median apophysis.

**TYPE LOCALITY:** Male holotype from Ajijic, Jalisco, Mexico, July 28, 1954 (W. J. Gertsch).

**DISTRIBUTION:** Widespread in southern Mexico, as indicated on the map (fig. 45).

**KNOWN RECORDS:** *Morelos:* Alpoyecá, June 1, 1946 (J. C. and D. L. Pallister), female; July 28, 1956 (W. J. Gertsch and V. Roth), three females. Acatlipa, August 10, 1946 (C. Goodnight), four males, females, immature. Coajomulco, June 7, 1946 (J. C. and D. L. Pallister), female. Ten kilometers south of Temixco, July 25, 27, 1946 (W. J. Gertsch and V. Roth), two males, two females. Cuernavaca, July 27, 1956 (W. J. Gertsch and V. Roth), female. Cocoyoc, July 27, 1956 (W. J. Gertsch and V. Roth), male, three females. Acatlipa, August 10, 1946 (C. Goodnight), male, female. *Hidalgo:* Five miles south of Zimapán, July 20, 1956 (W. J. Gertsch and V. Roth), male, three females. *Nuevo Leon:* Agua Chiquita, August 7, 1935, (S. Mulaik), two females. *Puebla:* Five miles north of Tehuacán, June 29, 1944 (L. I. Davis), female. Tehuacán, July 24, 1956 (W. J. Gertsch and V. Roth), males, females. Atlixco, June 26, 1947 (L. I. Davis), male, three females, penultimate male. Twelve miles north of Acatlán, July 3, 1947 (L. I. and A. M. Davis), four females. *Michoacan:* Tzararacua Falls, 7 miles from Uruapán, June 14, 1941 (L. I. and A. M. Davis), female. *Vera-cruz:* Perote, June 30, 1946 (H. Wagner), two females. *Oaxaca:* Oaxaca, July 17, 1955 (C. and P. Vaurie), two females; July 19, 1947 (B. Malkin), female; June 30, 1947 (L. I. Davis and M. Johnston), female. Monte Alban, July 26, 1947 (C. and M. Goodnight), male, two females. *Guerrero:* Taxco, fall, 1946 (L. Isaacs), male, female. Huaju-jutla, 5000 feet, August 12, 1946 (C. Goodnight), female. Mexcala, August, 1946 (C. Goodnight), two females. *Jalisco:* Ajijic, July 28, 1954 (W. J. Gertsch), males, females. Plan de Barrancas, August 4, 1956 (V. Roth and W. J. Gertsch), males, females. Near Tequila, August 14, 1956 (V. Roth and W. J. Gertsch), two females. Twenty miles north of La Quemada, July 28, 1954 (W. J. Gertsch), male, females. West side of Lake Sayula, August 3, 1956 (W. J. Gertsch and V. Roth), males, females.

***Steatoda alamosa*, new species**

Figures 45, 53, 59, 60, 68, 69

*Steatoda pulcher* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 39 (part: fig. 40).

**DIAGNOSIS:** This small species resembles *Steatoda nahuana* in general appearance but is distinctly different in features of the genitalia. The male palpus is a large organ, with all the elements laterally developed. The basal attachment of the embolus is near the apical edge of the greatly inflated bulb, and the embolus forms a broad oval coil. The median apophysis of the bulb is far longer and thinner than that of *nahuana* and is distinctive in its form as shown in the figures. The epigynum presents differences in the shape of the caudal emargination, and the lateral foveae are much closer together.

**COLORATION:** This small species closely approximates *Steatoda nahuana* in its color pattern but differs in details. The femora of the legs are typically dusky to blackish, and apical dark rings on some segments are quite conspicuous. The white spots on the abdomen are small. The basal band is usually reduced to a small spot on each shoulder, and the lumbar side spots are missing. The median spots on the dorsum are small, well separated, and the caudal ones may be twinned. A quite typical pattern for this species is illustrated in figure 53.

**STRUCTURE:** Females vary from 3 mm. to 5 mm. in total length, and the males are somewhat smaller. The eyes are subequal in size and set quite close together. The anterior median eyes are separated by one-half to two-thirds of their diameter and are less than half as far from the lateral eyes. The eyes of the posterior row are separated by their radius or slightly more. The median ocular quadrangle forms a square or is slightly wider in front.

**FEMALE FROM THE BASIN, TEXAS:** Total length, 4 mm.; carapace, 1.5 mm. long, 1.1 mm. wide; abdomen, 2.7 mm. long, 2.4 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	1.60	1.30	1.05	1.60
Patella	0.65	0.60	0.50	0.70
Tibia	1.25	0.90	0.65	1.20
Metatarsus	1.35	1.00	0.80	1.25
Tarsus	0.70	0.58	0.55	0.68
	<hr/>	<hr/>	<hr/>	<hr/>
Total	5.55	4.38	3.55	5.43

The first leg is 3.7 times as long as the carapace, and the first femur is slightly longer, and the first tibia distinctly shorter, than the carapace.

The epigynum is illustrated in figures 59 and 60. The broad bridge is quite deeply emarginated in front and is produced behind to form a triangular cleft, at the sides of which lie the foveae.

MALE FROM THE BASIN, TEXAS: Total length, 3 mm.; carapace, 1.4 mm. long, 1.05 mm. wide; abdomen, 1.8 mm. long, 1 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	1.60	1.30	1.10	1.60
Patella	0.60	0.52	0.43	0.60
Tibia	1.35	1.03	0.78	1.35
Metatarsus	1.40	1.05	0.90	1.45
Tarsus	0.65	0.58	0.50	0.65
Total	5.55	4.48	3.71	5.65

The first leg is about four times as long as the carapace; the first femur is longer and the first tibia nearly equal to the carapace in length.

The male palpus is illustrated in figures 68 and 69. The bulbal portion is inflated transversely to great size and presents a broad oval margined by the embolus which has its basal attachment near the apical end. The median apophysis is a slender, apically sinuous and pointed spur. This palpus is in its size and breadth similar to that of *apacheana*, but the form of the median apophyses is distinctive as shown in the figures.

TYPE LOCALITY: Male holotype from The Basin, Chisos Mountains, Texas, May 28, 1952 (W. J. Gertsch).

DISTRIBUTION: Southwestern Texas and adjacent Mexican states. (See fig. 45.)

KNOWN RECORDS: *Texas*: Mt. Locke Observatory, Davis Mountains, July 5, 1934 (S. Mulaik), one female. Raven Ranch, Kerr County, August, 1939 (D. Mulaik), two females. Boerne, December, 1939 (D. and S. Mulaik), penultimate male, female. Five miles south of Brady, December 1939 (D. and S. Mulaik), two females. Sanderson, May 26, 1952 (W. J. Gertsch), male, three females. Ten miles west of Eden, December, 1934 (D. and S. Mulaik), females, subadult. The Basin, Chisos Mountains, September 28, 1950 (W. J. Gertsch), two females; May 28, 1952 (W. J. Gertsch), two males, females, subadult. *Coahuila*: Five miles west of Saltillo, July 5, 1936 (L. I. Davis), two females. San

Pedro, July 5, 1936 (L. I. Davis), male, females. *Chihuahua*: Santa Barbara, July 18, 1947 (W. J. Gertsch), male. Matachic, July 6, 1947 (W. J. Gertsch), two males. Twenty miles west of Matachic, July 7, 1947 (W. J. Gertsch), male. Primavera, 5500–6000 feet, June 29, 1947 (W. J. Gertsch), male. Summit, west of Primavera, 7000 feet, July 2, 1947 (W. J. Gertsch), two females. *Durango*: Otinapa, 8200 feet, August 12, 1947 (W. J. Gertsch), two females. Las Puentes, 7000 feet, July 24, 1947 (W. J. Gertsch), female.

### *Steatoda apacheana*, new species

Figures 45, 54, 61, 63, 66, 67

*Lithyphantes distinctus* GERTSCH, 1935, Amer. Mus. Novitates, no. 792, p. 21.

*Steatoda pulcher* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 39 (part: figs. 39–50).

DIAGNOSIS: This is a much larger, typically darker species than *alamosa* but has the color markings as in that species. The broadly rounded apex of the median apophysis and the rather distinct angle near the base of the embolus are distinctive differences in the male palpus. The differences in the epigynum are apparent in the illustrations.

COLORATION: This large species most closely approximates *Steatoda alamosa* in its color pattern. The orange-brown carapace has dusky radiating lines, and the ocular area is blackish. The femora of the legs are dark brown to blackish, at least in part, and there are usually distinct dark rings on some of the other segments. The abdomen varies from very dark purplish brown to black and has the dorsal white spots small and distinctly separated as in *alamosa*. The lateral bands usually form distinct side spots below each shoulder. The frontal spot and the lumbar side spots are missing. A quite typical dorsal pattern of the female is shown in figure 54. The dorsal spots on the midline in some specimens are twinned as in *alamosa*. The males often have very black abdomens, with few white spots, but the median spot is always distinct.

STRUCTURE: Females vary from 4.5 mm. to 6 mm. in total length, and the males are a little smaller. The eyes are subequal in size. The anterior median eyes are separated by two-thirds of the diameter and are half as far from the lateral eyes. The eyes of the posterior row are separated by about two-thirds of their diameter. The median ocular quadrangle is square or nearly so and is as wide behind as in front.

FEMALE FROM PARADISE, ARIZONA: Total length, 5.7 mm.; carapace, 1.8 mm. long, 1.5 mm. wide; abdomen, 4.5 mm. long, 3 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	1.86	1.50	1.30	1.84
Patella	0.80	0.70	0.60	0.85
Tibia	1.40	1.10	0.85	1.40
Metatarsus	1.45	1.15	0.95	1.42
Tarsus	0.80	0.67	0.60	0.72
Total	6.31	5.12	4.30	6.23

The first leg is 3.5 times as long as the carapace; the first femur is about equal to, and the first tibia is much shorter than, the carapace.

The epigynum is illustrated in figures 61 and 63. The broad bridge is essentially straight in front, and the caudal margin is produced to form a rounded emargination, with large foveae on the sides.

MALE FROM PARADISE, ARIZONA: Total length, 4.5 mm.; carapace, 1.95 mm. long, 1.5 mm. wide; abdomen, 2.7 mm. long, 1.5 mm. wide.

	I	II	III	IV
	(mm.)	(mm.)	(mm.)	(mm.)
Femur	2.25	1.90	1.60	2.30
Patella	0.90	0.85	0.68	0.92
Tibia	1.80	1.40	1.15	1.90
Metatarsus	2.05	1.58	1.35	2.15
Tarsus	0.85	0.75	0.65	0.85
Total	7.85	6.48	5.43	8.12

The first leg is four times as long as the carapace; the first femur is distinctly longer than, and the first tibia is somewhat shorter than, the length of the carapace.

The male palpus is illustrated in figures 66 and 67. The very broad, heavy palpus agrees with that of *alamosa* in having the bulb enlarged transversely and the embolus, which is attached at the apical margin, broadly oval in shape. The median apophysis is narrow at base and becomes broadly rounded at the apex.

TYPE LOCALITY: Male holotype from Paradise, Cochise County, Arizona, July 3, 1954 (W. J. Gertsch).

DISTRIBUTION: Arizona and New Mexico. (See fig. 45.)

KNOWN RECORDS: *Arizona*: Five to seven miles west of Portal, July 4, 1956 (E. Ordway), two males; August 4, 1955 (W. J. Gertsch), female; August 5-15, 1955 (W. J. Gertsch), female; July 6-20, 1955 (W. J.

Gertsch), male, female; June 15, 1955 (M. Statham), male, female; July 12, 1956 (M. Cazier), two males. Rustler's Park, Chiricahua Mountains, 8400 feet, July 14, 1951 (W. S. Creighton), male. Chiricahua Mountains, August 4, 1933 (O. Bryant), female. Upper Carr Canyon, Huachuca Mountains, July 22, 1955 (W. J. Gertsch), female. Near Ranger Station, Mt. Lemmon, Santa Catalina Mountains, July 12-15, 1940 (W. J. Gertsch and L. Hook), female. South of Jerome, south slope of Mingus Mountain, June 17, 1958 (W. J. and J. W. Gertsch), male. South Rim of Grand Canyon, July 22, 1934 (E. L. Bell), female. *New Mexico*: Camp Mary White, Otero County, August 9-12, 1935 (S. Mulaik), females. Juan Tabo area, Sandia Mountains (C. C. Hoff), female; (C. C. Hoff), male, two females.

*Steatoda fulva* Keyserling

Figures 46, 62, 64, 65, 70, 71

*Lithyphantes fulvus* KEYSERLING, 1882, Die Spinnen Amerikas, vol. 2, pt. 1, p. 142, pl. 6, fig. 89. ROEWER, 1942, Katalog der Araneae, vol. 1, p. 408. BONNET, 1957, Bibliographia araneorum, vol. 2, pt. 3, p. 2556.

*Lithyphantes parvula* BANKS, 1898, Proc. California Acad. Sci., ser. 3, vol. 1, p. 238, pl. 14, fig. 1.

*Lithyphantes pulcher* BANKS, 1898, Proc. California Acad. Sci., ser. 3, vol. 1, p. 238, pl. 14, figs. 7-8.

*Lithyphantes venusta* MARX, 1898, in Banks, Proc. California Acad. Sci., ser. 3, vol. 1, p. 239, pl. 1, p. 239, pl. 14, fig. 2.

*Teutana nesiotae* CHAMBERLIN, 1924, Proc. California Acad. Sci., ser. 4, vol. 12, p. 639, fig. 80.

*Steatoda fulva* LEVI, 1957, Bull. Mus. Comp. Zoöl., vol. 117, p. 391, figs. 32, 33, 45-47, 52, map 9. (Levi gives a full bibliography, so I repeat here only the basic synonymy.)

**DIAGNOSIS:** This very distinct species is readily separated from other species of the series by features of the genitalia, which are illustrated. The male palpus presents about the same degree of stoutness as those of *pulcher* and *nahuana*, but the embolus forms a more broadly rounded coil of different form, and the median apophysis is a quite thin hook. The bridge of the epigynum is thin, has the frontal and caudal margins essentially straight, and the lateral foveae are widely separated.

**COLORATION:** This extremely variable species presents all of the extremes of both *pulcher* and *variata*. The base color of the carapace varies from yellowish or tawny to dark brown, and the appendages, which are usually distinctly annulated with dark color, show close correspondence. The dominant tendency in abdominal pattern is to

enlargement of the white spots to form a distinct median stripe on the dorsum and lateral stripes that join around the base of the abdomen. The frontal spot is rarely present, but the lumbar side spots are presumed to form part of the lateral stripes.

**STRUCTURE:** Females vary from 3 mm. to 6.5 mm. in total length, but the largest males reach only 4.5 mm. The eyes are nearly equal in size, but the anterior median eyes are usually slightly larger in both sexes. The median ocular quadrangle forms a nearly square figure.

**FEMALE FROM SALTON SEA, CALIFORNIA:** Total length, 4.2 mm.; carapace, 1.8 mm. long, 1.35 mm. wide; abdomen, 2.6 mm. long, 1.8 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	1.65	1.35	1.20	1.70
Patella	0.73	0.65	0.60	0.80
Tibia	1.23	0.95	0.80	1.32
Metatarsus	1.50	1.13	1.00	1.45
Tarsus	0.64	0.63	0.60	0.75
Total	5.75	4.71	4.20	6.02

The first leg is only 3.2 times as long as the carapace; the first femur and first tibia are considerably shorter than the carapace.

The rather small epigynum is illustrated in figures 62, 64, and 65. The thin transverse bridge has the front margin straight and the broader hind margin straight between the widely spaced lateral foveae. The rather large seminal receptacles lie quite close together and largely cover the flattened, oval bursae copulatrix.

**MALE FROM SALTON SEA, CALIFORNIA:** Total length, 3.3 mm.; carapace, 1.5 mm. long, 1.15 mm. wide; abdomen, 1.9 mm. long, 1.1 mm. wide.

	I (mm.)	II (mm.)	III (mm.)	IV (mm.)
Femur	1.62	1.40	1.25	1.73
Patella	0.62	0.56	0.52	0.65
Tibia	1.35	1.10	0.90	1.46
Metatarsus	1.60	1.25	1.15	1.70
Tarsus	0.75	0.65	0.60	0.75
Total	5.94	4.96	4.42	6.29

The first leg is about 4.2 times as long as the carapace; the first

tibia is nearly as long as, and the first femur is slightly longer than, the carapace. The fourth leg is longer than the first.

The male palpus is illustrated in figures 70 and 71. The embolus originates near the apical edge of the bulb and forms a nearly round loop. The median apophysis is broad at the base but is rapidly thinned to a thin hook.

**TYPE LOCALITIES:** Of *Lithyphantes fulvus*, Spring Lake, Sevier County, Utah, female lectotype in the United States National Museum; of *Lithyphantes parvulus*, San José del Cabo, Baja California, type originally in the California Academy of Sciences, now destroyed, cotypes or paratypes in the Museum of Comparative Zoölogy; of *Lithyphantes venustus*, San Francisquito, Baja California, female type originally in the California Academy of Sciences, now destroyed; and of *Teutana nesiotis*, Granite Island, Baja California, female holotype in the California Academy of Sciences.

**DISTRIBUTION:** Widespread in the western and southern United States from Oregon, Idaho, Nebraska, and Oklahoma eastward into Georgia and Florida, and southward into Baja California and deep into southern Mexico as shown on the map (fig. 46). Levi inadvertently omitted the Mexican records from his paper, so only those are offered below.

**MEXICAN RECORDS:** *Baja California:* Twenty miles south of Palacios, April 4, 1939, female. Isla Santa Inez, May 14, 1944 (B. Osorio), female, immature. Descanso, May 11, 1952 (W. Creighton), female. *Sonora:* Ten miles south of Hermosillo, June 16, 1939 (A. M. and L. I. Davis), two females. Navojoa, August 1, 1952 (P. and C. Vaurie), male. Immuris, July 17, 1954 (W. J. Gertsch), four females. La Choya, June 12, 1952 (W. J. Gertsch), males, females. La Choya Bay, March 28, 1949 (G. M. Bradt), male. Fifteen miles west of Agiabampo, April 28, 1949 (G. M. Bradt), male. Thirteen miles south of El Carrizo, July 21, 1954 (W. J. Gertsch), female. Desemboque, September 1–10, 1953 (B. Malkin), male; July 15–31, 1953 (B. Malkin), female. Guaymas, May 21, 1944 (F. Bonet), two females, penultimate male; July 15, 1945 (M. Cardenas), seven females, penultimate male; September 25, 1947 (B. Malkin), female. Ten miles west of Alamos, July 19, 1954 (W. J. Gertsch), three females. Minas Nuevas, August 8, 1952 (P. and C. Vaurie), two males. *Sinaloa:* Five miles east of Villa Union, July 23, 1954 (W. J. Gertsch), six females. Thirty miles north of Mazatlán, July 22, 1954 (W. J. Gertsch), male. *Nayarit:* San Blas, June 12, 1955 (B. Malkin), female; August 6, 1947 (C. and M. Goodnight), female. *Coahuila:* Saltillo, August 22, 1947 (W. J. Gertsch), male; May 23,

1952 (W. J. Gertsch), female. San Pedro, August 20, 1947 (W. J. Gertsch), male. *Chihuahua*: Santa Barbara, July 23, 1947 (W. J. Gertsch), female. Samalayuca, June 25, 1947 (W. J. Gertsch), female. Delicias, July 12, 1947 (W. J. Gertsch), two males. *Tamaulipas*: Jiménez, May 15, 1952 (W. J. Gertsch), two females. Ten miles south of Reynosa, November 6, 1951 (W. S. Creighton), female. Mier, October 24, 1937 (L. I. Davis), two females. *Hidalgo*: Ixmiquilpán, July 6, 1944 (L. I. Davis), female. *San Luis Potosí*: Four miles south of San Luis Potosí, June 7, 1941 (A. M. and L. I. Davis), male, two females. *Veracruz*: Tantoyuca, April 14, 1944 (E. K. Waering), two females, one penultimate male. *Guerrero*: Mexcala, July 2, 1941 (L. I. Davis), four females. Xilitla, June 4, 1940 (J. C. Pallister), female.