CONTRIBUTIONS TO ARACHNID SYSTEMATICS IN HONOR OF WILLIS J. GERTSCH

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 170 : ARTICLE 1 NEW YORK : 1981

Willis J. Gertsch; photograph taken about 1954 by C. Roff.

CONTRIBUTIONS TO ARACHNID SYSTEMATICS IN HONOR OF WILLIS J. GERTSCH

ON THE OCCASION OF HIS SEVENTY-FIFTH BIRTHDAY

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 170 : ARTICLE 1 NEW YORK : 1981

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY
Volume 170, article 1, pages 1–270, 137 figures, 12 tables
Issued October 4, 1981
Price: $19.15 a copy

ISSN 0003-0090

This article completes Volume 170.

Copyright © American Museum of Natural History 1981

CONTENTS

INTRODUCTION

Willis J. Gertsch: A Biography and Bibliography. B. J. KASTON 7

ORDER UROPYGIDA

A New Species of *Mastigoproctus* (Thelyphonidae), the First Record of Uropygida from Costa Rica. CARLOS E. VALERIO 15

ORDER RICINULEI

On the *Cryptocellus centralis* Group (Arachnida, Ricinulei). NORMAN I. PLATNICK AND MOHAMMAD U. SHADAB 18

ORDER SCORPIONES

A New Genus of Troglobitic Scorpion from Mexico (Chactoidea, Megacorminae). OSCAR F. FRANCKE .. 23

A New *Bothriurus* from Bolivia (Scorpiones, Bothriuridae). EMILIO A. MAURY 29

A Study of the Syntypes of *Diplocentrus keyserlingii* (Diplocentridae). HERBERT L. STAHNKE 34

ORDER ARANEAE: SUBORDER MESOTHELAE

On *Liphistius desultor* Schiödte (Araneae, Liphistiidae). JOHN A. MURPHY AND NORMAN I. PLATNICK .. 46

ORDER ARANEAE: SUBORDER OPISTHOTHELAE: INFRAORDER MYGALOMORPHAE

Three New Mygalomorph Spiders (Dipluridae, Masteriinae) from Colombia. ROBERT J. RAVEN 57

The Mygalomorph Spider Genus *Microhexura* (Araneae, Dipluridae). FREDERICK A. COYLE 64

Two New Species of the Mygalomorph Spider Genus *Neocteniza* (Araneae, Actinopodidae). NORMAN I. PLATNICK AND MOHAMMAD U. SHADAB 76

ORDER ARANEAE: SUBORDER OPISTHOTHELAE: INFRAORDER ARANEOMORPHAE

Spitting Spiders (Araneae, Scytodidae, *Scytodes*) from Central America. CARLOS E. VALERIO 80

Studies on the Pholcidae, I. Notes on the Genera *Artema* and *Physocyclus*. PAOLO MARCELLO BRIGNOLI 90

A New Genus of Spider (Agelenidae) from California Exhibiting a Third Type of Leg Autospasy. VINCENT D. ROTH 101

Classification of Two North American Species of *Pirata*, With a Description of a New Genus (Araneae, Lycosidae). CHARLES D. DONDALE AND JAMES H. REDNER 106

Studies on Species of Holarctic *Pardosa* Groups (Araneae, Lycosidae), II. Redescriptions of *Pardosa modica* (Blackwall), *Pardosa labradorensis* (Thorell), and *Pardosa sinistra* (Thorell). TORBJÖRN KRONESTEDT 111

A Revision of the *nigra* Group of the Genus *Pardosa* in North America (Araneae, Lycosidae). DONALD C. LOWRIE AND CHARLES D. DONDALE 125

The Neotropical Spider Genera *Architis* and *Staberius* (Pisauridae). JAMES E. CARICO 140

A New Species of *Trechalea* (Pisauridae) from North America. JAMES E. CARICO AND EDWIN W. MINCH 154

The Ctenidae of Temperate Zone North America. WILLIAM B. PECK 157

Color Variation in Two Species of *Castianeira* (Araneae, Clubionidae). JONATHAN REISKIND 170

A New Genus of the Spider Family Gnaphosidae (Arachnida, Araneae). NORMAN I. PLATNICK AND MOHAMMAD U. SHADAB 176

On the Spider Genus *Eilica* (Araneae, Gnaphosidae). NORMAN I. PLATNICK AND MOHAMMAD U. SHADAB 183

New Species and Records of Neotropical Gnaphosidae (Arachnida, Araneae). NORMAN I. PLATNICK AND MOHAMMAD U. SHADAB 189

A Revision of the Genus *Habrocestum* (Araneae, Salticidae) in North America. DAVID B. RICHMAN ... 197

A Revision of the Spider Genus *Paradamoetas* (Araneae, Salticidae). BRUCE CUTLER 207

Three New Species of Salticidae (Araneae). MARÍA ELENA GALIANO 216

New Central and South American Uloboridae (Arachnida, Araneae). BRENT D. OPELL 219

The Nearctic Species of *Oreonetides* (Araneae, Linyphiidae). P. J. VAN HELSDINGEN 229

The Erigonine Spiders of North America. Part 5. The Genus *Satilatlas* (Araneae, Linyphiidae). A. F. MILLIDGE 242

More on the Genus *Araneus* from North America. HERBERT W. LEVI 254
Structure of the Male Palpal Organ in *Mimetus, Ero,* and *Gelanor* (Araneae, Mimetidae). WILLIAM A. SHEAR 257
A Textricellid Spider from Chile (Araneae, Textricellidae). RAYMOND R. FORSTER AND NORMAN I. PLATNICK 263

Willis J. Gertsch: a Biography and Bibliography

B. J. KASTON[1]

I began a correspondence in April 1933 that has extended to the present day. As a graduate student in zoology, the work for my dissertation included studies on a few spiders, including thomisids. My mentor, Dr. Alexander Petrunkevitch, informed me one day that within the past half-year or so the American Museum of Natural History in New York had published two papers on thomisids written by a young scientist who had been recently added to their staff. Thinking back on it now, I can see that Dr. Petrunkevitch was more than pleased that the Museum had at last hired an arachnologist. No arachnological work had been done there since the publication of his monumental catalog in 1911. I wrote the Museum requesting reprints of the articles and was overjoyed to receive not only the two published by the Museum, but also two others published earlier, while the author was still an undergraduate student. From then on, Willis J. Gertsch has kept a continuous stream of reprints flowing my way, the results of his arachnological researches.

Willis John Gertsch was born in Montpelier, Idaho, on October 4, 1906, the son of Paul and Louise Sarbach Gertsch, both of Swiss ancestry. He was their first child, there being born to them later two more sons, Elmer (now living in California), and Walter (now living in Utah). Their youngest child, a daughter, Thelma, is now living in Utah.

Gertsch's early education was obtained in the local public schools. To help with family expenses during his high school years, he worked in a movie theater, and also had an early morning milk route. While in high school he developed an interest in nature and collected butterflies. When the time arrived for Gertsch to begin his college education in 1924, the family moved to Salt Lake City so that he could attend the University of Utah with less drain on the family finances. During his summer vacations he worked with a railroad maintenance crew.

At the University, Gertsch came into contact with the man whose influence was to strongly affect his life. There were at that time in the United States only eight workers who were doing research and publishing on arachnids. One of these workers was Ralph Vary Chamberlin, who had recently been at the Museum of Comparative Zoology at Harvard University, and had moved to the University of Utah to begin his teaching duties at the time that Gertsch entered his sophomore year in 1925. Although Gertsch still retained an interest in butterflies, spiders and other arachnids soon supplanted them as the area of his major scientific research.

Gertsch obtained his B.S. degree in 1928 but stayed on for an additional two years, working under Chamberlin to earn his Master's degree in 1930. For his doctoral studies he chose the University of Minnesota, and it was during the two years fulfilling his residence requirements there that he met two other people who affected his future. One was Jean Elizabeth Moore from Duluth. She was a graduate of Carleton College and was working on her M.A. Both she and Willis were aided by fellowship stipends of 66 dollars a month, a sum which, although tiny by today's standards, was not inconsiderable during the great depression. On August 20, 1932, Jean Moore and Willis Gertsch were married in Duluth.

The other person was Dr. Frank E. Lutz,

[1] Professor Emeritus, Department of Zoology, San Diego State University, San Diego, California 92115.

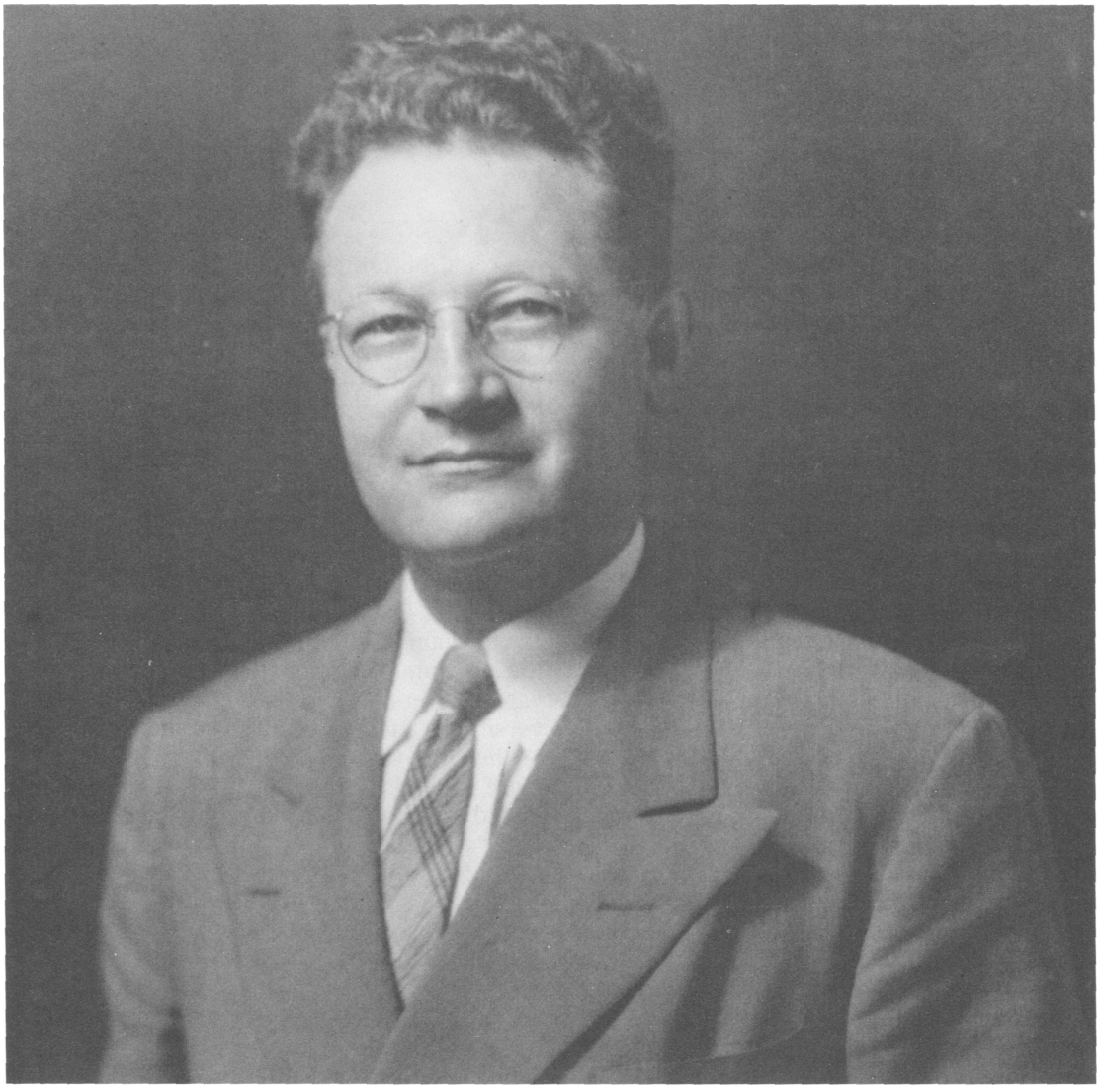


FIG. 1. Willis J. Gertsch, *ca.* 1933.

then Chairman of the Entomology Department at the American Museum of Natural History. Dr. Lutz interviewed Gertsch and offered him the post of Assistant Curator in the department. With all the other arachnologists in the country already well along at their respective institutions, it must have seemed to Dr. Lutz that Gertsch was an up and coming scientist who would be a credit to the Museum. He would build up the collection and do the desperately needed taxonomic work. And so it turned out, with Gertsch leading other Americans in the resurgence of interest in arachnology. He has described close to 1000 new species, including schizomids, scorpions, and ricinuleids, but it is with spiders that he has especially led, with revisions of many genera and families. He is now the doyen of the field of araneology in America. It was the beginning of

a new era. Gertsch was also instrumental in obtaining additions to the Museum such as the S. C. Bishop collection from Rochester, and particularly (even after his retirement) the R. V. Chamberlin collection from the University of Utah. In addition, he arranged for long-term loans from Cornell University and the National Museum of Natural History, Smithsonian Institution.

Gertsch arranged with the University of Minnesota to continue his doctoral dissertation work *in absentia,* and moved to New York City in the early fall of 1932 (fig. 1). The young couple rented an apartment in an old brownstone house on 81st Street, near the corner of Columbus Avenue, which is just northwest of the Museum grounds and only four blocks from what was then the entrance.

In the spring of 1933, the Gertschs moved to a house in Norwalk, Connecticut. Even though they lived there a relatively short time, until that fall, Gertsch managed by using his weekends and evenings to get in a great deal of collecting, as the published records attest. This abundance of specimens from Norwalk is all the more remarkable when one considers that a portion of that summer was spent on a camping-collecting trip to the Great Smoky Mountains of Tennessee, and the Kentucky cave region. On that trip the Gertschs were accompanied by Wilton Ivie and his new bride. Ivie had been another of Chamberlin's students at Utah, but in a later class. When Ivie fell upon hard times in his later years, his burden was eased somewhat by Gertsch, who arranged for Ivie to assist him at the Museum under his grant funds (fig. 3).

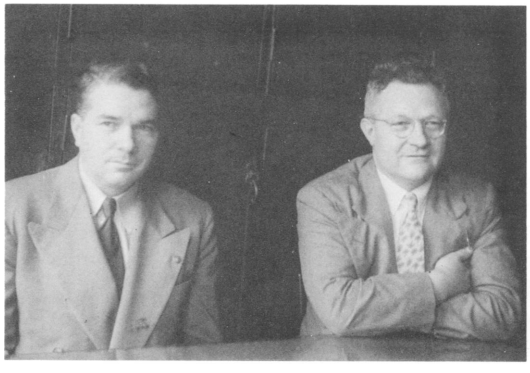
In the fall of 1933 Dr. Lutz, who lived in Ramsey, New Jersey, influenced the Gertschs to buy a house not far from him. They lived there until his retirement 35 years later. This meant a commuting time of about 90 minutes each way, to and from the Museum. At least some of this commuting time was used for reading and going over his notes. In fact, Gertsch had set up a laboratory in his basement where he could continue observations begun at the Museum.

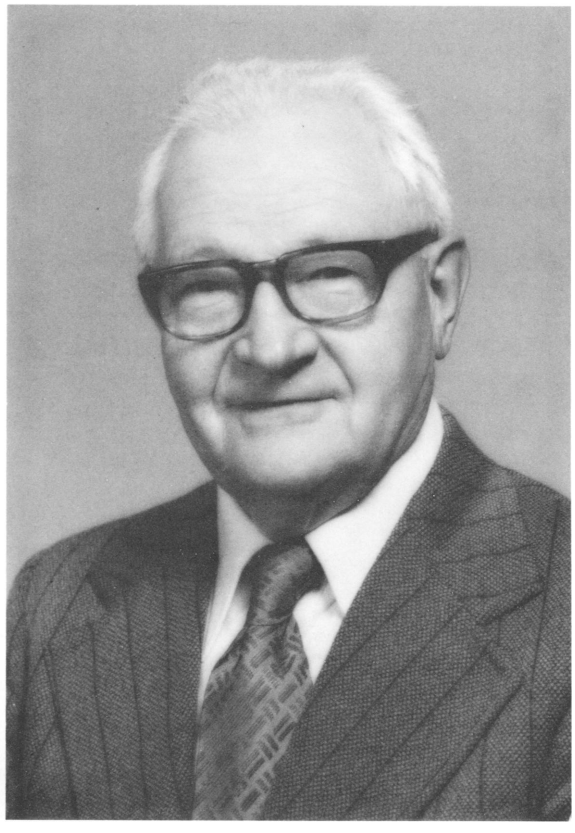
The Gertschs had three children. The eldest, Louise, was born July 25, 1934. She was educated as a concert musician and now teaches music in the schools of Washington, D.C. She has a son and a daughter. The second child, John, was born May 24, 1936. As a teenager, he accompanied his father on some of the collecting trips which took place during summer vacations. John now works in a bank in New York City and continues to live in Ramsey with his two daughters. The third, and youngest of the Gertsch children, is Mary Alice, born August 6, 1945. She now lives on a ranch near Tucson, Arizona and has a son and daughter. So, of their six grandchildren, these last two are the ones the Gertschs see most often, now that Willis is retired and living in Arizona.

My first visit to see Gertsch at the Museum was in October 1935. At that time he was housed in the old building with its entrance on 77th Street. I found him genial, with a pleasant smile, and most helpful with my taxonomic problems. And so it has been in the 45 years since! I was struck by the method he used for filing study specimens. He had perfected a system using vertical sheets of chicken wire (hardware cloth) on which the necked homeopathic vials were suspended by pieces of wire twisted around the neck.

Gertsch was always helpful, not only to the scientists who visited him, but also to those who wrote for help. He was always willing to lend specimens and give encouragement to the many who came along and needed material for revisionary work on particular genera or families. He also encouraged youngsters who came to the Museum with their questions. I can recall a number of occasions while I was in the laboratory when he would take time to help a youngster who had come to his door, or to answer questions over the phone. I felt myself quite fortunate when one day in June 1949, the famous British worker, W. S. Bristowe, came to visit. We had a most interesting visit. The well-known author, E. B. White, in his book *Charlotte's Web,* acknowledged Gertsch's help when it became necessary to suggest the name of the species to which Charlotte belonged.

It was in 1935 that Gertsch was awarded





FIGS. 2–4. 2 (upper left). Left to right, W. J. Gertsch, D. C. Lowrie, B. J. Kaston, A. Petrunkevitch; photograph taken at the American Museum of Natural History by B. J. Kaston on August 21, 1939. 3 (lower left). W. Ivie and W. J. Gertsch; photograph taken at the American Museum of Natural History by B. J. Kaston on June 21, 1950. 4 (right). W. J. Gertsch; photograph taken in 1979, courtesy J. E. Gertsch.

his Ph.D. degree, his dissertation being a revision of the Nearctic Thomisinae. Further work on thomisids was set aside for later years while he busied himself during the rest of that decade (fig. 2) with various other families of spiders, particularly from Florida (collected along with H. K. Wallace), and Texas with material from Edinburg collected by S. Mulaik, and from Harlingen collected by L. I. Davis. These papers were later followed by revisions of genera and families.

Much of the arachnid material at the Museum consisted of specimens that Gertsch himself had collected. The first extensive trip after his appointment was with Dr. Lutz to Panama, in January 1936. In 1939, his trip to the western United States resulted in collecting more than 5000 specimens. In 1942, he collected in Florida with Dr. Lutz and David Rockefeller, who was then a college student. For 13 weeks during the summer of 1947, Gertsch was on the Rockefeller Mexican Expedition, together with four other Museum scientists from the Department of Insects and Spiders, as it came to be called. In 1951, he collected on South Bimini in the Bahama Islands. Trips to the western United States, some of which also included parts of Mexico, were taken in 1953, 1954, 1956, 1958, 1959, 1960, 1961, and 1963; on several

of these he was accompanied by V. D. Roth, and on some by Ivie. A part of the summer of 1955 was spent in Arizona, at the newly opened Southwestern Research Station, near Portal. I took advantage of the opportunity for another get-together by stopping at the Station while passing through the area that August. Also, during the summer of 1962 Gertsch served as Acting Director of the Station.

Gertsch believed in making the results of his researches known by publishing them. He was not fond of speaking before groups at meetings. However, he did not object to sitting in the audience when somebody else was presenting a paper! And of course, if the meetings were being held in New York, he was always willing to give time at the Museum to anybody in need. I remember the Christmas meeting of the American Association for the Advancement of Science held in New York in 1949, and the one in 1960, and also held there, the meeting of the Entomological Society of America in November 1967, at which there was a symposium on spiders. In addition, I recall a two-hour drive in my car from New York to Philadelphia for the 1940 Christmas meeting, and the two-day drive with me from Arizona to Missouri for the June 1975 meeting of the American Arachnological Society. During all that time, we never ran out of topics for discussion.

In 1968, Gertsch ended his occupation with the single professional activity of his life, which had kept him busy for 36 years. He retired to a house in the village of Portal, Arizona, 4 miles from the Museum's Southwestern Research Station. It was in this house that he and Jean graciously played host to all the arachnologists who gathered at Portal for the meeting which resulted in the organization of the American Arachnological Society. He has served the Society well as a member of the Board of Directors, and is still serving on the Editorial Board of the Journal of Arachnology. He continues to carry on his researches, much of his later work dealing with cavernicolous spiders (fig. 4). And he continues publishing, as one can see from the literature list appended here. This volume is dedicated to one whose enthusiasm and efforts have been a major force in the flowering and advancement of arachnology in the United States. It contains a variety of papers on the (largely New World) arachnid groups that have most attracted Gertsch's attention in his published works.

SCIENTIFIC PUBLICATIONS OF WILLIS J. GERTSCH

Allred, Dorald M., and Willis J. Gertsch

1976. Spiders and scorpions from northern Arizona and southern Utah. Jour. Arachnol., vol. 3, pp. 87–100, 1 fig.

Chamberlin, Ralph V., and Willis J. Gertsch

1928. Notes on spiders from southeastern Utah. Proc. Biol. Soc. Washington, vol. 41, pp. 175–188.

1929. New spiders from Utah and California. Pomona College Jour. Ent. Zool., vol. 21, pp. 101–112, figs. 1–57.

1930. On fifteen new North American spiders. Proc. Biol. Soc. Washington, vol. 43, pp. 137–144, figs. 1–28.

1940. Descriptions of new Gnaphosidae from the United States. Amer. Mus. Novitates, no. 1068, pp. 1–19, figs. 1–34.

1958. The spider family Dictynidae in America north of Mexico. Bull. Amer. Mus. Nat. Hist., vol. 116, pp. 1–152, figs. 1–37, pls. 1–47.

Gertsch, Willis J.

1932. A new generic name for *Coriarachne versicolor* Keyserling, with new species. Amer. Mus. Novitates, no. 563, pp. 1–7, figs. 1–4.

1933a. Notes on American spiders of the family Thomisidae. *Ibid.*, no. 593, pp. 1–22, figs. 1–31.

1933b. New genera and species of North American spiders. *Ibid.*, no. 636, pp. 1–28, figs. 1–49.

1933c. Diagnoses of new American spiders. *Ibid.*, no. 637, pp. 1–14, figs. 1–17.

1934a. Notes on American Lycosidae. *Ibid.*, no. 693, pp.1–25.

1934b. Notes on American crab spiders (Thomisidae). *Ibid.*, no. 707, pp. 1–25, figs. 1–26.
1934c. Some American spiders of the family Hahniidae. *Ibid.*, no. 712, pp. 1–32, figs. 1–42.
1934d. Further notes on American spiders. *Ibid.*, no. 726, pp. 1–26, figs. 1–22.
1935a. Spiders from the southwestern United States, with descriptions of new species. *Ibid.*, no. 792, pp. 1–31, figs. 1–39.
1935b. New American spiders with notes on other species. *Ibid.*, no. 805, pp. 1–24, figs. 1–60.
1936a. Further diagnoses of new American spiders. *Ibid.*, no. 852, pp. 1–27, figs. 1–39.
1936b. The Nearctic Atypidae. *Ibid.*, no. 895, pp. 1–19, figs. 1–29.
1937. New American spiders. *Ibid.*, no. 936, pp. 1–7, figs. 1–7.
1939a. Report on a collection of Arachnida from the Chisos Mountains. Contrib. Baylor Univ. Mus., no. 24, pp. 17–26.
1939b. A new genus in the Pholcidae. Amer. Mus. Novitates, no. 1033, pp. 1–4, figs. 1–11.
1939c. A revision of the typical crab-spiders (Misumeninae) of America north of Mexico. Bull. Amer. Mus. Nat. Hist., vol. 76, pp. 277–442, figs. 1–271.
1939d. Spiders and silk. School Nature League Bull., ser. 9, no. 6, pp. 1–3.
1940a. Five new wolf-spiders from Florida. Florida Ent., vol. 23, pp. 17–23, figs. 1–9.
1940b. Two new American whip-scorpions of the family Schizomidae. Amer. Mus. Novitates, no. 1077, pp. 1–4, figs. 1–10.
1940c. The Houdini of the spider world. Nat. Hist., vol. 45, pp. 154–156.
1940d. Comstock's "Spider Book," revised edition. Cornell Univ. Press, Ithaca, 729 pp., 770 figs.
1941a. Report on some arachnids from Barro Colorado Island, Canal Zone. Amer. Mus. Novitates, no. 1146, pp. 1–14, figs. 1–33.
1941b. New American spiders of the family Clubionidae. I. *Ibid.*, no. 1147, pp. 1–20, figs. 1–53.
1941c. New American spiders of the family Clubionidae. II. *Ibid.*, no. 1148, pp. 1–18, figs. 1–54.
1942. New American spiders of the family Clubionidae. III. *Ibid.*, no. 1195, pp. 1–18, figs. 1–37.
1945. Two interesting species of *Thallumetus*. Trans. Connecticut Acad. Arts Sci., vol. 36, pp. 191–197, figs. 1–6.
1946a. Five new spiders of the genus *Neoantistea*. Jour. New York Ent. Soc., vol. 54, pp. 31–37, figs. 1–8.
1946b. Notes on American spiders of the family Dictynidae. Amer. Mus. Novitates, no. 1319, pp. 1–21, figs. 1–30.
1946c. Spiders, scorpions, ticks and mites. *In* Curran, C. H., Insects of the Pacific World. Macmillan, New York, pp. 243–264.
1947. Spiders that lasso their prey. Nat. Hist., vol. 56, pp. 152–158, 189.
1949. American Spiders. Princeton, Van Nostrand, 285 pp., 32 pls., 6 figs.
1951a. New American linyphiid spiders. Amer. Mus. Novitates, no. 1514, pp. 1–11, figs. 1–16.
1951b. Spiders and silk. Audubon Nat. Bull., ser. 18, no. 9, pp. 1–4.
1953a. The spider genera *Xysticus, Coriarachne,* and *Oxyptila* (Thomisidae, Misumeninae) in North America. Bull. Amer. Mus. Nat. Hist., vol. 102, pp. 413–482, figs. 1–93.
1953b. Nature's lacemakers. *In* The book of knowledge, New York, Grolier, pp. 49–53.
1955. The North American bolas spiders of the genera *Mastophora* and *Agatostichus*. Bull. Amer. Mus. Nat. Hist., vol. 106, pp. 221–254, text-figs. 1–48, pls. 3–6, table 1.
1957. Araneae—Spiders. *In* Lindroth, C. H., The faunal connections between Europe and North America. New York, Wiley, pp. 93–108.
1958a. Results of the Puritan-American Museum expedition to western Mexico 4. The scorpions. Amer. Mus. Novitates, no. 1903, pp. 1–20, tables 1–6.
1958b. The spider family Diguetidae. *Ibid.*, no. 1904, pp. 1–24, figs. 1–29.
1958c. The spider genus *Loxosceles* in North America, Central America, and the West Indies. *Ibid.*, no. 1907, pp. 1–46, figs. 1–97.
1958d. The spider family Hypochilidae. *Ibid.*, no. 1912, pp. 1–28, figs. 1–50.
1958e. The spider family Plectreuridae. *Ibid.*, no. 1920, pp. 1–53, figs. 1–91.

1960a. Descriptions of American spiders of the family Symphytognathidae. *Ibid.*, no. 1981, pp. 1–40, figs. 1–72.
1960b. The *fulva* group of the spider genus *Steatoda* (Araneae, Theridiidae). *Ibid.*, no. 1982, pp. 1–48, figs. 1–75.
1961a. The spider genus *Lutica*. Senckenbergiana Biol., vol. 42, pp. 365–374, figs. 1–8.
1961b. *Loxosceles laeta* (Nicolet), un nombre valido para la araña causante del Loxoscelismo en Sudamerica. Bol. Chileno Parasitol., vol. 16, pp. 1–4.
1961c. Herbert Ferlando Schwarz 1883–1960. Ent. News., vol. 72, pp. 84–89.
1964a. The spider genus *Zygiella* in North America (Araneae, Argiopidae). Amer. Mus. Novitates, no. 2188, pp. 1–21, figs. 1–20.
1964b. A review of the genus *Hypochilus* and a description of a new species from Colorado (Araneae, Hypochilidae). *Ibid.*, no. 2203, pp. 1–14, figs. 1–11.
1967a. The spider genus *Loxosceles* in South America (Araneae, Scytodidae). Bull. Amer. Mus. Nat. Hist., vol. 136, pp. 117–174, text-figs. 1–3, pls. 3–11, tables 1, 2.
1967b. A new liphistiid spider from China (Araneae: Liphistiidae). Jour. New York Ent. Soc., vol. 75, pp. 114–118, figs. 1–3.
1971a. A report on some Mexican cave spiders. Assoc. Mexican Cave Studies Bull., vol. 4, pp. 47–111, figs. 1–168.
1971b. Three new ricinuleids from Mexican caves (Arachnida, Ricinulei). *Ibid.*, vol. 4, pp. 127–135, figs. 1–19.
1973a. A report on cave spiders from Mexico and Central America. *Ibid.*, vol. 5, pp. 141–163, figs. 1–41.
1973b. The cavernicolous fauna of Hawaiian lava tubes, 3. Araneae (spiders). Pacific Insects, vol. 15, pp. 163–180, figs. 1–17.
1974. The spider family Leptonetidae in North America. Jour. Arachnol., vol. 1, pp. 145–203, figs. 1–155.
1977a. Report on cavernicole and epigean spiders from the Yucatan Peninsula. Assoc. Mexican Cave Studies Bull., vol. 6, pp. 103–131, figs. 1–86.
1977b. On two ricinuleids from the Yucatan Peninsula (Arachnida: Ricinulei). *Ibid.*, vol. 6, pp. 133–138, figs. 1–15.
1979. American spiders, 2nd ed. New York, Von Nostrand Reinhold, 274 pp., 32 pls., 8 figs.

Gertsch, Willis J., and Dorald M. Allred
1965. Scorpions of the Nevada Test Site. Brigham Young Univ. Sci. Bull., vol. 6, no. 4, pp. 1–15, figs. 1–19, tables 1–3.

Gertsch, Willis J., and A. F. Archer
1942. Descriptions of new American Theridiidae. Amer. Mus. Novitates, no. 1171, pp. 1–16, figs. 1–34.

Gertsch, Willis J., and L. Irby Davis
1936. New spiders from Texas. Amer. Mus. Novitates, no. 881, pp. 1–21, figs. 1–35.
1937. Report on a collection of spiders from Mexico. I. *Ibid.*, no. 961, pp. 1–29, figs. 1–44.
1940a. Report on a collection of spiders from Mexico. II. *Ibid.*, no. 1059, pp. 1–18, figs. 1–30.
1940b. Report on a collection of spiders from Mexico. III. *Ibid.*, no. 1069, pp. 1–22, figs. 1–35.
1942. Report on a collection of spiders from Mexico. IV. *Ibid.*, no. 1158, pp. 1–19, figs. 1–46.
1946. Report on a collection of spiders from Mexico. V. *Ibid.*, no. 1313, pp. 1–11, figs. 1–18.

Gertsch, Willis J., and Wilton Ivie
1936. Descriptions of New American spiders. Amer. Mus. Novitates, no. 858, pp. 1–25, figs. 1–54.
1955. The spider genus *Neon* in North America. *Ibid.*, no. 1743, pp. 1–17, figs. 1–24.

Gertsch, Willis J., and W. L. Jellison
1939. Notes on a collection of spiders from Montana. Amer. Mus. Novitates, no. 1032, pp. 1–13, figs. 1–6.

Gertsch, Willis J., and S. Mulaik
1936a. Diagnoses of new southern spiders. Amer. Mus. Novitates, no. 851, pp. 1–21, figs. 1–32.
1936b. New spiders from Texas. *Ibid.*, no. 863, pp. 1–22, figs. 1–39.
1939. Report on a new ricinuleid from Texas. *Ibid.*, no. 1037, pp. 1–5, figs. 1–10.
1940. The spiders of Texas. I. Bull. Amer. Mus. Nat. Hist., vol. 77, pp. 307–340, figs. 1–32.

Gertsch, Willis J., and Norman I. Platnick
1975. A revision of the trapdoor spider genus *Cyclocosmia* (Araneae, Ctenizidae). Amer. Mus. Novitates, no. 2580, pp. 1–20, figs. 1–36.

1979. A revision of the spider family Mecicobothriidae (Araneae, Mygalomorphae). *Ibid.*, no. 2687, pp. 1–32, figs. 1–91.

1980. A revision of the American spiders of the family Atypidae (Araneae, Mygalomorphae). *Ibid.*, no. 2704, pp. 1–39, figs. 1–60.

Gertsch, Willis J., and Susan E. Riechert

1976. The spatial and temporal partitioning of a desert spider community, with descriptions of new species. Amer. Mus. Novitates, no. 2604, pp. 1–25, figs. 1–41, table 1.

Gertsch, Willis J., and F. E. Russell

1975. *Loxosceles deserta* Gertsch. Toxicon, vol. 13, pp. 203–204, 1 fig.

Gertsch, Willis J., and Michael Soleglad

1966. The scorpions of the *Vejovis boreus* group (subgenus *Paruroctonus*) in North America (Scorpionida, Vejovidae). Amer. Mus. Novitates, no. 2278, pp. 1–54, figs. 1–72, tables 1–7.

1972. Studies of North American scorpions of the genera *Uroctonus* and *Vejovis* (Scorpionida, Vejovidae). Bull. Amer. Mus. Nat. Hist., vol. 148, pp. 547–608, figs. 1–150, tables 1–12.

Gertsch, Willis J., and Howard K. Wallace

1935. Further notes on American Lycosidae. Amer. Mus. Novitates, no. 794, pp. 1–22, figs. 1–45.

1936. Notes on new and rare American mygalomorph spiders. *Ibid.*, no. 884, pp. 1–25, figs. 1–37.

1937. New American Lycosidae with notes on other species. *Ibid.*, no. 919, pp. 1–22, figs. 1–18.

Gertsch, Willis J., and Lowell A. Woodbury

1930. Spiders found in the stomachs of *Sceloporus graciosus graciosus* (B. & G.) (Araneina). Ent. News, vol. 41, p. 318.

Gertsch, Willis J., and H. Zapfe

1953. Araña Hypochilidae en Chile. Invest. Zool. Chilensis, vol. 1, p. 10.

1956. *Austrochilus manni,* new genus and species. *In* Zapfe, H., Filogenia y función en *Austrochilus manni* Gertsch y Zapfe (Araneae—Hypochilidae) con una diagnosis sistematica por el Dr. Willis Gertsch. Trab. Lab. Zool. Univ. Chile, no. 2, pp. 47–50.

Lowrie, Donald C., and Willis J. Gertsch

1955. A list of the spiders of the Grant Teton Park area, with descriptions of some new North American spiders. Amer. Mus. Novitates, no. 1736, pp. 1–29, figs. 1–32.

Muma, Martin H., and Willis J. Gertsch

1964. The spider family Uloboridae in North America north of Mexico. Amer. Mus. Novitates, no. 2196, pp. 1–43, figs. 1–90.

Platnick, Norman I., and Willis J. Gertsch

1976. The suborders of spiders: A cladistic analysis (Arachnida, Araneae). Amer. Mus. Novitates, no. 2607, pp. 1–15, figs. 1–18.

Russell, F. E., J. Wainschel, and Willis J. Gertsch

1972. Bites of spiders and other arthropods. *In* Conn, H. F. (ed.), Current therapy. Philadelphia, Saunders, pp. 841–843.

1974. Bites of spiders and other arthropods. *In* Conn, H. F. (ed.), Current therapy. Philadelphia, Saunders, pp. 865–867.

A New Species of *Mastigoproctus* (Thelyphonidae), the First Record of Uropygida from Costa Rica

CARLOS E. VALERIO[1]

ABSTRACT

A new species, *Mastigoproctus nara,* is described from an isolated mountain range in southern Costa Rica, and its relationships are discussed.

INTRODUCTION

The southeastern portion of the Central American isthmus (including southern Nicaragua, all of Costa Rica, and most of Panama) has played an important role in the distribution of many groups of plants and animals, acting as a barrier for some species and as a bridge for others. This area was under water before Cretaceous times and an extensive canal separated the South American land mass from North America. Some 100 million years ago, an archipelago developed in the area lasting about 30–40 million years, but a land bridge was not definitely established until about 12 million years ago (Valerio, 1980).

Available data indicate that the center of diversity for the New World uropygids is tropical South America, since eight species are found there, whereas only three are present north of the Costa Rican barrier (Rowland and Cooke, 1973). Since uropygids have existed for many millions of years (Savory, 1971), it seems probable that the northern species crossed over the Central American canal long before the Costa Rica land connection was established, perhaps by the process of "island hopping."

The species of *Mastigoproctus* described here might represent a relict group from the faunal assemblage of archipelago times, since it is restricted to a small mountain range in an area often interpreted as an old island now integrated into Costa Rican territory (Valerio, 1980).

This new species is, at present, rather isolated ecologically from the South American species by an extensive swampy area in the Darien region of Panama. Geographically and ecologically, it is closer to the northern species *M. tantalus* Roewer from El Salvador and *M. liochirus* Pocock from Guatemala and Mexico.

Drawings have been made with the aid of a copying camera mounted on a Wild stereoscope. All measurements are in millimeters, made with an ocular micrometer or with a hand caliper. I am indebted to Drs. M. Grasshoff (Forschungsinstitut Senckenberg), F. Wanless (British Museum, Natural History), and A. Wille (Museo de Entomologíia, Universidad de Costa Rica) for the loan of specimens, and to N. I. Platnick (American Museum of Natural History) for a critical review of the manuscript.

Mastigoproctus nara, new species

Figures 1, 2, 4

TYPES: Male holotype and female allotype from Cerro Nara, near Quepos, San José Province, Costa Rica, deposited in the Museo de Zoología, Universidad de Costa Rica; paratypes from the same locality deposited in the Museo de Entomología, Universidad

[1] Associate Professor, Escuela de Biología, Universidad de Costa Rica, Ciudad Universitaria, Costa Rica.

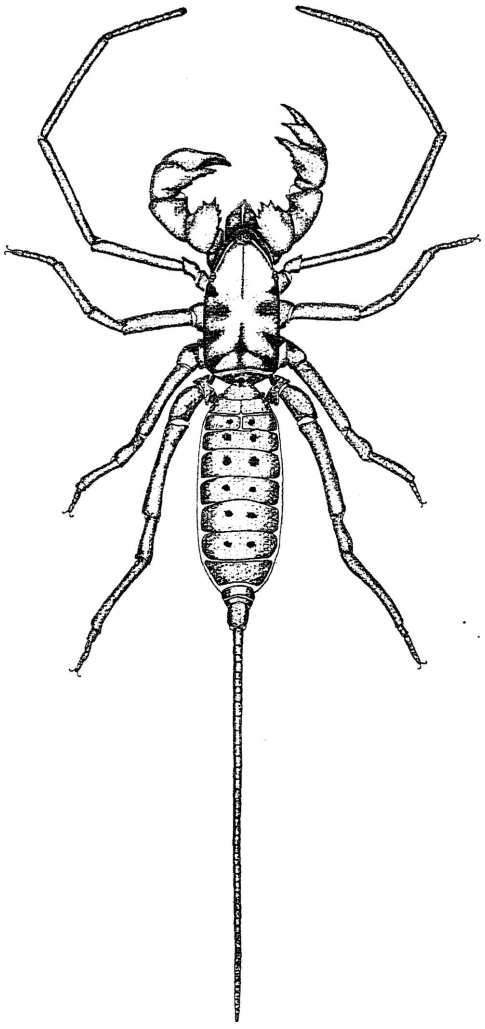


FIG. 1. *Mastigoproctus nara*, new species, female, dorsal view.

de Costa Rica, and the American Museum of Natural History.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

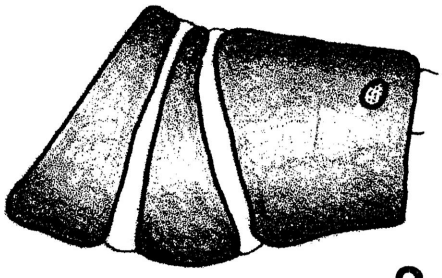
DIAGNOSIS: The species is characterized by having a narrow carapace (2.2 times longer than broad), all abdominal tergites entire in the male and only abdominal tergite II fully divided in the female (fig. 1), small round ommatoids in both sexes (fig. 2), and pedipalps covered with bumps and short spines giving the cuticle a very rough appearance, even in immatures. It is similar to *M. liochirus* Pocock of Guatemala and México in size and general features, differing in that the male of *M. liochirus* (female not known) has abdominal tergites I and II fully divided, the ommatoids large and oval (fig. 3), and the cuticle of the pedipalps rather smooth. *Mastigoproctus tantalus* Roewer of El Salvador, its geographically closest neighbor, is a very different form, half the body size (the carapace being 6.5 and 7.0 long in the types) and with all the abdominal tergites divided in both sexes. This last character creates doubts about the relationship of *M. tantalus* with other species of the genus and, perhaps, with the whole subfamily Uroproctinae, as defined by Rowland and Cooke (1973).

MALE: Cephalothorax 14.5 long, abdomen 19.0 long, pygidium 4.5 long, flagellum 30.5 long. Abdominal sternite II (genital sternite) with shallow groove anteriorly surrounded by swollen area and two conspicuous lateral depressions (fig. 4). Swollen area whitish, contrasting with general dark coloration. Sternite III not modified. Abdominal tergites all entire, but tergite II and posterior portion of I marked by faint line.

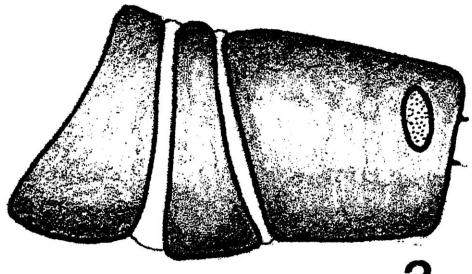
FEMALE: Cephalothorax 17.0 long, abdomen 24.0 long, pygidium 5.0 long, flagellum 40.5 long. Abdominal sternite not modified. Abdominal tergite I partially divided posteriorly, tergite II completely divided (fig. 1). Anterior portion of sternite I marked by faint line. Division of tergites clear even in very immature specimens.

DISTRIBUTION: The species is known only from Cerro Nara, an isolated hill formation near the Pacific coastline in southern Costa Rica, classified as a tropical wet area (Tosi, 1969).

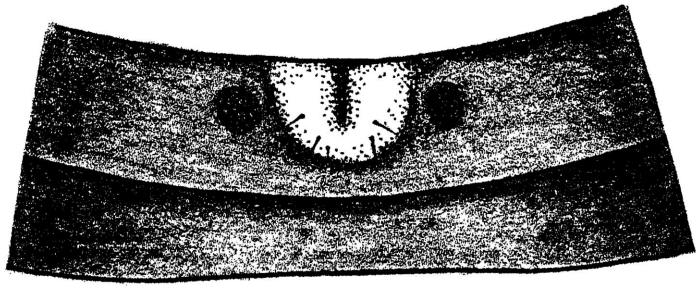
NATURAL HISTORY: Dr. Alvaro Wille (Museo de Entomología, Universidad de Costa Rica), collector of most of the specimens, informs me that he found most of them under rocks (rarely under logs and even inside houses) in an area of open pastures.



2



3



4

FIGS. 2–4. 2, 4. *Mastigoproctus nara,* new species. 3. *M. liochirus* Pocock. 2, 3. Pygidium showing ommatoid, lateral views. 4. Male, genital area, ventral view.

LITERATURE CITED

Rowland, J. Mark, and John A. L. Cooke
1973. Systematics of the arachnid order Uropygida (=Thelyphonida). Jour. Arachnol., vol. 1, pp. 55–71, figs. 1–17.

Savory, Theodore
1971. Evolution in the Arachnida. Merrow Publishing Company, Watford, England, 42 pp.

Tosi, Joseph A.
1969. Mapa Ecológico, República de Costa Rica. Centro Científico Tropical, San José, Costa Rica.

Valerio, Carlos E.
1980. Anotaciones sobre Historia Natural de Costa Rica. EUNED, San José, Costa Rica, 152 pp.

On the *Cryptocellus centralis* Group (Arachnida, Ricinulei)

NORMAN I. PLATNICK[1] AND MOHAMMAD U. SHADAB[2]

ABSTRACT

Two new species of the *centralis* group of *Cryptocellus* are described from Central America: *Cryptocellus verde* from Costa Rica and *Cryptocellus bocas* from Panama.

INTRODUCTION

Within a few weeks of the time that our recently completed review of the Central American ricinuleids of the genus *Cryptocellus* (Platnick and Shadab, 1981) went to press, we received two additional samples of these rare arachnids taken by Berlese extracts in Central America. As these samples were collected at localities from which ricinuleids have not previously been found, it is not surprising that they both contained undescribed taxa. In view of the special interest which Dr. Willis J. Gertsch has maintained in this order (Gertsch and Mulaik, 1939; Gertsch, 1971, 1977), it seemed appropriate to report on these new taxa here.

Both species have the anteroventral ledge on the male tarsal process characteristic of the *centralis* group of *Cryptocellus*. They bring to 11 the total number of species of that group known from Central America. One of these species, *Cryptocellus hanseni* Cooke and Shadab, is widespread in Nicaragua and Honduras, but the others are known only from Costa Rica and Panama (fig. 1), where the group has obviously undergone considerable diversification and further taxa probably await discovery.

We are indebted to Mr. Saul I. Frommer of the University of California, Riverside, for his kindness in sending the Costa Rican specimen to us for study, and especially to Dr. John Kethley of the Field Museum of Natural History, Chicago, for his hospitality during a recent visit and for providing us with ready access to the important Berlese extracts (containing a wealth of fascinating material) under his care. The format of the descriptions follows that used in our review.

Cryptocellus verde, new species

Figure 2

TYPE: Male holotype from Berlese extract of leaf litter taken at an elevation of 1300 m. at Monteverde, Puntarenas, Costa Rica (July 16, 1975; E. M. Fisher), deposited in the collection of the University of California, Riverside, on permanent loan to the California Academy of Sciences.

ETYMOLOGY: The specific name is a noun in apposition taken from part of the type locality.

DIAGNOSIS: *Cryptocellus verde* resembles *C. striatipes* in having the prolateral ridge of the male tarsal process elevated over the body of the process, but differs in having a much wider retrolateral ridge of the tarsal process.

FEMALE: Unknown.

MALE (holotype): Total length, excluding

[1] Associate Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York.

[2] Scientific Assistant, Department of Entomology, American Museum of Natural History.

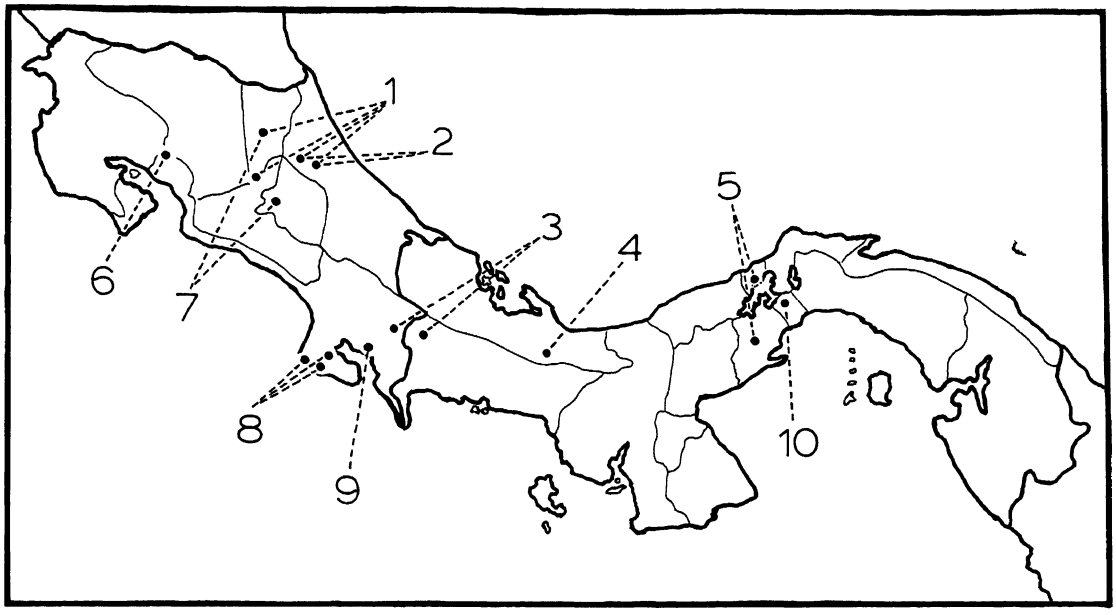
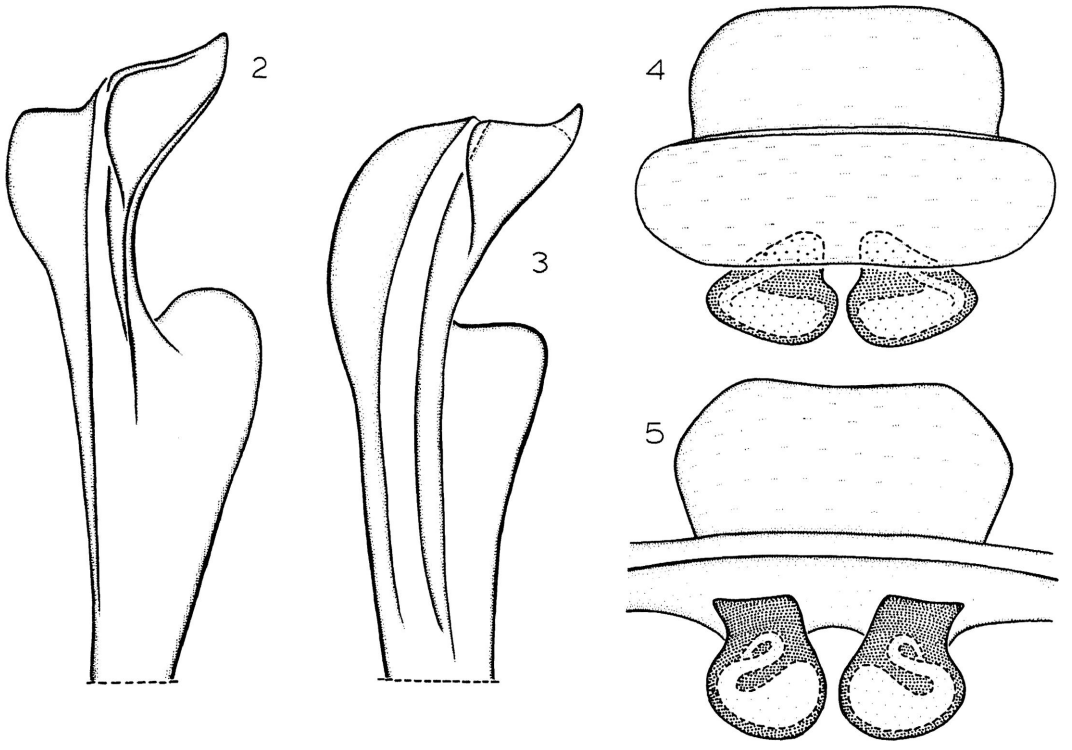


FIG. 1. Costa Rica and Panama, showing distribution records of *Cryptocellus centralis* (1), *C. striatipes* (2), *C. chiriqui* (3), *C. bocas* (4), *C. isthmius* (5), *C. verde* (6), *C. goodnighti* (7), *C. osa* (8), *C. fagei* (9), and *C. gamboa* (10).

pygidium, 4.21. Carapace 1.49 long, 1.78 wide between coxae II and III, where widest, red, darkest at sides, with small yellow translucent areas at margins opposite front of coxae II; surface sparsely coated with long white setae, with tubercles restricted to lateral and posterior margins, pair of short oblique lateral depressions, and median longitudinal depression occupying about three-fifths of length. Cucullus 0.76 long, 0.90 wide, coloration and setation as in carapace, with tubercles concentrated in median longitudinal row and on lateral and distal margins; lateral lobes essentially straight. Left chelicera: movable finger flattened posteriorly, not widened transversely, armed with eight teeth, of which fifth most distal is reduced to denticle, others subequal; fixed finger armed with five teeth of which most distal is much the largest. Sternal region with coxae I not meeting tritosternum; coxae II meeting along their posterior two-thirds, their suture line only slightly longer than that of coxae III; coxae IV meeting anteriorly. Abdomen 2.88 long, 2.27 wide between tergites 11 and 12, where widest; dark red with darkened depressions on median plates of tergites, darkened surface on sternites 11 and 12, and pale orange articular membranes; tubercles concentrated in tergite depressions and anterolaterally on sternite 10; median plates of all tergites much wider than long, with paired oblique anterolateral depressions (extra pair of posterolateral depressions on tergite 13); corresponding depressions on sternites reduced; lateral plates of tergites with long depressions along inner margins. Pygidium without notch in posterior dorsal margin of basal segment, with slight notch in ventral margin. Palpal coxae red, other segments orange; all segments with ventral tubercles becoming sparser on distal segments; coxae each with at least one thick white seta posteriorly along inner margin. Leg formula 2341. Legs red, tarsi lightest, sparsely coated with long white setae; tubercles rather evenly and densely scattered over all surfaces. Measurements:



FIGS. 2–5. 2. *Cryptocellus verde*, new species. 3–5. *C. bocas*, new species. 2, 3. Left male tarsal process, dorsal view, accessory piece removed. 4. Posterior genital lip and spermathecae, anterior view. 5. Same, posterior view.

	I	II	III	IV	Palp
Coxa	0.63	0.90	0.83	0.72	0.40
Trochanter I	0.47	0.58	0.47	0.50	0.47
Trochanter II	—	—	0.48	0.50	0.40
Femur	0.97	1.69	1.19	1.18	0.86
Patella	0.54	0.86	0.68	0.56	—
Tibia	0.75	1.30	0.77	0.83	1.21
Metatarsus	0.94	1.58	0.83	0.97	—
Tarsus	0.44	1.69	1.37	0.86	0.18
Total	4.74	8.60	6.62	6.12	3.52

Second legs not widened; femur I three times, femur II four times as long as wide. Tarsal claws thin, dorsoventrally expanded near base. Tarsal process as in figure 2.

MATERIAL EXAMINED: Only the holotype.

DISTRIBUTION: Northwestern Costa Rica (fig. 1).

Cryptocellus bocas, new species
Figures 3–5

TYPES: Male holotype and female paratype from Berlese extract of forest floor litter and root mat taken near a ridge top at an elevation of 1500 m. in the Quebrada Alicia cloud forest 25 km. north-northeast of San Félix, latitude 8°34′N, longitude 81°50′W, Bocas del Toro, Panama (June 6, 1980; J. Wagner), deposited in the Field Museum of Natural History.

ETYMOLOGY: The specific name is a noun in apposition taken from part of the type locality.

DIAGNOSIS: The male tarsal process of *C. bocas* is most similar to that of *C. fagei* but has a much wider retrolateral ridge (fig. 3); the triangular spermathecae with long, trun-

cated ventral extensions (figs. 4, 5) are also diagnostic.

FEMALE (paratype): Total length, excluding pygidium, 3.89. Carapace 1.44 long, 1.64 wide near front of coxae III, where widest, red, darkest immediately behind small yellow translucent areas at margins opposite coxae II; surface with few long white setae interspersed among numerous shorter white setae, coated with numerous tubercles sparsest near shallow median longitudinal depression; lateral depressions obsolete. Cucullus 0.72 long, 0.86 wide, coloration, setation, and tuberculation as in carapace; lateral lobes essentially straight. Left chelicera: movable finger flattened posteriorly, not widened transversely, armed with eight teeth becoming longer distally; fixed finger armed with four teeth of which second most proximal is reduced to denticle and most distal is much the largest. Sternal region with coxae I not meeting tritosternum; coxae II meeting along their posterior two-thirds, their suture line almost twice as long as that of coxae III; coxae IV meeting anteriorly. Abdomen 2.88 long, 2.19 wide near front of tergite 12, where widest, red with darkened depressions on median plates of tergites, lighter median sections on sternites 11 and 12, and pale orange articular membranes; tubercles densely coating median plates of tergites, inner margins of lateral plates of tergites, lateral portions of sternites 11 and 12, and entire surface of sternites 10 and 13; median plates of all tergites much wider than long, with paired oblique anterolateral depressions; sternites with depressions in corresponding depressions. Pygidium with slight notch in posterior dorsal and ventral margins of basal segment. Palpal segments orange, proximal ones with scattered tubercles ventrally; coxae each with two thick white setae posteriorly along inner margin. Leg formula 2431. Legs red, tarsi becoming orange distally, with setation as in carapace; numerous tubercles rather evenly scattered on distal segments but sparse laterally on trochanters and femora (especially anterior ones). Measurements:

	I	II	III	IV	Palp
Coxa	0.59	0.86	0.73	0.72	0.36
Trochanter I	0.36	0.47	0.47	0.50	0.46
Trochanter II	—	—	0.43	0.43	0.30
Femur	0.81	1.51	1.01	1.11	0.82
Patella	0.50	0.83	0.54	0.56	—
Tibia	0.60	1.19	0.72	0.79	1.14
Metatarsus	0.86	1.25	0.84	0.73	—
Tarsus	0.40	1.26	0.61	0.63	0.14
Total	4.12	7.37	5.35	5.47	3.22

Second legs not widened; femur I two and one-half, femur II four and one-half times as long as wide. Tarsal claws thin, evenly curved. Spermathecae as in figures 4, 5.

MALE (holotype): As in female, except for the following: Total length, excluding pygidium, 4.07. Carapace 1.48 long, 1.62 wide. Cucullus 0.76 long, 0.90 wide. Left chelicera: movable finger with only seven teeth, fixed finger with third (not second) most proximal tooth reduced to denticle. Sternal region with suture line of coxae II only about one and one-half times that of coxae III. Abdomen 2.63 long, 2.05 wide; median plates of tergites 11 and 13 and sternite 13 with fewer tubercles than in female. Pygidium with dorsal notch almost obliterated. Leg formula 2341. Measurements:

	I	II	III	IV	Palp
Coxa	0.50	0.76	0.74	0.66	0.32
Trochanter I	0.29	0.54	0.41	0.47	0.32
Trochanter II	—	—	0.50	0.47	0.30
Femur	0.92	1.58	1.15	1.14	0.83
Patella	0.58	0.84	0.61	0.56	—
Tibia	0.68	1.19	0.76	0.72	1.16
Metatarsus	0.91	1.44	0.72	0.86	—
Tarsus	0.40	1.33	1.19	0.79	0.16
Total	4.28	7.68	6.08	5.67	3.09

Femur I three times, femur II four times as long as wide. Tarsal process as in figure 3.

MATERIAL EXAMINED: One tritonymph, one deutonymph, and one larva taken with the types, plus the following (all from the type locality, collected by J. Wagner, depos-

ited in the Field Museum or American Museum): Berlese, floor litter on slope (June 4, 1980), one female, one tritonymph, one deutonymph, five larvae; Berlese, floor litter on slope (June 5, 1980), two females, one tritonymph, one protonymph, one larva; Berlese, concentrate of loose root mat (June 6, 1980), one male, one larva; Berlese, stage V log mold (June 9, 1980), one male, one female, Berlese, forest floor concentrate (June 9, 1980), one female, two tritonymphs; Berlese, floor litter and root mat (June 10, 1980), one female, two tritonymphs, three deutonymphs, two protonymphs, one larva.

DISTRIBUTION: Northern Panama (fig. 1).

LITERATURE CITED

Gertsch, Willis J.
1971. Three new ricinuleids from Mexican caves (Arachnida, Ricinulei). Assoc. Mexican Cave Studies Bull., vol. 4, pp. 127–135, figs. 1–19.
1977. On two ricinuleids from the Yucatan Peninsula (Arachnida, Ricinulei). *Ibid.*, vol. 6, pp. 133–138, figs. 1–15.

Gertsch, Willis J., and S. Mulaik
1939. Report on a new ricinuleid from Texas. Amer. Mus. Novitates, no. 1037, pp. 1–5, figs. 1–10.

Platnick, Norman I., and Mohammad U. Shadab
1981. On Central American *Cryptocellus* (Arachnida, Ricinulei). Amer. Mus. Novitates, no. 2711, pp. 1–13, figs. 1–21.

A New Genus of Troglobitic Scorpion from Mexico (Chactoidea, Megacorminae)

OSCAR F. FRANCKE[1]

ABSTRACT

Troglocormus, a new genus of troglobitic megacormine scorpion with paired ventral submedian carinae is described for two new species: *T. willis* from three caves in Tamaulipas, and *T. ciego* from a single cave in San Luis Potosí, Mexico.

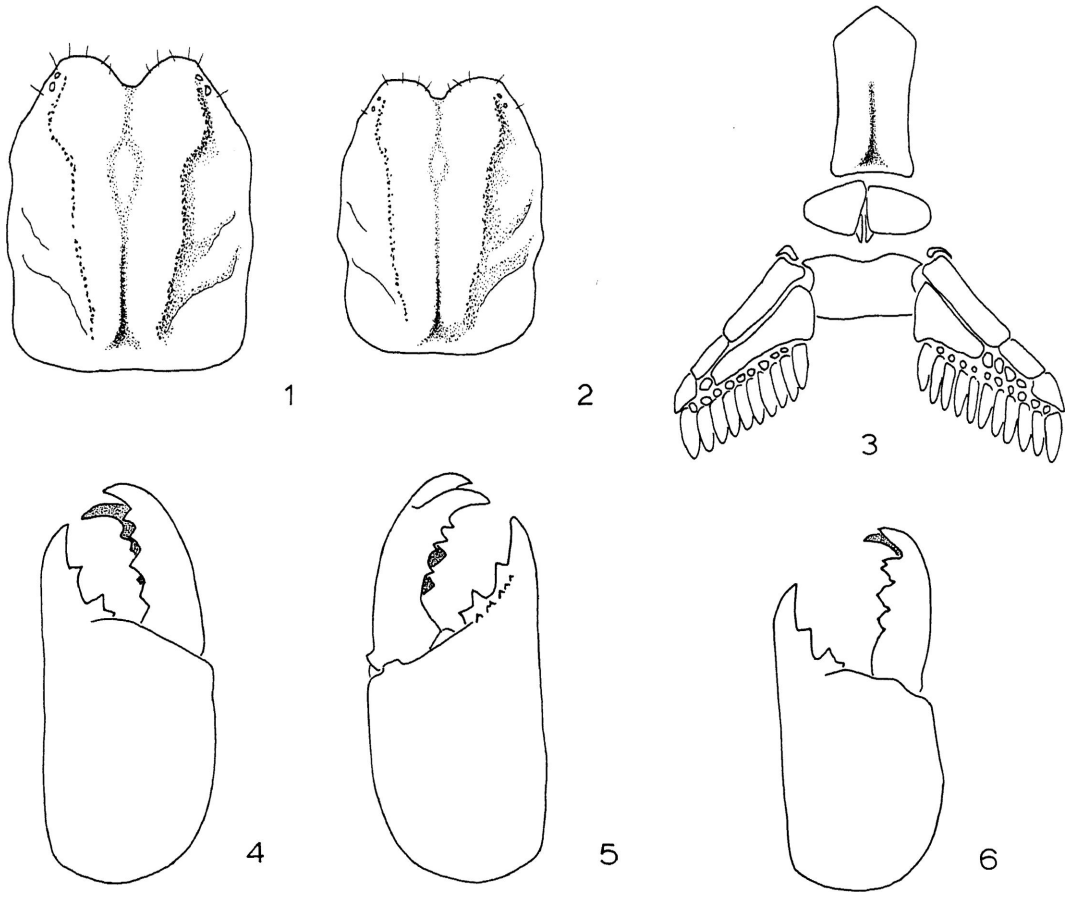
INTRODUCTION

Most scorpions have paired ventral submedian carinae on metasomal segments I–IV, or when ventral carinae are not developed most taxa have been assumed to have paired carinae. The fusion of these carinae into a single ventral median keel has occurred independently several times and has received variable taxonomic "weight." In the genus *Tityus* Koch (Buthidae) fused ventral median carinae are merely used to recognize a species group, whereas in other families it has been used to characterize subfamilies. In the Vaejovidae, the Syntropinae is based exclusively on this character (i.e., fused ventral carinae), even though the two monobasic genera placed in it most probably are not each other's closest relatives. In the Scorpionidae the Hemiscorpioninae (two genera whose separation is rather superficial), the Heteroscorpioninae (one genus), and the Urodacinae (one genus) are also based on the fused carinae on metasomal segments I–IV, obscuring the true phylogenetic relationships of those taxa. Finally, in the Chactidae, the Euscorpioninae (two genera which do not appear to be closely related) has sometimes been characterized as having fused carinae (Birula, 1917), even though no ventral carinae are detectable in the species referred to it (Soleglad, 1976; personal observ.), and the Megacorminae (two closely related genera) are founded on this character.

The objectives of this contribution are to describe a new genus, with two new species, of troglobitic megacormine scorpions with paired ventral submedian carinae. Consideration of phylogenetic relationships, and the consequent changes in taxonomy and classification (resulting from the discovery of the new taxon, which violates significantly the currently accepted subfamilial diagnosis) are not presented here due to space limitations, but will be treated in a future contribution.

Foremost I thank Dr. Norman I. Platnick and the American Museum of Natural History (AMNH) for the opportunity to join them, and the other authors of this volume, in wishing the best to Willis on this commemorative occasion. I also express my appreciation to Mr. Peter Sprouse, Mr. Andy G. Grubbs, Mr. David McKenzie, Mr. James Reddell, and other members of the Association for Mexican Cave Studies, Austin, for their continuous efforts in cave exploration and the furthering of biospeleology. Finally,

[1] Assistant Professor, Departments of Biological Sciences and Entomology, Texas Tech University, Lubbock, Texas 79409.



FIGS. 1–6. 1, 3–5. *Troglocormus willis,* new species. 2, 6. *T. ciego,* new species. 1, 2. Carapace of male, dorsal view 3. Sternopectinal area of male, ventral view. 4, 6. Chelicera, dorsal view. 5. Chelicera, ventral view.

I am grateful to Mr. Michael E. Soleglad and Dr. Platnick for reviewing a draft of the manuscript.

TROGLOCORMUS, NEW GENUS

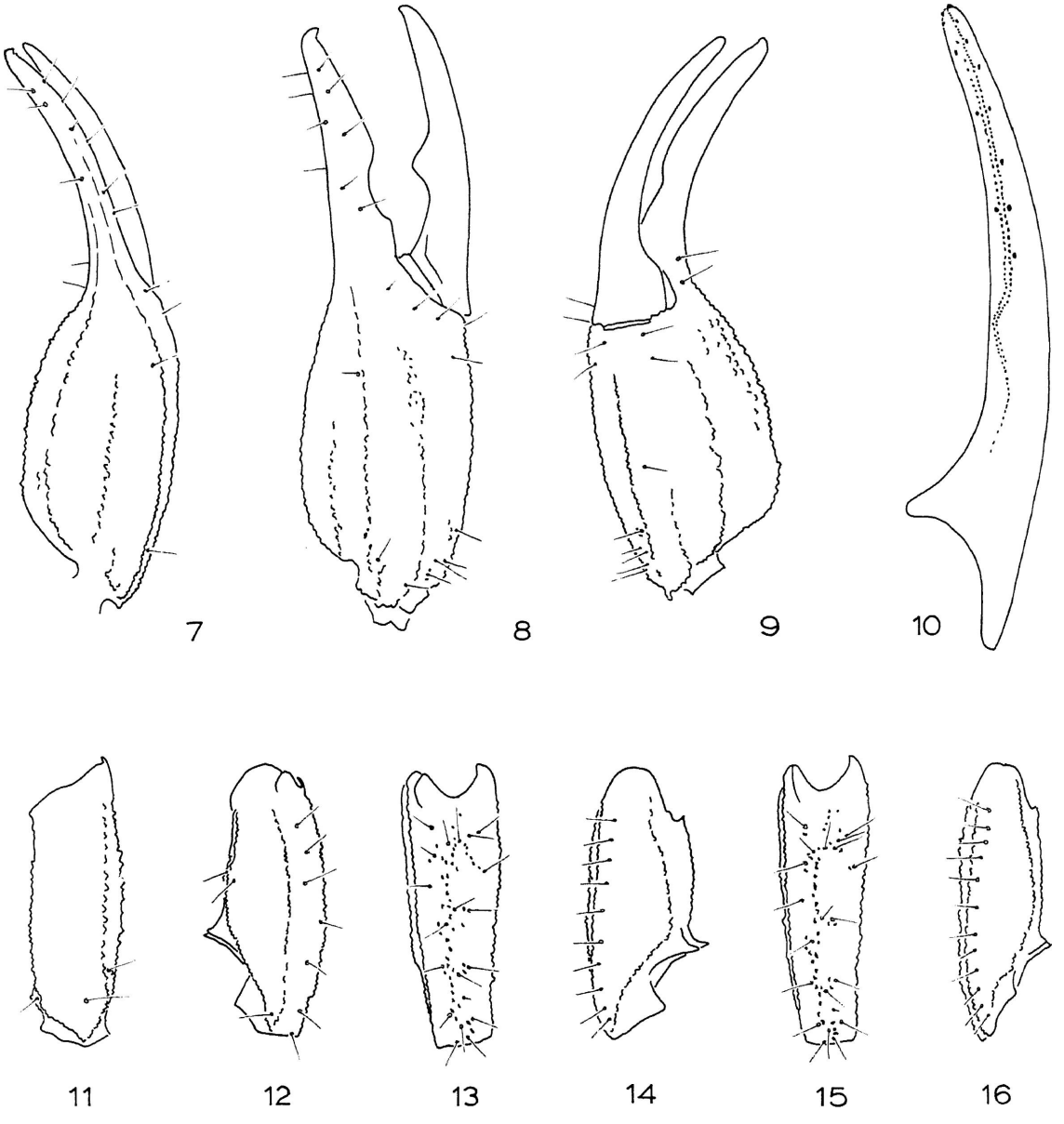
TYPE SPECIES: *Troglocormus willis,* new species.

ETYMOLOGY: The generic epithet reflects the troglobitic habits, and close phylogenetic relationships of this taxon with *Megacormus* Karsch. It is masculine in gender.

INCLUDED TAXA: *Troglocormus willis,* new species and *T. ciego,* new species.

DISTRIBUTION: Known only from caves in the states of Tamaulipas and San Luis Potosí, Mexico.

DIAGNOSIS: Carapace longer than broad, no median eyes, two pairs of lateral eyes; anterior margin moderately emarginate medially (figs. 1, 2). Sternum considerably longer than broad (fig. 3). Pectines with fulcra. Stigmata oval elongate. Metasomal segments I–IV with paired ventral submedian carinae. Aculeus defined at base by conspicuous semicircular groove. Chelicera with denticles on ventral aspect of fixed and movable fingers (figs. 4–6). Pedipalp femur with three trichobothria (fig. 11), tibia with 33–36 trichobothria (figs. 12–16), chela with 26 tricho-



FIGS. 7–16. 7–14. *Troglocormus willis,* new species. 15, 16. *T. ciego,* new species. 7. Chela, dorsal view. 8. Chela, external view. 9. Chela, ventrointernal view. 10. Movable finger, inner view. 11. Femur, dorsal view. 12. Tibia, dorsal view. 13, 15. Tibia, external view. 14, 16. Tibia, ventral view.

bothria (figs. 7–9). Pedipalp chela fingers with two rows of denticles (fig. 10), Prolateral and retrolateral pedal spurs present. Tarsi armed ventrally with one median row of spicules flanked by long, irregularly placed setae.

COMPARISONS: *Troglocormus* differs from all other described scorpions in the shape of

the sternum. The dentition on the movable finger of the chelicera, the armature of the pedipalp chela fingers, and the trichobothrial pattern on the pedipalp chela indicate that *Troglocormus* is more closely related to *Megacormus* and *Plesiochactas* Pocock than to any other Recent scorpion. Therefore, *Troglocormus* is hereby assigned to the subfamily Megacorminae.

Troglocormus differs significantly from *Megacormus* and *Plesiochactas* as follows: sternum considerably longer than wide in *Troglocormus,* as wide or wider than long in the other two genera; ventral margin of cheliceral fixed finger with 4–7 small denticles in *Troglocormus,* smooth in *Megacormus* and *Plesiochactas*; median eyes absent in *Troglocormus,* present in its two closest relatives; anterior margin of carapace notched in *Troglocormus,* straight in the other two genera; metasomal segments I–IV with paired ventral submedian carinae in *Troglocormus,* with a single ventral median carina in *Megacormus* and *Plesiochactas*; aculeus defined at base by a conspicuous semicircular groove in *Troglocormus,* basal subaculear groove absent in the other two genera.

Troglocormus willis, new species
Figures 1, 3–5, 7–14

TYPE: Holotype male from Cueva del Brinco (entrance passage), Tamaulipas, Mexico (May 3, 1978; Peter Sprouse), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the first name of Dr. W. J. Gertsch.

DIAGNOSIS: Adults dark brown. Dorsal margin of movable finger of chelicera with subdistal teeth distinct, not forming a bicusp. Pedipalp tibia with 10 (rarely 11) ventral trichobothria.

DESCRIPTION: The following description is based on the two known adult specimens (measurements in table 1); parenthetical statements refer to sexual dimorphism noted in the only known female.

Prosoma—Carapace dark brown, longer than wide; anterior margin deeply notched; sides slightly sinuous, subparallel (fig. 1). Median ocular tubercle vestigial, median eyes absent. Median furrow vestigial on anterior two-thirds, deep and narrow on posterior one-third. Mediolateral furrows shallow, broad; posterolateral furrows deep, broad. One pair prominent longitudinal submedian ridges extends from lateral eyes to base of posterolateral furrows, thus converging slightly posteriorly; median area of carapace relatively flat, with moderately dense small granulation; lateral areas of carapace set off at a sharp angle by submedian longitudinal ridges, with moderately dense medium granules. Ventral region dark brown, scabrose; sternum two times longer than wide, with deep posteromedian longitudinal furrow (fig. 3).

Mesosoma—Tergites medium brown, shagreened; VII with four longitudinal, granular keels. Venter light yellow-brown, moderately setose. Genital operculi subelliptical, papillae well developed (papillae absent, without median longitudinal membranous connection). Sternites smooth, stigmata oval elongate; last sternite with ventral submedian and ventrolateral carinae weak, granulose.

Metasoma—Medium brown, carinae dark brown. Segments I–IV with dorsolateral, lateral supramedian, and ventrolateral carinae strong, granulose; intercarinal spaces smooth. Lateral inframedian carinae on I strong, granulose; on II and III vestigial, on IV obsolete. Ventral submedian carinae on I weak, subgranulose; on II–IV moderate, granulose. Segment V with dorsolateral, mediolateral, ventrolateral, and ventromedian carinae strong, granulose. Telson yellow-brown; globose, about as wide as deep.

Chelicera—Chela yellow-brown, fingers medium brown. Dorsal margin of movable finger with two distinct, subequal subdistal teeth (fig. 4); ventral margin with 4–7 denticles, without serrula. Ventral edge of fixed finger with 4–7 denticles (fig. 5).

Pedipalp—Medium brown, carinae and fingers dark brown. Carinae strong, granulose; intercarinal spaces shagreened. Femur with three trichobothria (fig. 11). Tibia with 33 (34) trichobothria: one internal, two dorsals, 20 (21) externals, and 10 ventrals (figs.

TABLE 1
Measurements (in Millimeters) of *Troglocormus willis* and *Troglocormus ciego*

	willis holotype	*willis* female	*willis* juvenile	*willis* juvenile	*ciego* holotype
Total length	58.40	66.50	39.00	21.85	50.90
Carapace length	9.10	10.40	6.60	3.80	8.00
Median width	7.20	7.80	4.90	2.80	5.90
Mesosoma length	17.70	22.80	13.30	7.25	15.60
Metasoma length	31.60	33.30	19.10	10.80	27.30
Segment I: length	3.20	3.20	2.00	1.10	2.70
width	3.10	3.10	2.00	1.10	2.50
Segment II: length	3.70	3.90	2.30	1.30	3.30
width	2.90	2.80	1.90	1.00	2.30
Segment III: length	4.10	4.30	2.50	1.40	3.50
width	2.90	2.80	1.80	0.95	2.20
Segment IV: length	4.70	5.00	2.80	1.60	3.90
width	2.70	2.70	1.65	0.90	2.20
Segment V: length	7.50	8.20	4.50	2.60	6.40
width	2.50	2.10	1.55	0.85	2.00
Telson length	8.40	8.70	5.00	2.80	7.50
Vesicle: length	6.40	6.70	3.50	1.80	5.60
width	3.30	3.30	2.00	1.10	3.00
depth	3.20	3.20	1.70	0.80	2.75
Aculeus: length	2.00	2.00	1.50	1.00	1.90
Pedipalp length	35.10	38.70	24.00	15.05	31.30
Femur: length	9.00	9.90	6.20	3.80	8.00
width	2.80	2.90	1.90	1.10	2.10
depth	1.50	1.80	1.00	0.70	1.40
Tibia: length	8.70	9.70	6.20	3.95	8.00
width	3.00	3.30	2.00	1.20	2.40
depth	2.80	3.00	1.60	1.10	2.20
Chela: length	17.40	19.10	11.60	7.30	15.30
width	4.30	4.60	2.60	1.55	3.30
depth	5.40	5.50	3.30	1.80	4.00
Movable finger length	9.00	10.20	6.00	3.70	8.00
Fixed finger length	7.50	8.10	4.90	3.00	6.60
Chelicera length	3.40	3.85	2.50	1.40	2.80
Chela: length	2.40	2.50	1.75	0.95	1.90
width	1.70	1.80	1.20	0.75	1.50
Movable finger length	1.80	2.20	1.35	0.85	1.50
Fixed finger length	1.00	1.35	0.75	0.45	0.90
Pectinal tooth count	11–10	9–9	9–10	10–11	11–12

12–14). Chela with 26 trichobothria (figs. 7–9). Fingers scalloped, leaving a moderate basal gap when fingers closed (leaving a narrow basal gap when fingers closed); dentition as in figure 10.

Legs—Medium brown; dorsal and ventral edges of femora and tibiae dark brown. Prolateral and retrolateral pedal spurs strong. Apotele (="subunguicular spine") well developed.

VARIATION: Aside from differences in size (table 1), and sexually dimorphic structures such as sternopectinal region and pedipalp fingers, the two adults are very similar in

most respects. A medium-sized immature male (measurements in table 1) is medium yellow, with carinae and pedipalp fingers medium brown; the pedipalp fingers are slightly sinuous and close completely. A small immature male (measurements in table 1) is cream-colored, and the pedipalp fingers are straight.

The three males, from two nearby caves, have 20 external and 10 ventral trichobothria on the tibia, whereas the female, from a cave some 25 km. distant, has 21 external and 10–11 (asymmetrical) ventral trichobothria on the tibia.

RECORDS: **Mexico**: *Tamaulipas:* Cueva del Brinco (entrance passage), May 3, 1978 (P. Sprouse, AMNH), 1♂ (holotype), July 1978 (P. Sprouse, author's collection), small juvenile ♂; Cueva X, Conrado Castillo, Mar. 28, 1978 (A. G. Grubbs, AMNH), medium size juvenile; Cueva de Esperanza, Yerbabuena, Nov. 20, 1979 (P. Sprouse, author's collection), 1♀.

DISTRIBUTION: Known only from three caves in Tamaulipas, Mexico.

Troglocormus ciego, new species

Figures 2, 6, 15, 16

TYPE: Holotype male from Cueva de Elias, 13 km. north of Agua Buena, San Luis Potosí, Mexico (August 3, 1975; D. McKenzie), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition, based on the Spanish word meaning blind.

DIAGNOSIS: Adult light brown. Dorsal margin of movable finger of chelicera with subdistal teeth fused, forming a distinct bicusp. Pedipalp tibia with 12 ventral trichobothria.

DESCRIPTION: Known only from the holotype (measurements in table 1). As in *T. willis* except for the following: Considerably lighter in color throughout; most structures light brown, with carapace and pedipalpal carinae medium brown. Carapace proportionally narrower; lateral margins with conspicuous inflections at distal one-third, marking apices of posterolateral furrows (fig. 2). Dorsal margin of movable finger of chelicera with subdistal teeth fused, forming a distinct bicusp (fig. 6). Pedipalp tibia with 21 external and 12 ventral trichobothria (figs. 15–16).

RECORDS: Known only from the type.

REMARKS: The lateral eyes in *T. ciego* are reduced in size relative to those of *T. willis* (figs. 1, 2), and in both species they are relatively smaller than in the epigean *Megacormus* and *Plesiochactas*. In addition, as noted above, *T. ciego* is paler in color than *T. willis*, and the latter is only slightly paler than its epigean relatives. Therefore, it appears that *T. ciego* has slightly greater troglobitic facies than *T. willis*, and may have been isolated in a cave environment for a longer period of time. Morphometrically, however, there are no detectable differences between the two species of *Troglocormus* in appendage attenuation: in both species the pedipalp femur length and pedipalp chela movable finger length are about equal to the carapace length, and the relative length of the metasoma with respect to the carapace is about the same. Thus, the presumed differences in time since isolation in the cave environment between the two species might be spurious.

LITERATURE CITED

Birula, A. A. B.
1917. Arachnoidea. Scorpions. *In* Nasonov, N. V., Fauna of Russia and adjacent countries. Russian Academy of Sciences, Petrograd, vol. 1, no. 1, pp. 1–224, figs. 1–21, plates I–III [English translation by Israeli Program for Scientific Translations, Jerusalem, 1965, pp. 1–154].

Soleglad, Michael E.
1976. A revision of the scorpion subfamily Megacorminae (Scorpionida: Chactidae). Wasmann Jour. Biol., vol. 34, pp. 251–303, figs. 1–134.

A New *Bothriurus* from Bolivia (Scorpiones, Bothriuridae)

EMILIO A. MAURY[1]

ABSTRACT

Bothriurus inermis, a new species of the scorpion family Bothriuridae, is described from Bolivia. The male can be recognized by the absence of an apophysis on the inner face of the pedipalp chela and by the morphology of the hemispermatophore.

INTRODUCTION

The scorpion fauna of Bolivia has been largely neglected and that is undoubtedly one of the major problems that investigators face in understanding the distribution of these arachnids in South America. The few references to scorpions from Bolivia are usually to original descriptions of species that are urgently in need of revision. The presence of the families Buthidae and Bothriuridae in Bolivia is well established (Kraepelin, 1895, 1911; Lönnberg, 1902; Werner, 1939; Abalos, 1954, 1955; Maury, 1973, 1974a) but the "Vaejovidae" are mentioned with certain doubts (Maury, 1974b) and the Chactidae, presumed to be found in this region, have not actually been reported. However, Bolivia is situated almost in the center of South America and is a point of convergence of large biogeographical regions, such as Amazonia, Chaco, and Puna, each with an endemic biota. Thus, the presence of a very rich scorpiofauna of considerable zoogeographic interest is expected in Bolivia.

In spite of the scarcity of specimens from Bolivia in scorpion collections, I have had the opportunity to study at least 20 species from that country. Hence, I have a slight idea of the Bolivian scorpiofauna, but further studies and above all more adequate collections from the region will be necessary before we can understand the zoogeographic implications.

As a contribution to the knowledge of Bolivian scorpions I describe here a new *Bothriurus*, the fifth species of the genus reported from that country.

The material mentioned in this paper is deposited in the Museo Argentino de Ciencias Naturales, Buenos Aires (MACN) and National Museum of Natural History, Smithsonian Institution, Washington (USNM). My sincere gratitude to Dr. Oscar F. Francke, Texas Tech University, Lubbock, for critical reading of the manuscript; to Dr. R. E. Crabill, National Museum of Natural History, Washington, for the loan of some Neotropical scorpions, and to Dr. Norman I. Platnick, American Museum of Natural History, New York, for the kind invitation to participate in the present volume in homage to Dr. Willis J. Gertsch.

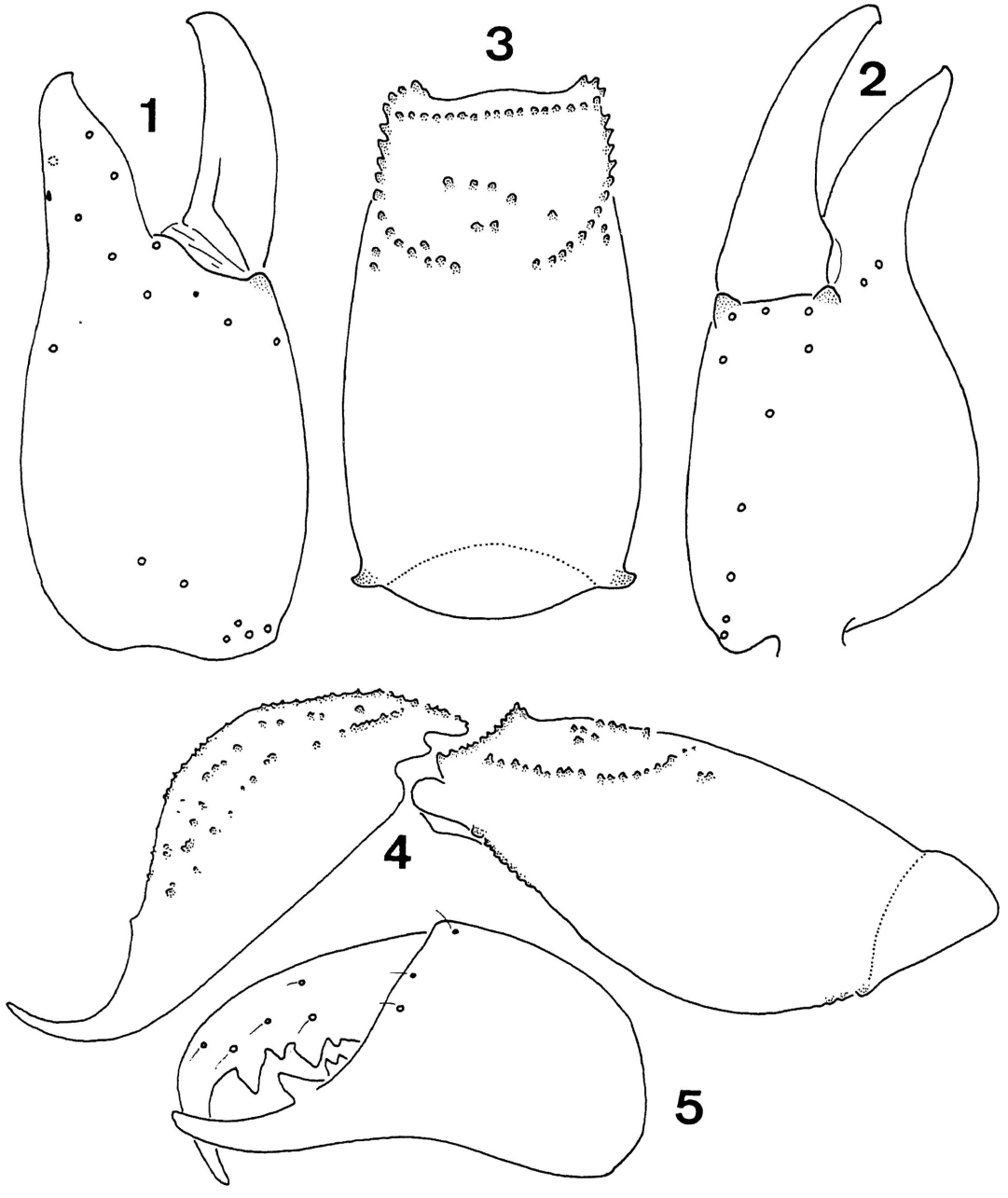
Bothriurus inermis, new species

Figures 1–9

TYPES: Male holotype from Buenavista, departamento Santa Cruz, Bolivia (February 1951; J. A. Prosen); female allotype, same locality and collector (October 1949); male paratype from Santa Cruz, Bolivia (October 1949; J. A. Prosen), all deposited in MACN.

ETYMOLOGY: The specific name is from the Latin *inermis* (unarmed) because adult

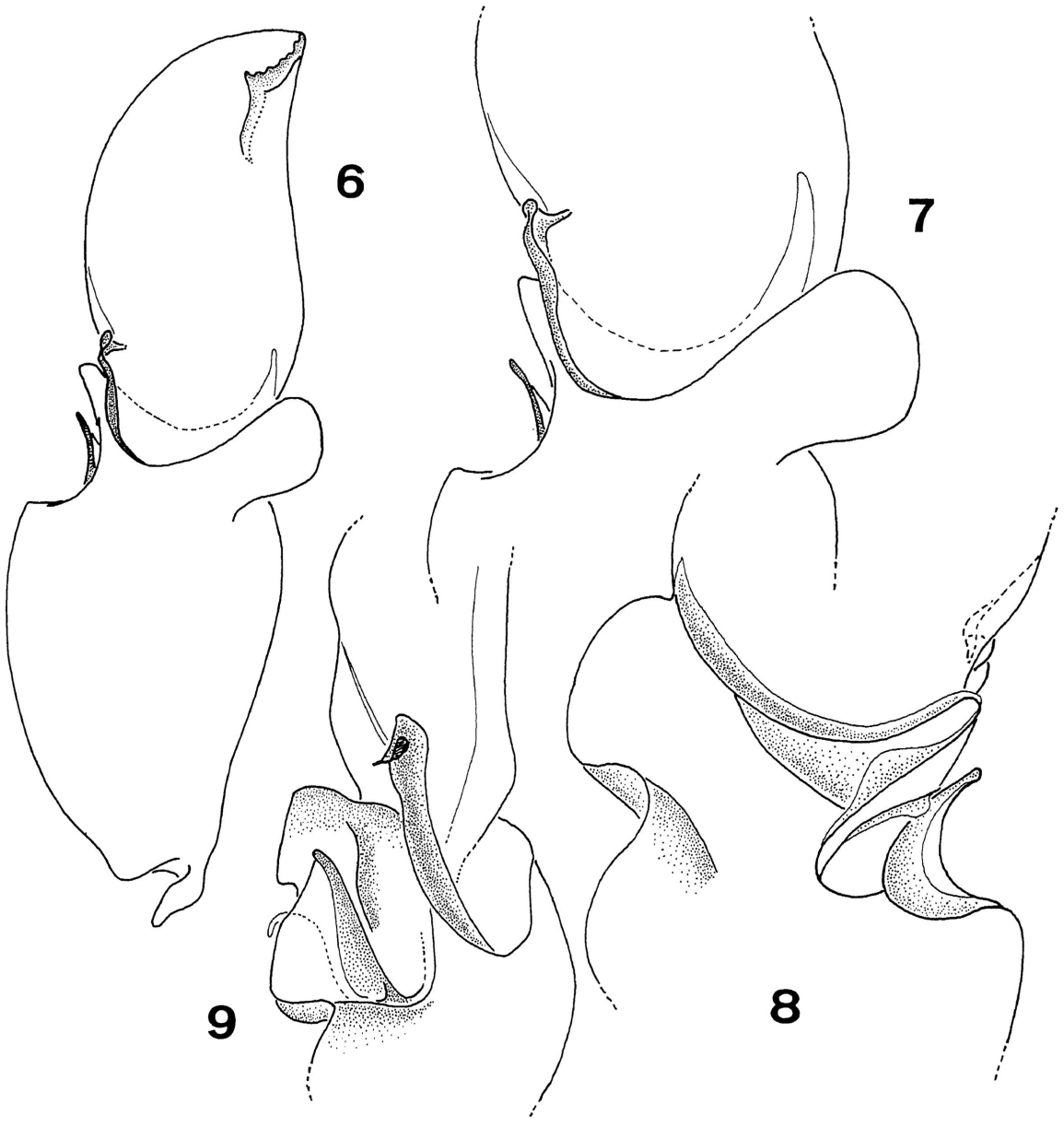
[1] Jefe, Sección Aracnología, Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina.



FIGS. 1–5. *Bothriurus inermis*, new species, holotype male. 1. Right chela, lateral view. 2. Right chela, ventral view. 3. Caudal segment V, ventral view. 4. Caudal segment V and telson, lateral view. 5. Right chelicera, dorsal view.

males lack the typical, toothlike apophysis on the inner face of pedipalp chela.

DIAGNOSIS: *Bothriurus* of moderate size: total length between 32 and 37 mm. in adult



FIGS. 6–9. *Bothriurus inermis,* new species, holotype male. 6. Hemispermatophore, lateral view. 7. Hemispermatophore, capsular region, lateral view. 8. Hemispermatophore, capsular region, medial view. 9. Hemispermatophore, capsular region, ¾ side ventral view.

specimens. Base color dusky brown, with moderately dense variegated darker pattern. Male and female without ventral carinae on sternite V and caudal segments I–IV. Pectinal tooth count 15–16 in males; 12–14 in females. Chelicera with only one subdistal tooth on movable finger (fig. 5). Two ventral lateral carinae on caudal segment V form-

ing an almost perfect arc (fig. 3). Male telson without concavity on dorsal face. Male pedipalp chela without apophysis on the inner face (fig. 2). Pedipalp chela with trichobothrium *Esb* placed between *Eb2* and *Eb3*; trichobothrium *Et3* located more terminal than *Est* (figs. 1–2). Hemispermatophore as shown in figures 6–9.

By its external appearance, *Bothriurus inermis* resembles some species of the *araguayae* group: *B. araguayae* Vellard and *B. moojeni* Mello-Leitão, or the *bonariensis* group: *B. bonariensis* (C. L. Koch). But it may be distinguished by the absence of the apophysis, a secondary sexual character, on the inner face of the male pedipalp chela (it is the first exception found in the genus *Bothriurus*; Maury, 1975) and by the structure of the hemispermatophore, a new "fundamental model" not mentioned in Maury, 1980.

TABLE 1
Measurements (in Millimeters) of *Bothriurus inermis*, New Species

	Holotype ♂	Allotype ♀	Paratype ♂
Total length	32.86	37.08	32.55
Carapace length	4.33	4.33	4.12
Carapace anterior width	2.37	2.47	2.27
Carapace posterior width	4.43	4.94	4.43
Mesosoma total length	8.86	14.32	9.58
Metasoma total length	19.67	18.44	18.85
Segment I length	1.96	1.96	1.96
Segment I width	3.30	3.09	2.99
Segment II length	2.37	2.27	2.16
Segment II width	3.19	2.88	2.88
Segment III length	2.99	? 37	2.47
Segment III width	3.09	2.88	2.88
Segment IV length	2.99	2.88	2.99
Segment IV width	2.99	2.88	2.88
Segment V length	4.02	4.02	4.12
Segment V width	2.99	2.78	2.78
Segment V depth	2.27	2.27	2.27
Telson length	5.36	4.94	5.15
Vesicle length	3.81	3.40	3.60
Vesicle width	2.37	2.16	2.27
Vesicle depth	1.75	1.54	1.65
Aculeus length	1.54	1.54	1.54
Pedipalp total length	12.77	12.46	12.26
Femur length	3.09	3.09	3.09
Femur width	1.34	1.34	1.24
Tibia length	3.60	3.40	3.30
Tibia width	1.44	1.34	1.34
Chela length	6.08	5.97	5.87
Chela width	2.27	2.16	2.06
Chela depth	3.09	2.37	2.78
Movable finger length	2.88	3.09	2.88

MALE (holotype): Measurements in mm. in table 1. Carapace, tergites, sternite V, metasoma, and pedipalps dusky brown, with shade color pattern of spots and bands largely masked by base color; legs, sternites I–IV, pectines, and genital operculum yellowish; tergites I–VI without pale median longitudinal band; a yellowish spot on dorsal face of vesicle. Carapace with light median notch; anterior median furrow slight, not reaching ocular prominence; posterior median furrow moderately deep; ocular prominence with slight furrow on posterior half; carapacial surface shagreened. Tergites I–VI shagreened; tergite VII granulose. Sternites I–V smooth, without carinae; stigmata elongate. Pectines with 16-16 teeth. Chelicera with only one subdistal tooth on movable finger (fig. 5). Metasoma, caudal segments I–IV: dorsal lateral carinae almost complete, absent at anterior margin; lateral supramedian carinae present only on distal third; lateral inframedian carinae vestigial on distal third of segments I–III, absent on IV; ventral lateral and ventral submedian carinae obsolete. Caudal segment V: dorsal lateral carinae slightly developed, except at both ends, where some granules are more prominent; ventral lateral arinae strong, with about 12 granules each, forming an almost perfect arc but leaving a narrow anterior opening; ventral median carina represented by about 6 granules inside arc formed by ventral lateral carinae (figs. 3–4). Telson with aculeus short, moderately curved; ventral face of vesicle granulose; dorsal face smooth, without any depression or concavity (fig. 4). Pedipalps: femur shagreened, with granulate carinae; tibia shagreened, trichobothrial pattern as in other *Bothriurus*; chela strong (length/depth: 2.0), fingers relatively short; without apophysis on inner face; with 27

trichobothria, of which *Esb* placed between *Eb2* and *Eb3*, and *Et3* located more terminal than *Est* (figs. 1–2; nomenclature follows Vachon, 1973). Hemispermatophore as shown in figures 6–9.

FEMALE (allotype): Measurements in mm. in table 1. Coloration and morphology as in male holotype, except for the following: carapace and tergites with tegument smooth; pectines with 13-13 teeth; pedipalp chela more elongated (length/depth: 2.5); dorsal face of vesicle without yellowish spot.

VARIATION: Except for the differences in size and sexual secondary characters, the studied specimens (5 males, 4 females) are very similar. In males, pectinal tooth counts show the following variation: 16-16 (2 cases) and 15-16 (3); in females: 12-12 (1), 12-13 (1), 13-13 (1), and 14-14 (1).

RECORDS: **Bolivia**: *Santa Cruz:* Buenavista, Feb. 1951 (J. A. Prosen, MACN), 1♂ (holotype); Oct. 1949 (J. A. Prosen, MACN), 1♀ (allotype); Santa Cruz, Oct. 1949 (J. A. Prosen, MACN), 1♂ (paratype); Buenavista, Oct. 17, 1949 (A. Martínez, MACN), 2♀; "Huachi," Sept. (W. M. Mann, USNM), 1♂; "Sumupasa," Dec. 2 (W. M. Mann, USNM), 2♂, 1♀.

DISTRIBUTION: Known only from departamento Santa Cruz, Bolivia. (I have not been able to situate the localities "Huachi" and "Sumupasa.")

LITERATURE CITED

Abalos, Jorge W.

1954. Descripción de una nueva especie de *Tityus* (Buthidae, Scorpiones). Anal. Inst. Med. Reg., Tucumán, vol. 4, pp. 107–114, figs. 1–15.

1955. *Tityus birabeni*, sp. n. de Bolivia (Buthidae, Scorpiones). *Ibid.*, vol. 4, pp. 223–230, figs. 1–17.

Kraepelin, Karl

1895. Nachtrag zu Theil I der Revision der Skorpione. Jahrb. Hamburg Wiss Ans., vol. 12, pp. 73–96.

1911. Neue beiträge zur systematik der gliederspinnen. Mitt. Naturhist. Mus. Hamburg, vol. 28, pp. 59–107, figs. 1–9.

Lönnberg, Einar

1902. On some scorpions collected in North-Western Argentina and Bolivia by Baron Erland Nordenskiöld. Ent. Tidskr., vol. 23, pp. 253–256.

Maury, Emilio A.

1973. Las tricobotrias y su importancia en la sistemática del género *Brachistosternus* Pocock, 1893 (Scorpiones, Bothriuridae). Physis, Secc. C, vol. 32, pp. 247–254, figs. 1–3.

1974a. Escorpiofauna chaqueña. II. *Tityus confluens* Borelli, 1899 (Buthidae). *Ibid.*, vol. 33, pp. 85–92, figs. 1–10.

1974b. Escorpiones y escorpionismo en el Perú. IV: Revisión del género *Hadruroides* Pocock, 1893 (Scorpiones, Vejovidae). Rev. Peruana Ent., Lima, vol. 17, pp. 9–21, figs. 1–47.

1975. Sobre el dimorfismo sexual de la pinza de los pedipalpos en los escorpiones Bothriuridae. Bull. Mus. Natl. Hist. Nat., Paris, 3e. sér., no. 305, Zool. 215, pp. 765–771, fig. 1.

1980. Usefulness of the hemispermatophore in the systematics of the scorpion family Bothriuridae. Proc. Eighth Internatl. Arachnologen-Kongress, Wien, 1980, pp. 335–339, figs. 1–19.

Vachon, Max

1973. Etude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en Arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les scorpions. Bull. Mus. Natl. Hist. Nat., Paris, 3e. sér., no. 140, Zool. 104, pp. 857–958, figs. 1–243.

Werner, Franz

1939. Neue-Eingänge von Skorpionen im Zoologischen Museum in Hamburg. II. Teil. Festschr. E. Strand. Riga, vol. 5, pp. 351–360, figs. 1–3.

A Study of the Syntypes of *Diplocentrus keyserlingii* (Diplocentridae)

HERBERT L. STAHNKE[1]

ABSTRACT

A study of the four known syntypes of *Diplocentrus keyserlingii* Karsch indicates that they represent two taxa, one of which is designated as *Diplocentrus moritzi*, new species.

INTRODUCTION

The scorpion species *Diplocentrus keyserlingii* Karsch (1880) has seldom been identified correctly in the literature. In order to clarify the situation the four known syntypes were studied. This led to the discovery that the four specimens represent two different taxa.

In order to obtain a thorough coverage of the scorpion body, morphometric observations were made in millimeters on the following body regions: carapace, cauda, appendages (leg IV, pedipalps, and chelicerae), sterno-pectinal area, and intertrichobothrial distances of the D, I, M, and E systems. Cheliceral measurements, when taken, were after Francke (1977). Terminology and other measurements follow Stahnke (1970).

Since shape and proportion are frequently more important than absolute size in taxonomy, the direct measurements were often used to create ratios. This introduces more variables and consequently allows more comparisons.

The courtesies extended to me by the Zoologisches Museum, Humboldt Universität, Berlin (ZMB), are greatly appreciated. My thanks to the British Museum (Natural History) for permitting me to study the holotype of *D. rectimanus* and to Dr. Norman I. Platnick of the American Museum of Natural History for the opportunity to study the primary types of *D. reticulatus* and *D. hoffmanni*.

Diplocentrus keyserlingii Karsch

Figures 1, 2, 5, 6

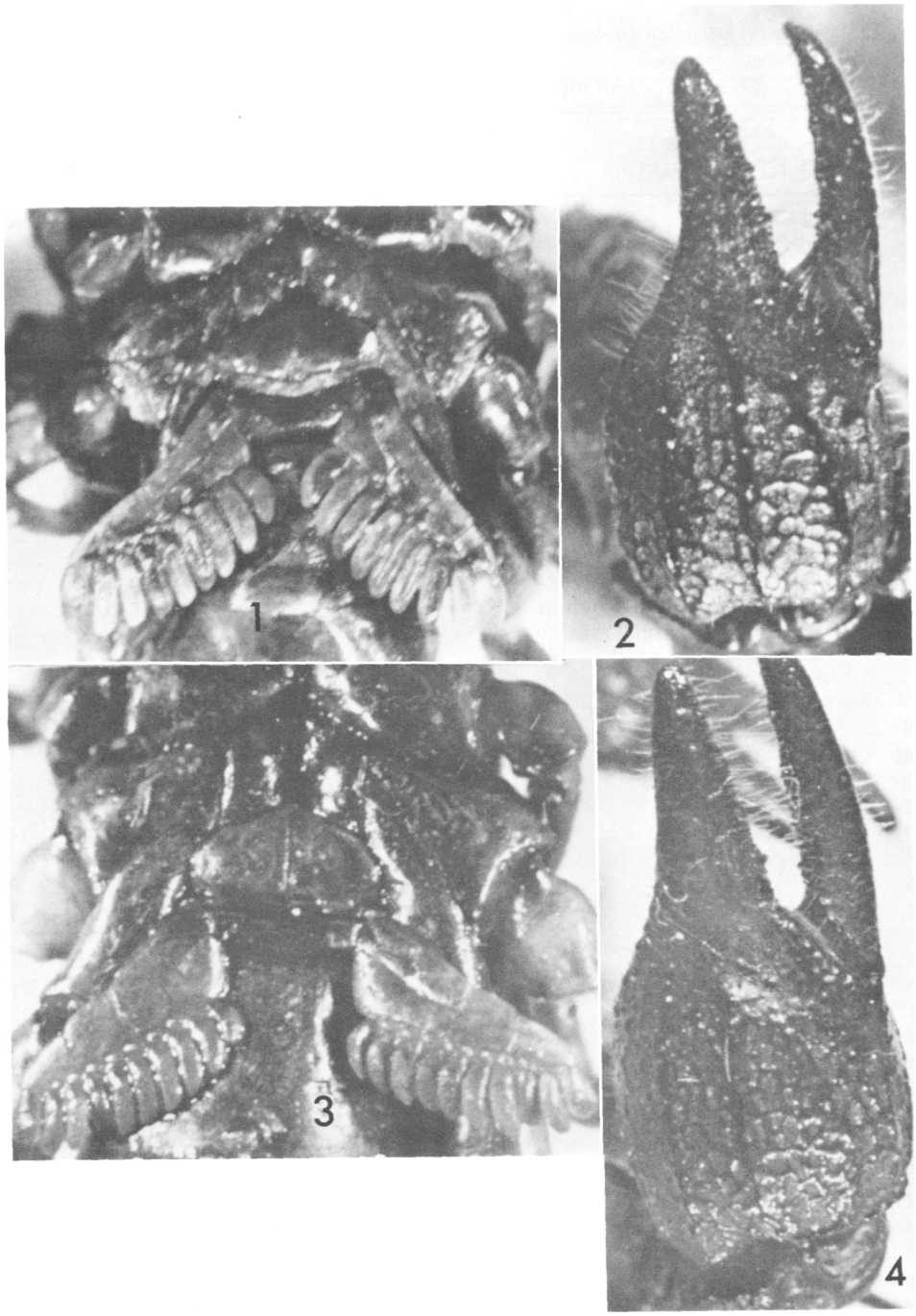
Diplocentrus keyserlingii Karsch, 1880, p. 57 (male lectotype here designated from Oaxaca, Mexico, in ZMB, examined).

Didymocentrus keyserlingii: Werner, 1934, p. 275.

DISCUSSION: Although the original description states that the general coloration is nigro-brunneus, later workers have assigned red-brown to golden-brown specimens to this taxon. Some of these assignments are dubious (Kraepelin, 1899, p. 102; Pocock, 1902, p. 4; Herrera, 1921, p. 159; Bishop and Ferriz, 1964, p. 154); others are definitely incorrect (Banks, 1910, p. 188; Ewing, 1928, p. 6; Hoffmann, 1931, p. 317; Gertsch, 1939, p. 26; Francke, 1977, p. 185).

The four syntypes are males from Oaxaca, Mexico (no females of the species are known), and are in very poor condition. Originally they had been mounted dry on pins and later placed in a single container of liquid preservative. Although there may have been some distortion from preservation, this seems to have been surprisingly uniform, judging from the relative consistency of the detailed morphometric observa-

[1] Emeritus Professor of Zoology, Arizona State University, Tempe, Arizona 85282.



FIGS. 1–4. 1, 2. *Diplocentrus keyserlingii,* male lectotype. 3, 4. *D. moritzi,* male holotype. 1, 3. Sterno-pectinal area, ventral views. 2, 4. Right pedipalp chela, dorsal views.

TABLE 1
Morphometric Observations on *Diplocentrus keyserlingii* (Specimens 10, 11) and *Diplocentrus moritzi* (Specimens 12, 13)
(All measurements in millimeters.)

Code no.	Attribute	Specimen number			
		10	11	12	13
1.0	Total length	38.90	39.76	46.71	47.68
2.0	Trunk length (carapace + mesosoma)	15.80	16.35	20.17	21.53
3.0	Cauda length (metasoma + telson)	23.10	23.41	26.54	28.15
PROSOMA					
4.0	Carapace length	5.00	5.05	6.20	6.50
4.1	Anterior width	2.65	2.87	3.52	3.70
4.2	Width at median eyes	4.05	4.10	4.80	4.75
4.3	Posterior width	4.50	4.55	5.90	6.07
APPENDAGES					
6.1	Pedipalp length	16.20	17.20	20.08	21.54
6.2	Tibia (chela) length	8.00	8.50	10.14	11.29
6.201	Fixed finger length	3.70	3.60	5.50	4.50
6.3	Manus length	4.70	5.00	5.60	6.00
6.4	width	4.20	4.40	5.10	5.30
6.5	depth	2.80	2.90	3.10	3.00
6.6	Tarsus (movable finger) length	5.13	5.20	6.30	7.30
6.7	Patella (brachium) length	4.60	4.85	5.47	5.60
6.8	width	1.70	1.90	2.20	2.10
6.9	Femur length (humerus)	3.60	3.85	4.47	4.65
6.10	width	1.60	1.80	2.20	2.30
6.101	depth	1.90	2.00	2.40	2.50
6.11	Leg IV length	17.85	18.10	20.54	22.20
6.12	Coxa length	3.68	3.65	4.33	4.50
6.13	Trochanter length	2.12	2.25	2.53	2.90
6.14	Femur length	4.75	4.60	5.33	5.50
6.15	width	1.30	1.15	1.50	1.63
6.16	Patella length	3.65	3.75	4.35	4.65
6.17	width	1.45	1.50	1.90	2.00
6.18	Tibia length	1.85	1.95	1.97	2.29
6.19	width	0.70	0.70	0.80	0.85
6.21	Tarsomere length	1.80	1.90	2.03	2.36
6.22	width	0.60	0.60	0.65	0.70
6.25	Chelicera length	2.97	3.05	3.80	3.70
6.26	Manus length	1.67	1.70	2.20	2.20
6.27	width	1.27	1.30	1.63	1.60
6.28	Fixed finger length	1.30	1.35	1.67	1.70
6.29	Movable finger length	1.80	1.90	2.47	2.35
OPISTHOSOMA					
7.0	Mesosoma length (sum of tergites)	9.81	11.30	13.97	15.03
7.1	Pectine teeth	9/9	8/9	10/10	10/10
7.21	Pectine length	3.35	3.15	3.50	3.75
7.22	Dentate area length	2.90	2.85	3.20	3.50
7.6	Basal piece length	0.63	0.67	0.70	0.75
7.7	width (anterior)	1.93	1.83	2.20	2.13

TABLE 1—(*Continued*)

Code no.	Attribute	Specimen number 10	11	12	13
8.0	Cauda length (metasoma length)	23.10 (18.75)	23.41 (19.08)	26.54 (21.47)	28.15 (22.95)
8.1	Segment I length	2.75	2.80	3.27	3.50
8.2	width	3.13	3.30	4.00	4.15
8.3	depth	2.25	2.50	2.80	3.05
8.4	II length	3.20	3.25	3.80	4.15
8.5	width	2.80	3.00	3.60	3.75
8.6	depth	2.40	2.45	2.90	2.95
8.7	III length	3.50	3.50	4.07	4.40
8.8	width	2.67	2.95	3.50	3.70
8.9	depth	2.35	2.45	2.90	2.95
8.10	IV length	4.00	4.20	4.73	5.00
8.11	width	2.50	2.60	3.30	3.50
8.12	depth	2.35	2.30	2.60	2.70
8.13	V length	5.30	5.33	5.60	5.90
8.14	width	2.07	2.10	2.70	2.75
8.15	depth	2.00	2.00	2.40	2.40
8.16	Telson length	4.35	4.33	5.07	5.20
8.17	Vesicle length	3.40	3.30	4.00	4.20
8.18	width	1.97	1.95	2.40	2.75
8.19	depth	1.60	1.65	2.13	2.20
8.20	Aculeus length	1.07	1.05	1.07	1.07
INTERTRICHOBOTHRIAL DISTANCES					
9.1	D1–D6	1.87	1.90	2.60	2.85
9.4	D1–D2	0.55	0.48	0.60	0.71
9.5	D1–D3	0.47	0.43	0.63	0.80
9.51	D1–D4	1.35	1.40	1.63	1.93
9.52	D1–D5	1.18	1.19	1.93	1.95
9.6	D2–D3	0.43	0.37	0.60	0.63
9.75	D3–D4	1.02	1.03	1.07	1.25
9.9	D4–D5	0.57	0.57	0.87	0.80
9.10	D4–D6	0.67	0.63	1.17	1.13
9.105	D4–M1	1.35	1.40	1.83	2.17
9.21	E2–E4	2.03	1.98	2.13	1.96
9.23	E3–E4	1.62	1.77	1.63	1.68
9.24	E4–E5	0.88	0.80	1.25	1.23
9.27	I1–I4	2.80	2.70	3.70	4.55
9.30	I3–I4	0.55	0.60	0.62	0.62
9.31	Tibia tip to D1	0.70	0.63	0.97	1.17

tions, especially those of the intertrichobothrial distances.

These four specimens appear to represent two taxa. Specimens ID no. 10 and 11 represent *D. keyserlingii,* whereas 12 and 13 represent a new species, *D. moritzi.* The individuals making up each of the pairs are about the same length (table 1). Since the specimens are in too poor a condition to examine the internal reproductive organs, adulthood cannot be positively determined. However, examination of the pecten shape and tooth development (figs. 1, 3) of each pair suggests that they are adults.

DIAGNOSIS: See tables 1–4. Adults of this species are about 40 mm. in total length. The trunk, cauda, and pedipalps are blackish-brown with faint indications of a fuscous pattern on the trunk dorsum; the legs, chelicerae, and venter are more reddish brown. The body is generally nonpunctate but is strongly granular over most of the surface (except legs). The pectine tooth count is 9/9; the angle of the proximal middle lamella is about 100 degrees.

The species differs from *D. reticulatus* Francke (1977) as follows: that species is larger (total length 45.75 mm.), with the trunk, cauda, and pedipalps a dusky reddish brown and legs slightly lighter. In *D. keyserlingii* the carapace is densely covered throughout with fine- to medium-sized granules but the anterior portion of the interocular triangle is more coarsely granular, whereas in *D. reticulatus* only the anterior portion of the carapace is granular. Morphometric comparisons (*D. reticulatus* values listed first): carapace anterior-posterior taper (posterior width minus anterior width, divided by length), 0.53 versus 0.37; ratio of carapace length:pedipalp patella length, 1.27 versus 1.09; ratio of pedipalp tibia length:manus length, 2.44 versus 1.70; ratio of manus exterior surface length:manus depth, 1.28 versus 1.11; ratio of pedipalp patella length:pedipalp femur length, 1.07 versus 1.28; ratio of patella length:width, 2.37 versus 2.71; ratio of pectine dentate-area length:pectine width at first tooth level, 2.77 versus 3.87; ratio of genital plate width:length, 1.69 versus 2.12; ratio of caudal length:mesosoma length, 1.93 versus 2.35; ratio of vesicle length:depth, 2.29 versus 2.13; intertrichobothrial distance ratios: 9.4:9.6, 1.40 versus 1.28; 9.75:9.9, 1.84 versus 1.63; 9.21:9.22, 0.58 versus 0.73; 9.23:9.24, 1.07 versus 1.84; 9.27:9.21, 1.89 versus 1.38; 9.30:9.31, 1.14 versus 0.79.

DESCRIPTION (lectotype, specimen no. 10): Carapace longer than broad; ratio of length to anterior width 1.23; densely covered throughout with fine- to medium-sized granules but anterior portion of interocular triangle more coarsely granular; sparsely hirsute along anterior margin. Strongly developed frontal lobes densely granular, with interspersed patches of apparently very fine punctations. Well-developed median notch, depth about 0.06 times length of carapace. Three pairs of lateral eyes, first pair smallest. Median ocular tubercle located about one-third of length posteriad. Furrows: median ocular moderately developed, enough so as to form weak to moderate superciliary crests; anterior marginals and central transverse lacking; anterior median deep and broad over anterior one-half but lacking on posterior half; slight vestiges of lateral oculars; central median broad, deep, well developed but not slitlike; posterior median deep, moderately broad with posterior portion almost slitlike; posterior marginal deep, narrow (not slitlike), well developed with anterior margin rising well above posterior margin, slightly continuous with posterior laterals, which are well developed and broad throughout length.

Chelicerae with movable finger forked, inferior tine about four times length of superior tine, which bears three teeth: one and three about one-third as large as median; distal tooth partially on base of superior tine, posterior tooth partially united to median tooth. Fixed finger superior edge bearing two teeth, one bicuspid with proximal cusp about two-thirds size of other. Inferior surface of fixed finger and inferior manus surface bearing long whitish setae. Fixed finger longer than manus width, movable finger longer than manus length.

Pedipalp chela tarsus (movable finger) moderately to densely hirsute. Inner edge with inconspicuous basal lobe bearing large tooth on apex. Four subequally spaced clusters of large denticles distad to tooth. Tibia (chela manus plus fixed finger): manus lightly hirsute; agranular except in region of interior marginal keel; very strongly developed costate reticulation (fig. 2); interstices of reticulum densely covered by very minute punctations. Keels (figs. 2, 5): external marginal (fig. 5.87) moderately developed and diagonal, extending to approximate midpoint between trichobothria E1 and E2; agranular but bearing portions of reticulum which give effect of confluent granules; exterior second-

TABLE 2
Differentiating Attributes of *Diplocentrus keyserlingii* and *Diplocentrus moritzi*

Attribute	*D. moritzi* Holotype	*D. moritzi* Paratype	*D. keyserlingii* Lectotype
1. Carapace: length/anterior width	1.29	1.37	1.23
2. Median notch depth as % of carapace length	.08	.09	.06
3. Median ocular tubercle as % of carapace length	.11	.11	.13
4. Superciliary crests	absent	absent	moderate
5. Tarsomere II spine formula	$\frac{55\ 55}{55:66}$: $\frac{66\ 66}{66:66}$	$\frac{?5\ 55}{?6:66}$: $\frac{66\ 66}{66:66}$	$\frac{44\ 55}{55:55}$: $\frac{?5\ ?5}{?5:?6}$
6. Pectines:			
a. Tooth number	10/10	10/10	9/9
b. Angle of proximal middle lamella	85°	85°	100°
c. Third marginal lamella length/terminal tooth length	1.29	1.12	0.66
d. Third marginal lamella length/second marginal lamella length	1.47	1.33	1.09
7. Cauda:			
a. Segment V length vs. carapace length	shorter	shorter	longer
b. Segment V length/pedipalp tibia length	0.55	0.52	0.66
c. Segment IV length/width	1.43	1.43	1.60
d. Segment IV width/depth	1.27	1.30	1.11
e. Segment V length/width	2.07	2.15	2.56
f. Segment V length/depth	2.33	2.46	2.65
g. Segment V length/telson length	1.10	1.13	1.22
h. Segment V length/vesicle depth	1.13	1.09	1.25
i. Vesicle length/depth	1.88	1.91	2.13
j. Segment V length/segment IV length	1.18	1.18	1.33
8. Trichobothria:			
a. D1–D2/D1–D3	0.95	0.89	1.17
b. D1–D4/D1–D5	0.84	0.99	1.14
c. D1–D4/D4–M1	0.89	0.89	1.00

ary (figs. 2, 5.89) moderately developed but extends over only proximal two-thirds of manus; digital (figs. 2, 5.90) agranular, very strongly developed but extends only to base of fixed finger; manus strongly convex in this area; inner secondary (figs. 2, 5.92) well developed, agranular but does not extend to fixed finger; interior marginal (figs. 2, 5.94) well developed, densely covered with large, round granules over distal two-thirds. Fixed finger: large basal tooth somewhat more distad than that of tarsus; other denticles similar to that of tarsus. Trichobothria (figs. 2, 5): D1–D6 arranged in two scalene triangular clusters: D4 proximad to D5, D1–D4 = D4–M1; see table 1.

Patella (brachium): keels: dorso-inner very strongly developed, dorso-exterior moderately developed, exterior median and ventro-inner weakly developed, ventro-exterior vestigial; all agranular. Surfaces: dorsal has incomplete, coarse costate reticulum with interstices densely covered with minute punctations; inner well covered with small to

TABLE 3
Morphometric Observations on Males of *Diplocentrus reticulatus* (paratype), *Diplocentrus rectimanus* (holotype), and *Diplocentrus hoffmanni* (holotype)
(All measurements in millimeters.)

Code no.	Attribute	*D. reticulatus*	*D. rectimanus*	*D. hoffmanni*
1.0	Total length	45.00	48.20	51.70
2.0	Trunk length (carapace + mesosoma)	19.10	22.20	22.75
3.0	Cauda length (metasoma + telson)	25.90	27.50	28.95
PROSOMA				
4.0	Carapace length	5.70	6.40	6.85
4.1	Anterior width	2.77	3.65	3.50
4.2	Width at median eyes	4.60	4.40	5.20
4.3	Posterior width	5.80	6.55	6.90
4.5	Anterior margin to median eyes	1.75	2.30	2.35
4.11	Median eyes to posterior margin	3.95	4.00	4.50
APPENDAGES				
6.1	Pedipalp length	18.20	20.65	19.05
6.2	Tibia length	9.50	11.20	10.10
6.201	Fixed finger length	3.90	5.10	4.55
6.3	Manus length	5.60	6.30	5.90
6.4	width	4.80	5.50	5.35
6.5	depth	2.90	3.10	3.30
6.51	Exterior surface length	3.70	3.00	4.00
6.6	Tarsus length	5.75	7.15	6.30
6.7	Patella length	4.50	4.70	4.40
6.8	Patella width	1.90	2.05	2.15
6.9	Femur length	4.20	4.75	4.55
6.10	width	1.80	1.85	2.05
6.11	Leg IV length	20.25	22.03	22.80
6.12	Coxa length	4.40	4.58	5.00
6.13	Trochanter length	2.70	2.95	2.70
6.14	Femur length	4.80	5.60	6.00
6.15	width	1.40	1.40	1.60
6.16	Patella length	4.20	4.60	4.70
6.17	width	1.65	1.8	2.00
6.18	Tibia length	2.00	2.12	2.40
6.19	width	0.80	—	0.80
6.21	Tarsomere length	1.88	2.18	2.00
6.22	width	0.65	—	0.70
6.25	Chelicera length	3.15	3.95	4.25
6.26	Manus length	1.85	2.25	2.40
6.27	width	1.38	1.60	1.80
6.28	Fixed finger length	1.30	1.70	1.85
6.29	Movable finger length	1.95	2.30	2.60
OPISTHOSOMA				
7.0	Mesosoma length (sum of tergites)	13.40	14.40	14.80
7.1	Pectine teeth	9/8	10/10	10/10
7.21	Pectine length	3.75	4.10	4.10
7.22	Dentate area length	3.60	3.60	3.60
7.6	Basal piece length	1.05	1.30	1.20
7.7	width (anterior)	2.20	2.20	2.50

TABLE 3—(*Continued*)

Code no.	Attribute	*D. reticulatus*	*D. rectimanus*	*D. hoffmanni*
8.0	Cauda length (metasoma length)	25.90 (20.90)	27.50 (22.40)	28.95 (23.45)
8.1	Segment I length	3.10	3.30	3.65
8.2	width	3.60	3.90	4.10
8.3	depth	2.60	—	3.10
8.4	II length	3.50	3.85	4.00
8.5	width	3.30	3.60	3.75
8.6	depth	2.65	—	3.10
8.7	III length	4.00	4.30	4.50
8.8	width	3.60	3.45	3.65
8.9	depth	2.65	—	2.80
8.10	IV length	4.50	4.95	5.20
8.11	width	3.00	3.40	3.35
8.12	depth	2.60	—	2.70
8.13	V length	5.80	6.00	6.10
8.14	width	2.40	2.70	2.80
8.15	depth	2.30	—	2.30
8.16	Telson length	5.00	5.10	5.50
8.17	Vesicle length	4.00	4.00	4.50
8.18	width	2.40	2.60	3.30
8.19	depth	1.75	2.10	2.10
8.20	Aculeus length	1.15	1.10	1.00
INTERTRICHOBOTHRIAL DISTANCES				
9.1	D1–D6	2.05	—	2.50
9.4	D1–D2	0.60	—	0.70
9.5	D1–D3	0.50	—	0.75
9.51	D1–D4	1.68	—	1.75
9.52	D1–D5	1.50	—	1.88
9.6	D2–D3	0.43	—	0.68
9.75	D3–D4	1.25	—	1.18
9.9	D4–D5	0.68	—	0.93
9.10	D4–D6	0.58	—	1.00
9.105	D4–M1	1.65	—	1.48
9.21	E2–E4	1.75	—	1.77
9.23	E3–E4	1.47	—	1.40
9.24	E4–E5	1.37	—	1.53
9.27	I1–I4	3.30	—	2.37
9.30	I3–I4	0.80	—	0.68
9.31	Tibia tip to D1	0.70	—	1.00

large granules but with median longitudinal concentration; two or three large, cone-shaped granules on dorso-proximal margin; ventral with costate reticulum and very fine interstitial punctations; exterior weakly costate reticulate with punctations as above. Trichobothria (see fig. 6): three on inner face of dorso-interior keel, 13 on exterior surface: P6 and P10 slightly superior to line between P2 and P11; P8 touching line between P3 and P12; P9, 12, and 13 form isosceles triangle with P9–P12 = P9–P13; other triangles scalene; three trichobothria on exterior margin of ventral surface.

Femur (humerus): keels: dorso-inner moderately developed, bearing very large, irreg-

TABLE 4
Comparison of Five *Diplocentrus* Species

Code ratios[a]	*D. keyserlingii* lectotype	*D. moritzi* paratype	*D. reticulatus* paratype	*D. rectimanus* holotype	*D. hoffmanni* holotype
3.0/2.0	1.46	1.31	1.36	1.33	1.35
3.0/4.0	4.62	4.33	4.54	4.37	4.23
3.0/6.1	1.43	1.31	1.42	1.27	1.52
3.0/6.4	5.50	5.31	5.40	5.00	5.41
3.0/7.0	2.35	1.87	1.93	1.91	1.82
4.0/4.1	1.89	1.76	2.06	1.75	1.96
4.0/4.2	1.23	1.37	1.24	1.43	1.32
4.0/6.51	1.61	1.63	1.54	2.10	1.71
4.0/6.7	1.09	1.16	1.27	1.24	1.56
4.0/6.12	1.36	1.44	1.30	1.38	1.37
4.3/4.1	1.70	1.64	2.09	1.79	1.94
$\frac{4.3 - 4.1}{4.0}$	0.37	0.36	0.53	0.45	0.50
5.0/7.8	1.21	1.40	0.94	1.13	1.13
5.0/7.6	2.11	2.24	1.43	1.31	1.50
6.2/6.3	1.70	1.88	2.44	1.88	1.70
6.2/6.4	1.90	2.13	1.98	2.16	1.88
6.2/6.9	2.22	2.43	2.26	2.52	2.21
6.2/6.14	1.68	2.05	1.96	2.12	1.68
6.4/6.5	1.50	1.77	1.66	1.77	1.62
6.51/6.5	1.11	1.33	1.28	1.25	1.21
6.7/6.8	2.71	2.67	2.37	2.29	2.05
6.7/6.9	1.28	1.20	1.07	1.09	0.97
6.7/6.16	1.26	1.20	1.07	1.11	0.94
6.14/6.15	3.65	3.37	3.43	4.00	3.75
6.26/6.28	1.28	1.47	1.26	1.41	1.30
7.21/7.9	1.44	1.47	1.39	1.88	1.41
7.22/7.23	3.87	—	2.77	—	3.00
7.5/7.3	0.66	1.12	0.76	—	0.92
7.6/7.7	0.33	0.35	0.48	0.59	0.48
7.9/7.8	2.12	2.23	1.69	1.87	1.81
8.7/8.8	1.31	1.19	1.11	1.24	1.23
8.13/8.14	2.56	2.15	2.42	2.26	2.18
9.4/9.6	1.28	1.13	1.40	—	1.04
9.75/9.9	1.63	1.56	1.84	—	1.27
9.23/9.24	1.84	1.37	1.07	—	1.34

[a] See table 3 for meaning of code numbers.

ularly arranged granules which do not extend to proximal margin; dorso-exterior moderately developed with small to very large granules on proximal two-thirds; exterior median obsolete; ventral inner weakly developed, bearing a row of large, blunt granules; small granules extend along proximal margin; ventral exterior weakly developed, bearing widely separated small granules. Surfaces: dorsal moderately convex, densely covered with fine to large granules; inner well covered with small to large granules with median, longitudinal concentration; ventral well covered with small granules and surface rounded along longitudinal axis; exterior irregularly covered with fine to small granules. Trichobothria: three; one on inner, dorsal proximal margin; another on dorso-

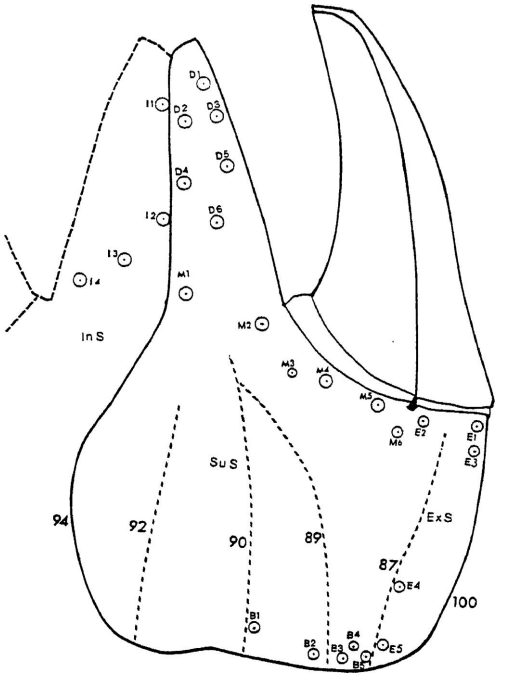


FIG. 5. Stereogram showing three dimensional aspect of trichobothrial systems on pedipalp chela of *Diplocentrus keyserlingii* (see figs. 1, 2); InS = inner surface; SuS = superior surface; ExS = exterior surface; Keels: 87 = external marginal; 89 = exterior secondary; 90 = digital; 92 = inner secondary; 94 = interior marginal; 100 = inferior exterior marginal.

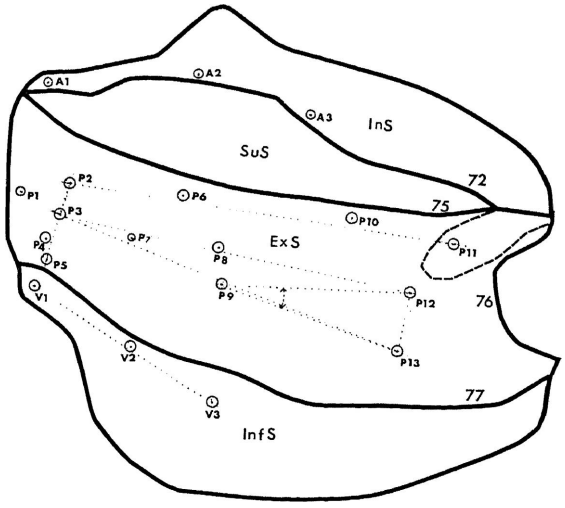


FIG. 6. Stereogram showing three dimensional aspect of trichobothrial systems on pedipalp patella of *Diplocentrus keyserlingii*; InS = inner surface; SuS = superior surface; ExS = exterior surface; InfS = inferior surface; Keels: 72 = dorso-lateral; 75 = dorso-exterior; 76 = exterior median; 77 = ventro-exterior.

exterior margin near proximal end; third on exterior dorsal margin about one-half length of femur.

Legs lightly hirsute; laterad densely, finely granular with file of larger granules on inferior edge of femora. Moderately long tarsomere median lobe bearing terminal macrochaete. Only exterior pedal spurs present. Tarsomere II spine formulae: (see table 2).

Mesosoma (preabdomen): tergites very sparsely hirsute, very densely covered with fine granules, somewhat coarser along posterior margin on VII; only slight vestiges of median keels on all segments; no distinct lateral keels on VII. Sternites very sparsely hirsute; III–VI agranular, VII densely covered with fine granules; VII with four well-developed lateral keels extending almost length of segment. Stigma elongate, somewhat slitlike. Sternum pentagonal, sides subparallel, not converging anteriorly; no distinct triangular basal pit but broad furrow that fans out anteriorly into elongate diamond-shaped depression. Genital operculum: anterior margin protrudes considerably more than posterior margin; divided, with small genital papillae. Pectines lightly hirsute; no distinctly formed small middle lamellae; second marginal lamella extends to fulcra (fig. 1). Angle of most proximal median lamella about 100 degrees. Ratio of third marginal lamella length to terminal tooth length 0.66. Ratio of third marginal lamella length to second marginal lamella length 1.09. Fulcra small, subtriangular. Basal piece very short; ratio of length to width 0.33; without deep, anterior, median notch. Teeth 9/9, very large with length about five times width. About 80 percent of inferior surface (not only edge) covered with sensilla.

Cauda (metasoma plus telson): all inter-

carinal spaces covered densely with fine- to medium-sized granules and weak indications of reticulation; lightly hirsute in crescent region, otherwise sparsely so; dorsal furrow moderately developed on segments I–IV, weakly on V; segment I wider than long, all other segments longer than wide. Keels: dorsals moderately developed but densely granular with small- to moderate-sized granules on segments I–IV; superior laterals well developed, bearing moderately large granules on all segments except V, which is weak and covered densely but irregularly with granules; median laterals moderately developed on I, weakly on II–IV, vestigial on V (all bearing broad, low granules); inferior laterals well developed, bearing large granules on I and converging moderately posteriad, II like I but less convergence, III not as well developed, less convergence throughout and granules more confluent, IV approximately like III but subparallel and weaker, V strongly developed, diverging posteriad to form lateral boundaries of crescent and bearing large, subserrate granules; inferior medians subparallel, moderately well developed on segments I–IV, bearing relatively large confluent granules that are increasingly smaller distad; single median keel of V strongly developed, bearing large serrate granules that extend to crescent. Crescentic area: no transverse keel; area delimited proximally by irregular transverse row of cone-shaped granules and distad by anterior crest by anal arch which is well developed; anterior crest bears row of about 14 broad, flat, chisel-shaped granules arranged in continuous row which does not join inferior lateral keels; posterior crest well covered with sharp, cone-shaped granules. Telson lightly hirsute with large, blunt, hirsute subaculear protuberance; vesicle agranular except for scattered granules on ventral surface and three clusters of very large, pointed, conical granules along ventroproximal margin; aculeus short, sharply curved.

MATERIAL EXAMINED: One male (specimen no. 11) taken with the lectotype (ZMB).

Diplocentrus moritzi, new species

Figures 3, 4

TYPES: Male holotype (specimen no. 12) and male paratype (specimen no. 13) from Oaxaca, Mexico (A. Kesserling), deposited in ZMB (reg. no. 3248).

ETYMOLOGY: The specific name is a patronym in honor of Dr. D. M. Moritz, curator of the arachnid collection of the Zoologisches Museum, Humboldt Universität zu Berlin.

DIAGNOSIS: This species is known only from two males (formerly considered as syntypes of *D. keyserlingii*), 46.7 and 47.7 mm. in total length (table 1). The descriptions of *D. moritzi* and *D. keyserlingii* are essentially the same, except for the differentiating attributes listed in table 2. Special attention is directed to the following: the angle of the proximal middle lamella; that the carapace is shorter than caudal segment V; the higher tarsomere II spine count; the consistent differences in caudal segment ratios; and the lower ratios in selected intertrichobothrial distances.

Diplocentrus moritzi also differs from *D. rectimanus* (male holotype 48.2 mm. total length) and *D. hoffmanni* (male holotype 51.7 mm. total length) as follows: anterior posterior carapace taper of 0.36 versus 0.45 and 0.50, respectively; leg IV femur length:width 3.37 versus 4.00 and 3.75; basal piece length:width, 0.35 versus 0.59 and 0.48; pedipalp chela length:leg IV femur length, 2.05 versus 2.12 and 1.68; pedipalp patella length:leg IV patella length, 1.20 versus 1.11 and 0.94; basal piece length:genital plate length, 0.63 versus 0.87 and 0.75.

LITERATURE CITED

Banks, Nathan
1910. The scorpions of California. Pomona Jour. Ent., vol. 2, pp. 185–188.

Bishop, A. S., and M. G. Ferriz
1964. Estudio morfologico, histologico é histoquimico de la glandula venenosa de

algunas especies de los generos *Vejovis* C. L. Koch, *Diplocentrus* Peters y *Centruroides* Marx. An. Inst. Biol. Mexico, vol. 35, pp. 139–155.

Ewing, H. E.
1928. The scorpions of the western part of the United States, with notes on those occurring in northern Mexico. Proc. U.S. Natl. Mus., no. 2730, vol. 73, no. 9, pp. 1–24.

Francke, Oscar F.
1977. Scorpions of the genus *Diplocentrus* from Oaxaca, Mexico. Jour. Arachnol., vol. 4, pp. 145–200.

Gertsch, Willis J.
1939. Report on a collection of Arachnida from the Chisos Mountains. Contr. Baylor Univ. Mus., vol. 24, pp. 17–26.

Herrera, M.
1921. Los escorpiones de Mexico. Mem. Soc. Scient. Antonio Alzate, vol. 39, pp. 137–159.

Hoffmann, C. C.
1931. Los scorpiones de Mexico. Prim. Parte, Diplocentridae, Chactidae, Vejovidae. An. Instituto Biol. Mexico, vol. 2, pp. 290–409.

Karsch, F.
1880. Zwei neue Skorpione des Berliner Museums. S. B. Ges. Natur. Fr. Berlin, pp. 57–58.

Kraepelin, K.
1899. Scorpiones und Pedipalpi. *In* Schulze, Franz E. (ed.), Das Tierreich. Berlin, vol. 8 (Lieferung), 265 pp.

Pocock, Reginald I.
1902. Arachnida: Scorpiones, Pedipalpi, and Solifugae. *In* Godman, F. D., and O. Salvin, Biologia Centrali-Americana. London, pp. 1–71.

Stahnke, Herbert L.
1970. Scorpion nomenclature and mensuration. Ent. News, vol. 81, pp. 297–316.

Werner, F.
1934. "Scorpiones." *In* Bronns, H. G. (ed.), Klassen und Ordnungen des Tierreichs. Berlin, vol. 5, pt. 4, bk. 8, p. 275.

On *Liphistius desultor* Schiödte (Araneae, Liphistiidae)

JOHN A. MURPHY[1] AND NORMAN I. PLATNICK[2]

ABSTRACT

The male of the type species of *Liphistius* is described for the first time and data on the natural history of the species are provided. Comparative genitalic illustrations for all three described Malaysian *Liphistius* are supplied. Scanning electron micrographs are included of the peculiar clavate trichobothria that are suggested to be synapomorphic for the genus.

INTRODUCTION

During a brief visit to Penang Island, Malaysia, in August 1979, the first author collected a juvenile specimen of the spider genus *Liphistius* from a retreat in a bank on the west side of Penang Hill. The specimen was taken alive to England, successfully reared to maturity, and proved to be the previously undescribed male of *Liphistius desultor* Schiödte, the type species of the genus. We are pleased to be able to contribute a study of the male, and other Malaysian *Liphistius*, to this volume, for the liphistiids, because of their unique phylogenetic significance as the apparent sister group of all other spiders (Platnick and Gertsch, 1976), are among the very few Old World spider groups in which Dr. Willis J. Gertsch has maintained a continuing interest over many years (see, for example, Gertsch, 1949, 1967, 1979).

We are indebted to several colleagues for assistance of various sorts: to Mr. Eric Classey for facilitating fieldwork and donating specimens, to Mrs. Frances Murphy for allowing us to use her splendid photographs, to Mr. Phillip Nussle for rearing the specimen and communicating his observations on it, to Dr. Mohammad Shadab for providing the genitalic illustrations, to Mr. Robert Koestler for assistance with the scanning electron microscope, to Mr. Walter Sedgwick for generous gifts and loans of specimens, and to Dr. JoAnn Tenorio of the B. P. Bishop Museum, and Mr. Fred Wanless of the British Museum (Natural History) for lending material. All measurements provided below are in millimeters.

NATURAL HISTORY

The juvenile male of *L. desultor* was captured in August 1979, transported to England, and reared to maturity by Mr. Phillip Nussle, who has had much experience in raising theraphosid spiders. The specimen emerged as a mature male on October 26, 1979; it subsequently ate only one meal (a maggot) and made no attempt to burrow. It constructed its only visible web on the afternoon of November 24, a sperm web (very similar to those of male theraphosids) spun between two small lumps of soil approximately 7–8 mm. apart and initially having the shape of a flattened disc. Although Mr. Nussle was not able to observe the actual sperm induction, he did note that the web was soon torn in two places, leaving a central strip with concave front and back edges separated by holes from front and back strips. The

[1] 323 Hanworth Road, Hampton, Middlesex, England TW12 3EJ.

[2] Associate Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York.

holes enabled the spider to climb beneath the central strip, where it deposited a sperm droplet underneath the front edge of the central strip. The web was removed within two or three days, presumably by ingestion. The spider eventually died on December 24.

Some two years earlier, in mid-1977, Mr. Eric Classey brought to England (also from Penang) two specimens of *L. desultor,* a mature female and a juvenile. They survived in captivity for about a year before succumbing, probably from low temperatures during a period of unseasonably cold weather. In life, the spiders are dark brown with strikingly contrasting orange femora; the females have plump, almost spherical abdomens with spaces of soft cuticle between the abdominal tergites (figs. 1, 2). The male was paler, and had overlapping abdominal tergites (doubtless due to being less well fed).

The female was given a cardboard tube buried in earth, occupied it, and constructed a trapdoor much like those capping the burrows in nature (figs. 3, 4), with a hinge at the top and seven "fishing lines" radiating from the bottom rim. The juvenile specimen, although provided with a similar cardboard tube, constructed no trapdoor. Both specimens, however, freely accepted flies, maggots, and woodlice as prey. The female spent the daylight hours at the far end of her tube, but was sometimes found at night just behind the trapdoor; when prey walked over the "fishing lines," she reached out from under the door and grabbed it. If forced from her tube, she would wander until encountering the trapdoor, then lift it like a curtain, and re-enter. Neither specimen molted during the year.

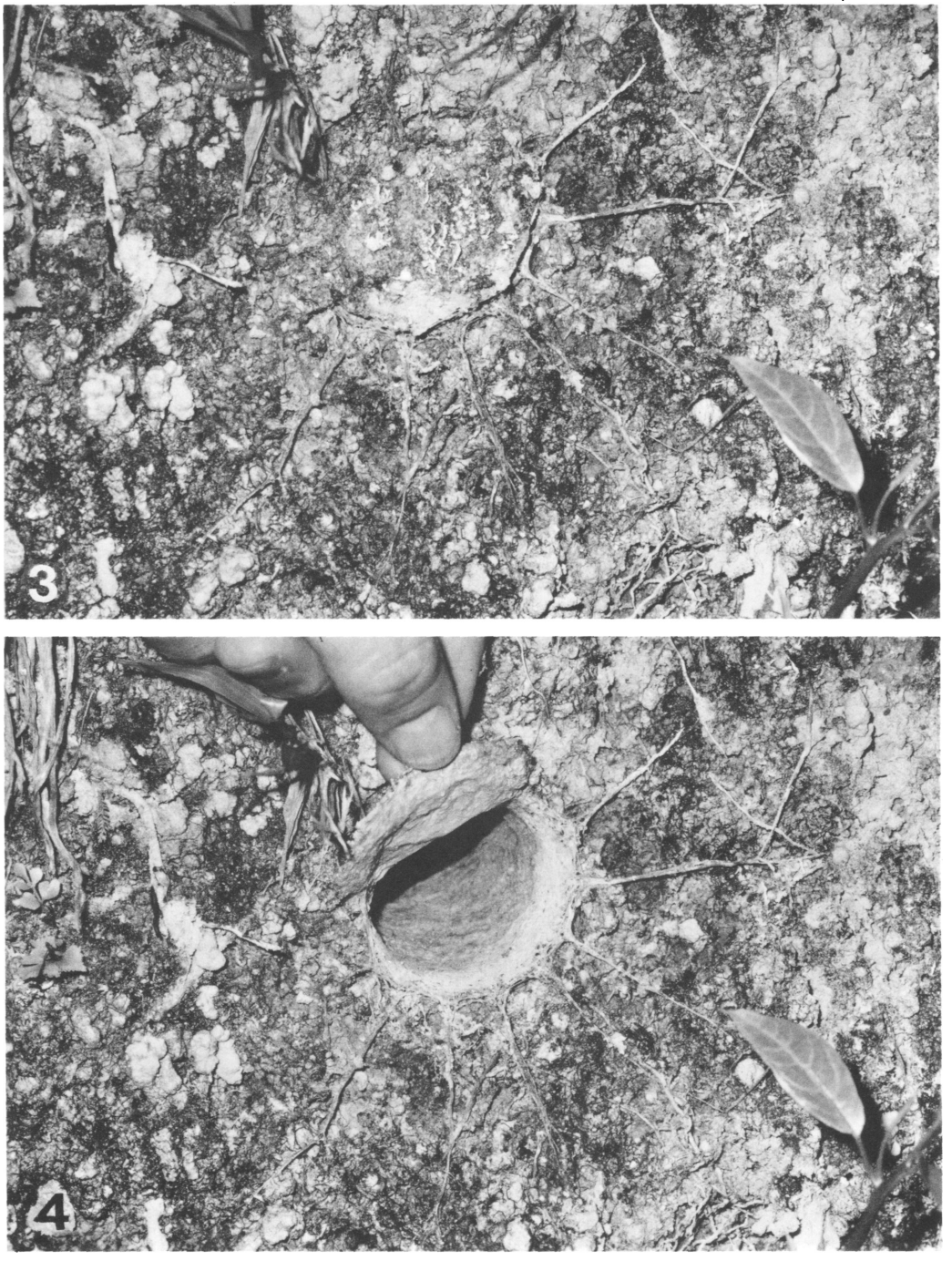
MORPHOLOGY AND RELATIONSHIPS

Males of the genus *Liphistius* are extremely rare in collections, probably because they live for relatively short periods of time after maturation. Of the seven species currently regarded as valid (Bristowe, 1976), only three are represented by males: *L. malayanus* Abraham and *L. batuensis* Abraham, both from Malaysia, and *L. tonkinensis* Bristowe from Vietnam. As is not surprising for such sedentary spiders, the male of *L. desultor* described below has palpal features indicating much closer relationship to the two other Malaysian species than to *L. tonkinensis.* Although the palpi of the known males were figured by Abraham (1923, 1929) and Bristowe (1932), and the internal female genitalia (vulva) of *L. malayanus* was figured by Schiapelli and de Pikelin (1962), only one modern study of the genitalic morphology of any *Liphistius* species has been published (Kraus, 1978). Kraus presented scanning electron micrographs of the terminal elements of the palpi and the receptacula of the vulva, as well as illustrations and photographs of slide preparations of the vulva of specimens identified as *L. batuensis,* a species originally described (and known only) from the Batu Caves.

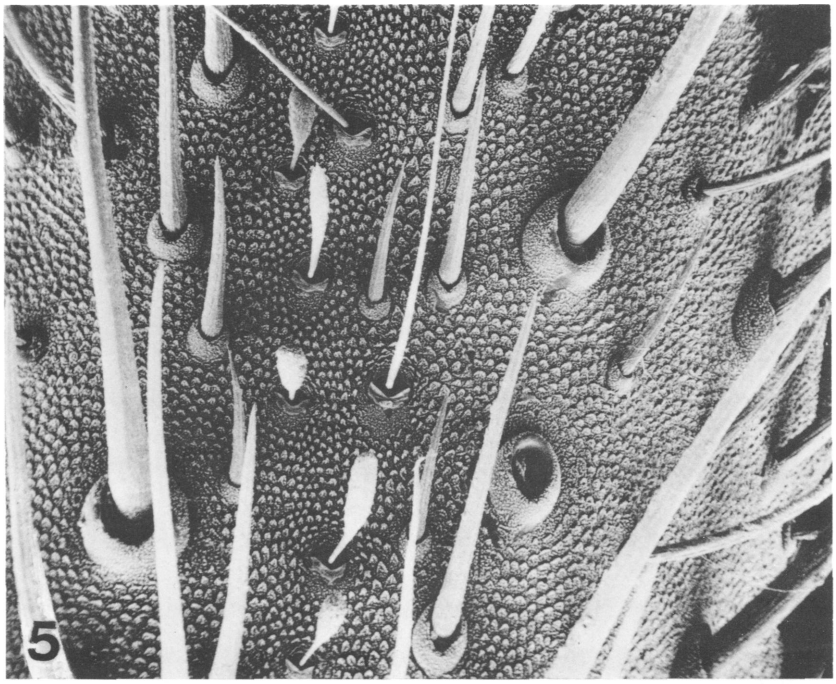
A comparison with the male holotype and other topotypical specimens of *L. batuensis* indicates that Kraus's specimens do not belong to that species; both sexes match instead topotypical specimens of *L. desultor.* To allow reliable identifications, we include below comparable illustrations of the palpus and vulva of all three described Malaysian *Liphistius* species. As these illustrations indicate, *L. batuensis* and *L. malayanus* are very similar species that are each easily distinguishable from *L. desultor* in both sexes.

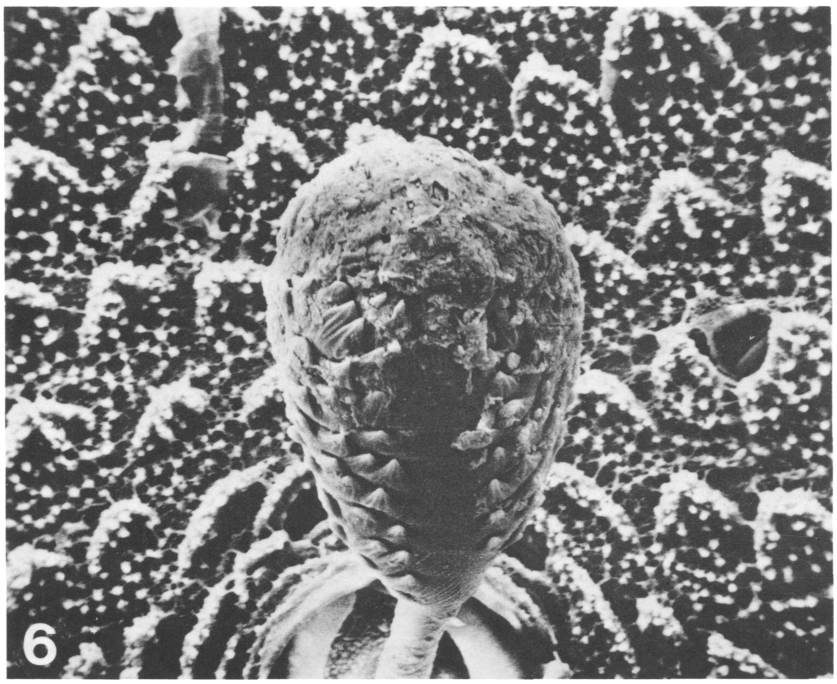
The vulva of *Liphistius* is extremely heavily sclerotized, and carries ventrally a projection bearing numerous small receptacula (figs. 22–27). This type of structure is very different from that found in the sister genus *Heptathela,* where the receptacula are concentrated on multiple lobe-shaped spermathecae (Gertsch, 1967, fig. 3; Haupt, 1979, fig. 12). It is probable that each type of vulva is synapomorphic for one of the two genera, but there are in addition other apparent synapomorphies for each genus. In *Heptathela,* as the name indicates, the two posterior median spinnerets have fused, producing a total complement of seven spinnerets. In all the specimens of *Liphistius* (but none of those of *Heptathela*) we have been able to examine, the tarsi and metatarsi of the legs and the tarsi of the palpi bear peculiar clavate trichobothria (figs. 5, 6) in addition to nor-

FIGS. 1, 2. *Liphistius desultor* Schiödte, adult female from Penang Island, Malaysia. 1. Lateral view. 2. Anterior view. Photographs by F. M. Murphy.



FIGS. 3, 4. Entrance to tubes of *Liphistius desultor* Schiödte on Penang Island, Malaysia. 3. Closed. 4. Open. Photographs by F. M. Murphy.





FIGS. 5, 6. *Liphistius desultor* Schiödte, female, tarsus I, dorsal view, showing normal and clavate trichobothria. 5. 140×. 6. 1400×.

mal, elongate ones. These modified trichobothria were illustrated by Abraham (1929, fig. 16) from the male palpal tarsus and described as having "inflated apical portions . . . [that] appear to be marked with spiral striae." Lehtinen (1980) has reported clavate trichobothria in the Theraphosidae and Dipluridae, and we have observed them in some Ctenizidae as well (despite Lehtinen's claim that they do not occur there), but none of the mygalomorph clavate trichobothria yet observed with scanning electron microscopy have the circularly arranged rows of tiny spikes typical of the liphistiid forms (fig. 6).

Liphistius desultor Schiödte

Figures 1–7, 10, 13, 16, 19, 22, 23

Lipistius desultor Schiödte, 1849, p. 621, figs. 1–7 (female holotype from Penang Island, Malaysia, depository unknown).

Liphistius mammillanus O. P.-Cambridge, 1875, p. 249, figs. 1–3 (female holotype from Penang Island, Malaysia, in British Museum, not examined). First synonymized by Hasselt, 1880, p. 186.

Liphistius desultor: Hasselt, 1880, p. 186.

Liphistius batuensis (misidentification): Kraus, 1978, p. 237, figs. 2–9.

NOTE: The International Commission on Zoological Nomenclature has been requested to validate the almost universally adopted emendation of the generic name to *Liphistius* (Levi, 1968).

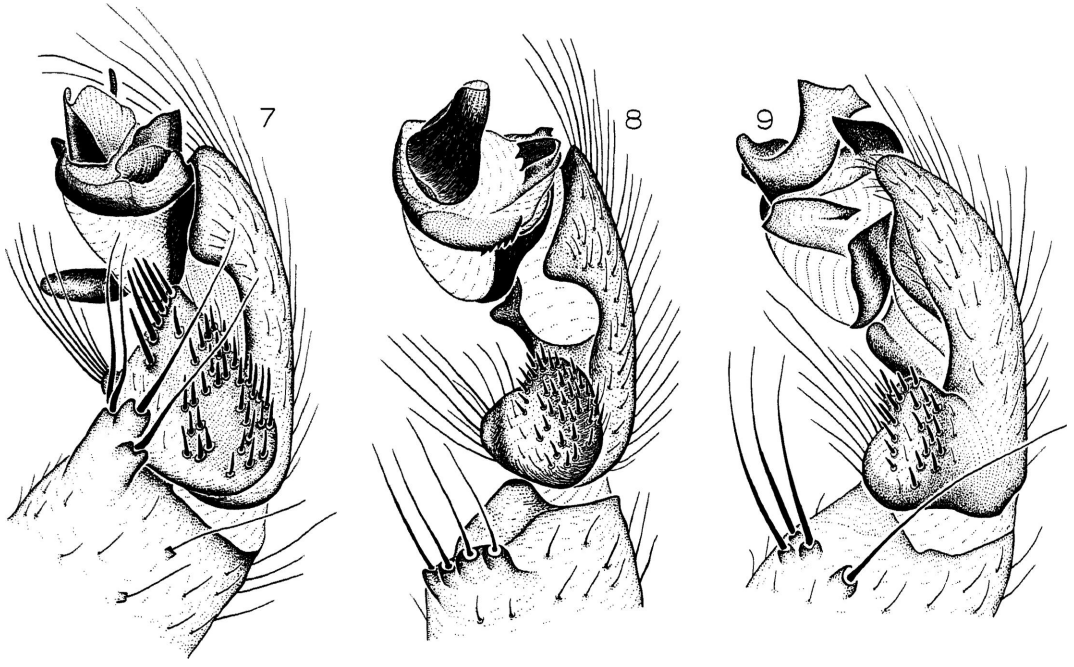
DIAGNOSIS: Specimens of *L. desultor* can be easily recognized by having bicolored legs with the femora concolorous with the carapace and the distal leg segments much darker; of the other known species, only *L. sumatranus* has bicolored legs, and in that species the carapace is concolorous with the distal leg segments, not the femora (color photographs of both species were published by Bristowe, 1975). Both sexes of *L. desultor* can be easily distinguished from the other Malaysian species (*L. malayanus* and *L. batuensis*) by numerous genitalic differences (compare figs. 7–27).

MALE: Total length 11.1. Carapace 6.2 long, 5.3 wide, light brown, with lateral triangular dark patches radiating from thoracic groove (with bases along carapace edge) and well-defined, thin, dark brown rim slightly widened in ocular area; cephalic grooves pronounced, deep, broad; thoracic groove conical, deep; few minute bristles emerge from small pits along side of cephalic grooves and edges of two light-colored areas just behind eyes; single line of closely spaced pits along rim; lowest posteriorly, height gradually increasing to maximum (about 1.7) just behind small, almost hemispherical eye tubercle occupying about one-seventh of carapace length at front edge of carapace; clypeus narrow, about one-tenth of ALE vertical diameter, with few symmetrically placed bristles directed forward.

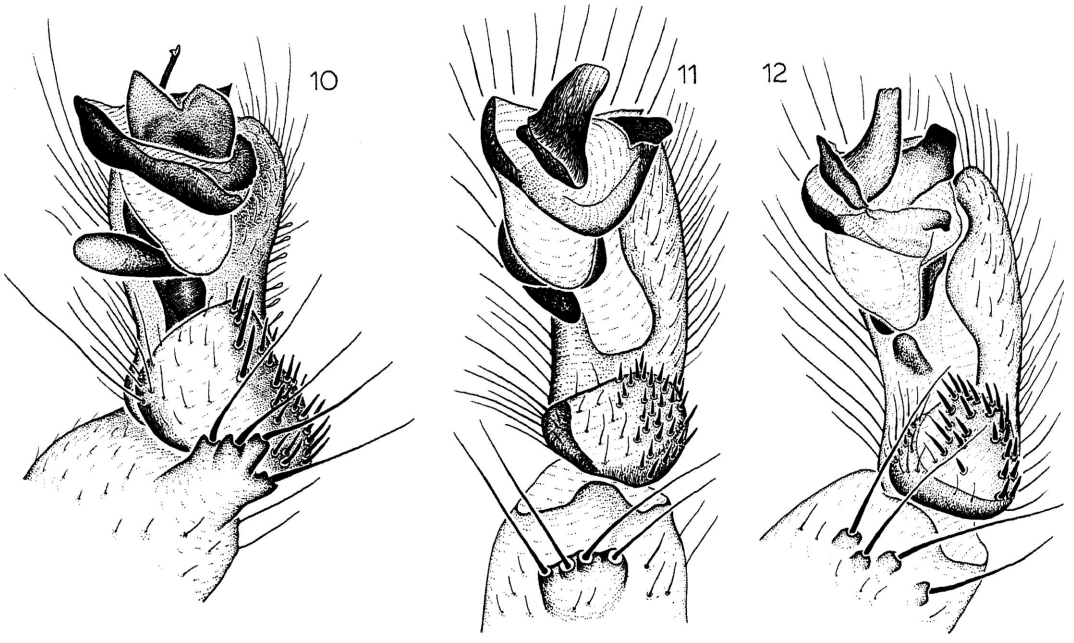
Ocular tubercle black, transverse diameter 1.0, longitudinal diameter 0.8, with few bristles mostly near midline, including long, prostrate spine between PME and short, upright spine behind AME. Transverse diameters of AME, ALE, PME, PLE, 0.07, 0.58, 0.29, 0.45; longitudinal diameters, 0.07, 0.40, 0.36, 0.25; interdistances: AME–AME 0.07, AME–ALE 0.07, PME–PME 0.03; PME–PLE 0.05, ALE–PLE 0.05.

Chelicerae parallel, directed slightly forward, pale brown, lighter proximally, front smooth, bounded laterally by longitudinal row of bristles, medially by ridge bearing bristles; remainder of surface with numerous bristles in irregular longitudinal rows. Inner edge of fang groove with 10 small teeth, of which second, fourth, and seventh most distal are largest; outer edge with row of dense, long, reddish hairs. Fang uniformly cylindrical except for rather rounded tip. Sternum three times as long as wide, with long extension reaching midway between coxae IV, smooth centrally, with double row of spines along edge; characteristic ventral sternite on pedicel just behind sternal extension. Labium about one and one-third times wider than long. Palpal coxae without trace of endites.

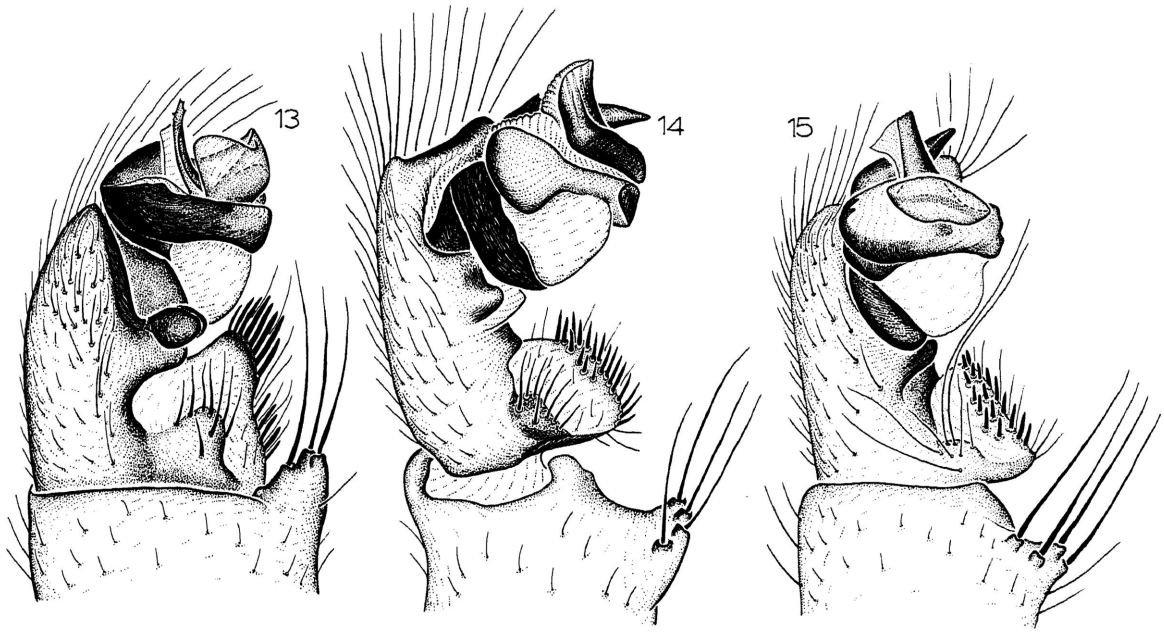
Leg formula 4321. Coxae flattened ventrally, with numerous bristles strongest on



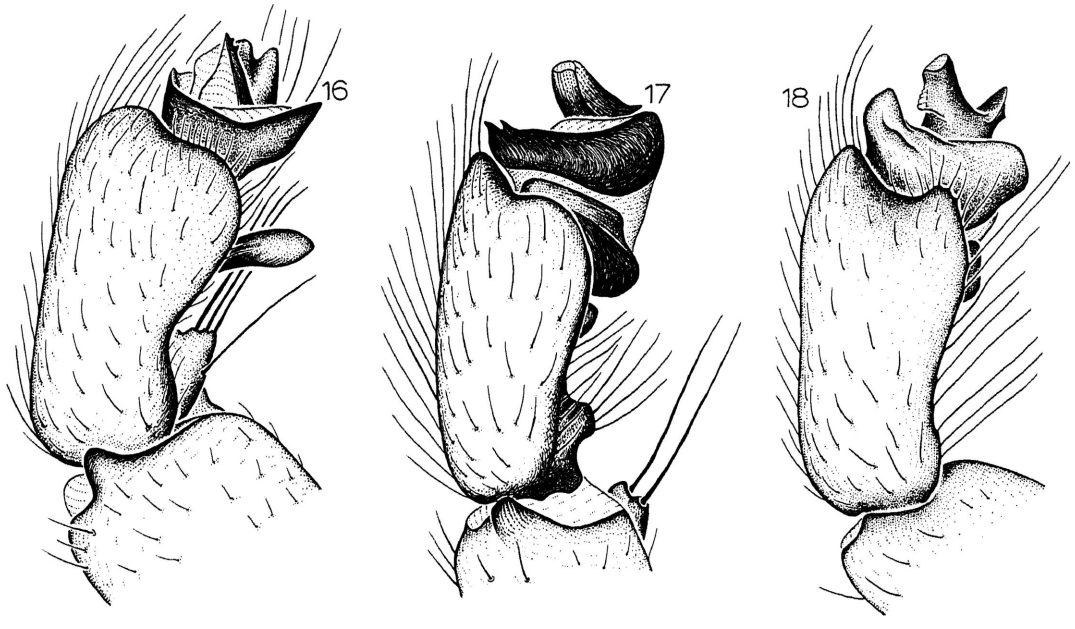
FIGS. 7–9. Left male palpus of *Liphistius* species, retrolateral views. 7. *L. desultor* Schiödte. 8. *L. malayanus* Abraham. 9. *L. batuensis* Abraham.



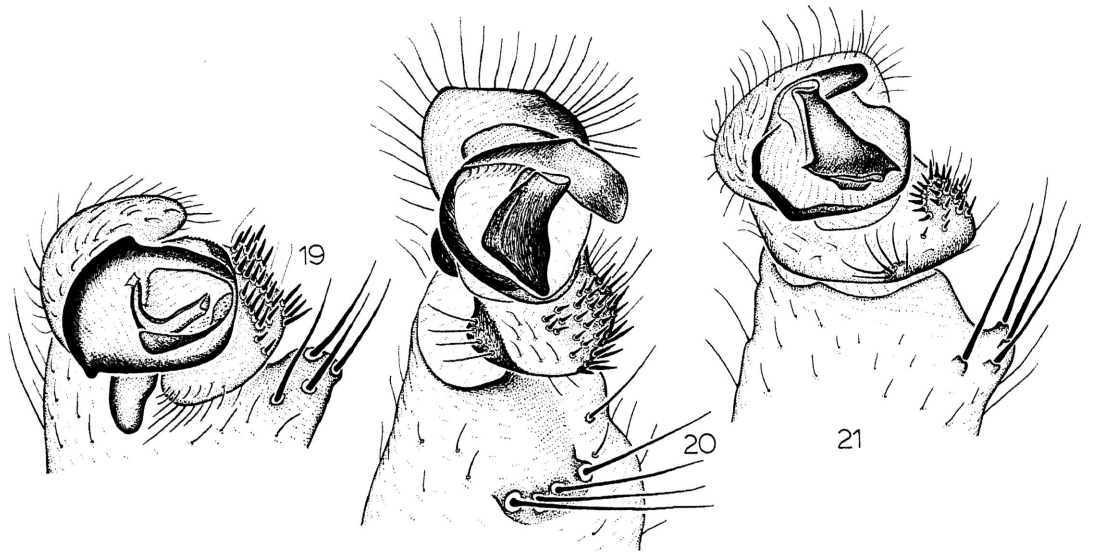
FIGS. 10–12. Left male palpus of *Liphistius* species, retroventral views. 10. *L. desultor* Schiödte. 11. *L. malayanus* Abraham. 12. *L. batuensis* Abraham.



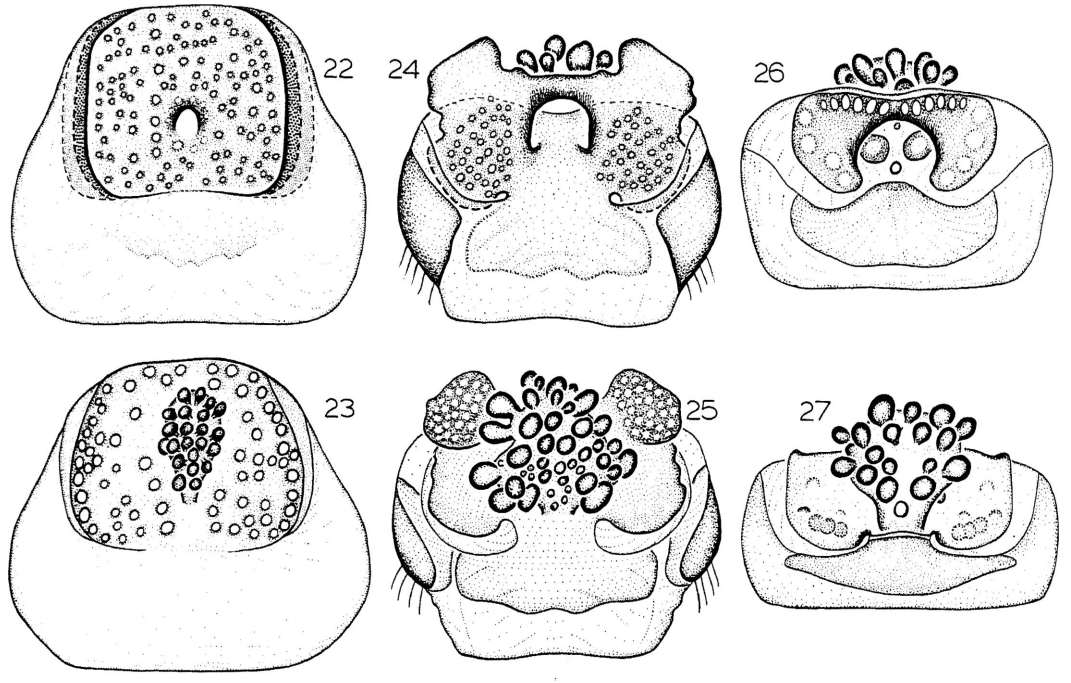
FIGS. 13–15. Left male palpus of *Liphistius* species, ventral views. 13. *L. desultor* Schiödte. 14. *L. malayanus* Abraham. 15. *L. batuensis* Abraham.



FIGS. 16–18. Left male palpus of *Liphistius* species, prolateral views. 16. *L. desultor* Schiödte. 17. *L. malayanus* Abraham. 18. *L. batuensis* Abraham.



FIGS. 19–21. Left male palpus of *Liphistius* species, distal views. 19. *L. desultor* Schiödte. 20. *L. malayanus* Abraham. 21. *L. batuensis* Abraham.



FIGS. 22–27. Vulva (dissected) of *Liphistius* species, dorsal (top row) and ventral (bottom row) views. 22, 23. *L. desultor* Schiödte. 24, 25. *L. malayanus* Abraham. 26, 27. *L. batuensis* Abraham.

inner edges, smooth dorsally, usually with short spines at distal edge; coxae IV recessed around sternite. Trochanters broad, with ventral bristles, smooth above with occasional short spine at distal edge. Legs dark brown except for lighter femora bearing two almost complete broad annulations, faint one basally, darker one apically. Spines typically in three longitudinal rows dorsally and two longitudinal rows ventrally occupying entire lengths of femora and more distal segments; spines of ventral rows occasionally appearing paired; ventral spines usually larger than dorsals; spine numbers increasing from legs IV to I; apical edges of segments frequently with additional spines, including dorsal pair on femora and ventrals on tibiae and metatarsi. Several longitudinal rows of bristles between spine rows, bristles smallest on femora, increasing in size toward tarsi. Dorsal surface of tarsi with row of five–eight normal trichobothria distributed over apical two-thirds of segment between retrolateral and median spine rows; central one-third of segment with row of four–six clavate trichobothria (figs. 5, 6), some slender, others almost spherical, no more than one-fourth the length of normal trichobothria. Paired tarsal claws with three teeth on legs I and II, four on legs III and IV; inferior claws bare. Measurements:

	I	II	III	IV	Palp
Femur	5.0	5.0	4.8	6.2	3.2
Patella	2.5	2.5	2.5	2.7	1.8
Tibia	3.6	4.0	3.9	5.2	3.1
Metatarsus	4.3	4.8	6.0	7.7	—
Tarsus	1.9	2.1	2.5	3.2	2.2
Total	17.3	18.4	19.7	25.0	10.3

Abdomen entirely covered dorsally by nine overlapping tergites (because abdomen is not distended, ninth tergite is almost invisible) bearing dark patches toward base and sides; short, black spines emerge from dark patches at distal edges; usually two long, symmetrically placed spines on plates, anterior two plates with additional smaller spines. Sides with numerous procumbent short bristles lying longitudinally. Venter with anterior half occupied by two bristly lung plates. Spinnerets and anal tubercle typical for genus.

Palpi with spine arrangements as in legs. Femora with two ventral rows discernible with spines of retrolateral row stronger. Tibiae swollen, with ventral spine rows moved closer to dorsolateral rows; ventral retrolateral row terminates apically in four long, strong spines on marked apophysis; ventral prolateral row with additional spines apically; small, bare tibial apophysis near distal edge. As on legs, spines and bristles difficult to distinguish on tarsi, which bear dorsal row of clavate trichobothria, large, elongate, spine-covered basal apophysis with spines arranged in three main linear groups (most ventral group with nine in double row), and smaller apophysis bearing long spines behind large apophysis, the two separated by white membrane. Bulb as in figures 7, 10, 13, 16, 19.

FEMALE: Described by Schiödte (1849); comparative data in Bristowe (1932).

DISTRIBUTION: Known only from Penang Island and adjacent mainland areas of northern Malaysia (Bristowe, 1932, pl. II).

LITERATURE CITED

Abraham, H. C.

1923. A new spider of the genus *Liphistius* from the Malay Peninsula and some observations on its habits. Proc. Zool. Soc. London, pp. 769–774, 1 fig., 1 pl.

1929. The male of the spider *Liphistius malayanus* H. C. Abr., with further notes on the female and on its habits. *Ibid.*, pp. 671–677, pls. 1–3.

Bristowe, William S.

1932. The liphistiid spiders. With an appendix on their internal anatomy by J. Millot. Proc. Zool. Soc. London, pp. 1016–1057, figs. 1–11, pls. 1–6.

1975. A family of living fossil spiders. Endeavour, vol. 34, pp. 115–117, figs. 1–5.

1976. A contribution to the knowledge of liphistiid spiders. Jour. Zool., London, vol. 178, pp. 1–6, figs. 1–4.

Cambridge, Octavius Pickard-

1875. On a new species of *Liphistius*

(Schiödte). Ann. Mag. Nat. Hist., vol. 15, pp. 249–251, figs. 1–3.

Gertsch, Willis J.
1949. American spiders. Princeton, Van Nostrand, 285 pp., 32 pls., 6 figs.
1967. A new liphistiid spider from China (Araneae: Liphistiidae). Jour. New York Ent. Soc., vol. 75, pp. 114–118, figs. 1–3.
1979. American spiders, second edition. New York, Van Nostrand Reinhold, 274 pp., 32 pls., 8 figs.

Hasselt, A. W. M. van
1880. Bijdrage tot de Kennis van den *Liphistius desultor* Schiödte. Verslag. Meded. K. Akad. Wetensch., vol. 15, pp. 186–196.

Haupt, Joachim
1979. Lebensweise und Sexualverhalten der mesothelen Spinne *Heptathela nishihirai* n. sp. (Araneae, Liphistiidae). Zool. Anz., Jena, vol. 202, pp. 348–374, figs. 1–13.

Kraus, Otto
1978. *Liphistius* and the evolution of spider genitalia. *In* Merrett, Peter (ed.), Arachnology, Symposia of the Zoological Society of London, no. 42. London, pp. 235–254, figs. 1–22.

Lehtinen, Pekka T.
1980. Trichobothrial patterns in high level taxonomy of spiders. *In* Gruber, Jürgen (ed.), 8. Internationaler Arachnologen-Kongress. Vienna, pp. 493–498, 1 fig.

Levi, Herbert W.
1968. *Liphistius* Schiødte, 1849 (Araneae): Proposed validation under the plenary powers. Bull. Zool. Nomen., vol. 24, p. 359.

Platnick, Norman I., and Willis J. Gertsch
1976. The suborders of spiders: A cladistic analysis. Amer. Mus. Novitates, no. 2607, pp. 1–15, figs. 1–18.

Schiapelli, Rita D., and Berta S. Gerschman de Pikelin
1962. Importancia de las espermatecas en la sistemática de las arañas del suborden Mygalomorphae (Araneae). Physis, vol. 23, pp. 69–75, pls. 1–4.

Schiödte, J. C.
1849. Om en afvigende Slaegt af Spindlernes Orden. Naturhist. Tidsskr., vol. 2, pp. 617–624, pl. IV.

Three new Mygalomorph Spiders (Dipluridae, Masteriinae) from Colombia

ROBERT J. RAVEN[1]

ABSTRACT

One new genus (*Striamea*) and three new species (*S. gertschi, S. magna,* and *Masteria colombiensis*) are described from Colombia. *Striamea* differs from *Masteria,* the only other genus in the subfamily, in having no apophysis or megaspines on tibia I of males and undivided spermathecae in females.

INTRODUCTION

The Masteriinae include small mygalomorphs inhabiting leaf litter in the rainforests of several biogeographic regions: South America, Indomalaysia, New Guinea, northern Australia, and Fiji (Raven, 1979). This previously monogeneric subfamily is characterized by a linear maxillary serrula and reduced or absent anterior median eyes. The new material described here comes from a collection made by Mr. J. A. Kochalka in the Sierra Nevada de Santa Marta, Colombia. All measurements are in millimeters, except eye measurements which are to a common scale; abbreviations follow Raven (1979).

ACKNOWLEDGMENTS

I am grateful to Dr. Norman I. Platnick, American Museum of Natural History, for giving me this opportunity to honor Dr. Willis Gertsch on the seventy-fifth anniversary of his birthday. Dr. V. Davies, Mr. B. M. Campbell, and Dr. N. I. Platnick kindly read the manuscript. Miss Robyn Owens graciously typed the manuscript.

STRIAMEA, NEW GENUS

TYPE SPECIES: *Striamea gertschi,* new species.

ETYMOLOGY: The generic name is an anagram of *Masteria,* and is considered feminine in gender.

DIAGNOSIS: *Striamea* is distinguished from *Masteria* by the presence of a thoracic pattern (fig. 4), the absence of apophyses or megaspines on tibia I of males, and undivided spermathecae in females (fig. 12).

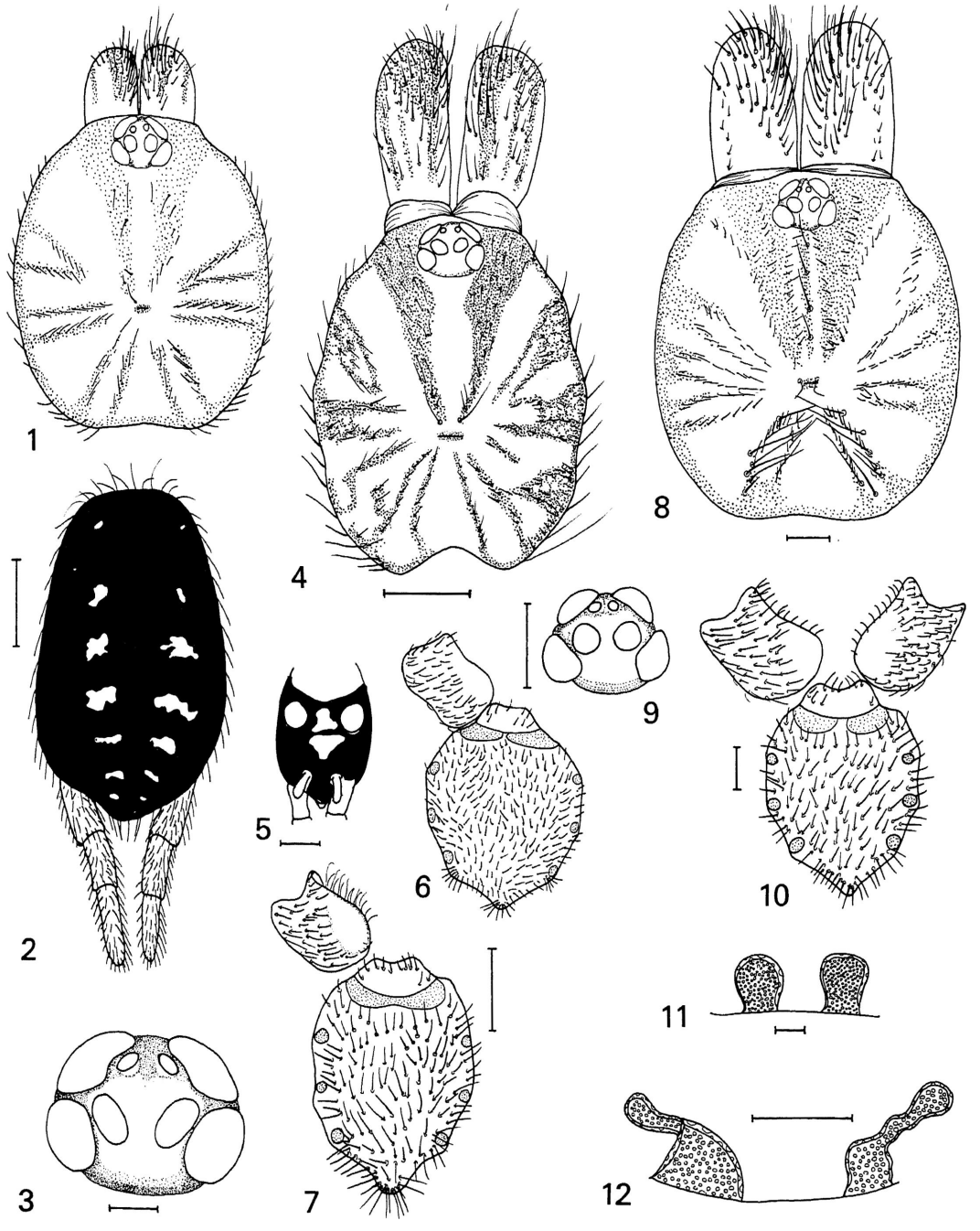
DESCRIPTION: Small mygalomorph spiders with transverse fovea. Eight eyes with small or reduced AME. Maxillae pear-shaped; serrula linear, as in *Masteria.* No cuspules on labium or maxillae. Four spinnerets, apical segment of posterior laterals digitiform. Three claws, one row of teeth on paired claws, third claw with basal apophysis bearing several teeth. Sternum with six small marginal sigilla. No spines on leg tarsi. Carapace and abdomen with brown pigmentation. Males without apophyses or megaspines on tibia I; palpal bulb without paraembolic apophysis. Spermathecae a single undivided lobe on each side.

Striamea gertschi, new species

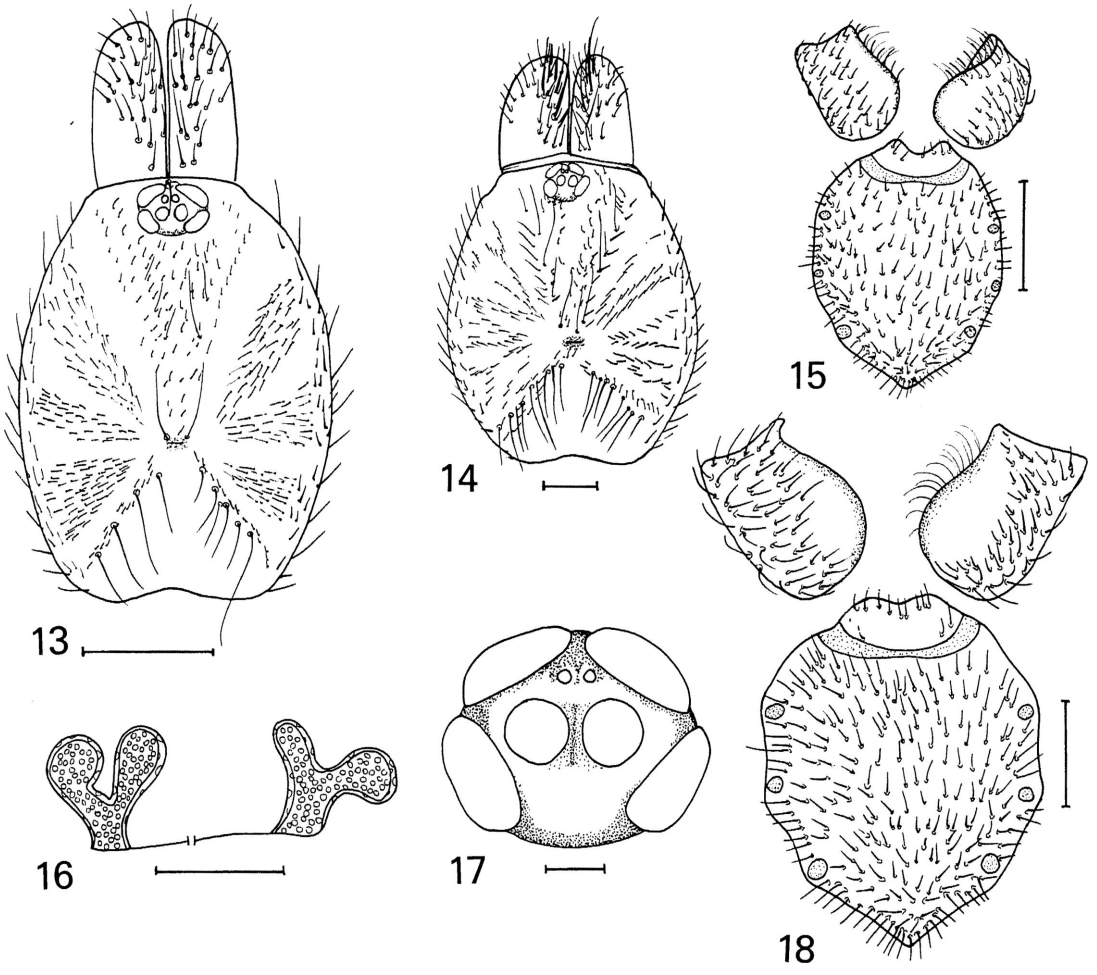
Figures 1–7, 12, 19, 21, 23

TYPES: Male holotype and female allotype sifted from leaf litter and under logs and rocks at elevations of 1250 m. (♂) and 960 m. (♀) at San Pedro, Sierra Nevada de Santa

[1] Assistant Arachnologist, Queensland Museum, Gregory Terrace, Fortitude Valley, Queensland 4006, Australia.



FIGS. 1–12. 1–7, 12. *Striamea gertschi*, new species. 8–11. *S. magna*, new species. 1. Male carapace and chelicerae, dorsal view. 2. Male abdomen, dorsal view. 3, 9. Female eyes, dorsal views. 4, 8. Female carapace and chelicerae, dorsal views. 5. Male abdomen, ventral view. 6, 7, 10. Sternum, maxillae, and labium, ventral views. 6. Male. 7, 10. Female. 11, 12. Spermathecae, dorsal views. Scale lines are 0.5 mm. except figures 3, 12 are 0.1 mm.



FIGS. 13–18. *Masteria colombiensis*, new species. 13, 15. Male. 14, 16–18. Female. 13. 14. Carapace and chelicerae, dorsal views. 15, 18. Sternum, maxillae, and labium, ventral views. 16. Spermathecae, dorsal view. 17. Eyes, dorsal view. Scale lines are 0.5 mm. except figures 16, 17 are 0.1 mm.

Marta, Magdalena, Colombia (♂, May 4, 1975; ♀, May 19, 1975; J. A. Kochalka), deposited in the American Museum of Natural History courtesy of Mr. Kochalka.

ETYMOLOGY: The specific epithet is a patronym in honor of Dr. W. J. Gertsch.

DIAGNOSIS: *Striamea gertschi* differs from *S. magna* in having an abdominal pattern and females with elongate spermathecae.

MALE: Carapace brown with darker radial markings on interstrial ridges and caput; chelicerae dark brown; legs yellow brown with brown annulations; dorsal abdomen brown with seven small paired white ovoid spots; sternum and coxae yellow brown; maxillae with broad white tear-shaped tumid area anteriorly; ventral abdomen brown with off-white booklung covers and broad white medial region; spinnerets with brown annulations.

Carapace 1.70 long, 1.44 wide, with numerous long prostrate gray bristles on edges of striae and caput. Two pairs of long straight bristles in front of narrow straight fovea.

Eight eyes raised on distinct tubercle 0.14 high. Group occupies 0.42 of head width;

group width:length, 27:22; as wide in front as behind. ALE with slightly incurved inner edges. PME oval, with divergent long axes. Ratio of AME:ALE:PME:PLE, 4:14:7:13. MOQ front width:back width:length, 7:13:10. Interspaces: AME–AME 3, AME–ALE 0, ALE–ALE 1, ALE–PLE 1, PME–PLE 0, PME–PME 4.

Chelicerae small, porrect; eight teeth on promargin. Labium 0.31 wide, 0.15 long. Maxillae 0.44 long, 0.38 wide. Sternum 1.05 long, 0.88 wide, separated from labium by two sigilla; domed so six marginal round sigilla, 0.06 long, are on subvertical face.

Palp with three apical spines on tarsus; four–five stout "spines" on retroventral apophysis on distal part of tibia, one spine on retrodistal edge. Bulb elongate, barrel-shaped; embolus with broad, strongly pigmented origin, distally flattened, forming blunt tip adjacent to depression and mound on tibia.

	I	II	III	IV	Palp
Femur	1.56	1.32	1.26	1.68	0.88
Patella	0.90	0.70	0.60	0.80	0.50
Tibia	1.40	0.90	0.94	1.50	0.90
Metatarsus	1.40	1.10	1.10	1.74	—
Tarsus	0.94	0.74	0.72	0.94	0.40
Total	6.20	4.76	4.62	6.66	2.68

Leg formula 4123. Femora with long bristles. No apophyses or megaspines on leg I. A circular depression enclosing about 14 microsetae about halfway along retrolateral metatarsus I (fig. 21). Spines (no spines on leg tarsi): leg I, femur p1, d6, patella 0, tibia p2, v1, metatarsus v3; leg 2, femur p1, d6, patella p1, tibia p2, v3, metatarsus p2, v3; leg 3, femur p1, d6, r2, patella p1, r1, tibia p3, d2, r2, v3, metatarsus p2, d1, r2, v5; leg 4, femur p2, d5, r1, patella p1, r1, tibia p3, d4, r2, v2, metatarsus p3, r3, v6; palp, femur d5, patella d1, tibia p1, d1, r1 plus four–five spines on apophysis, tarsus three apical. Paired tarsal claws with one row of about seven teeth; third claw with basal apophysis bearing five elongate teeth (fig. 23). Two rows of trichobothria, each of about seven, for full length of tibia, four in line on metatarsus, seven on tarsus. Abdomen 1.60 long, 1.04 wide. Four spinnerets: PMS 0.30 long, 0.10 wide, 0.26 apart; basal, middle, and apical segments of PLS 0.44, 0.30, 0.50 long, respectively.

FEMALE: As in male, except as noted. Carapace markings darker, slightly more extensive than in male. Carapace 1.90 long, 1.52 wide, with broadly scalloped edges; fovea narrow, slightly recurved. Eight eyes on pronounced tubercle; group occupies 0.36 of head width; group width:length, 29:22. Ratio of AME:ALE:PME:PLE, 3:10:7:12. MOQ front width:back width:length, 10:17:12. Eye interspaces: AME–AME 3, AME–ALE 4, PME–PME 3, ALE–PLE 1, PME–PLE 0. Chelicerae with 10 teeth on promargin of furrow and 10–12 spinules mesobasally. Labium 0.44 wide, 0.22 long. Maxillae 0.56 long, 0.40 wide. Sternum 1.20 long, 0.96 wide; with six round sigilla, 0.06 across, near sloping margin; group of bristles radiating from three posterior corners of sternum.

	I	II	III	IV	Palp
Femur	1.62	1.20	0.84	1.60	0.96
Patella	0.96	0.70	0.70	0.80	0.60
Tibia	1.36	0.86	0.84	1.40	0.80
Metatarsus	1.22	0.90	1.00	1.40	—
Tarsus	0.96	0.64	0.64	0.74	0.80
Total	6.12	4.30	4.02	5.94	3.16

Leg formula 1423. Spines elongate; leg 1, femur d5, patella 0, tibia p2, v3, metatarsus v4; leg 2, femur d7, patella p2, tibia p3, d1, v3, metatarsus p1, v5; leg 3, femur p1, d1, r1, patella p2, r1, tibia p3, d1, r2, v5, metatarsus p2, d2, r2, v5; leg 4, femur p1, d3, r1, patella r1, tibia p1, r3, v4, metatarsus p3, r3, v7; palp, femur d3, patella 0, tibia p1, v4, tarsus v2. Claws similar to male; palpal claw with 12 teeth. Abdomen 1.84 long, 1.36 wide. Spinnerets: PMS 0.40 long, 0.14 wide, 0.64 apart; basal, middle, and apical segments of PLS 0.64, 0.42, 0.60 long, respectively. Spermathecae two, undivided, widest basally (fig. 12).

OTHER MATERIAL EXAMINED: 1♂, from large terrestrial bromeliads, 1♀ from under logs and rocks, 10 juveniles sifted from leaf litter, all with same data as allotype; 1♂, 1♀, 1 juvenile, same data as types but at 1160 m., under rocks and logs, Apr. 3, 1975; 1♀, same data but at 1250 m., May 16, 1975; 2

juveniles, same data but from Carmelo, 1250 m., Feb. 7, 1974.

DISTRIBUTION: Known only from the Sierra Nevada de Santa Marta, Colombia.

Striamea magna, new species
Figures 8–12, 24

TYPE: Female holotype from terrestrial bromeliads at an elevation of 2621 m. on top of Sierra Cinai, Sierra Nevada de Santa Marta, Magdalena, Colombia (April 26, 1975; J. A. Kochalka), deposited in the American Museum of Natural History courtesy of Mr. Kochalka.

ETYMOLOGY: The specific epithet is from the Latin *magnus* (large), since this species includes the largest known specimens of the Masteriinae.

DIAGNOSIS: *Striamea magna* differs from *S. gertschi* in its larger size, stouter spermathecae, and lack of abdominal color pattern. The carapace length of 11 females is 2.69–5.00, mean 3.56 (standard error 0.22).

MALE: Unknown.

FEMALE: Carapace orange-brown with brown markings on striae and lateral carapace; abdomen brown, entirely without pattern. Sternum yellow brown; maxillae yellow-brown with tumid white region on anterior edge.

Carapace 3.38 long, 3.32 wide, with numerous long erect bristles on posterior interstrial ridges, finer prostrate bristles elsewhere; at least two pairs of foveal bristles; fovea narrow, transverse.

Eight eyes raised on slightly elevated tubercle; group narrowest in front, occupying 0.31 of head width; front width:back width:length, 21:28:21. Ratio of AME:ALE: PME:PLE, 2:11:7:13. MOQ front width:back width:length, 7:13:12. Eye interspaces: AME–AME 2, AME–ALE 0, ALE–ALE 2, ALE–PLE 1, PME–PME 2, PME–PLE 1.

Cheliceral furrow with eight long and 10 smaller teeth on promargin, four small teeth mesobasally. Labium 0.83 wide, 0.40 long. Maxillae 1.35 long behind, 1.13 long in front, 0.88 wide. Sternum 2.18 long, 1.75 wide, with six oval marginal sigilla 0.15 long.

	I	II	III	IV	Palp
Femur	3.40	3.00	2.72	3.52	2.20
Patella	1.88	1.60	1.48	1.72	1.20
Tibia	2.80	1.92	1.88	3.04	1.64
Metatarsus	2.52	2.00	2.16	2.96	—
Tarsus	1.62	1.32	1.20	1.40	1.52
Total	12.22	9.84	9.44	12.64	6.56

Leg formula 4123; femora covered with long curved bristles. Spines: leg 1, tibia v1, metatarsus v4; leg 2, patella p2, tibia p2, v3, metatarsus v4; leg 3, patella p1, r1, tibia p3, d2, r3, v6, metatarsus p4, d3, r3, v7; leg 4, femur p1 plus numerous long thick bristles proximally, patella r1, tibia p2, r4, v6, metatarsus p4, r4, v8; palp, tibia v2, tarsus v2. Ten to 12 teeth on paired claws; third claw with basal apophysis bearing 12 long teeth (fig. 24); palpal claw with about 15 teeth. Five to six trichobothria in line on metatarsi and tarsi, two distally converging rows of five each on tibiae.

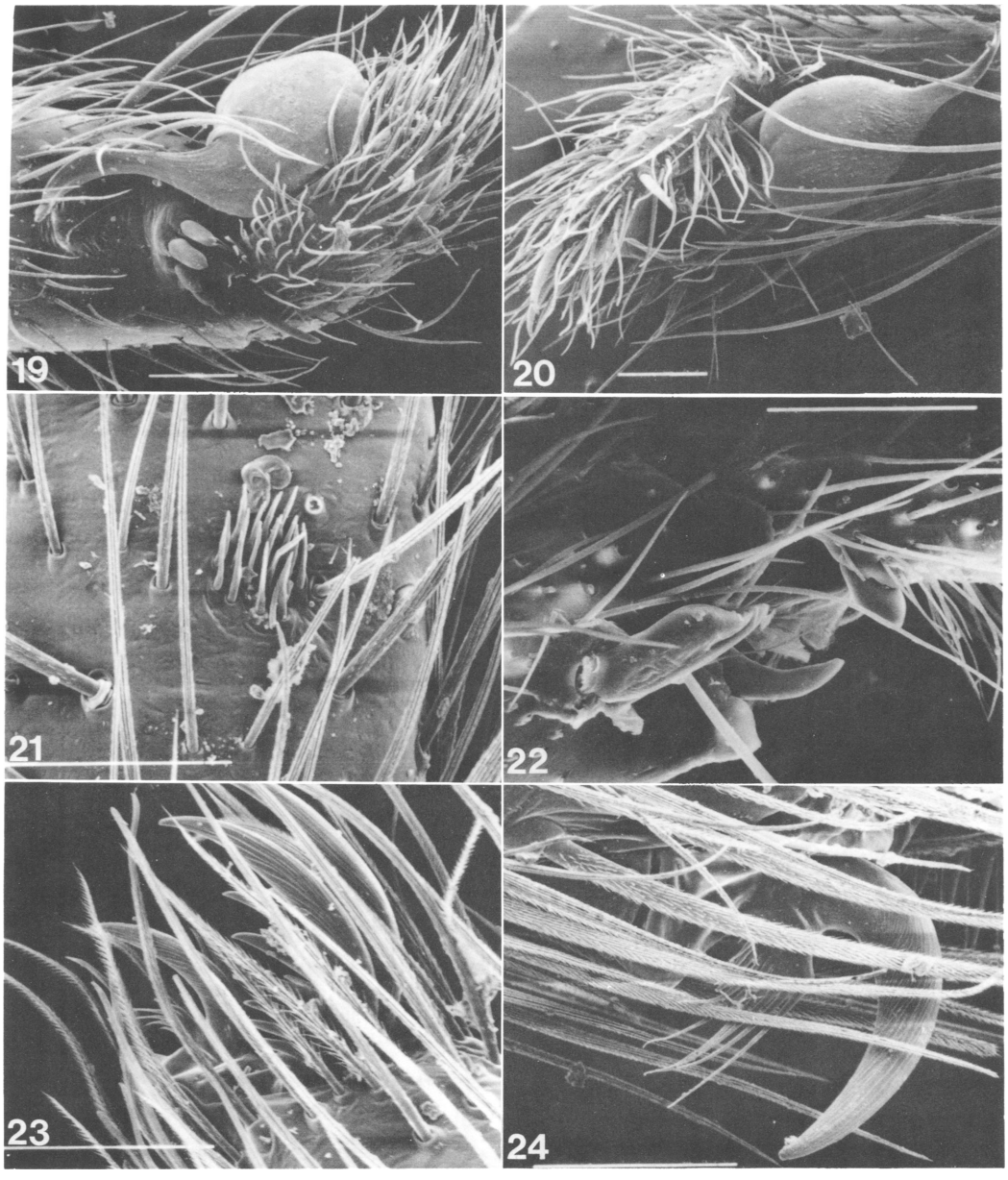
Abdomen 5.60 long, 3.88 wide. Epigastric plate tumid, not produced posteriorly. Spinnerets: PMS 0.80 long; basal, middle, and apical segments of PLS 1.32, 0.84, 1.08 long, respectively. Spermathecae two, broadly domed, undivided.

OTHER MATERIAL EXAMINED: All collected from the Sierra Nevada de Santa Marta, Magdalena, Colombia, by J. A. Kochalka: 1♀, 2 juveniles taken with type; 3♀, 1 juvenile, Cerro Kennedy, 2240 m. (Feb. 22, 1974); 3♀, 1 penultimate ♂, 2 juveniles, Sierra Nevada, Granada, old hut, 2469 m. (Apr. 26, 1975); 2♀, 4 penultimate ♂, Río Donachui, Kondia, 2820 m. (Jan. 2, 1974).

Masteria colombiensis, new species
Figures 13–18, 20, 22

TYPES: Male holotype and female allotype from an elevation of 1563 m. at San Janvier, San Pedro, Sierra Nevada de Santa Marta, Magdalena, Colombia (March 29, 1975; J. A. Kochalka), deposited in the American Museum of Natural History courtesy of Mr. Kochalka.

DIAGNOSIS: *Masteria colombiensis* differs from other species of the genus in the presence of a proximal ventral spur on male metatarsus I, and having no paraembolic



FIGS. 19–24. 19, 21, 23. *Striamea gertschi,* new species, male. 20, 22. *Masteria colombiensis,* new species, male. 24. *S. magna,* new species, female. 19, 20. Palp, retroventral views, 133×. 21. Metatarsus I, retrolateral view, 490×. 22. Tibia and metatarsus I, prolateral view showing megaspines, 220×. 23. Claws of leg I, lateral view, 395×. 24. Claws of leg I, lateral view, 520×.

apophysis on the male palpal bulb, in association with eight eyes.

MALE: Entirely pallid. Carapace 1.80 long, 1.40 wide, clothed with long (0.02) prostrate gray bristles on interstrial ridges; longer bristles in posterior striae and on lateral caput form "cages"; a long recurved bristle between AME.

Eight eyes in compact group on tubercle occupying 0.38 of head width. Eye group length:width, 23:18. AME small, close, circular. Ratio of AME:ALE:PME:PLE, 1:11:7:10. MOQ front width:back width: length, 3:11:8. Eye interspaces: AME–AME 0, AME–ALE 0, ALE–ALE 2, ALE–PLE 0, PME–PLE 1, PME–PME 1.

Chelicerae with nine widely spaced teeth on furrow promargin and 15–20 spinules mesobasally. Labium 0.34 wide, 0.14 long. Maxillae 0.48 long, 0.35 wide. Sternum 1.05 long, 0.80 wide; six sigilla barely distinguishable in margin.

Palp with four apical and one retrodistal spine on tarsus; bulb pyriform with broad sinuous embolus.

	I	II	III	IV	Palp
Femur	1.46	1.20	1.04	1.56	1.00
Patella	0.94	0.68	0.64	0.80	0.62
Tibia	1.34	0.90	0.84	1.48	0.88
Metatarsus	1.16	0.86	1.06	1.52	—
Tarsus	0.96	0.68	0.66	0.90	0.48
Total	5.86	4.32	4.24	6.26	2.98

Leg formula 4123. Tibia I with three prodistal processes: one dorsal spur, and lateral megaspine above lower spur. Metatarsus I with proximoventral spur. Spines elongate; leg 1, tibia p1 plus megaspines and two spurs, metatarsus v1; leg 2, femur d3, patella p2, tibia p2, v2, metatarsus p1, v3; leg 3, patella p1, tibia p2, d2, r3, v4, metatarsus p2, r1, v6; leg 4, femur p1, patella p1, r1, tibia p2, d2, r1, v4, metatarsus p4, r2, v7; palp, tibia v1, tarsus 5. About eight teeth on paired claws; group of five–seven teeth on basal apophysis of third claw.

Abdomen 2.08 long, 1.20 wide. Spinnerets: PMS 0.36 long, 0.10 wide, 0.24 apart; basal, middle, and apical segments of PLS 0.72, 0.62, 0.62 long, respectively.

FEMALE: As in male, except as noted. Carapace 2.76 long, 2.06 wide, with small pitlike fovea. Eight eyes occupying 0.30 of head width. Eye group width:length, 31:22, slightly wider behind than in front. MOQ front width:back width:length, 5:16:12. Ratio of AME:ALE:PME:PLE, 2:14:8:15. Cheliceral furrow with 11 widely spaced teeth on promargin; mesobasally with five–six spinules. Labium 0.52 wide, 0.28 long. Maxillae 0.76 long, 0.60 wide. Sternum 1.50 long, 1.20 wide, with six round sigilla, 0.10 across.

	I	II	III	IV	Palp
Femur	2.22	2.00	1.90	2.35	1.52
Patella	1.27	1.02	0.86	1.40	0.89
Tibia	1.94	1.37	1.33	1.94	1.37
Metatarsus	1.75	1.40	1.52	2.03	—
Tarsus	1.21	1.02	0.98	1.17	1.21
Total	8.39	6.81	6.59	8.89	4.99

Leg formula 4123. Spines: leg 1, tibia v2, metatarsus v4; leg 2, tibia p2, v4, metatarsus p2, v6; leg 3, femur p1, d3, r1, patella p2, tibia p2, d2, r2, v6, metatarsus p3, d1, r1, v7; leg 4, femur p1, r1, patella r1, tibia p2, r2, v6, metatarsus p3, d1, r3, v7; palp, tibia v3, tarsus v2. Claws similar to male; palpal claw with 15–20 teeth. Abdomen 3.30 long, 2.48 wide. Epigastric plate not posteriorly produced; spermathecae two, basally divided (fig. 16). Spinnerets: PMS 0.57 long, 0.13 wide, 0.57 apart; basal, middle, and apical segments of PLS 0.98, 0.79, 0.83 long, respectively.

OTHER MATERIAL EXAMINED: All collected from Sierra Nevada de Santa Marta, Magdalena, Colombia, by J. A. Kochalka: 1♀, taken with types; 1♂, San Pedro (Apr. 4, 1975); 1♂, Cordillera Lagila, 1539 m., pitfall trap (Apr. 15–30, 1975); Sierra Nevada, Granada: 2♀, V. Leonor, 1311 m. (Apr. 12, 1975), 1♂, 1♀, 1609 m. (Apr. 28, 1975), 2♀, 2012 m. (Apr. 7, 1975).

DISTRIBUTION: *Masteria colombiensis* is known only from the Sierra Nevada de Santa Marta, Colombia.

LITERATURE CITED

Raven, Robert J.
1979. Systematics of the mygalomorph spider genus *Masteria* (Masteriinae: Dipluridae: Arachnida). Australian Jour. Zool., vol. 27, pp. 623–636, figs. 1–29.

The Mygalomorph Spider Genus *Microhexura* (Araneae, Dipluridae)

FREDERICK A. COYLE[1]

ABSTRACT

The two tiny species of the North American diplurid genus *Microhexura* are redescribed and diagnosed, and new data on their natural history are presented. On the basis of an analysis of variation in populations from the Pacific Northwest, *Microhexura rainieri* Chamberlin and Ivie is newly synonymized with *M. idahoana* Chamberlin and Ivie.

INTRODUCTION

The North American diplurid genus *Microhexura*, first collected by Crosby and Bishop (1925) on the summit of the highest mountain in eastern North America, is a remarkable taxon. Its two species, ranging from 2.5 to 5.6 mm. in adult body length, are among the world's smallest known mygalomorphs (Gertsch and Platnick, 1979; Raven, 1979). In addition, *Microhexura* is the northernmost diplurid, and as such is adapted to colder environments than many diplurid genera. Furthermore, *Microhexura* is the only diplurid known to have a longitudinal fovea.

Only two publications (Crosby and Bishop, 1925; Chamberlin and Ivie, 1945) contain original taxonomic and biological data on *Microhexura*. The species descriptions are brief, poorly illustrated, and based upon few specimens. Two species are described from only one sex. The rediscovery of *Microhexura montivaga* Crosby and Bishop by Dr. William A. Shear and myself at the type locality, my continued success in collecting this species, and Mr. Wendell Icenogle's recent collection of *Microhexura* males in the Pacific Northwest now make it possible to present a much clearer picture of *Microhexura* taxonomy and natural history.

Although Crosby and Bishop (1925) said that *Microhexura* is "closely related to *Hexura*," thereby implying that it is a mecicobothriid, Gertsch (in Comstock, 1940; 1949), Chamberlin and Ivie (1945), and recently Gertsch and Platnick (1979) and Raven and Platnick (1981) all consider *Microhexura* to be a diplurid, in spite of its longitudinal fovea. I concur with this placement of *Microhexura* in the Dipluridae. Gertsch and Platnick (1979) point out that the fovea of *Microhexura* is "somewhat deepened and expanded anteriorly," making it distinct from the "shallow and longitudinal" fovea which they suggest may "be a defining character of the Mecicobothriidae." The character state which Gertsch and Platnick (1979) more confidently consider to be synapomorphic for the Mecicobothriidae, an elongate palpal tarsus which encloses the palpal bulb, is definitely not possessed by *Microhexura*.

Based upon traditional diplurid subfamily definitions, *Microhexura* would fit within the Macrothelinae. However, as Raven and Platnick (1978) have pointed out, this subfamily "may possibly be a paraphyletic assemblage." Until a reevaluation of the interrelationships of diplurid genera is performed, it is best not to assign *Microhexura* to a subfamily.

[1] Research Associate, Department of Entomology, American Museum of Natural History; Associate Professor, Department of Biology, Western Carolina University, Cullowhee, North Carolina 28723.

ACKNOWLEDGMENTS

I thank Drs. William A. Shear, Richard C. Bruce, and J. Dan Pittillo, and my son Alec for help in collecting *M. montivaga*. I owe special thanks to Wendell Icenogle for traveling to the Pacific Northwest primarily to collect males of *Microhexura* and for his perseverance in rearing these to adulthood. The following people and institutions lent *Microhexura* specimens: Dr. Norman I. Platnick (American Museum of Natural History), Dr. Herbert W. Levi (Museum of Comparative Zoology), and Mr. Rod Crawford (Burke Museum, University of Washington). Financial support for this study was provided by the Highlands Biological Station through its grant-in-aid program. This paper is dedicated to Dr. Willis Gertsch, without whose example and help I might never have begun my research in mygalomorph spider systematics.

NATURAL HISTORY

HABITAT: *Microhexura montivaga* is restricted to the spruce-fir forest community of the highest elevations (5300–6600 ft.) of the southern Blue Ridge Province. The webs are underneath moss (and liverwort) mats that cover rock outcrops or boulders, under moss and litter mats lying against the base of these rocks, and less often under moss mats on tree trunks or under pieces of wood lying on boulders. Mats from 1–4 cm. thick which are humid but well-drained are preferred; dry or soggy mats are not used. In the laboratory these spiders die quickly if their moisture source disappears.

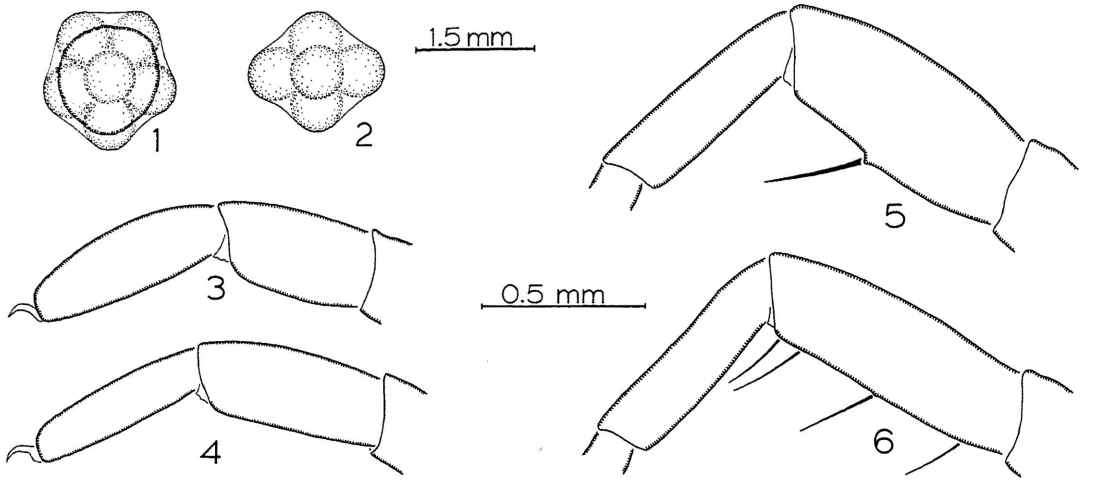
Microhexura idahoana Chamberlin and Ivie lives at elevations of 2000–7500 ft. in conifer forests in the Pacific Northwest. The webs are most frequently found in duff or duff and moss on the forest floor, often where boulders occur. Commonly these webs are under pieces of wood or bark resting on duff, less commonly under rocks or under the edges of decaying logs. Like *M. montavaga,* this species requires constant high humidity (Chamberlin and Ivie, 1945).

WEB STRUCTURE: *Microhexura montivaga* webs, which usually are sandwiched in the thin space between the moss mat and rock surface, normally remain undamaged and attached to the moss mat undersurface when the mat is pulled away from the rock. Apparently, few silk lines are attached to the rock surface. These webs are broad, irregular, extremely flattened tubes, usually with short side branches. They lie in one plane and do not penetrate into the mat. The tube is extremely thin-walled so that the spider is easily visible inside. One large web covered a roughly rectangular area of 16 by 28 mm.; some other webs were longer but narrower. I observed no prey within the webs, but suspect that collembolans, which are abundant in some of these moss mats, may be a common prey item. Chamberlin and Ivie (1945) described the apparently similar webs of *M. idahoana* as "small webs, mainly in the form of tubular runways, with a number of openings, and with connecting strands and sheets."

EGG SAC STRUCTURE AND EGGS: Three *M. montivaga* females have been collected with egg sacs in their webs. Two of the sacs contained seven eggs apiece, the third sac nine eggs. The eggs are oval and white or cream-colored. The eggs in two sacs were measured before being placed in alcohol and varied little in size and shape, ranging from 0.67 mm. (minimum diameter) × 0.74 mm. (maximum diameter) to 0.74 mm. × 0.81 mm. The egg cluster is held together by a very thin, transparent silk sac (figs. 1, 2). A circular seam exists where the edges of two separately formed sheets of silk have apparently been crimped together. The largest sac was 1.46 mm. (minimum diameter) × 1.93 mm. (maximum diameter) and the smallest was 1.46 mm. × 1.77 mm.

Only one *M. idahoana* egg sac is present in collections. This sac (from Wallowa Lake, Oregon) contains 19 eggs and is a slightly flattened sphere, 2.11 mm. (minimum diameter) by 2.69 mm. (maximum diameter) in alcohol. As in *M. montivaga,* this sac is very thin-walled and has a distinct circular seam. The eggs ranged from 0.60 mm. (minimum diameter) by 0.62 mm. (maximum diameter) to 0.64 mm by 0.68 mm. in size.

PARENTAL CARE: Chamberlin and Ivie



FIGS. 1–6. 1, 2. Egg sac of *Microhexura montivaga* Crosby and Bishop, 1.5 mm. scale. 1. "Top" view showing seam. 2. Side view. 3–6. *Microhexura idahoana* Chamberlin and Ivie, 0.5 mm. scale. 3. Left penultimate male pedipalp, retrolateral view. 4. Left female pedipalp, retrolateral view. 5. Left penultimate male leg I, retrolateral view. 6. Left female leg I, retrolateral view.

(1945), who observed several adult female *M. idahoana* with egg sacs, reported that the sacs "were carried about by the female, being held by the fangs beneath the body between the front legs." A label with two *M. idahoana* females collected at Santiam Pass, Oregon, describes the same behavior.

Field and laboratory observations of *M. montivaga* indicate that, in this species at least, the egg sac is not always held by the spider, that it may be lying in the web several mm. from the spider, but that, when the spider is disturbed, she picks up and carries the sac, often holding it for a long time thereafter. The egg sac is held under the cephalothorax primarily by the chelicerae, whose fangs are imbedded through the sac at its upper anterior end. Often one or both pedipalps are flexed around the front of the sac to help support it. The legs do not appear to assist in holding the sac. When carrying the sac, the spider walks with its legs fully extended as if on its "tip toes."

The presence of a few spiderlings in each of two webs with *M. montivaga* females collected on September 10, 1978, at Mt. Mitchell indicates that they remain within the maternal web for at least a short period following emergence from the egg sac.

LIFE HISTORY: *Microhexura montivaga* females lay eggs in June and the spiderlings emerge from the egg sac in September. Males mature in September and October and mating probably occurs from then through November. Size class distribution in two autumn, 1978, Tullgren funnel collections from Clingman's Dome (fig. 7) indicates that many individuals probably reach sexual maturity in their fourth autumn season.

According to Chamberlin and Ivie (1945) and three newer records of females with broods, the egg laying schedule of *M. idahoana* is like that of *M. montivaga*. Unlike *M. montivaga*, however, *M. idahoana* males probably mature in the winter or early spring and may not mate until spring. All 13 adult males examined were collected in late September and mid-October in the penultimate instar and matured in late November (three specimens), December (five), January (one), February (one), and March (three). Eleven of these were reared at the relatively mild outdoor temperatures of Winchester, California, and the other two were kept at

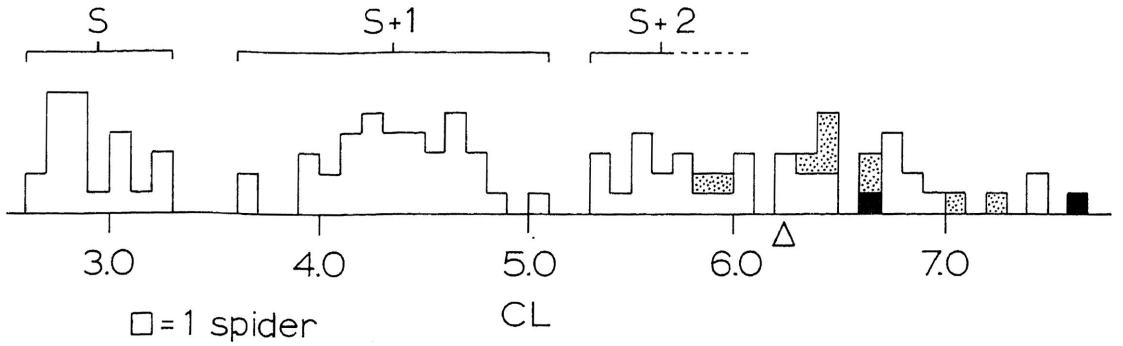


FIG. 7. Frequency histogram of cephalothorax length of all (106) *M. montivaga* specimens collected at Clingman's Dome on October 18 and November 4, 1978. Specimens were extracted from moss using Tullgren funnels. One CL unit equals 0.185 mm. S includes only spiderlings; these match spiderlings found with females in their webs on September 10 on Mt. Mitchell. S + 1 probably includes all individuals in their second autumn of life. S + 2 probably includes all individuals in their third autumn of life and older individuals. Adult males are represented by stippled boxes. Females with fully developed spermathecae are represented by black boxes. Triangle marks the size of the smallest *M. montivaga* female collected with brood (from Mt. Mitchell).

room temperature (Chamberlin and Ivie, 1945). Probably maturation and/or mating activity is normally delayed by the low winter temperatures in Mt. Rainier National Park and west central Idaho, where these males were collected. It is noteworthy that the Mt. Rainier specimens all matured later (February and March) than did the Idaho specimens.

Two observations suggest the possibility that *M. idahoana* penultimate males, which can be recognized by their swollen pedipalp tarsi and the tibia I spine pattern (figs. 3–6), may balloon and/or wander before their final molt. One penultimate male was collected at Mt. Rainier on July 5 as "part of windblown fallout on snowfield," and eight spiders, all penultimate males, were collected in Mineral Co., Montana, in February and are accompanied by the note, "snow spiders."

METHODS

Most of the measurements and meristic characters used in this study are defined in earlier papers (Coyle, 1968, 1971, 1974). Here I only identify their abbreviations and define those measurements not used previously: BL, body length from anterior edge of chelicerae to tip of abdomen; CL, carapace length; CW, carapace width; OQW, ocular quadrangle width; ALD, anterior lateral eye diameter; ALS, anterior lateral eye separation; IFL, IPL, ITL, IML, ITarL, lengths of leg I articles; ITA, distance from proximal end of line defining ITL to the right-angle intersection of that line and one passing through crotch at base of tibial spur (fig. 21); ITB, distance from spur crotch to distal end of tibia on its ventral surface (fig. 21); ITC, distance from crotch to tip of tibial spur (fig. 21); PFL, PPL, PTL, PTarL, lengths of pedipalp articles; PTT, maximum thickness of pedipalp tibia in side view; PL, length of palp in prolateral view from base of bulb to tip of embolus (fig. 27); PW, width of palpal bulb in prolateral view (fig. 27); EL, length of embolus in prolateral view (fig. 27); CT, number of cheliceral teeth; CMT, number of cheliceral denticles (microteeth).

I took measurements with a Wild M-5 and a Leitz RS stereomicroscope with 20× eyepiece lenses and an eyepiece micrometer scale. BL measurements were accurate to 0.037 mm., most of the other measurements were accurate to 0.018 mm., and all eye, palp, PTL, PTT, and PTarL measurements were accurate to 0.005 mm. All measurements are in millimeters. The sample range

is followed by the mean and standard deviation in parentheses.

Spermathecae were examined by removing the portion of body wall to which they are attached, clearing this in a KOH solution, rinsing in water, partly dehydrating in a series of ethanols, and then placing the preparation in glycerine on a temporary slide and viewing through a compound light microscope at 400×. Drawings were made with a drawing tube.

In the Material Examined sections any locality not followed by a sex symbol yielded only immature specimens. Dates are not given for such collections.

MICROHEXURA CROSBY AND BISHOP

Microhexura Crosby and Bishop, 1925, p. 145 (type species by monotypy *Microhexura montivaga* Crosby and Bishop).

DIAGNOSIS: *Microhexura* differs from all other known diplurids by its longitudinal fovea. It can be distinguished from mecicobothriids by the presence of only four spinnerets (*Hexura rothi* Gertsch and Platnick is the only mecicobothriid with four spinnerets), the absence of abdominal tergites, and the absence of a palpal conductor.

DESCRIPTION: Small spiders with longitudinal fovea. Carapace glabrous except for two prominent erect setae (rarely one absent or an additional one present) side by side in front of fovea and one to several smaller setae in front of ocular quadrangle. Pars cephalica not elevated above pars thoracica. Eight eyes in two rows forming compact quadrangle wider than long and elevated on median prominence; anterior row straight, posterior row slightly recurved. Sternum slightly longer than wide. Six faint, small subequal sigilla on lateral margins of sternum; larger transverse area just behind labium apparently formed by another pair of sigilla. Labium wider than long, strongly inclined from plane of sternum. Labium and maxillae lack cuspules. Serrula consists of 30–80 teeth on anterior edge and adjacent medial surface of palpal endite, arranged in band which narrows at both ends; reduced in some males. Chelicerae with row of four (rarely three) large teeth on promargin of fang furrow and parallel row of 11–23 denticles along retromargin. No rastellum. Legs with three tarsal claws; single rows of one to four teeth on superior claws; none to three teeth on inferior claw. Single row of four to six teeth on pedipalp claw. No preening combs or scopulae on legs. Two rows of trichobothria on dorsal surface of each tibia; single row on each metatarsus and tarsus. Male tibia I with strong ventral spur anchored to ventral prominence; ventral surface of metatarsus flattened or concave proximally, swollen distally. Palpal bulb simple, pyriform, with elongate embolus; conductor not present. Two spermathecae, each consisting of perforate, sclerotized principal chamber to which is laterally attached thin-walled side chamber. Four spinnerets; median pair short, unsegmented; lateral pair long, consisting of three subequal segments, the middle segment usually shorter than the others.

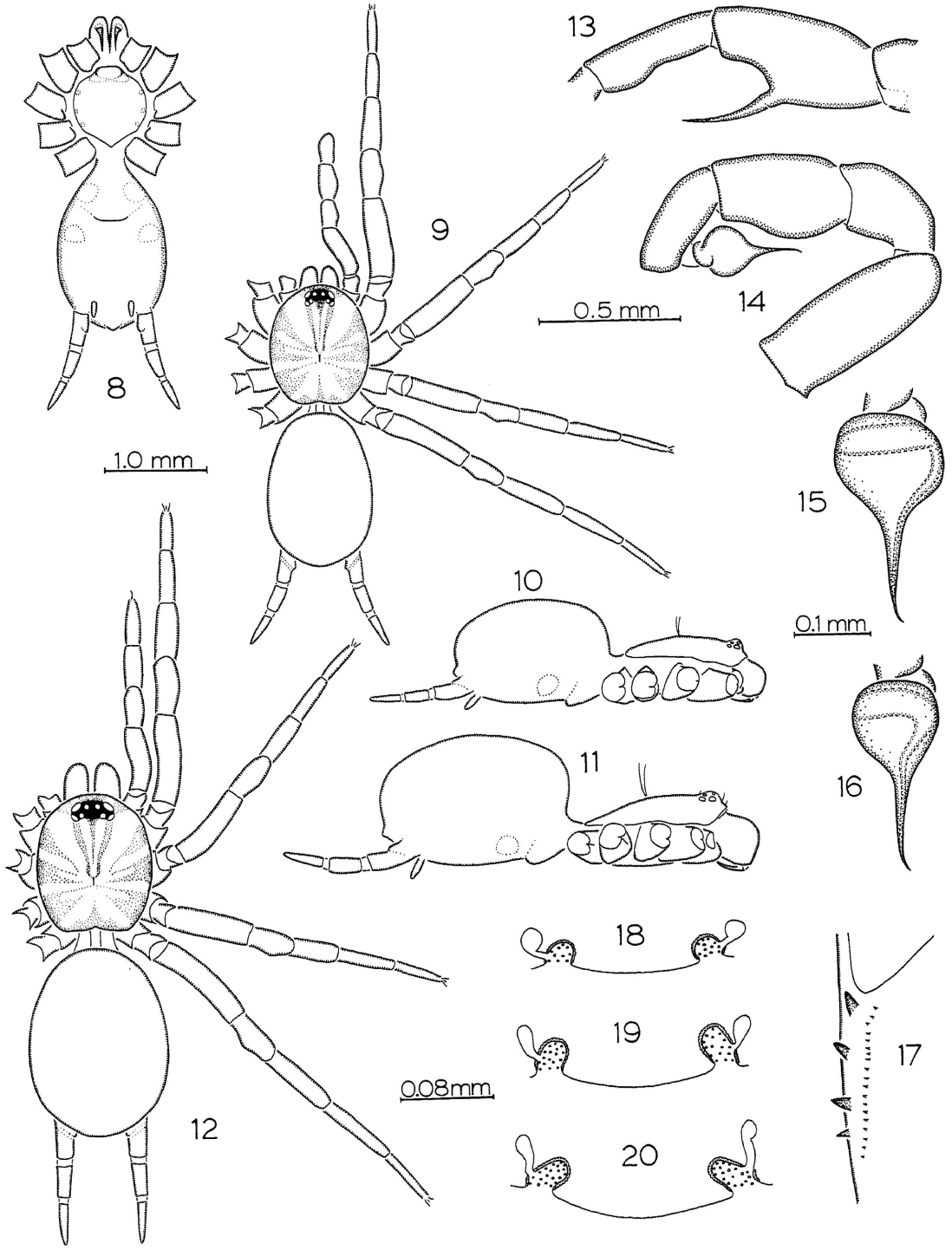
Microhexura montivaga Crosby and Bishop

Figures 8–20; Map 1

Microhexura montivagus Crosby and Bishop, 1925, p. 145, fig. 2 (male holotype from summit of Mt. Mitchell, Yancey County, North Carolina, in AMNH, examined). Bishop and Crosby, 1926, p. 169. Comstock, 1940, p. 246.

→

FIGS. 8–20. *Microhexura montivaga* Crosby and Bishop. 8–12. 1.0 mm. scale. 8–10. Male. 8. Ventral view. 9. Dorsal view. 10. Lateral view. 11, 12. Female. 11. Lateral view. 12. Dorsal view. 13, 14. 0.5 mm. scale. 13. Male left leg I, retrolateral view. 14. Male left pedipalp, retrolateral view. 15–17. 0.1 mm. scale. 15, 16. Left male palp, prolateral view. 15. Holotype. 16. Clingman's Dome. 17. Ventral view of female chelicera, showing cheliceral teeth. 18–20. Spermathecae, 0.08 mm. scale. 18. Mt. Mitchell. 19. Clingman's Dome. 20. Grandfather Mtn.


8
1.0 mm
9
0.5 mm
10
11
12
13
14
15
0.1 mm
16
17
18
19
20
0.08mm

Microhexura montivaga: Bonnet, 1957, p. 2884.

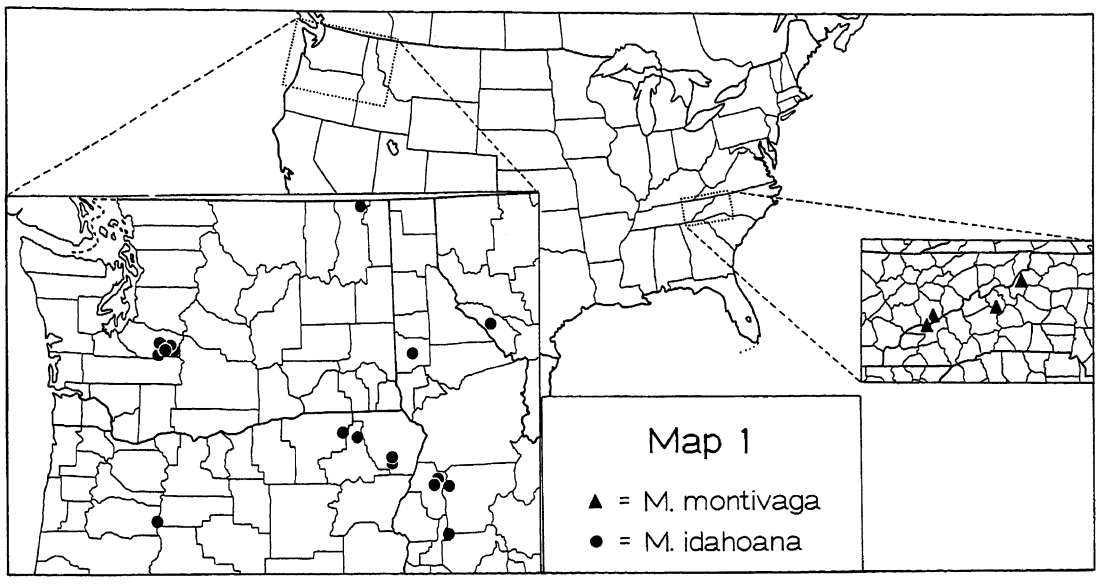
DIAGNOSIS: The evenly tapered embolus and evenly curved embolus tip (figs. 14–16), the relatively long embolus (EL/CL = 0.100–0.119), and the more distal position of the tibia I spur (fig. 13) (ITA/ITB = 1.45–1.89; ITB/CL = 0.14–0.17; ITB = 0.17–0.22) best distinguish males of this species from *M. idahoana* males. If the two *Microhexura* species were not allopatric, it would be difficult to identify the females to species. *Microhexura montivaga* females are best recognized morphologically by their less heavily sclerotized spermathecae with relatively short side branches (figs. 18–20).

MALE DESCRIPTION: Figs. 8–10, 13–16. Number of specimens examined and measured = 17. BL = 2.48–3.22 (2.92 ± 0.21). CL = 1.07–1.37 (1.20 ± 0.08); CW = 0.91–1.15 (1.00 ± 0.07). OQW = 0.296–0.361 (0.324 ± 0.019); ALD = 0.074–0.120 (0.103 ± 0.012); ALS = 0.139–0.176 (0.157 ± 0.012); AMD = 0.028–0.046 (0.039 ± 0.006); AMS = 0.046–0.056 (0.054 ± 0.004). IFL = 0.78–0.96 (0.87 ± 0.05); IPL = 0.44–0.56 (0.50 ± 0.03); ITL = 0.50–0.65 (0.56 ± 0.04); ITA = 0.26–0.35 (0.31 ± 0.03); ITB = 0.17–0.22 (0.18 ± 0.02); ITA/ITB = 1.45–1.89 (1.66 ± 0.12); ITB/CL = 0.14–0.17 (0.15 ± 0.01); ITC = 0.32–0.40 (0.35 ± 0.03); IML = 0.44–0.56 (0.49 ± 0.03); ITarL = 0.39–0.47 (0.42 ± 0.03). PFL = 0.52–0.63 (0.57 ± 0.03); PPL = 0.33–0.40 (0.36 ± 0.02); PTL = 0.324–0.389 (0.351 ± 0.021); PTT = 0.204–0.259 (0.233 ± 0.016); PTarL = 0.296–0.352 (0.326 ± 0.015). Pedipalp tibia strongly swollen ventrally (fig. 14); PTL/PTT = 1.46–1.59 (1.51 ± 0.03). Palpal embolus elongate, evenly tapered, and tip curved (figs. 14–16); PL = 0.241–0.305 (0.268 ± 0.017); PW = 0.111–0.148 (0.129 ± 0.011); EL = 0.111–0.139 (0.130 ± 0.007); EL/CL = 0.100–0.119 (0.108 ± 0.005). CT = 3–4 (3.9); CMT = 12–17 (14.0). Color in alcohol (fig. 9): Carapace background color and chelicerae light yellow-brown. Ocular area black. Center of clypeus and lateral and posterior margins of carapace medium to dark brown; lateral and posterior marginal pigmented areas converging irregularly toward fovea, becoming lighter and much narrower as they do. Two narrow medium to dark brown bands extend from anterior end of fovea forward to posterior lateral border of ocular area and form a V; between these a medium to dark brown line extends back from ocular area almost to fovea. Legs and pedipalps light gray-yellow or light yellow-brown, often slightly darker distally. Spinnerets light gray-yellow. Abdominal dorsum mottled light to dark reddish-brown.

FEMALE DESCRIPTION: Figures 11, 12, 17–20. Number of specimens examined and measured = 10. BL = 2.62–3.77 (3.26 ± 0.28). CL = 1.15–1.48 (1.32 ± 0.12); CW = 0.96–1.20 (1.07 ± 0.08). OQW = 0.315–0.389 (0.353 ± 0.025); ALD = 0.102–0.130 (0.112 ± 0.008); ALS = 0.148–0.185 (0.165 ± 0.012); ALS/CL = 0.113–0.137 (0.125 ± 0.007); AMD = 0.028–0.037 (0.036 ± 0.003); AMS = 0.056–0.065 (0.061 ± 0.005). IFL = 0.80–1.00 (0.87 ± 0.07); IPL = 0.46–0.57 (0.51 ± 0.04); ITL = 0.44–0.63 (0.53 ± 0.05); IML = 0.37–0.52 (0.46 ± 0.05); IML/CL = 0.28–0.38 (0.34 ± 0.03); ITarL = 0.35–0.44 (0.38 ± 0.03); ITarL/CL = 0.25–0.31 (0.29 ± 0.02). CT = 3–4 (3.9); CMT = 14–21 (16.6). Principal chamber of spermatheca short to moderately short and weakly sclerotized (figs. 18–20); side branch relatively short. Coloration as in males (fig. 12).

DISTRIBUTION: Higher mountain peaks of the southern Blue Ridge Province in western North Carolina and eastern Tennessee (map 1).

MATERIAL EXAMINED: *North Carolina:* Avery Co.: Grandfather Mtn., 5300 ft., Nov. 17, 1978 (F. Coyle, R. Bruce, J. D. Pittillo), 3♂, 1♀. Swain Co.: Clingman's Dome, just below parking lot, 6200 ft., Oct. 18, 1978 (F. Coyle), 5♂, 2♀, Nov. 4, 1978 (F. Coyle), 5♂; Clingman's Dome, on NW slope just below top, 6500 ft. (F. Coyle); Mt. Collins, 6100 ft., Sept. 17, 1978 (V. McNeilus), 1♂. Yancey Co.: Mt. Mitchell, 6500 ft., Oct. 22, 1923 (Crosby, Bishop), ♂ holotype; Mt. Mitchell, 6600 ft., Oct. 20, 1977 (F. Coyle), 1♂, 1♀, May 22, 1978 (F. Coyle), 1♀, Sept. 10, 1978 (F. Coyle), 2♀, June 23, 1979 (F. and A. Coyle), 2♀, Aug. 19, 1979 (F. Coyle), 1♀, Aug. 23, 1980 (F. Coyle), 1♀. *Tennessee:*



MAP 1. United States, showing distribution of *Microhexura* species.

Sevier Co., top of Mt. LeConte, 6500 ft., Oct. 10, 1926, 1♂.

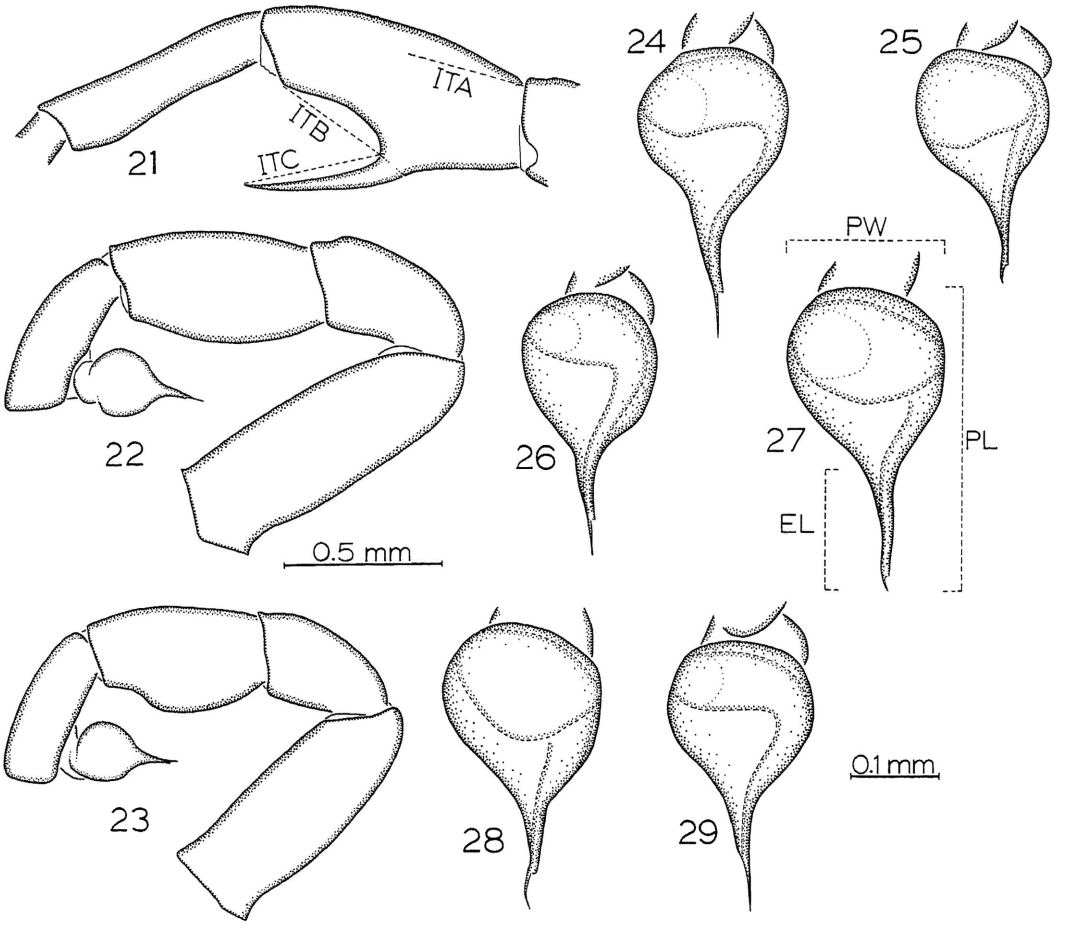
Microhexura idahoana Chamberlin and Ivie
Figures 3–6, 21–43; Map 1

Microhexura idahoana Chamberlin and Ivie, 1945, p. 552, figs. 17, 18 (male holotype from 4 miles NE of McCall, Valley County, Idaho, in AMNH, examined). Vogel, 1962, p. 250.

Microhexura rainieri Chamberlin and Ivie, 1945, p. 554, fig. 16 (female holotype from Emmons Trail, Mount Rainier National Park, Pierce County, Washington, in AMNH, examined). Vogel, 1962, p. 250. NEW SYNONYMY.

DIAGNOSIS: The abrupt narrowing of the embolus to form a slender spinelike tip (figs. 22–29), the relatively short embolus (EL/CL = 0.059–0.087), and the more proximal position of the tibia I spur (fig. 21) (ITA/ITB = 0.86–1.17; ITB/CL = 0.21–0.26; ITB = 0.30–0.41) best distinguish males of this species from *M. montivaga* males. *M. idahoana* females have spermathecae (figs. 33–43) that are more heavily sclerotized and possess relatively longer side branches than those of *M. montivaga* females.

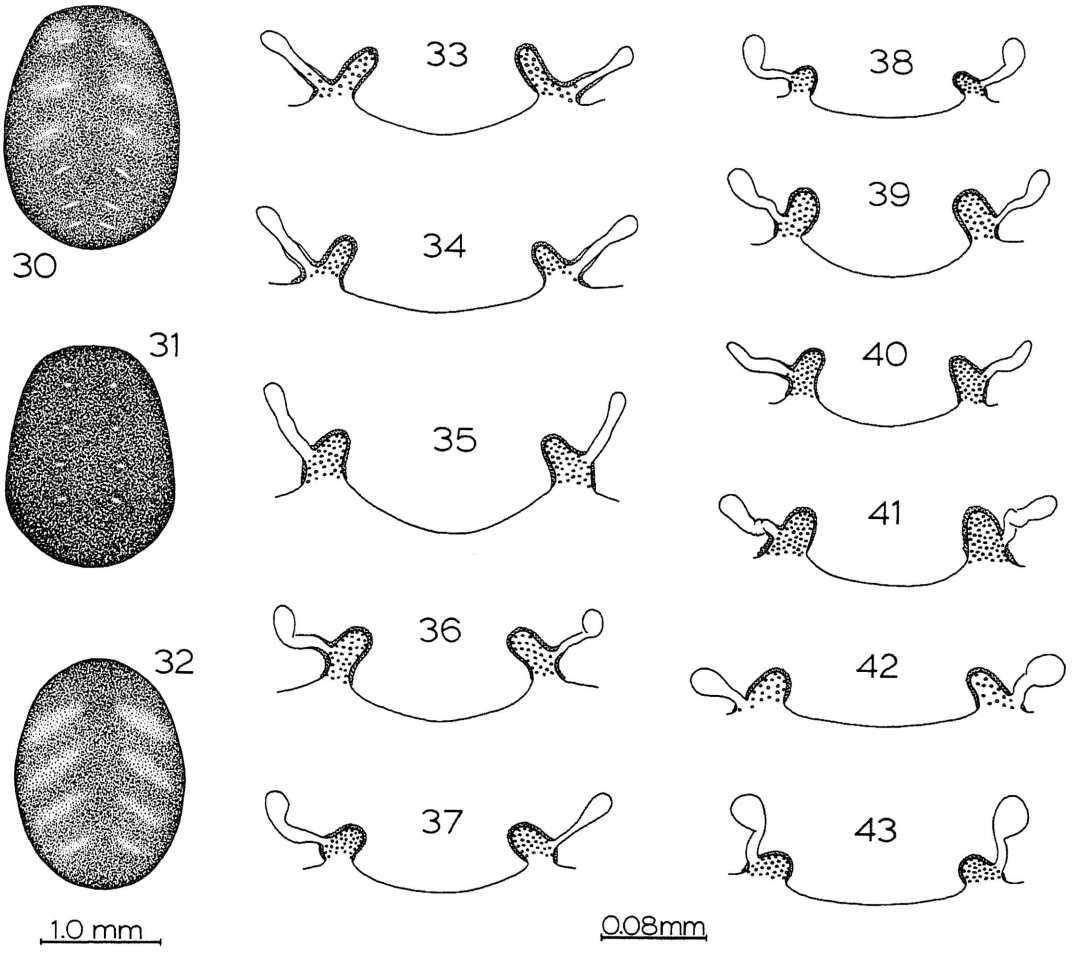
MALE DESCRIPTION: Figures 21–29. Number of specimens examined and measured = 13. BL = 3.08–4.54 (3.61 ± 0.44). CL = 1.37–1.74 (1.55 ± 0.11); CW = 1.13–1.48 (1.30 ± 0.12). OQW = 0.333–0.426 (0.376 ± 0.028); ALD = 0.093–0.130 (0.115 ± 0.012); ALS = 0.157–0.204 (0.179 ± 0.016); AMD = 0.037–0.056 (0.048 ± 0.006); AMS = 0.065–0.093 (0.074 ± 0.008). IFL = 1.00–1.30 (1.15 ± 0.09); IPL = 0.59–0.74 (0.66 ± 0.04); ITL = 0.70–0.93 (0.82 ± 0.07); ITA = 0.32–0.41 (0.36 ± 0.03); ITB = 0.30–0.41 (0.36 ± 0.03); ITA/ITB = 0.86–1.17 (0.99 ± 0.09); ITB/CL = 0.21–0.26 (0.23 ± 0.02); ITC = 0.43–0.52 (0.47 ± 0.03); IML = 0.59–0.81 (0.72 ± 0.06); ITarL = 0.48–0.61 (0.55 ± 0.04). PFL = 0.63–0.81 (0.72 ± 0.05); PPL = 0.39–0.50 (0.44 ± 0.03); PTL = 0.389–0.555 (0.465 ± 0.042); PTT = 0.222–0.296 (0.273 ± 0.020); PTarL = 0.389–0.472 (0.427 ± 0.026). Pedipalp tibia moderately to strongly swollen ventrally (figs. 22, 23); PTL/PTT = 1.56–1.88 (1.70 ± 0.10). Palpal embolus narrows abruptly to form sharp spinelike tip (figs. 22–29); PL = 0.278–0.333 (0.308 ± 0.016); PW = 0.148–0.185 (0.168 ± 0.011); EL = 0.102–0.148 (0.118 ± 0.014); EL/CL = 0.059–0.087 (0.077 ± 0.009). CT = 4; CMT = 12–15 (13.7). Color in alcohol: Carapace background color light to medium



FIGS. 21–29. *Microhexura idahoana* Chamberlin and Ivie, males. 21–23. 0.5 mm. scale. 21. Left leg I, retrolateral view. 22, 23. Left pedipalp, retrolateral view. 22. Mt. Rainier, Washington. 23. Holotype. 24–29. Left palp, prolateral view, 0.1 mm. scale. 24. Mt. Rainier, Washington. 25. Holotype. 26–29. All from 11 mi. south of Smith's Ferry, Idaho.

brown. Ocular area black. Center of clypeus and lateral and posterior margins of carapace dark brown; lateral and posterior marginal dark areas converging irregularly toward fovea, becoming narrower and lighter. Two narrow medium to dark brown bands extend from anterior end of fovea forward to posterior lateral border of ocular area and form a V; between these a medium to dark brown line extends back from ocular area almost to fovea. Legs, pedipalps, and chelicerae light yellow-gray with widespread darker areas with more brown pigment; spinnerets similar or lighter. Abdominal dorsum usually even dark purple-brown; very faint pairs of small oblique light areas occasionally present.

FEMALE DESCRIPTION: Figures 30–43. Number of specimens examined and measured = 53. BL = 2.92–5.62 (4.03 ± 0.62). CL = 1.09–2.07 (1.50 ± 0.23); CW = 0.91–1.67 (1.22 ± 0.18). OQW = 0.278–0.500 (0.390 ± 0.047); ALD = 0.093–0.157 (0.122 ± 0.014); ALS = 0.120–0.241 (0.172 ± 0.027); ALS/CL = 0.089–0.140 (0.115 ± 0.012); AMD = 0.028–0.056 (0.040 ± 0.007); AMS = 0.046–0.102 (0.074 ± 0.010). IFL =



FIGS. 30–43. *Microhexura idahoana* Chamberlin and Ivie, females. 30–32. Pigmentation, abdominal dorsum, 1.0 mm. scale. 30. Mt. Rainier, Washington. 31. McCall, Idaho. 32. N. Kamiah, Idaho. 33–43. Spermathecae, 0.08 mm. scale. 33, 34. Mt. Rainier, Washington. 35. Santiam Pass, Oregon. 36. Toll Gate, Oregon. 37. Wallowa Mtns., Oregon. 38. Elgin, Oregon. 39. McCall, Idaho. 40, 41. N. Kamiah, Idaho. 42, 43. Cedar Lake, Washington.

0.76–1.39 (1.06 ± 0.17); IPL = 0.44–0.85 (0.63 ± 0.10); ITL = 0.44–0.93 (0.67 ± 0.13); IML = 0.40–0.81 (0.60 ± 0.11); IML/CL = 0.35–0.46 (0.40 ± 0.03); ITarL = 0.35–0.61 (0.47 ± 0.07); ITarL/CL = 0.26–0.37 (0.31 ± 0.02). CT = 3–4 (3.9); CMT = 11–23 (16.2). Principal chamber of spermathecae moderately to heavily sclerotized; side branch often rather elongate (figs. 33–43). Coloration similar to that of males except females often lighter and more likely to have paired light marks on abdominal dorsum (figs. 30–32).

VARIATION AND SYNONYMY: The male pedipalp tibiae of the Mt. Rainier, Washington, sample (n = 4) are longer and less swollen (fig. 22) (PTL = 0.481–0.555 (0.514 ± 0.032), PTL/PTT = 1.75–1.88 (1.82 ± 0.059)) than those of nearly all of the other male specimens (n = 9, from McCall and Smith's Ferry, Idaho) (fig. 23) (PTL = 0.389–0.472 (0.443 ± 0.025), PTL/PTT = 1.56–1.75 (1.65

± 0.067)). In view of the small sample sizes, it is safe to assume that the real populations overlap markedly in these features. Although the Mt. Rainier sample shows little variation in the shape of the embolus tip (fig. 24) and has a tip form that is distinct from the two McCall, Idaho, specimens (fig. 25), the seven males from near Smith's Ferry, Idaho, exhibit a wide range of variation which includes both of these forms (figs. 26, 27), intermediates (fig. 28), and others (fig. 29).

Adult females vary in the pigmentation pattern on the abdominal dorsum. Chamberlin and Ivie (1945) decided that the Mt. Rainier population was a distinct species solely because of the presence on their three female specimens of "six pairs of inconspicuous oblique bars of lighter gray on the dorsum" of the abdomen, as contrasted with the unmarked abdomens of their specimens from McCall, Idaho. My examination of larger and more numerous samples reveals that there may be from 0–6 pairs of these light markings on an adult female, and that these light markings are present on nearly all Mt. Rainier females (fig. 30), are reduced to only two pairs of extremely faint markings on one Mt. Rainier female, and are present, although usually fewer and smaller or fainter, on some adult females in several other populations (Elgin and Wallowa Lake, Oregon, and McCall and N. Kamiah, Idaho) (figs. 31, 32). At all *M. idahoana* localities at least some immatures possess these light markings, and the frequency of immatures that are marked is greater than that of marked adult females.

Considerable variation is found in spermathecae form (figs. 33–43) but no major discontinuities are apparent. It is worth noting that the pigmentation, which is deposited in tissue around the spermathecae and can be easily seen through the body wall in other populations, is much lighter in the Cedar Lake, Washington, population. An examination of measurement and ratio variation among the female samples reveals that only ITarL/CL, and, to a lesser extent, IML/CL, show a pattern of nearly discontinuous variation. The Cedar Lake, Washington, sample

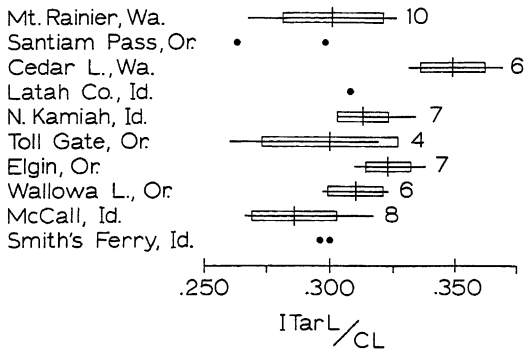


FIG. 44. Modified Dice-Leraas diagram of ITarL/CL variation in *M. idahoana* females. Horizontal line represents the range, vertical line the mean, open rectangle the standard deviation, and number to right of range line the sample size.

is divergent in both, but more so in ITarL/CL (fig. 44).

That all known populations of *Microhexura* in the western United States are conspecific is the most reasonable conclusion to be drawn from the present data. *M. idahoana* exhibits a degree of geographic variation no greater than that of *Antrodiaetus* species with similar geographic ranges (Coyle, 1971). The Cedar Lake, Washington, population, known only from females, appears to be the most divergent population genetically. More collections of *Microhexura* males are needed to test these hypotheses.

DISTRIBUTION: Cascade Mountains, Blue Mountains, and northern Rocky Mountains of Washington, Oregon, Idaho, and Montana (map 1).

MATERIAL EXAMINED: *Idaho:* Adams Co.: Lost Lake, lat. 44°57′ N, long. 116°W, Aug. 20, 1936 (W. Ivie), 1♀; 4 mi. N New Meadows, June 14, 1962 (W. Ivie), 1♀; Evergreen Park, S. Tamarack (W. Ivie). Latah Co.: Section 9 Pond, lat. 46° N, long. 116° W, June 20, 1962 (W. Barr, R. Stecker), 1♀. Lewis Co.: North Kamiah, lat. 46°15′ N, long. 116°2′ W, 2000 ft., June 13, 1962 (W. Ivie), 8♀. Valley Co.: 4 mi. NE McCall, Oct. 18, 1944 (W. Ivie), ♂ holotype and another ♂ (matured in Dec.), 1♀, May 31, 1944 (W.

ie), 1♀; McCall, Oct. 1944 (W. Ivie), 6♀; ıyette Lake, hill on E side, July 5, 1943, ♀; Swinging Bridge Camp Ground, 11 mi. Smith's Ferry, 4000 ft., Sept. 25, 1979 (W. enogle), 7♂ (matured in Nov., Dec., and n.), 2♀. *Montana:* Mineral Co. *Oregon:* inn Co.: Santiam Pass, 4800 ft., Aug. 13, 949 (V. Roth), 2♀. Umatilla Co.: Tollgate, 00 ft., July 25, 1950 (B. Malkin), 3♀; Lang- on Lake, Sept. 13, 1949 (V. Roth), 2♀. nion Co.: 4 mi. N, 3 mi. E Elgin, June 1974 E. Benedict), 10♀; Wallowa Co.: Wallowa ake, 4750 ft., July 26, 1950 (B. Malkin), 2♀; 'allowa Lake State Park, ¼ mi. on E Fork rail, 5000 ft., June 29, 1968 (B. and L. Cu- er), 3♀; Aneroid Lake, Wallowa Mtns., 500 ft., July 27, 1950 (B. Malkin), 1♀. *'ashington:* Pierce Co.: Mt. Rainier National Park (MRNP), White River Campgrd., near trail to Sunrise, 4400 ft., Sept. 28, 1979 (W. Icenogle), 4♂ (matured in Feb. and March), 6♀, July 22, 1954 (B. Malkin), 2♀; MRNP, Emmons Trail, lat. 46°54′ N, long. 121°39′ W, July 6, 1938 (W. Ivie), ♀ holotype and another ♀; MRNP, Carbon River, 2000–3000 ft., Oct. 3, 1954 (B. Malkin, A. Bryan), 3♀; MRNP, Skyline Trail, 0–1.9 km. NNE Paradise, 5400–6300 ft. (D. Mann); MRNP, Nisqually Glacier Br., 2.1 km. WSW Paradise, 3900 ft. (L. K. Russell); MRNP, Cayuse Pass, 4630 ft., Sept. 24, 1965 (I. Spring), 1♀. Stevens Co.: Cedar Lake, 3 mi. N Leadpoint, 2100 ft., June 1–10, 1962 (W. Ivie), 7♀, May 1962 (W. Ivie), 8♀, Sept. 30, 1964 (J. and W. Ivie), 3♀, Sept. 10, 1963 (J. and W. Ivie), 2♀.

LITERATURE CITED

ishop, Sherman C., and C. R. Crosby
1926. Notes on the spiders of the southeastern United States with descriptions of new species. Jour. Elisha Mitchell Sci. Soc., vol. 41, pp. 165–212, pls. 20–25.

onnet, Pierre
1957. Bibliographia araneorum. Toulouse, vol. 2, pt. 3, pp. 1927–3026.

hamberlin, Ralph V., and Wilton Ivie
1945. On some Nearctic mygalomorph spiders. Ann. Ent. Soc. Amer., vol. 38, pp. 549–558, figs. 1–20.

omstock, John H.
1940. The spider book. Revised and ed. by W. J. Gertsch. Ithaca, New York, 729 pp., 770 figs.

oyle, Frederick A.
1968. The mygalomorph spider genus *Atypoides* (Araneae: Antrodiaetidae). Psyche, vol. 75, pp. 157–194, figs. 1–94.
1971. Systematics and natural history of the mygalomorph spider genus *Antrodiaetus* and related genera (Araneae: Antrodiaetidae). Bull. Mus. Comp. Zool., vol. 141, pp. 269–402, figs. 1–330.
1974. Systematics of the trapdoor spider genus *Aliatypus* (Araneae: Antrodiaetidae). Psyche, vol. 81, pp. 431–500, figs. 1–194.

rosby, Cyrus R., and Sherman C. Bishop
1925. Two new spiders from the Blue Ridge Mountains of North Carolina (Araneina). Ent. News, vol. 36, pp. 142–146, figs. 1, 2.

Gertsch, Willis J.
1949. American spiders. Princeton, New Jersey, 285 pp., 32 pls.

Gertsch, Willis J., and Norman I. Platnick
1979. A revision of the spider family Mecicobothriidae (Araneae, Mygalomorphae). Amer. Mus. Novitates, no. 2687, pp. 1–32, figs. 1–91.

Raven, Robert J.
1979. Systematics of the mygalomorph spider genus *Masteria* (Masteriinae: Dipluridae: Arachnida). Australian Jour. Zool., vol. 27, pp. 623–636, figs. 1–29.

Raven, Robert J., and Norman I. Platnick
1978. A new genus of the spider family Dipluridae from Chile (Araneae, Mygalomorphae). Jour. Arachnol., Vol. 6, pp. 73–77, figs. 1–7.
1981. A revision of the American spiders of the family Microstigmatidae (Araneae, Mygalomorphae). Amer. Mus. Novitates, no. 2707, pp. 1–20, figs. 1–54.

Vogel, Beatrice
1962. Supplementary bibliography of North American tarantulas, 1939–1959 (Araneida, Mygalomorphae). Ent. News, vol. 73, pp. 245–250.

Two New Species of the Mygalomorph Spider Genus *Neocteniza* (Araneae, Actinopodidae)

NORMAN I. PLATNICK[1] AND MOHAMMAD U. SHADAB[2]

ABSTRACT

Two new species of the mygalomorph spider genus *Neocteniza* are described: *Neocteniza malkini* from Ecuador and *Neocteniza occulta* from Panama.

INTRODUCTION

The mygalomorph spiders of the genus *Neocteniza* are extremely rare in collections; in our recent revision (Platnick and Shadab, 1976), only one of the seven known species was represented by more than a single specimen. Hence it was a great pleasure to discover two additional females of the genus from Ecuador and Panama during recent visits to the spider collections at the Field Museum of Natural History and the University of Kansas, respectively. As no *Neocteniza* were previously known from either country, it is not surprising that both specimens proved to belong to undescribed taxa. Unfortunately, no ecological data accompanied either specimen. The Panamanian spider, however, was collected on Barro Colorado Island; that only a single specimen is known from such a relatively well-collected locale tends credence to our earlier hypothesis, based on morphology, that the spiders construct and remain within concealed burrows.

It is also a great pleasure to dedicate this study to Dr. Willis J. Gertsch, both because of his long-standing interest in mygalomorphs and the special help (including an undescribed species) he provided for our original revision, the format of which is followed below. We are particularly indebted to Drs. John Kethley and Henry Dybas of the Field Museum, and George Byers and Peter Ashlock of the University of Kansas, for their hospitality.

Neocteniza malkini, new species
Figures 1, 2

TYPE: Female holotype from Cusuime, Río Cusuime, 150 km. southeast of Puyo, Pastaza, Ecuador (May 15–31, 1971; B. Malkin), deposited in the Field Museum of Natural History.

ETYMOLOGY: The specific name is a patronym in honor of the collector of the holotype.

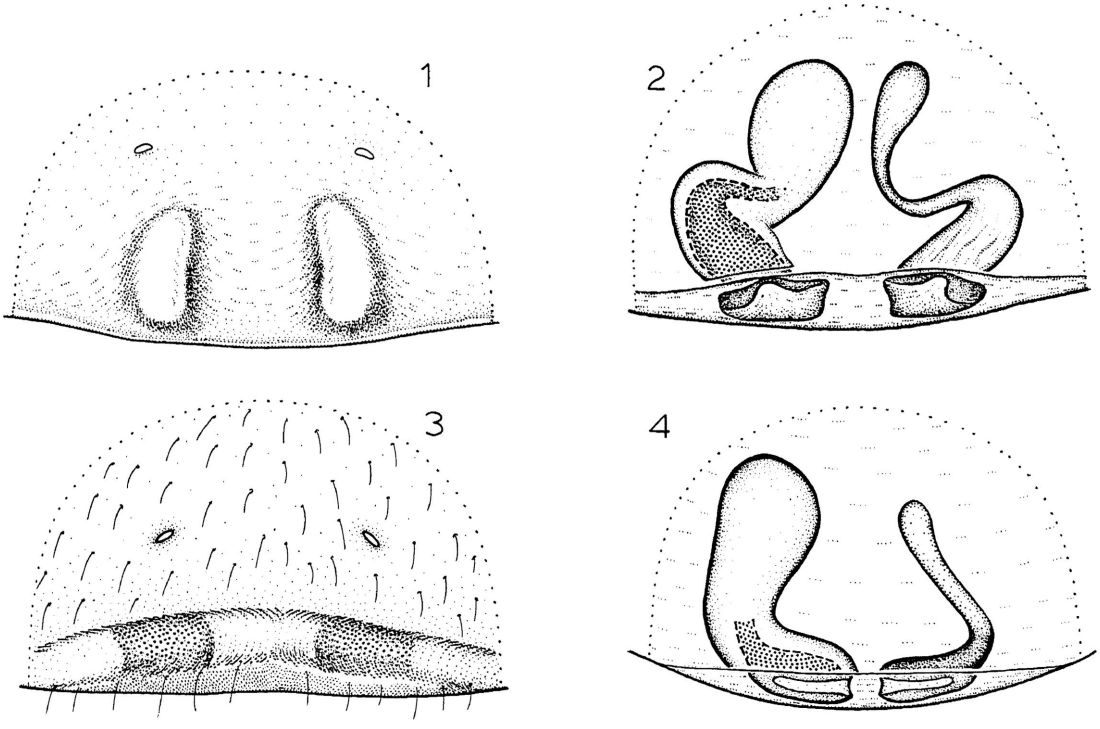
DIAGNOSIS: *Neocteniza malkini* seems most closely related to *N. pococki* (and will key out to that species; Platnick and Shadab, 1976, p. 7) but may be distinguished by the shorter epigynal horns (fig. 1) and longer sclerotized basal portion of the spermathecae (fig. 2).

MALE: Unknown.

FEMALE: Total length, including chelicerae, 26.14. Carapace 10.08 long, 7.70 wide; ocular area with transverse row of about 40 stiff setae posteriorly and about 45 anteriorly; thoracic groove equaling at greatest width about three-tenths of carapace width at that point; situated back about three-fifths of carapace length.

[1] Associate Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York.

[2] Scientific Assistant, Department of Entomology, American Museum of Natural History.



FIGS. 1–4. 1, 2. *Neocteniza malkini,* new species. 3, 4. *N. occulta,* new species. 1, 3. Epigynum, ventral view. 2, 4. Epigynum, dorsal view.

Ratio of eyes, anterior lateral:anterior median:posterior lateral:posterior median, 24:11:22:18. Anterior median eyes separated by twice their diameter, by five times their diameter from anterior laterals. Lateral eyes of each side separated by almost posterior lateral eye diameter. Posterior median eyes separated by more than five times their diameter, by slightly more than their diameter from posterior laterals. Median ocular quadrangle wider than long (138/34), narrowed in front (138/47).

Sternum and labium 7.47 long, 5.17 wide. Anterior sternal depression equaling at branching point roughly one-seventh of sternal width at that point. Cheliceral rastellum consisting of about 15 scattered stiff spines, three subterminal strong cusps, and terminal row of five strong cusps on projecting lobe; transverse row of about 18 long spines above origin of fang. Cheliceral promargin with seven teeth, retromargin with nine small teeth; about 20 small denticles scattered between rows.

Leg formula 4321. Femur IV with dorsal series of about 24 cusps arranged in three oblique rows at distal end. Patella III with anterodorsal series of 18 or 24, apical comb of 10 or 11, and two or three retrolateral cusps. Leg cusps: palpal tibia, 12 or 13 prolateral, nine or 10 retrolateral; tibia I, five or seven prolateral, 13 or 17 retrolateral, one ventral; tibia II, zero or one prolateral, 11 or 15 retrolateral, zero ventral; tibia III, 15 or 16 prolateral, 10 retrolateral, eight or nine dorsal; metatarsus I, 20 or 24 prolateral, 31 or 33 retrolateral; metatarsus II, 18 or 23 prolateral, 20 or 21 retrolateral; metatarsus III, nine or 12 prolateral, seven or 11 retrolateral; metatarsus IV, two prolateral, two retrolateral, apical comb of five; palpal tarsus, 20 or 22 prolateral, 19 retrolateral; tarsus I, five or

eight prolateral, eight or 11 retrolateral; tarsus II, seven or eight prolateral, six or seven retrolateral. Tibia I 1.9, tibia III less than 1.1 times as long as greatest width. Palpal claw with one tiny denticle distal to long tooth bearing one dorsal tubercle; proclaw of leg I with one denticle distal to large tooth, retroclaw with large tooth only; claws of leg II similar but with one ventral denticle on each large tooth; claws of legs III and IV as in leg II but without distal denticle. Measurements:

	I	II	III	IV	Palp
Femur	4.57	4.75	4.90	6.32	3.98
Patella	2.88	2.99	3.38	3.85	2.18
Tibia	2.74	2.95	2.28	3.74	2.40
Metatarsus	2.57	2.43	2.95	4.97	—
Tarsus	1.22	1.19	1.73	1.55	2.47
Total	13.98	14.31	15.24	20.43	11.03

Abdomen 10.58 long, 7.64 wide. Spinneret segments bearing patches of around two, 17, and nine ventral tubercles. Epigynum darkened posteriorly, with two short, widely separated, outwardly curved horns (fig. 1). Narrowly separated bursae copulatrix with anteromedian openings leading to long, basally recurved, distally expanded, sinuous spermathecae (fig. 2).

MATERIAL EXAMINED: Only the holotype from Ecuador.

Neocteniza occulta, new species
Figures 3, 4

TYPE: Female holotype from Barro Colorado Island, Canal Zone, Panama (March 1956; C. W. and M. E. Rettenmeyer), deposited in the collection of the University of Kansas.

ETYMOLOGY: The specific name is from the Latin *occulta* (hidden), referring to the absence of the species from previous collections taken at the type locality.

DIAGNOSIS: *Neocteniza occulta* seems most closely related to *N. osa* (and will key out to that species; Platnick and Shadab, 1976, p. 7) but may be distinguished by the more posteriorly situated epigynal elevations (fig. 3) and wider bursae copulatrix (fig. 4).

MALE: Unknown.

FEMALE: Total length, including chelicerae, 21.46. Carapace 7.70 long, 5.90 wide; ocular area with transverse row of about 20 stiff setae posteriorly, about 15 very long clypeal setae, and transverse row of about 10 shorter subclypeal setae; thoracic groove equaling at greatest width almost one-third of carapace width at that point, situated back about three-fifths of carapace length.

Ratio of eyes, anterior lateral:anterior median:posterior lateral:posterior median, 34:20:32:25. Anterior median eyes separated by twice their diameter, by four times their diameter from anterior laterals. Lateral eyes of each side separated by anterior lateral eye diameter. Posterior median eyes separated by five and one-half times their diameter, by their diameter from posterior laterals. Median ocular quadrangle wider than long (118/30), narrowed in front (118/40).

Sternum and labium 5.80 long, 4.00 wide. Anterior sternal depression equaling at branching point one-fourth of sternal width at that point. Cheliceral rastellum consisting of seven transverse rows of about seven stiff spines, two subterminal median strong cusps, and terminal row of five strong cusps on projecting lobe; transverse row of about 17 long spines above origin of fang. Cheliceral promargin with eight teeth, retromargin with 10 small teeth; 19 or 21 small denticles scattered between rows.

Leg formula 4312. Femur IV with dorsal series of 23 or 24 cusps arranged in three irregular rows at distal end. Patella III with anterodorsal series of 18 or 20, apical comb of seven or nine, and one or two retrolateral cusps. Leg cusps: palpal tibia, nine or 10 prolateral, six or seven retrolateral; tibia I, six or nine prolateral, nine or 12 retrolateral, zero or one ventral; tibia II, zero or one prolateral, five or eight retrolateral, zero ventral; tibia III, 10 or 13 prolateral, six or eight retrolateral, four or seven dorsal; metatarsus I, 16 or 19 prolateral, 22 or 24 retrolateral; metatarsus II, 13 or 16 prolateral, 10 or 12 retrolateral; metatarsus III, nine or 10 prolateral, eight retrolateral; metatarsus IV, six prolateral, two retrolateral, apical comb of three; palpal tarsus, 17 prolateral, 12 or 13 retrolateral; tarsus I, six or seven prolateral,

five or six retrolateral; tarsus II, five or seven prolateral, five retrolateral. Tibia I 1.7, tibia III 1.4 times as long as greatest width. Palpal claw with one tiny denticle distal to long tooth bearing one ventral denticle; claws of legs I and II with one denticle distal to large tooth bearing ventral denticle; proclaw of leg III with ventral denticle, retroclaw with long tooth only; both claws of leg IV with ventral denticle. Measurements:

	I	II	III	IV	Palp
Femur	4.26	3.92	3.71	5.11	2.99
Patella	2.63	2.53	2.52	2.66	1.73
Tibia	2.52	2.27	1.98	3.28	1.84
Metatarsus	2.16	2.20	2.59	3.92	—
Tarsus	0.86	0.94	1.66	1.44	2.27
Total	12.43	11.86	12.46	16.41	8.83

Abdomen 8.39 long, 5.54 wide. Spinneret segments bearing patches of around three, 13, and six ventral tubercles. Epigynum with transverse posterior bulge and pair of posterolateral darkened elevations (fig. 3). Bursae copulatrix with transverse median openings leading to short, angular, medially directed spermathecae (fig. 4).

MATERIAL EXAMINED: Only the holotype from Panama.

LITERATURE CITED

Platnick, Norman I., and Mohammad U. Shadab
1976. A revision of the mygalomorph spider genus *Neocteniza* (Araneae, Actinopodidae). Amer. Mus. Novitates, no. 2603, pp. 1–19, figs. 1–32, table 1.

Spitting Spiders (Araneae, Scytodidae, *Scytodes*) from Central America

CARLOS E. VALERIO[1]

ABSTRACT

The seven species of *Scytodes* known from Central America are diagnosed and illustrated, three being described as new (*S. gertschi* from Panama and *S. diminuta* and *S. uligocetes* from Costa Rica). The male of *S. intricata* Banks is described for the first time. *Scytodes bajula* Simon, *S. hebraica* Simon, *S. nannipes* Chamberlin and Ivie, and *S. torquatus* Kraus are newly synonymized with *S. fusca* Walckenaer.

INTRODUCTION

The primitive spiders of the genus *Scytodes* are well known for their habit of throwing, at considerable distance, a sticky substance from the chelicerae (Gertsch, 1979; McAlister, 1960). This behavior is present in all species (so far as known), but absent in the well-known genus *Loxosceles* (Gertsch, 1967) and in its close relative *Drymusa* (Valerio, 1974).

Some species have adapted to life in human dwellings (*S. longipes, S. fusca*), and one is common on outside walls and surroundings (*S. intricata*), whereas those occurring in the field are found on vegetation (*S. championi*), under logs and rocks, or in forest litter (the new species described in this paper). All seem to be mostly nocturnal, hiding during the day in crevices or holes, or lying flat against the substrate. The two domestic species treated here exhibit considerable morphological variation, have a wide geographical range, and, in Central America, are found in a variety of microhabitats away from buildings.

The internal genitalia of females are useful taxonomic characters at the species level, which is not the case in other related groups (Beatty, 1970). In disagreement with Brignoli (1976), I think that the sclerotized ridges, posterior to the genital groove in females, are also valuable specific features, particularly their relative size and position. These structures have been called "positioning ridges" (Gertsch, 1958), "foveae" (Gertsch, 1967), and "scutulae" (Brignoli, 1976), among other terms.

The name "scutulae" as used by Brignoli seems inappropriate, because in some species the ridges are not associated with any chitinous areas. I am using the term "positioning ridge" for the thickened longitudinal structure and "foveae" for the depressed chitinous areas located laterally to the ridge (figs. 10–12).

The male palpal bulb can be diagnostic in some species (e.g., *S. championi*) or confusingly similar among other species (e.g., *S. intricata* and *S. longipes*).

Drawings are made based on sketches from a copying camera adapted to a stereomicroscope. All measurements are given in millimeters. Principal types are deposited in the Museo de Zoología, Universidad de Costa Rica (MZUCR) and paratypes in the Museum of Comparative Zoology (MCZ) and the American Museum of Natural History (AMNH).

The following persons kindly provided col-

[1] Associate Professor, Escuela de Biología, Universidad de Costa Rica, Ciudad Universitaria, Costa Rica.

lections for study: Drs. Max Vachon (Muséum National d'Histoire Naturelle, MNHN), F. R. Wanless (British Museum, Natural History, BMNH), Herbert W. Levi (MCZ), and Norman I. Platnick (AMNH). I am indebted to Norman I. Platnick for his critical review of the manuscript.

GENUS *SCYTODES* LATREILLE

Scytodes Latreille, 1804, p. 134 (types species by monotypy *Aranea thoracica* Latreille).
Scytoda Simon, 1864, p. 45 (illegal orthographic change).
Dictis L. Koch, 1872, p. 294 (type species by monotypy *D. striatipes* L. Koch). First synonymized by Simon, 1893, p. 427.

DIAGNOSIS: *Scytodes* can be distinguished from the other two valid genera in the family (*Drymusa* and *Loxosceles*) by the following combination of characters: tarsi with three claws, leg formula 1243, carapace arched, lacking grooves or pits; male palpal bulb located near base of tarsus (not at the tip); female with a pair of chitinous ridges located posterior to genital groove (positioning ridges), in some cases associated with lateral chitinous depressions (foveae).

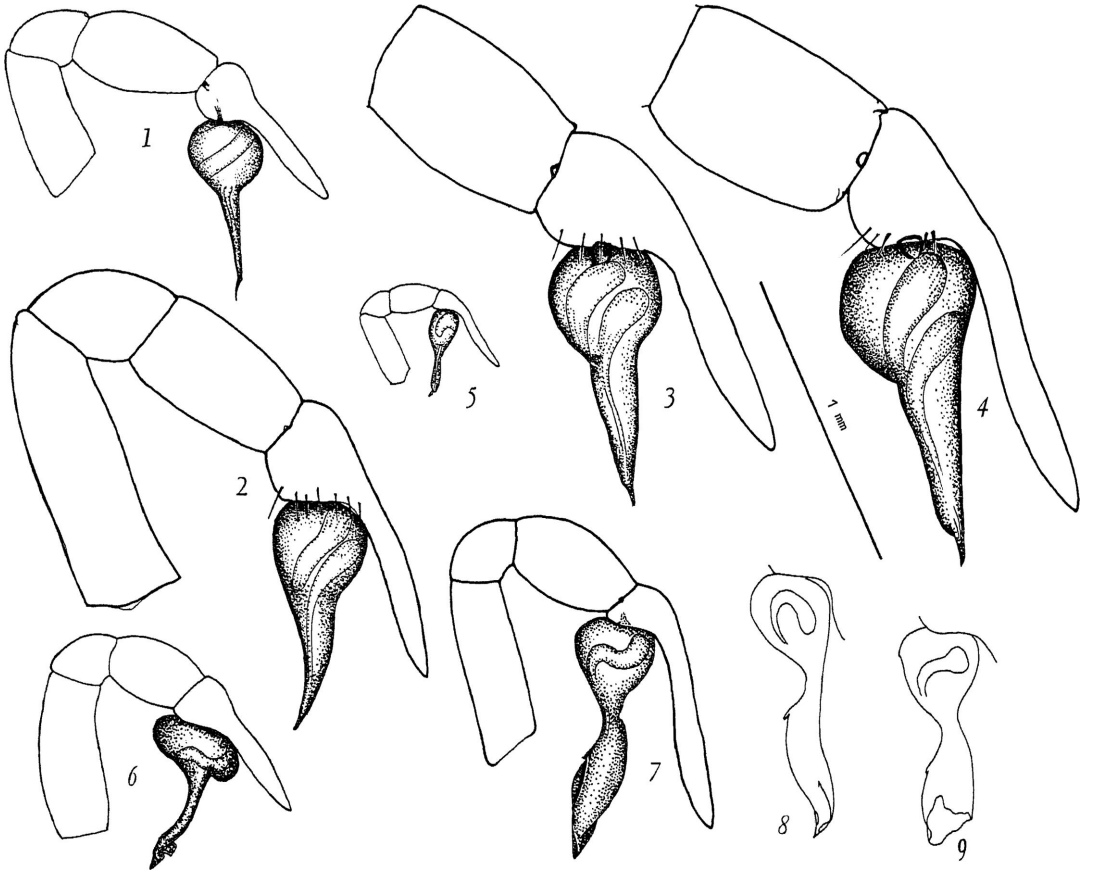
SPECIES GROUPS: The female genitalia clearly indicate three different groups of Central American species: 1) *S. intricata, S. longipes,* and *S. uligocetes* possess large oval foveae, lateral to the positioning ridges, and, internally, a large atrium with one or two relatively small seminal receptacles on each side (figs. 11, 12, 18); 2) *S. fusca,* with circular foveae, a very reduced atrium, and small seminal receptacles (one on each side) with recurved pedicels (fig. 10); and 3) *S. championi, S. diminuta,* and *S. gertschi,* with widely separated positioning ridges, with no foveae, a depressed atrium, and large seminal receptacles, one on each side, with slender pedicels. Also, in these three species there is a chitinous plate, additional to the positioning ridge, located just anterior to the genital groove (figs. 13–17).

The males in group 1 have very similar palpi, almost indistinguishable in shape among the three species, whereas in group 3 considerable interspecific variation is observed in the shape of the bulb.

The species in group 1 are long-legged, leg I being 8 or more times as long as the carapace in females, and 10.5–17 or more times as long in males. The species in group 3 are short-legged, leg I being 4.5 times the carapace length or less in females, 10 times or less in males. *Scytodes fusca* is a short-legged species.

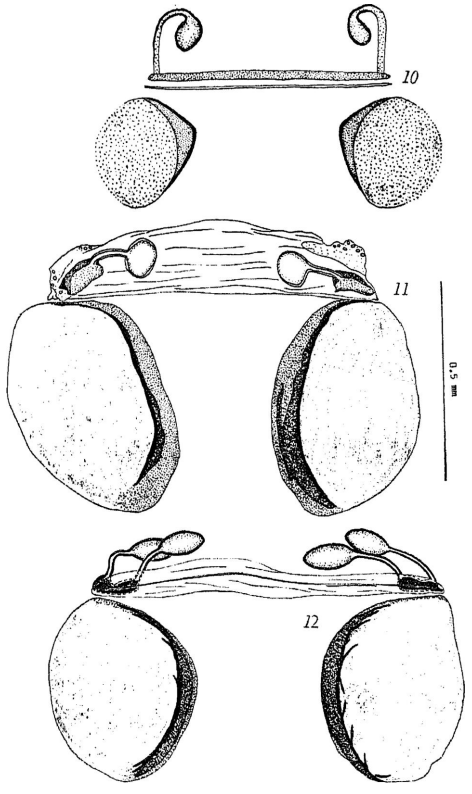
KEY TO SPECIES OF *SCYTODES* IN CENTRAL AMERICA

1. Males 2
   Females 8
2. Bulb simple and styliform (figs. 1–4) 3
   Bulb distally rounded, twisted, or otherwise modified 6
3. Bulb shorter than 0.65 mm., with a slender terminal portion (fig. 1); leg I shorter than 20 mm.; all legs uniformly colored; abdomen with pale and dark transverse bands ..... *fusca*
   Bulb longer than 0.65 mm. and bulkier; leg I longer than 30 mm.; legs annulated; abdomen pale, irregularly marked with brown 4
4. Bulb curved ventrally (fig. 2); leg I 16 times longer than carapace ..... *uligocetes*
   Bulb straight; leg I less than 13 times the length of the carapace 5
5. Bulb shorter than 0.7 mm.; length of tibia-patella I less than 13 mm. (7.0 to 12.2) ..... *intricata*
   Bulb longer than 0.7 mm.; length of tibia-patella I more than 13 mm. (13.5 to 18.0) ..... *longipes*
6. Bulb shorter than 0.4 mm., straight and rounded at apex (fig. 5); carapace shorter than 1.5 mm. ..... *diminuta*
   Bulb longer than 0.5 mm., curved ventrally, keeled and grooved; carapace longer than 1.8 mm. 7
7. Bulb 0.5–0.6 mm. in length, with a slender tubular portion and a serrated keel at the tip (fig. 30); leg I shorter than 12 mm.; carapace dark colored ..... *gertschi*
   Bulb longer than 0.7 mm., with distal portion expanded (fig. 7); leg I longer than 13 mm.; carapace pale ..... *championi*
8. Positioning ridges and foveae present (figs. 10–13) 9
   Positioning ridges prominent, foveae absent (figs. 14–16) 12



FIGS. 1–9. Right male palpal bulb, lateral view. 1. *Scytodes fusca* Walckenaer. 2. *S. uligocetes,* new species. 3. *S. intricata* Banks (from the Central Valley, Costa Rica). 4. *S. longipes* Lucas. 5. *S. diminuta,* new species. 6. *S. gertschi,* new species. 7. *S. championi* F. O. P.-Cambridge (from Barro Colorado Island, Panama). 8. *S. championi* (variant, from Barro Colorado Island, Panama). 9. *S. championi,* broken, probably due to copulation.

9. Atrium reduced, pedicel (or stalk) of seminal receptacles recurved (fig. 10); positioning ridges separated from each other by nearly twice the width of one fovea; leg I shorter than 15 mm. ..... *fusca*
   Atrium large, pedicel of seminal receptacles straight or slightly curved; positioning ridges separated from each other by the width of one fovea or less; leg I longer than 25 mm. 10
10. Atrium oriented vertically, not covering seminal receptacles in dorsal view; seminal receptacles oblong; positioning ridges separated from each other by the width of one fovea (fig. 12) ..... *intricata*
    Atrium oriented longitudinally, lying flat against ventral cuticle, normally covering seminal receptacles; seminal receptacles rounded; positioning ridges separated from each other by one half the width of one fovea 11
11. Two seminal receptacles on each side of atrium; fovea longer than 0.65 mm. (fig. 13) ..... *longipes*
    One seminal receptacle on each side of atrium; fovea shorter than 0.60 mm. (fig. 11) ..... *uligocetes*
12. Carapace shorter than 1.5 mm., leg I shorter than 4 mm. ..... *diminuta*



FIGS. 10–12. Female genitalia, dorsal view. 10. *Scytodes fusca* Walckenaer. 11. *S. uligocetes*, new species. 12. *S. intricata* Banks (from the Central Valley, Costa Rica).

Carapace more than 2.0 mm.; leg I more than 4 mm. 13

13. Anterior edge of atrium sclerotized; diameter of seminal receptacle much shorter than length of positioning ridge (fig. 14); carapace dark, 2 mm. or less in length; leg I shorter than 8.5 mm. ..... *gertschi*

Anterior edge of atrium not sclerotized; diameter of seminal receptacle longer than length of positioning ridge (fig. 16); carapace pale, 2.5 mm. or more in length; leg I longer than 9.5 mm. ..... *championi*

Scytodes fusca Walckenaer

Figures 1, 10, 19–20

Scytodes fusca Walckenaer, 1837, p. 272 (male and female syntypes from Cayenne, French Guiana, in MNHN, lost).

Scytodes hebraica Simon, 1891, p. 568 (juvenile female holotype from St. Vincent, in BMNH, examined; adults mentioned by F. O. P.-Cambridge, 1899, not found). F. O. P.-Cambridge, 1899, p. 50. NEW SYNONYMY.

Scytodes bajula Simon, 1891, p. 569 (male holotype from St. Vincent, in BMNH, examined). NEW SYNONYMY.

Scytodes nannipes Chamberlin and Ivie, 1936, p. 8 (female holotype from Barro Colorado Island, Canal Zone, Panama, in AMNH, examined; synonymy recommended by W. J. Gertsch in a label kept with the specimen). Bonnet, 1958, p. 3987 (*S. nanipes*). NEW SYNONYMY.

Scytodes torquatus Kraus, 1955, p. 12 (male holotype from Cutuco, La Union, El Salvador, in Natur-Museum Senckenberg, not examined; paratypes in AMNH, examined). NEW SYNONYMY.

DIAGNOSIS: The male palpal bulb is styliform and very slender distally (fig. 1); the female genitalia have a reduced atrium, the stalk of the seminal receptacle recurved, and the foveae nearly circular (fig. 10).

MALE: Carapace 2.4 long (2.2–2.6). Leg lengths: I 14.7 (13.3–16.2), II 12.3 (10.9–13.8), III 7.9 (6.7–9.3), IV 11.1 (10.0–12.5). Bulb 0.6 long. Legs uniformly yellowish, carapace as in figure 19, abdomen with transverse light and dark bands.

FEMALE: Carapace 2.8 long (2.5–3.1). Leg lengths: I 9.9 (9.0–10.8), II 8.1 (7.5–8.9), III 5.7 (5.5–6.1), IV 7.5 (6.5–8.8). Legs and body uniformly dark (fig. 20), few specimens with faint pattern similar to male. Immatures as in male.

MATERIAL EXAMINED: Abundant material from many localities in MZUCR, mainly Panamanian specimens in AMNH and MCZ.

DISTRIBUTION: Pantropical, ubiquitous in Central America.

NATURAL HISTORY: Specimens are commonly associated with human dwellings, where they seem to compete with *Theridion rufipes* (Theridiidae), but are also frequent in the field in hollow tree trunks, under loose bark, and in nests of small mammals. The species is reproductively active throughout the year, having from 19 to 24 eggs per sac.

SYNONYMY: The type material of each of the four specific names here synonymized with *S. fusca* fits the diagnosis given above for this pantropical species.

Scytodes uligocetes, new species
Figures 2, 11, 21

TYPES: Male holotype and female allotype from Laguna Bosque Alegre, on the northern slope of Volcán Poás, Alajuela Province, Costa Rica (September 10, 1978; C. E. Valerio), deposited in MZUCR.

ETYMOLOGY: The name is a combination of Greek roots referring to the microhabitat of the species.

DIAGNOSIS: The male palpal bulb is simple and somewhat similar to that of *S. intricata* and *S. longipes*, but is curved ventrally (fig. 2). The atrium has a single seminal receptacle on each side and foveae less than 0.6 mm. in length, separated from each other by one half their width (fig. 11).

MALE: Carapace 3.0 long. Leg lengths: I 50.0, II 38.0, III 23.5, IV 32.0. Bulb 0.73 long. Legs pale with dark rings; carapace very dark, similar to some darker specimens of *S. intricata* but without pale central area (fig. 21). Abdomen dark.

FEMALE: Carapace 3.0 long. Leg lengths: I 35.5, II 25.5, III 17.5, IV 24.5. Coloration similar to that of male (fig. 21).

MATERIAL EXAMINED: Only the types.

DISTRIBUTION: Known only from the type locality in a middle-elevation (premontane) rain forest.

NATURAL HISTORY: Specimens were collected in an extremely humid microhabitat under rocks on a lake shore. Early immatures were associated with the female in September.

Scytodes intricata Banks
Figures 3, 12, 22, 23

Scytodes intricata Banks, 1909, p. 196 (female holotype from Costa Rica, in MCZ, examined). Reimoser, 1940, p. 334.

DIAGNOSIS: The male palpal bulb is simple and straight (fig. 3), similar to that of *S. longipes* but shorter, 0.64 on the average (0.83 in *S. longipes*). The atrium is oriented vertically, exposing oblong seminal receptacles; the foveae are separated from each other by almost their width (fig. 12).

MALE: Carapace 3.5 long. Leg lengths: I 38.5, II 29.0, III 17.5, IV 25.0. Bulb 0.64 long (0.62–0.66). Legs annulated, carapace variable in coloration (figs. 22, 23).

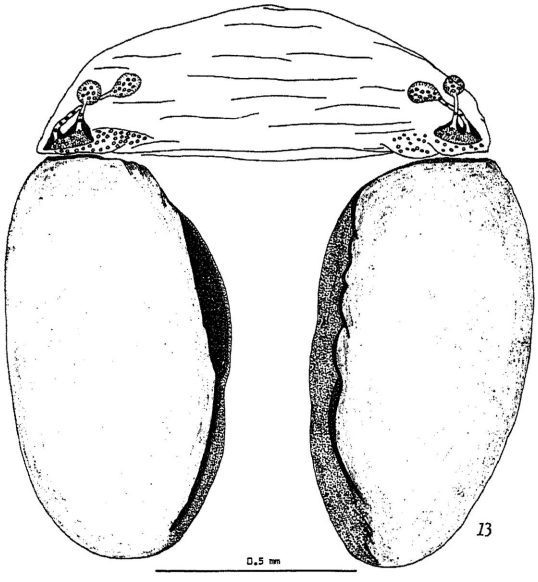


FIG. 13. *S. longipes* Lucas, female genitalia, dorsal view.

FEMALE: Carapace 3.2 long (3.0–3.5). Leg lengths: I 25.3 (23.0–29.5), II 19.0 (16.5–23.0), III 13.0 (12.0–15.0), IV 17.0 (15.0–20.0). Coloration variable, as in male.

MATERIAL EXAMINED: Abundant material from many Costa Rican localities and from Panama (Chilibre, Volcán Chiriquí, and Canal Zone).

DISTRIBUTION: Previously known only from Costa Rica, but recorded here from Panama. The report of its presence in Texas (Gertsch and Davis, 1937) seems based on an erroneous identification (Brown, 1973).

NATURAL HISTORY: Specimens are abundant in the field in a variety of protected microhabitats, mainly under logs, in hollow tree trunks, and rarely found in houses. The species is reproductively active throughout the year, with from 46 to 71 eggs per sac, and is often parasitized by a scelionid wasp.

Scytodes longipes Lucas
Figures 4, 13, 24–26

Scytodes longipes Lucas, 1844, p. 72 (holotype from Mexico, in MNHN, lost). F. O. P.-Cam-

bridge, 1899, p. 50. Reimoser, 1940, p. 334. Kraus, 1955, p. 13.

DIAGNOSIS: The male palpal bulb is simple and straight (fig. 4), similar to that of *S. intricata* but longer, 0.83 on the average (0.64 in *S. intricata*). The foveae are very long, 0.7 or more, and the positioning ridges are close to each other (fig. 13).

MALE: Carapace 4.0 long (3.5–4.5). Leg lengths: I 48.5 (43.5–58.0), II 37.3 (33.0–44.0), III 23.7 (20.0–28.0), IV 33.2 (29.0–39.5). Bulb 0.84 long (0.75–0.97). Variation in length of bulb considerably larger than in other species. Legs pale with dark rings and spots, color design of carapace highly variable (figs. 24–26), similar to that of *S. intricata*.

FEMALE: Carapace 4.0 long (3.5–4.5). Leg lengths: I 34.6 (31.0–39.0), II 27.1 (25.5–30.5), III 18.2 (16.5–20.0), IV 24.5 (22.5–28.0). Coloration as in male. Atrium lies against ventral cuticle, normally this area swollen (seen from outside) to fit atrium (fig. 13).

MATERIAL EXAMINED: Many specimens from Panama and Costa Rica, some from Nicaragua, Honduras, and El Salvador.

DISTRIBUTION: Very common in the Neotropics, and probably pantropical in distribution (depending on the identity of *S. marmorata*; see discussion in Bonnet, 1958, p. 3985).

NATURAL HISTORY: Specimens are common inside buildings everywhere in Central America, and occasionally found in the field, although not as commonly as *S. intricata*. Sacs contain from 37 to 40 eggs.

NOTE: In one population (collections number 204, 230, 266, and 501, MZUCR) all individuals show consistent differences from typical specimens. Males exhibit short bulbi about 0.70 long (longer than 0.75 in typical specimens) and females have smaller foveae about 0.62 long (average length 0.70 in typical specimens) with the positioning ridges irregularly curved. The legs are notably shorter but highly variable: in males, leg I 29.5–45.0, II 20.0–34.0, III 15.0–22.5, IV 19.0–30.5; in females, leg I 20.7–32.0, II 15.5–24.0, III 11.5–17.0, IV 15.5–22.5. These specimens were not used in computing the average measurements for the species. They all come from cloud forests and very humid microhabitats, whereas typical individuals prefer drier places. They might represent a different species but the details of the internal genitalia do not provide a sound base to establish this at the moment. They might instead represent hybrids between *S. longipes* and *S. intricata* or *S. uligocetes*. Until more detailed data on the biology of this population are available, I prefer to keep them as *S. longipes*.

Scytodes diminuta, new species
Figures 5, 14, 31–34

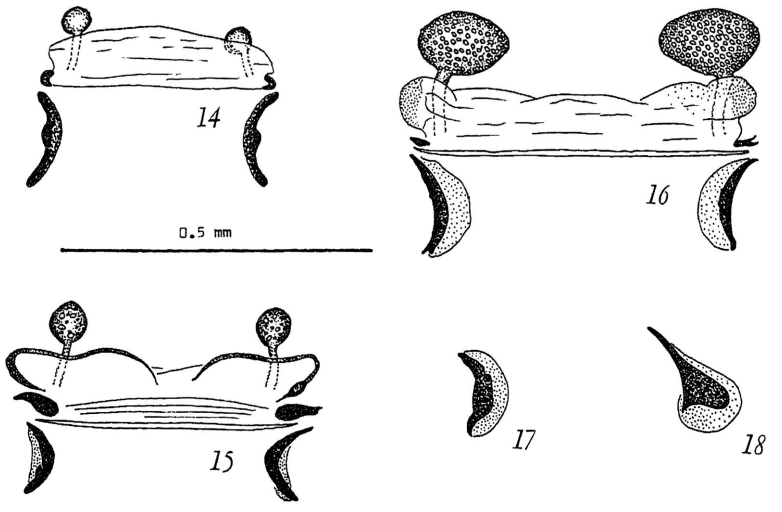
TYPES: Male holotype from Río Toro Amarillo, Guápiles, Limón Province, Costa Rica (March 1966; W. L. Brown), deposited in MCZ; female allotype from Rincón, Osa, Puntarenas Province, Costa Rica (March 2, 1967; C. E. Valerio), deposited in MZUCR.

ETYMOLOGY: The specific name is a derivation of a Latin root referring to the very small size of the species.

DIAGNOSIS: The male palpal bulb is spatulate distally (fig. 31), 0.3 in length. The total body length is 2.1 in the male, 2.4 in the female, being the smallest species of the genus, approached only by *S. lorenzoi* Alayón (1977) from Cuba. It differs from the Cuban species in the size and position of the chitinous ridges in the female and in the color pattern.

MALE: Carapace 1.1 long. Leg lengths: I 3.1, II 2.7, III 2.1, IV 2.9. Bulb 0.3 long, straight, spatulate distally (figs. 5, 31). Coloration similar to that of female.

FEMALE: Carapace 1.1 long. Leg lengths: I 3.8, II 3.1, III 2.7, IV 3.0. Carapace very arched, almost semicircular in outline viewed from side (fig. 32); general color yellowish brown, with brown pattern: two darker lines running back from lateral diads, one on each side, shortly joining pair of wider stripes coming from behind anterior diad parallel to mid-dorsal line and converging on center of prosoma into V-shaped apex; rest of color distributed in somewhat geometrical figures (fig. 33). Sternum unicolorous, lighter than



FIGS. 14–18. Female genitalia, dorsal view. 14. *S. diminuta*, new species. 15. *S. gertschi*, new species. 16. *S. championi* F. O. P.-Cambridge (from Chiriquí, Panama). 17. *S. championi*, right positioning ridge (from Tilarán, Costa Rica). 18. *S. championi*, right positioning ridge (from El Zamorano, Honduras).

carapace, 0.55 wide between coxae II, equal to length along midventral line; labium 0.14 wide at base, 0.11 long (fig. 34). Legs yellowish, lighter than carapace and sternum, femora and tibiae with brown rings. Opisthosoma darker than prosoma, with transverse stripes. Foveae lacking, positioning ridges present behind genital groove (fig. 13).

MATERIAL EXAMINED: Besides the types only one immature female is known, from the same locality as the female.

DISTRIBUTION: Probably restricted to lowland wet forests of the Atlantic coast and of the Osa Peninsula on the Pacific coast.

NATURAL HISTORY: The species seems to be restricted to leaf litter in primary forests. The long pedicel (fig. 33) suggests that it might be an ant-mimicking species, like many Salticidae, Clubionidae, and Theridiidae.

Scytodes gertschi, new species
Figures 6, 15, 27, 30

TYPES: Male holotype and female allotype from Barro Colorado Island, Canal Zone, Panama (June 1950; A. M. Chickering), deposited in MCZ; paratypes in MZUCR.

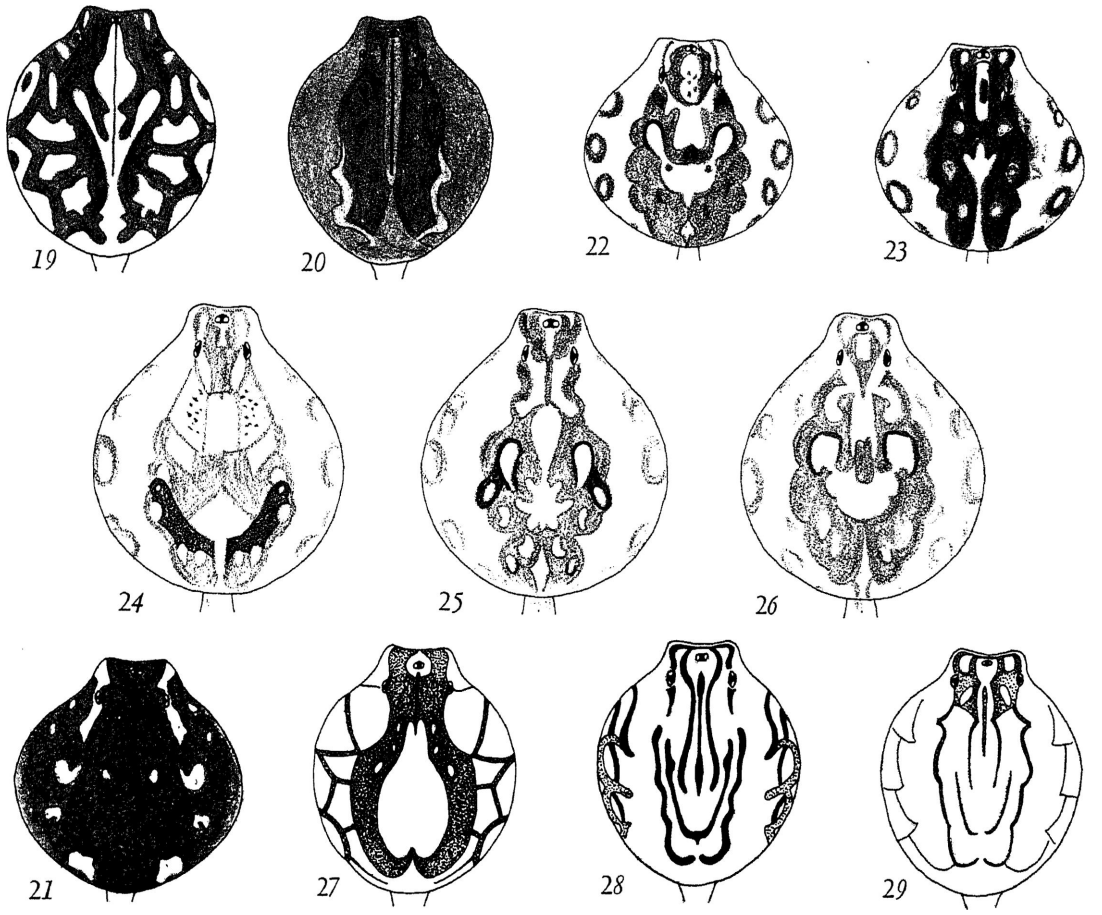
ETYMOLOGY: The species is named in honor of Willis J. Gertsch, in recognition of his major contributions to our knowledge of the family Scytodidae.

DIAGNOSIS: This species is close to *S. championi*, but is distinguished by the bulb having a tubular portion (fig. 6) and a terminal serrated keel (fig. 30). The seminal receptacles of the female are small, with their diameter shorter than the length of the positional ridge (fig. 14).

MALE: Carapace 2.0 long. Leg lengths: I 9.6, II 7.5, III 5.2, IV 7.2. Bulb 0.46 long. Medial side of femora dark, tibiae with two longitudinal bands, tarsi yellowish. Carapace with light central area surrounded by black, reticulated on sides (fig. 27). Abdomen with transverse bands. Bulb varies in length from 0.44 to 0.47.

FEMALE: Carapace 2.2 long (2.0–2.5). Leg lengths: I 7.7, II 6.3 (6.1–6.5), III 5.1 (4.9–5.2), IV 6.3 (6.1–6.4). Similar to male in coloration. Genitalia as in *S. diminuta* and *S. championi*, lacking foveae, positioning ridges very far apart (fig. 15).

MATERIAL EXAMINED: Several collections in MCZ, all from Barro Colorado Island, and some specimens in AMNH from the same locality.



FIGS. 19–29. Carapace, dorsal view (not to scale). 19. *Scytodes fusca* Walckenaer, male. 20. *S. fusca*, female. 21. *S. uligocetes*, new species. 22, 23. *S. intricata* Banks. 24–26. *S. longipes* Lucas. 27. *S. gertschi*, new species. 28. *S. championi* F. O. P.-Cambridge, from Tilarán, Costa Rica (lowland). 29. *S. championi*, from near La Gloria, Costa Rica (1500 m.).

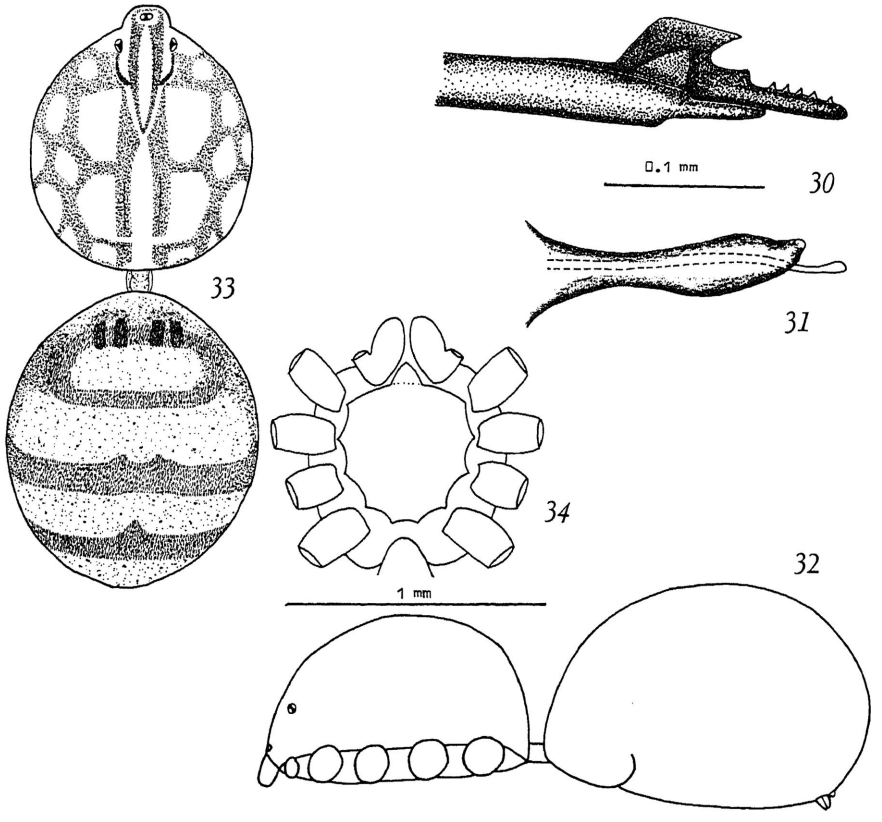
DISTRIBUTION: Known only from the type locality in Panama.

Scytodes championi F. O. P.-Cambridge
Figures 7, 16–18, 28, 29

Scytodes championi F. O. P.-Cambridge, 1899, p. 51 (male and female syntypes from Chiriquí, Panama, in BMNH, examined). Banks, 1909. Reimoser, 1939.

DIAGNOSIS: This species might be identical with *S. guttipes* Simon from Venezuela (see discussion). It can be distinguished from all other Central American species by its pale color, the distally twisted and expanded male palpal bulb (fig. 7), and large seminal receptacles (fig. 16).

MALE: Carapace 2.3 long (2.0–2.6). Leg lengths: I 20.9 (20.5–21.4), II 14.3 (14.0–14.5), III 10.1 (9.1–11.0), IV 13.0 (12.7–13.3). Bulb 0.68 long (0.56–0.63), considerable variation observed even in same population (figs. 15, 16), often breaks at middle of distal portion (fig. 17). Legs yellowish with brown or pinkish spots, femora and tibiae with longitudinal dark lines. Carapace pale with V-shaped pattern in central area (fig. 28). Abdomen pale with transverse dark bands.



FIGS. 30–34. 30. *Scytodes gertschi,* new species, tip of right male palpal bulb, lateral view. 31–34. *S. diminuta,* new species. 31. Tip of right male palpal bulb, lateral view. 32. Profile of body. 33. Color pattern, dorsal view. 34. Prosoma, ventral view.

FEMALE: Carapace 2.7 long (2.5–3.0). Leg lengths: I 11.3 (9.9–13.5), II 8.5 (7.3–10.1), III 5.8 (5.3–6.5), IV 8.3 (7.2–10.0). Color as in male, specimens from higher altitudes (1500 m.) show very faint pattern on the carapace (fig. 29). Large variation observed in shape of positioning ridges (figs. 16–18).

MATERIAL EXAMINED: Abundant material from Panama (Barro Colorado and Volcán Chiriquí), Costa Rica (many localities), Honduras (Lancetilla Valley and Zamorano), and a few specimens from Guatemala; the Mexican material studied by Cambridge has not been examined. Many Panamanian specimens in MCZ and AMNH were identified as *S. guttipes* by Gertsch (see below).

DISTRIBUTION: Common in Central America, probably in Mexico, and if identical with *S. guttipes,* the species ranges into South America.

DISCUSSION: All specimens identified as *S. guttipes* that I have studied are identical with *S. championi.* I have not been able to locate the types of the first species (they might be lost) and prefer to keep the name *S. championi* for the Central American forms until a general revision of the genus is done (*S. guttipes* Banks, 1893, would have priority over *S. championi*).

NATURAL HISTORY: These spiders are found in vegetation, sometimes associated with flowers.

LITERATURE CITED

Alayón, Giraldo
1977. Nuevas especies de *Scytodes* Latreille, 1804 (Araneae: Scytodidae) de Cuba. Poeyana, no. 177, pp. 1–20.

Banks, Nathan
1909. Arachnida from Costa Rica. Proc. Acad. Nat. Sci. Philadelphia, vol. 61, pp. 194–234, pls. 5, 6.

Beatty, Joseph A.
1970. The spider genus *Ariadna* in the Americas (Araneae, Dysderidae). Bull. Mus. Comp. Zool., vol. 139, pp. 433–517, figs. 1–56.

Berland, Lucien
1924. Araignées de la Nouvelle Calédonie et des îles loyalty. Nova Caledonia, Zoologie, vol. 3, pp. 159–255.

Bonnet, Pierre
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4230.

Brignoli, Paolo Marcello
1976. Beitrage zur kenntnis der Scytodidae (Araneae). Ann. Soc. Suisse Zool., vol. 83, pp. 125–191, figs. 1–115.

Brown, Katherine M.
1973. A preliminary checklist of the spiders of Nacogdoches, Texas. Jour. Arachnol., vol. 1, pp. 229–240.

Cambridge, Frederick Octavius Picard-
1899. Arachnida—Araneida. *In* Godman, F. D., and O. Salvin, Biologia Centrali-Americana. London, vol. 2, pp. 48–52, pl. 4.

Chamberlin, Ralph V., and Wilton Ivie
1936. New spiders from Mexico and Panama. Bull Univ. Utah, vol. 25, no. 5, pp. 1–103, pls. 1–17.

Gertsch, Willis J.
1958. The spider genus *Loxosceles* in North America, Central America, and the West Indies. Amer. Mus. Novitates, no. 1907, pp. 1–46, figs. 1–97.
1967. The spider genus *Loxosceles* in South America (Araneae, Scytodidae). Bull. Amer. Mus. Nat. Hist., vol. 136, pp. 119–173, pls. 3–11.
1979. American Spiders, second edition. New York, Van Nostrand Reinhold. 274 pp., 32 pls.

Gertsch, Willis J., and L. Irby Davis
1937. Report on a collection of spiders from Mexico. I. Amer. Mus. Novitates, no. 961, pp. 1–29, figs. 1–44.

Koch, Ludwig
1872. Die Arachniden Australiens, nach der Natur beschrieben und abgebildet. Nurnberg, 1872, pp. 105–368.

Kraus, Otto H.
1955. Spinnen aus El Salvador. Abhandl. Senckenbergischen Naturf. Gesell., no. 493, pp. 1–112, pls. 1–12.

Latreille, Pierre A.
1804. Tableau méthodique des Insectes. Arachnides. Dictionnaire Hist. Nat., vol. 24, pp. 131–136.

Lucas, H.
1844. Notice sur une nouvelle espèce d'Araneida appartenant au genre *Scytodes* de M. Walckenaer. Rev. Zool., p. 72.

MacAlister, Wayne H.
1960. The spitting habit in the spider *Scytodes intricata* Banks (Family Scytodidae). Texas Jour. Sci., vol. 12, pp. 17–20.

Petrunkevitch, Alexander
1925. Arachnida from Panama. Trans. Connecticut Acad. Arts Sci., vol. 27, pp. 51–248, figs. 1–114.

Reimoser, Edvard
1940. Wissenschaftliche Ergebnisse der Österreichischen biologischen Expedition nach Costa Rica, die Spinnenfauna. Ann. Naturhist. Mus. Wien, vol. 50, pp. 328–384, figs. 1–14.

Simon, Eugène
1864. Histoire naturelle des Araignées. Paris, 540 pp., 207 figs.
1891. On the spiders of the Island of St. Vincent. I. Proc. Zool. Soc. London, pp. 549–575, pl. 42.
1893. Voyage de M. E. Simon au Venezuela. Arachnides. Ann. Soc. Ent. France, vol. 61, pp. 423–462, figs. 1–31.

Valerio, Carlos E.
1974. Prey capture by *Drymusa dinora* (Araneae, Scytodidae). Psyche, vol. 81, pp. 284–287, 1 fig.

Walckenaer, Charles A.
1837. Histoire naturelle des Insectes Aptére. Paris, vol. 1, 682 pp.

Studies on the Pholcidae, I. Notes on the Genera *Artema* and *Physocyclus* (Araneae)

PAOLO MARCELLO BRIGNOLI[1]

ABSTRACT

The genera of the Pholcidae are provisionally divided into two groups (one largely American and the other largely Old World) on the basis of male genitalic structure. The type species of *Artema* and *Physocyclus* are redescribed; the genera *Priscula* Simon and *Hypsorinus* Chamberlin are newly synonymized with *Physocyclus*. *Artema* includes only one unequivocally valid species, which may have been introduced into the Americas. *Physocyclus* is basically an American genus, with about 20 nominal species distributed from the United States to northern South America; apparently only the type species, *P. globosus* (Taczanowski), has been introduced into other parts of the world. Misplaced in the genus or not identifiable are six species; of these, *Physocyclus macrostylus* Mello-Leitão, from Argentina, is placed as the type species of the new genus *Gertschiola*, which is possibly related to *Blechroscelis* Simon but has unique female genitalia.

INTRODUCTION

I began work on a revision of the Pholcidae about 10 years ago, more or less in the style of H. W. Levi's papers on the Theridiidae, but after a comparatively short time had to abandon the project because too many important types were unavailable.

The invitation to contribute to this volume prompted me to re-examine the notes I took some years ago. Even if my conclusions are in some cases preliminary, I believe that what is here published should prove useful in understanding a group represented in the Americas by an extremely large number of species that are extremely difficult to identify, even at the generic level, from the existing literature.

Like many other recent arachnologists, I consider as related only those species which share specialized structures (apomorphies); as in other families, in the Pholcidae the genitalia give the most obvious clues to affinities. Simon (1893a) examined (perhaps more accurately than in many other groups) the morphology of pholcid male genitalia; consequently, a large number of his genera appear to be justified. Unfortunately, in his generic keys—as always—only somatic characters are used. The result is that many of his genera (especially in the Blechroscelеae) appear extremely vague and have been interpreted in many different ways.

The system I propose here is purely provisional, as it is based primarily on examination of the male pedipalp; the structure of the vulva of too many type (and other) species is too poorly known to use in a comparable way.

A short description of the structure of the male pedipalp of the Pholcidae was published by Wiehle (1953); I follow his terminology. The structure of the vulva, as explicated by the same author (1933), though exact, is not easy to compare with what is seen in a normal preparation. It is sufficient here to note that in this family the dorsal and ventral surfaces of the uterus externus (bursa copulatrix) are limited by two more or less sclerotized lamellae; the anterior (cephalic) margin of each lamella is usually strongly sclerotized (sometimes also the posterior—

[1] Director, Zoological Institute, University of L'Aquila, L'Aquila, Italy.

caudal—margin may be more or less sclerotized). In a normal preparation in which the cleared vulva is examined on a slide, the two—anterior—sclerotized arches are always seen more or less superimposed and the limits between them are difficult to determine. Between the arches lies the passage to the uterus internus (a small sclerotized chamber, often with a spiral duct); dorsally to this passage may be a small "pocket," which Wiehle (1933) considered a spermatheca. In most species this spermatheca is not visible, and perhaps the whole uterus externus (the space between the lamellae) acts as a spermatheca, as happens (at least apparently) in some other haplogynes. On the weakly sclerotized part of the dorsal lamella are two usually roundish or elliptical structures which may be called "pore-plates."

I have examined representatives of most genera of the Pholcidae; by the structure of the male pedipalp they can be roughly divided into two groups: in the first, which includes genera better (or exclusively) represented in the Old World (such as *Pholcus, Holocnemus, Hoplopholcus, Smeringopus, Crossopriza,* etc.) the bulb is relatively complicated, as from it arise not only the embolus but also other structures of still unclear meaning (such as the uncus and appendix); in the second group, which seems to be limited to the New World (with few exceptions), the bulb is simpler, with the embolus more or less large, but with the other structures absent or less well developed.

One of the most evident parts of the pedipalp is the procursus (paracymbium); in the species of the first group it seems to be usually larger and very similar to a supplementary article (bearing hairs, etc.); in the second group, it is smaller and often curiously transformed (it becomes ribbon- or spine-like).

In the first group the vulva is relatively uniform; the sclerotized arches are always evident and usually straight (transverse to the major axis of the spider); in the second group, the vulva is sometimes transformed (the arches may be reduced and usually are more or less curved, delimiting a chamber that is longer than wide).

The chelicerae (especially of the male) usually are more transformed in the second group than in the first and bear an astonishing variety of (probably sensory) structures or even enormous spines. Finally, in most genera of the second group the abdomen is more or less rounded (or triangular and elevated), whereas in the first group usually it is elongated, oval, or sausage-shaped.

As mentioned, this system is purely provisional; there are a few genera (including all Ninetidinae) which I have not examined; given our current state of knowledge, it is impossible to conclude anything about the affinities between these two groups.

I am indebted to the following curators who have lent types or other material: Drs. O. Blanco, Museo de la Plata (MLP), M. Hubert, Muséum National d'Histoire Naturelle, Paris (MNHN), H .W. Levi, Museum of Comparative Zoology, Harvard University (MCZ), E. Sutter, Naturhistorisches Museum Basel (NMB). Dr. Norman I. Platnick read the manuscript and revised my English; my wife, Micha, helped in the preparation of the illustrations. All measurements are in millimeters.

ARTEMA WALCKENAER

Artema Walckenaer, 1837, p. 656 (type species, designated by Simon, 1893a, *Artema mauriciana* Walckenaer, = *Artema atlanta* Walckenaer according to Chrysanthus, 1967, p. 92).

DIAGNOSIS: To this genus belong very large pholcids with long and strong legs; the prosoma and eyes are not specialized; the chelicerae of the male bear anteriorly a very large, elongated (sensory?) ridge; the pedipalp of the male has a simple trochanter and a large, massive femur with no apophyses; the procursus is comparatively small and simple, with a triangular, unmodified ending; the bulb is very simple, with a short, sclerotized embolus, parallel to the procursus; no appendix is visible; a small specialized region on the bulb may be homologous to an uncus; the epigynum is sclerotized, with two roundish or oval "spots" anteriorly; the structure of the vulva is unknown (no specimen that I examined was sufficiently well

preserved for a detailed examination); the opisthosoma is roundish and elevated.

AFFINITIES: Judging by the structure of the male pedipalp and of the chelicerae, *Artema* is closely related to *Physocyclus*.

SPECIES: According to Chrysanthus (1967), with whom I agree, both *A. sisyphoides* (Doleschall) and *A. mauriciana* Walckenaer are synonyms of the type species. *Artema transcaspica* Spassky (Turkestan) and *A. magna* Roewer (Afghanistan), may both be synonyms of *A. doriai* (Thorell) from Iran; all these species are insufficiently known and their types are unavailable. *Artema kochi* Kulczyński (Etritrea) is of doubtful validity and, as noted by Chrysanthus (1967), may be a synonym of the type species. *Artema cretica* Roewer, sometimes placed in *Neartema*, is a synonym of *Hoplopholcus labyrinthi* (Kulczyński), according to Senglet (1971).

DISTRIBUTION: *Artema atlanta* is probably an introduced element in the Americas, judging by the relatively limited number of records (see below); as a whole, this very small genus seems to be an Old World element, which lends special interest to its evident affinities with the essentially American *Physocyclus*.

Artema atlanta Walckenaer

Figures 1–7

Artema atlanta Walckenaer, 1837, p. 656 (male and female syntypes from Brazil, probably lost). Chrysanthus, 1967, p. 92, figs. 15–19.

DIAGNOSIS: See generic diagnosis.

DESCRIPTION: Prosoma yellowish, with darkened grooves; clypeus much more vertical in female than male; opisthosoma whitish, with dark irregular spots (see Chrysanthus, 1967, fig. 16). Eye sizes and interdistances (more or less correspondent in both sexes): ALE, AME, PLE 18 (ratios, not absolute values), PME 16; ALE–AME 8, AME–AME 5, PLE–PME 10, PME–PME 20. Anterior row straight, posterior row slightly procurved.

MALE (from Tucson): Total length 9.40. Prosoma 4.4 long (clypeus 0.9), 4.25 wide.

	I	II	III	IV
Femur	17.8	13.0	10.8	14.0
Patella	1.8	1.6	1.4	1.6
Tibia	16.4	13.0	9.3	13.2
Metatarsus	24.4	17.8	14.9	19.3
Tarsus	3.8	2.5	2.3	2.4
Total	64.2	47.9	38.7	50.5

FEMALE (from Tucson): Total length 10.0. Prosoma 4.3 long (clypeus 0.7), 4.25 wide.

	I	II	III	IV
Femur	15.0	11.5	10.5	13.5
Patella	1.8	1.8	1.8	1.8
Tibia	16.0	11.8	8.5	11.8
Metatarsus	21.7	15.5	12.8	16.9
Tarsus	3.5	2.8	2.2	2.3
Total	58.0	43.4	35.8	46.3

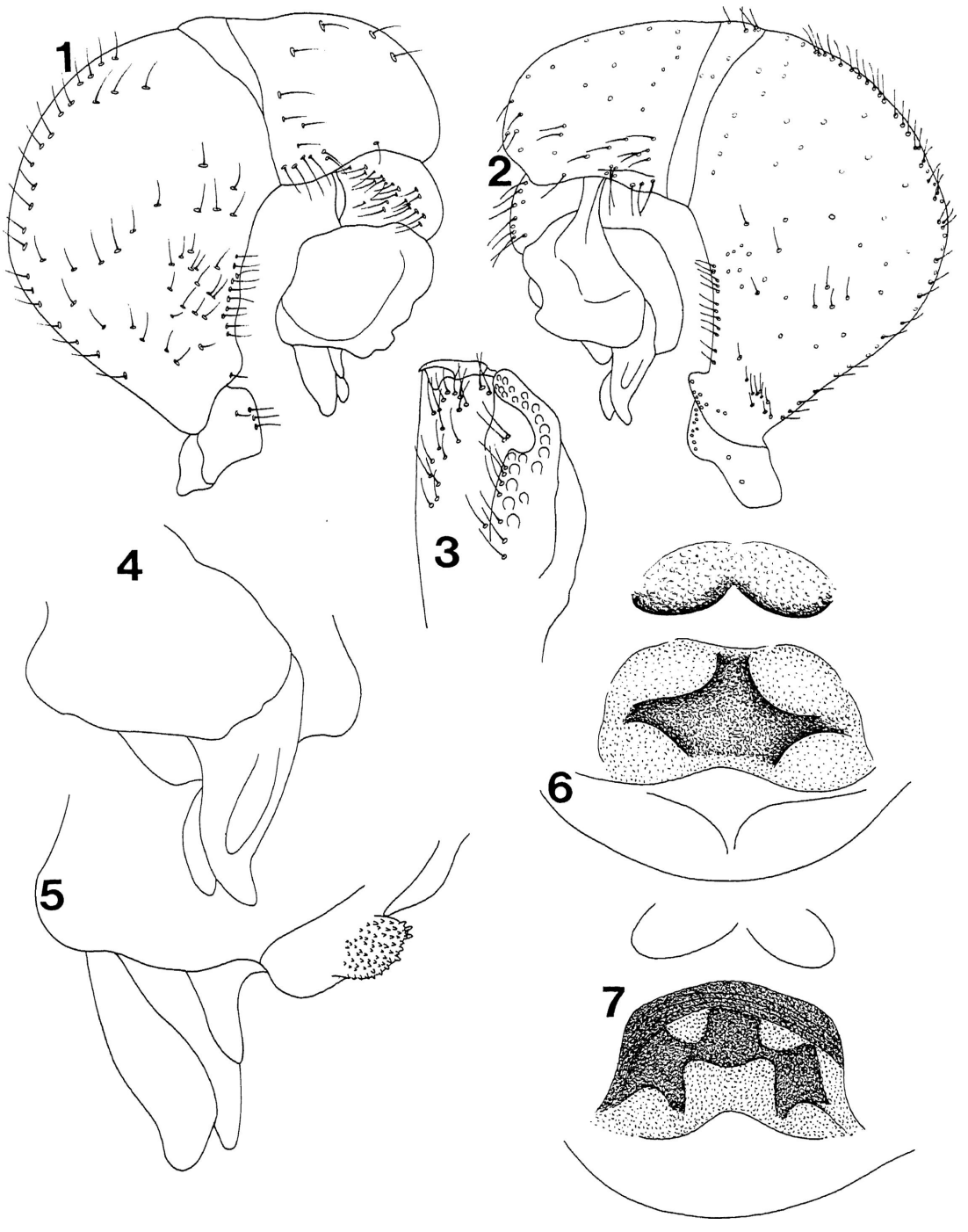
MATERIAL EXAMINED: **United States**: *Arizona:* Pima Co.: Tucson, July 1937 (NMB), 3♂, 4♀. **Mexico**: *Baja California Sur:* San José del Cabo, Sept. 1895 (Billa, MCZ), 1♂. **Brazil**: *Pará*, Oct. (Cook, MCZ), 1♀. **Egypt**: surroundings of Cairo, 1911 (E. Graeter, NMB), 2♀.

DISTRIBUTION: Bonnet (1955) listed a large number of Old World records; in the Palearctic region this species ranges from the southern and eastern Mediterranean (Greece, Turkey, Israel, Egypt, Libya) to southern Arabia; it is apparently known from the whole of tropical Africa and the Oriental region, up to southern China. There are also records from many Pacific islands. In the Americas, the species has been recorded from the United States to Paraguay, but the existing data, as a whole, are scanty and often very old. Even though this species is not easily confused with other pholcids, many old records should be checked.

PHYSOCYCLUS SIMON

Physocyclus Simon, 1893a, p. 470 (type species by original designation *Pholcus globosus* Taczanowski).

DIAGNOSIS: Medium-sized pholcids with the following combination of characters: long but not especially strong legs; eyes not specialized; prosoma, at least in female of type species, posteriorly somewhat elevated;



FIGS. 1–7. *Artema atlanta* Walckenaer. 1. Palp, prolateral view. 2. Palp, retrolateral view. 3. Chelicera, male, anterior view. 4. Palpal bulb, retrolateral view. 5. Palpal bulb, prolateral view. 6. Epigynum, ventral view. 7. Vulva, dorsal view, semischematic.

chelicerae of male with lateral elongated stridulatory ridge, often with sensory (?) "cones"; pedipalp of male with simple trochanter, large and massive femur with no apophyses or only small proximal one; procursus small, its ending pointed, even spinelike, more complex than in *Artema*; embolus very large, sclerotized; no appendix, sometimes with small uncus; epigynum sclerotized, usually complicated, with elevated prominence anteriorly, easily visible from side; vulva with large sclerotized arches tending to the shape of an inverted "V"; opisthosoma roundish, more or less elevated.

AFFINITIES: This genus is evidently related to *Artema,* from which it can be distinguished by the more complicated epigynum, the larger embolus, and the smaller size.

SPECIES: Tō this genus belong without doubt a considerable number of species distributed between the southwestern United States and the isthmus of Panama, such as *P. dugesi* Simon, *P. enaulus* Crosby, *P. tanneri* Chamberlin (I have seen material of these three species, not typical, determined by Simon and Gertsch), *P. cornutus* Banks, *P. mexicanus* Banks, *P. rotundus* O. P.-Cambridge, *P. californicus* Chamberlin and Gertsch, *P. neomexicanus* Chamberlin and Gertsch, *P. hoogstraali* Gertsch and Davis, and probably all seven species recently described by Gertsch (1971). Of the South American species, *P. dubius* Mello-Leitão seems a probable synonym of the type species.

UNCERTAIN SPECIES: Totally insufficient for any conclusion are the descriptions of the South American *P. muricola* Badcock and *P. viridis* Mello-Leitão; *P. difficilis* Mello-Leitão may be correctly placed in this genus.

MISPLACED SPECIES: *P. mysticus* Chamberlin belongs perhaps to *Psilochorus,* whereas *P. macrostylus* Mello-Leitão is here placed as the type species of the new genus *Gertschiola* (see below).

DISTRIBUTION: *Physocyclus,* as a whole seems an American element; only the type species, probably by passive transport, has become diffused over a large part of the world.

Physocyclus globosus (Taczanowski)
Figures 14–18, 21–24

Pholcus globosus Taczanowski, 1873, p. 105 (female syntypes from Cayenne, French Guyana, not examined).

Pholcus gibbosus Keyserling, 1877, p. 208, pl. VII, figs. 2–2a (female holotype from Santa Fe de Bogotá, Colombia, not examined). First synonymized by Simon, 1893a, p. 470.

Physocyclus globosus: Workman and Workman, 1896, p. 72, pl. 72. F. O. P.-Cambridge, 1902, p. 368, pl. 34, figs. 22a–b, 23. Chamberlin, 1921, p. 247, fig. 4. Petrunkevitch, 1929, p. 141, figs. 132–135.

Decetia incisa O. P.-Cambridge, 1898, p. 234, pl. 29, fig. 1 (female type from Teapa, Tabasco, Mexico, not examined). First synonymized by F. O. P.-Cambridge, 1902, p. 369.

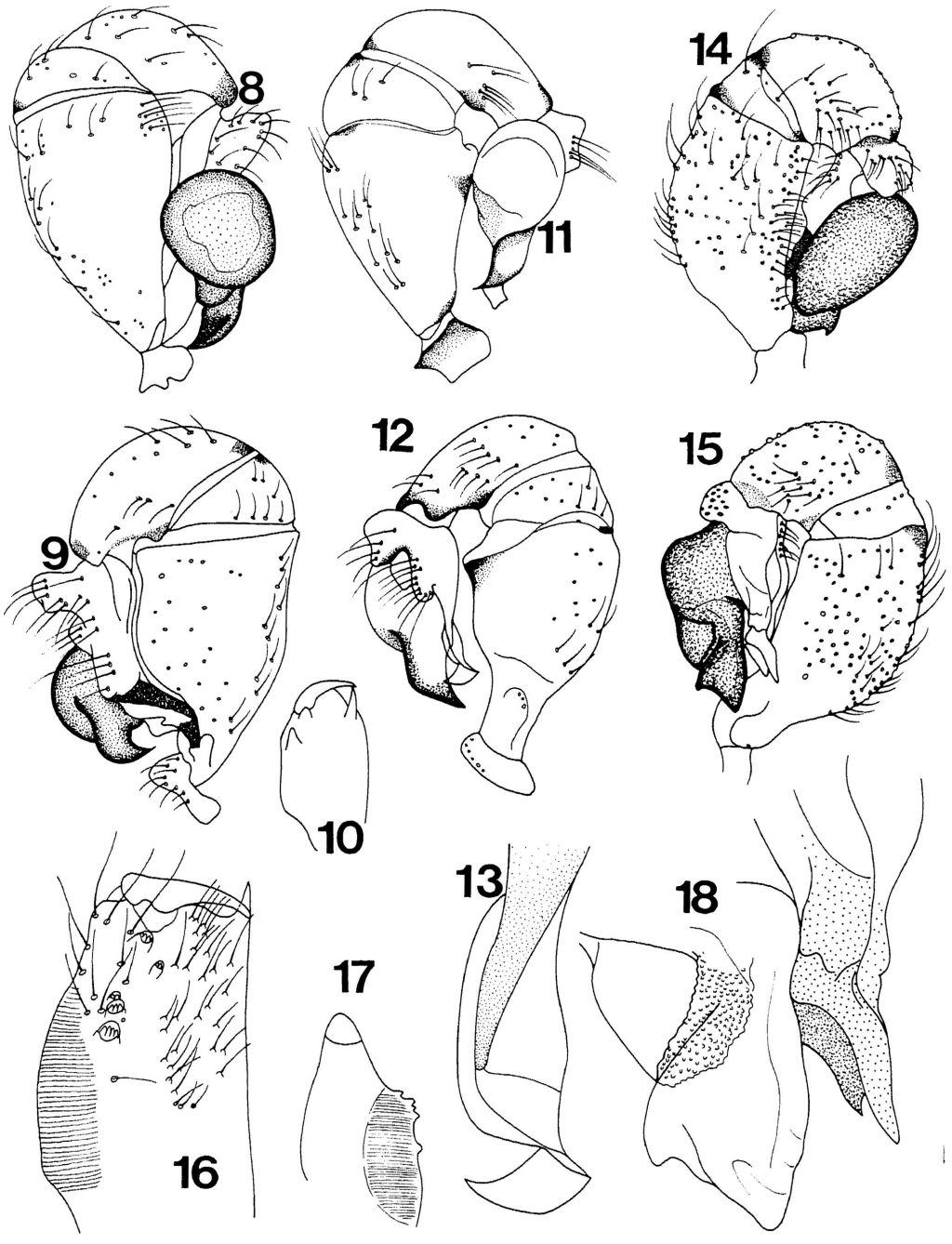
DIAGNOSIS: This species seems characterized by the posterior elevation of the prosoma in the female (illustrated by Keyserling, 1877, somewhat exaggerated), by the epigynum, and by the easily visible uncus (the illustrations by F. O. P.-Cambridge are exaggerated, and those by Petrunkevitch are too simplified). As I have not examined any typical material (which should still exist), I did not prepare a description.

MATERIAL EXAMINED: **Mexico**: *Veracruz:* La Buena Ventura (NMB), 1♂, 1♀. **Jamaica**: Kingston, museum basement, Nov. 9, 1963 (A. M. Chickering, MCZ), 1♀ **Colombia**: *Antioquia:* Medellín, La Estrella, 1962, Sept.–Oct. 1963, May–June 1964 (P. B. Schneble, MCZ) 1♂, 3♀, 10 juv. *Valle:* Cali, Jan. 1964 (P. B. Schneble, MCZ), 1♂, 2♀, 6 juv. **Brazil**: *Amazonas:* Egas, Rio Teffè, Nov.–Dec. 1919 (H. O. Parrish, MCZ), 1♂, 2♀, 6 juv. **New Caledonia**: Koné, Aug. 1911 (Roux and Sarasin, NMB), 1♀, 2 juv.

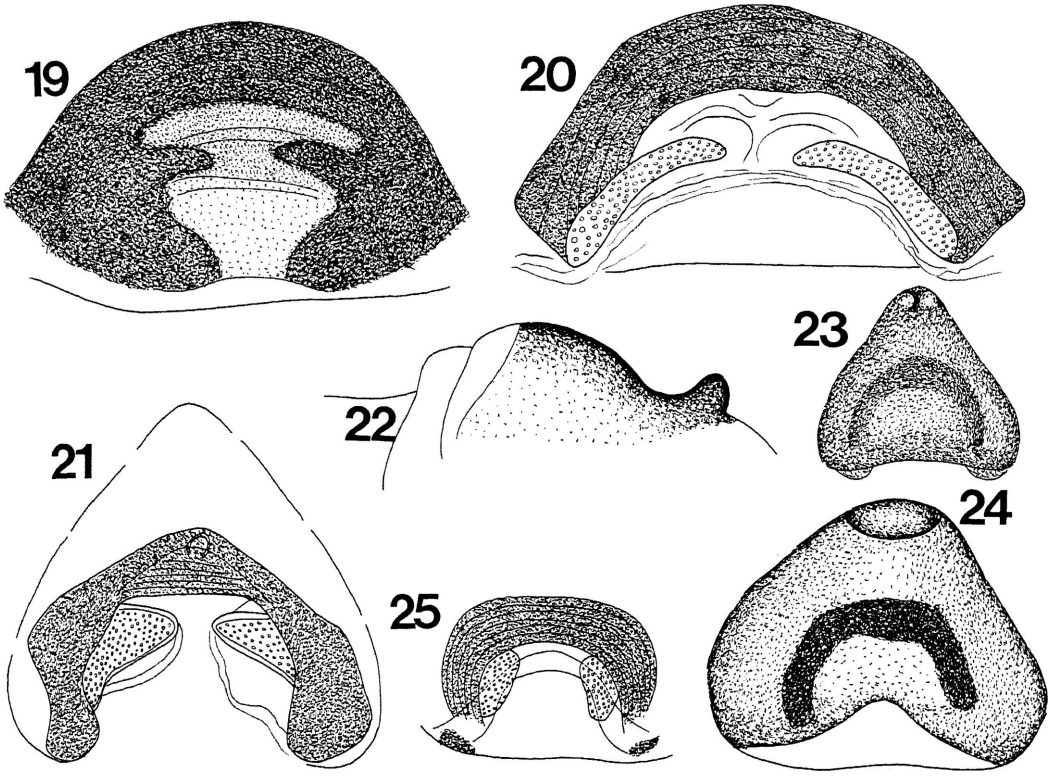
DISTRIBUTION: According to Bonnet (1958), this species is relatively common in the Americas, from the United States to Brazil (although most of the records are from Mexico and the West Indies); there are some (mostly old) records from the Oriental region and the Pacific islands, where it has almost surely been introduced.

PRISCULA SIMON

Priscula Simon, 1893a, p. 478 (type species by original designation *Priscula gularis* Simon).



FIGS. 8–18. 8–10. *Physocyclus gularis* (Simon). 11–13. *P. binghamae* (Chamberlin). 14–18. *P. globosus* (Taczanowski). 8, 11, 14. Palp, prolateral views. 9, 12, 15. Palp, retrolateral views. 10. Chelicera, schematic, not dissected. 16. Chelicera, anterior view. 17. Chelicera, lateral view, not dissected. 13. Procursus, terminal part. 18. Embolus and terminal part of procursus.



FIGS. 19–25. 19, 20, *Physocyclus binghamae* (Chamberlin). 21–24. *P. globosus* (Taczanowski). 25. *P. gularis* (Simon). 19. Epigynum, ventral view. 20, 21. Vulva, dorsal view. 22. Epigynum, lateral view. 23, 24. Epigynum, ventral view, two different "forms," not at the same scale. 25. Vulva, dorsal view, semischematic.

PLACEMENT: According to Simon (1893a), this genus is unique in the disposition of its eyes. By the structure of its genitalia, it cannot be distinguished from *Physocyclus*, with which I here synonymize it.

SPECIES: Evidently related with the type species (and belonging therefore to *Physocyclus*) are also *P. paeta* Simon and *P. venezuelana* Simon; wholly uncertain is the position of *Pholcus tigrinus* Taczanowski, which had been provisionally attributed to *Priscula* by Simon (1893a, p. 478, in footnote).

Physocyclus gularis (Simon), new combination
Figures 8–10, 25

Priscula gularis Simon, 1893b, p. 319 (male and female syntypes from Ecuador, in MNHN, examined).

DIAGNOSIS: A typical *Physocyclus* distinguishable by the structure of its genitalia.

DESCRIPTION: Prosoma whitish, with darkened grooves, not elevated in either sex, opisthosoma with traces of reticulate irregular pattern and small white spots. Eye sizes and interdistances: ALE, PLE 16 (ratios), PME 12, AME 5; ALE–AME 8, AME–AME 4, PLE–PME 3, PME–PME 25. Anterior row slightly procurved, posterior row straight.

MALE: Total length 5.75. Prosoma 2.5 long (clypeus 1.0), 2.12 wide.

	I	II	III	IV
Femur	10.0	lacking	6.0	8.0
Patella	0.8	lacking	1.0	1.0
Tibia	10.8	lacking	5.5	7.5
Metatarsus	15.8	lacking	8.0	10.5
Tarsus	2.2	lacking	1.8	1.8
Total	39.6	?	22.3	28.8

FEMALE: Total length 4.75. Prosoma 2.25 long (clypeus 0.60), 2.05 wide.

	I	II	III	IV
Femur	7.5	5.8	4.7	6.2
Patella	0.8	0.8	0.8	lacking
Tibia	7.3	5.4	4.2	lacking
Metatarsus	10.2	7.7	5.8	lacking
Tarsus	2.0	1.5	1.3	lacking
Total	27.8	21.2	16.8	?

MATERIAL EXAMINED: **Ecuador**: Nariguel (MNHN), 1♂, 1♀ (syntypes).

DISTRIBUTION: Ecuador.

HYPSORINUS CHAMBERLIN

Hypsorinus Chamberlin, 1916, p. 224 (type species by original designation *Hypsorinus binghamae* Chamberlin).

PLACEMENT: According to the original description, this genus is related to *Smeringopus* Simon, with which it has nothing in common (Brignoli, in prep.); by all characters it is instead extremely close to *Priscula* and *Physocyclus*, and I consider it therefore a synonym of the latter genus.

SPECIES: *Hypsorinus conwayi* Mello-Leitão is evidently misplaced and probably belongs to *Systenita*.

Physocyclus binghamae (Chamberlin), new combination

Figures 11–13, 19–20

Hypsorinus binghamae Chamberlin, 1916, p. 224, pl. 13, figs. 1–4, pl. 14, figs. 1–7 (male holotype from Peru, in MCZ, examined).

DIAGNOSIS: A typical *Physocyclus* distinguishable by the structure of its genitalia.

DESCRIPTION: Prosoma whitish, with many irregular brownish spots, not elevated in either sex; opisthosome with a small sclerotized stripe before the spinnerets, at place of colulus (as in some "*Priscula*"). Eye sizes and interdistances: ALE 14, AME 9, PLE 16, PME 12; ALE–AME 4, AME–AME 5, PLE–PME 4, PME–PME 15. Anterior row procurved, posterior row nearly straight.

MALE: Total length 5.00. Prosoma 2.55 long (clypeus 0.55), 2.50 wide.

	I	II	III	IV
Femur	9.5	7.2	5.9	8.0
Patella	1.0	1.0	0.8	1.0
Tibia	10.0	6.6	5.0	7.0
Metatarsus	14.0	9.8	7.5	10.2
Tarsus	3.6	1.8	1.5	2.0
Total	38.1	26.4	20.7	28.2

FEMALE: Total length about 5.00 (opisthosoma shrivelled). Prosoma 2.25 long (clypeus 0.65), 2.20 wide.

	I	II	III	IV
Femur	9.3	6.5	5.2	7.8
Patella	1.2	1.0	0.8	1.0
Tibia	10.0	6.8	5.0	7.0
Metatarsus	13.5	8.5	6.8	9.5
Tarsus	3.0	1.5	1.5	2.0
Total	37.0	24.3	19.3	27.3

MATERIAL EXAMINED: **Peru**: Huadquina, 5000 ft., July 1911 (MCZ), 1♂, 1♀ (holotype, paratype).

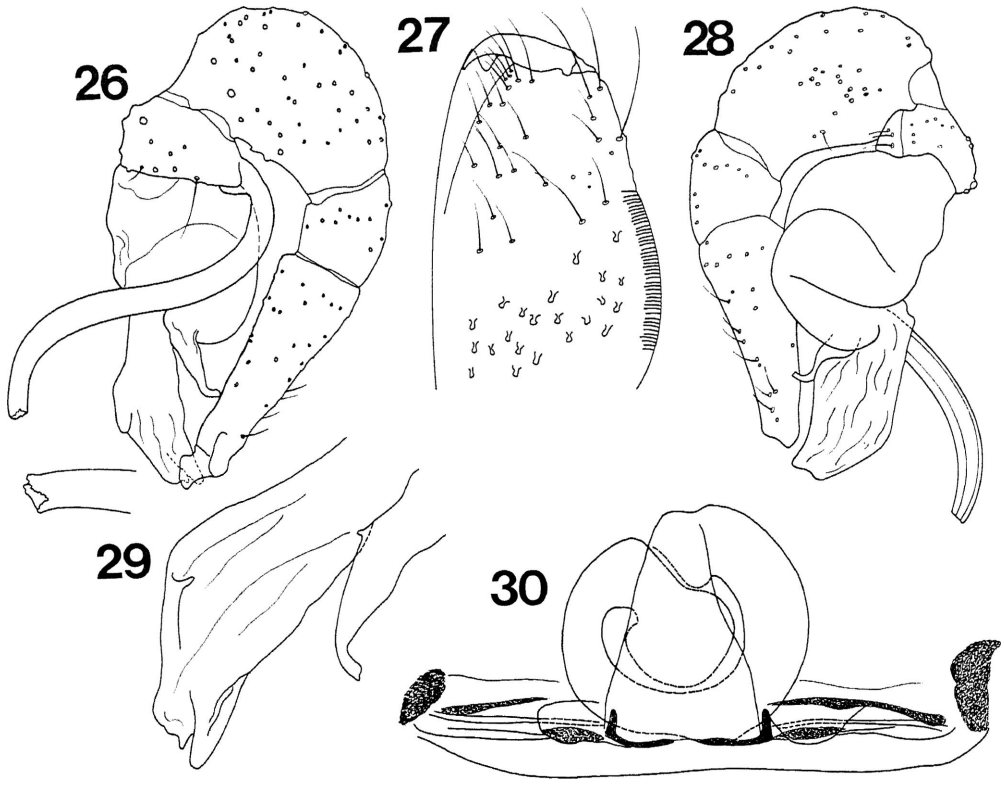
DISTRIBUTION: Peru.

GERTSCHIOLA, NEW GENUS

TYPE SPECIES: *Physocyclus macrostylus* Mello-Leitão, 1941.

ETYMOLOGY: The generic name is dedicated to Dr. Willis J. Gertsch, with my best wishes on his seventy-fifth birthday, and is considered feminine in gender.

DIAGNOSIS: This genus belongs to the "second group" as provisionally limited above, and is characterized by a rather simple femur of the male pedipalp, with only a small basal apophysis, a very elongated, ribbon-like, and simple procursus, a large, elongated, embolic region, a small appendix (?), and an extremely modified vulva, completely different from that of all other genera known to me, not corresponding to the usual struc-



FIGS. 26–30. *Gertschiola macrostylus* (Mello-Leitão). 26. Palp, retrolateral view. 27. Chelicera, anterior view. 28. Palp, prolateral view. 29. Procursus and embolus, terminal parts. 30. Vulva, dorsal view.

ture, but with a large, membranous, spiralized spermatheca.

AFFINITIES: In the morphology of the male pedipalp, this genus resembles many other genera of the "second group," especially *Blechroscelis* Simon (in the form of the femur and procursus), but the vulva appears to be unique in the whole family.

Gertschiola macrostylus (Mello-Leitão), new combination

Figures 26–30

Physocyclus macrostylus Mello-Leitão, 1941, p. 110, figs. 8, 9 (male and female syntypes from Argentina, in MLP, examined).

DIAGNOSIS: A small pholcid, with the characters of the genus.

DESCRIPTION: Prosoma low, brownish, without evident furrows; clypeus nearly horizontal in male, more vertical in female; sternum subcircular, its obtuse ending separating coxae IV by more than their diameter. Eye sizes and interdistances: ALE 7, AME 5, PLE, PME 6; ALE nearly touching AME, AME–AME 2, PLE nearly touching PME, PME–PME 7; both eye rows straight. Chelicerae slightly modified in male; gnathocoxae quandrangular, widely convergent before labium. Legs relatively short, with many strong hairs on femora. Opisthosoma roundish, elevated, blue whitish; genital region of male slightly sclerotized; epigynum sclerotized, indistinct.

MALE: Total length 2.2. Prosoma 0.95 long (clypeus 0.2), 0.75 wide.

	I	II	III	IV
Femur	2.32	1.87	1.62	2.20
Patella	0.35	0.35	0.32	0.42
Tibia	2.25	2.08	1.68	2.25
Metatarsus	2.80	2.38	2.12	2.70
Tarsus	0.65	lacking	lacking	lacking
Total	8.37	?	?	?

FEMALE: Total length 2.38. Prosoma 1.0 long (clypeus 0.25), 0.88 wide. All legs lacking in the examined specimen.

MATERIAL EXAMINED: **Argentina**: *Tucumán:* Bañado, M. Biraben (MLP), 2♂, 1♀ (syntypes).

DISTRIBUTION: According to the original description, Bañado is the type locality; other "paratypes" came from La Rioja (Villa Unión, Nonogasta, Peñas, Pinchas) and Catamarca (Andalgalá).

CONCLUSIONS

In this paper I have examined only two genera of the "second group"; the description of *Gertschiola* was made possible by the fact that I have already sufficient information on the whole family. As I do not know when I will be able to publish another paper on American genera of the family, it may be useful to indicate that the original material of the type species of *Litoporus* Simon, *Mecolaesthus* Simon, and *Coryssocnemis* Simon cannot be found in the collections of the Paris Museum.

Based on undetermined material (MCZ), I am fairly sure that the current interpretations of *Coryssocnemis* are not correct. Also *Litoporus* and *Blechroscelis* have been often misinterpreted. *Pholcophora* Banks, as limited by Gertsch (1971), is probably heterogeneous; not all the species seem to be closely related to the type species. *Hedypsilus* Simon and *Bryantia* Mello-Leitão are apparently synonyms of other genera and the same is true of *Ninetella* Bryant, which does not belong to the Ninetidinae. Correctly interpreted appear to be *Modisimus* Simon and *Psilochorus* Simon. Of the other American genera, *Metagonia* Simon still poses some problems, even after examination of the type species, and the same is true of *Systenita* Simon.

The American species attributed to *Pholcus* Walckenaer, *Smeringopus* Simon, *Leptopholcus* Simon, *Micromerys* Bradley, and *Ninetis* Simon are either introduced (and synonyms) or misplaced; curiously enough, at least one *Crossopriza* Simon seems both valid and correctly placed. Also *Spermophora* Hentz may be not American. Finally, in the absence of the types, unrecognizable and of uncertain placement (even at the family level) are *Physoglenes* Simon and *Ibotyporanga* Mello-Leitão.

LITERATURE CITED

Bonnet, Pierre
1955. Bibliographia araneorum. Toulouse, vol. 2, pt. 1, pp. 1–918.
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4230.

Brignoli, Paolo Marcello
In prep. Études sur les Pholcidae, II. Notes sur les genres *Smeringopus* Simon, 1890, *Smeringopina* Kraus, 1957 et *Crossopriza* Simon, 1893.

Cambridge, Frederick Octavius Pickard-
1902. Arachnida—Araneida. *In* Godman, F. D., and O. Salvin, Biologia Centrali-Americana. London, vol. 2, pp. 313–424, pls. 31–39.

Cambridge, Octavius Pickard-
1898. Arachnida—Araneida. *In* Godman. F. D., and O. Salvin, Biologia Centrali-Americana. London, vol. 1, pp. 223–288, pls. 30–33.

Chamberlin, Ralph V.
1916. Results of the Yale Peruvian Expedition of 1911. The Arachnida. Bull. Mus. Comp. Zool., vol. 60, pp. 177–299, pls. 1–25.
1921. On some arachnids from Southern

Utah. Canadian Ent., vol. 53, pp. 245–247.

Chrysanthus, Father
1967. Spiders from South New Guinea IX. Tijdschr. Ent., vol. 110, pp. 89–105.

Gertsch, Willis J.
1971. A report on some Mexican cave spiders. Assoc. Mexican Cave Stud. Bull., vol. 4, pp. 47–111.

Keyserling, Eugen
1877. Amerikanische Spinnenarten aus den Familien der Pholcidae, Scytodoidae und Dyseroidae. Verhandl. K. K. Zool.-Bot. Gesell. Wien, vol. 27, pp. 205–234, pl. 7.

Mello-Leitão, Candido Firmino de
1941. Las arañas de Córdoba, La Rioja, Catamarca, Tucumán, Salta y Jujuy. Rev. Mus. La Plata, new ser., vol. 2, pp. 99–198.

Petrunkevitch, Alexander
1929. The spiders of Porto Rico. Part one. Trans. Connecticut Acad. Arts Sci., vol. 30, pp. 1–158.

Senglet, Antoine
1971. Note sur les Pholcidae de Grèce. Mitt. Schweiz Ent. Gesell., vol. 44, pp. 345–359.

Simon, Eugène
1893a. Histoire naturelle des Araignées. Paris, vol. 1, pt. 2, pp. 257–488.
1893b. Études arachnologiques. 25e Mémoire. XL. Descriptions d'espèces et de genres nouveaux de l'ordre des Araneae. Ann. Soc. Ent. France, vol. 62, pp. 299–330, pl. 7.

Taczanowski, Wladyslaw
1873. Les Aranéides de la Guyane Française. Horae Soc. Ent. Ross., vol. 10, pp. 56–115, pl. 2.

Walckenaer, Charles A.
1837. Histoire naturelle des Insectes. Aptères. Paris, vol. 1, pp. 1–682.

Wiehle, Hermann
1933. *Holocnemus hispanicus* sp.n. und die Gattungen *Holocnemus* Simon und *Crossopriza* Simon. Zool. Anz., vol. 104, pp. 241–252.
1953. Spinnentiere oder Arachnoidea (Araneae). IX: Orthognatha—Cribellatae—Haplogynae—Entelegynae. *In* Die Tierwelt Deutschlands und der angrenzenden Meeresteile. Jena, vol. 42, pp. iii–viii, 1–150.

Workman, Thomas, and M. E. Workman
1896. Malaysian spiders. Belfast, parts 4–10, pp. 25–80, pls. 25–80.

A New Genus of Spider (Agelenidae) from California Exhibiting a Third Type of Leg Autospasy

VINCENT D. ROTH[1]

ABSTRACT

A new genus (*Willisus*) is described for a new species (*W. gertschi*) related to *Calymmaria* and exhibiting a dorsal cleavage plane on the leg patellae.

INTRODUCTION

In 1978, Mr. Don J. Boe forwarded a female spider from the San Bernardino Mountains of southern California which he could not place in any known agelenid genus. This specimen apparently represented a new genus, but without males the description was postponed. With a great effort on Mr. Boe's part, he managed to return in 1980 and collected both sexes. The spiders were found in a pine forest under large stones (over 100 lbs.). Another agelenid, *Calymmaria monicae* Chamberlin and Ivie, was common in the same microhabitat.

With the agreement of the collector, it was decided that this genus and species should be named in honor of Dr. Willis J. Gertsch, who has willingly assisted beginning students and fellow arachnologists for over 40 years. Since 1947, he has been my correspondent, mentor, traveling companion, friend, and now, neighbor. It gives me great pleasure to participate in honoring one of the great men of arachnology.

Special thanks are extended to Patricia Wittig of Cook College, Rutgers University, who prepared the illustrations, my wife, Barbara, who typed and proofread the manuscript, and especially to Don Boe of Mission Viejo, California, who generously provided the specimens for this study.

The new genus can be inserted into the key to Nearctic agelenid genera (Roth and Brame, 1972, pp. 11–16) by the addition of the following couplet (20a) between couplets 19 and 20 on p. 14, and by changing numeral 20 on line 16 to 20a, and on line 18 to 20b. Definitions of abbreviations, terms, and explanations of fractions used in the following description and keys are found in the same paper. The term tibia-patella is here reversed to patella-tibia to conform with normal usage in naming segments of appendages from the base distally.

20a. Patella-tibia I as long as carapace; tibia I with at least two pairs of ventral spines 20b

Patella-tibia I 1.2 times (♀) to twice as long (♂) as carapace; tibia I lacking ventral spines; southern California ..... *Willisus*

The following change in the second half of couplet 1 and the first half of couplet 2 (p. 11) of the same key should improve it; exceptions proved to be a stumbling block at this point.

Eight eyes, six, or none; when eyes eight, both rows almost straight, slightly recurved, or occasionally procurved, 6/6 or less (figs. 19, 20) 2

2. Tibia I with three or fewer pairs of ventral spines (fig. 6) or spineless 6

[1] Resident Director, Southwestern Research Station, Portal, Arizona 85632.

The holotype and allotype will be placed in the collection of the American Museum of Natural History. Paratypes will be distributed among the California Academy of Sciences, the Museum of Comparative Zoology, and the collections of the author, and Don Boe.

It has been observed during manipulation that the legs of these spiders break off near the base of the patella with unusual regularity. This break (autospasy) is apparently associated with the presence of a cleavage plane sometimes visible dorsally as a transverse line (fig. 1) near the base of patellae I–IV that will hereafter be called the "patellar cleavage plane." It is present in *Calymmaria* but unknown in all other spiders. The presence of this patellar cleavage plane, along with uncommon accessory claws, semicircular setae between the paired claws, slender legs, similar eyes, and the absence of epigastric glands, suggest that this genus is most closely related to *Calymmaria*. Some of the differences between *Willisus* and *Calymmaria* may be due, in part, to its reduced size (almost half the size of the smallest *Calymmaria*) resulting in a loss of pigment and denticles on the chelicerae, and the reduction of spines, tarsal trichobothria, and the size of the colulus (with a reduction of setae on the colulus). A similar correlation is found in the agelenid genus *Blabomma*, which ranges from 2 to 7 mm. in length. Among the smaller species there is also a reduction in color, eye size, number of ventral tibial and metatarsal spines, number of trichobothria, and number of setae that occur on the colulus (Roth and Brame, 1972, p. 23).

Other differences from *Calymmaria* such as the general pattern of the male and female genitalia, truncated sternum, widely spaced posterior coxae, and shorter distal segment of the posterior spinnerets prompt me to give *Willisus* generic status. This decision has been confirmed by Mr. John Heiss (personal commun.), who is revising *Calymmaria*.

WILLISUS, NEW GENUS

TYPE SPECIES: *Willisus gertschi*, new species.

ETYMOLOGY: Named for Dr. Willis J. Gertsch; the gender is considered masculine.

DIAGNOSIS: *Willisus* differs from all other North American agelenids by its small size, the absence of ventral spines on tibia I, and the near absence of spines on the other legs. It is similar to *Calymmaria* but lacks denticles on the retromargin of the chelicerae and has a truncated sternum with widely separated hind coxae.

DESCRIPTION: Adults tiny, length about 2 mm. Eight eyes, relatively large, compactly arranged; posterior eye row recurved (4/6); anterior eye row straight. AME dark, smallest, ½ diameter of ALE, slightly separated; lateral eyes separated by ½ their diameter; posterior eyes equally spaced, PME separated by about $^4/_5$ their diameter. Clypeus strongly arched, as high as ALE. Chelicerae straight, boss present; both margins with three teeth. Labium about ⅔ as long as wide. Endites slightly convergent, less than twice as wide as long (12/20), with serrula. Sternum almost as broad as long, truncated between hind coxae, separating latter by $^3/_5$ their width. Patella-tibia I 1.2 times to twice as long as carapace. Tibia I lacking ventral spines; metatarsus I with zero–three scattered ventral spines. Patellae of all legs with dorsal cleavage plane. Paired tarsal claws with 12 teeth, median claw with three; two pairs of accessary claws flanking median claw, semicircular hair between claws. All tarsi and metatarsi with two long dorsal trichobothria. Trochanters not notched. Palpal claw of female slightly curved, with five teeth. Abdomen with few scattered simple hairs. Colulus inconspicuous, with eight–10 setae. Neither epigastric glands nor tracheal spiracle opening visible. Anterior spinnerets stout, conical, slightly separated, set slightly anterior to posterior spinnerets, distal segment hemispherical; posterior spinnerets longer than anterior with wedge-shaped distal segment not longer than width of basal segment. Median spinnerets hidden. Female genitalia with paired openings, single pair elongate spermathecae. Male palpus with distal patellar apophysis; tibia with basal and distal ectal processes. Bulb with distal tegular process; ectal swollen conductor with basal apophysis. Embolus slender, sinuate.

Willisus gertschi, new species
Figures 1–8

TYPES: Male holotype and female allotype (and two female paratypes) taken under large stones at an elevation of 6000 ft. at Manker Flats Campground, north of Mt. Baldy, San Bernardino County, California (October 27, 1980; D. and M. Boe), deposited in the American Museum of Natural History; two female paratypes from the same locality (December 31, 1978, and November 15, 1980; D. Boe).

ETYMOLOGY: The specific name is a patronym in honor of Willis J. Gertsch.

DIAGNOSIS: With the characters of the genus.

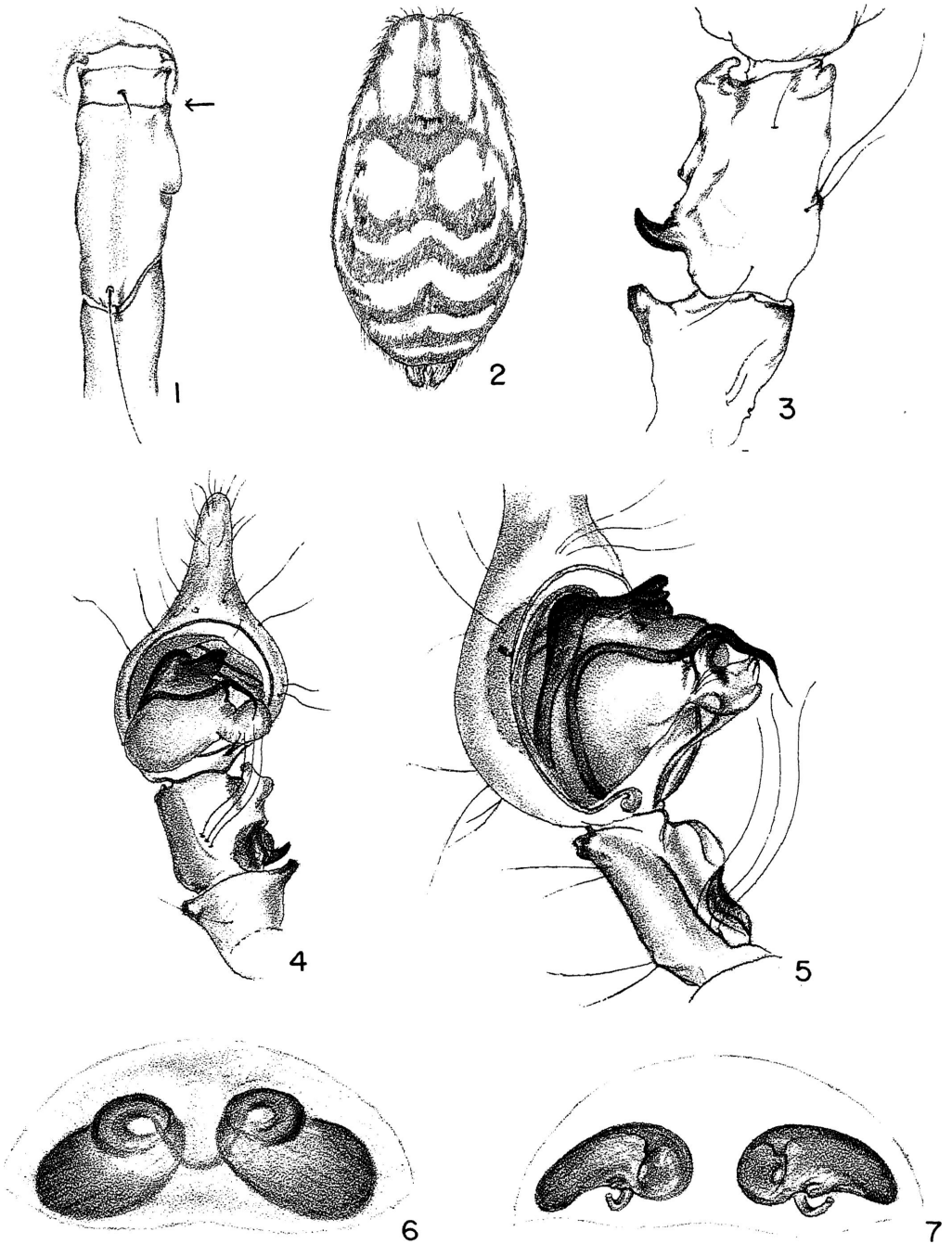
MALE (holotype): Color in alcohol: sclerotized parts off-white, fangs reddish. Carapace polished, few scattered setae present with dusky mark diverging and fading anteriorly from thoracic furrow toward black-ringed lateral eyes. Appendages unmarked. Sternum dusky gray laterally toward rear, becoming dark gray between hind coxae. Abdomen as illustrated (fig. 2), chevrons extending forward on sides. Venter with medium light gray wash flanked by pale white area of equal width, darker at base of pale spinnerets. Total length 2.14 mm. Carapace length 0.99 mm., width 0.82 mm., head width 0.40 mm., posterior eye row width 0.31 mm. Ratio of eyes AME:ALE:PME:PLE = 3:6:5:6. Carapace/patella-tibia I ratio, 206. Length of patella-tibiae I and IV 2.04 mm., 1.77 mm. Spination sparse. Femur I, one prolateral at distal one-third. Femora II–IV lacking spines. Patellae I–IV dorsal, one distal. Tibia I, II one dorsal near base; III, IV two dorsal near base and tip; IV also one ventral at distal one-third, one retrolateral near tip (or absent). Metatarsi I, II zero–three scattered spines, III, IV one–two ventral spines plus two at tip. Palpus (figs. 3–5) with wedge-shaped lateral patellar apophysis, tibia sculptured ectal-ventrally with black basal curved spur and distal hooklike process. Cymbium short, bulbous, tip slender, shorter than bulb; latter with distal toothed tegular process; ectal swollen conductor produced basally to a point, directed to a basal cymbial slot.

FEMALE (allotype): Marked as male. Total length 2.1 mm. Carapace length 1.2 mm., width 0.78 mm. Lengths of patellae-tibiae I 1.43 mm., IV 1.39 mm. Carapace/patella-tibia ratio, 1.27. Structure and spination essentially as in male. Genitalia: ventral aspect (fig. 6); paired reddish donut-like rings above oval (kidney bean-shaped from anterior aspect) spermathecae. Openings visible only in cleared genitalia; connecting canals not visible, apparently short, entering ventral side of spermathecae. Large fertilization ducts arise from middle of spermathecae, extending toward epigastric furrow. Cleared epigynum (fig. 7), dorsal view, with transversely oval spermathecae showing slight indication of round ventral opening about one-third distance in from median side.

NOTE: The term autospasy (Piéron, 1907, pp. 425–427) has been overlooked in spider literature (Wood, 1926; Berland, 1932, pp. 257–258; Torre-Bueno, 1937, p. 28; Millot, 1968, p. 710; and Bonnet, 1975, pp. 193–194) or hesitantly used in quotes (Gertsch, 1949, p. 48; 1979, p. 45) or italics (Kaston, 1948, p. 37). Usually "autotomy" is used in arachnology with a much broader meaning than was originally intended. Gertsch (1939, pp. 291–292) used the term autospasy correctly for spiders. He defined it as involving "the separation of an appendage from the body at a predetermined locus of weakness, when pulled by an outside agent," evidently a translation from Piéron (1907, pp. 425–427), whereas autotomy is the shedding of appendages by reflex action.

Two places at which segments of a leg may be readily separated have been previously known, the coxa-trochanter and patella-tibial joints. Berland (1932, p. 257) made the statement "Elle (the patella-tibia breaking point) se recontre en particulier chez les Araignées à longues pattes et chez toute les Linyphiinae et Erigoninae, je l'ai observée aussi chez *Filistata* et *Leptoneta*."

An examination of local Linyphiidae (in the broad sense) shows only the patella-tibia break in the long-legged species. The local *Filistata* males and females show no breaks, possibly because the legs are relatively stout, and neither the *Leptoneta* nor long-legged *Physocyclus* show an unusual tendency to



FIGS. 1–7. *Willisus gertschi*, new species. 1. Patella with cleavage plane, dorsal view. 2. Abdomen, dorsal view. 3. Patella-tibia of male palp, dorsal view. 4. Male palp, ventral view. 5. Male palp, retrolateral view. 6. Epigynum, ventral view (uncleared). 7. Epigynum, dorsal view (cleared).

FIG. 8. *Willisus gertschi,* new species, female from California; photograph by D. J. Boe.

break between the patella and tibia like the long-legged Linyphiidae. My impression is that the junction between these joints is especially weak in the long-legged Linyphiidae only, and to a much lesser (but perhaps variable) degree among other long-legged spiders.

If the tarsus of a *Calymmaria* or *Willisus* is grasped and tugged, the leg separates near the junction of the femur and patella, leaving a wedge-shaped piece of the patella attached to the femur. This piece separates dorsally about one-seventh of the length of the patella from its base angling downward to the femur. If the latter in *Calymmaria* and *Willisus* is pulled with sufficient force, the leg separates with a tearing of the trochanter or with a rough break between the coxa-trochanter, leaving muscle tissue extruded from the coxa. This is quite unlike the autospasy found in the families Theridiidae, Agelenidae, Pisauridae, and Lycosidae by Wood (1926) and in many other families of spiders (personal observ.).

Preliminary studies have shown that spiders either show no autospasy (some primitive forms) or one of three types, the coxa-trochanter or patella-tibial breaking points or the patellar cleavage plane.

LITERATURE CITED

Berland, Lucien
1932. Les Arachnides. Paris, 485 pp.

Bonnet, Pierre
1975. Las Arañas. Graellsia, Rev. Ent. Ibéricos, vol. 29, pp. 183–200.

Gertsch, Willis J.
1939. A revision of the typical crab spiders (Misumeninae) of America north of Mexico. Bull. Amer. Mus. Nat. Hist., vol. 76, pp. 277–442, figs. 1–271.
1949. American spiders. Princeton, Van Nostrand, 285 pp., 32 pls., 6 figs.
1979. American Spiders, second edition. New York, Van Nostrand Reinhold, 274 pp., 32 pls., 8 figs.

Kaston, Benjamin Julian
1948. Spiders of Connecticut. Bull. Connecticut Geol. Nat. Hist. Survey, no. 70, pp. 1–874, text figs. 1–4, pls. 1–144.

Millot, Jacques
1968. Ordre des Aranéides. *In* Grassé, Pierre (ed.), Traité de Zoologie. Paris, vol. 6, pp. 589–743.

Piéron, Henri
1907. Autotomie et "Autospasie." Compte Rendu hebdomadaire Seances Mem. Soc. Biol. Paris, vol. 63, pp. 425–427.

Roth, Vincent D., and Patricia L. Brame
1972. Nearctic genera of the spider family Agelenidae (Arachnida, Araneida). Amer. Mus. Novitates, no. 2505, pp. 1–52, figs. 1–70.

Torre-Bueno, J. R.
1937. A glossary of entomology. Lancaster, Pennsylvania, 336 pp., 9 pl.

Wood, Florence Dowden
1926. Autotomy in Arachnida. Jour. Morph., vol. 42, pp. 143–195, pls. 1–5.

Classification of Two North American Species of *Pirata*, with a Description of a New Genus (Araneae, Lycosidae)

CHARLES D. DONDALE[1] AND JAMES H. REDNER[2]

ABSTRACT

The generic positions of *Pirata giganteus* Gertsch and *P. marxi* Stone are re-examined. Males of *P. giganteus*, in common with those of *P. piraticus* (Clerck), the type species of Pirata, and of all other species of *Pirata* examined, possess a peculiar character in the genital bulb: the embolus and terminal apophysis arise together near the prolateral margin of the bulb, and the terminal apophysis functions as a conductor. It is concluded that *P. giganteus* should remain in the genus *Pirata*. The generic name *Piratula* Roewer (type species *Pirata hygrophilus* Thorell) is newly synonymized with *Pirata*. In *P. marxi* the embolus and terminal apophysis arise far apart, as in genera remote from *Pirata*, but the embolus is long and its tip lies in a groove on a process of the terminal apophysis as in *Pirata* species; the median apophysis is unique, as is the epigynum of the female. It is inferred that *P. marxi* represents the sister group of *Pirata*, and the new genus *Trebacosa* is described for it.

INTRODUCTION

The genus *Pirata* dates from 1832, when Sundevall divided the species of wolf spiders, which until that time constituted the large genus *Lycosa* Latreille, into three sections, namely, Lycosae, Tarentulae, and Piratae. These were to become, respectively, the subgenera *Lycosa*, *Tarentula* Sundevall, and *Pirata* Sundevall (Sundevall, 1833). *Pirata*, in which Sundevall included the single species *Pirata piraticus* (Clerck), included some 47 world species by 1939 (Bonnet, 1958).

In North America, a modest fauna of 26 species of *Pirata* was known to 1977, owing to the work of Emerton (1885, 1909), Stone (1890), O. P.-Cambridge (1898), Banks (1892, 1904), Tullgren (1901), Chamberlin (1904), Montgomery (1904), Gertsch (1934, 1940), Gertsch and Wallace (1935), Gertsch and Davis (1940), and Chamberlin and Ivie (1944). In a recent revision of all the North America forms, Wallace and Exline (1978) proposed a number of significant new synonyms, described or redescribed a new total of 32 species for the continent, and provided a guide to their identification.

The purpose of our present paper is to re-examine two species of North American *Pirata* in the light of certain new genitalic characters indicated by Michelucci and Tongiorgi (1975) and exploited by Kronestedt (1980) for European species. The two species re-examined are *P. giganteus* Gertsch (1934) and *P. marxi* Stone (1890).

We acknowledge with thanks the gift of representatives of Palaearctic species of *Pirata* to the Canadian National Collection of Insects and Arachnids by Mr. Torbjörn

[1] Research Scientist, Biosystematics Research Institute, Research Branch, Agriculture Canada, Ottawa, Ontario K1A 0C6.

[2] Technical Assistant, Biosystematics Research Institute, Research Branch, Agriculture Canada, Ottawa, Ontario K1A 0C6.

Kronestedt, Swedish Museum of Natural History. We also acknowledge loans of needed material by Dr. Norman I. Platnick, American Museum of Natural History, Dr. Herbert W. Levi, Museum of Comparative Zoology, Harvard University, and Mr. John A. Kochalka, University of Florida, Gainesville. We wish, as well, to record our gratitude to Dr. Willis J. Gertsch, whose incomparable fund of arachnological knowledge has been generously shared with us for many years.

GENERIC POSITION OF *PIRATA GIGANTEUS* AND *PIRATA MARXI*

Pirata giganteus Gertsch

Figures 5, 6

Pirata giganteus was described from females collected near Chicago, Illinois (Gertsch, 1934). Wallace and Exline (1978) described the male and gave the range as Illinois and Wisconsin. We add Moingona and Ledges State Park, Boone Co., Iowa (specimens deposited in the American Museum of Natural History).

Wallace and Exline (1978) distinguished specimens of *P. giganteus* from those of the other North American species of *Pirata* by their large size, by the shape of the median apophysis of the male palpus, and by the unusual external "plates" found in the epigynum of the female. The species was placed as a "leftover" having uncertain relationships, though Wallace and Exline (1978) pointed out a resemblance between specimens of this species and those of the European *P. hygrophilus* Thorell.

We have confirmed that *P. giganteus* and *P. hygrophilus* possess a shared derived character in the genital bulb, namely, that the embolus and terminal apophysis arise together near the prolateral margin of the bulb and remain together so that part of the terminal apophysis becomes a functional conductor of the embolus (compare figs. 6, 7). This relationship is shown clearly for several species of *Pirata,* including the type species *P. piraticus* (Clerck), in scanning electron micrographs by Kronestedt (1980); the resting embolus lies in a groove formed by the folded margin of the terminal apophysis. This character indicates that both *P. giganteus* and *P. hygrophilus* belong to the genus *Pirata.*

A consequence of our decision regarding *P. giganteus* and *P. hygrophilus* is that the generic name *Piratula* (first used as a *nomen nudum* by Roewer, 1955, but subsequently validated by Roewer, 1960), whose type species is *P. hygrophilus,* should be treated as a junior synonym of *Pirata,* new synonymy.

Pirata marxi Stone

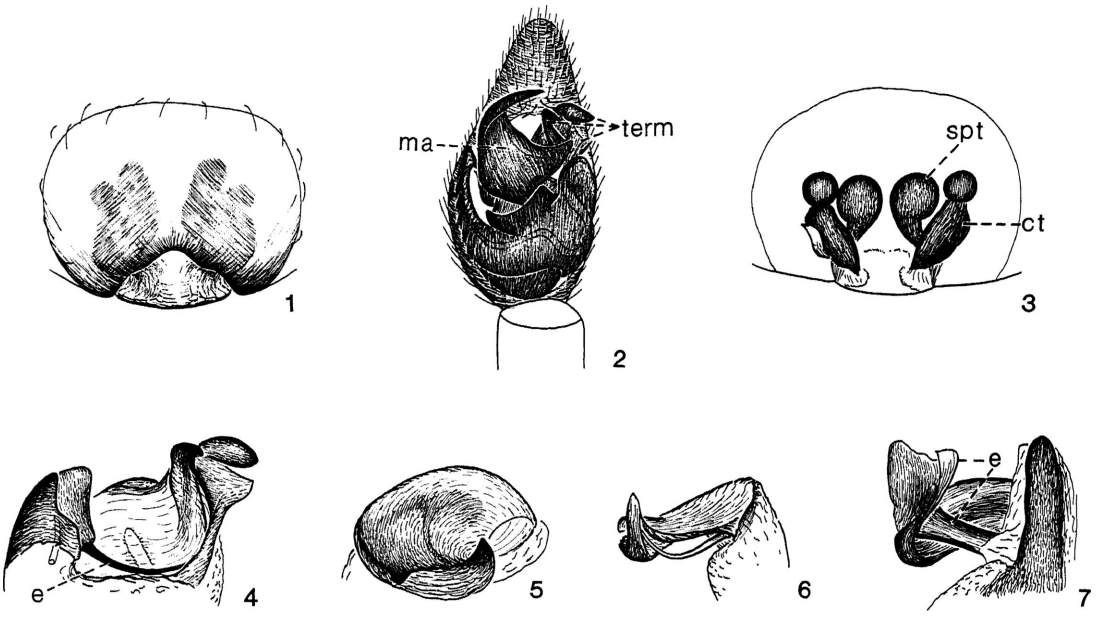
Pirata marxi was also placed among the North American species of uncertain relationship by Wallace and Exline (1978). The embolus of the male arises prolaterally on the genital bulb, as in males of other *Pirata* species, but the terminal apophysis lies far to the retrolateral side, in the position usually taken in *Lycosa, Schizocosa, Alopecosa, Pardosa,* and similar genera. The terminal apophysis does, however, retain its function as a conductor in *P. marxi,* for on one of the small processes of this apophysis is a groove in which lies the tip of the resting embolus (fig. 4). In addition to this quite unique feature, we find that the median apophysis, which in males of *Pirata* is rather small and pointed, is massive and armed with two large, pointed processes in *P. marxi* (fig. 2), and the epigynum has a small triangular depressed atrium (fig. 1). In view of these characters we regard *P. marxi* as the sister group of the genus *Pirata,* and we propose a new genus for it.

TREBACOSA, NEW GENUS

TYPE SPECIES: *Pirata marxi* Stone.

ETYMOLOGY: The generic name is derived from the Latin *trebax,* meaning crafty or cunning, and the Latin suffix *osa* denoting full of, or prone to. The name is feminine in gender.

DIAGNOSIS: The embolus and terminal apophysis of the male genital bulb arise far apart, though the tip of the embolus lies in a groove on a process of the terminal apophysis, which thus becomes a functional con-



FIGS. 1–7. Genitalia of *Trebecosa* and *Pirata*. 1–4. *T. marxi* (Stone). 1. Epigynum, ventral view. 2. Male palpus, ventral view. 3. Epigynum, dorsal view. 4. Apical division of male genital bulb, ventral view. 5, 6. *P. giganteus* Gertsch, apical division of male genital bulb. 5. Ventral view. 6. Retrolateral view. 7. *P. hygrophilus* Thorell, apical division of male genital bulb, retrolateral view. *ct*, copulatory tube. *e*, embolus. *ma*, median apophysis. *spt*, spermatheca. *term*, terminal apophysis.

ductor. The median apophysis is unique among lycosid genera, being massive and armed with stout pointed processes. The atrium of the female epigynum is small, depressed, triangular, and located posteriorly.

DESCRIPTION: Total length 6.00–8.75 mm. Carapace dark orange, with pattern of dark longitudinal bands; convex along lateral margins, narrowed at level of coxae I and II; approximately uniform in height from dorsal groove to posterior row of eyes, then sloped to margin of front. Anterior row of eyes as long as middle row, slightly procurved to slightly recurved, with anterior medians equal to or slightly larger than anterior laterals. Chelicerae with two retromarginal teeth. Legs yellow orange, darker distally, lacking annulations, with sparse scopulae; femur I with one prolateral macroseta near tip; tibia I with two or three pairs of ventral macrosetae; basitarsus I with two pairs of ventral macrosetae and, sometimes, unpaired ventral macroseta at tip; trochanter with deep ventral notch at tip. Abdomen ovoid, with indistinct heart mark and mottled black pattern, and with cluster of stout dark erect setae at anterior end; venter orange yellow. Tibia of male palpus approximately twice as long as wide, with small stridulating organ at tip on prolateral side; median apophysis massive, rather flat, with two stout pointed processes at distal end; embolus arising on prolateral margin of genital bulb, extending in long curve to retrolateral side where its tip lies in groove on ventral surface of process on terminal apophysis; terminal apophysis arising retrolaterally on bulb, with three small processes, one of which receives embolus in groove (fig. 4.). Epigynum of female with genital plate large, approximately rectangular, somewhat convex, with distinct depressed triangular atrium at midline posteriorly (fig. 1); spermathecae large, bulbous (fig. 3).

Trebacosa marxi (Stone), new combination
Figures 1–4

Pirata piraticus (misidentification): Emerton, 1885, p. 492, pl. 48, figs. 7, 7a–7d.
Pirata marxi Stone, 1890, p. 429, pl. 15, figs. 1, 1a (female holotype from York County, Pennsylvania, not examined).
Pirata marxi: Montgomery, 1902, p. 582, pl. 30, fig. 47; 1904, p. 309, pl. 19, fig. 27. Chamberlin, 1908, p. 307, pl. 21, fig. 8, pl. 22, fig. 8. Kaston, 1938, pl. 16, fig. 5; 1948, p. 309, pl. 49, figs. 985, 986, pl. 50, fig. 1006. Comstock, 1940, p. 655, fig. 724d. Bonnet, 1958, p. 3662. Wallace and Exline, 1978, p. 93, figs. 199–203.
Pirata emertoni F. Dahl, 1908, p. 526. Replacement name for *P. piraticus* of Emerton (1885).
Pirata piratica: Banks, 1910, p. 61.
Piratessa marxi: Roewer, 1955, p. 286.

DIAGNOSIS: Males of *T. marxi* are distinguished from those of species in other lycosid genera by having the embolus and terminal apophysis well separated at their bases and by having a massive median apophysis with prominent distal processes. Females are distinguished by the triangular depressed atrium at the posterior end of the epigynal plate.

MALE: Total length approximately 6.25 mm. Carapace 3.40 ± 0.32 mm. long, 2.45 ± 0.21 mm. wide (20 specimens measured). Carapace dark orange, with darker margins, broad indistinct pale submarginal bands, and narrow median band; somewhat concave along posterior margin, nearly smoothly convex along lateral margins, narrowed at level of coxae I and II; approximately uniform in height from dorsal groove to posterior row of eyes, sloped to margin of front. Eyes, chelicerae, and color of legs as described for genus. Femur I with three dorsal macrosetae, one prolateral (near tip), zero retrolaterals; tibia I with zero dorsal macrosetae, one or two prolaterals, zero–two retrolaterals, three pairs of ventrals; basitarsus I with zero or one dorsal macroseta, one or two prolaterals, one retrolateral (at tip), two pairs of ventrals, sometimes with unpaired ventral at tip. Abdomen ovoid, with dull red heart mark outlined in black, and with reticulated dorsal pattern; venter orange yellow. Palpus as described for genus (figs. 2, 4).

FEMALE: Total length 5.40–8.75 mm. Carapace 3.58 ± 0.33 mm. long, 2.66 ± 0.27 mm. wide (20 specimens measured). Color and general structure as described for male. Epigynum as described for genus (figs. 1, 3).

MATERIAL EXAMINED: **Canada**: *New Brunswick:* Kent Co.: Kouchibouguac National Park. *Nova Scotia:* Lunenburg Co.: Bridgewater. *Ontario:* Carleton Co.: Mer Bleue bog, 8 mi. E Ottawa. Hastings Co.: Chatterton, 13 mi. N Belleville. Leeds and Grenville Co.: 18 mi. E Gananoque; St. Lawrence Islands National Park; Spencerville; Upper Rock Lake, near Chaffeys Locks. Oxford Co.: Tillsonburg. Wentworth Co.: Hamilton. *Québec:* Papineau Co.: Poltimore. **United States**: *Maryland:* Anne Arundel Co., Cecil Co.: Elk Neck State Park. *Massachusetts:* Norfolk Co.: Sharon. *New York:* Orange Co.: Greenwood Lake. Suffolk Co.: Cold Spring Harbor. *Vermont:* Chittenden Co.: Colchester. *Virginia:* Fairfax Co.: Falls Church. Nansemond Co.: 7 mi S Suffolk. Princess Anne Co.: Virginia Beach. Sussex Co.: Stoney Creek.

RANGE: Southern Ontario to Nova Scotia, south to Arkansas and Florida.

NATURAL HISTORY: The usual habitats are swamps, marshes, sphagnum bogs, and wet leaf litter. Both sexes have been collected in greatest numbers from April to December, though Kaston (1948) claims that adults overwinter, along with juveniles, in Connecticut. Wallace and Exline (1978) observed egg sacs in July.

LITERATURE CITED

Banks, Nathan
1892. The spider fauna of the upper Cayuga Lake basin. Proc. Acad. Nat. Sci. Philadelphia, vol. 44, pp. 11–81, pls. 1–5.
1904. Some Arachnida from California. Proc. California Acad. Sci., ser. 3, vol. 1, pp. 331–376, pls. 38–41.
1910. Catalogue of Nearctic spiders. Bull. United States Natl. Mus., vol. 72, pp. 1–80.

Bonnet, Pierre
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4230.
Cambridge, O. Pickard-
1898. Arachnida—Araneida. *In* Godman, F. D., and O. Salvin, Biologia Centrali-Americana. London, vol. 1, pp. 233–288, pls. 30–33.
Chamberlin, Ralph V.
1904. Three new lycosids. Canadian Ent., vol. 36, pp. 286–288.
1908. Revision of North American spiders of the family Lycosidae. Proc. Acad. Nat. Sci. Philadelphia, vol. 60, pp. 158–318, pls. 8–23.
Chamberlin, Ralph V., and Wilton Ivie
1944. Spiders of the Georgia region of North America. Bull. Univ. Utah, vol. 35, no. 9, pp. 1–267, figs. 1–217.
Comstock, James H.
1940. The spider book, revised edition. Ithaca, 729 pp.
Dahl, Friedrich
1908. Die Lycosiden oder Wolfspinnen Deutschlands und ihre Stellung im Haushalte der Natur. Nov. Act. Abh. Kaiserl. Leop.-Carol. Deut. Akad. Naturf., vol. 88, pp. 175–678, figs. 1–86, map 1.
Emerton, James H.
1885. New England Lycosidae. Trans. Connecticut Acad. Arts Sci., vol. 6, pp. 481–505, pls. 46–49.
1909. Supplement to the New England spiders. *Ibid.*, vol. 14, pp. 171–236, pls. 1–11.
Gertsch, Willis J.
1934. Notes on American Lycosidae. Amer. Mus. Novitates, no. 693, pp. 1–25.
1940. Five new wolf-spiders from Florida. Florida Ent., vol. 23, pp. 17–23, figs. 1–9.
Gertsch, Willis J., and L. Irby Davis
1940. Report on a collection of spiders from Mexico. II. Amer. Mus. Novitates, no. 1059, pp. 1–18, figs. 1–30.
Gertsch, Willis J., and Howard K. Wallace
1935. Further notes on American Lycosidae. Amer. Mus. Novitates, no. 794, pp. 1–22, figs. 1–45.
Kaston, Benjamin J.
1938. Notes on little known New England spiders. Canadian Ent., vol. 70, pp. 12–17, figs. 1–14.
1948. Spiders of Connecticut. Bull. Connecticut State Geol. Nat. Hist. Surv., no. 70, pp. 1–874, text figs. 1–4, pls. 1–144.
Kronestedt, Torbjörn
1980. Comparison between *Pirata tenuitarsis* Simon, new to Sweden and England, and *P. piraticus* (Clerck), with notes on taxonomic characters in male *Pirata* (Araneae: Lycosidae). Ent. Scandinavica, vol. 11, pp. 65–77, figs. 1–10, col. pl. 1.
Michelucci, Michael, and Paolo Tongiorgi
1975. *Pirata tenuitarsis* Simon (Araneae, Lycosidae): a widespread but long-ignored species. Bull. British Arachnol. Soc., vol. 3, pp. 155–158, figs. 1–13.
Montgomery, Thomas H., Jr.
1902. Descriptions of Lycosidae and Oxyopidae of Philadelphia and its vicinity. Proc. Acad. Nat. Sci. Philadelphia, vol. 54, pp. 534–592, pls. 29–30.
1904. Descriptions of North American Araneae of the families Lycosidae and Pisauridae. *Ibid.*, vol. 56, pp. 261–323, pls. 18–20.
Roewer, Carl F.
1955. Katalog der Araneae. Brussels, vol. 2, pt. 1, 923 pp.
1960. Exploration du Parc National de l'Upemba. Brussels, vol. 2, pp. 519–1040, figs. 292–555.
Stone, Witmer
1890. Pennsylvania and New Jersey spiders of the family Lycosidae. Proc. Acad. Nat. Sci. Philadelphia, vol. 42, pp. 420–434, pl. 15.
Sundevall, Carolus J.
1832. Svenska spindlarmes beskrifning fortsättning och scientarum upsaliensis. Kongl. Vetensk-Akad. Handl., pp. 171–272.
1833. Conspectus arachnidum. Lund, 39 pp.
Tullgren, Albert
1901. On the spiders collected in Florida by Dr. Einar Lönnberg 1892–93. Bih. Kongl. Svenska Vetensk-Akad. Handl., vol. 27, pp. 1–29, pl. 1.
Wallace, Howard K., and Harriet Exline
1978. Spiders of the genus *Pirata* in North America, Central America and the West Indies (Araneae: Lycosidae). Jour. Arachnol., vol. 5, pp. 1–112, figs. 1–237.

Studies on Species of Holarctic *Pardosa* Groups (Araneae, Lycosidae), II. Redescriptions of *Pardosa modica* (Blackwall), *Pardosa labradorensis* (Thorell), and *Pardosa sinistra* (Thorell)

TORBJÖRN KRONESTEDT[1]

ABSTRACT

Three North American *Pardosa* species assigned to the *modica* group are redescribed and illustrated: *P. modica* (Blackwall), for which a neotype is selected, *P. labradorensis* (Thorell), which is placed as a senior synonym of *P. lengi* Gertsch, and *P. sinistra* (Thorell), which is placed as a senior synonym of *P. cascadae* Schenkel.

INTRODUCTION

The aim of the present paper, like the first paper in this series (Kronestedt, 1975), is to revise certain species of the wolf spider genus *Pardosa* here assigned to the *modica* species group (provisionally named the *glacialis/groenlandica* complex in Kronestedt, 1975, and recently named the *glacialis* group by Zjuzin, 1979).

Three North American species of the *modica* group are dealt with here: *P. modica* (Blackwall), *P. labradorensis* (Thorell), and *P. sinistra* (Thorell), all in need of taxonomic clarification. I became interested in this group partly because of the works of Emerton (1885, 1894) and Gertsch (1933), on a number of its species. Although the intraspecific variation in certain structures may be considerable in species within the group, Emerton (1894) did not apprehend the species diversity documented by his excellent illustrations of the copulatory organs. Two species, *P. glacialis* (Thorell) and *P. groenlandica* (Thorell), were considered by Emerton (1894) to encompass some different species previously described as distinct by Thorell (1872, 1875, 1877) and by Emerton himself (1885: *P. brunnea* and *P. albomaculata*). Emerton's *P. glacialis* consisted of some "forms" all having in common continuous lateral bands on the carapace. In one of his earliest papers, Gertsch (1933) scrutinized this collective species of Emerton and came to the conclusion that

> I have been able correctly to place all of Thorell's species in this group except *labradorensis*. As this name was based upon material that had previously been dried, it now would seem to be impossible ever to place it correctly. Undoubtedly it is one of the species described below and quite possibly *Pardosa lengi*, new species, which is common in Labrador, but the connection of this female with the one described by Thorell, which I regard as the type, seems too risky at the present time. Blackwall's *modica* is probably the species Emerton described as *brunnea*.

Examination of the type material of *P. labradorensis* has now revealed that Gertsch's assumption was correct. This species is redescribed below together with *P. modica*.

[1] Curator, Section of Entomology, Swedish Museum of Natural History, S-104 05, Stockholm, Sweden.

Out of the species Emerton synonymized with *P. groenlandica, Pardosa albomaculata* has been found to be a distinct species (Kronestedt, 1975), and *P. sinistra* (Thorell) is redescribed below after examining type material.

The *modica* group encompasses a number of Holarctic species with a proportionally high representation at far northern latitudes as well as in montane regions farther south. *Pardosa modica* is found in lowland areas (including the Great Lakes and the New England states) but its distribution is not clear. *Pardosa labradorensis* has a northern distribution (Labrador), southwards probably restricted to isolated outposts on high mountains in the northeastern United States, whereas *P. sinistra* seems to be confined to montane conditions in the Rocky Mountains, reaching the western coastal area via the Cascade Range (map 1).

The species of this group show certain structural similarities in their copulatory organs. As shown by Kronestedt (1975), the conformation of the terminal part of the palpal bulb and its apophyses is most informative in diagnosing the species as well as in supplying clues for future studies about relationships. However, from this aspect, knowledge about a number of species is still wanting. A tentative characterization of the group may be given here although there are species which are structurally more or less deviant in certain structures: (1) the tegular apophysis of the male palp consists of a short, stout, forwardly directed branch, sometimes only like a bump, and a well-developed process directed retrolaterad (e.g., as in fig. 1b); (2) the terminal apophysis is well-developed, often terminating in a curved, heavily sclerotized toothlike process projecting anteriad; the conductor is distinct, ventrally more or less covering the terminal apophysis, and in some species distally formed into a groove or (as in fig. 1a) a fold by a flap extending from the lower margin; (3) in the female, the epigynum is often flask-shaped (as in fig. 1c) with an anterior narrow and shallow portion divided by a septal ridge, anteriorly separating two transverse pockets, and a wider posterior portion having a more or less high septum separating two more or less deep cavities, each more or less covered by a cavity sclerite posteriorly. Certain of these structural conformations may also be found in species which have been assigned to other, probably related groups, such as the *lapponica* group (*sensu* Zjuzin, 1979).

Terminology and methods of study are as in Kronestedt (1975). Measurements (except of eyes) are in mm. and refer to specified individuals. Eyepiece micrometer units can be transferred to mm. by dividing by 80. Scanning electron micrographs are presented only for *P. modica,* of which extensive material of both sexes was available.

Material was provided by the late Mr. D. J. Clark and Mr. F. R. Wanless, British Museum (Natural History), London (BMNH); Dr. J. A. L. Cooke, formerly at the American Museum of Natural History (AMNH); Dr. D. Barr, Royal Ontario Museum, Toronto (ROM); Dr. C. D. Dondale, Canadian National Collections, Ottawa (CNC); Prof. R. L. Fischer, Michigan State University, East Lansing (MSU); Prof. H. W. Levi, Museum of Comparative Zoology, Harvard University, Cambridge (MCZ); Prof. D. C. Lowrie; Mr. J. P. O'Connor, National Museum of Ireland, Dublin (NMI); Prof. U. Rahm, Naturhistorisches Museum, Basel (NMB); Dr. R. Schmoller; and Dr. B. R. Vogel (BRV). Mr. E. Taylor, University Museum, Oxford, provided information. I express my appreciation and gratitude to all these persons and institutions. Some material is housed in the Swedish Museum of Natural History, Stockholm (NRS). Special thanks to Dr. C. D. Dondale and Mr. J. H. Redner for a critical review of the manuscript.

Pardosa modica (Blackwall)

Figures 1, 2a, 3a, 4a, 5A, 5a, 5B, 5b, 6a, 7a, 8

Lycosa modica Blackwall, 1846, p. 33 (type material from vicinity of Toronto, Ontario, Canada, lost; male neotype here designated from Newmarket, York County, Ontario, Canada, deposited in ROM).

Pardosa brunnea Emerton, 1885, p. 495, pl. XLVIII, fig. 4b (female lectotype here desig-

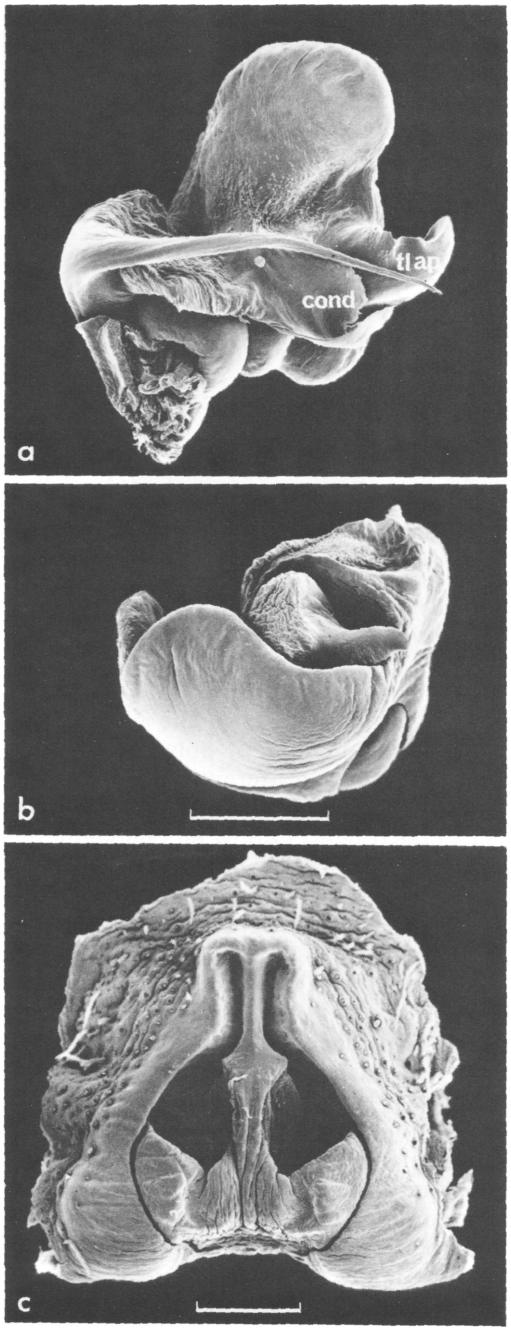


FIG. 1. *Pardosa modica* (Blackwall) from Chatterton, Ontario; a, b, left male palp, ventral views: terminal part (a) with conductor (*cond*) and terminal apophysis (*tl.ap*); tegulum (b) with tegular apophysis; c, epigynum. Scale lines = 0.2 mm. (a and b to same scale).

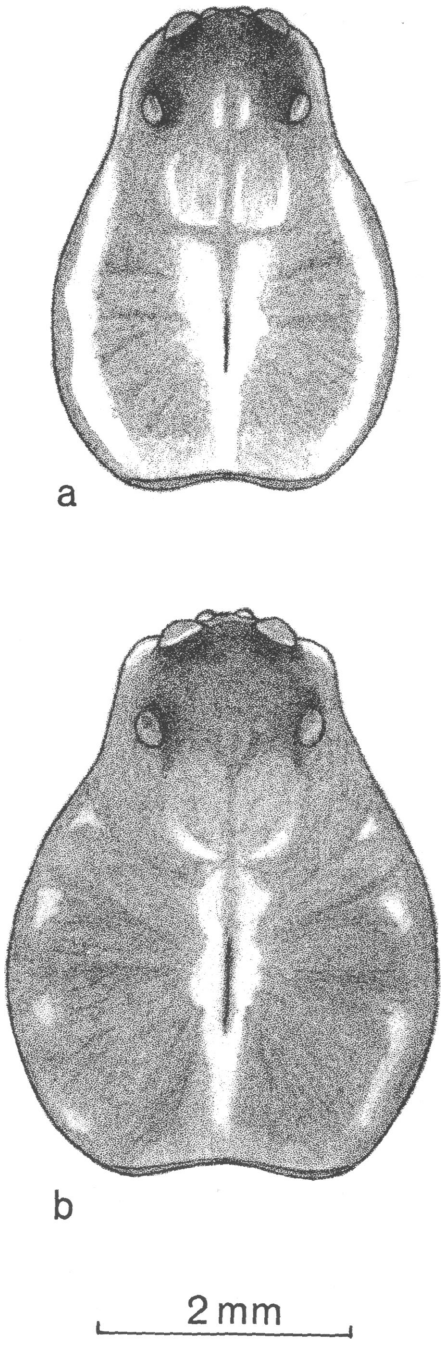


FIG. 2. Female carapace, dorsal views: a, *Pardosa modica* (Blackwall); b, *P. sinistra* (Thorell).

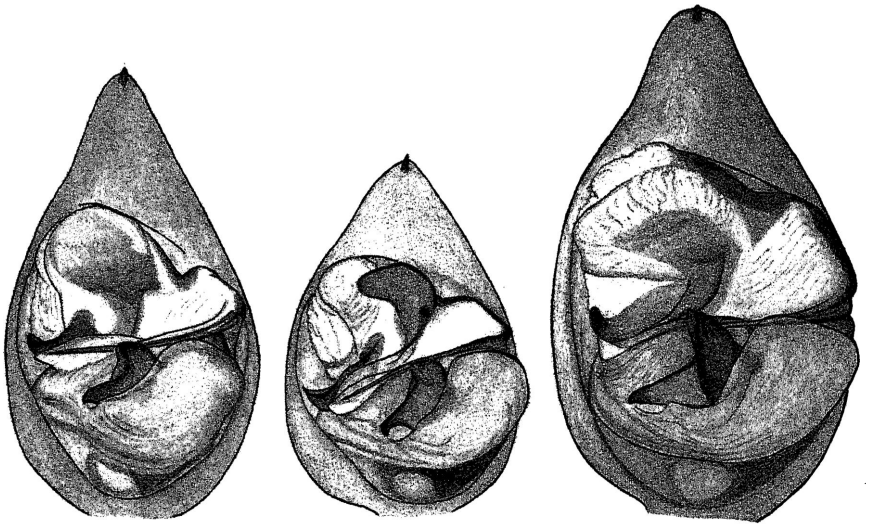


FIG. 3. Right male palp, ventral views: a, *Pardosa modica* (Blackwall) from Chatterton, Ontario; b, *P. labradorensis* (Thorell), holotype of *P. lengi*; c, *P. sinistra* (Thorell), lectotype.

nated from Beverly, Essex County, Massachusetts, in MCZ, examined).

Pardosa glacialis (misidentification, in part): Emerton, 1894, p. 424, pl. IV, fig. 2f.

Pardosa modica: Chamberlin, 1908, p. 202 (in part; pl. xv, figs. 3, 4 only). Gertsch, 1933, figs. 30, 41. Kaston, 1948, p. 336, fig. 1128 (in part). Roewer, 1954, p. 193. Bonnet, 1958, p. 3389.

Pardosa modica brunnea: Roewer, 1954, p. 193.

REMARKS: A survey of the taxonomic literature dealing with the names *P. modica* and *P. brunnea* leads to a rather confusing picture of the application of these names. I have therefore tried to present below the interpretations given in a number of papers in order to explain the arrangement adopted in the present paper.

Blackwall (1846) described a male *Pardosa* (as a *Lycosa*) from the vicinity of Toronto under the name *modica,* but the criteria given are insufficient for present species recognition. The identity of *P. modica* therefore is uncertain, especially as no type material can be traced in the University Museum, Oxford, where Blackwall's collection is housed.

Emerton (1885) described *P. brunnea* from several localities in the New England states. Examination of some syntypes revealed that two different species were involved, one being *P. labradorensis*. Emerton's (1885) figures show an epigynum of *P. brunnea* and a male palp of *P. labradorensis*. In 1894 Emerton made his drastic lumping of species which he assigned to *P. glacialis* (see also Kronestedt, 1975, p. 217).

Montgomery (1904) followed Emerton's concept about *P. glacialis* and *P. brunnea* being identical, but his drawing of an epigynum was based on specimens of *P. labradorensis* originating from Mt. Washington.

Chamberlin (1908) listed a number of species names, including *P. glacialis* and *P. brunnea,* under the name *P. modica,* following Emerton's view for the time being. Chamberlin's drawings show epigyna of *P. glacialis* and *P. brunnea* (pl. XV, figs. 1, 3) and male palps of *P. fuscula* (Thorell) and the male later found to be conspecific with Emerton's original *P. brunnea* females (pl. XV, figs. 2, 4). However, for his figures 3 and 4 (pl. XV) he noted that they were from "*P. modica* var. *brunnea.*"

Gertsch (1933) tried to bring some order

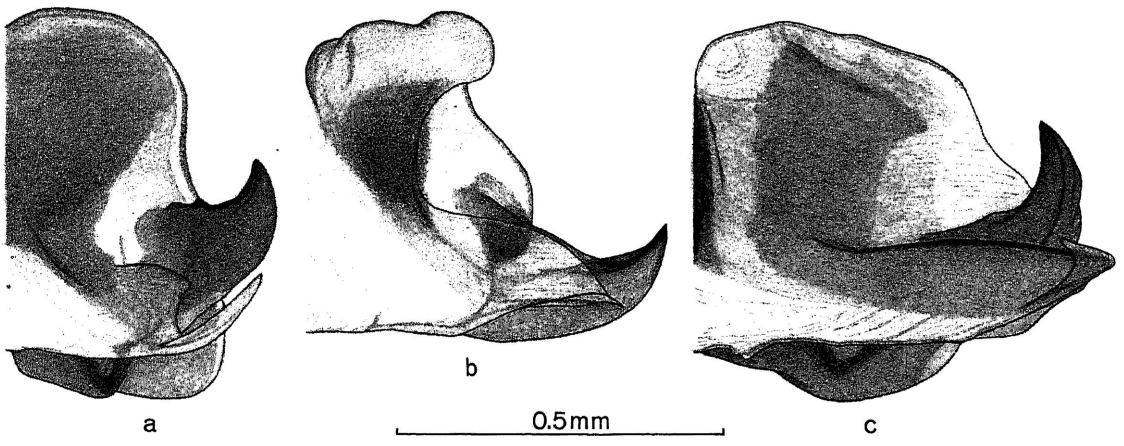


FIG. 4. Terminal part of left male palp with conductor and terminal apophysis; a, *Pardosa modica* (Blackwall) from Chatterton, Ontario; b, *P. labradorensis* (Thorell) from Nain, Labrador; c, *P. sinistra* (Thorell) from Long's Peak, Colorado.

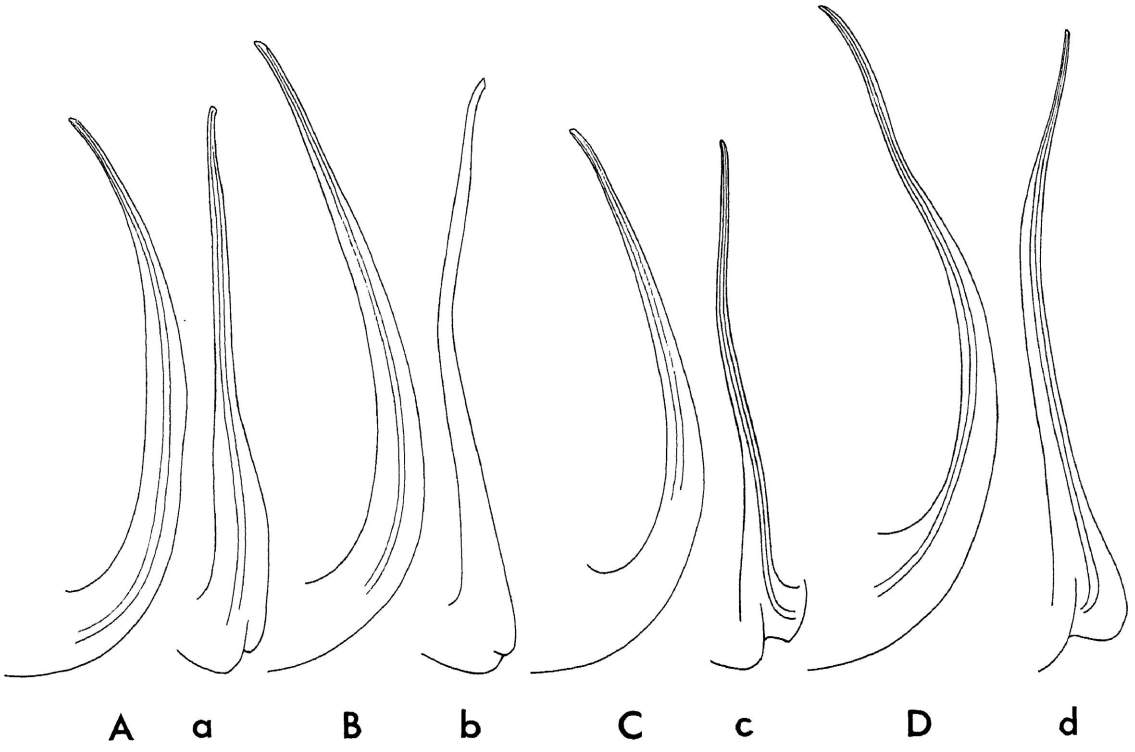


FIG. 5. Embolus as seen from in front (A–D) and in ventral view (a–d); A, a, *Pardosa modica* (Blackwall) from Chatterton, Ontario; B, b, *P. modica* from Ipswich, Massachusetts; C, c, *P. labradorensis* (Thorell) from Nain, Labrador; D, d, *P. sinistra* (Thorell) from Long's Peak, Colorado.

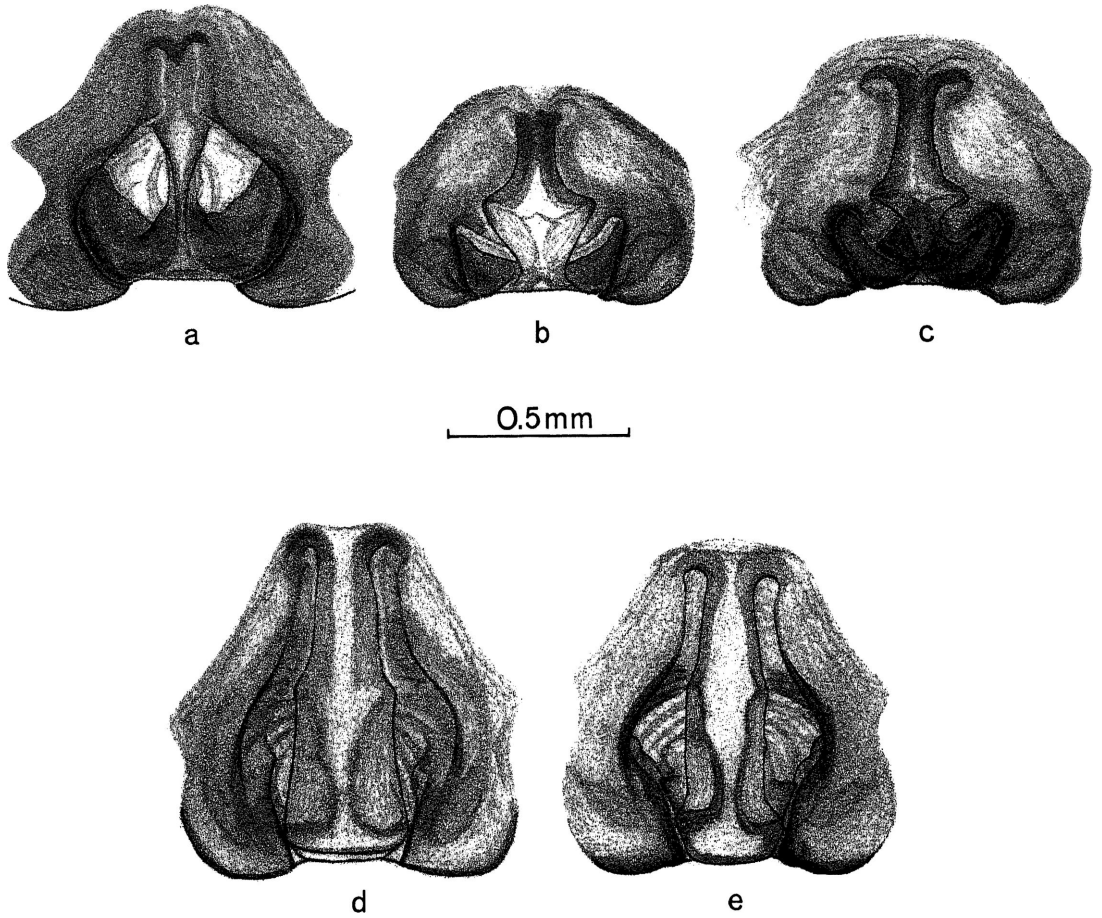


FIG. 6. Epigyna, ventral views: a, *Pardosa modica* (Blackwall), lectotype of *P. brunnea*; b, *P. labradorensis* (Thorell), allotype of *P. lengi*; c, *P. labradorensis* from Akpatok Island, Northwest Territories; d, *P. sinistra* (Thorell), paralectotype; e, *P. sinistra*, holotype of *P. cascadae*.

into the somewhat chaotic situation caused by previous authors. He figured a male palp and an epigynum of what he called *P. modica*, which he believed to be conspecific with *P. brunnea*. In connection with some records, Gertsch further (1934) listed *P. modica* and *P. brunnea* as synonyms.

Comstock (1940) depicted (redrawn from Chamberlin) the epigynum (fig. 731e) and the male palp (fig. 732b) of "*P. modica brunnea*" at the same time stating (in text, p. 665) that figure 731d (rather than 731e) represents the typical form of *P. modica* (the figure legend, however, is correctly given as *P. glacialis*).

Kaston (1948) only referred to Comstock's figures 731e and 732b as *P. modica*. On the other hand, he reproduced the illustrations of Emerton (1885) based on an epigynum of *P. brunnea* and a male palp of *P. labradorensis*.

Although the name *P. brunnea* can be fixed to existing type material, the name *P. modica* has been commonly used during this century. The interpretations of the latter have, unfortunately, been divergent and one

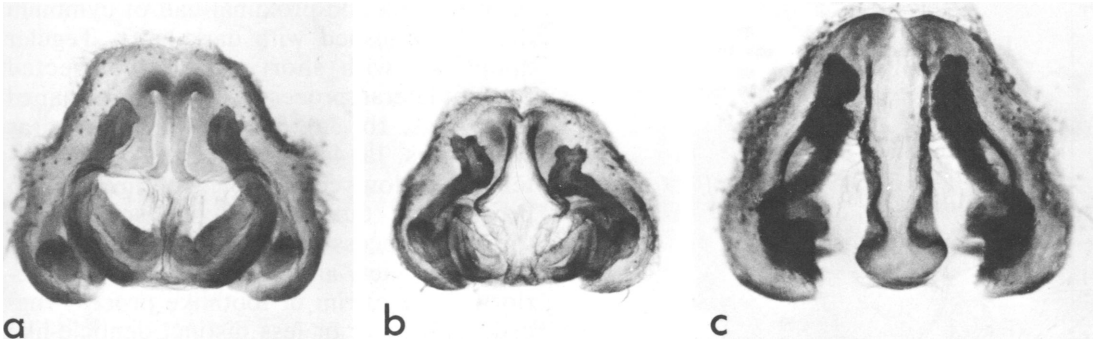


FIG. 7. Epigyna (cleared), ventral views, showing receptacles; a, *Pardosa modica* (Blackwall) from Seymour, Connecticut; b, *P. labradorensis* (Thorell) from Fort Chimo, Quebec; c, *P. sinistra* (Thorell) from Long's Peak, Colorado.

cannot fully rely on the identifications reported as "*Pardosa modica*" in faunistic papers. For the sake of stability, a neotype of *P. modica* from a site close to the type locality is selected here.

SYNONYMY: Roewer (1954) and Bonnet (1958) both listed *Lycosa albimontis* Strand as a synonym of *P. modica*. I have been able to examine the female holotype from Mt. Pleasant, White Mountains, New Hampshire, preserved in NMI and find it conspecific with *P. hyperborea* (Thorell).

DIAGNOSIS: Males may be distinguished by the shape of the conductor (fig. 4a), females by the prominent cavity sclerites in the epigynum (fig. 6a).

MALE (neotype): Total length 6.7. Carapace 3.70 long, 2.70 wide, brownish; median band in thoracic part lighter brown to yellowish; lateral bands continuous, lighter to yellowish brown. Cephalic portion in postocular area with two large light to yellowish brown spots, often with darker center. Thoracic part with short dark hairs and recumbent grayish hairs. Median band behind fovea with whitish hairs. Scattered long erect dark hairs, somewhat wavy, mainly in median part of carapace. Clypeus yellowish (even in darker specimens) with whitish hairs and few long, forwardly directed dark ones. Chelicerae yellowish brown with darker streaks; furnished with dark hairs. Sternum dusky brown with lighter indistinct median stripe; furnished with dark hairs and thin appressed light ones. Width of eyerow I 54 (slightly procurved as seen from front), row II 78, row III 105, row II–III 74. Diameter of AME 11, ALE 10, PME 28, PLE 24. Distance between AME 9, between AME and ALE 3 (measurements in eyepiece micrometer units). Abdomen dorsally grayish brown, mottled in lighter brown laterally; in front with light brown lanceolate stripe margined by blackish marks; posteriorly on each side with row of irregular blackish marks. Dorsum with long erect and short dark hairs as well as recumbent light hairs. Venter light brown with erect dark hairs and numerous recumbent light ones. Legs light brown, without annulations. Femora darker with lighter longitudinal streaks aside darker dorsal midline. Patellae and tibiae also with faint longitudinal pattern (slightly darker midline). Tibia I with two, one (distal), or no retrolateral spines. Tibia II occasionally with one (distal) retrolateral spine, normally with two. Hairiness of leg I as in rest of legs.

	I	II	III	IV
Femur	2.45	2.40	2.35	3.00
Patella	1.20	1.15	1.05	1.25
Tibia	2.05	1.90	1.75	2.55
Metatarsus	2.20	2.10	2.35	3.75
Tarsus	1.55	1.50	1.40	1.90
Total	9.45	9.05	8.90	12.45

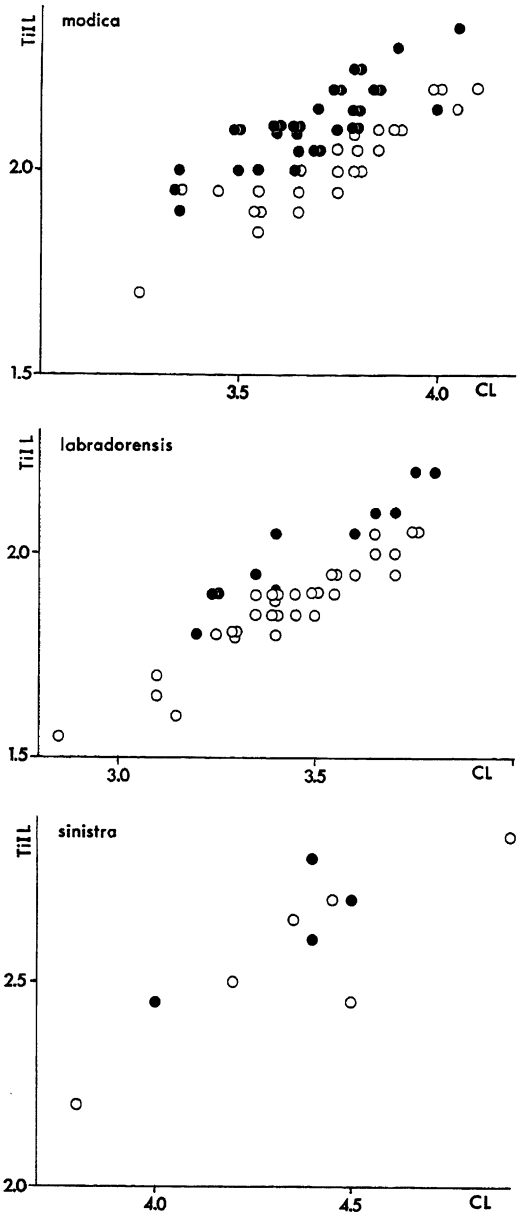


FIG. 8. Carapace length (CL)/tibia I length (TiIL) in adult males (closed circles) and females (open circles) of *P. modica* (Blackwall), *P. labradorensis* (Thorell), and *P. sinistra* (Thorell).

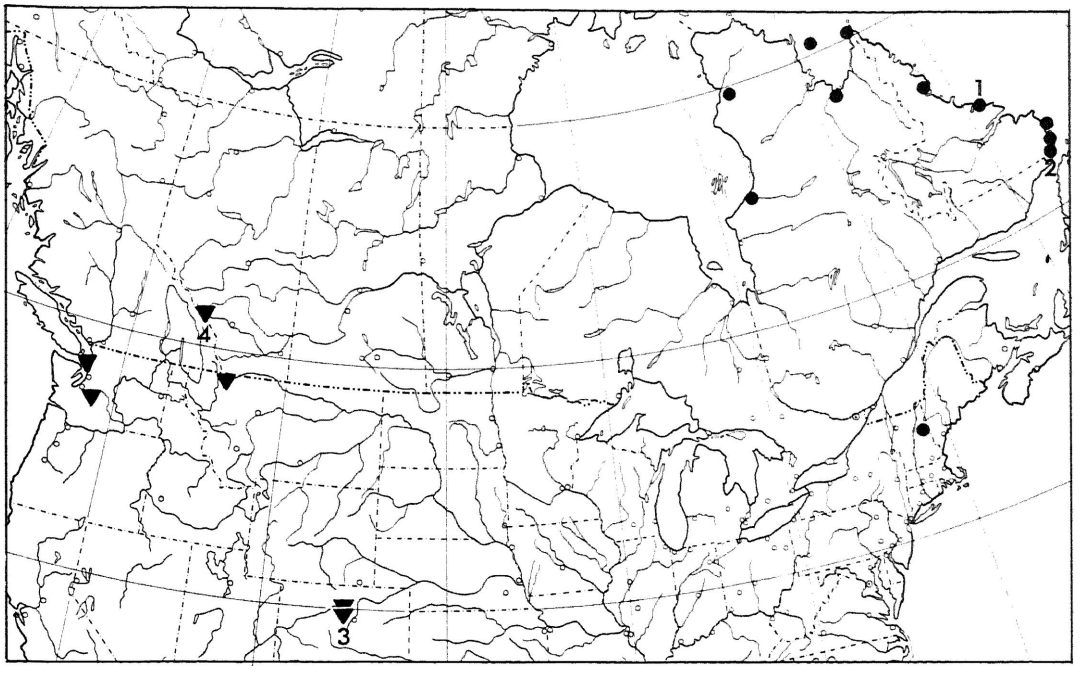
Palpal patella 0.70, tibia 0.65, cymbium 1.40 long. Femur, patella, and tibia brownish (femur mainly grayish brown), cymbium dark grayish brown proximally, distally light brown. Tibia and proximal half of cymbium densely furnished with dark hairs. Tegular apophysis with short anteriorly directed branch; laterad process slightly hook-shaped at tip (figs. 1b, 3a). Terminal apophysis (as seen in figs. 1a, 4a) of sclerotized portion extending below conductor, continuing into protruding, curved, heavily sclerotized toothlike process with forwardly directed tip (in frontal view also slightly ventrad); anterior (concave) rim of toothlike process rugged, with more or less distinct denticle-like protrusion proximally (in frontal view directed ventrad). Conductor (figs. 1a, 4a) broad, distally semitransparent, with lower (posteriad) part protruding into narrow, obliquely curved process. Embolus narrow, in frontal view almost evenly tapering to tip, in ventral view showing some variation in form (figs. 5A, 5a, 5B, 5b).

FEMALE (Chatterton, Ontario): Total length 7.9. Carapace 3.75 long, 2.65 wide, body similar to male in color pattern and setation. Carapace with lateral bands, median band, and postocular spots yellowish (fig. 2a). Lateral bands wider than in male, continuing to clypeus, with white hairs. Venter of abdomen light yellowish, often darker mesally, covered with white pubescence and scattered dark hairs, the latter slenderer than in male.

	I	II	III	IV
Femur	2.55	2.45	2.40	3.25
Patella	1.25	1.20	1.10	1.30
Tibia	1.95	1.80	1.80	2.70
Metatarsus	1.95	1.90	2.20	3.75
Tarsus	1.40	1.35	1.30	1.80
Total	9.10	8.70	8.80	12.80

Epigynum flask-shaped (figs. 1c, 6a; cleared, fig. 7a), with short "neck." Sides of septum with lateral laminous projections widening posteriad, continuing into prominent cavity sclerites.

VARIATION: Carapace lengths of material measured (males: 3.35–4.05, N = 32; females: 3.25–4.10, N = 25) plotted versus lengths of tibia I (fig. 8) as a presentation of body versus leg length.



MAP 1. Distribution of *Pardosa sinistra* (triangles) and *P. labradorensis* (circles); type localities of *Lycosa labradorensis* Thorell (1), *P. lengi* Gertsch (2), *L. sinistra* Thorell (3), and *P. cascadae* Schenkel (4).

MATERIAL EXAMINED: **Canada**: *Ontario:* Hastings Co.: Chatterton, 13 mi. N Belleville, pitfall in meadow, Apr. 26–29, 1966 (C. D. Dondale, NRS), 6♂, 4♀. York Co.: Newmarket, Apr. 16, 1942 (S. Harrod, ROM), 1♂ (neotype). **United States**: *Connecticut:* New Haven Co.: 2 mi. E Seymour, May 6, 1964 (B. Vogel, BRV, NRS), 1♂, 8♀. *Massachusetts:* Essex Co.: Beverly, salt marsh, May 20, 1873 (J. H. Emerton, MCZ), 2♂, 1♀ (including lectotype of *P. brunnea*); Ipswich, edge of marsh, May 2, 1904 (J. H. Emerton, MCZ), 6♂, 1♀. Middlesex Co.: Holliston, May 18, 1923 (J. H. Emerton, N. Banks, MCZ), 1♀. Norfolk Co.: Blue Hills, meadow, May 28, 1915 (J. H. Emerton, MCZ), 4♀. *Michigan* (all MSU): Alpena Co.: July 4, 1948 (R. R. Dreisbach), 1♀. Clinton Co.: Bath and Rose Lake Wildlife Experiment Station, most in pitfalls, various dates, Apr.–June 1960–1967 (D. E. Bixler, L. C. Drew, T. F. Hlavac), 10♂, 3♀. Ingham Co.: East Lansing, partly pitfalls, May–June 1959–1966 (D. E. Bixler, L. C. Drew, R. W. Koss), 6♂, 2♀. Kent Co.: Grandville, pitfall in unmowed field, May 11, 1970 (C. Reitsma), 1♂. *New York:* Nassau Co.: Mill Neck, Long Island, Apr. 17, 1896 (N. Banks, MCZ), 1♂.

Pardosa labradorensis (Thorell)

Figures 3b, 4b, 5C, 5c, 6b, 6c, 7b, 8; Map 1

Lycosa labradorensis Thorell, 1875, p. 502 (female lectotype here designated from Strawberry Harbour, Labrador, Canada, in NRS [Collectio Thorell no. 244/1528], examined).

Pardosa brunnea (misidentification): Emerton, 1885, p. 495, pl. XLVIII, fig. 4a (male only).

Pardosa glacialis (misidentification): Montgomery, 1904, p. 274, pl. XIX, fig. 25.

Pardosa labradorensis: Chamberlin, 1908, p. 205. Roewer, 1954, p. 192. Bonnet, 1958, p. 3379.

Lycosa fuscula (misidentification): Jackson, 1933, p. 147, pl. I, fig. 5.

Pardosa lengi Gertsch, 1933, p. 23, figs. 24, 34

(male holotype from Chateau Bay, Labrador, Canada, in AMNH, examined). Roewer, 1954, p. 192. Bonnet, 1958, p. 3380. NEW SYNONYMY.

REMARKS AND SYNONYMY: *Pardosa brunnea* was described on the basis of material including both *P. modica* and *P. labradorensis,* the male palp figured evidently belonging to the latter species (see further comments under *P. modica*). Chamberlin (1908) based his redescription of *P. labradorensis* on Thorell's original description, adding that "this form is certainly very close to *modica,* and it may prove not to be anything different." As already mentioned in the Introduction, Gertsch (1933) believed that *P. lengi* might be conspecific with *P. labradorensis,* and comparison of the type material reveals this to be the case. Jackson (1933) misidentified the material from Akpatok Island with *P.* (as *Lycosa*) *fuscula* (Thorell). Examination of several specimens from this material shows that they all belong to *P. labradorensis.*

DIAGNOSIS: Males may be distinguished by the shape of the conductor and terminal apophysis (fig. 4b), females by the shape of the septum and cavity sclerites in the epigynum (figs. 6b, 6c).

MALE (holotype of *P. lengi*): Total length 6.0. Carapace 3.20 long, 2.30 wide, brownish; median band in thoracic part lighter brown to yellowish; lateral bands continuous, light to yellowish brown. Cephalic portion in postocular area with two large light to yellowish brown spots, often with darker center. Sides of thoracic part covered with short dark hairs and recumbent grayish hairs; lateral and median bands and postocular area with recumbent whitish hairs in addition (often still present in median band behind fovea). Scattered long erect dark hairs, somewhat wavy, mainly in median part of carapace. Clypeus yellowish (even in darker specimens) with whitish hairs and few long forwardly directed dark ones. Chelicerae yellowish brown with darker streaks; furnished with dark hairs. Sternum dusky brown with lighter median stripe; furnished with dark and thin recumbent light hairs. Width of eyerow I 46 (slightly procurved as seen from front), row II 65, row III 86, row II–III 65. Diameter of AME 10, ALE 9, PME 24, PLE 18. Distance between AME 8, between AME and ALE 2 (measurements in eyepiece micrometer units). Abdomen dorsally brown to grayish, in front with light brown lanceolate stripe usually margined by black marks. Each side of dorsum posteriorly with row of black spots alternating with tufts of whitish hairs. Dorsum with long erect and short dark hairs as well as recumbent light to whitish hairs; lanceolate stripe densely furnished with whitish recumbent hairs. Venter light to grayish brown with erect dark hairs and numerous recumbent whitish hairs. Legs light brown, without annulations. Femora darker, with lighter longitudinal streaks aside dorsal midline. Patellae and tibiae also with faint longitudinal pattern (slightly darker midline). Tibia I with two, one (distal), or no retrolateral spines. Hairiness of leg I as in rest of legs.

	I	II	III	IV
Femur	2.20	2.15	2.10	2.80
Patella	1.00	1.00	0.95	1.10
Tibia	1.80	1.65	1.60	2.30
Metatarsus	1.95	1.90	2.15	3.35
Tarsus	1.30	1.25	1.20	1.70
Total	8.25	7.95	8.00	11.25

Palpal patella 0.65, tibia 0.60, cymbium 1.20 long. Femur, patella, and tibia brownish (femur mainly grayish brown), cymbium dark grayish brown proximally, distally light brown. Tibia and proximal half of cymbium densely furnished with dark hairs. Tegular apophysis with short anteriorly directed branch; laterad process basally broad, distally tapering into distinctly hook-shaped tip directed ventrad (fig. 3b). Terminal apophysis (as seen in fig. 4b) like sclerotized prominent hook, anteriorly scooped out before tip. Conductor semitransparent, distally folded, upper margin (as in fig. 4b) smoothly sloping to tip. Embolus as seen from front narrow, evenly tapering to tip, in ventral view narrow, smoothly bent (figs. 5C, 5c).

FEMALE (Nain, Labrador): Total length 6.1. Carapace 3.10 long, 2.25 wide, Body

similar to male in color pattern and setation. Carapace with lateral bands, median band, and postocular spots yellowish (pattern as in fig. 2a). Lateral bands wider than in male. Sides of abdomen richly furnished with white hairs, venter with recumbent white pubescence and scattered dark hairs, the latter slenderer than in male.

	I	II	III	IV
Femur	2.20	2.10	2.10	2.85
Patella	1.05	1.00	0.90	1.10
Tibia	1.70	1.60	1.55	2.35
Metatarsus	1.65	1.65	2.00	3.40
Tarsus	1.15	1.10	1.10	1.60
Total	7.75	7.45	7.65	11.30

Epigynum (figs. 6b, 6c; cleared, fig. 7b) with short cavities, more or less covered by cavity sclerites. Septum widest in front of cavities. Shape of epigynum subject to variation; in most specimens examined, septal ridge is longer than in figure 6b, otherwise that seems to be typical shape.

VARIATION: Carapace lengths of material measured (males: 3.20–3.80, N = 11; females: 2.85–3.75, N = 31) plotted versus lengths of tibia I (fig. 8) as a presentation of body versus leg length.

MATERIAL EXAMINED: **Canada**: *Labrador:* Battle Harbour, July 30, 1912 (Engelhart, AMNH), 1♂, 1♀ (paratypes of *P. lengi*, only cocoon of female present); Chateau Bay, July 1927 (C. Leng, AMNH), 1♂, 1♀ (holotype and allotype of *P. lengi*); Nain, June 15, 1922 (AMNH), 1♂, 1♀, without date (AMNH, NRS), 2♂, 7♀; Square Island, July 1864 (A. S. Packard, Jr., NRS), 1♂ (palp only, paralectotype of *P. labradorensis*); Strawberry Harbour, July 28, 1864 (A. S. Packard, Jr., NRS), 1♀ (lectotype of *P. labradorensis*). *Northwest Territories:* Akpatok Island, 1931 (BMNH), 7♀. *Quebec:* Port Burwell, 1931 (BMNH), 1♀; Fort Chimo, June 25, 1948 (N. Smith, AMNH), 1♂, 2♀; nr. 10th fall of Kogaluk River, 43 mi. from Hudson Bay, July 21, 1948 (J. Rousseau, AMNH), 1♀ (together with 1♀ of *P. glacialis*); Hudson Bay, Great Whale River to Richmond Gulf, Aug. 1920 (F. Johansen, AMNH), 1♀, **United States**: *New Hampshire:* Coos Co.: Mt. Washington, summit, June 11, 1877 (J. H. Emerton, MCZ), 2♂, 2♀ (syntypes of *P. brunnea*), from trees to summit, July 8, 1904 (J. H. Emerton, MCZ), 3♂, 9♀, Lakes of Clouds, June 22, 1938 (F. Harper, MCZ), 1♂, 2♀, (R. V. Chamberlin, AMNH), 1♀, 6000 ft., Sept. 16, 1939 (E. L. Bell, AMNH), 2♀.

Pardosa sinistra (Thorell)

Figures 2b, 3c, 4c, 5D, 5d, 6d, 6e, 7c, 8; Map 1

Lycosa sinistra Thorell, 1877, p. 517 (male lectotype here designated from Arapaho Peak, Boulder County, Colorado, in NRS [Collection Thorell no. 247/1552], examined).

Pardosa groenlandica (misidentification): Emerton, 1894, p. 423 (in part). Chamberlin, 1908, p. 202. Bonnet, 1958, p. 3372.

Pardosa sinistra: Roewer, 1954, p. 194.

Pardosa cascadae Schenkel, 1951, p. 25, fig. 35 (female holotype from Cascade Mountains, Banff National Park, Alberta, Canada, in NMB, examined). Roewer, 1954, p. 190. NEW SYNONYMY.

REMARKS: This species was hitherto known only from its original description. Emerton (1894) synonymized it with *P. groenlandica* (Thorell), together with some other species described by Thorell (1877).

The male in NRS bears a handwritten label by Thorell ("L. sinistra Thor. Arapahovisak Col. U.S.A. Packard ded.") indicating that the specimen belongs to the type species. A female of *P. sinistra* was found together with a single female of *P. uncata* (Thorell), the latter syntype being from Georgetown, Colorado (NRS; Collectio Thorell no. 247/1563). This female of *P. sinistra* has probably been misplaced and is regarded as belonging to the type series. Males and females of this species were seen together in a vial with more recent material, thus evidencing the conspecificity.

Schenkel's figure of the epigynum of *P. cascadae* is rather poor, but an examination of the holotype suggests that it is conspecific with *P. sinistra*. This is further supported by the identification of two males of *P. sinistra* from Banff National Park.

DIAGNOSIS: Males may be distinguished by the shape of the conductor (fig. 4c) and the embolus (as seen from in front, fig. 5D),

females by the broad septal ridge in the epigynum (figs. 6d, 6e).

MALE (Glacier National Park, Montana): Total length 8.5. Carapace 4.00 long, 3.05 wide, dusky brown; thoracic part with brownish median band; lateral bands broken into three brownish spots. Cephalic part with two large spots in postocular area, outer margin of which is concolorous with median thoracic band. Thoracic part with recumbent dark and grayish hairs and long erect, somewhat wavy, dark hairs. Whitish hairs in median band posterior to fovea. Cephalic portion with long erect dark hairs and recumbent dark and light (shiny) hairs. Clypeus light brown lateral to and below eye row I. Chelicerae brown with darker stripes, furnished with dark hairs. Sternum dusky brown with erect dark and recumbent light hairs; faint median stripe may be visible. Width of eye-row I 56 (slightly procurved as seen from front), row II 78, row III 109, row II–III 78. Diameter of AME 12, ALE 10, PME 30, PLE 25. Distance between AME 9, between AME and ALE 4 (measurements in eyepiece micrometer units). Abdomen dorsally dark grayish with brownish lanceolate stripe anteriorly. Dorsum with long erect, somewhat wavy, hairs as well as short dark and recumbent light (shiny) hairs, latter dominating in lanceolate stripe. Venter dusky brown with yellowish dots, notably marginally; with rather short erect dark and recumbent whitish hairs. Legs dusky brown, usually with distinct lighter annulation (cf. female). Tibia I with two (or fewer?) retrolateral spines. Hairiness of leg I not markedly different from rest of legs.

	I	II	III	IV
Femur	2.85	2.80	2.80	3.55
Patella	1.40	1.40	1.30	1.50
Tibia	2.45	2.30	2.20	3.00
Metatarsus	2.55	2.65	3.15	4.70
Tarsus	1.60	1.60	1.55	2.10
Total	10.85	10.75	11.00	14.85

Palpal patella 0.80, tibia 0.75, cymbium 1.80 long. All segments mainly dusky brown, with dark hairs. Femur and patella lighter dorsally, cymbium lighter distally. Femur dorsally, patella distally with whitish hairs; tibia densely furnished with long dark hairs, notably laterally. Tegular apophysis with anteriorly directed branch pointed, triangular in ventral view, shorter than lateral process which is slightly curved ventrad in frontal view and has slightly hook-shaped tip (fig. 3c). Terminal apophysis with lower (posteriad) portion visible below conductor (as seen in fig. 4c), continuing into retrolaterad laminar process (partly hidden by conductor in fig.) and curved toothlike process directed forward. Conductor distally curved dorsad (frontal view) and folded (as in fig. 4c), almost forming tube by flap given off from posterior margin. Embolus long, thin, in frontal view smoothly curved inwards in distal half (as in fig. 5D).

FEMALE (holotype of *P. cascadae*; measurements of female from Rocky Mountain National Park, Colorado, in parentheses): Total length (8.3). Carapace 4.50 (4.20) long, 3.40 (3.30) wide, body similar to male in color pattern and setation. Carapace with median band and outer margins of postocular spots yellowish brown; lateral bands broken into three or four yellowish brown spots, latter two sometimes confluent; lateral spots in addition with white hairs (fig. 2b). Abdomen dorsally dark grayish with lighter grayish brown areas, latter covered with recumbent light (yellowish) hairs. Each side of dorsum posteriorly with row of white hair tufts. Venter light brown with pubescence similar to male. Legs dusky brown with annulations more distinct than in male. Femora in dorsal view with three to four incomplete annuli, present as pro- and retrolateral light spots, middle pair most prominent, apical smallest. Patellae largely light. Tibiae with prominent light median annulus. Metatarsi with one broad light annulus in each half.

	I	II	III	IV
Femur	3.10	3.00	2.95	3.90
Patella	1.60	1.55	1.45	1.60
Tibia	2.45	2.30	2.25	3.15
Metatarsus	2.40	2.40	2.95	4.80
Tarsus	1.50	1.50	1.50	2.00
Total	11.05	10.75	11.10	15.45

Epigynum flask-shaped (figs. 6d, 6e; cleared fig. 7c), with broad "neck." Cavities usually deep, anteriorly continuing into furrows flanking broad septal ridge. Septum broad.

VARIATION: Carapace lengths of material measured (males: 4.00–4.50, N = 4; females: 3.80–4.90, N = 6) plotted versus lengths of tibia I (fig. 8) as a presentation of body versus leg length. The holotype of *P. cascadae* has comparatively short legs.

MATERIAL EXAMINED: **Canada**: *Alberta:* Banff, 1919 (E. Hearle, CNC), 1♂; Banff National Park, Cascade Mt., Aug. 19, 1939 (H. Schenkel-Rudin, NMB), 1♀ (holotype of *P. cascadae*); Laggan (=Lake Louise), Aug. 12, 1914 (J. H. Emerton, MCZ), 1♂. **United States**: *Colorado:* Boulder Co.: Arapaho Peak, July 1, 1875 (A. S. Packard, Jr., NRS), 1♂, 1♀ (lectotype and paralectotype of *P. sinistra,* locality of female uncertain, cf. remarks); Rocky Mountain National Park, Long's Peak, 13,200 ft., Aug. 15, 1937 (W. Kiener, AMNH), 2♂, 3♀, 12,300 ft., pitfall trap, June 22–July 7, 1967 (R. Schmoller, NRS), 1♀. *Montana:* Glacier Co.: Glacier National Park, Iceberg Lake, rocks edge, July 24, 1964 (D. C. Lowrie, NRS), 1♂. *Washington:* Pierce Co.: Mazama Ridge, 6200 ft., 1.4 mi. NE Paradise, on snowfield, Aug. 3, 1974 (R. Crawford, BRV), 1♀; Skyline Trail, 0–1.9 km. NNE Paradise, on snow, July 5, 1975 (D. Mann, NRS), 1♀. San Juan Co.: Orcas Island, Mt. Constitution, Aug. 7, 1927 (L. G. Worley, CNC), 1♀.

LITERATURE CITED

Blackwall, John
1846. Notice of spiders captured by Professor Potter in Canada, with descriptions of such species as appear to be new to science. Ann. Mag. Nat. Hist., ser. 1, vol. 17, pp. 30–44, 76–82.

Bonnet, Pierre
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4230.

Chamberlin, Ralph V.
1908. Revision of North American spiders of the family Lycosidae. Proc. Acad. Nat. Sci. Philadelphia, vol. 60, pp. 158–318.

Comstock, John Henry
1940. The spider book, revised and edited by W. J. Gertsch, Ithaca, New York, xi + 729 pp.

Emerton, James Henry
1885. New England Lycosidae. Trans. Connecticut Acad. Arts Sci., vol. 6, pp. 481–505.
1894. Canadian spiders. *Ibid.*, vol. 9, pp. 400–429.

Gertsch, Willis J.
1933. New genera and species of North American spiders. Amer. Mus. Novitates, no. 636, pp. 1–28.
1934. Notes on American Lycosidae. *Ibid.*, no. 693, pp. 1–25.

Jackson, Arthur R.
1933. Results of the Oxford University expedition to Akpatok in 1931; Araneae. Proc. Zool. Soc. London, pp. 145–159.

Kaston, Benjamin J.
1948. Spiders of Connecticut. Bull. Connecticut State Geol. Nat. Hist. Surv., vol. 70, pp. 1–874.

Kronestedt, Torbjörn
1975. Studies on species of Holarctic *Pardosa* groups (Araneae, Lycosidae). I. Redescription of *Pardosa albomaculata* Emerton and description of two new species from North America, with comments on some taxonomic characters. Zool. Scripta, vol. 4, pp. 217–228.

Montgomery, Thomas Harrison, Jr.
1904. Descriptions of North American Araneae of the families Lycosidae and Pisauridae. Proc. Acad. Nat. Sci. Philadelphia, vol. 56, pp. 261–323.

Roewer, Carl F.
1954. Katalog der Araneae. Brussels, vol. 2, pt. 1, 923 pp.

Schenkel, Ehrenfried
1951. Spinnentiere aus dem westlichen Nordamerika, gesammelt von Dr. Hans Schenkel-Rudin. Verhandl. Naturf. Gesell. Basel, vol. 62, pp. 24–62.

Thorell, Tamerlan
1872. Om några arachnider från Grönland. Öfvers. K. Vetensk. Akad. Förh., vol. 29, pp. 147–166.
1875. Notice of some spiders from Labrador. Proc. Boston Soc. Nat. Hist., vol. 17, pp. 490–504.
1877. Descriptions of the Araneae collected in

Colorado in 1875 by A. S. Packard, Jr., M.D. Bull. U.S. Geol. Surv., vol. 3, pp. 477–529.

Zjuzin, Alexey A.
1979. Taxonomic study of Palaearctic spiders of the genus *Pardosa* C. L. Koch (Aranei, Lycosidae). Part I. Taxonomic structure of the genus. Ent. Obozr., vol. 58, pp. 431–447; English translation in Ent. Rev., vol. 58, pp. 165–185.

A Revision of the *nigra* Group of the Genus *Pardosa* in North America (Araneae, Lycosidae)

DONALD C. LOWRIE[1] AND CHARLES D. DONDALE[2]

ABSTRACT

This paper treats eight species of North American *Pardosa* in which the body color is typically brown, the tegulum of the male palpus protrudes conspicuously at the base, and the median guide of the female epigynum occupies the entire atrium and is laterally expanded in its posterior part and slender anteriorly. All the species are ground inhabitants in moist conifer forests or in adjacent alpine tundra. The species treated are *P. uintana* Gertsch, 1933; *P. dorsuncata,* new species; *P. hetchi* Chamberlin and Ivie, 1942 (the first known male is described); *P. gothicana,* new species; *P. rainieriana,* new species; *P. mackenziana* (Keyserling, 1877) = *P. metlakatloides* Schenkel, 1951, new synonymy; *P. uncata* (Thorell, 1877); and *P. dorsalis* Banks, 1894.

INTRODUCTION

Previous studies on wolf spiders of the genus *Pardosa* in North America have dealt with the *lapidicina* group (Barnes, 1959), the *distincta* group (Vogel, 1964), the *sternalis* and *furcifera* groups (Vogel, 1970), and the *groenlandica* group (Kronestedt, 1975). In this paper we present results on a group of species having distinctive coloration and genitalic structure, exemplified by the widespread species *P. mackenziana* (Keyserling). Representatives of this group inhabit moist boreal and alpine conifer forests or adjacent areas of alpine tundra, and are distributed accordingly on the North American continent, i.e., northward as far as the tree line and, more abundantly, in the Cordilleran region of the west (Lowrie, 1973).

Eight species are treated here. *Pardosa mackenziana* (Keyserling) is perhaps the best known of these, being found over vast areas of Canada and the continental United States. *Pardosa uintana* ranges about as widely, but is rather poorly known and has often been misidentified. The male of *P. hetchi* Chamberlin and Ivie is described for the first time. *Pardosa uncata* (Thorell), despite much effort, must remain in some doubt since only a single, equivocal female of the original type series could be found; Emerton (1894) claimed to have seen the specimens described by Thorell (1877), but he illustrated two other species under that name, and the vital male specimen has been missing since that time.

None of the North American species of this group are found in the Palaearctic region, though the group is certainly represented there. The well-known Old World species include *P. nigra* (C. L. Koch), *P. eiseni* (Thorell), *P. giebeli* (Pavesi), *P. lasciva* L. Koch, *P. lyrata* (Odenwall), and *P. traili* (O. P.-Cambridge). We follow Zyuzin (1978) in his use of the oldest name to designate the group.

We are indebted to Dr. Willis J. Gertsch, who initially encouraged the first author to

[1] Route 2, Box 305, Santa Fe, New Mexico 87501.

[2] Research Scientist, Biosystematics Research Institute, Research Branch, Agriculture Canada, Ottawa, Ontario K1A 0C6.

take up the study of *Pardosa* and assisted us in many ways to bring this part of the study to completion. He has helped both taxonomists and ecologists more often than he knows. Mr. Jerry Battaglia and Mr. James H. Redner assisted with the drawings, and Dr. H. K. Wallace provided the photographs. Sigma Xi funded a summer's collecting in the Pacific Northwest. The various curators and collectors who helped with loans of material are listed below. All measurements are in millimeters.

COLLECTIONS EXAMINED

AMNH, American Museum of Natural History, Drs. W. J. Gertsch and N. I. Platnick
BMNH, British Museum (Natural History), the late Mr. D. J. Clark
BRV, Dr. B. R. Vogel
CNC, Canadian National Collection of Insects and Arachnids
DEB, Mr. D. E. Bixler
DJB, Mr. D. J. Buckle
MCZ, Museum of Comparative Zoology, Harvard University, Dr. H. W. Levi
NMB, Naturhistorisches Museum, Basel
NRS, Naturhistoriska Riksmuseet, Stockholm, Mr. T. Kronestedt
REL, Dr. R. E. Leech

GROUP CHARACTERS

The body is usually of various shades of brown, and the color persists in alcohol. The only exceptions are *P. gothicana,* new species, and *P. rainieriana,* new species, in which the body is essentially black. There is little sexual dimorphism in color. The carapace usually exhibits a pale brown median band that dilates posterior to the eyes (figs. 1, 3). The lateral areas of the carapace are mottled with dark brown or black, and there may be a pair of narrow submarginal bands. The eye area is often black. The abdomen is usually mottled with various shades of brown, and has an indistinct heart mark. The legs are brown dorsally, and are often mottled and ringed with dark brown or black. The chelicerae are brown with darker reticulations. The sternum is dark brown or black, and the venter of the abdomen lighter.

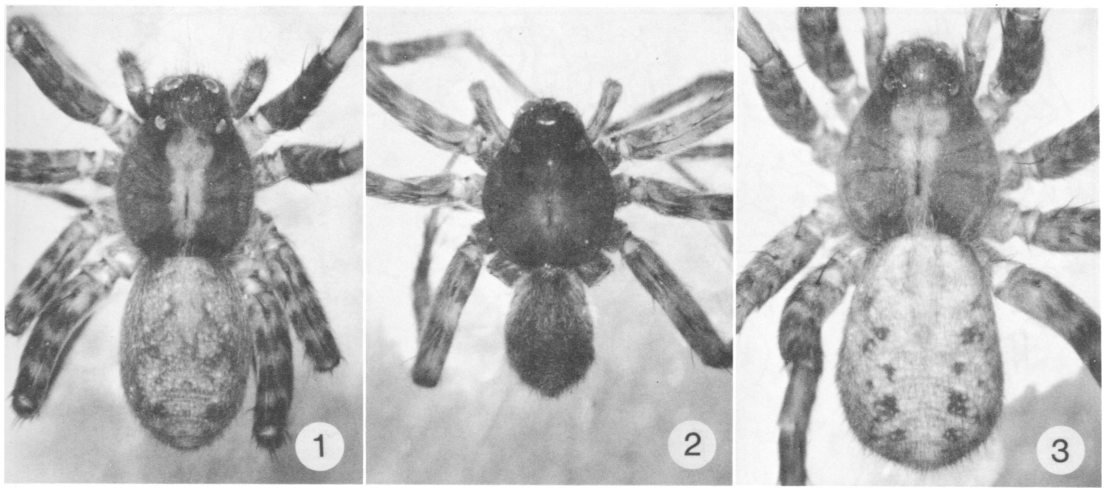
The male palpus features a strongly protruding tegulum (fig. 9), a prominent tegular (or median) apophysis of various lengths, a long embolus that arises prolaterodistally and lies obliquely across the bulb, and a slender terminal apophysis that hangs free over the tip of the embolus (fig. 10). The embolus tip rests on the conductor (fig. 12).

The epigynum is rather uniform throughout the group (at least in the North American forms), and has a median guide (or septum) that is broadly expanded in the posterior part and contrastingly slender anteriorly. The guide occupies the entire atrium, and there is a small, dark hood at the anterior end of the guide. The copulatory openings are concealed by a pair of lateral swellings in the integument at the sides of the posterior part of the median guide. The copulatory tubes become visible on dissection; they are thick and dark basally, but slender and curved toward the midline in their distal parts. The spermathecae are ovoid or elliptical, without a spermathecal organ (figs. 8, 13, 19).

North American specimens belonging to the *nigra* group can be distinguished from those of other groups in the genus *Pardosa* by the greatly protuberant tegulum of the male palpus and by the median guide of the female epigynum, which completely occupies the atrium and is broadly expanded posteriorly and contrastingly slender anteriorly.

KEY TO SPECIES

1. Male 2
   Female 9
2. Embolus twisted or flattened, not hairlike (e.g., figs. 7, 18, 36) 3
   Embolus hairlike, i.e., slender and evenly tapered to tip (e.g., fig. 43) 7
3. Embolus with corkscrew-shaped tip (figs. 4, 7) ..... *uintana*
   Embolus twisted or flattened, not corkscrew-shaped at tip (e.g., figs. 18, 36) 4
4. Embolus tapered (figs. 10, 12, 18) .... *dorsuncata*
   Embolus not tapered, but broad and twisted near tip (figs. 25, 36) 5
5. Embolus blunt at tip (figs. 21, 24, 25); carapace brown with pale median and submarginal bands (as in figs. 1, 3) ..... *hetchi*
   Embolus pointed at tip (fig. 36); carapace



FIGS. 1–3. Bodies of *Pardosa* species, dorsal views. 1. *P. dorsalis* Banks. 2. *P. gothicana,* new species. 3. *P. mackenziana* (Keyserling).

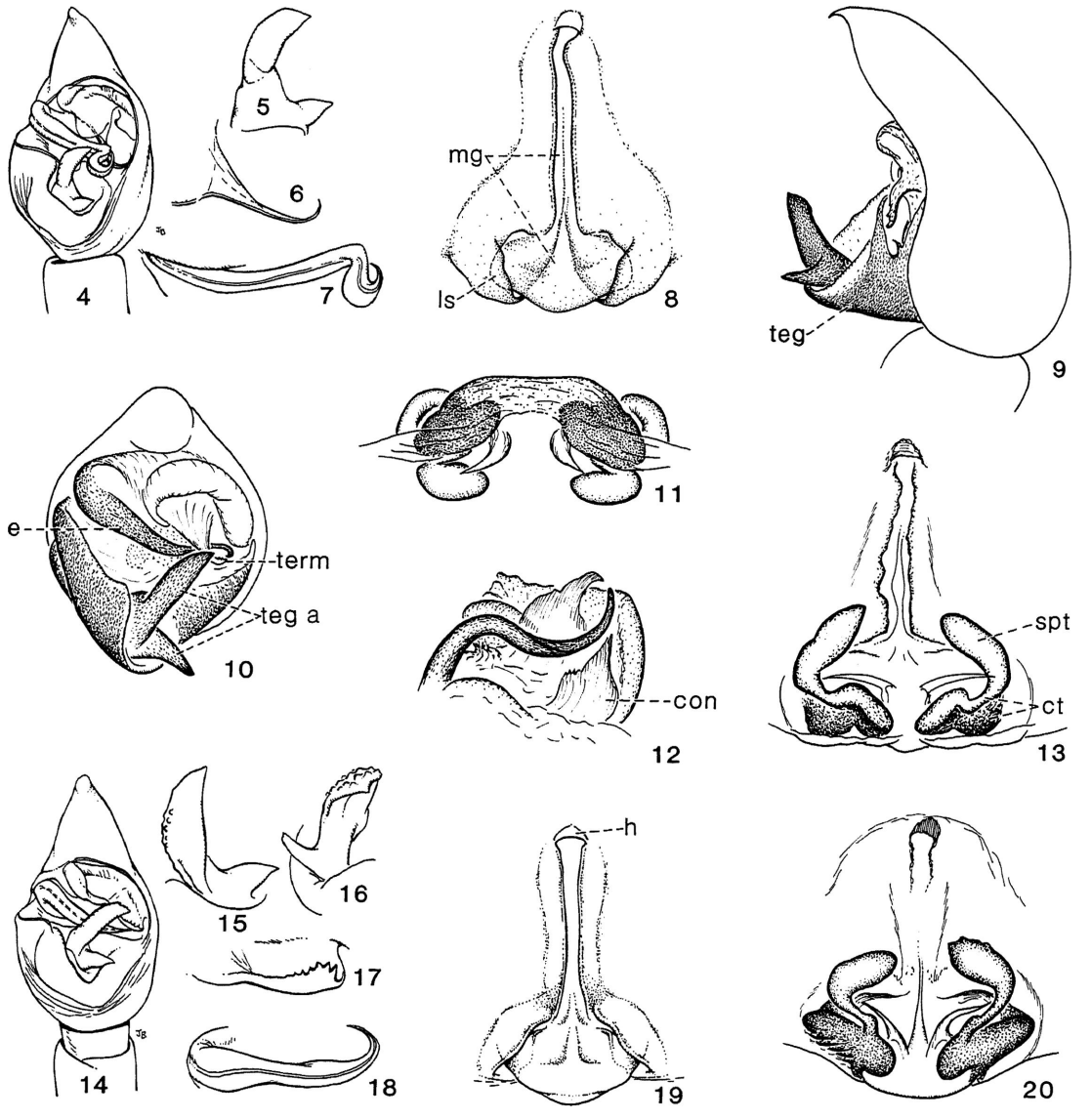
nearly black, with a few indistinct pale spots (fig. 2) 6

6. Carapace less than 2.8 mm. wide; Colorado (map 3) ..... *gothicana*
   Carapace more than 2.8 mm. wide; Oregon to British Columbia (map 3) .... *rainieriana*
7. Distal process of tegular apophysis truncate and irregularly toothed, as if splintered, at tip (figs. 38, 40, 43); terminal apophysis tapered, toothed (figs. 41, 43) .. *mackenziana*
   Distal process of tegular apophysis pointed at tip (figs. 53, 61); terminal apophysis broad, with or without teeth (figs. 54, 62) 8
8. Distal arm of tegular apophysis short (figs. 52, 53); terminal apophysis with distinct teeth (figs. 51, 54) ..... *uncata*
   Distal arm of tegular apophysis long (figs. 60, 61, 64); terminal apophysis with minute teeth or none (figs. 62, 64) ..... *dorsalis*
9. Epigynum with lateral swellings converging posteriad (fig. 8); spermathecae elongate ovoid, clearly more than twice as long as broad (fig. 13) ..... *uintana*
   Epigynum with lateral swellings parallel, or diverging posteriad (e.g., figs. 19, 28); spermathecae ovoid or rounded, less than twice as long as wide (e.g., figs. 20, 29) 10
10. Epigynum with lateral swellings approximately parallel (figs. 28, 33); carapace nearly black, with a few indistinct pale spots (fig. 2) 11
    Epigynum with lateral swellings diverging posteriad (e.g., figs. 19, 45); carapace brown with pale median and submarginal bands (figs. 1, 3) 12
11. Epigynum with inverted T-shaped sclerite (dorsal view, figs. 27, 29); Colorado (map 3) ..... *gothicana*
    Epigynum without inverted T-shaped sclerite (dorsal view, figs. 34, 37); Oregon to British Columbia (map 3) ..... *rainieriana*
12. Copulatory tubes broad, not looped (posterior view, figs. 11, 23) 13
    Copulatory tubes slender, looped (posterior view, figs. 49, 65) 14
13. Median guide of epigynum with posterior expanded part approximately three times as broad as long (fig. 22); basal parts of copulatory tubes transverse (fig. 26) .. *hetchi*
    Median guide of epigynum with posterior expanded part approximately one and one-half times as broad as long (fig. 19); basal parts of copulatory tubes oblique (fig. 20) ..... *dorsuncata*
14. Epigynum with lateral swellings large, extending far anteriad of expanded part of median guide (figs. 45, 46) .. *mackenziana*
    Epigynum with lateral swellings smaller, hardly extending anteriad of expanded part of median guide (figs. 50, 57) .... *uncata, dorsalis*

Pardosa uintana Gertsch

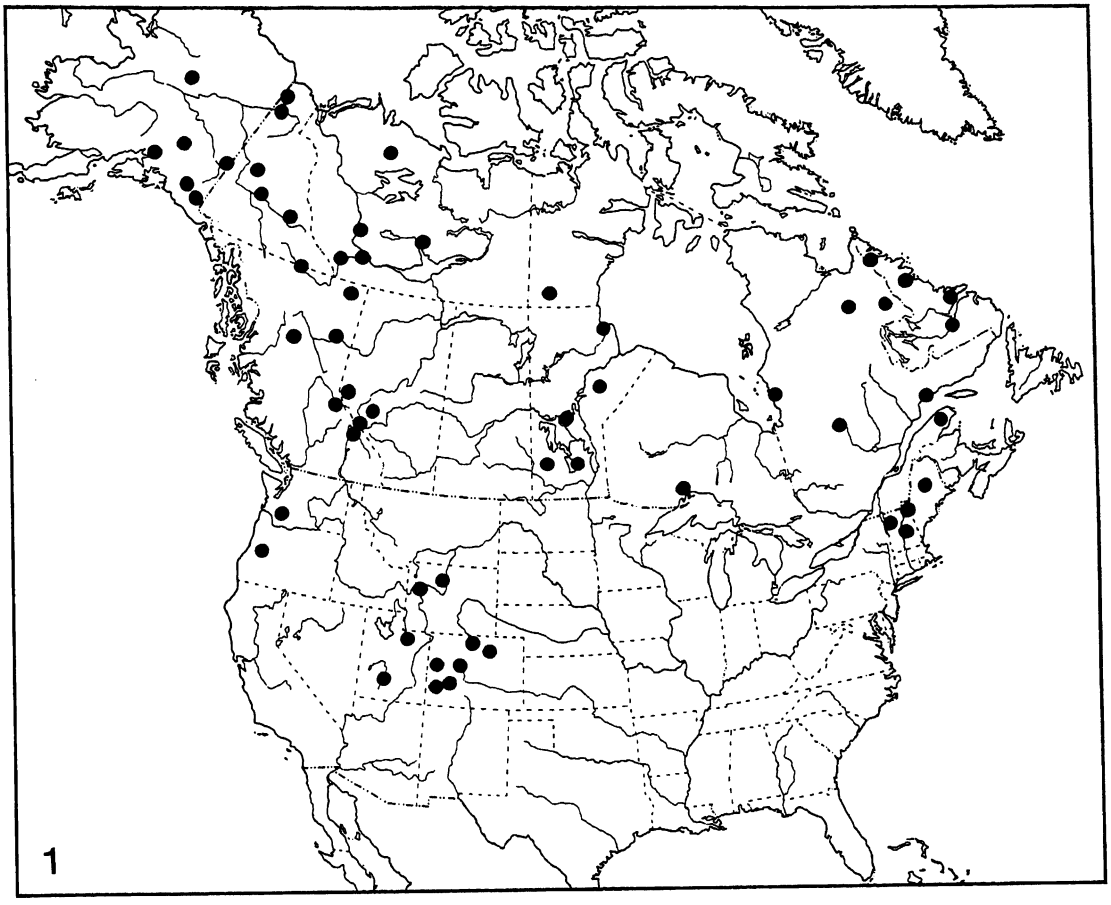
Figures 4–9, 13; Map 1

Pardosa uncata (misidentification, in part): Emerton, 1894, p. 425, pl. 3, figs. 8c, 8d, 8f only.



FIGS. 4–20. Genitalia of *Pardosa* species. 4–9, 13. *P. uintana* Gertsch. 4. Male palpus, ventral view. 5. Tegular apophysis. 6. Terminal apophysis. 7. Embolus. 8. Epigynum, ventral view. 9. Male palpus, retrolateral view. 13. Epigynum, dorsal view. 10–12, 14–20. *P. dorsuncata*, new species. 10. Male palpus, distroventral view. 11. Epigynum, posterior view. 12. Apical division of male genital bulb, basoventral view. 14. Male palpus, ventral view. 15, 16. Tegular apophysis. 17. Terminal apophysis. 18. Embolus. 19. Epigynum, ventral view. 20. Epigynum, dorsal view. *con*, conductor. *ct*, copulatory tube. *e*, embolus. *h*, hood. *ls*, lateral swelling. *mg*, median guide. *spt*, spermatheca. *teg*, tegulum. *tega*, tegular apophysis. *term*, terminal apophysis.

Pardosa uintana Gertsch, 1933, p. 27 (holotype male from "Uintah Mountains, eastern Utah," deposited in AMNH, examined). Bishop, 1949, p. 103, figs. 4–6. Levi and Levi, 1951, p. 225.



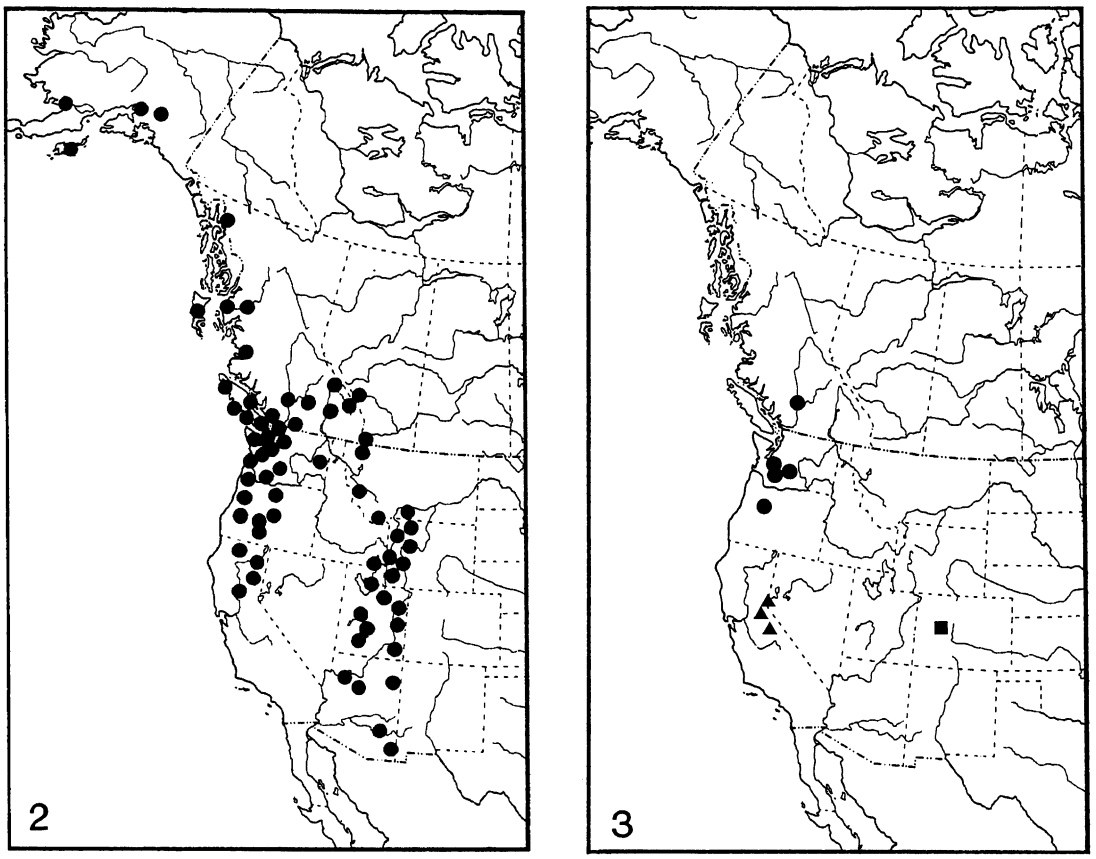
MAP 1. North America, showing collection localities of *Pardosa uintana*.

DIAGNOSIS: The stout embolus, which is corkscrew-shaped at the tip, distinguishes males of *P. uintana* from those of the other species in the group. The posteriorly converging lateral swellings on the epigynum, and the long spermathecae, distinguish females.

MALE: Carapace 2.21 ± 0.098 wide, with 95 percent confidence limits of 2.15–2.27 (13 specimens). Carapace dark brown to nearly black, with lighter median band. Abdomen dark brown, indistinctly mottled. Legs dark brown, with indistinct black rings and light brown distal segments. Tegulum of palpus strongly protuberant at base (fig. 9). Tegular apophysis with distal process rather short, slender, curved, pointed, lacking teeth at tip (fig. 5). Embolus stout, with corkscrew-shaped tip (fig. 7). Terminal apophysis slender, sometimes with few minute teeth toward tip (figs. 6, 9).

FEMALE: Carapace 2.34 ± 0.122 wide, with 95 percent confidence limits of 2.29–2.39 (23 specimens). Color essentially as in male. Epigynum with median guide laterally expanded posteriorly and slender anteriorly; lateral swellings converging posteriad (fig. 8). Spermathecae elongate ovoid, clearly more than twice as long as wide (fig. 13).

RANGE: Alaska to Labrador, south to Utah, Colorado, and northern New England (map 1).



MAPS 2, 3. 2. Western North America, showing collection localities of *Pardosa dorsuncata*. 3. Same, showing collection localities of *Pardosa hetchi* (triangles), *P. gothicana* (square), and *P. rainieriana* (circles).

NATURAL HISTORY: Specimens of *P. uintana* have been collected commonly in spruce-fir forests at upper elevations in the western mountains. In Canada, many have been collected at lower elevations, and even at sea level, often in sphagnum bogs and lichen mats near streams. A few were collected on alpine tundra. Nine egg sacs contained 41–57 eggs, with a mean of 49 ± 4.9 and with 95 percent confidence limits of 45–53 eggs.

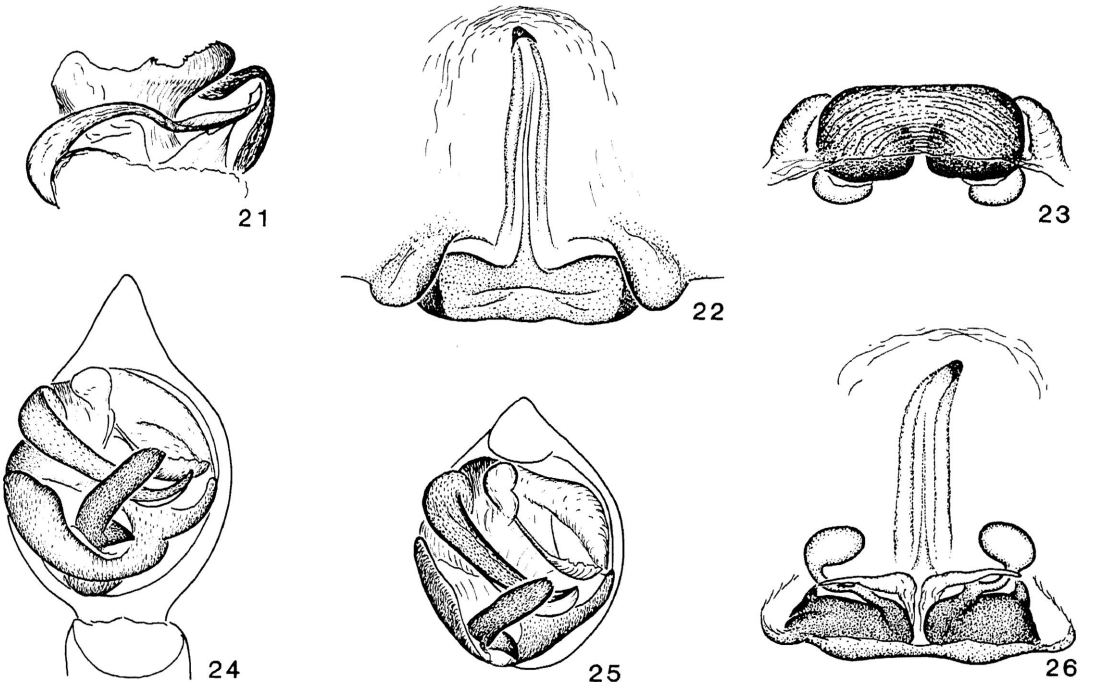
Pardosa dorsuncata, new species
Figures 10–12, 14–20; Map 2

TYPES: Holotype male from Jackson Hole Biological Station, Grand Teton National Park, Teton County, Wyoming (July 1962; D. C. Lowrie), deposited in AMNH; paratypes deposited in AMNH, MCZ, and CNC.

ETYMOLOGY: The specific name is a combination of the names *dorsalis* and *uncata*.

DIAGNOSIS: Males of *P. dorsuncata* differ from those of the other species in the group by having a flattened, tapered embolus. Females differ by having a combination of posteriorly divergent lateral swellings, median guide with the expanded part approximately one and one-half times as broad as long, and broad copulatory tubes without loops (posterior view).

MALE: Carapace 2.31 ± 0.117 wide, with 95 percent confidence limits of 2.28–2.34 (73 specimens). Carapace dark brown with light-



FIGS. 21–26. Genitalia of *Pardosa hetchi* Chamberlin and Ivie. 21. Apical division of genital bulb, basoventral view. 22. Epigynum, ventral view. 23. Epigynum, posterior view. 24, Male palpus, ventral view. 25. Male palpus, distoventral view. 26. Epigynum, dorsal view.

er median band; eye area black. Abdomen mottled light and dark brown. Legs mottled light and dark brown, with darker rings on femora and tibiae. Tegulum of palpus protuberant at base. Tegular apophysis with distal process long, broad throughout its length, usually roughened, with row of minute teeth at tip (figs. 10, 14–16). Embolus flattened, gradually tapered to tip, not hairlike (figs. 12, 18). Terminal apophysis slender, with minute teeth toward tip on prolateral side (figs. 10, 17).

FEMALE: Carapace 2.47 ± 0.159, with 95 percent confidence limits of 2.45–2.49 (240 specimens). Color essentially as in male. Epigynum with median guide rather broad posteriorly (approximately one and one-half times as broad as long), slender anteriorly, with lateral swellings diverging posteriad (fig. 19). Copulatory tubes broad at base; spermathecae ovoid, oblique (fig. 20).

RANGE: Southern Alaska to northern California and southern Arizona (map 2).

NATURAL HISTORY: Specimens of *P. dorsuncata* have been collected in the same habitats as those of *P. dorsalis*. Fifty egg sacs contained 20–66 eggs, with a mean 46 ± 11.3 and 95 percent confidence limits of 43–49 eggs.

Pardosa hetchi Chamberlin and Ivie

Figures 21–26; Map 3

Pardosa hetchi Chamberlin and Ivie, 1942, p. 34, fig. 75 (holotype female from Aspen Valley, Yosemite National Park, California, deposited in AMNH, examined). Vogel, 1967, p. 104. Roewer, 1955, p. 191.

DIAGNOSIS: Males of *P. hetchi* differ from those of the other species in the group by having a flattened, blunt embolus. Females differ by the unusually broad expanded part

of the median guide (approximately three times as broad as long).

MALE: Carapace 2.71 wide (one specimen). Carapace brown, with broad light brown median band and narrow indistinct submarginal bands; eye area black. Abdomen brown, with darker heart mark, rather mottled. Legs brown, with broad dusky rings. Tegulum of palpus protuberant. Tegular apophysis with distal process rather long, nearly straight, broad throughout its length, slightly roughened, with row of minute teeth at tip (figs. 24, 25). Embolus flattened, blunt at tip (figs. 21, 24, 25). Terminal apophysis slender, with enlarged toothed tip (figs. 21, 24, 25).

FEMALE: Carapace 2.36–2.95 wide (mean 2.64, 9 specimens). Color essentially as in male. Epigynum with median guide unusually broadly expanded posteriorly (approximately three times as broad as long), slender anteriorly, with lateral swellings diverging posteriad (fig. 22). Copulatory tubes with basal parts broad, transverse; spermathecae ovoid (fig. 26).

RANGE: Interior California (map 3).

NATURAL HISTORY: Nothing is recorded.

Pardosa gothicana, new species
Figures 2, 27–32; Map 3

TYPES: Holotype male from Galena Mountain, near Gothic, Gunnison County, Colorado (August 4, 1971; D. C. Lowrie), deposited in AMNH; paratypes in AMNH and MCZ.

ETYMOLOGY: The specific name is derived from the place name, Gothic, near which the holotype was collected.

DIAGNOSIS: Specimens of *P. gothicana* closely resemble those of *P. rainieriana* in color and external genitalia, but are apparently smaller and occupy a different geographic region. Females of *gothicana* possess an inverted T-shaped sclerite in the epigynum which is lacking in *rainieriana*.

MALE: Carapace 1.97–2.68 wide (mean 2.25, four specimens). Carapace nearly black, with few indistinct pale spots. Abdomen dark brown. Legs dark brown, with indistinct rings. Tegulum of palpus protuberant at base. Tegular apophysis with distal process short, broad (figs. 30, 32). Embolus flattened, twisted, pointed at tip (as in fig. 36). Terminal apophysis slender, slightly expanded and toothed at tip (figs. 31, 32).

FEMALE: Carapace 2.27–2.98 wide (mean 2.71, 4 specimens). Color essentially as in male (fig. 2). Epigynum with median guide rather broad posteriorly (approximately as broad as long), with lateral swellings approximately parallel (fig. 28), with inverted T-shaped sclerite at posterior end (visible in dorsal view, figs. 27, 29). Spermathecae ovoid or elliptical (figs. 27, 29).

RANGE: Colorado (map 3).

NATURAL HISTORY: The available specimens were collected at high elevations.

Pardosa rainieriana, new species
Figures 33–37; Map 3

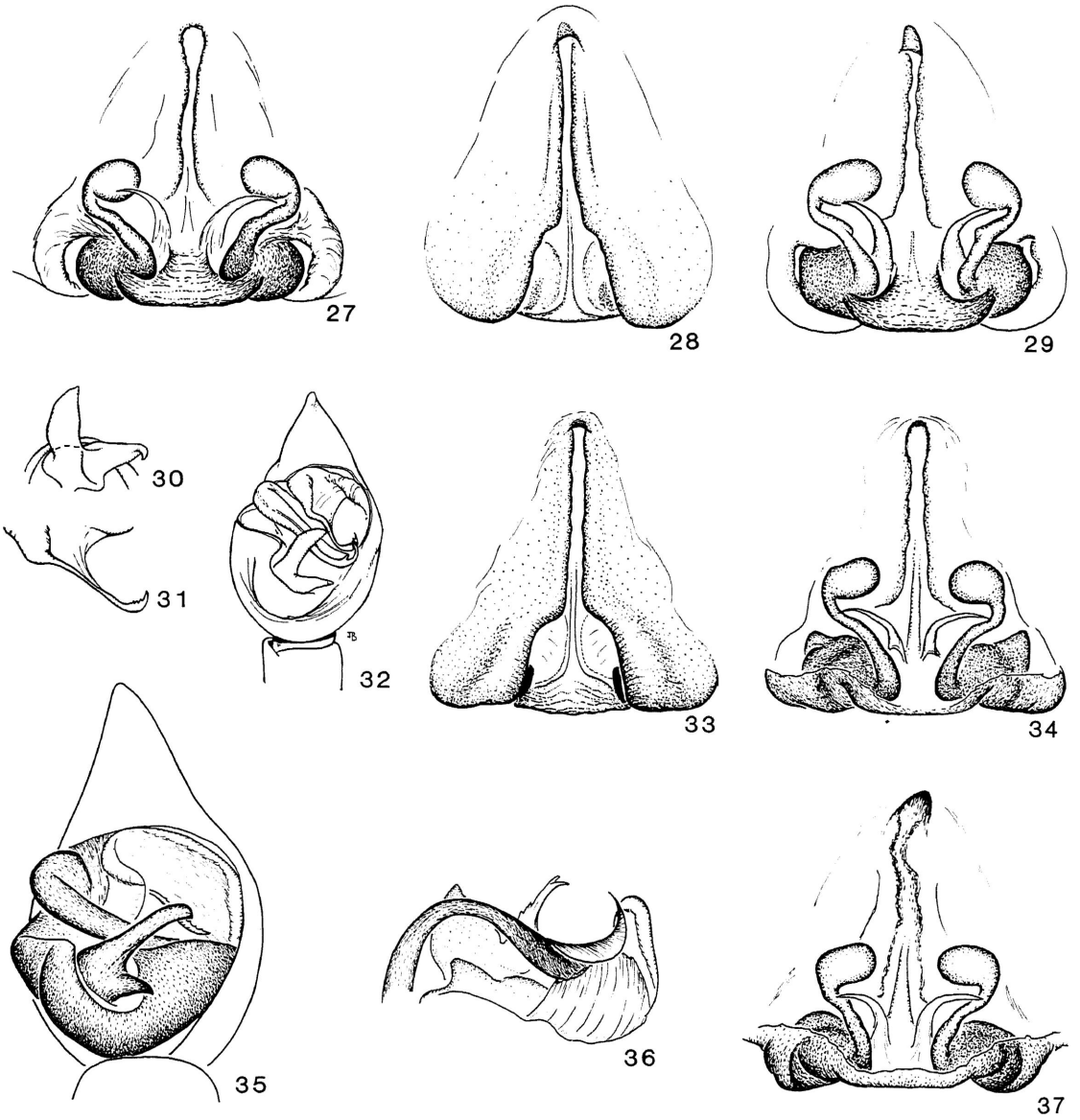
TYPES: Holotype male from Mt. Adams, Skamania County, Washington (July 31, 1962; V. Roth), deposited in AMNH; paratypes in AMNH.

ETYMOLOGY: The specific name is derived from the name of Mt. Rainier, the source of most of the specimens.

DIAGNOSIS: Specimens of *P. rainieriana* closely resemble those of *P. gothicana* in color and external genitalia, but are apparently larger and occupy a different geographic region. Females of *rainieriana* lack the inverted T-shaped sclerite seen in the epigynum of females of *gothicana*.

MALE: Carapace 2.97 ± 0.082 wide, with 95 percent confidence limits of 2.94–3.12 (eight specimens). Carapace nearly black, with few indistinct pale spots. Abdomen dark brown. Legs dark brown, with indistinct rings. Tegulum protuberant at base. Tegular apophysis with distal process short, broad (fig. 35). Embolus flattened, twisted, pointed at tip (fig. 36). Terminal apophysis slender, slightly expanded and toothed at tip (fig. 35).

FEMALE: Carapace 3.40 ± 0.278 wide, with 95 percent confidence limits of 3.23–3.59 (11 specimens). Color essentially as in

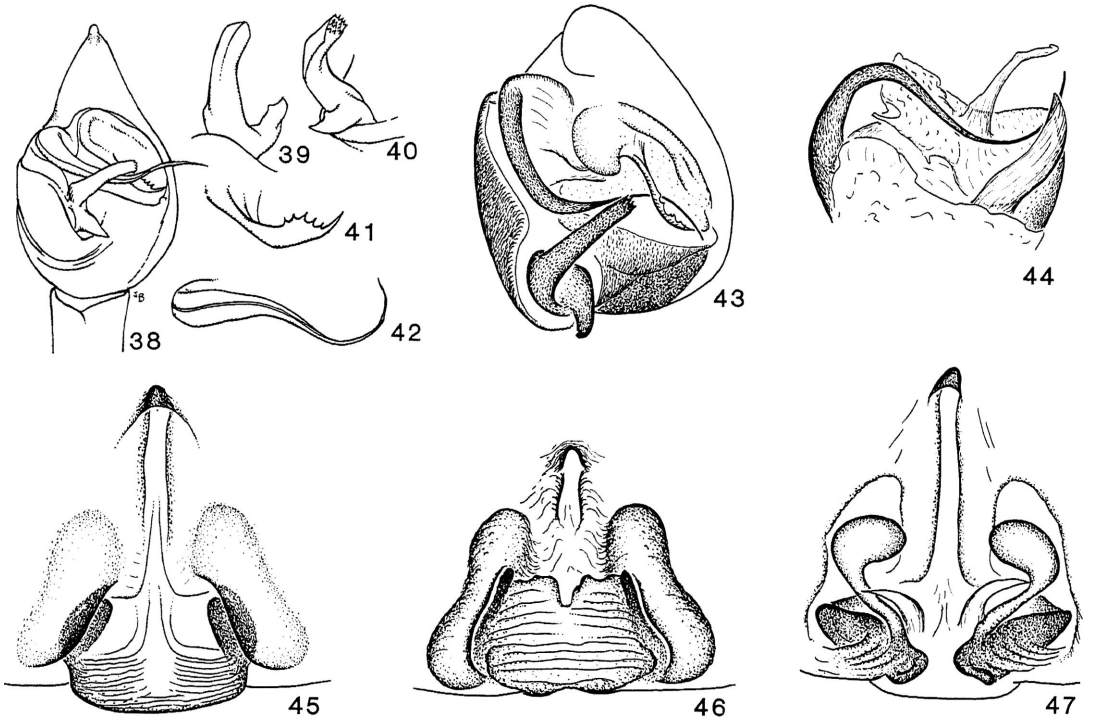


FIGS. 27–37. Genitalia of *Pardosa* species. 27–32. *P. gothicana*, new species. 27, 29. Epigynum, dorsal view. 28. Epigynum, ventral view. 30. Tegular apophysis. 31. Terminal apophysis. 32. Male palpus, ventral view. 33–37. *P. rainieriana*, new species. 33. Epigynum, ventral view. 34, 37. Epigynum, dorsal view. 35. Male palpus, ventral view. 36. Apical division of genital bulb, basoventral view.

male. Epigynum with posterior part of median guide rather broad (approximately as broad as long), with lateral swellings approximately parallel (fig. 33), lacking inverted T-shaped sclerite at posterior end (dorsal view, figs. 34, 37). Spermathecae ovoid or elliptical (figs. 34, 37).

RANGE: Oregon to British Columbia (map 3).

NATURAL HISTORY: Nothing is recorded.



FIGS. 38–47. Genitalia of *Pardosa mackenziana* (Keyserling). 38. Male palpus, ventral view. 39, 40. Tegular apophysis. 41. Terminal apophysis. 42. Embolus. 43. Male palpus, distoventral view. 44. Apical division of genital bulb, basoventral view. 45. Epigynum, ventral view. 46. Epigynum, basoventral view. 47. Epigynum, dorsal view.

Pardosa mackenziana (Keyserling)
Figures 3, 38–47; Map 4

Lycosa mackenziana Keyserling, 1877, p. 621, pl. 1, fig. 7 (holotype female from "Mackenzie River," Northwest Territories, Canada, deposited in BMNH, examined).

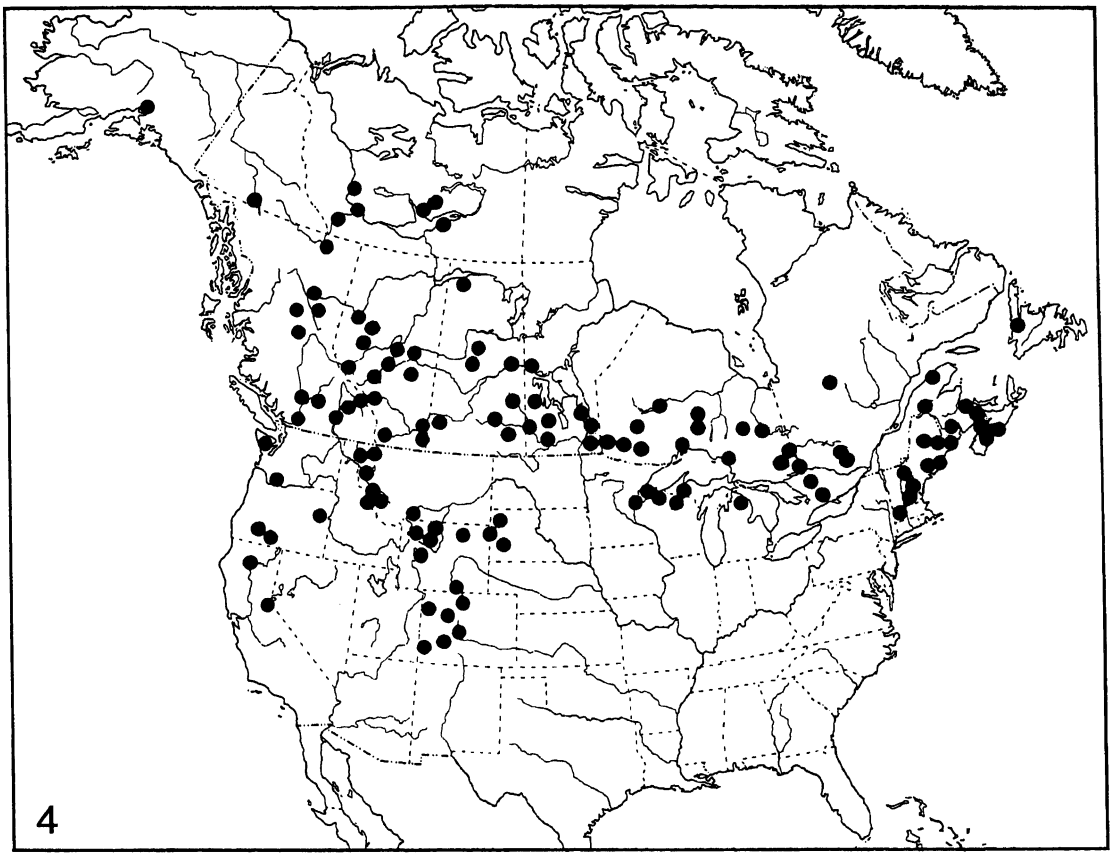
Pardosa uncata (misidentification, in part): Emerton, 1894, p. 425, pl. 3, figs. 8, 8a, 8b, 8e only.

Pardosa mackenziana: Chamberlin, 1908, p. 207, pl. 15, figs. 5, 6 (not fig. 7). Kaston, 1948, p. 338, pl. 58, figs. 1133–1136. Levi and Levi, 1951, p. 225; 1955, p. 38.

Pardosa metlakatloides Schenkel, 1951, p. 27, fig. 36 (lectotype female from Canmore, Banff National Park, Alberta, Canada, designated by Forcart (1961), deposited in NMB, examined). Roewer, 1955, p. 192. Vogel, 1967, p. 104. NEW SYNONYMY.

DIAGNOSIS: Males of *P. mackenziana* most resemble those of *P. dorsalis* and *P. uncata,* as all three possess a hairlike embolus. Males of *P. mackenziana* differ from the others by having a truncate, toothed tegular apophysis and a long, tapered, toothed terminal apophysis. Females of *P. mackenziana* most resemble those of *P. uncata, P. dorsalis,* and *P. dorsuncata,* but can be separated by the combination of looped copulatory tubes and large lateral swellings.

MALE: Carapace 2.41 ± 0.137 wide, with 95 percent confidence limits of 2.38–2.44 (77 specimens). Carapace brown with light brown median band, sometimes with indistinct submarginal bands. Abdomen mottled dull red and brown, with lateral areas nearly black. Legs brown with broad black rings. Tegulum of palpus protuberant. Tegular apophysis with distal process rather long, slender, parallel at sides, slightly curved, truncate, provided with several minute, ir-



MAP 4. North America, showing collection localities of *Pardosa mackenziana*.

regular teeth as if splintered at tip (figs. 38, 40, 43). Embolus hairlike, curved in two planes (figs. 43, 44). Terminal apophysis slender, with several minute teeth toward tip (figs. 41, 43).

FEMALE: Carapace 2.55 ± 0.165 wide, with 95 percent confidence limits of 2.52–2.58 (136 specimens). Color essentially as in male (fig. 3). Epigynum with median guide composed of broad posterior part and slender anterior part, and with lateral swellings long, extending far anteriad of expanded part of median guide (figs. 45, 46). Copulatory tubes slender, looped; spermathecae ovoid or elliptical (fig. 47).

RANGE: Alaska to Newfoundland, south to northern California and Colorado (map 4).

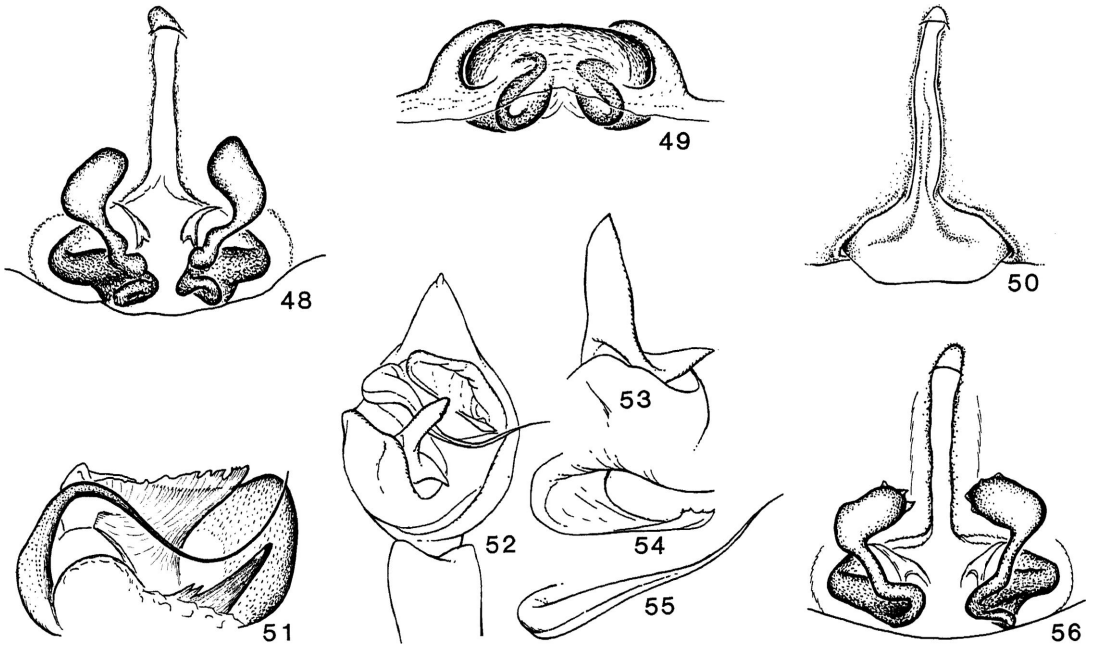
SYNONYMY: Comparison of the holotype of *P. metlakatloides* with numerous females of *P. mackenziana* revealed no specific differences.

NATURAL HISTORY: Individuals of *P. mackenziana* are commonly collected in spruce and lodgepole pine forests in the western mountains, and in conifer forests of many kinds across Canada. Occasional specimens were taken in oak, poplar, or birch forests, as well as in salt marshes, sphagnum bogs, and beach litter along the shores of seas and lakes. Forty-five egg sacs contained 14–81 eggs, with a mean of 50 ± 16.0 and with 95 percent confidence limits of 45–55 eggs.

Pardosa uncata (Thorell)

Figures 48–56; Map 6

Lycosa uncata Thorell, 1877, p. 508 (syntypes: one male and one female from Georgetown,



FIGS. 48–56. Genitalia of *Pardosa uncata* (Thorell). 48, 56. Epigynum, dorsal view. 49. Epigynum, posterior view. 50. Epigynum, ventral view. 51. Apical division of genital bulb, basoventral view. 52. Male palpus, ventral view. 53. Tegular apophysis. 54. Terminal apophysis. 55. Embolus.

Colorado; two females from "the Blackhawk, Colorado"; one female from "Mount Gray," Colorado; and one female, from "Idaho," all lost except the female from Georgetown, which is deposited in NRS, examined). Not *P. uncata*, Emerton, 1894.

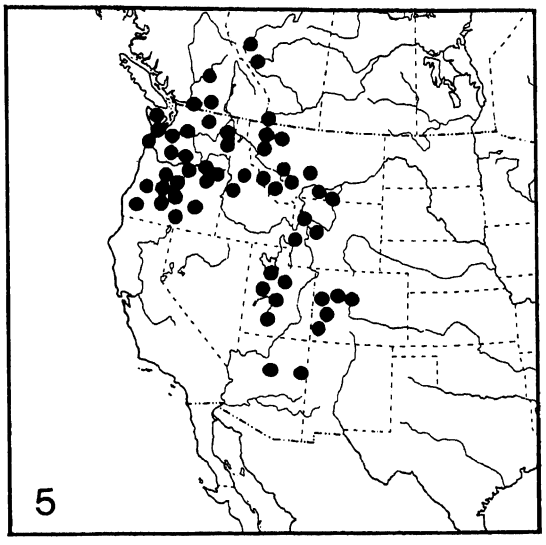
DIAGNOSIS: Males of *P. uncata* resemble those of *P. mackenziana* and *P. dorsalis* in possessing a long, hairlike embolus, but differ in having a short, pointed tegular apophysis, and further from *P. dorsalis* in having distinct teeth on the terminal apophysis. Females of *P. uncata* most resemble those of *P. mackenziana, P. dorsuncata,* and *P. dorsalis*; they can be separated from females of *P. mackenziana* by the smaller lateral swellings on the epigynum, and from those of *P. dorsuncata* by having slender, looped copulatory tubes. Characters for separating females of *P. uncata* and *P. dorsalis* have not been found.

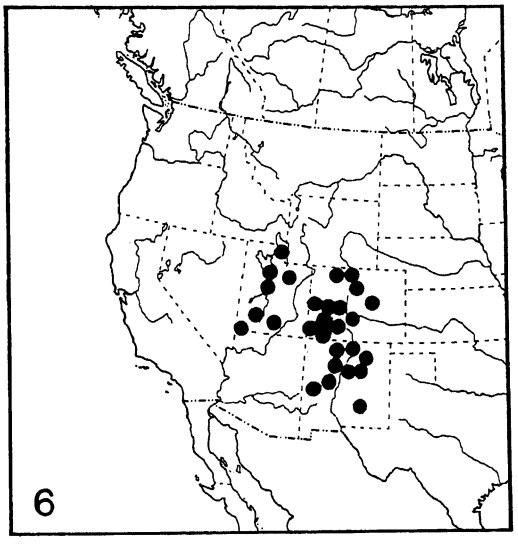
MALE: Carapace 2.34 ± 0.120 wide, with 95 percent confidence limits of 2.31–2.38 (50 specimens). Carapace brown, with lighter median band. Abdomen brown, darker laterally. Legs brown or dull brown yellow, with black rings. Tegulum of palpus protuberant at base. Tegular apophysis rather short, with pointed distal process (figs. 52, 53). Embolus hairlike (figs. 51, 55). Terminal apophysis with several distinct teeth toward tip (figs. 51, 54).

FEMALE: Carapace 2.44 ± 0.149 wide, with 95 percent confidence limits of 2.41–2.46 (177 specimens). Color essentially as in male. Epigynum with broad posterior part and slender anterior part (fig. 50). Copulatory tubes slender, looped; spermathecae ovoid (figs. 49, 56).

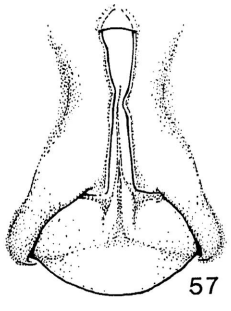
RANGE: Idaho, Utah, Colorado, and New Mexico (map 6).

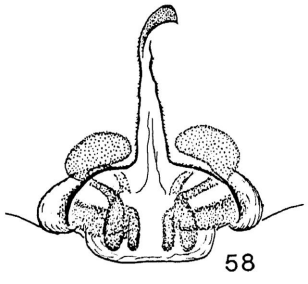
NATURAL HISTORY: Most individuals of *P. uncata* were collected on the ground in moist conifer forest in the western mountains. Those collected in the southernmost parts of the range were found in swampy

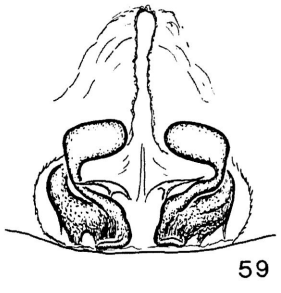


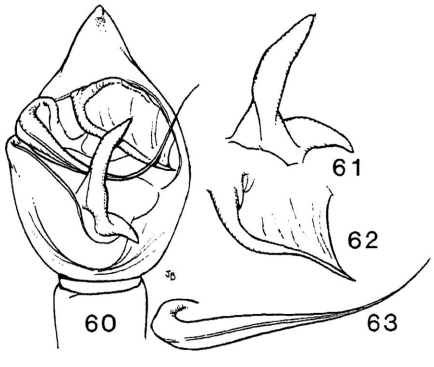


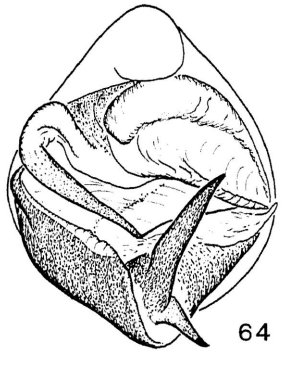
MAPS 5, 6. 5. Western North America, showing collection localities of *Pardosa dorsalis*. 6. Same, showing collection localities of *Pardosa uncata*.

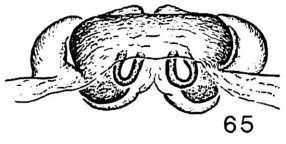


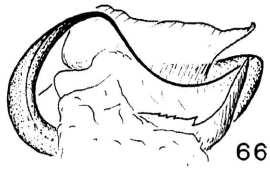












FIGS. 57–66. Genitalia of *Pardosa dorsalis* Banks. 57. Epigynum, ventral view. 58. Epigynum, ventral view, cleared. 59. Epigynum, dorsal view. 60. Male palpus, ventral view. 61. Tegular apophysis. 62. Terminal apophysis. 63. Embolus. 64. Male palpus, distoventral view. 65. Epigynum, posterior view. 66. Apical division of genital bulb, basoventral view.

areas or under moist, decaying logs. Fifty-two egg sacs contained 13–75 eggs, with a mean of 44 ± 7.9 and with 95 percent confidence limits of 42–46.

Pardosa dorsalis Banks

Figures 1, 57–66; Map 5

Pardosa dorsalis Banks, 1894, p. 51 (holotype female from "West Cliff" [probably Westcliffe, Custer County], Colorado, deposited in MCZ, examined).

DIAGNOSIS: Males of *P. dorsalis* most resemble those of *P. mackenziana* and *P. uncata* in that all have a long, hairlike embolus. They differ by lacking distinct teeth on the terminal apophysis, and by having a long, pointed distal process on the tegular apophysis. Females of *P. dorsalis* most resemble those of *P. mackenziana, P. dorsuncata,* and *P. uncata*; they can be separated from those of *P. mackenziana* by the smaller lateral swellings on the epigynum, and from those of *P. dorsuncata* by having slender, looped copulatory tubes. Characters for separating females of *P. dorsalis* and *P. dorsuncata* have not been found.

MALE: Carapace 2.33 ± 0.095 wide, with 95 percent confidence limits of 2.31–2.36 (58 specimens). Carapace dark brown, with lighter median band; eye area black. Abdomen mottled light and dark brown. Legs mottled light and dark brown, with dark rings on femora and tibiae. Tegulum of palpus protuberant. Tegular apophysis with distal process long, thin, pointed (figs. 60, 61, 64). Embolus hairlike (figs. 63, 66). Terminal apophysis tapered, without distinct teeth (figs. 62, 66).

FEMALE: Carapace 2.51 ± 0.114 wide, with 95 percent confidence limits of 2.48–2.54 (78 specimens). Color essentially as in male. Epigynum with median guide broad posteriorly, slender anteriorly (fig. 57). Copulatory tubes slender, looped; spermathecae ovoid (figs. 58, 59, 65).

RANGE: British Columbia and Alberta to Arizona (map 5).

NATURAL HISTORY: Individuals of *P. dorsalis* have been collected at lower elevations in the conifer-covered mountains of the west. Twenty egg sacs contained 23–76 eggs, with a mean of 49 ± 10.6 and with 95 percent confidence limits of 44–54 eggs.

LITERATURE CITED

Banks, Nathan
1894. On the Lycosidae of Colorado. Jour. New York Ent. Soc., vol. 2, pp. 49–52.

Barnes, Robert D.
1959. The *lapidicina* group of the wolf spider genus *Pardosa* (Araneae: Lycosidae). Amer. Mus. Novitates, no. 1960, pp. 1–20, figs. 1–41.

Bishop, Sherman C.
1949. Spiders of the Nueltin Lake Expedition, Keewatin, 1947. Canadian Ent., vol. 81, pp. 101–104, figs. 1–13.

Chamberlin, Ralph V.
1908. Revision of North American spiders of the family Lycosidae. Proc. Acad. Nat. Sci. Philadelphia, vol. 60, pp. 158–318, pls. 8–23.

Chamberlin, Ralph V., and Wilton Ivie
1942. A hundred new species of American spiders. Bull. Univ. Utah, vol. 37, no. 10, pp. 1–117, figs. 1–230.

Emerton, James H.
1894. Canadian spiders. Trans. Connecticut Acad. Arts Sci., vol. 9, pp. 400–429, pls. 1–4.

Forcart, Lothar
1961. Katalog der Typusexemplare in der Arachnida-Sammlung des Naturhistorischen Museums zu Basel: Scorpionidea, Pseudoscorpionidea, Solifuga, Opilionidea und Araneida. Verhandl. Naturf. Ges. Basel, vol. 72, pp. 47–87.

Gertsch, Willis J.
1933. New genera and species of North American spiders. Amer. Mus. Novitates, no. 636, pp. 1–28, figs. 1–49.

Kaston, Benjamin J.
1948. Spiders of Connecticut. Bull. Connecticut State Geol. Nat. Hist. Surv., no. 70, pp. 1–874, text figs. 1–4, pls. 1–144.

Keyserling, Eugen
1877. Ueber amerikanische Spinnenarten der

Unterordnung Citigradae. Verhandl. Zool.-Bot. Ges. Wien, vol. 26, pp. 609–708, pls. 7, 8.

Kronestedt, Torbjörn

1975. Studies on species of Holarctic *Pardosa* groups (Araneae, Lycosidae). 1. Redescription of *Pardosa albomaculata* Emerton and description of two new species from North America, with comments on some taxonomic characters. Zool. Scripta, vol. 4, pp. 217–228, figs. 1–9.

Levi, Herbert W., and Lorna R. Levi

1951. Report on a collection of spiders and harvestmen from Wyoming and neighboring states. Zoologica, New York, vol. 36, pp. 219–237, figs. 1–50.

Levi, Lorna R., and Herbert W. Levi

1955. Spiders and harvestmen from Waterton and Glacier National Parks. Canadian Field-Nat., vol. 69, pp. 32–40, figs. 1–30.

Lowrie, Donald C.

1973. The microhabitats of western wolf spiders of the genus *Pardosa*. Ent. News, vol. 84, pp. 103–116.

Roewer, Carl F.

1955. Katalog der Araneae. Brussels, vol. 2, pt. 1, 923 pp.

Schenkel, Ehrenfried

1951. Spinnentiere aus dem westlichen Nordamerika, gesammelt von Dr. Hans Schenkel-Rudin. Verhandl. Naturf. Gesell. Basel, vol. 62, pp. 24–62, figs. 35–51.

Thorell, Tamerlan

1877. Descriptions of the Araneae collected in Colorado in 1875 by A. S. Packard, Jr., M.D. Bull. U.S. Geol. Surv., vol. 3, pp. 477–529.

Vogel, Beatrice R.

1964. A taxonomic revision of the *distincta* group of the wolf-spider genus *Pardosa* in America north of Mexico (Araneida, Lycosidae). Postilla, no. 82, pp. 1–30, figs. 1–28.

1967. A list of new North American spiders, 1940–1966. Mem. Amer. Ent. Soc., no. 23, pp. 1–186.

1970. Taxonomy and morphology of the *sternalis* and *falcifera* species groups of *Pardosa* (Araneida: Lycosidae). Armadillo Pap., no. 3, pp. 1–31, figs. 1–120.

Zyuzin, A. A.

1978. A taxonomic study of Palaearctic spiders of the genus *Pardosa* (Aranei, Lycosidae). Part 1. The taxonomic structure of the genus. Ent. Rev., vol. 58, pp. 165–185.

The Neotropical Spider Genera *Architis* and *Staberius* (Pisauridae)

JAMES E. CARICO[1]

ABSTRACT

Architis tenuis and *A. nitidopilosa* are redescribed, and five new species (*A. cymatilis, A. robusta, A. ikuruwa, A. capricorna,* and *A. vilhena*) are described. *Tetragonophthalma spinipes* (Taczanowski) is transferred to *Staberius* and placed as a senior synonym of *S. aculeatus* Simon.

INTRODUCTION

Species of the genus *Architis* and *Staberius* are the smallest and least known of the Western Hemisphere pisaurids, with the exception of *Thaumasia argenteonotatus*. The facts that they are among the smallest pisaurids and that their range is largely in poorly collected areas probably contribute to their relative scarcity in collections. Practically nothing is known about their biology; only an occasional note in a collection vial provides us with any clue to their habits. These data are included with the following descriptions of each species. It is clear that the female exhibits the typical pisaurid maternal characters of making a spherical egg sac which she carries in her chelicerae. Apparently some kind of web is produced, but it is not known if this is the typical nursery web of the family.

Repeated efforts were made by Dr. H. W. Levi to acquire the Brazilian types of Mello-Leitão without success. As a result, I must presume them to be nonexistent for the purposes of this paper. Only one species was attributed by Mello-Leitão to this group, and it is apparently not a synonym of any species described herein.

Special nomenclatural problems have involved Simon's type collection of *A. tenuis*, and these are discussed under the description of that species.

I appreciate the cooperation of the following people and institutions who put their collections at my disposal: Drs. H. W. Levi, Museum of Comparative Zoology; N. I. Platnick, American Museum of Natural History; M. Hubert, Muséum National d'Histoire Naturelle; M. W. R. V. Graham, University Museum of Oxford; J. Prószyński, Polska Akademia Nauk, Instytut Zoologiczny; K. W. Brown, Peabody Museum of Natural History. I am also grateful to H. W. Levi for his help in obtaining type specimens. I wish to thank J. B. Cocking, H. D. Cameron, and W. A. Sherwood for their help with translations, and Nelle Carico for editing. All measurements are in millimeters.

ARCHITIS SIMON

Architis Simon, 1898a, p. 2 (type species by monotypy *Architis tenuis* Simon).

DIAGNOSIS: See Diagnosis under *Staberius* for comparisons of the two genera.

DESCRIPTION: Carapace low to moderately high, longer than wide. Posterior eye row moderately recurved, wider than anterior row, PE equal and usually larger than AE, PME closer to each other than to PLE; anterior row straight to strongly procurved; ocular quandrangle wider above than below, higher than height of clypeus. Sternum lan-

[1] Professor, Department of Biology, Lynchburg College, Lynchburg, Virginia 24501.

ceolate, about as long as wide. Chelicerae moderately robust with three promarginal, three retromarginal teeth on fang furrow. Legs typically long and slender, with numerous long macrosetae; length sequence varies, III shortest. Abdomen longer than wide, unmodified, slightly overlaps posterior edge of carapace; colulus present. Male pedipalp bulb simple, compact ventrally with no free sclerites; embolus long, slender, only tip visible externally; tibial apophysis variable. Female epigynum usually simple with two openings anterior to epigastric furrow; internal copulatory apparatus composed of one or two pairs of spermathecae.

NOTE: The body configuration and eye pattern show considerable variation among the species of *Architis*, a similar situation to that found in *Pisaurina* (Carico, 1972). Particularly, the anterior eye row may be straight with the clypeus high or in some cases strongly procurved with the ALE almost on the clypeal margin. The eyes of the anterior row vary also in relative diameters; the ALE may be larger or subequal to the AME.

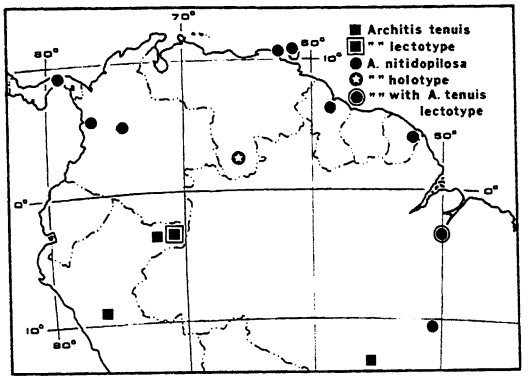
UNCERTAIN SPECIES: Mello-Leitão's description of *Architis paulistana* (1917, pp. 99–100), which contains no figures, is not sufficient to make certain its generic placement or identification. It is clear, from his description of the eyes, that it is not synonymous with any species described in this paper. I will have to await the availability of the type in order to make a further determination.

Architis tenuis Simon

Figures 4, 8, 16, 17, 26, 27; Map 1

Architis tenuis Simon, 1898b, pp. 12, 13 (syntypes: No. 4,093 from Cameta, Para, Brazil and Pebas, Peru, in the Muséum National d'Histoire Naturelle, Paris, examined; lectotype designated, see note below), 1898a, p. 292. Roewer, 1954, p. 110. Bonnet, 1955, p. 639.

DIAGNOSIS: *Architis tenuis* and *A. nitidopilosa* are similar but distinguished from other species by the procurved anterior row of subequal eyes. Details of the genitalia differentiate the former by the shape of the tibial apophysis of the male palp and the number of spermathecae in the female.



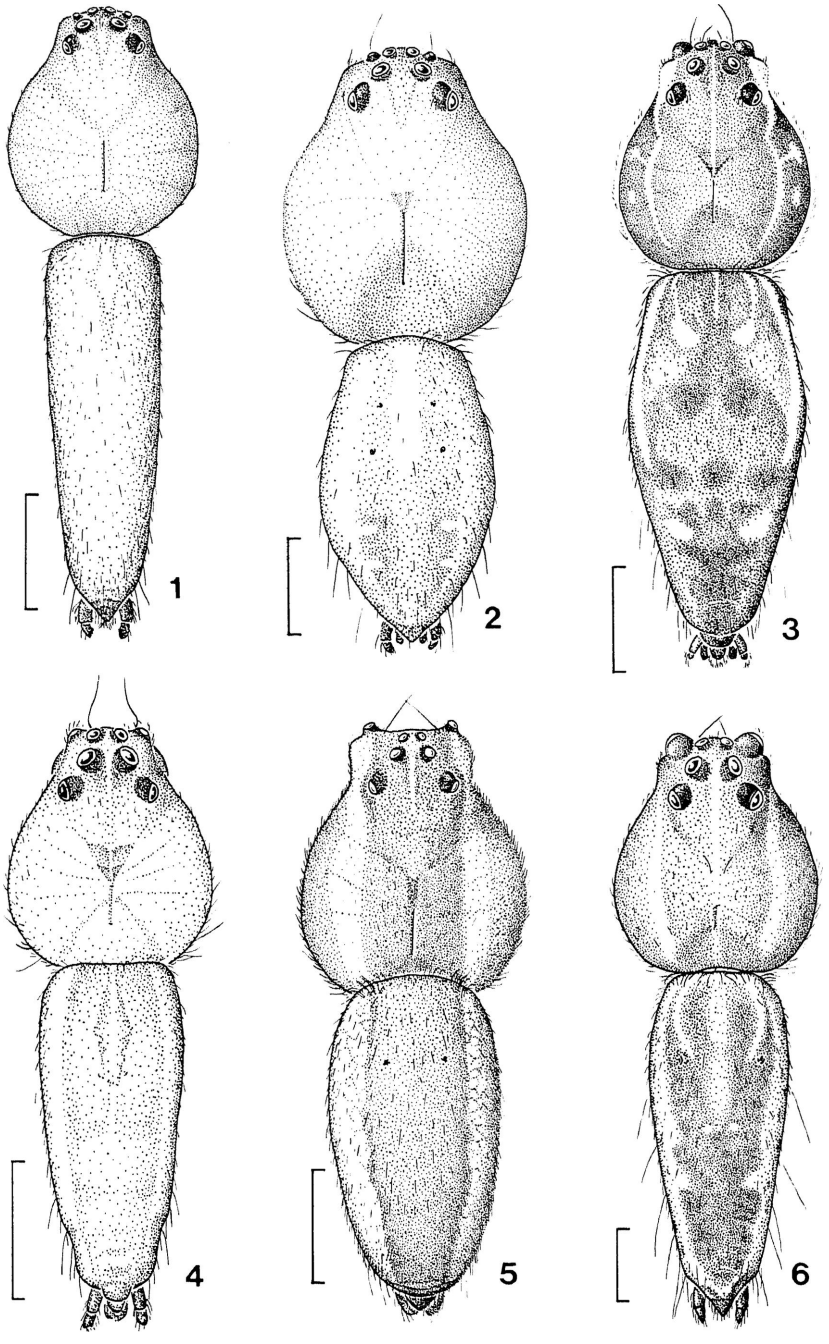
MAP 1. Distributions of *Architis tenuis* and *A. nitidopilosa*.

MALE (lectotype): Carapace (fig. 4) moderately high, narrow light median band, submarginal light bands, each eye surrounded by discrete dark ring, length 1.77, width 1.48. Sternum pale, unmarked. Eye measurements in table 1, anterior row procurved, ALE on low tubercles (fig. 8). Leg measurements in table 2, unmarked, very slender, several short stout macrosetae on ventral side of coxae I and II and trochanter I. Abdomen (fig. 4) with faint dusky median band dorsally, cardiac area outlined by dark, lateral and ventral surfaces light and unmarked, length 2.5. Palp (figs. 16, 17) with tibial apophysis composed of two elements, wide bladelike and dorsal blunt, curved tubercle; pencil of hairs projects from between two elements.

FEMALE (paralectotype): Carapace length 2.1, width 1.7, pattern similar to male. Eye measurements in table 1. Sternum light and unmarked. Leg measurements in table 2. Abdomen with pattern similar to male, length 3.8. Epigynum with very simple external surface configuration, lightly sclerotized with pair of inconspicuous openings in surface, dark red spermathecae visible through integument; internal copulatory apparatus composed only of pair of blind, heavily sclerotized spermathecae.

NATURAL HISTORY: Unknown.

DISTRIBUTION: *Brazil:* Vila Vera. *Peru:* Pebas, Yquitos, Tingo Maria (map 1).



FIGS. 1–6. Dorsum patterns of *Architis* species. 1. *A. vilhena*, male holotype. 2. *A. capricorna*, male holotype. 3. *A. nitidopilosa*, female from Panama. 4. *A. tenuis*, male lectotype. 5. *A. robustus*, male holotype. 6. *A. piscinis*, male holotype. Scale lines are 1 mm.

TABLE 1
Eye Measurements (in Millimeters) of Species of *Architis* and *Staberius*

Species	Diameters				Row length		Ocular quadrangle			
	ALE	AME	PLE	PME	Ant.	Post.	Width ant.	Width post.	Height	Clyp.
A. tenuis ♂	0.13	0.14	0.17	0.17	0.55	0.77	0.30	0.46	0.40	0.05
A. tenuis ♀	0.15	0.15	0.20	0.20	0.70	0.92	0.33	0.54	0.45	0.05
A. nitidopilosa ♂	0.15	0.14	0.20	0.20	0.65	0.86	0.34	0.50	0.42	0.07
A. nitidopilosa ♀	0.13	0.12	0.18	0.16	0.61	0.83	0.29	0.48	0.37	0.09
A. cymatilis ♂	0.15	0.11	0.15	0.17	0.62	0.67	0.25	0.43	0.36	0.04
A. cymatilis ♀	0.22	0.13	0.21	0.21	0.91	0.88	0.33	0.58	0.50	0.06
A. robusta ♂	0.11	0.13	0.15	0.15	0.76	0.84	0.31	0.47	0.40	0.11
A. ikuruwa ♀	0.23	0.13	0.20	0.20	0.86	0.85	0.33	0.55	0.45	0.08
A. capricorna ♂	0.25	0.25	0.14	0.17	0.73	1.20	0.42	0.60	0.52	0.22
A. vilhena ♂	0.12	0.12	0.20	0.19	0.57	0.80	0.30	0.45	0.38	0.17
S. spinipes ♂	0.11	0.11	0.15	0.15	0.54	0.75	0.27	0.40	0.38	0.16
S. spinipes ♀	0.13	0.13	0.20	0.20	0.65	0.96	0.31	0.51	0.48	0.23

MATERIAL EXAMINED: Six males, five females.

NOTE: Obviously Simon combined two different collections into the type vial because there were two distinct, but closely related, species among the eight syntypes. He also listed the "habitat" as two widely separated localities in South America. In an examination of the type collection, I found that the male holotype he described could not be distinguished among the males of either species in the vial. Difficulties also arose concerning matching the corresponding males and females in the appropriate species because of the close similarity in general morphology.

In order to resolve these problems, I compared Simon's specimens with other collections made from the regions listed by Simon in order to match males and females and to determine from which locality each species was taken. Of the two species represented, one was synonymous with *A. nitidopilosa* and the other was not described by any other author. It is this second species that I am calling *A. tenuis* and from which I selected the lectotype. I presume the lectotype locality is Pebas, Peru (map 1), and that the *A. nitidopilosa* specimens were collected from Cameta, Brazil (map 1).

TABLE 2
Leg Measurements (in Millimeters) of Species of *Architis* and *Staberius* (1) approximated; (2) missing

Species	I	II	III	IV
A. tenuis ♂	12.2	13.1	10.2	13.3
A. tenuis ♀	14.4	16.3	10.7	14.5
A. nitidopilosa ♂	19.6	20.7	11.9	15.9
A. nitidopilosa ♀	12.3	13.3	9.5	11.4
A. cymatilis ♂	11.8	12.2	9.4	11.2
A. cymatilis ♀	15.1	15.3	11.2	14.8
A. robusta ♂	10.9	10.5	8.5	8.7
A. ikuruwa ♀	(2)	13.2	10.6	12.7
A. capricorna ♂	15.5	15.5	11.2	15.4
A. vilhena ♂	13.5 (1)	13.5	10.3	11.6
S. spinipes ♂	14.2	13.6	10.8	12.9
S. spinipes ♀	16.8	16.7	14.1	15.8

Architis nitidopilosa Simon
Figures 3, 12–15, 32, 33; Map 1

Architis nitidopilosa Simon, 1898b, p. 42 (male holotype No. 9611 from Orinoco, Venezuela, in the Muséum National d'Histoire Naturelle, Paris, examined), 1898a, p. 292 (*A. nitidoplumosa* [*sic*]). Roewer, 1954, p. 110. Bonnet, 1955, p. 639.

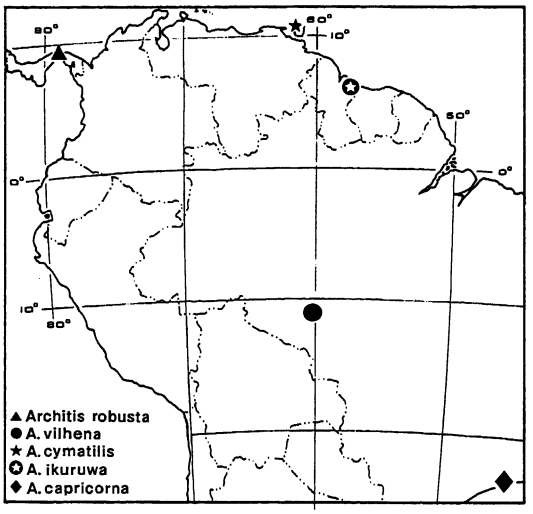
DIAGNOSIS: *Architis nitidopilosa* and *A. tenuis* are very similar; see the Diagnosis of the latter species for a comparison.

MALE (holotype): Carapace light, with indistinct dusky median band; each eye surrounded by a dark ring; length 2.0, width 1.8. Sternum light, unmarked. Eye measurements in table 1, anterior row procurved, ALE on low tubercles. Leg measurements in table 2, unmarked, very slender, few short stout macrosetae on ventral side of coxa I and trochanter I. Abdomen broad, with irregular dusky band on dorsum, sides and venter light and unmarked, length 3.0. Palp (figs. 14, 15) with tibial apophysis composed of two elements; wide curved, bladelike part and dorsal tubercle; indistinct patch of hairs near area between two elements.

FEMALE: (From Simon's *A. tenuis* type collection.) Carapace length 1.8, width 1.5, light with indistinct median dusky band, similar to male. Eye measurements in table 1, anterior row procurved, ALE on low tubercles. Leg measurements in table 2. Abdomen light, unmarked, length 3.2. Epigynum (figs. 32, 33) with very simple external surface configuration, lightly sclerotized with pair of inconspicuous openings in surface, dark red spermathecae visible through integument; internal copulatory apparatus composed of pair of blind, heavily sclerotized spermathecae; median spermathecae with coiled lumens.

VARIATION: Simon's specimens, which are described above, have evidently lost most of their color pattern. The material collected by A. M. Chickering from Panama in the 1930s still has the pattern distinct. A female dorsal pattern of a Panamanian specimen is illustrated (fig. 3), and is further described as follows: median dusky band on venter of abdomen, sternum with irregular maculae and light median area, legs with indistinct annulae.

None of the available males have the pattern well preserved. There is some variation in the palpi, especially in the shape of the tibial apophysis. The bladelike part varies in shape, as can be seen in a comparison of figures of the holotype (figs. 14, 15) and a male from Simon's type collection of *A. tenuis* (figs. 12, 13).



MAP 2. Distributions of *Architis robusta, A. vilhena, A. cymatilis, A. ikuruwa,* and *A. capricorna.*

NATURAL HISTORY: Apparently this species is relatively abundant, judging from the number of specimens collected by A. M. Chickering in Panama. Notes with his collections indicate that the egg sac is carried in the chelicerae like other pisaurids. Egg sacs occurred from June 6 to July 30. Two collection notes (June 6, July 14) state that the females were taken from "webs" with many young. Unfortunately he does not describe these webs and we do not know if they are the familiar pisaurid nursery-type webs or another type. A collection from the Ikuruwa River in Guyana was from a forest savanna.

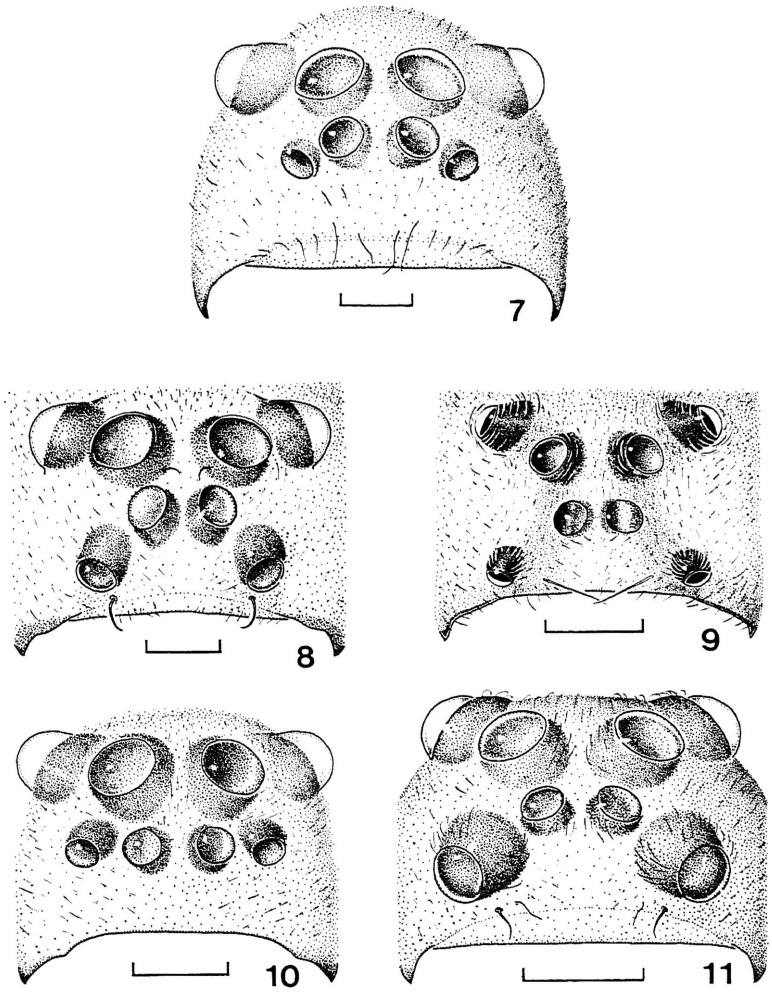
DISTRIBUTION: From Panama south to Colombia, Venezuela, the Guianas, and into central Brazil (map 1).

MATERIAL EXAMINED: Five males (including the holotype) from Trinidad, Guyana, Venezuela, and Cameta, Brazil. Eighty-three females from throughout the distribution range, mostly from Panama.

Architis cymatilis, new species

Figures 6, 11, 18, 19, 28, 29; Map 2

TYPES: Male holotype and female paratype from Blue Basin, Port of Spain, Trinidad (July 2, 1926; A. Petrunkevitch), deposited



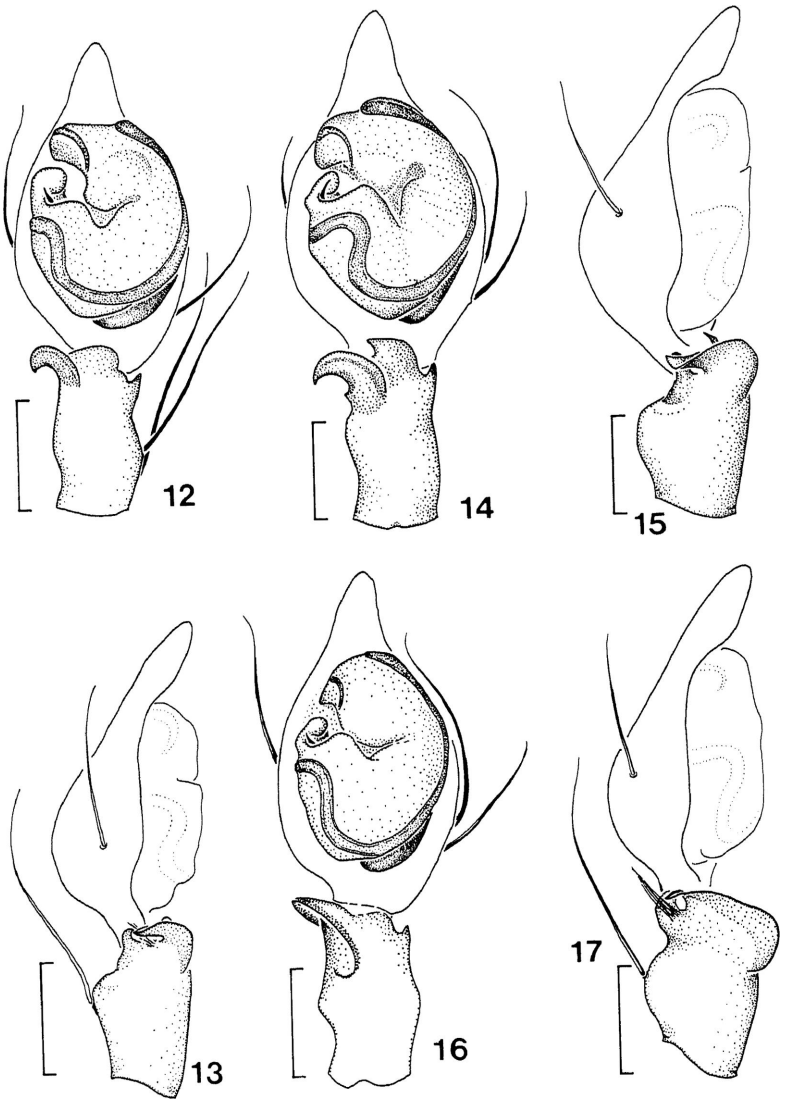
FIGS. 7–11. Faces of *Architis* species, anterior views. 7. *A. capricorna*, male holotype. 8. *A. robusta*, male holotype. 9. *A. tenuis*, male lectotype. 10. *A. vilhena*, male holotype. 11. *A. cymatilis*, male holotype. Scale lines are 0.25 mm.

in the Peabody Museum of Natural History, Yale University.

ETYMOLOGY: The name is from the Latin adjective for sea-blue.

DIAGNOSIS: Both sexes of this species and *A. ikuruwa* are distinguished from other species by the ALE, which are distinctly larger than the AME and are situated on prominent tubercles. *Architis cymatilis* is distinguished from *A. ikuruwa* by the shape of the spermathecae.

MALE (holotype): Carapace (fig. 6) moderately high, narrow light median band, submarginal light bands, narrow light marginal bands, each eye surrounded by discrete dark ring; length 1.70, width 1.42. Sternum with median light band bordered laterally by dark. Eyes (fig. 11), measurements in table 1, anterior row procurved, ALE on prominent tubercles. Leg measurements in table 2, unmarked, very slender, several short stout macrosetae on ventral side of first coxa and trochanter. Abdomen (fig. 6) with dorsal wide median dark band bordered by irregular



FIGS. 12–17. Male palpi of *Architis* species. 12, 13. *A. nitidopilosa* from the Simon type collection of *A. tenuis*. 14, 15. *A. nitidopilosa,* holotype. 16, 17. *A. tenuis,* lectotype. 12, 14, 16. Ventral views. 13, 15, 17. Retrolateral views. Scale lines are 0.25 mm.

light bands, cardiac area light, two curved light lines anteriorly, ventrally with scattered maculae and pair of short bands projecting anteriorly from spinnerets, length 2.5. Palp (figs. 18, 19) with prominent tibial apophysis projecting distally, with two distal subdivisions, ventral one acute, thickly sclerotized, dorsal one rounded, not so heavily sclerotized.

FEMALE (paratype): Carapace length 2.4, width 2.2; pattern similar to male but with lighter rings around eyes. Eye measurements in table 1. Sternum uniformly dusky. Leg measurements in table 2. Abdomen with dor-

sal pattern similar to male; ventrally with median dark band, wider posteriorly, bordered laterally by light bands, length 4.5. Epigynum (figs. 20, 28) with dark red bursae visible through lightly sclerotized cuticle, two openings facing laterally; internal copulatory apparatus composed of two pairs of spermathecae.

NATURAL HISTORY: The only available natural history information is found in the vial with the specimens: "in recticular webs on low plants near ground along path."

DISTRIBUTION AND MATERIAL EXAMINED: Known only from the types (map 2).

Architis robusta, new species
Figures 5, 9, 24, 25; Map 2

TYPE: Male holotype from forest preserve, Canal Zone, Panama (July 25, 1954; A. M. Chickering), deposited in the Museum of Comparative Zoology, Harvard University.

ETYMOLOGY: The name is from the Latin noun for strong.

DIAGNOSIS: The male, like *A. capricorna,* has a complex tibial apophysis composed of four distinct elements. It differs from the latter species in the characteristic ALE, which are situated on small tubercles close to the clypeal margin. Also, there is no cheliceral carina in *A. cymatilis* as there is in *A. capricorna.*

MALE (holotype): Carapace (fig. 5) moderately high, with sloping clypeus, wide median dark band, lighter laterally, dark ring around each eye; length 2.5, width 2.1. Sternum light, slightly darker medially near base of labium. Eyes (fig. 9), measurements in table 1, anterior eye row procurved, ALE on prominent tubercles (fig. 5). Leg measurements in table 2, unmarked, more robust than other species. Abdomen with dorsal wide median dark band continuous with carapace band, bordered laterally by white bands, median indistinct dusky band on venter, genital area dark; length 3.1. Palp (figs. 24, 25) with complex tibial apophysis with four elements located distally on ventral and retrolateral sides.

FEMALE: Unknown.

NATURAL HISTORY: Unknown.

DISTRIBUTION AND MATERIAL EXAMINED: The only known specimens are the holotype and a juvenile male from the type locality (map 2).

NOTE: The two ventral spines drawn on the cymbium tip in figures 24 and 25 are probably not diagnostic, because they were absent from the cymbium of the other palp on the same specimen.

Architis ikuruwa, new species
Figures 30, 31; Map 2

TYPE: Female holotype from Canje (lat. 57°50′ W, long. 5°70′ N), Guyana, on the Ikuruwa River (August–December 1961; G. Bently), deposited in the American Museum of Natural History, New York.

ETYMOLOGY: The name is a noun in apposition taken from the type locality.

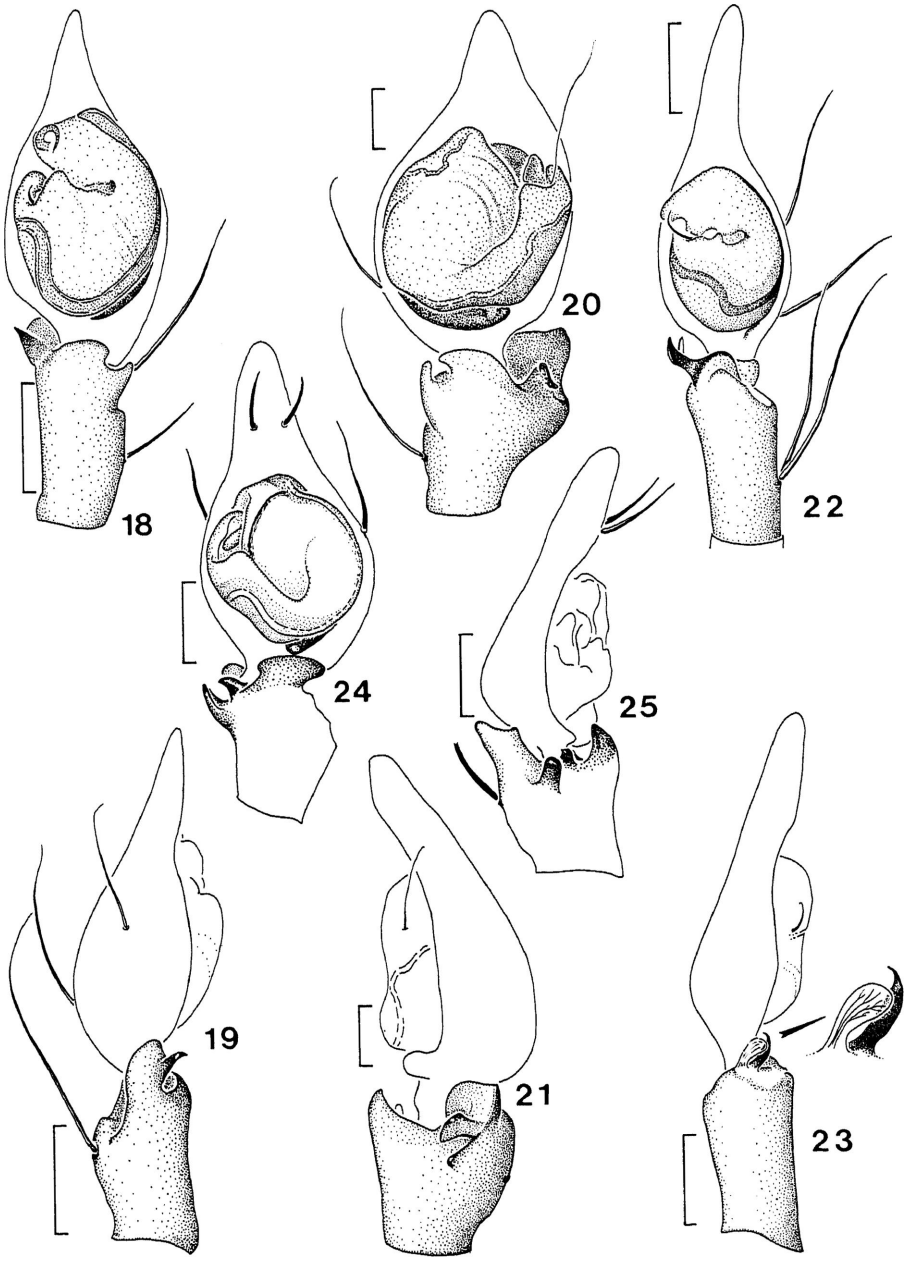
DIAGNOSIS: There are close affiniites between this species and *A. cymatilis,* as is evident from the eye pattern and female genitalia. However, there are differences in the shape of the spermathecae.

MALE: Unknown.

FEMALE (holotype): Carapace moderately low; broad, dark median band, submarginal bands each with two extensions to lateral carapace margin, median light line interrupted by thoracic furrow; length 2.1, width 1.8. Sternum light, with scattered faint maculae. Eye measurements in table 1, anterior row procurved, ALE on prominent tubercles. Leg measurements in table 2, faint annulae present. Abdomen dark dorsally, with pair of anterior short curved light marks, median ventral band bordered laterally by light bands; length 2.8 (pattern mostly obscured). Epigynum (figs. 30, 31) with two openings facing laterally, internal copulatory apparatus dark red, heavily sclerotized, visible through cuticle.

NATURAL HISTORY: Unknown.

DISTRIBUTION AND MATERIAL EXAMINED: The only known specimen, the holotype, is in a good state of preservation; however, the abdomen is somewhat distorted, as if it was starved or had laid eggs before being killed. The abdominal pattern is thus probably not typical (map 2).

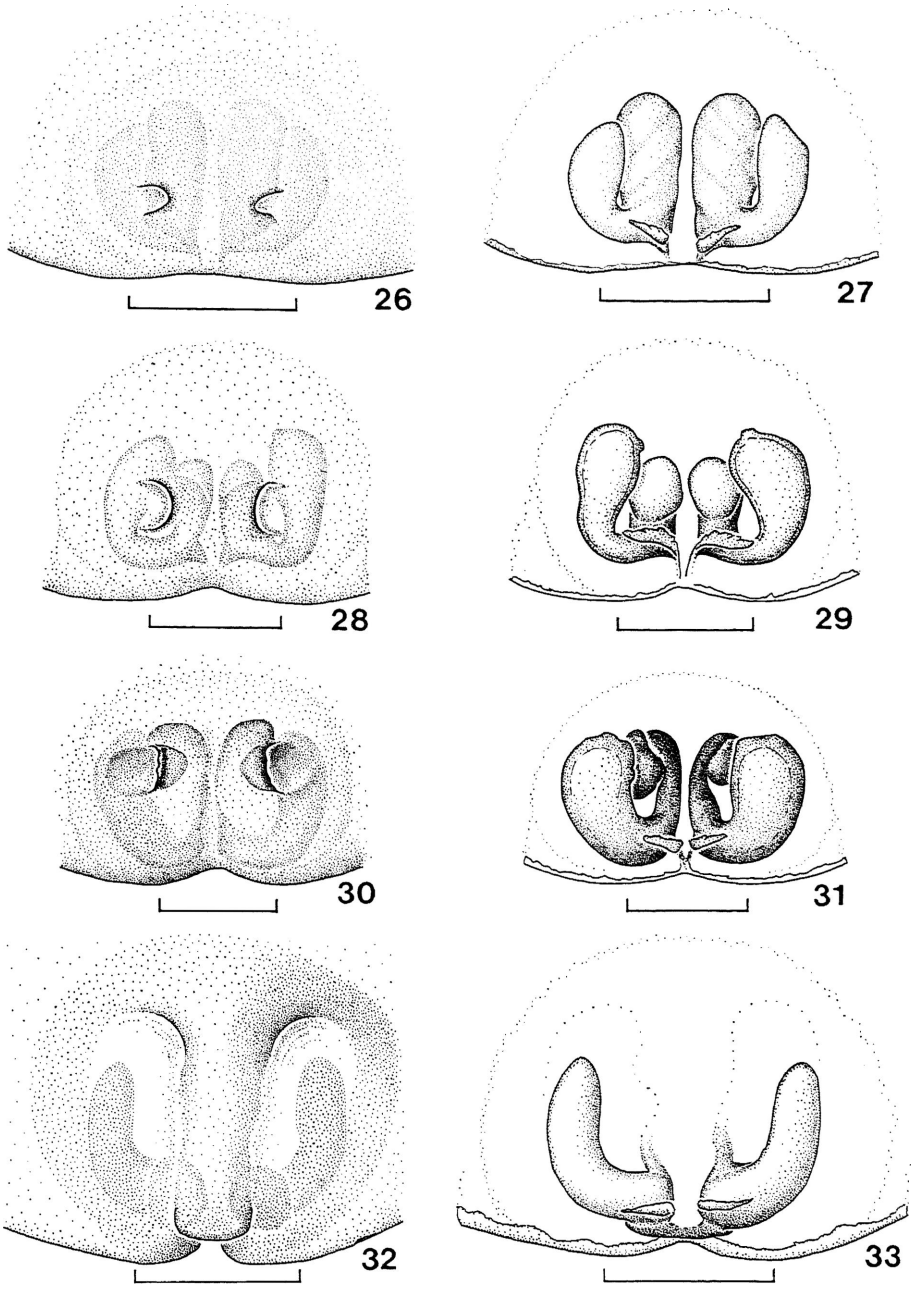


FIGS. 18–25. Male palpi of *Architis* species. 18, 19. *A. cymatilis,* holotype, right palp. 20, 21. *A. capricorna,* holotype, left palp. 22, 23. *A. vilhena,* holotype, right palp. 24, 25. *A. robusta,* holotype, right palp. 18, 20, 22, 24. Ventral views. 19, 21, 23, 25. Retrolateral views. Scale lines are 0.25 mm.

Architis capricorna, new species
Figures 2, 7, 20, 21; Map 2

TYPE: Male holotype from São Paulo, Brazil (1897; Moenkhouse), deposited in the Peabody Museum of Natural History.

ETYMOLOGY: The name is from the Tropic of Capricorn.



FIGS. 26–33. Epigyna of *Architis* species. 26, 27. *A. tenuis*, paralectotype. 28, 29. *A. cymatilis*, paratype. 30, 31. *A. ikuruwa*, holotype. 32, 33. *A. nitidopilosa*, from the Simon type collection of *A. tenuis*. 26, 28, 30, 32. Ventral views. 27, 29, 31, 33. Dorsal views. Scale lines are 0.25 mm.

DIAGNOSIS: The chelicerae are proportionally longer and have a longitudinal carina laterally near the fang, similar to species of *Thaumasia*. The tibial apophysis is complex,

with four distinct elements along the ventral and retrolateral sides of the tibia.

MALE (holotype): Carapace (fig. 2) moderately high, light, unmarked except for dark rings around eyes; length 3.0, width 2.5. Sternum light, unmarked. Eyes (fig. 7), measurements in table 1, anterior row procurved. Leg measurements in table 2, unmarked. Abdomen (fig. 2) light but with faint median darker band dorsally; length 3.2. Palp (figs. 20, 21) with complex tibial apophysis with four elements located distally on ventral and retrolateral sides (right pedipalp missing).

FEMALE: Unknown.

NATURAL HISTORY: Unknown.

DISTRIBUTION AND MATERIAL EXAMINED: The only known specimen is the holotype (map 2).

Architis vilhena, new species
Figures 1, 10, 22, 23; Map 2

TYPES: Male holotype from Vilhena, Rondonia, Brazil (November, 1973; M. Alvarenga), deposited in the American Museum of Natural History.

ETYMOLOGY: The name is a noun in apposition taken from the type locality.

DIAGNOSIS: The males are distinguished by the straight anterior eye row and characteristics of the tibial apophysis (figs. 22, 23). Also, the legs are clothed with numerous short fine hairs which are "S-shaped."

MALE (holotype): Carapace (fig. 1) moderately high, light brown, unmarked except for dark eye rings, smooth and shining with few visible hairs; length 2.0, width 1.7. Sternum light, unmarked, smooth, shining, with few hairs. Eyes (fig. 10) measurements in table 1. Leg measurements in table 2, slender, unmarked, clothed in slender hairs curved in "S-shape." Abdomen (fig. 1) light, unmarked, clothed in short, prone hairs, narrow; length 3.5. Palp (figs. 22, 23) with tibial apophysis composed of dorsal, thin, transparent part and ventral, acute, heavily sclerotized spine.

FEMALE: Unknown.

NATURAL HISTORY: Unknown.

DISTRIBUTION: Known only from the type locality (map 2).

MATERIAL EXAMINED: Four males, including the holotype.

STABERIUS SIMON

Staberius Simon, 1898a, p. 293 (type species by monotypy *S. aculeatus* [= *Ocayle spinipes* Taczanowski]). Roewer, 1954, p. 124. Bonnet, 1958, p. 4126.

DIAGNOSIS: *Staberius* differs from *Architis* in the structure of the genitalia. Specifically, *Architis* has a fixed tibial apophysis on the male palpus whereas *Staberius* has an articulating apophysis. The bursae of the female epigynum in *Architis* enter through discrete openings on the ventral face, whereas *Staberius* has a single large opening.

DESCRIPTION: Carapace moderately high, lower than wide. Posterior eye row moderately recurved, wider than anterior row, PE subequal, larger than subequal AE; anterior row procurved, ocular quadrangle wider above than below, higher than height of clypeus. Sternum lanceolate, about as long as wide. Chelicerae moderately robust, with three promarginal, three retromarginal teeth on fang furrow. Legs (fig. 39) long, slender, with numerous long macrosetae which often equal half the length of segment, length sequence (I-II)-IV-III. Male palpal bulb simple, with no free sclerites, tibial apophysis with large and articulating element. Female epigynum with single, large anterior opening; internal copulatory apparatus with two pairs of spermathecae.

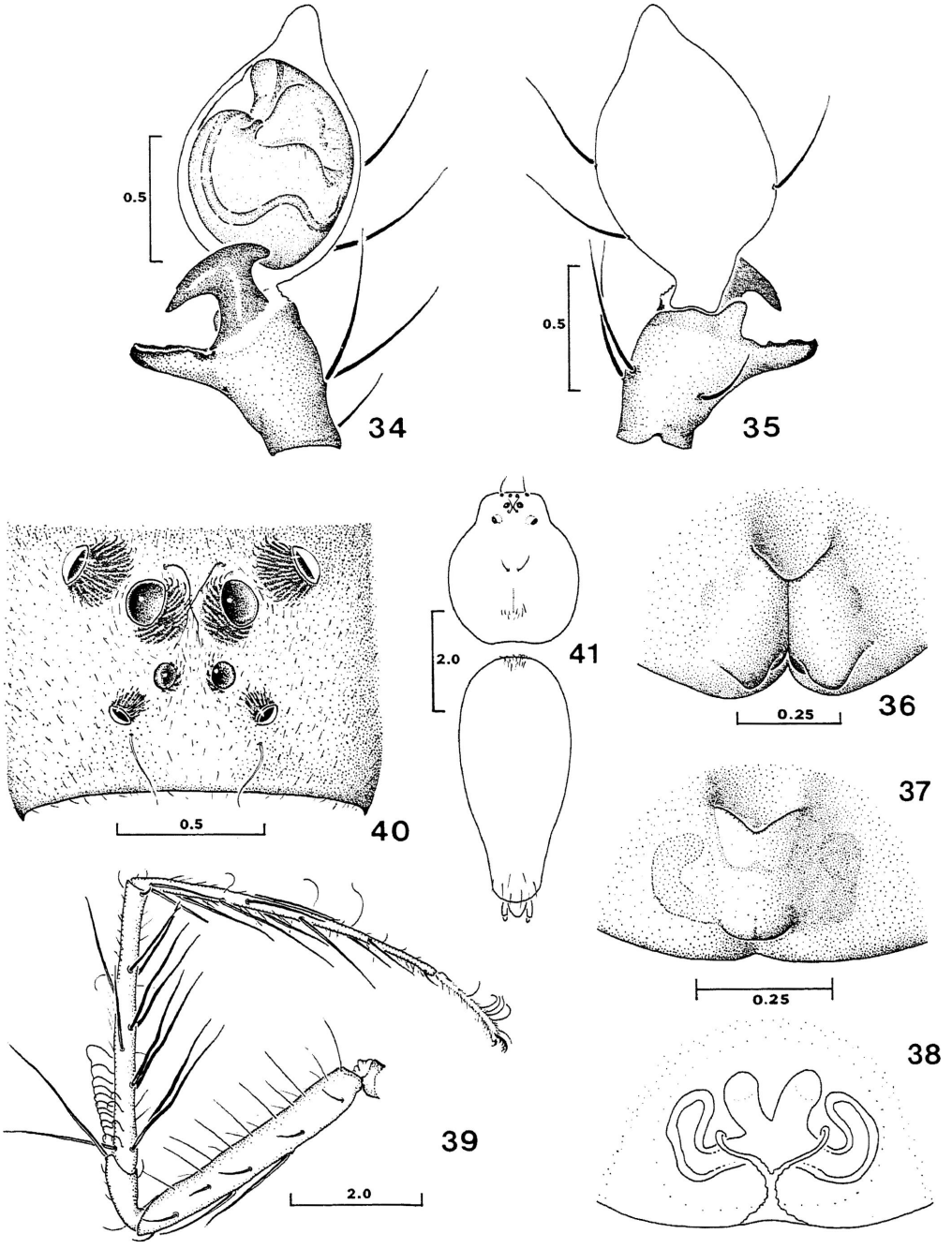
MISPLACED SPECIES: *Staberius argenteonotatus* Simon is a senior synonym of *Thaumasia uncata* F. O. P.-Cambridge.

Staberius spinipes (Taczanowski), new combination
Figures 34–38; Map 3

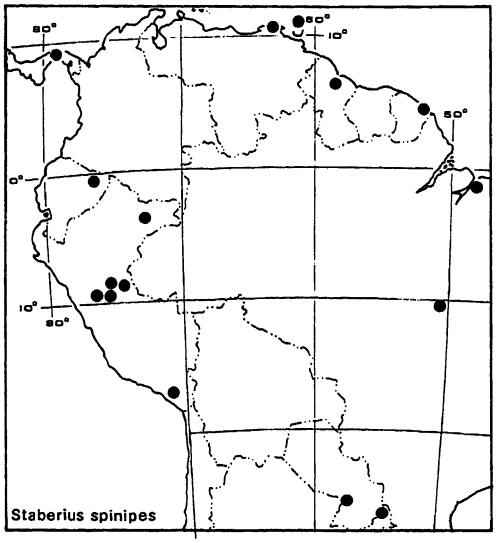
Ocayle spinipes Taczanowski, 1873, pp. 93–95. (syntypes from Cayenne, French Guiana, in Polska Akademia Nauk, Warsaw, examined; male lectotype designated below).

Tetragonophthalma spinipes: Petrunkevitch, 1911, p. 546. Roewer, 1954, p. 125. Bonnet, 1959, p. 4361.

Staberius aculeatus Simon, 1898b, p. 16 (female holotype from Teffe, Pebas, Peru in Muséum



FIGS. 34–41. Morphology of *Staberius spinipes*. 34, 35. Right pedipalp of male lectotype. 34. Ventral view. 35. Dorsal view. 36. Epigynum of Panamanian specimen, ventral view. 37, 38. Epigynum of female paralectotype. 37. Ventral view. 38. Dorsal view. 39. Right leg II of female from Panama, retrolateral view. 40. Face of female from Panama. 41. Pattern of large dorsal setae, female from Panama.



MAP 3. Distribution of *Staberius spinipes*.

National d'Histoire Naturelle, examined). Roewer, 1954, p. 124. Bonnet, 1958, p. 4126, NEW SYNONYMY.

DIAGNOSIS: With the characters of the genus.

MALE (from Panama): Carapace pale, smooth, shining, no pattern evident, black rings around eyes obscured by light hairs, pair of erect spines just anterior to cephalic groove; length 2.4, width 2.1. Sternum pale, unmarked. Eyes (fig. 40), measurements in table 1, anterior row procurved. Leg measurements in table 2, pale, unmarked, smooth, shining, with numerous long dark macrosetae (fig. 39). Abdomen pale with white areas dorsolaterally, greatest width in anterior third; length 0.35. Palp (lectotype, figs. 34, 35) with two prominent tibial apophyses, retrolateral one nearly at right angles, cupped distally, ventral one dark, hammer-shaped, articulating.

FEMALE (from Panama): Carapace (fig. 41) pale, shining, pattern as in male, pair of erect spines just anterior to cephalic groove, pair of spines behind AME, group of short spines posterior to cephalic groove. Sternum pale, unmarked. Eyes (fig. 40), measurements in table 1, anterior row procurved. Leg measurements in table 2, pale, unmarked, smooth, shining, with numerous long dark macrosetae. Abdomen pale with white covering most of dorsum and sides, greatest width in anterior third, tapering posteriorly (fig. 41); length 0.6. Epigynum (figs. 36; [holotype] 37, 38) elevated with medial suture, single large atrium which opens anteriorly, filled with fibrous material; internal copulatory apparatus composed of two pairs of spermathecae.

VARIATION: It is obvious that the color and pattern in alcohol are quite different from that of the living animal. The general color of the preserved female specimen is very light with an irregular pattern of white on the dorsum of the abdomen. Males tend to be distinctly darker. According to two notes in collections by A. M. Chickering, the living animal has "yellowish-green" or "greenish" legs, the cephalothorax "light green" or "bright green," the chelicerae "light green," and the cardiac area "green."

The external configuration of the epigynum varies noticeably, being higher and with two lobes protruding posteriorly in northern specimens (fig. 36), whereas in the south it is lower with a single low protuberance (fig. 37).

NATURAL HISTORY: The egg sac, described as green by Chickering, averages about 4 mm. in diameter and has a thin covering which permits the eggs to be easily seen. Apparently the egg sac is carried in the chelicerae because some museum specimens were found still holding it this way. Six collections containing egg sacs ranged from June 18 to August 7.

Many females contained a plug of a curious, unidentified fibrous substance in the single large atrium of their epigynum. This was found also in females with egg sacs.

DISTRIBUTION: From Panama south to southern Paraguay (map 3).

MATERIAL EXAMINED: Forty-eight males, 101 females, and 25 juveniles.

NOTE: I have attempted to find the type of *Staberius lemoulti* Caporiacco (1954, pp. 56, 57) without success. However, a specimen in the American Museum of Natural History which bears Caporiacco's identification label

for this species is actually *S. spinipes*. Therefore, I assume that *S. lemoulti* is probably a junior synonym of *S. spinipes*.

SYNONYMY: Careful examination of the types of *spinipes* and *aculeatus* has revealed no significant differences.

LITERATURE CITED

Bonnet, Pierre
1955. Bibliographia araneorum. Toulouse, vol. 2, pt. 1, pp. 1–918.
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4320.
1959. Bibliographia araneorum. Toulouse, vol. 2, pt. 5, pp. 4321–5058.

Caporiacco, Lodovico di
1954. Araignées de la Guyane Francaise du Muséum d'Histoire Naturelle de Paris. Comm. Pontif., vol. 16, no. 3, pp. 45–193, figs. 1–75.

Carico, James E.
1972. The Nearctic spider genus *Pisaurina* (Pisauridae). Psyche, vol. 79, pp. 295–310, figs. 1–22, maps 1–4.

Mello-Leitão, Candido Firmino de
1917. Notas Arachnologicas. V. Especies novas ou pouco conhecidas do Brasil. Broteria, vol. 15, pp. 74–102.

Petrunkevitch, Alexander
1911. A synonymic index-catalogue of spiders of North, Central, and South America with all adjacent islands, Greenland, Bermuda, West Indies, Tierra del Fuego, Galapagos, etc. Bull. Amer. Mus. Nat. Hist., vol. 29, pp. 1–791.

Roewer, Carl F.
1954. Katalog der Araneae. Brussels, vol. 2, pt. 1, 923 pp.

Simon, Eugène
1898a. Histoire naturelle des araignées. Paris, vol. 2, pt. 2, pp. 193–380, figs. 201–384.
1898b. Descriptions d'Arachnides nouveau des familles des Agelenidae, Pisauridae, Lycosidae, et Oxyopidae. Ann. Soc. Ent. Belgique,vol. 42, pp. 5–34.

Taczanowski, Ladislas
1873. Les aranéides de la Guyane Francaise. Horae Soc. Ent. Ross. St. Petersbourg, vol. 10, pp. 56–115, pl. 2.

A New Species of *Trechalea* (Pisauridae) from North America

JAMES E. CARICO[1] AND EDWIN W. MINCH[2]

ABSTRACT

Trechalea gertschi, the first species of the genus known from the United States or northern Mexico, is described from Arizona and Sonora.

INTRODUCTION

Most of the 22 described species of *Trechalea* are found in South and Central America, with only a single species listed from North America. The latter is *T. connexa* (O. P.-Cambridge, 1898, p. 233) which was described from Veracruz, Mexico. The new species described herein is the first from northern Mexico or the United States. Willis Gertsch has long recognized that this species was probably new and referred to it in his first edition of "American Spiders" (1949, p. 207) and in the second edition (1979, p. 194).

A revision of this complex genus and related genera is in progress. This species description is being published now because the name is needed for a forthcoming treatise by the junior author and Dr. Neil Hadley on the biology of this interesting spider.

We appreciate the constructive comments of Dr. Charles Dondale and Mr. Vincent Roth on an earlier version of the present paper.

Trechalea gertschi, new species
Figures 1, 2

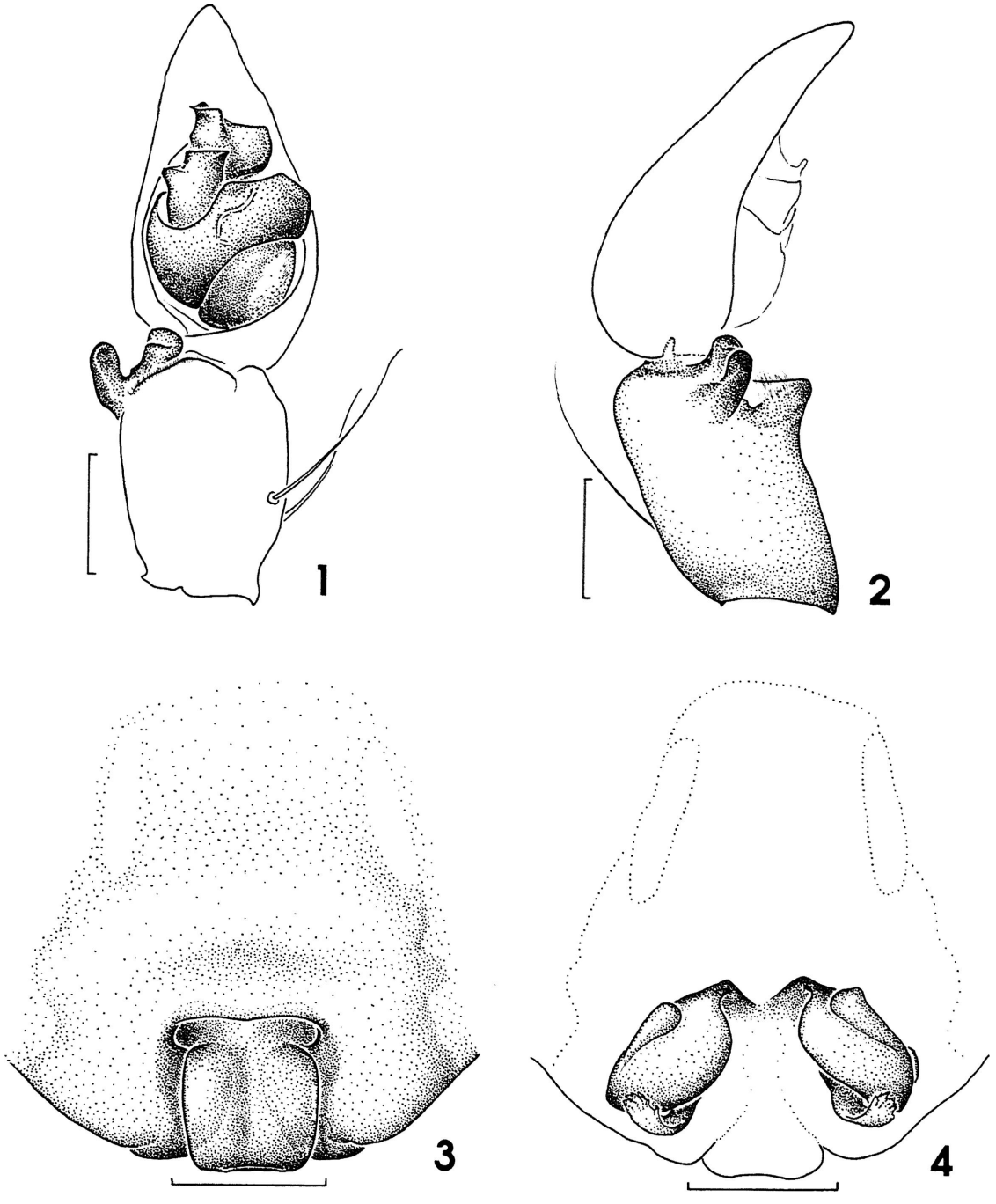
TYPES: Male holotype and female paratype from 9 mi. south of Sunflower, Maricopa County, Arizona (June 9, 1979; Edwin Minch), deposited in the American Museum of Natural History.

ETYMOLOGY: The name is in honor of Dr. Willis J. Gertsch, in recognition of his help to us.

DIAGNOSIS: This species differs from *T. connexa,* its closest relative, by characteristics of the genitalia. In the male, the apical end of the ventral face of the conductor is truncated, whereas in *T. connexa* it is more pointed. The females differ in the structure of the external and internal parts of the epigynum.

MALE (holotype): Measurements in millimeters. Carapace length 7.0, width 7.4. Abdomen length 6.0, width 4.3. Eye measurements: diameter of ALE, AME, PLE, PME = 0.25, 0.34, 0.55, 0.50; width of PE row 2.80, AE row 1.48; ocular quadrangle height 1.15, width above 1.32, width below 0.85. Clypeus height 0.75. Chelicerae dark with three promarginal subequidistant teeth, middle largest; three retromarginal teeth equal in size and with distal two closest. Labium length 1.6, width 1.4; indented distally, with transverse groove across middle of its length. Palpal endites dark, length 2.80, indented along lateral margin. Sternum light, length 3.6, width 3.8. Leg measurements in table 1. Color of carapace: ocular area dark with dusky marginal band, submarginal serrated light band, and light median band extending from anterior end of thoracic groove to posterior carapace margin. Abdomen dor-

[1] Professor, Department of Biology, Lynchburg College, Lynchburg, Virginia 24501.
[2] Professor, Department of Zoology, Arizona State University, Tempe, Arizona 85281.



FIGS. 1–4. Genitalia of *Trechalea gertschi*, new species. 1, 2. Male holotype. 3, 4. Female paratype. 1. Palp, ventral view. 2. Palp, retrolateral view. 3. Epigynum, ventral view. 4. Epigynum, dorsal view. Scales: male genitalia 1.0 mm., female genitalia 0.5 mm.

TABLE 1
Measurements (in Millimeters) of *Trechalea gertschi*, New Species

Leg no.		Femur	Patella-tibia	Meta-tarsus	Tarsus
Male	I	10.0	13.4	10.0	5.5
	II	12.0	15.5	11.8	6.5
	III	9.6	11.6	9.4	5.5
	IV	11.2	14.2	13.5	7.6
Female	I	10.5	13.9	10.0	6.2
	II	12.5	16.5	12.2	—
	III	11.0	13.3	10.7	6.1
	IV	12.5	14.6	14.7	8.1

sally with irregular dark mottling and with numerous long, black setae; ventrally light, with darker genital area clothed with black hair. Palp (figs. 1, 2).

FEMALE (paratype): Carapace length 7.9, width 7.4. Abdomen length 8.5, width 5.6. Eye measurements: diameters of ALE, AME, PLE, PME = 0.25, 0.40, 0.65, 0.50; width of PE row 1.98, AE row 1.61; ocular quadrangle height 1.25, width above 1.40, width below 0.96. Clypeus height 0.80. Chelicerae dark, clothed with numerous long white hairs and fewer black bristles; teeth as in male. Labium length 1.60, width 1.50; shape as in male. Palpal endites dark, length 2.75, shape as in male. Sternum light, length 4.0, width 4.0. Leg measurements in table 1. Color of carapace and abdomen as in male. Epigynum (figs. 3, 4).

MATERIAL EXAMINED: **United States**: *Arizona:* Gila Co.: Gisela, Nov. 5, 1977 (E. Minch), 1♀. Pima Co.: Sabino Canyon, Santa Catalina Mts., Aug. 1, 1939 (R. H. Crandall), 1♂, Oct. 5, 1937, 1♂, 2♀, July 6, 1937 (R. A. Flock), 1♀, July 17, 1971 (J. E. Carico), 3♂, 6♀. Santa Cruz Co.: Santa Rita Mts., 1♀. Maricopa Co.: 9 mi. S Sunflower, June 3, 1979 (E. Minch), 1♂, 2♀, July 11, 1979 (E. Minch), 2♂. **Mexico**: *Sonora:* SE Alamos on Río Cuchujaqui, Jan. 1968 (V. Roth), 1♂, 3♀.

LITERATURE CITED

Cambridge, Octavius Pickard-
1898. Arachnida-Araneida. *In* Godman, F. D., and O. Salvin, Biologia Centrali-Americana. London, vol. 1, pp. 233–288, pls. 30–33.

Gertsch, Willis J.
1949. American spiders. Princeton, New Jersey, Van Nostrand. 285 pp., 32 pls., 6 figs.
1979. American spiders, 2nd ed. New York, Van Nostrand Reinhold. 274 pp., 32 pls., 8 figs.

The Ctenidae of Temperate Zone North America

WILLIAM B. PECK[1]

ABSTRACT

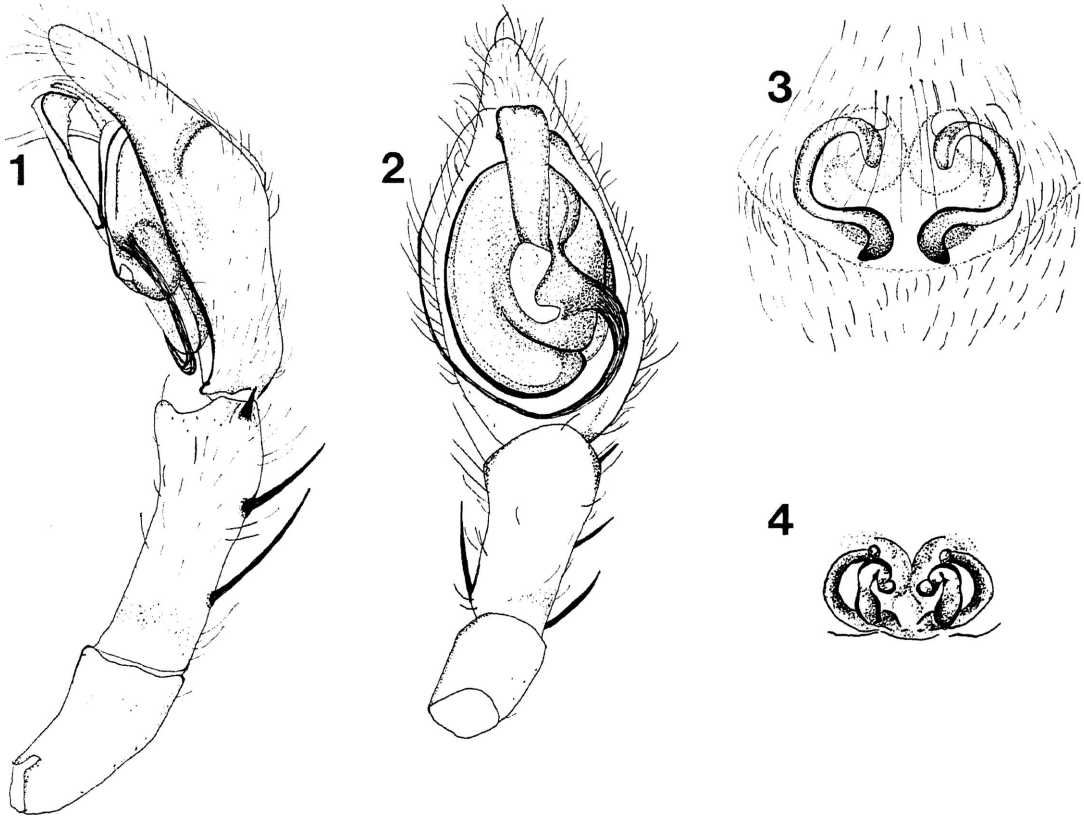
The eight known species of Ctenidae from temperate zone North America are diagnosed and described. The type locality of *Ctenus minimus* F. O. P.-Cambridge is undetermined beyond "North America." The affiliation of *Titiotus californicus* Simon is discussed but remains uncertain. Two new species of *Ctenus*, *C. exlineae* from Arkansas and *C. valverdiensis* from Texas, and two new species of *Leptoctenus*, *L. gertschi* and *L. sonoraensis*, both from Sonora, Mexico, are described.

INTRODUCTION

The Ctenidae comprise a large, principally pantropical family. Twenty New World genera have been described, containing from one to 150 named species. A few genera have only a tenuous familial affiliation, and many species are very similar and known from few specimens. Their relationships and synonymies remain uncertain. Some of the tropical species are inadvertently transported to other parts of the world with fruit shipments and sometimes attract considerable attention because of their spectacular size. Their occurrence as residents of the temperate zone, however, is relatively sparse and limited.

Of the named species of temperate zone North America, *Ctenus hibernalis* Hentz, 1844, *Anahita punctulata* (Hentz, 1844), *Leptoctenus byrrhus* Simon, 1888, and *Ctenus captiosus* Gertsch, 1935, are recognized species herein. Chamberlin and Ivie (1944) identified *Lycosa animosa* Walckenaer (1837), a name based on an illustration by Abbot, as a senior synonym of *Anahita punctulata* (Hentz), but the name is here regarded as a *nomen dubium* because it cannot be unambiguously associated with a known species. *Ctenus minimus* F. O. P.-Cambridge, 1897 (type examined), is not *A. punctulata*, a possibility that was originally suggested by the author. Its type locality, "North America," has not been further specified, and only the type specimens are known. *Zora pumila* was described by Hentz (1850) in the "subgenus" *Katadysas* which he referred to as a "very anomalous spider . . . [having] all the essential characters of *Mygale* but one (having but two pulmonary orifices), and yet it is obviously related to *Lycosa*." It has since been placed in Clubionidae (Simon [Zoreae], 1897; Petrunkevitch, 1911; Gertsch, 1940; and Kaston, 1948), in Lycosidae (Dahl and Dahl, 1927), in Ctenidae (Petrunkevitch, 1928; Kaston, 1938; and Homann, 1950), and in Zoridae (Dahl, 1912; and Kaston, 1978). Its family affiliation is not resolved, and it has not been included here. Simon described *Titiotus californicus* (1897) under his clubionid subfamily Cteninae, apparently from a single female which I have examined. Although the name appears in several faunal lists, other specimens are not known. A male specimen in the MCZ collection, collected in San Bernardino, California, by D. C. Lowrie in 1971, is closely allied, but it cannot be matched with Simon's female with any confidence. Like *Zora*, the combination of its characters that are normally used to separate families makes the placement of *Titiotus* problematic and it too has been omitted.

[1] Professor, Department of Biology, Central Missouri State University, Warrensburg, Missouri 64093.



FIGS. 1–4. *Anahita punctulata* (Hentz). 1. Palp, retrolateral view. 2. Palp, ventral view. 3. Epigynum, ventral view. 4. Epigynum, dorsal view.

Four additional temperate zone species are described, albeit from few specimens in three cases. Several others from north-central Mexico are known but for this study they are considered tropical and are not included. Three of the species that follow were originally recognized as undescribed by W. J. Gertsch, to whom I am especially indebted.

I am also grateful to Drs. H. W. Levi, Museum of Comparative Zoology (MCZ); N. I. Platnick, American Museum of Natural History (AMNH); G. B. Edwards, Florida State Collection of Arthropods; M. Hubert, Muséum National d'Histoire Naturelle (MNHN); D. H. Kavanaugh, California Academy of Sciences; and F. R. Wanless, British Museum (Natural History) for the loan of specimens, and to J. S. Heiss, University of Arkansas, for pertinent data.

Morphological measurements are in millimeters and are the mean values of five to 10 specimens with standard deviations as a ± figure where given. Values of the SD of less than 0.1 mm. have been omitted.

Anahita punctulata (Hentz)

Figures 1–4

Ctenus punctulatus Hentz, 1844, p. 394 (holotype from Alabama, destroyed). F. O. P.-Cambridge, 1897, p. 62. Banks, 1898, p. 277. Bishop and Crosby, 1926, p. 184.

Anahita punctulata: Simon, 1897, p. 121. Bonnet, 1955, p. 310.

DIAGNOSIS: Males may be distinguished from other North American ctenids by the long, spatulate median lobe of the palpal bulb and the short, conical apophysis situated api-

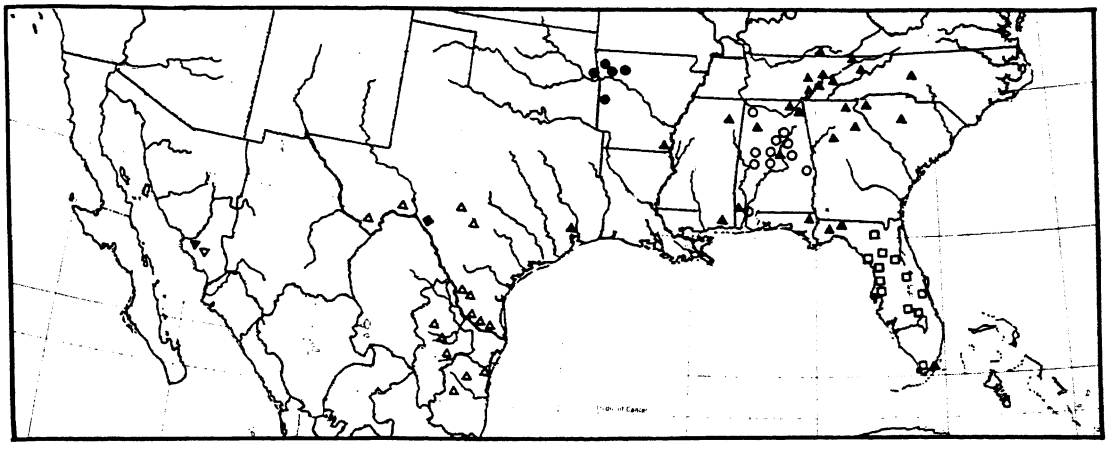


FIG. 5. North America, showing distribution of *Anahita punctulata* (closed upright triangles), *Ctenus hibernalis* (open circles), *C. exlineae* (closed circles), *C. captiosus* (squares), *C. valverdiensis* (diamonds), *Leptoctenus byrrhus* (open upright triangles), *L. gertschi* (closed inverted triangle), and *L. sonoraensis* (open inverted triangle).

cally on the palpal tibia. The epigynum of the female is not emergent from the venter surface as in other ctenids and is discernable only by the lightly sclerotized, curving, internal ducts.

MALE: Total length 6.76 ± 0.48. Carapace, length 3.46 ± 0.22, width 2.89 ± 0.19. Femur, I 4.01 ± 0.42, II 3.50 ± 0.33; patella/tibia, I 6.09 ± 0.49, II 5.02 ± 0.41; metatarsus, I 4.68 ± 0.40, II 3.73 ± 0.31. Eye sizes and interdistances, AME 0.11, ALE 0.12, PME 0.18, PLE 0.20; AME–AME 0.11, AME–ALE 0.19, AME–PME 0.12, PME–PME 0.18, PME–PLE 0.19, PLE–ALE 0.14; MOA, length 0.41, front width 0.33, back width 0.54. Clypeus slightly wider than AME diameter. Carapace yellow with light median band width of PME–PME interdistance, narrowing by one-third at posterior declivity. Darker, irregular lateral bands about equal to width of median band. Wide, light submarginal band and fine, black marginal line. Black rings around eyes (except ALE) are not or barely confluent. Long, red thoracic groove. Dorsum, venter, and legs concolorous, yellow, sprinkled with many small black dots without apparent pattern except to outline light median band length of dorsum. Spinnerets yellow with lateral surface of anterior pair black. Sternum and coxae pale yellow, unmarked. Labium three-fifths as long as wide. Chelicerae yellow with short dark vertical line proximally. Retromargin of fang furrow with four teeth and 1–3 denticles. Five (rarely six) paired, equally long, ventral spines on tibiae I and II with none apical. Three pairs of similar spines on metatarsi I and II. Distal leg segments not or sparsely scopulate. Palpus (figs. 1, 2) with small, conical tibial apophysis apically and long, spatulate, median apophysis of bulb extending beyond alveolus.

FEMALE: Total length 8.33 ± 1.60. Carapace, length 3.46 ± 0.50, width 2.76 ± 0.42. Femur, I 2.88 ± 0.50, II 2.57 ± 0.44; patella/tibia, I 4.27 ± 0.63, II 3.72 ± 0.59; metatarsus, I 2.31 ± 0.41, II 2.29 ± 0.44. Eye sizes and interdistances, AME 0.12, ALE 0.11, PME 0.17, PLE 0.22; AME–AME 0.12, AME–ALE 0.19, AME–PME 0.13, PME–PME 0.18, PME–PLE 0.20, PLE–ALE 0.13; MOA, length 0.42, front width 0.36, back width 0.52. Color, markings, and general features as in male. Palpal claw with 4–5 long teeth. Epigynum (figs. 3, 4) lightly sclerotized and not emergent from surface of venter.

DISTRIBUTION AND NATURAL HISTORY:

Southeastern United States (fig. 5). Banks (1898) recorded "a few from Tepic (Mexico) in November," a record repeated by F. O. P.-Cambridge (1897) but doubtful.

Specimens have been collected in mesic woods, Florida hammocks, pitfall traps, and in woodrat (*Neotoma*) nests. Adult females have been collected year round, males from April through July.

CTENUS WALCKENAER, 1805

The four species of North American *Ctenus* here recognized are large to very large spiders resembling large species of *Lycosa* and *Dolomedes*, with which they are allied according to Homann (1961). They are easily distinguished from both by their eye arrangement and by having claw tufts. A fifth species, *C. mitchelli* Gertsch (1971), described from Mexican caves in southern Tamaulipas, and several other undescribed species, may range into the temperate zone.

All the species included have been reported at least once from caves or karst terrain, but they are wanderers and have been taken in other habitats frequently.

Ctenus species have four long, heavy pairs of erectable spines and a fifth shorter pair apically on the ventral surface of tibiae I and II and three similar pairs on the metatarsi of those legs. The tarsi, metatarsi, and distal portion of the tibiae are heavily scopulate, especially on the anterior legs. There are immaculate furrows in the scopulae that accommodate the erectable spines when they are at rest. The AME are about two-thirds the diameter of the PME, and the clypeus is barely as wide as the AME diameter. The chelicerae are heavy, slightly geniculate, and the anterior surface has many long, stiff setae. They are armed with 4–5 teeth and 1–3 denticles on the retromargin of the fang furrow and three on the anterior margin. The labium is longer than wide. The carapace in profile is level from the eyes to the sharp posterior declivity. The tibia of the male palp has a heavy, short apophysis. The female palpal claw has 3–5 curved teeth. The epigynum is a sclerotized emergent bulb with lateral spurs protruding from beneath it.

Ctenus hibernalis Hentz

Figures 6, 7, 12, 13

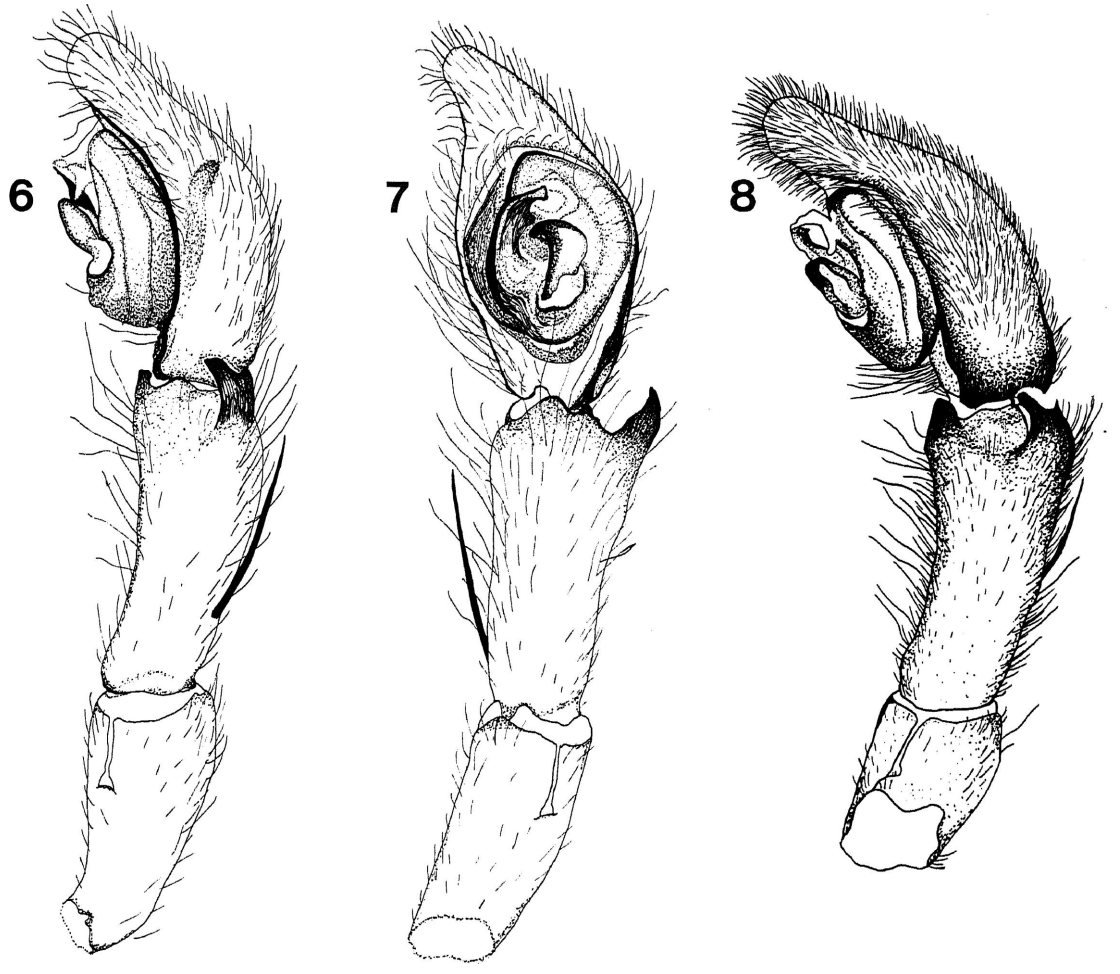
Ctenus hybernalis Hentz, 1844, p. 393 (male holotype from southern Alabama, destroyed). Simon, 1897, p. 111. F. O. P.-Cambridge, 1897, p. 64. Bishop and Crosby, 1926, p. 187. Roewer, 1954, p. 657.

Ctenus hibernalis: Banks, 1898, p. 277. Bonnet, 1956, p. 1282. Gertsch, 1935, p. 24.

DIAGNOSIS: *Ctenus hibernalis* strongly resembles *C. exlineae* but differs in details of coloration and of the palpus and epigynum, as discussed under that species. The only confirmed records are from Alabama.

MALE: Total length 14.11 ± 0.34. Carapace, length 7.81 ± 0.64, width 6.05 ± 0.33. Femur, I 7.84 ± 0.10, II 7.23 ± 0.21; patella/tibia, I 10.80 ± 0.34, II 9.82 ± 0.15; metatarsus, I 6.19 ± 0.61, II 6.17 ± 0.17. Eye sizes and interdistances, AME 0.23, ALE 0.28, PME 0.34, PLE 0.40; AME–AME 0.21, AME–ALE 0.31, AME–PME 0.24, PME–PME 0.22, PME–PLE 0.35, PLE–ALE 0.19; MOA, length 0.81, front width 0.67, back width 0.90. Carapace dark reddish brown with lighter median band as wide as PME–PME interdistance invested with fine white recumbent setae, especially near eye region. Sides of carapace with black recumbent setae. Ocular area occasionally somewhat darker but black rings around eyes (except ALE) seldom convergent. Abdomen grayish yellow, densely covered with moderately long, black setae except on distinct, light, five-lobed folium of dorsum and V-shaped mark of light dots converging posteriorly on venter. Venter anterior to genital groove and spinnerets grayish yellow. Sternum, coxae, and ventral surface of proximal leg segments concolorous, light brown. Chelicerae usually darker than carapace. Tibial apophysis of palp (figs. 6, 7) short, stout, unequally bifid near tip, larger portion of which is relatively broad, thickly spatulate.

FEMALE: Total length 16.34 ± 1.84. Carapace, length 8.16 ± 0.81, width 6.70 ± 0.52. Femur, I 7.32 ± 0.75, II 6.91 ± 0.74; patella/tibia, I 10.30 ± 1.35, II 9.66 ± 1.10; metatarsus, I 6.02 ± 0.78, II 5.60 ± 0.73. Eye sizes and interdistances, AME 0.26,

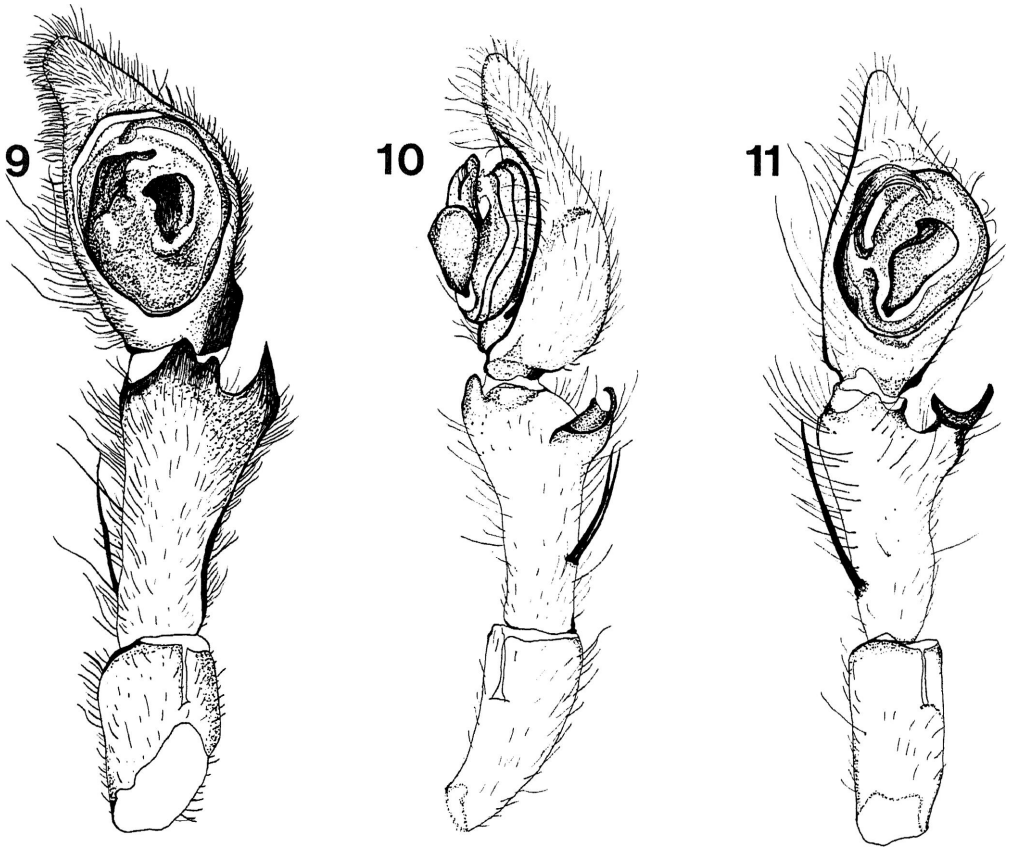


FIGS. 6–8. Palpi. 6, 7. *Ctenus hibernalis* Hentz. 8. *C. exlineae*, new species.

ALE 0.29, PME 0.36, PLE 0.41; AME–AME 0.26, AME–ALE 0.36, AME–PME 0.26, PME–PME 0.24, PME–PLE 0.47, PLE–ALE 0.21; MOA, length 0.88, front width 0.78, back width 0.96. Coloration, markings, and general structure as in male. Palpal claw with 4–5 curved teeth. External epigynum (fig. 12) emergent from venter surface, bluntly triangular with dark heavily sclerotized lateral ridges diverging posteriorly. Lateral spurs pointed and directed posteriomesially. Viewed dorsally (fig. 13), mesial lobe of heavily sclerotized spermatheca directed anteriorly.

DISTRIBUTION AND NATURAL HISTORY: Although the only confirmed records are from Alabama (fig. 5), Banks (1898) wrote, "a few from Miniatitlan, Orizaba, and La Chuparosa (Mexico)." These records were repeated by F. O. P.-Cambridge (1897) and Roewer (1954) but are probably in error. Petrunkevitch (1911), in addition to the above, adds New Mexico and the West Indies.

Little habitat information is recorded other than that several collections have been from pitfall traps and caves. Both males and females have been collected from March through October.



FIGS. 9–11. Palpi. 9. *Ctenus exlineae*, new species. 10, 11. *C. captiosus* Gertsch.

Ctenus exlineae, new species
Figures 8, 9, 14, 15

TYPE: Male holotype from Devils Den State Park, Washington County, Arkansas (July 12, 1970; W. B. Peck), deposited with one male and two female paratypes in AMNH.

ETYMOLOGY: The specific name is a patronym in honor of the late Dr. Harriet Exline.

DIAGNOSIS: This species is very similar to, but lighter in coloration than, *C. hibernalis* Hentz, having the carapace concolorous, lacking a median band, and with the markings on the dorsum and venter much less defined. It differs in details of the palpus in the tibial apophysis being stouter, more curved, and with the terminal portion narrower and more rounded than in *C. hibernalis*. In dorsal view the mesial lobe of the spermatheca is directed posteriorly rather than anteriorly. It is known only from northwest Arkansas and vicinity.

MALE: Total length 14.98 ± 0.67. Carapace, length 7.36 ± 0.63, width 5.72 ± 0.40. Femur, I 7.17 ± 0.59, II 6.75 ± 0.43; patella/tibia, I 10.90 ± 0.68, II 9.68 ± 0.65; metatarsus, I 6.69 ± 0.32, II 5.98 ± 0.36. Eye sizes and interdistances, AME 0.25, ALE 0.27, PME 0.37, PLE 0.44; AME–AME 0.23, AME–ALE 0.33, AME–PME 0.21, PME–PME 0.23, PME–PLE 0.40, PLE–ALE 0.23; MOA, length 0.83, front width 0.73, back width 0.97. Carapace dark reddish brown, concolorous, covered with fine, black re-

cumbent setae. Darker in ocular area with black eye rings (except ALE) not or barely confluent. Abdomen covered with dark setae occasionally with indistinct, lighter folium. Spinnerets grayish yellow. Sternum, coxae, and ventral surface of legs light brown; labium and endites darker. Chelicerae darker than carapace. Palpus (figs. 8, 9) with stout, curved tibial apophysis with short, rounded termination that has small, sharp point near its base.

FEMALE: Total length 17.19 ± 1.93. Carapace, length 7.79 ± 1.24, width 6.05 ± 0.85. Femur, I 6.86 ± 0.95, II 6.63 ± 0.95; patella/tibia, I 11.24 ± 0.98, II 9.25 ± 1.32; metatarsus, I 6.00 ± 0.76, II 5.28 ± 0.60. Eye sizes and interdistances, AME 0.27, ALE 0.28, PME 0.42, PLE 0.46; AME–AME 0.25, AME–ALE 0.38, AME–PME 0.21, PME–PME 0.25, PME–PLE 0.42, PLE–ALE 0.23; MOA, length 0.90, front width 0.79, back width 1.09. Coloration, markings, and general structure as in male. The palpal claw has 4–5 teeth. External epigynum (fig. 14) essentially as in *C. hibernalis* but somewhat shorter and more rounded. In dorsal view (fig. 15), mesial lobe of spermatheca directed posteriorly.

DISTRIBUTION AND NATURAL HISTORY: Records are limited to northwest Arkansas and the Ozark mountains of that vicinity, where large populations are known in locally restricted habitats.

Although *C. exlineae* has not been recorded specifically from caves, it is abundant in talus slopes of southern exposure in karstlike terrain where there are numerous small cavities. It is apparently limited to this habitat. Although I have been able to maintain living specimens under ordinary laboratory conditions for as long as six months, during which time several have molted to maturity, they do not live longer. I have never been able to induce courtship or mating. This may suggest that its distribution and habitat are restricted because of the narrow parameters of environmental conditions under which it is able to survive. It is a nocturnal wanderer and can be readily spotted, and distinguished from lycosids also present, by headlighting.

Ctenus captiosus Gertsch

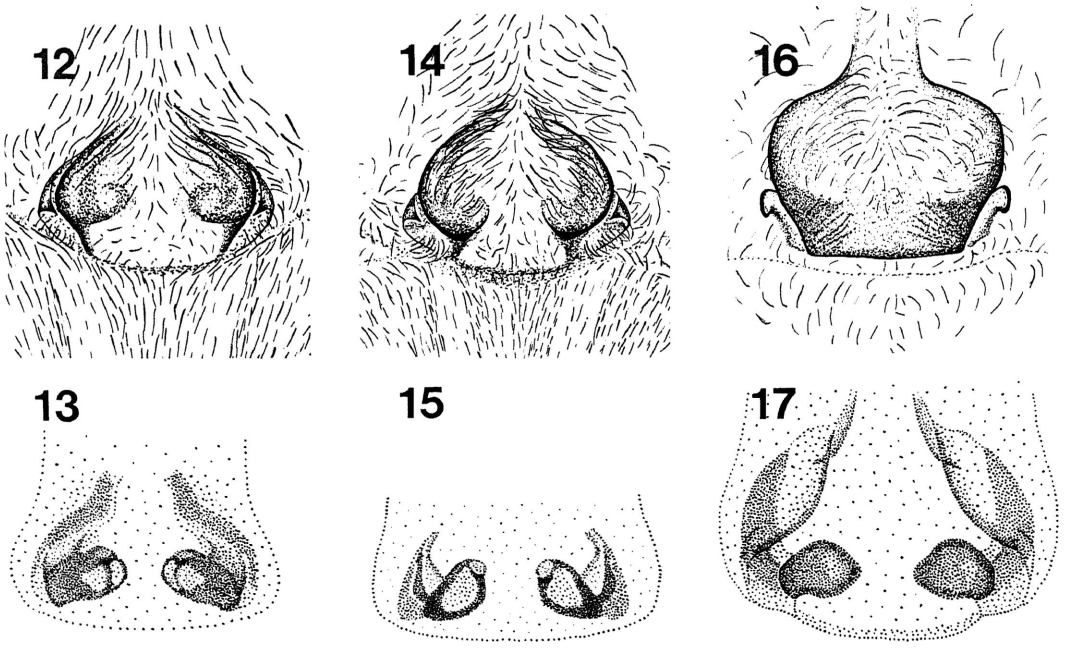
Figures 10, 11, 16, 17

Ctenus captiosus Gertsch, 1935, p. 22 (male holotype from Seahorse Island, Levy County, Florida, in AMNH, not examined). Roewer, 1954, p. 648. Bonnet, 1956, p. 1277.

DIAGNOSIS: This species is similar to *C. hibernalis* and *C. exlineae* in size, color, and markings, but both sexes are readily distinguished by their genital organs (figs. 6–11 and 12–17). Records are limited to the Florida peninsula.

MALE: Total length 12.00 ± 2.05. Carapace, length 6.39 ± 1.00, width 5.20 ± 0.80. Femur, I 6.97 ± 0.98, II 6.53 ± 1.19, patella/tibia, I 9.87 ± 1.59, II 8.88 ± 1.47; metatarsus, I 6.41 ± 1.00, II 5.60 ± 0.89. Eye sizes and interdistances, AME 0.23, ALE 0.21, PME 0.37, PLE 0.38; AME–AME 0.21, AME–ALE 0.25, AME–PME 0.18, PME–PME 0.20, PME–PLE 0.23, PLE–ALE 0.16; MOA, length 0.78, front width 0.67, back width 0.94. Carapace medium yellow-brown, wide median band in cephalic region that narrows sharply in thoracic region, anteriorly covered with recumbent white setae. Slightly darker striae radiate laterally on pars thoracica; scattered recumbent white setae submarginally. Ocular area seldom darker except for black rings around eyes which are not confluent. Dorsum with yellowish, indistinct folium, otherwise grayish yellow. Chelicerae proximally and dorsal surface of legs concolorous with carapace. Sternum, coxae, and ventral surface of legs slightly lighter, all unmarked. Tibial apophysis of palpus (figs. 10, 11) short, heavy, distally excavated as palmate, tripartite termination.

FEMALE: Total length 17.89 ± 2.27. Carapace, length 8.94 ± 1.16, width 6.81 ± 0.48. Femur, I 8.30 ± 0.72, II 7.69 ± 0.69; patella/tibia, I 11.73 ± 0.80, II 10.29 ± 0.88; metatarsus, I 6.69 ± 0.65, II 6.05 ± 0.68. Eye sizes and interdistances, AME 0.31, ALE 0.29, PME 0.46, PLE 0.43; AME–AME 0.28, AME–ALE 0.40, AME–PME 0.36, PME–PME 0.23, PME–PLE 0.36, PLE–ALE 0.21; MOA, length 1.13, front width 0.90, back width 1.15. Color and mark-



FIGS. 12–17. Epigyna, ventral and dorsal views. 12, 13. *Ctenus hibernalis* Hentz. 14, 15. *C. exlineae*, new species. 16, 17. *C. captiosus* Gertsch.

ings basically as in male, but coloration tends to be somewhat darker and markings more distinct. Epigynum (fig. 16) bulbous, ovoid, wider than long with narrow, anterior "neck." Small lateral spurs just posterior to midline of ovoid are directed anteriorly, then recurved.

DISTRIBUTION AND NATURAL HISTORY: Known only from the Florida peninsula. Specimens have been collected from mesic hammocks, on oak trees, under pine bark, and under detritus. Two juveniles were collected in caves. Females have been collected all year round, males from December through May.

Ctenus valverdiensis, new species
Figures 18, 19

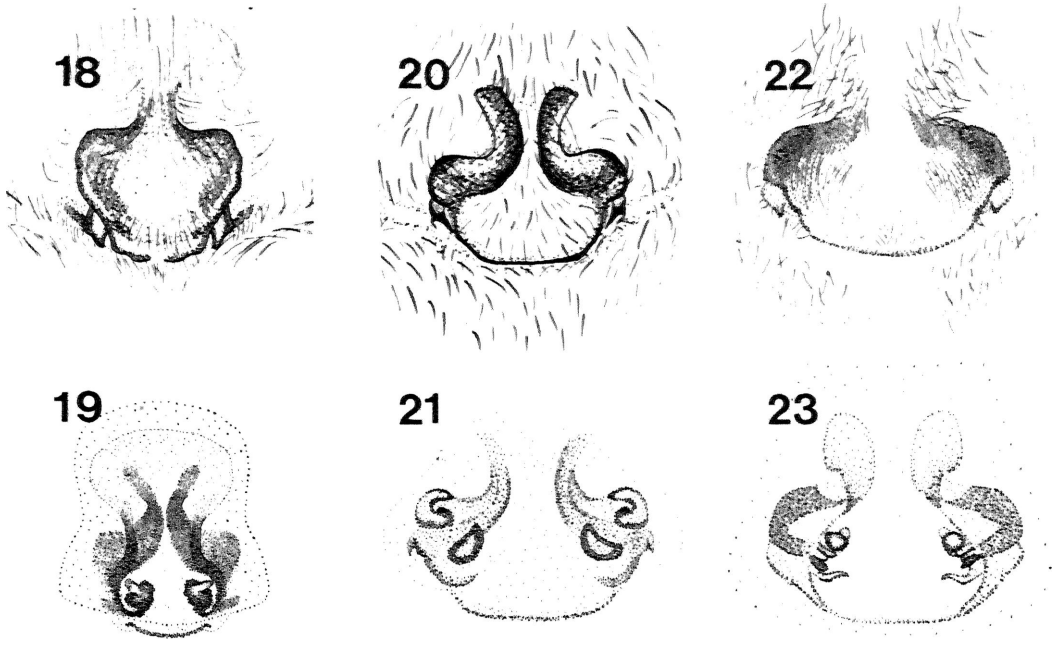
TYPE: Female holotype from East Gypsum Cave, 1 mi. west of Langtry, Valverde County, Texas (January 25, 1964; J. Reddell, D. McKenzie, J. Porter), deposited in AMNH.

ETYMOLOGY: The specific name refers to the type locality.

DIAGNOSIS: This species is comparable in its large size and rather uniform coloration to *C. mitchelli* Gertsch, although it may be somewhat darker. The carapace is essentially concolorous with only faint radiating striae and a slightly darker mark bordering the pars cephalica laterally, whereas the cephalic area of *C. mitchelli* is darker than the rest of the carapace. The two species differ sharply in details of the epigynum. The lateral spurs of *C. valverdiensis* are short and laterally buttressed whereas those of *C. mitchelli* are very long, extending beyond the posterior margin of the bulbous plate.

MALE: Unknown.

FEMALE: Total length 30.63. Carapace, length 13.83, width 10.59. Femur, I 14.00, II 14.09; patella/tibia, I 19.95, II 19.95; metatarsus, I 12.43, II 11.20. Eye sizes and interdistances, AME 0.40, ALE 0.42, PME 0.76, PLE 0.74; AME–AME 0.32, AME–ALE 0.70, AME–PME 0.26, PME–PME 0.36, PME–PLE 0.64, PLE–ALE 0.30; MOA, length 1.42, front width 1.12, back



FIGS. 18–23. Epigyna, ventral and dorsal views. 18, 19. *Ctenus valverdiensis*, new species. 20, 21. *Leptoctenus byrrhus* Simon. 22, 23. *L. gertschi*, new species.

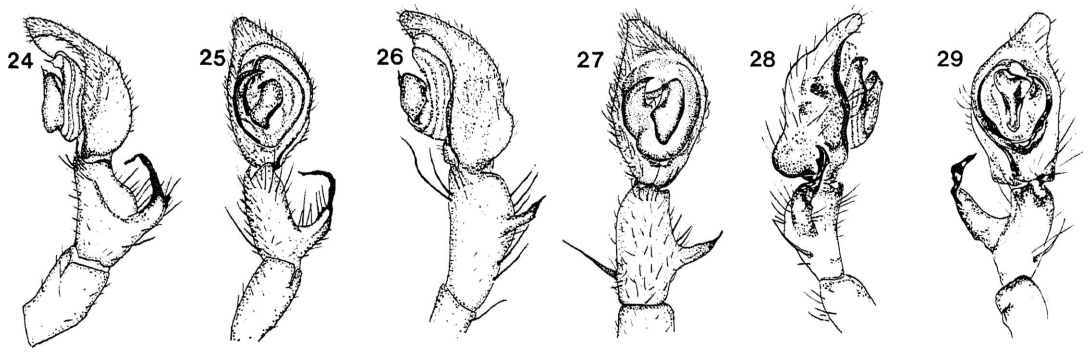
width 1.88. Carapace dark reddish yellow covered with fine, black, recumbent setae; faint radiating striae and slightly darker area outlining pars cephalica laterally. Sparse, white, recumbent setae around ocular area and forming short, narrow line anterior to thoracic groove. Eye rings absent or very reduced. Dorsum and venter concolorous grayish yellow, unmarked. Sternum, coxae, and ventral surface of femora yellowish brown; labium, endites and other leg segments somewhat darker. Chelicerae very dark. Epigynum (fig. 18) bluntly triangular, broadest anteriorly with undulate lateral margins and narrow neck; lateral spurs near posterior margin.

DISTRIBUTION AND NATURAL HISTORY: Although the holotype is the only adult specimen known, a number of juveniles, including a penultimate male (August 14, 1964) of probably the same species have been collected in Diablo Cave and a third (?) unnamed cave also in Valverde County, Texas.

LEPTOCTENUS L. KOCH

Although Simon (1888) described *L. byrrhus* in Koch's genus, which had been established for *L. agelenoides*, an Australian species, he reassigned it and several other genera to *Ctenus* in 1897. Sixteen species have at some time been assigned to *Leptoctenus*, from such widely ranging locales as Australia, East and West Africa, Southeast Asia, and South America, and I am uncertain about its status. At least *L. byrrhus*, however, can be readily separated from *Ctenus*, and I agree with Gertsch (1935) that for the time being it should remain in the genus in which it was described. Despite the uncertainty about the genus, two other species described here are apparently congeneric and have been assigned to *Leptoctenus*.

Leptoctenus can be separated from *Ctenus* by the retromargin of the fang furrow having three teeth rather than four or five, the pars thoracica being higher than the pars ce-



FIGS. 24–29. Palpi. 24, 25. *Leptoctenus byrrhus* Simon. 26, 27. *L. gertschi,* new species. 28, 29. *L. sonoraensis,* new species.

phalica rather than on a plane, and the scopulae being less well defined.

Leptoctenus byrrhus Simon
Figures 20, 21, 24, 25

Leptoctenus byrrhus Simon, 1888, p. 210 (female holotype from Mexico, in MNHN, examined). Gertsch, 1935, p. 24.

Ctenus byrrhus: Simon, 1897, p. 111. F. O. P.-Cambridge, 1902, p. 414. Chickering, 1937, p. 280.

DIAGNOSIS: This species is the largest of the three *Leptoctenus* species and has more definite markings. The males are distinguished by the long attenuated extension of the tibial apophysis and having only a low keel on the cymbium that is prominent in the other two species (figs. 24–28). The females of *L. byrrhus* and *L. gertschi* can be distinguished by lack of markings on the latter and by slight differences in the lateral spurs of the epigynum (figs. 20–23).

MALE: Total length 9.50 ± 0.95. Carapace, length 5.08 ± 0.47, width 4.10 ± 0.40. Femur, I 4.95 ± 0.73, II 4.66 ± 0.53; patella/tibia, I 7.23 ± 0.73, II 6.25 ± 0.68; metatarsus, I 4.61 ± 0.49, II 3.92 ± 0.42. Eye sizes and interdistances, AME 0.15, ALE 0.15, PME 0.47, PLE 0.39; AME–AME 0.13, AME–ALE 0.51, AME–PME 0.10, PME–PME 0.20, PME–PLE 0.22, PLE–ALE 0.18; MOA, length 0.72, front width 0.43, back width 1.14. Clypeus about ¾ the AME diameter. Carapace yellow with light median band width of PME–PME interdistance anteriorly, broadening slightly in thoracic region, narrowing by one-third at posterior declivity; irregularly margined, maculated lateral bands brown, darker posteriorly; wide light submarginal band with three supracoxal spots; interrupted find black line along carapace margin. Black eye rings (except ALE) barely convergent. Long white recumbent setae in ocular area. Dorsum with yellow, seven-lobed folium outlined by dark maculations, sometimes as stripes, extending down sides of abdomen. All femora and usually tibiae III and IV banded dorsally. Anterior spinnerets ringed in black, others yellow. Sternum, coxae, and venter light yellow, often with scattered small black dots on lateral and posterior venter. Palpal tibia (figs. 24, 25) excavated distal to stout base of apophysis, extension of which is long, dark, slender attenuation that curves sharply toward cymbium about midlength. Low, broad keel on retrodorsal surface of cymbium proximally.

FEMALE: Total length 11.63 ± 1.94. Carapace, length 5.46 ± 1.07, width, 4.17 ± 0.86. Femur, I 4.59 ± 0.97, II 4.32 ± 0.83; patella/tibia, I 6.67 ± 1.28, II 5.99 ± 1.10; metatarsus, I 3.69 ± 0.65, II 3.40 ± 0.61. Eye sizes and interdistances, AME 0.17, ALE 0.16, PME 0.43, PLE 0.37; AME–AME 0.16, AME–ALE 0.55, AME–PME 0.14, PME–PME 0.28, PME–PLE 0.32, PLE–ALE 0.20; MOA, length 0.74, front width 0.50, back width 1.14. Coloration,

markings, and general structure as in male. Epigynum (fig. 20) ovoid, nearly twice as wide as long, lateral spurs small, sharply pointed, mesially directed.

DISTRIBUTION AND NATURAL HISTORY: Specimens have been collected in southwest Texas and northeast Mexico on the coastal plains and in the mountains. They have been collected among detritus and, in one case, in a woodrat (*Neotoma*) nest.

Leptoctenus gertschi, new species
Figures 22, 23, 26, 27

TYPE: Holotype male and paratype female from 10 mi. west of Alamos, Sonora, Mexico (July 19, 1954; W. J. Gertsch), deposited in AMNH.

ETYMOLOGY: The specific name is a patronym in honor of Dr. W. J. Gertsch.

DIAGNOSIS: This species is smaller than *L. byrrhus* and *L. sonoraensis* and devoid of markings on the carapace. The femora are not banded and the tibial apophysis of the male palp lacks the long extension of the above species.

MALE: Total length 6.85. Carapace, length 3.68, width 2.98. Femur, I 4.20, II 4.03; patella/tibia, I 6.13, II 5.34; metatarsus, I 4.03, II 3.58. Eye sizes and interdistances, AME 0.16, ALE 0.16, PME 0.34, PLE 0.32; AME–AME 0.10, AME–ALE 0.38, AME–PME 0.10, PME–PME 0.20, PME–PLE 0.16, PLE–ALE 0.10; MOA, length 0.60, front width 0.42, back width 0.88. Carapace uniformly yellow with faint hints of darker striae. Black eye rings confluent. Abdomen lighter yellow with black, yellow-punctuated patches outlining folium and 3–4 vertical lines on sides; venter yellow, unmarked. Sternum, coxae, chelicerae, endites, and legs all concolorous with carapace, slightly lighter ventrally. Tibial apophysis (figs. 26, 27) of palp heavy at base with short, sharp, conical extension. Cymbium with moderate retrodorsal keel proximally.

FEMALE: Total length 12.25. Carapace, length 4.46, width 3.33. Femur, I 4.03, II 3.50; patella/tibia, I 5.60, II 4.81; metatarsus, I 3.06, II 2.71. Eye sizes and interdistances, AME 0.16, ALE 0.18, PME 0.30, PLE 0.34; AME–AME 0.10, AME–ALE 0.34, AME–PME 0.14, PME–PME 0.20, PME–PLE 0.20, PLE–ALE 0.11; MOA, length 0.60, front width 0.42, back width 0.80. Carapace uniformly yellow with sparse, black, recumbent setae forming faint bands dorsolaterally, legs same color, unmarked. Black eye rings (except ALE) not confluent. Border of sternum slightly darker, otherwise sternum and coxae color of carapace. Chelicerae, labium, and proximal portion of endites slightly darker. Abdomen light grayish yellow, dorsum with faint, ill-defined folium; venter and spinnerets slightly lighter. Epigynum (fig. 22) closely resembles that of *L. byrrhus* but lateral spurs less sharply pointed and details of spermatheca differ.

Leptoctenus sonoraensis, new species
Figures 28, 29

TYPE: Holotype male from 10 mi. west of Alamos, Sonora, Mexico (July 19, 1954; W. J. Gertsch), deposited in AMNH.

ETYMOLOGY: The specific name refers to the type locality.

DIAGNOSIS: This species is darker than *L. byrrhus* and *L. gertschi* with markings resembling the former but less defined. The extension of the tibial apophysis of the palp is wider, shorter, and more angular than in *L. byrrhus*. The species is known only from the holotype.

MALE: Total length 9.28. Carapace, length 5.25, width 3.94. Femur, I 5.00, II 4.55; patella/tibia, I 7.35, II 6.13; metatarsus, I 4.55, II 4.03. Eye sizes and interdistances, AME 0.18, ALE 0.16, PME 0.42, PLE 0.37; AME–AME 0.18, AME–ALE 0.42, AME–PME 0.12, PME–PME 0.20, PME–PLE 0.20, PLE–PLE 0.14; MOA, length 0.72, front width 0.54, back width 1.04. Carapace dark yellow with relatively narrow irregular median band having thin black line extending length of pars cephalica; lateral and submarginal bands moderately wide, ill defined. Black eye rings confluent. Long white recumbent setae in eye region. Folium and vertical lateral lines of greyish yellow dorsum outlined by many black dots often merging into small black patches. Femora, and to

lesser degree patellae and tibiae, ringed in black, more pronounced on posterior legs. Venter with scattered black dots posterior to genital groove. Sternum, coxae, and endites yellow, unmarked. Ventral surface of coxa II with anterior tubercle armed with about 12 short, curved macrosetae on posterior portion and about 6 longer, more attenuated ones anteriorly. Chelicerae light brown-yellow, unmarked. Tibial apophysis (figs. 28, 29) of palp heavy at base, terminating in dark, twisted, irregularly spatulate extension. Cymbium with pronounced retrodorsal keel proximally.

FEMALE: Unknown.

LITERATURE CITED

Banks, Nathan
1898. Arachnida from Baja California, and other parts of Mexico. Proc. California Acad. Sci., ser. 3, vol. 1, pp. 205–308.

Bishop, Sherman C., and Cyrus R. Crosby
1926. Notes on the spiders of the southeastern United States with descriptions of new species. Jour. Elisha Mitchell Sci. Soc., vol. 41, pp. 163–212.

Bonnet, Pierre
1955. Bibliographia araneorum. Toulouse, vol. 2, pt. 1, pp. 1–918.
1956. Bibliographia araneorum. Toulouse, vol. 2, pt. 2, pp. 919–1925.

Cambridge, Frederick O. Pickard-
1897. On cteniform spiders from the lower Amazons and other regions of North and South America, with list of all known species of these groups hitherto recorded in the new world. Ann. Mag. Nat. Hist., vol. 19, no. 6, pp. 52–106.
1902. New species of spiders belonging to the genus *Ctenus*, with supplementary notes. Ann. Mag. Nat. Hist. vol. 9, no. 7, pp. 401–415.

Chamberlin, Ralph V., and Wilton Ivie
1944. Spiders of the Georgia region of North America. Bull. Univ. Utah, vol. 35, no. 9, pp. 1–267.

Chickering, Arthur M.
1937. Notes and studies on Arachnida. III. Arachnida from the San Carlos Mountains, *In* The geology and biology of the San Carlos Mountains, Tamaulipas, Mexico. Univ. Michigan Press, Ann Arbor, pp. 271–283.

Dahl, Friedrich
1912. Arachnoidea, *In* Korschelt, E., and G. Link, Handwörterbuch des Naturwissenschaften. Jena, pp. 485–514.

Dahl, Friedrich, and Maria Dahl
1927. Spinnentiere oder Arachnoidea. II. Lycosidae s. lat. (Wolfspinnen im weiteren Sinne). Die Tierwelt Deutschlands, 1927, 80 pp.

Gertsch, Willis J.
1935. New American spiders with notes on other species. Amer. Mus. Novitates, no. 805, pp. 1–24.
1940. Family Clubionidae, *In* Comstock, J. H., The spider book. Comstock Publ. Assoc., Ithaca, New York, pp. 571–597.
1971. A report on some Mexican cave spiders. Assoc. Mexican Cave Studies Bull., vol. 4, pp. 47–111.

Hentz, Nicholas M.
1844. Descriptions and figures of the araneides of the United States. Boston Jour. Nat. Hist., vol. 4, pp. 386–396.
1850. Descriptions and figures of the araneides of the United States. *Ibid.*, vol. 6, pp. 18–35, 271–295.

Homann, Heinrich
1950. Die Nebenaugen der Araneen. Zool. Jahrbücher, vol. 71, no. 1, pp. 56–144.
1961. Die Stellung der Ctenidae, Textricinae, und Rhoicininae im System der Araneae. Senckenbergiana Biol., vol. 42, no. 4, pp. 397–408.

Kaston, B. J.
1938. Checklist of the spiders of Connecticut. Bull. Connecticut State Geol. Nat. Hist. Surv., vol. 60, pp. 175–201.
1948. The spiders of Connecticut. *Ibid.*, vol. 70, pp. 1–878.
1978. How to know the spiders, 3rd ed. Wm. C. Brown, Dubuque, Iowa, 272 pp.

Koch, Ludwig
1878. Die Arachniden australiens. Abh. naturh. Ges. Nürnberg, pp. 969–1044.

Petrunkevitch, Alexander
1911. A synonymic index-catalogue of spiders of North, Central, and South America with all adjacent islands, etc. Bull. Amer. Mus. Nat. Hist., vol. 29, pp. 1–791.

1928. Systema araneorum. Trans. Connecticut Acad. Arts Sci., vol. 29, pp. 1–270.
Roewer, Carl F.
1954. Katalog der Araneae. Bremen, vol. 2, pt. 1, 923 pp.
Simon, Eugene
1888. Études arachnologiques. 21re Memoire, XXIX. Descriptions d'espèces et de genres nouveaux de l'Amerique centrale et des Antilles. Ann. Soc. Entomol. France, vol. 8, pp. 203–216.
1897. Histoire naturelle des araignées. Paris, vol. 2, 1080 pp.
Walckenaer, Charles A.
1805. Tableaux des Araneides. Paris, 88 pp.
1837. Histoire naturelle des insectes aptères. Paris, vol. 1, 682 pp.

Color Variation in Two Species of *Castianeira* (Araneae, Clubionidae)

JONATHAN REISKIND[1]

ABSTRACT

The considerable variation in the abdominal hair patterns of two species of *Castianeira* from central Florida is described. Superficial resemblances of the two suggest convergent or parallel evolution of the patterns, perhaps as adaptations for mutillid mimicry.

INTRODUCTION

Muma (1973) studied ground surface spiders in central Florida over a three-year period. His extensive collections from four distinct habitats have offered a unique opportunity to study local populations of two species of *Castianeira, C. crocata* (Hentz) and *C. floridana* (Banks), in numbers hitherto unobtainable.

Both *C. crocata* and *C. floridana* have a dorsal abdominal red-orange spot. Several species of *Castianeira* found in the United States exhibit bright red-orange spots or longitudinal bands on the dorsum of their abdomens (opisthosomas): three species in the *longipalpus* group—*C. crocata* (eastern U.S.), *C. floridana* (Florida), and *C. thalia* (west coast of U.S.)—and three species in the *descripta* group: *C. descripta* (eastern U.S.), *C. occidens* (southwestern U.S.), and *C. walsinghami* (west coast of U.S.). (Several species of the large salticid spider, *Phidippus,* exhibit similar color patterns [Edwards, 1980].) It has been reported (Reiskind, 1969) that the amount of abdominal red-orange coloration varies both geographically (as in *C. descripta,* in which the spot is more extensive in specimens from the southern U.S. than in ones from the northern U.S.) and within populations (in *C. thalia* from southern California some individuals have a red-orange band overlying the typical black and white hair patterns). This paper describes the considerable variation of the red-orange abdominal spot within the local populations of the two species studied.

METHODS

The spiders were collected from four randomly placed pitfall traps in each of the four habitats sampled, two xeric: sand-pine dune and pine flatwoods, and two mesic: citrus grove and residential (see Muma, 1973, for details of can trap design and precise location of study areas in central Florida), the traps being surveyed biweekly. To examine the variation within a single local population or deme this study was restricted to the two largest samples: that of *Castianeira floridana* in the citrus grove habitat and *C. crocata* in the sand-pine dune habitat. The two sites were within 10 miles of one another in Polk County, Florida.

The abdominal hair patterns were examined under a dissecting scope and were drawn using a camera lucida attachment on a Wild dissecting microscope. In both species the dorsal abdominal hair patterns appeared to be of two sorts: 1) a red-orange spot or continuous band and 2) a white or yellow-white series of horizontal bands. A numerical scale of the extent of each type of pattern in each species was proposed to permit comparisons of individuals *within* each

[1] Associate Professor of Zoology, University of Florida, Gainesville, Florida 32611.

TABLE 1
Criteria for Scoring Abdominal Hair Patterns in *Castianeira crocata*
(See figure 1 for band designations.)

YELLOW-WHITE PATTERN (bands part or whole count as present)

0 = absent
1 = band I
2 = bands I and II, separate
3 = bands I and II, connected
4 = bands I, II, and III *or* bands I, II, and IV
5 = bands I, II, III, and IV
6 = bands I, II, (III), IV, and V
7 = bands I, II, III, IV, V, and VI
8 = bands I to VII present

RED-ORANGE REGION

0 = absent
1 = a few red-orange hairs
2 = very small; bands VII to VIII (posterior end)
3 = small; bands VI to VIII
4 = small; bands V to VIII
5 = moderate; bands IV to VIII
6 = moderate; bands III to VIII
7 = large; bands II to VIII
8 = large; covering part of II to VIII

species. Tables 1 and 2 list the scales and scoring criteria for the patterns in each species. Figures 1 and 2 are schematic diagrams of the abdominal dorsa of the two species showing the maximum extent of light hair patterns.

RESULTS AND DISCUSSION

It is likely that *Castianeira crocata* and *C. floridana* will often be confused with one another and misidentified. Both species are in the *longipalpus* species-group, which is characterized by an abdominal pattern of horizontal white hair bands on a dark ground, moderately large epigynal openings in the female, and a straight, thick and fairly short spiraled embolus on the male pedipalp. In the revision of the genus (Reiskind, 1969) females of both species could key out to either species. Remarks about distinct abdominal patterns found in the diagnoses of that revision are demonstrated by the exten-

TABLE 2
Criteria for Scoring Abdominal Hair Patterns in *Castianeira floridana*
(See figure 2 for band designations.)

WHITE PATTERN (bands part or whole count as present except where noted)

0 = absent
1 = no distinct bands, a few anterior white hairs
2 = band VIII (posterior) only
3 = bands I and VIII
4 = bands I, II, and VIII
5 = bands I, II, III, and VIII
6 = bands I, II, III, IV, and VIII
7 = bands I, II, III, IV, V, and VIII
8 = bands I, II, III, IV, V, small bands VI and VII, and VIII
9 = bands I, II, III, IV, V, VI, VII, and VIII, but III and IV not connected
10 = as 9 but bands III and IV connected

RED-ORANGE REGION

0 = absent
1 = a few red-orange hairs
2 = very small; spans bands V and VI or less
3 = small; spans V to VII but not quite reaching them
4 = small; spans V to VII
5 = small; spans V to VII, extending somewhat beyond them
6 = moderate; spans bands IV to VII
7 = moderate; spans IV to VIII (posterior)
8 = moderate; spans IV to VIII, extending somewhat anterior to IV
9 = large; spans III to VIII
10 = very large; extends beyond posterior band

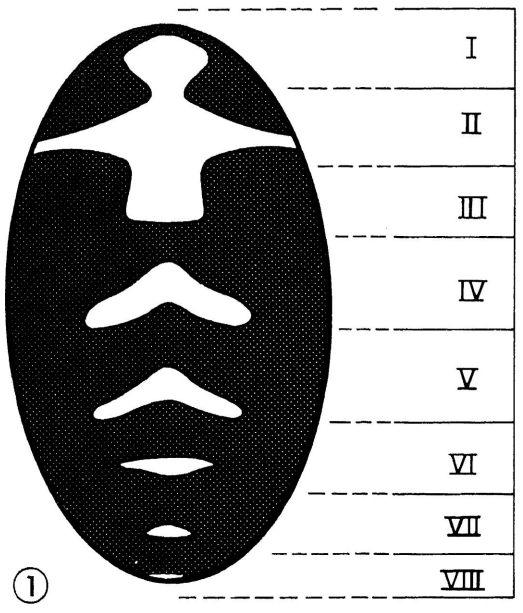


FIG. 1. Schematic diagram of the dorsum of the abdomen of *Castianeira crocata* male showing maximum extent of the yellow-white hair pattern.

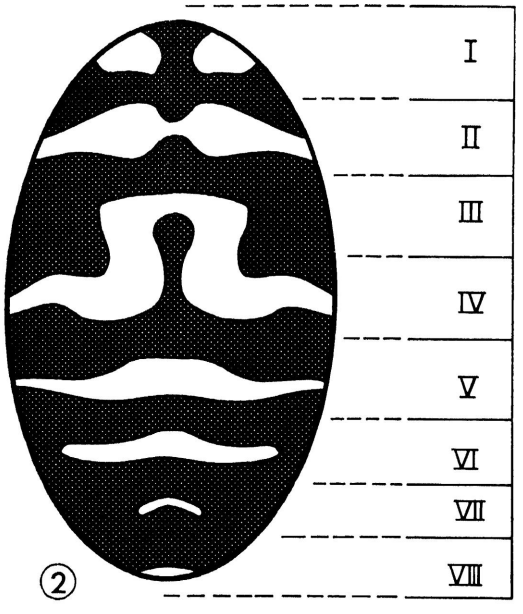


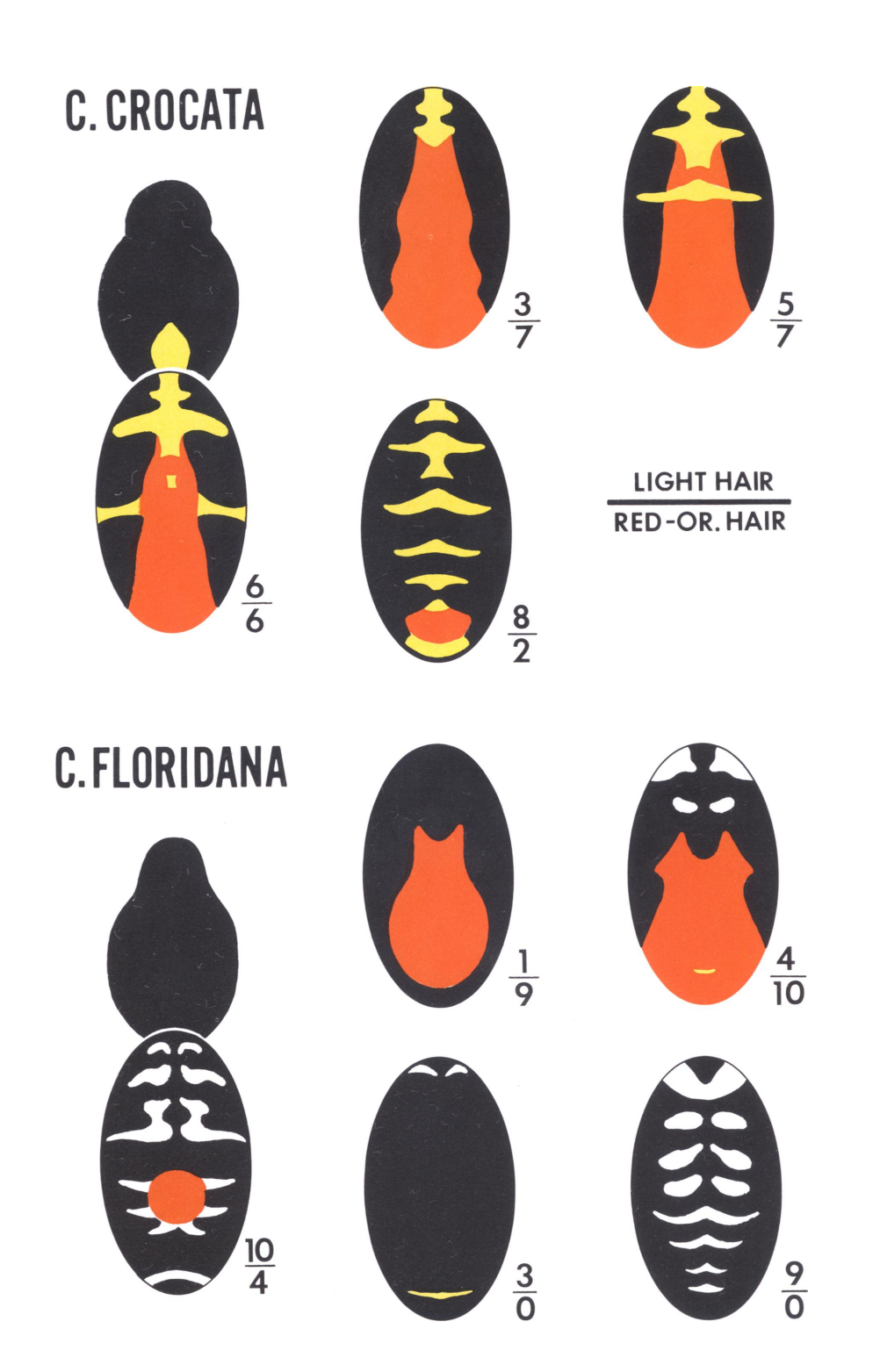
FIG. 2. Schematic diagram of the dorsum of the abdomen of *Castianeira floridana* male showing the maximum extent of the white hair pattern.

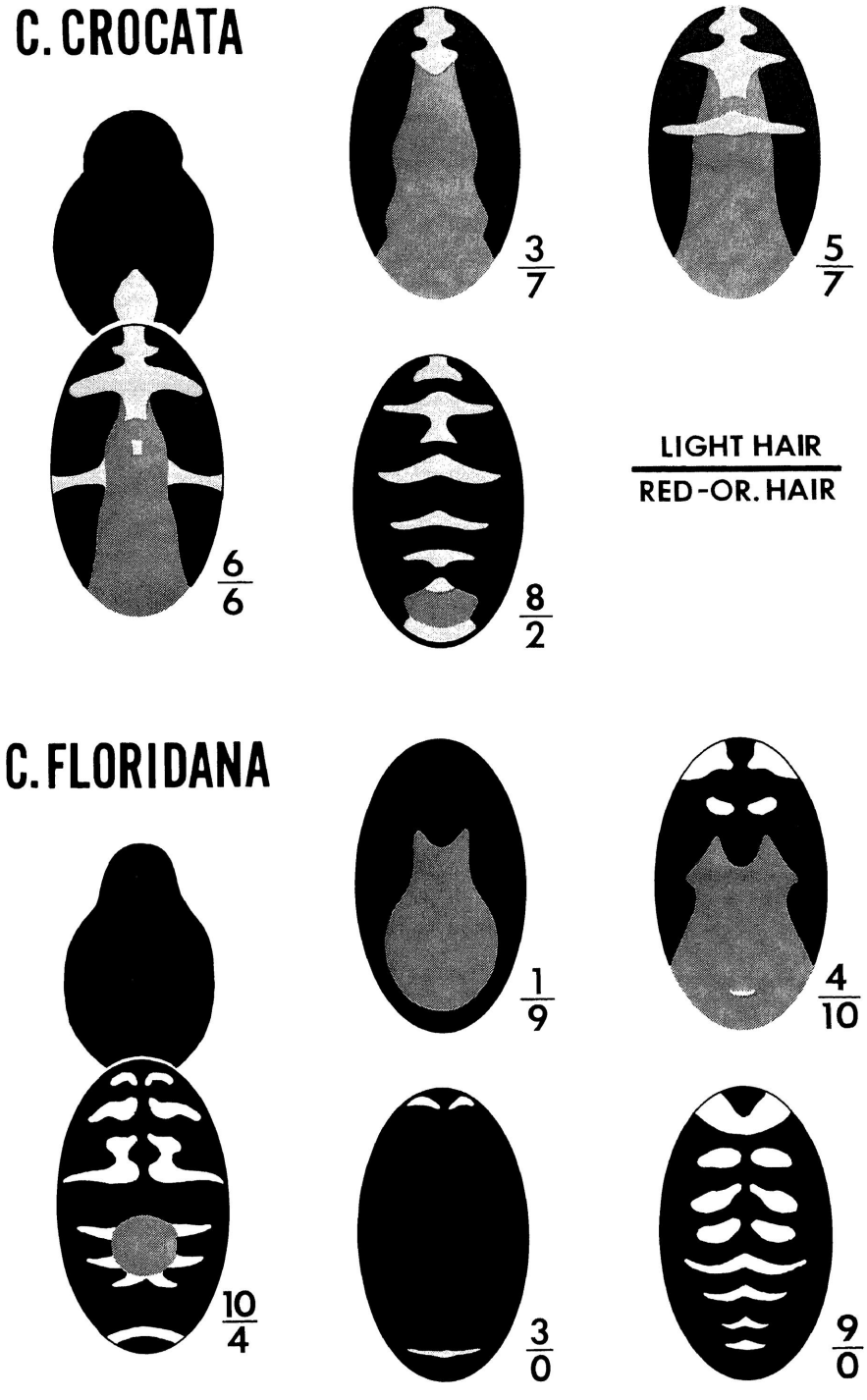
sive variation in both species documented in this paper to be incorrect. From this study it appears that the two species can unambiguously be separated by means of certain key hair pattern components—chiefly the color and arrangement of the light plumose hairs on the abdomen and on the posterior of the carapace. *Castianeira crocata* is characterized by having a carapace with a distinct patch of yellow-white plumose hairs forming an expanding triangle posterior to the thoracic groove, whereas the remainder of the carapace is covered with short sparse black plumose hairs and a scattering of white plumose hairs. The carapace of *Castianeira floridana* has no such yellow-white patch but is covered with black and white plumose hairs, often with the white hairs somewhat denser in the head regions and in a wide longitudinal medial stripe. The dorsal abdominal patterns are varied but distinctly different (figs. 1–3), the light hairs of *C. crocata* being yellow-white and those of *C. floridana* always pure white.

An intriguing aspect of both species is the variation observed in the distribution of the plumose hairs on the abdominal dorsum. Both species show extensive variation in the extent of both light-colored hairs and red-orange hairs (fig. 3). Each adult in each of the two populations studied was scored using the scales mentioned earlier (tables 1 and 2). The results are charted on graphs (figs. 4 and 5)

→

FIG. 3. Diagrams of examples of dorsal hair patterns in two species of *Castianeira*. The numbers at the bottom right of each abdomen indicate the score for the light hair pattern over the score for the red-orange hair pattern using the criteria in tables 1 and 2. All the examples of *C. crocata* are males; those of *C. floridana* are females.


C. CROCATA
6/6
3/7
5/7
8/2
LIGHT HAIR
RED-OR. HAIR
C. FLORIDANA
10/4
1/9
4/10
3/0
9/0


C. CROCATA
3/7
5/7
6/6
8/2
LIGHT HAIR
RED-OR. HAIR
C. FLORIDANA
1/9
4/10
10/4
3/0
9/0

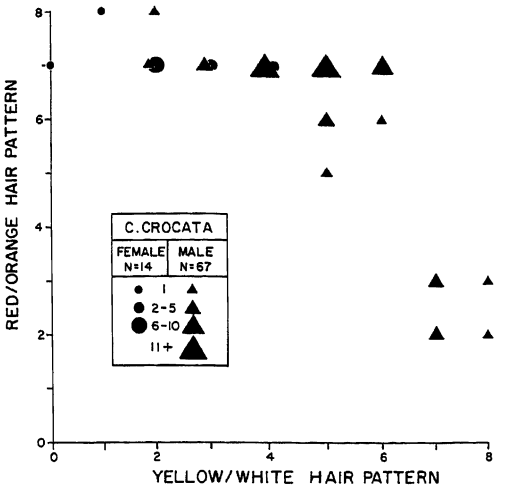


FIG. 4. Abdominal pattern variation of the sand-pine dune population of *Castianeira crocata* using the criteria in table 1.

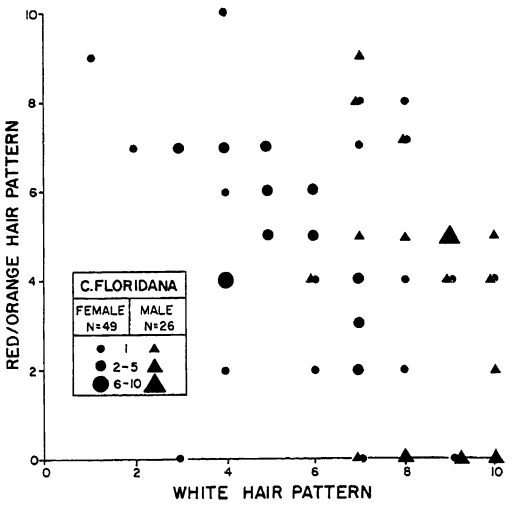


FIG. 5. Abdominal pattern variation of the citrus grove population of *Castianeira floridana* using the criteria in table 2.

with two axes (one for the light hair scale and one for the red-orange scale). The graphed samples are based on specimens from the two demes studied; other specimens have been examined, some having patterns somewhat beyond the limits of those recorded.

The most extensive variation with respect to both patterns was observed in the females of *C. floridana* (fig. 3, bottom) with somewhat less variation in the light hair pattern among the males (fig. 5). In *C. crocata* the males show greater variation in both patterns (fig. 3, top) than do the females, although the extensive pattern of one sort appears to either obscure or inhibit the expression of the other pattern (fig. 4). The reduction of the overall pattern to two gradients is possibly an oversimplification of a more complex relationship. The genetic bases for these abdominal patterns are presently being investigated and they may very well involve polygenes and other interactive genetic factors.

The hairs are highly "deciduous" and specimens much handled (or old living specimens) often have lost substantial portions of their pattern. However, enough hairs remained to allow 99 percent of the specimens of *C. crocata* to be confidently scored with respect to both patterns in each sex, while only about 80 percent of *C. floridana* specimens allowed such evaluation.

It appears that the similarities of the abdominal patterns in these two congeneric species are the result of convergent or parallel evolution since the resemblances are superficial and the details of the elements of each pattern are quite different. That both patterns show similar types of variation suggests that similar selective pressures are acting on both species.

The function of the abdominal pattern has not yet been determined although there has been speculation that the red-orange abdominal spot resembles a similarly colored region on the abdomens of female mutillid wasps (Scheffer, 1906) and the somewhat segmented appearance produced by the light hair abdominal bands and the velvet-like texture produced by the plumose hairs do not detract from such speculation. That the spiders are truly Batesian mimics of velvet ants has not been demonstrated.

ACKNOWLEDGMENTS

I thank Ms. Esta Belcher for assistance with the illustrations. This work was supported in part by a grant from the Division of Sponsored Research of the University of Florida.

LITERATURE CITED

Edwards, Glavis Bernard
1980. Taxonomy, ethology, and ecology of *Phidippus* (Araneae, Salticidae) in eastern North America. Doctoral Thesis, University of Florida.

Muma, Martin H.
1973. Comparison of ground surface spiders in four central Florida ecosystems. Florida Ent., vol. 56, pp. 173–196.

Reiskind, Jonathan
1969. The spider subfamily Castianeirinae of North and Central America (Araneae, Clubionidae). Bull. Mus. Comp. Zool., vol. 138, pp. 163–325, figs. 1–290.

Scheffer, Theodore H.
1906. Additions to the list of Kansas Arachnida. Trans. Kansas Acad. Sci., vol. 20, pp. 121–130.

A New Genus of the Spider Family Gnaphosidae (Arachnida, Araneae)

NORMAN I. PLATNICK[1] AND MOHAMMAD U. SHADAB[2]

ABSTRACT

A new genus, *Gertschosa,* is described in the family Gnaphosidae. *Poecilochroa concinna* Simon, *P. cingulata* (Roewer), *P. amphiloga* (Chamberlin), *Cesonia cincta* Banks, and *C. nigra* Chickering are transferred to *Gertschosa.* Two specific names are newly synonymized: *G. cingulata* with *G. concinna,* and *G. nigra* with *G. cincta.* One new species, *G. palisadoes,* is described from Jamaica.

INTRODUCTION

Willis Gertsch has made a number of contributions to the study of American gnaphosoid spiders, not only by the description of new taxa (Gertsch, 1933, 1935, 1941, 1942; Gertsch and Davis, 1936, 1940; Gertsch and Mulaik, 1936a, 1936b; Gertsch and Riechert, 1976; Chamberlin and Gertsch, 1940; Lowrie and Gertsch, 1955) but especially by his studies of the types of the many species poorly described by Chamberlin and other earlier workers and the consequent recognition of many synonymies and generic misidentifications that have been recorded in the catalog published by Ubick and Roth (1973). It is therefore with great pleasure that we name here a newly recognized gnaphosid genus in his honor.

In addition to specimens from the collection of the American Museum of Natural History (AMNH), we have examined material lent by Dr. M. Grasshoff of the Natur-Museum Senckenberg (NMS), Dr. M. Hubert of the Muséum National d'Histoire Naturelle (MNHN), Dr. H. W. Levi of the Museum of Comparative Zoology (MCZ), and Mr. D. Ubick (DU). The format of the descriptions follows that of Platnick and Shadab (1975); all measurements provided are in millimeters.

GERTSCHOSA, NEW GENUS

TYPE SPECIES: *Poecilochroa concinna* Simon.

ETYMOLOGY: Named in honor of Dr. W. J. Gertsch; the gender is considered feminine.

DIAGNOSIS: A genus of the *Herpyllus* complex (see Platnick and Shadab, 1977, 1980) differing from the North and Central American genera of the complex other than *Litopyllus* by the extremely simple palpi without a conductor or median apophysis, and from *Litopyllus* by the coiled palpal duct, anterior epigynal hood, and characteristic abdominal color pattern (dorsum dark with transverse white bands at anterior edge and near middle). The species here transferred to *Gertschosa* have previously been placed in *Cesonia* or with the group of North American species called either *Sergiolus* or *Poecilochroa* by various authors. Specimens of *Gertschosa* have neither the widely separated posterior median eyes nor the widened em-

[1] Associate Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York.

[2] Scientific Assistant, Department of Entomology, American Museum of Natural History.

bolar base characteristic of *Cesonia,* and lack the closely spaced and twisted arrangement of the median apophysis, embolus, and conductor typical of *Sergiolus.* The closest relatives of *Gertschosa* will probably be found among the still poorly known South American members of the *Herpyllus* complex, but no South American specimens of *Gertschosa* are known at present.

DESCRIPTION: Total length 2.5–6.2. Carapace rounded posteriorly, narrowed in front to half its maximal width (between coxae II and III), flattened, with shallow posterior declivity and longitudinal thoracic groove about one-eighth of carapace length, set back three-fifths of length, dark brown with darker infuscations and ocular area, coated with recumbent white setae at sides and rear, with erect dark setae in ocular area and along clypeal margin. From front, anterior eye row straight, about two-thirds the width of slightly procurved posterior row; from above, both rows recurved; AME circular, dark, other eyes oval, light; ALE largest, others subequal; AME separated by less than their diameter, almost touching ALE; PME separated by their diameter or more, usually closer to PLE; lateral eyes of each side separated by their diameter or more; MOQ almost as wide in back as long, narrowed in front; clypeal height roughly equal to AME diameter. Cheliceral retromargin with single minute denticle, promargin with low carina not divided into distinct teeth; chelicerae, mouthparts, and sternum brown; endites rounded laterally, obliquely depressed, with white anteromedian corners; labium slightly more than half of endite length, widest at middle, with rebordered tip; sternum narrow, slightly invaginated opposite coxae IV. Leg formula 4123; typical leg spination pattern (only surfaces bearing spines listed): femora: I, II d1-1-1, p0-0-1; III d1-1-1, p0-1-1, r0-1-1; IV d1-1-1, p0-0-1, r0-0-1; patellae: III p0-1-0, r0-1-0; IV r0-1-0; tibiae: II v0-1p-1p; III d1-0-0, p2-1-1, v1p-2-2, r0-1-1; IV p1-0-1, v1p-2-2, r1-0-1; metatarsi: II v1p-0-0; III p1-2-2, v2-0-2, r1-1-2; IV p1-2-2, v2-2-2, r0-2-2; anterior coxae, all trochanters, femora, base and tip of patellae (and sometimes tibiae and metatarsi) dark brown, other segments yellow; anterior metatarsi and all tarsi lightly scopulate; tarsi with two dentate claws and claw tufts; trochanters unnotched; metatarsal preening comb lacking; distal leg segments with few trichobothria. Abdomen dark gray dorsally, lighter ventrally; dorsum with wide brown scutum covering anterior half in males, usually with narrow transverse white band near anterior margin and second transverse white band (medially interrupted in *G. palisadoes*) near middle of length, neither band reaching venter (except in *G. amphiloga*); venter usually with wide transverse white band immediately behind epigastric furrow; six spinnerets, medians narrow, anteriors separated at base by their diameter. Palp with coiled duct and long embolus originating prolaterally near middle of bulb, without conductor or median apophysis, with short, wide, distally hooked retrolateral tibial apophysis. Epigynum with anterior hood, posterior spermathecae, and elongate anterior ducts.

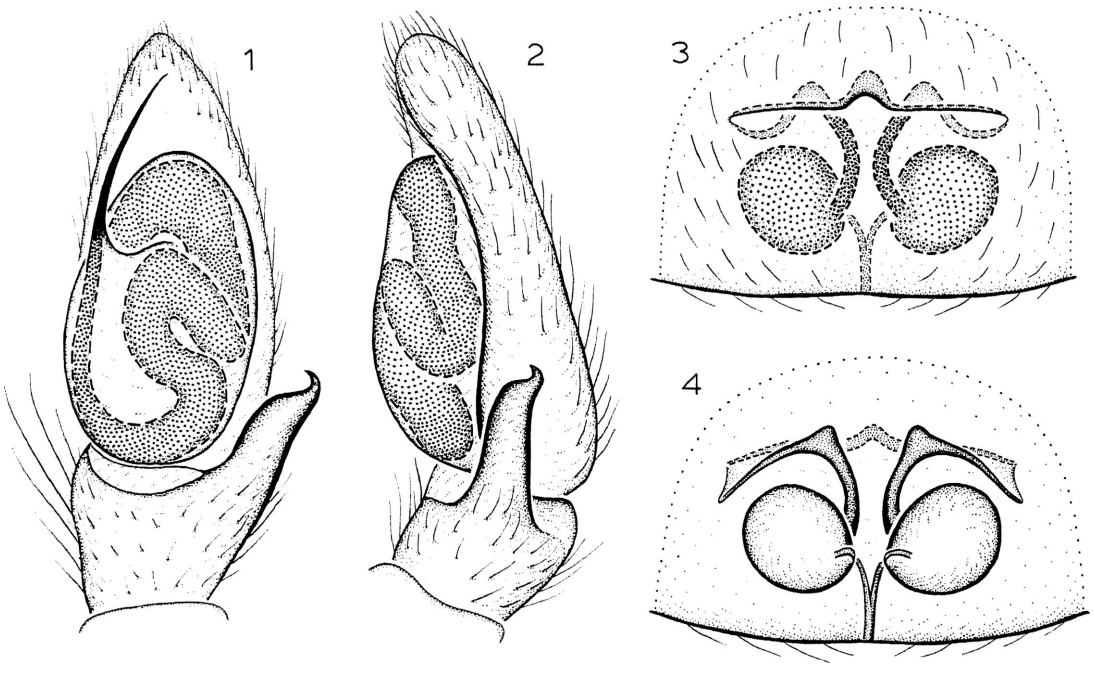
KEY TO SPECIES OF *GERTSCHOSA*

1. Males (those of *G. amphiloga* unknown) 2
   Females (those of *G. palisadoes* unknown) 4
2. Retrolateral tibial apophysis relatively straight (fig. 2) ..... *concinna*
   Retrolateral tibial apophysis relatively sinuous (figs. 6, 10) 3
3. Tip of retrolateral tibial apophysis pointing ventrally (fig. 6); Panama ..... *cincta*
   Tip of retrolateral tibial apophysis pointing anteriorly (fig. 10); Jamaica..... *palisadoes*
4. Epigynum with wide anterior margin (figs. 3, 7) 5
   Epigynum without wide anterior margin (fig. 11) ..... *amphiloga*
5. Spermathecae round (figs. 3, 4); Mexico ..... *concinna*
   Spermathecae elongate (figs. 7, 8); Panama ..... *cincta*

Gertschosa concinna (Simon), new combination

Figures 1–4

Poecilochroa concinna Simon, 1895, p. 107 (male holotype from Baja California, Mexico, in MNHN, examined).



FIGS. 1–4. *Gertschosa concinna* (Simon). 1. Palp, ventral view. 2. Palp, retrolateral view. 3. Epigynum, ventral view. 4. Epigynum, dorsal view.

Cesonia cingulata Roewer, 1933, p. 186, fig. 2 (female holotype from Mirador, Veracruz, Mexico, in NMS, examined). NEW SYNONYMY.

Poecilochroa cingulata: Ubick and Roth, 1973, suppl. 3, p. 2.

DIAGNOSIS: *Gertschosa concinna* seems most closely related to *G. cincta* and *G. palisadoes* but may be distinguished from them by the relatively straight retrolateral tibial apophysis (fig. 2) and rotund spermathecae (figs. 3, 4).

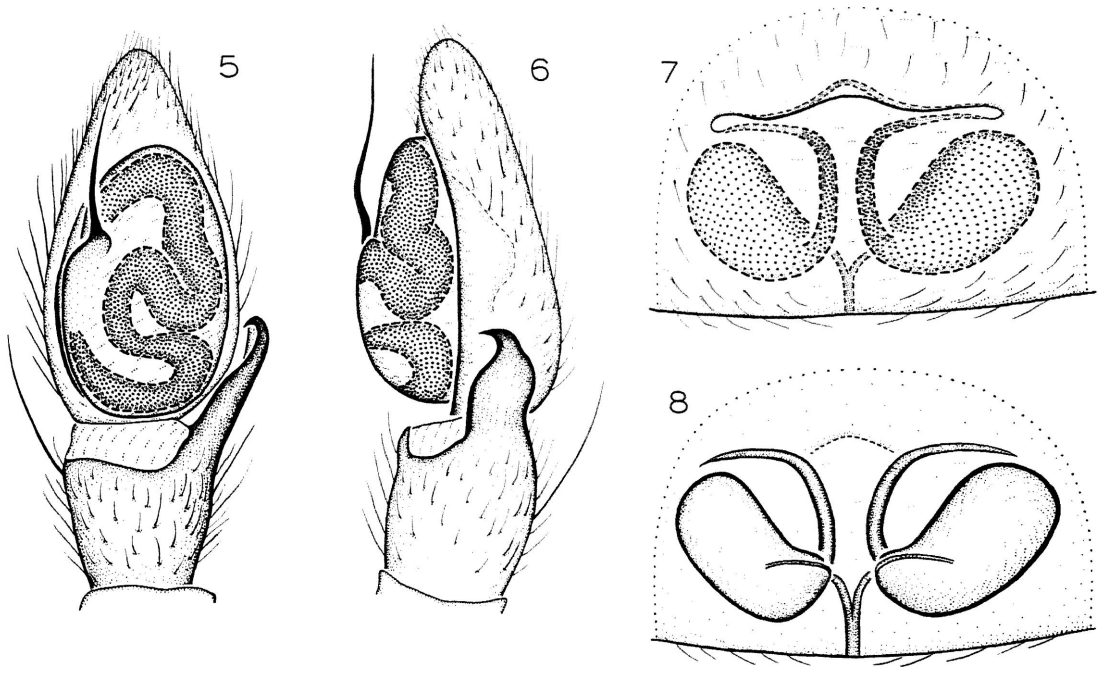
MALE: Total length 2.59–3.73. Carapace 1.15–1.68 long, 0.79–1.16 wide. Femur II 0.58–0.85 long. Eye sizes and interdistances: AME 0.04, ALE 0.07, PME 0.06, PLE 0.05; AME–AME 0.05, AME–ALE 0.02, PME–PME 0.08, PME–PLE 0.07, ALE–PLE 0.10. MOQ length 0.20, front width 0.13, back width 0.20. Retrolateral tibial apophysis relatively straight, with dorsally situated, anteriorly directed tip (figs. 1, 2). Leg spination: patellae: III p0-0-0; IV r0-0-0; metatarsi: III p0-2-2, v1p-0-1p, r0-1-2; IV p0-2-2.

FEMALE: Total length 4.39, 5.26. Carapace 2.12, 2.20 long, 1.40, 1.53 wide. Femur II 0.97, 1.13 long. Eye sizes and interdistances: AME 0.07, ALE 0.08, PME 0.07, PLE 0.07; AME–AME 0.05, AME–ALE 0.02, PME–PME 0.10, PME–PLE 0.07, ALE–PLE 0.10. MOQ length 0.27, front width 0.19, back width 0.24. Epigynum with wide anterior margin and round spermathecae (figs. 3, 4). Leg spination: tibia I v1p-1p-0; metatarsi: I v1p-0-0; IV r1-2-2.

MATERIAL EXAMINED: **Mexico**: *Baja California:* no specific locality, 1895 (L. Diguet, MNHN), 1♂ (holotype). *Oaxaca:* 7 mi. S Nochixtlán, June 27, 1947 (L. I. and A. M. Davis, AMNH), 1♂. *San Luis Potosí:* Tamazunchale, Aug. 17, 1964 (J. and W. Ivie, AMNH), 1♀. *Sonora:* 20 mi. W. Cananea, July 8, 1979 (D. Ubick, DU), 1♂. *Veracruz:* Mirador, 1929 (E. Skwarra, NMS), 1♀ (holotype).

DISTRIBUTION: Mexico.

SYNONYMY: The close similarity of both sexes to those of *G. cincta* and their over-



FIGS. 5–8. *Gertschosa cincta* (Banks). 5. Palp, ventral view. 6. Palp, retrolateral view. 7. Epigynum, ventral view. 8. Epigynum, dorsal view.

lapping distribution indicate that *cingulata* is the female of *concinna*.

Gertschosa cincta (Banks), new combination
Figures 5–8

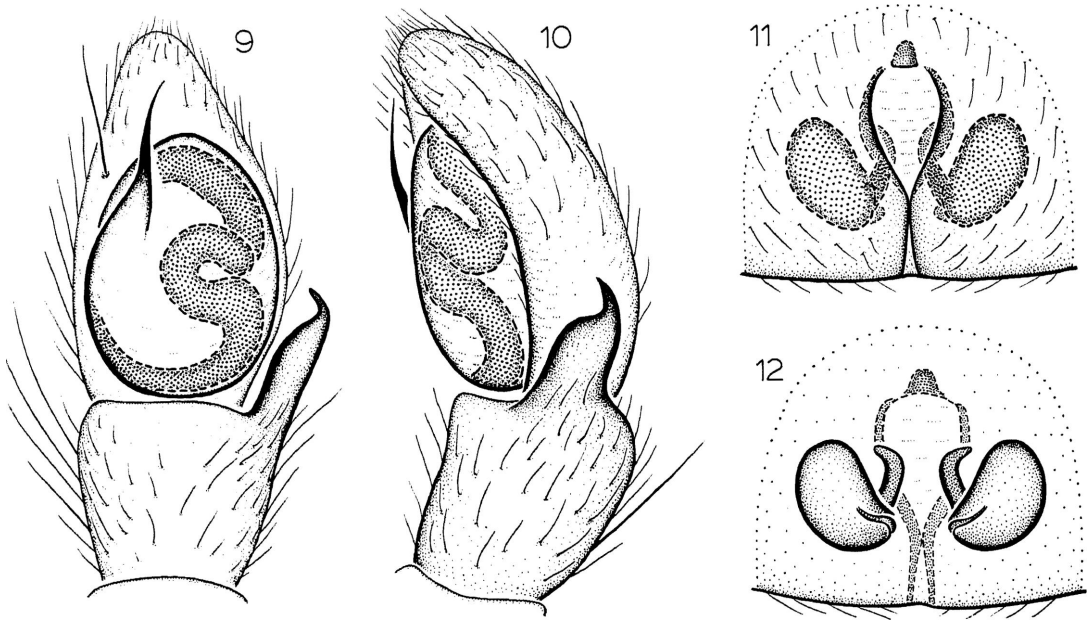
Cesonia cincta Banks, 1929, p. 58, fig. 79 (female holotype from Las Sabanas, Coclé, Panama, in MCZ, examined).
Cesonia nigra Chickering, 1949, p. 316, figs. 3–5 (male holotype from El Valle, Coclé, Panama, in MCZ, examined). NEW SYNONYMY.

DIAGNOSIS: *Gertschosa cincta* seems most closely related to *G. palisadoes*; in both species the male has a sinuous retrolateral tibial apophysis. Females of the latter species are unknown but those of the former have distinctly elongate spermathecae (figs. 7, 8); males of *G. cincta* have the terminal hook of the retrolateral tibial apophysis directed ventrally (figs. 5, 6).

MALE: Total length 2.70–3.03. Carapace 1.31–1.50 long, 0.93–0.98 wide. Femur II 0.79–0.86 long. Eye sizes and interdistances: AME 0.05, ALE 0.06, PME 0.05, PLE 0.06; AME–AME 0.04, AME–ALE 0.01, PME–PME 0.05, PME–PLE 0.04, ALE–PLE 0.06. MOQ length 0.19, front width 0.14, back width 0.15. Retrolateral tibial apophysis sinuous, with medially situated, ventrally directed tip (figs. 5, 6). Leg spination: tibiae: I v0-2-1p; II v0-1r-1p; metatarsi: I, II v2-0-0; III p0-2-2, r0-1-2; IV p0-2-2, v1p-2-2.

FEMALE: Total length 4.46–6.19. Carapace 1.80–2.61 long, 1.42–1.81 wide. Femur II 0.97–1.19 long. Eye sizes and interdistances: AME 0.06, ALE 0.09, PME 0.07, PLE 0.08; AME–AME 0.06, AME–ALE 0.02, PME–PME 0.09, PME–PLE 0.06, ALE–PLE 0.11. MOQ length 0.25, front width 0.18, back width 0.23. Epigynum with wide anterior margin and elongate spermathecae (figs. 7, 8). Leg spination: tibia I v1p-1p-1p; metatarsus I v1p-0-0.

MATERIAL EXAMINED: **Panama**: *Canal Zone:* Ancón, March (Wheeler, MCZ), 1♀; Barro Colorado Island, July 13–31 (N.



FIGS. 9–12. 9, 10. *Gertschosa palisadoes*, new species. 11, 12. *G. amphiloga* (Chamberlin). 9. Palp, ventral view. 10. Palp, retrolateral view. 11. Epigynum, ventral view. 12. Epigynum, dorsal view.

Banks, MCZ), 1♀, shore east of lab, July 21, 1954 (A. M. Chickering, MCZ), 1♂; Fort Gulick, on weeds, Sept. 1979 (H. J. Harlan, AMNH), 1♂; Fort Sherman, Aug. 1939 (A. M. Chickering, MCZ), 1♀. *Coclé:* El Valle, July 1936 (A. M. Chickering, MCZ), 1♂ (holotype); Las Sabanas, July 7 (N. Banks, MCZ), 1♀ (holotype).

DISTRIBUTION: Panama.

SYNONYMY: There is no reason to doubt Chickering's (1949, p. 319) judgment that *nigra* is probably the male of *cincta*.

Gertschosa palisadoes, new species
Figures 9, 10

TYPE: Male holotype from Palisadoes area, Kingston, Jamaica (October 30, 1957; A. M. Chickering), deposited in MCZ.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: *Gertschosa palisadoes* resembles *G. cincta* in having a sinuous retrolateral tibial apophysis, but differs in having the tip of the apophysis directed anteriorly (figs. 9, 10).

MALE: Total length 3.26. Carapace 1.56 long, 0.83 wide. Femur II 0.83 long. Eye sizes and interdistances: AME 0.05, ALE 0.07, PME 0.06, PLE 0.07; AME–AME 0.04, AME–ALE 0.01, PME–PME 0.06, PME–PLE 0.05, ALE–PLE 0.07. MOQ length 0.22, front width 0.14, back width 0.18. Retrolateral tibial apophysis sinuous, with dorsally situated, anteriorly directed tip (figs. 9, 10). Leg spination: tibia I v1p-1p-1p; metatarsi: I, II v2-0-0; IV r1-2-2.

FEMALE: Unknown.

MATERIAL EXAMINED: Only the holotype.

DISTRIBUTION: Jamaica.

Gertschosa amphiloga (Chamberlin), new combination
Figures 11, 12

Sergiolus amphilogus Chamberlin, 1936, p. 4, fig. 18 (female holotype from Brownsville, Cameron County, Texas, in AMNH, examined).

Poecilochroa amphiloga: Ubick and Roth, 1973, suppl. 2, p. 6.

DIAGNOSIS: *Gertschosa amphiloga* is a distinctive species easily recognized by the small epigynal hood and longitudinal epigynal margins (figs. 11, 12).

MALE: Unknown.

FEMALE: Total length 5.73, 5.87. Carapace 2.06, 2.28 long, 1.33, 1.80 wide. Femur II 0.97, 1.01 long. Eye sizes and interdistances: AME 0.06, ALE 0.07, PME 0.07, PLE 0.07; AME–AME 0.06, AME–ALE 0.02, PME–PME 0.10, PME–PLE 0.10, ALE–PLE 0.12. MOQ length 0.25, front width 0.18, back width 0.24. Epigynum with small anterior hood and longitudinal margins (figs. 11, 12). Leg spination: femur IV p0-0-0; patella IV r0-0-0; tibiae: II v0-0-0; IV p1-0-0; metatarsi: III v2-0-1p; IV p0-1-2.

MATERIAL EXAMINED: **Mexico**: *Nuevo León:* Iturbide Cañon, Linares, elevation 2400 ft., Feb. 13, 1952 (Creighton, AMNH), 1♀. **United States**: *Texas:* Cameron Co.: Brownsville, June 1, 1924 (J. N. Knull, AMNH), 1♀ (holotype).

DISTRIBUTION: Southeastern Texas and northeastern Mexico.

LITERATURE CITED

Banks, Nathan
1929. Spiders from Panama. Bull. Mus. Comp. Zool., vol. 69, pp. 53–96, pls. 1–4.

Chamberlin, Ralph V.
1936. Further records and descriptions of North American Gnaphosidae. Amer. Mus. Novitates, no. 853, pp. 1–25, figs. 1–47.

Chamberlin, Ralph V., and Willis J. Gertsch
1940. Descriptions of new Gnaphosidae from the United States. Amer. Mus. Novitates, no. 1068, pp. 1–19, figs. 1–34.

Chickering, Arthur M.
1949. The Gnaphosidae (Araneae) of Panama. Trans. Amer. Micros. Soc., vol. 68, pp. 314–331, figs. 1–19.

Gertsch, Willis J.
1933. Diagnoses of new American spiders. Amer. Mus. Novitates, no. 637, pp. 1–14, figs. 1–17.
1935. New American spiders with notes on other species. *Ibid.*, no. 805, pp. 1–24, figs. 1–60.
1941. Report on some arachnids from Barro Colorado Island, Canal Zone. *Ibid.*, no. 1146, pp. 1–14, figs. 1–33.
1942. New American spiders of the family Clubionidae. III. *Ibid.*, no. 1195, pp. 1–18, figs. 1–37.

Gertsch, Willis J., and L. Irby Davis
1936. New spiders from Texas. Amer. Mus. Novitates, no. 881, pp. 1–21, figs. 1–35.
1940. Report on a collection of spiders from Mexico. III. *Ibid.*, no. 1069, pp. 1–22, figs. 1–35.

Gertsch, Willis J., and S. Mulaik
1936a. Diagnoses of new southern spiders. Amer. Mus. Novitates, no. 851, pp. 1–21, figs. 1–32.
1936b. New spiders from Texas. *Ibid.*, no. 863, pp. 1–22, figs. 1–39.

Gertsch, Willis J., and Susan E. Riechert
1976. The spatial and temporal partitioning of a desert spider community, with descriptions of new species. Amer. Mus. Novitates, no. 2604, pp. 1–25, figs. 1–41, table 1.

Lowrie, Donald C., and Willis J. Gertsch
1955. A list of the spiders of the Grand Teton Park area, with descriptions of some new North American spiders. Amer. Mus. Novitates, no. 1736, pp. 1–29, figs. 1–32.

Platnick, Norman I., and Mohammad U. Shadab
1975. A revision of the spider genus *Gnaphosa* (Araneae, Gnaphosidae) in America. Bull. Amer. Mus. Nat. Hist., vol. 155, pp. 1–66, figs. 1–150, maps 1–15.
1977. A revision of the spider genera *Herpyllus* and *Scotophaeus* (Araneae, Gnaphosidae) in North America. *Ibid.*, vol. 159, pp. 1–44, figs. 1–130, maps 1–9.
1980. A revision of the spider genus *Cesonia* (Araneae, Gnaphosidae). *Ibid.*, vol. 165, pp. 335–386, figs. 1–145, maps 1–6.

Roewer, Carl
1933. Araneen aus mexikanischen Ameisenwohnpflanzen. Zool. Anz., vol. 102, pp. 183–188, figs. 1–3.

Simon, Eugène

1895. Sur les arachnides recueillis en Basse-Californie par M. Diguet. Bull. Mus. Natl. Hist. Nat., pp. 105–107.

Ubick, Darrell, and Vincent D. Roth

1973. Nearctic Gnaphosidae including species from adjacent Mexican states. Amer. Arachnol., no. 9, suppl. 2, pp. 1–12; suppl. 3, pp. 1–6.

On the Spider Genus *Eilica* (Araneae, Gnaphosidae)

NORMAN I. PLATNICK[1] AND MOHAMMAD U. SHADAB[2]

ABSTRACT

The genera *Gytha* Keyserling and *Fedotovia* Charitonov are newly synonymized with *Eilica*. One new species, *E. puno*, is described from Peru, and the males of *E. trilineata* (Mello-Leitão) and *E. cincta* (Simon) are described for the first time.

INTRODUCTION

The spider genus *Eilica* Keyserling was revised by Platnick (1975), who placed *Laronia* Simon, *Gnaphosoides* Hogg, and *Caridrassus* Bryant as generic synonyms and treated the then known fauna of 12 species (six from America, two from Africa, and four from Australia). Since that time, additional material has been discovered from India (Platnick, 1976a; Tikader and Gajbe, 1976), Brazil (Platnick, 1977), and Australia (Platnick, 1978). The present paper supplements these studies by establishing two additional generic synonyms, discussing the first known males of three species, and describing a new species from Peru. As now known, the genus contains a total of 18 species and has a classic Gondwanian distribution (with extensions into southern parts of the Holarctic region; Platnick, 1976b).

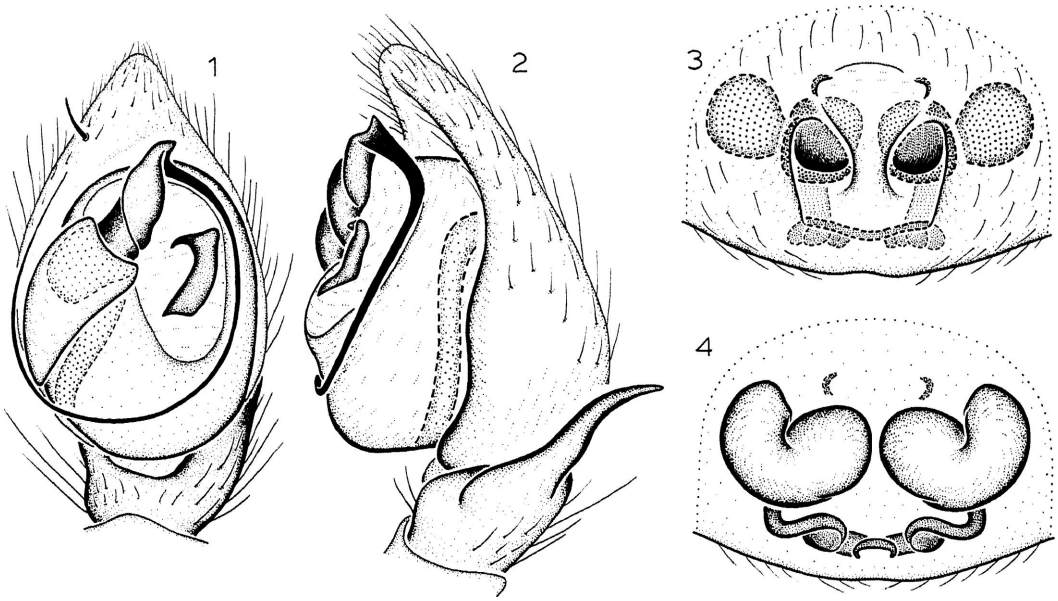
The genus *Gytha* was established by Keyserling (1891) for a female gnaphosid from Brazil, but has been generally ignored by students of the family because Simon (1897), without having seen any specimens and without providing any explanation, transferred the genus to the Clubionidae and placed it *incertae sedis* within the liocranines. Simon's placement was accepted by all subsequent catalogers and workers except Mello-Leitão (1940, 1944, 1945), who correctly returned the genus to the Gnaphosidae but described two additional species that, judging from his illustrations, do not appear to belong to the genus. Examination of the type specimen of Keyserling's species indicates that it has the cheliceral laminae, anteriorly produced chelicerae, convergent endites, and type of genitalia diagnostic of *Eilica*. Placement of Mello-Leitão's species must await revisionary studies of the South American gnaphosid fauna.

The genus *Fedotovia* was established by Charitonov (1946) for a female gnaphosid from Ishkent, Uzbekistan. No specimens have been available for study but Charitonov illustrated (1946, figs. 31, 32) both the eye pattern and the epigynum. The eye shapes, positions, and relative sizes agree with those of *Eilica*, and the epigynum has the connected anterior and lateral margins, elongated and curled basal ducts, and paramedially situated, coiled spermathecae typical of many *Eilica* females. We therefore regard *Fedotovia* as a synonym.

As the three *Eilica* species from Asia are known only from females, it seems worthwhile to include here, for comparative purposes, illustrations (figs. 9, 10) of the palp of

[1] Associate Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York.

[2] Scientific Assistant, Department of Entomology, American Museum of Natural History.



FIGS. 1–4. 1, 2. *Eilica trilineata* (Mello-Leitão). 3, 4. *E. obscura* (Keyserling). 1. Palp, ventral view. 2. Palp, retrolateral view. 3. Epigynum, ventral view. 4. Epigynum, dorsal view.

a male taken at the type locality of *E. tikaderi* Platnick and presumably belonging to that species; the specimen will be described in a forthcoming review of Indian Gnaphosidae by Dr. B. K. Tikader.

In addition to specimens from the collection of the American Museum of Natural History (AMNH), including material kindly donated by Drs. G. R. Noonan and A. Russell-Smith, we have examined specimens lent by Mr. F. R. Wanless of the British Museum (Natural History) (BMNH), Dr. D. Kavanaugh of the California Academy of Sciences (CAS), Mr. J. A. Murphy (JAM), Mr. Charles Griswold of the University of California at Berkeley (UCB), and Dr. B. K. Tikader of the Zoological Survey of India. We also thank Mr. R. Rak of the American Museum for help with translations. The format of the descriptions follows that used in the revision (Platnick, 1975); all measurements presented are in millimeters.

We are happy to dedicate this paper to Dr. Willis J. Gertsch, whose interest in the genus *Eilica* spans four decades (Gertsch and Davis, 1940).

EILICA KEYSERLING

Eilica Keyserling, 1891, p. 29 (type species by monotypy *Eilica modesta* Keyserling). Platnick, 1975, p. 3.

Gytha Keyserling, 1891, p. 27 (type species by monotypy *Gytha obscura* Keyserling). NEW SYNONYMY.

Fedotovia Charitonov, 1946, p. 24 (type species by original designation *Fedotovia uzbekistanica* Charitonov). NEW SYNONYMY.

SYNONYMY: Although *Gytha* has page priority over *Eilica,* as first revisers we choose the name *Eilica.* The new synonymies are justified in the Introduction.

Eilica obscura (Keyserling), new combination

Figures 3, 4

Gytha obscura Keyserling, 1891, p. 28, fig. 8 (female holotype from Rio Grande, Rio Grande do Sul, Brazil, in BMNH, examined).

DIAGNOSIS: *Eilica obscura* resembles *E. trilineata* and *E. maculipes* in having a relatively narrow anterior epigynal margin, but

differs from them in having a median longitudinal epigynal ridge (fig. 3).

MALE: Unknown.

FEMALE: Total length 5.62. Carapace 2.14 long, 1.51 wide. Femur II 1.19 long (holotype). Carapace light brown with darker infuscations; abdomen uniformly light gray; femora brown, other leg segments orange. Eye sizes and interdistances: AME 0.06, ALE 0.11, PME 0.09, PLE 0.10; AME–AME 0.09, AME–ALE 0.03, PME–PME 0.14, PME–PLE 0.07, ALE–PLE 0.13. MOQ length 0.25, front width 0.21, back width 0.32. Anterior epigynal margin narrow, slightly interrupted anterolaterally, almost connected to median epigynal ridge (fig. 3); ducts narrow, in transverse line posteriorly (fig. 4). Leg spination: femur III r0-0-0; metatarsus IV v1r-1r-2, r0-0-1.

MATERIAL EXAMINED: Only the holotype.

DISTRIBUTION: Southeastern Brazil.

Eilica trilineata (Mello-Leitão)

Figures 1, 2

Laronia trilineata Mello-Leitão, 1941, p. 173, fig. 63 (female holotype from Alemania, Salta, Argentina, lost).

Laronia variegata (misidentification): Gerschman de Pikelin and Schiapelli, 1967, p. 202 (in part; some females only).

Eilica trilineata: Platnick, 1975, p. 6, figs. 14, 15.

DIAGNOSIS: *Eilica trilineata* is most closely related to *E. modesta,* as evidenced by the greatly elongated retrolateral tibial apophysis and the similarly twisted embolar bases of males and the semicircular anterior epigynal margins of females. Males of *E. trilineata* have the most anterior portion of the embolar base rounded, so that in lateral view the connection to the embolus is smooth (fig. 2), not sharply incised as in *E. modesta* (Platnick, 1975, fig. 9). Females of *E. trilineata* have a shorter anterior epigynal margin.

MALE: Total length 2.95. Carapace 1.30 long, 0.94 wide. Femur II 0.79 long. Carapace dark brown; abdomen uniformly dark gray; femora dark brown, other leg segments brownish yellow. Eye sizes and interdistances: AME 0.04, ALE 0.07, PME 0.03, PLE 0.06; AME–AME 0.06, AME–ALE 0.01, PME–PME 0.07, PME–PLE 0.06, ALE–PLE 0.08. MOQ length 0.16, front width 0.14, back width 0.14. Protruding portion of embolar base twisted, joined smoothly, narrowly to embolus (fig. 1); retrolateral tibial apophysis long, bent near midpoint (fig. 2). Leg spination: tibiae: I v1r-1r-2; III, IV v1p-2-2; metatarsi I, II v1r-0-2.

FEMALE: Described by Platnick (1975).

NEW RECORD: **Argentina**: *Chubut:* 3 km. N Puerto Lobos, on 20 m. dunes, Dec. 14, 1966 (E. I. Schlinger, M. Irwin, UCB), 1♂.

DISTRIBUTION: Chile and western Argentina.

Eilica puno, new species

Figures 7, 8

TYPE: Female holotype taken under rock 8.7 km. northwest of Puño, Puño, Peru (April 5, 1978; G. R. Noonan and M. Moffett), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

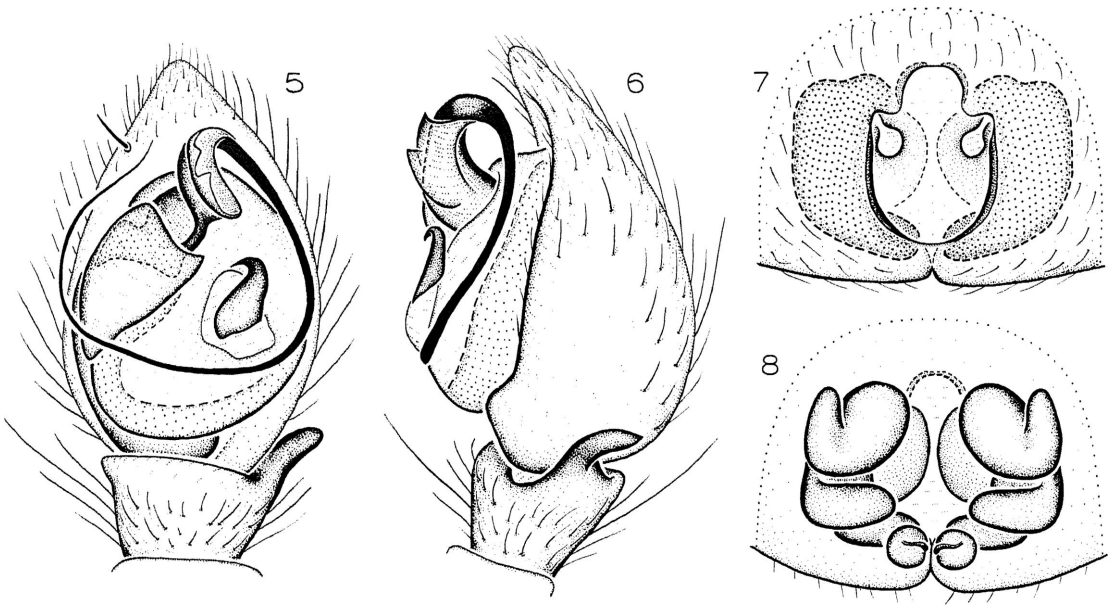
DIAGNOSIS: The shield-shaped epigynum of *E. puno* (fig. 7) is diagnostic; only *E. rufithorax* has similarly enlarged spermathecal ducts (but differs in having the lateral epigynal margins abruptly narrowed posteriorly).

MALE: Unknown.

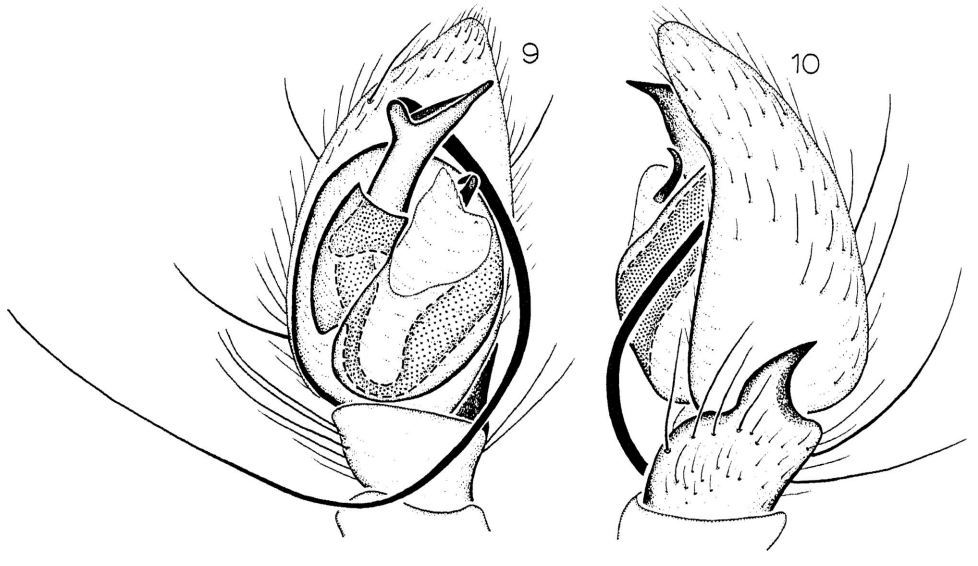
FEMALE: Total length 4.25, 5.15. Carapace 1.62, 1.67 long, 1.33, 1.43 wide. Femur II 1.15, 1.19 long (two specimens). Carapace reddish brown; abdomen uniformly gray; legs chocolate brown with femora slightly darker. Eye sizes and interdistances: AME 0.06, ALE 0.08, PME 0.06, PLE 0.09; AME–AME 0.05, AME–ALE 0.00, PME–PME 0.12, PME–PLE 0.05, ALE–PLE 0.06. MOQ length 0.18, front width 0.17, back width 0.24. Anterior epigynal margin narrow, rounded, connected to lateral margins (fig. 7); spermathecae expanded ventrally, with enlarged posterior ducts (fig. 8). Legs spineless, with distal bristles on tibiae and metatarsi.

OTHER MATERIAL EXAMINED: One female taken with the holotype (AMNH).

DISTRIBUTION: Peru.



FIGS. 5–8. 5, 6. *Eilica cincta* (Simon). 7, 8. *E. puno,* new species. 5. Palp, ventral view. 6. Palp, retrolateral view. 7. Epigynum, ventral view. 8. Epigynum, dorsal view.



FIGS. 9, 10. *Eilica tikaderi* Platnick, palp. 9. Ventral view. 10. Retrolateral view.

Eilica cincta (Simon)
Figures 5, 6

Laronia cincta Simon, 1893, p. 312 (female holotype from Sierra Leone, nc specific locality, in Muséum National d'Histoire Naturelle, examined previously). Gerschman de Pikelin and Schiapelli, 1967, p. 197, figs. 9–12.
Eilica cincta: Platnick, 1975, p. 13, figs. 24, 25.

DIAGNOSIS: Males of *E. cincta* can be recognized by the bilobed tip of the embolar base (figs. 5, 6), females by the sinuous lateral epigynal margins (Platnick, 1975, fig. 24).

MALE: Total length 3.02, 3.38. Carapace 1.28, 1.42 long, 0.96, 1.03 wide. Femur II 0.83, 0.93 long (two specimens). Carapace dark brown; abdomen with two longitudinal oval white spots anteriorly and two transverse oval white spots at middle of length (Kenya specimen), or with just posterior pair of spots vaguely indicated (Nigeria specimen); femora, distal halves of patellae and tibiae dark brown, other leg segments brownish yellow. Eye sizes and interdistances: AME 0.04, ALE 0.08, PME 0.06, PLE 0.07; AME–AME 0.06, AME–ALE 0.01, PME–PME 0.06, PME–PLE 0.06, ALE–PLE 0.05. MOQ length 0.19, front width 0.15, back width 0.18. Embolar base bilobed at tip, median apophysis set in unusually small unsclerotized area (fig. 5); retrolateral tibial apophysis short, directed dorsally (fig. 6). Leg spination: tibiae: I v1r-1r-2; III v1p-1p-2, r1-1-1; IV v1p-1p-2; metatarsi: II v0-0-2; III v1p-0-2; IV v1p-0-1p.

FEMALE: Described by Platnick (1975).

NEW RECORDS: **Gabon**: Port Gentil, July 12, 1957 (E. S. Ross, R. E. Leech, CAS), 1♀. **Kenya**: *Rift Valley:* Lake Naivasha, Aug. 3, 1974 (J. A. Murphy, JAM), 1♂. **Nigeria**: *Western:* Iita, Ibadan, fallow bush, Sept. 20, 1974 (A. Russell-Smith, AMNH), 1♂.

DISTRIBUTION: Central Africa.

LITERATURE CITED

Charitonov, D. E.
1946. New forms of spiders of the USSR. Bull. Inst. Sci. Nat. Univ. Molotov, vol. 12, pp. 19–32, figs. 1–60. [in Russian]

Gerschman de Pikelin, Berta S., and Rita D. Schiapelli
1967. El genero *Laronia* Simon, 1892 (Araneae-Drassodidae). Acta Zool. Lilloana, vol. 23, pp. 189–205, figs. 1–36, maps 1, 2.

Gertsch, Willis J., and L. Irby Davis
1940. Report on a collection of spiders from Mexico. III. Amer. Mus. Novitates, no. 1069, pp. 1–22, figs. 1–35.

Keyserling, Graf Eugen
1891. Die Spinnen Amerikas. Brasilianische Spinnen. Nürnberg, vol. 3, 278 pp., 10 pls.

Mello-Leitão, Candido Firmino de
1940. Arañas de la Provincia de Buenos Aires y de las Gobernaciones de La Pampa, Neuquén, Río Negro y Chubut. Rev. Mus. La Plata, new ser., vol. 2 (Zool.), pp. 1–62, figs. 1–64.
1941. Las arañas de Córdoba, La Rioja, Catamarca, Tucumán, Salta y Jujuy. *Ibid.*, vol. 2 (Zool.), pp. 99–198, figs. 1–91, pls. 2–12.
1944. Arañas de la Provencia de Buenos Aires. *Ibid.*, vol. 3 (Zool.), pp. 311–393, figs. 1–87.
1945. Arañas de Misiones, Corrientes y Entre Ríos. *Ibid.*, vol. 4 (Zool.), pp. 213–302, figs. 1–93.

Platnick, Norman I.
1975. A revision of the spider genus *Eilica* (Araneae, Gnaphosidae). Amer. Mus. Novitates, no. 2578, pp. 1–19, figs. 1–35, maps 1–4.
1976a. A new *Eilica* from India (Araneae, Gnaphosidae). Bull. British Arachnol. Soc., vol. 3, pp. 189–190, figs. 1, 2.
1976b. Drifting spiders or continents?: Vicariance biogeography of the spider subfamily Laroniinae (Araneae: Gnaphosidae). Syst. Zool., vol. 25, pp. 101–109, figs. 1–3.
1977. Notes on Brazilian *Eilica* (Araneae, Gnaphosidae). Rev. Brasiliana Biol., vol. 37, pp. 395–397, figs. 1–6.
1978. On Australian *Eilica* (Araneae, Gnaphosidae). Bull. British Arachnol. Soc., vol. 4, pp. 226–227, figs. 1–6.

Simon, Eugène
1893. Descriptions d'espèces et de genres nouveaux de l'ordre des Araneae. Ann. Soc. Ent. France, vol. 62, pp. 299–330, figs. 1–7.
1897. Histoire naturelle des Araignées. Paris, vol. 2, pt. 1, 192 pp., 200 figs.

Tikader, B. K., and U. A. Gajbe
1976. A new species of spider of the genus *Eilica* (Gnaphosidae) from India. Bull. British Arachnol. Soc., vol. 3, pp. 252–253, figs. 1–6.

New Species and Records of Neotropical Gnaphosidae (Arachnida, Araneae)

NORMAN I. PLATNICK[1] AND MOHAMMAD U. SHADAB[2]

ABSTRACT

Revisions of the genera *Lygromma, Zimiromus,* and *Echemoides* are supplemented by new records, descriptions of seven new species (*L. volcan* from Panama, *L. domingo* from Ecuador, *Z. rothi* from Mexico, *Z. lawa* and *Z. volksberg* from Surinam, *Z. sinop* from Brazil, and *Z. beni* from Bolivia), and descriptions of the first known males of *L. simoni* (Berland) and *Z. exlineae* Platnick and Shadab.

INTRODUCTION

Thanks to continuing support from the National Science Foundation, the backlog of unprocessed spider material in the arachnid collection of the American Museum of Natural History (the scope and tremendous size of which are due largely to the efforts of Dr. Willis J. Gertsch) has been sorted, during recent years, to the family level. Included among this material were several thousand vials of gnaphosid spiders, belonging largely to genera that have been recently revised. Most of these specimens were from North America and were readily identifiable as species already known from the large collections that had previously been examined. Not surprisingly, however, the Neotropical material, even of recently revised groups, contains a significant number of new taxa and records. This paper reports on the new material pertaining to previous revisions of the genera *Lygromma* (Platnick and Shadab, 1976a), *Zimiromus* (Platnick and Shadab, 1976b), and *Echemoides* (Platnick and Shadab, 1979). It is with pleasure that we dedicate this contribution to Willis in recognition of his monumental efforts in building the collection which has served as the primary basis for virtually all the systematic studies of American spiders published over the last three decades. The format of the descriptions follows that of the revisions; all measurements are in millimeters. We thank Dr. N. P. Ashmole for donating the male of *L. simoni* and Mr. F. R. Wanless of the British Museum (Natural History) for lending the female of *Z. volksberg*.

Lygromma volcan, new species

Figures 1–4

TYPES: Male holotype and female paratype from dung traps at an elevation of 1200 m. at Hartmann Finca, 15 km. northwest of Hato del Volcán, Chiriquí, Panama (May 20–31, 1977; S. Peck), deposited in AMNH.

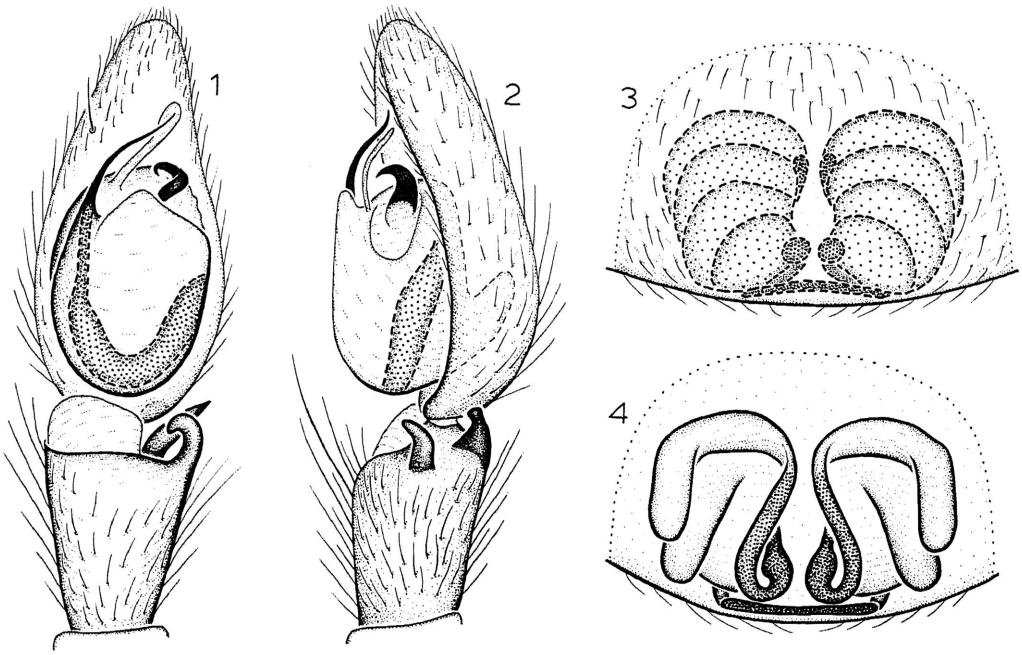
ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: Both sexes of *L. volcan* will key out to *L. quindio* in our published key but may be distinguished by the palpal duct extending almost to the base of the tegulum (figs. 1, 2) in males and the medially expanded outer epigynal ducts (fig. 4) in females.

MALE: Total length 2.63, 3.02. Carapace 1.15, 1.48 long, 0.90, 1.19 wide. Femur II 0.86, 1.22 long. Eye pattern typical for six-

[1] Associate Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York.

[2] Scientific Assistant, Department of Entomology, American Museum of Natural History.



FIGS. 1–4. *Lygromma volcan,* new species. 1. Palp, ventral view. 2. Palp, retrolateral view. 3. Epigynum, ventral view. 4. Epigynum, dorsal view.

eyed species of the genus. Embolus long, sinuous, prolaterally situated, arising from long palpal duct (fig. 1). Ventrally situated tibial apophysis bent ventrally at about half its length (fig. 2). Leg spination: femora III, IV p0-0-0, r0-0-0; tibiae: III v0-1p-2; IV r0-1-1; metatarsus III p0-0-1, r0-0-1.

FEMALE: Total length 2.34. Carapace 0.94 long, 0.67 wide. Femur II 0.70 long. ALE separated by almost their diameter. Epigynum with recurved basal sclerotized strip behind posterior openings, separated from pair of anterior duct darkenings (fig. 3). Inner branch of outer epigynal ducts sinuous, expanded medially (fig. 4). Leg spination: femora as in male; tibiae: III v0-1p-2, r1-0-0; IV r1-0-1; metatarsi: II v0-1p-0; IV p0-1-1, r0-1-0.

OTHER MATERIAL EXAMINED: **Panama**: *Chiriquí:* Lagunas, 5 km. SW Hato del Volcán, elevation 1360 m., dung traps, May 22–26, 1977 (S. Peck, AMNH), 1♂.

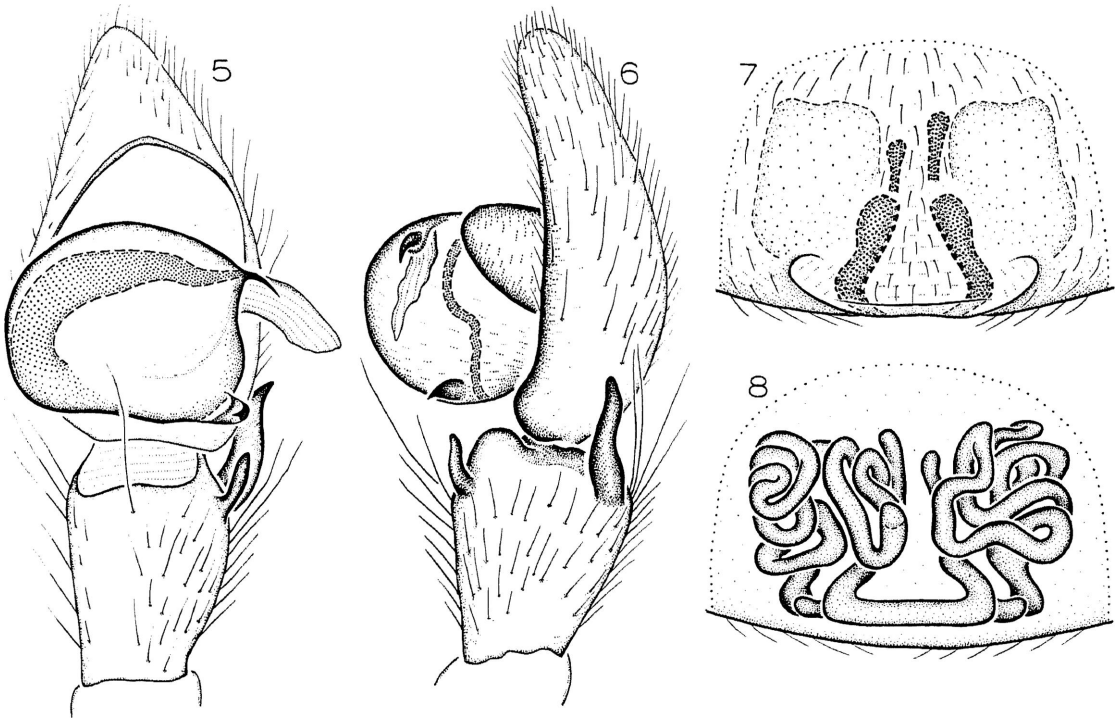
DISTRIBUTION: Northern Panama.

Lygromma simoni (Berland)
Figures 5, 6

Pseudolygromma simoni Berland, 1913, p. 85, figs. 12–15.
Lygromma simoni: Platnick and Shadab, 1976a, p. 14, figs. 39, 40.

DIAGNOSIS: Males of *L. simoni* will key out to *L. chamberlini* in our published key but may be distinguished by the presence of anterior median eyes.

MALE: Total length 4.03. Carapace 1.53 long, 1.26 wide. Femur II 1.19 long. ALE separated by their diameter; AME present, about one-fifth of ALE diameter. Embolus short, evenly curved, prolaterally situated, arising from long palpal duct (fig. 5). Ventrally situated tibial apophysis about half as long as dorsally situated one (fig. 6). Leg spination: femur IV p0-0-0; tibiae: II v0-1p-0; IV v1p-2-2, r2-1-1; metatarsi: III p1-0-2, r0-0-1; IV v2-2-0.



FIGS. 5–8. 5, 6. *Lygromma simoni* (Berland), partially expanded palp. 5. Ventral view. 6. Retrolateral view. 7, 8. *L. domingo*, new species, epigynum. 7. Ventral view. 8. Dorsal view.

FEMALE: Described by Platnick and Shadab (1976a).

RECORD: **Ecuador**: *Cotopaxi:* Cotopaxi National Park, elevation 3500 m., under rock in gully, Aug. 9, 1976 (N. P. Ashmole, AMNH), 1♂.

DISTRIBUTION: Northern Ecuador.

Lygromma domingo, new species
Figures 7, 8

TYPE: Female holotype from dung trap in forest at an elevation of 250 m. at Río Palenque Station, 47 km. south of Santo Domingo, Pichincha, Ecuador (May 11–25, 1975; S. Peck), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: Females of *L. domingo* will key out to *L. gertschi* in our published key but may be easily distinguished by the presence of eyes.

MALE: Unknown.

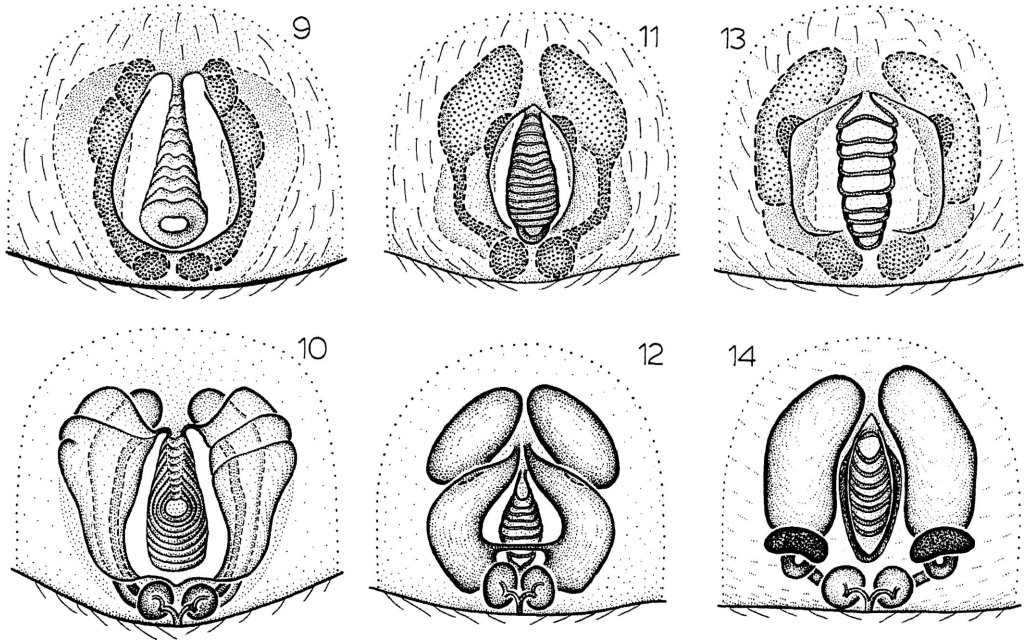
FEMALE: Total length 3.83. Carapace 1.66 long, 1.26 wide. Femur II 1.22 long. ALE separated by almost their radius, by one-third their diameter from PLE. Epigynum with procurved basal ridge (fig. 7). Epigynal ducts loosely coiled (fig. 8). Leg spination (leg I missing): femur IV d1-1-0, p0-0-0, r0-0-0; tibiae: II v0-1-1; IV p0-0-1, v3-2-2, r1-0-1; metatarsi: III p0-1-2; IV p1-1-2, v2-3-0.

MATERIAL EXAMINED: Only the holotype from northern Ecuador.

Zimiromus rothi, new species
Figures 9, 10

TYPE: Female holotype from 38 mi. southeast of San Cristóbal de las Casas, Chiapas, Mexico (January 21, 1980; B. and V. Roth), deposited in AMNH.

ETYMOLOGY: The specific name is a pat-



FIGS. 9–14. Epigyna of *Zimiromus* species, ventral (top row) and dorsal (bottom row) views. 9, 10. *Z. rothi,* new species. 11, 12. *Z. lawa,* new species. 13, 14. *Z. volksberg,* new species.

ronym in honor of Mr. Vincent D. Roth, who collected the species and first recognized it as new.

DIAGNOSIS: Females of *Z. rothi* will key out to *Z. medius* in our published key but may be distinguished from that species and all others of the *tropicalis* group by the expanded and anteriorly overlapped median epigynal ducts (fig. 10).

MALE: Unknown.

FEMALE: Total length 5.56. Carapace 2.09 long, 1.66 wide. Femur II 1.58 long. Eye sizes and interdistances: AME 0.10, ALE 0.12, PME 0.11, PLE 0.10; AME–AME 0.12, AME–ALE 0.05, PME–PME 0.12, PME–PLE 0.06, ALE–PLE 0.07. MOQ length 0.32, front width 0.32, back width 0.33. Epigynal atrium relatively long, narrow, with anteriorly narrowed scape (fig. 9). Median epigynal ducts wide, overlapped anteriorly (fig. 10). Leg spination: femur II d1-1-0; patella IV p0-0-0, r0-0-0; tibiae: I v0-1r-1p; II v1r-1r-1p; metatarsi: III v1p-1r-1p; IV v1p-2-1p.

MATERIAL EXAMINED: Only the holotype from Chiapas, Mexico.

Zimiromus lawa, new species
Figures 11, 12

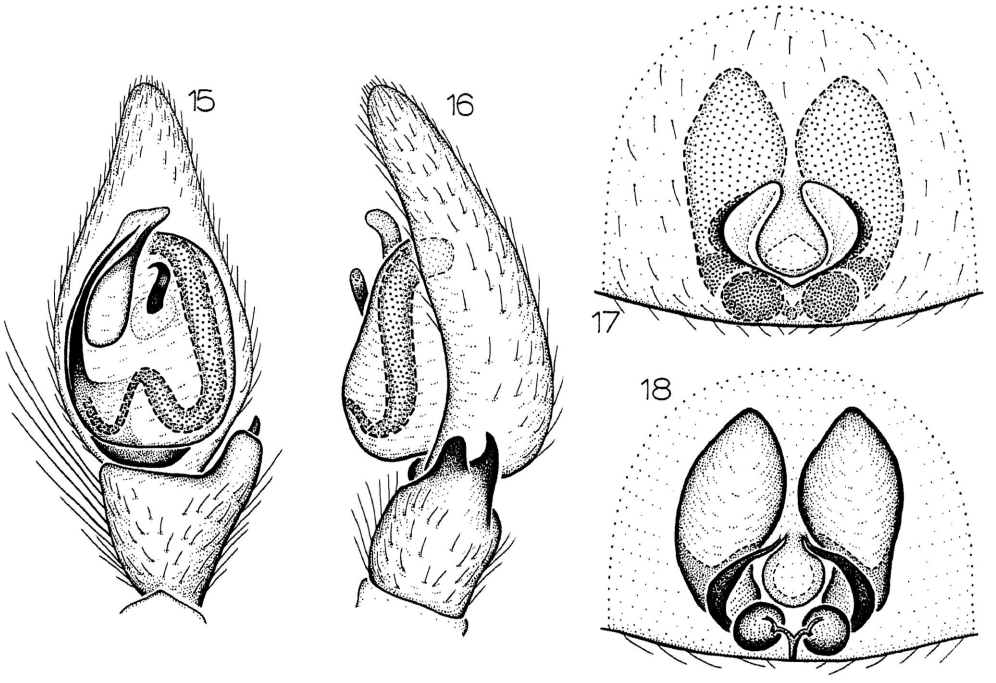
TYPE: Female holotype from Anapaike village, Lawa River, Marowijne, Surinam (November 8–29, 1963; B. Malkin), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: Females of *Z. lawa* (a member of the *tropicalis* group) will key out to *Z. rabago* in our published key but may be distinguished by the semicircular median epigynal ducts (fig. 12).

MALE: Unknown.

FEMALE: Total length 3.83. Carapace 1.67 long, 1.22 wide. Femur II 1.33 long. Eye sizes and interdistances: AME 0.10, ALE 0.09, PME 0.10, PLE 0.09; AME–AME 0.10, AME–ALE 0.05, PME–PME 0.10, PME–PLE 0.06, ALE–PLE 0.05. MOQ length 0.27, front width 0.29, back width 0.30. Epigynum with long, narrow atrium (fig. 11). Median epigynal ducts semicircular (fig. 12). Leg spination: femora: II d1-1-0; III p0-0-1; patella IV p0-0-0; tibiae: I v2-2-1p; II p1-0-1.



FIGS. 15–18. *Zimiromus sinop*, new species. 15. Palp, ventral view. 16. Palp, retrolateral view. 17. Epigynum, ventral view. 18. Epigynum, dorsal view.

MATERIAL EXAMINED: Only the holotype from Surinam.

Zimiromus volksberg, new species
Figures 13, 14

TYPE: Female holotype from the Volksberg Mountains, Surinam (August 1977; J. E. D. Milner), deposited in the British Museum (Natural History).

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: Females of *Z. volksberg* (a member of the *tropicalis* group) will key out to *Z. chickeringi* in our published key but may be distinguished by the longer spermathecae (fig. 14).

MALE: Unknown.

FEMALE: Total length 5.54. Carapace 1.89 long, 1.51 wide. Femur II 1.57 long. Eye sizes and interdistances: AME 0.12, ALE 0.11, PME 0.15, PLE 0.11; AME–AME 0.11, AME–ALE 0.06, PME–PME 0.08, PME–PLE 0.07, ALE–PLE 0.04. MOQ length 0.34, front width 0.35, back width 0.38. Epigynal atrium almost square (fig. 13). Spermathecae elongate, with coiled ducts at base (fig. 14). Leg spination: femur I d1-1-1; tibia IV d1-0-1.

MATERIAL EXAMINED: Only the holotype from Surinam.

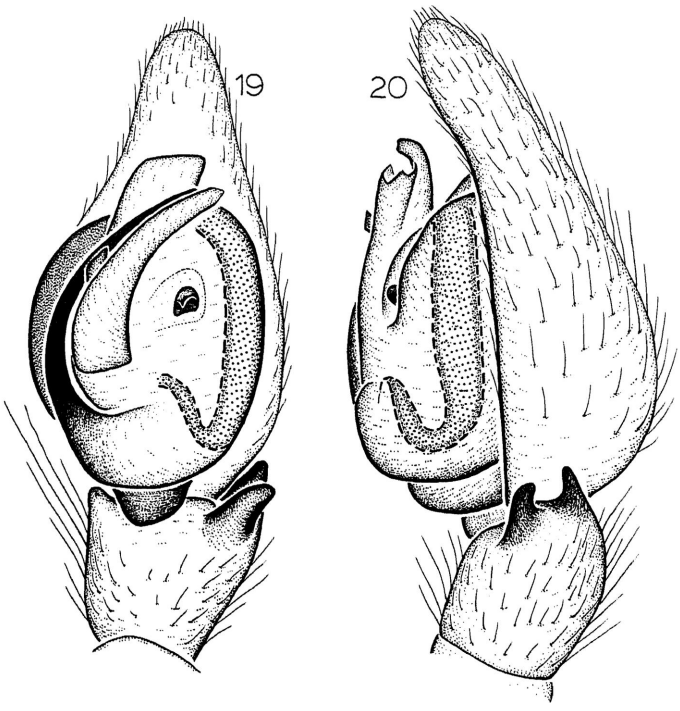
NOTE: It is possible that this species may prove to be the female of *Z. canje* Platnick and Shadab, described from Guyana.

Zimiromus sinop, new species
Figures 15–18

TYPES: Male holotype and female paratype from Sinop, Mato Grosso, Brazil (October 1976; M. Alvarenga), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: Males of *Z. sinop* (a member of the *lubricus* group) will key out to *Z. aduncus* in our published key but may be distinguished by the deeply incised retrolateral tibial apophysis (fig. 16); females will



FIGS. 19, 20. *Zimiromus exlineae* Platnick and Shadab, palp. 19. Ventral view. 20. Retrolateral view.

key out to *Z. lubricus* but may be distinguished by the larger epigynal scape (fig. 17).

MALE: Total length 3.73. Carapace 1.51 long, 1.20 wide. Femur II 1.35 long. Eye sizes and interdistances: AME 0.11, ALE 0.10, PME 0.11, PLE 0.10; AME–AME 0.08, AME–ALE 0.05, PME–PME 0.09, PME–PLE 0.05, ALE–PLE 0.04. MOQ length 0.28, front width 0.30, back width 0.31. Embolus short, conductor slightly expanded distally (fig. 15). Retrolateral tibial apophysis deeply incised (fig. 16). Leg spination: tibia III r0-0-1.

FEMALE: Total length 4.50. Carapace 1.51 long, 1.22 wide. Femur II 1.22 long. Eye sizes and interdistances: AME 0.09, ALE 0.09, PME 0.10, PLE 0.10; AME–AME 0.10, AME–ALE 0.04, PME–PME 0.08, PME–PLE 0.05, ALE–PLE 0.04. MOQ length 0.27, front width 0.28, back width 0.28. Epigynal scape relatively large, not striated; epigynal atrium relatively wide (fig. 17). Median epigynal ducts oblique (fig. 18). Leg spination: femur III p0-0-1; patellae III p0-0-0, r0-0-0; IV p0-0-0; tibiae: I v0-1p-1p; III v0-1r-1p; IV d0-0-0.

MATERIAL EXAMINED: Only the types from Brazil.

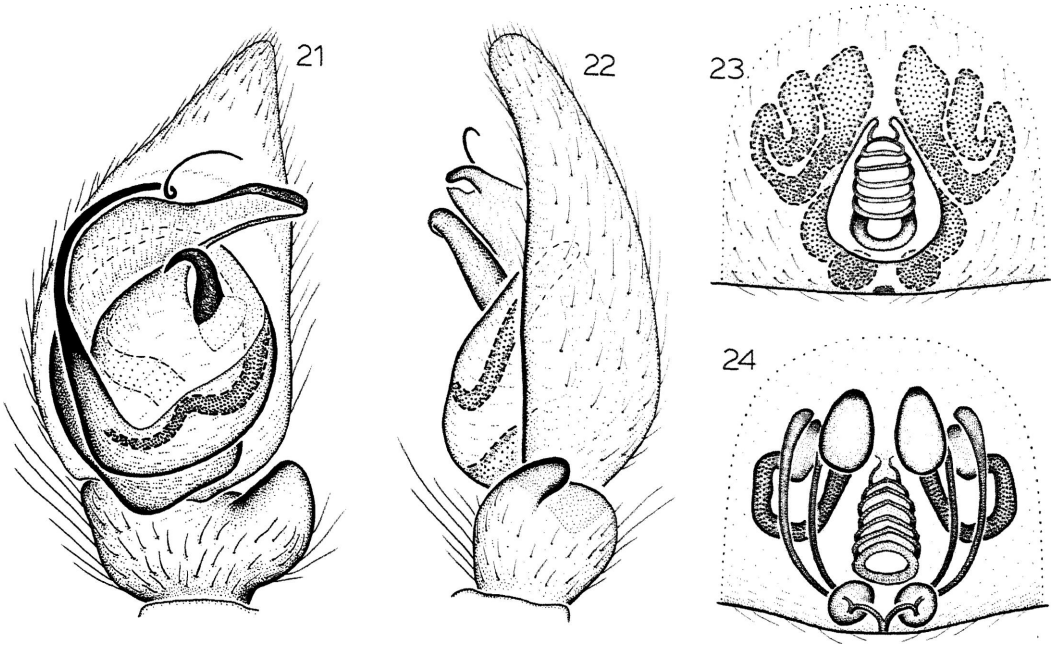
Zimiromus exlineae Platnick and Shadab

Figures 19, 20

Zimiromus exlineae Platnick and Shadab, 1976b, p. 19, figs. 53, 54.

DIAGNOSIS: Males of *Z. exlineae* will key out to *Z. muchmorei* in our published key but may be distinguished by the narrow ventral lobe of the retrolateral tibial apophysis (fig. 20).

MALE: Total length 3.67. Carapace 1.66 long, 1.28 wide. Femur II 1.50 long. Eye sizes and interdistances: AME 0.12, ALE 0.09, PME 0.11, PLE 0.10; AME–AME 0.12, AME–ALE 0.06, PME–PME 0.11, PME–PLE 0.08, ALE–PLE 0.05. MOQ length 0.29, front width 0.36, back width 0.33. Em-



FIGS. 21–24. *Zimiromus beni*, new species. 21. Palp, ventral view. 22. Palp, retrolateral view. 23. Epigynum, ventral view. 24. Epigynum, dorsal view.

bolus and conductor relatively wide (fig. 19). Ventral lobe of retrolateral tibial apophysis narrow, dorsal lobe pointed (fig. 20). Leg spination (leg III missing): tibia I v2-2-1p.

FEMALE: Described by Platnick and Shadab (1976b).

RECORDS: **Ecuador**: *Tungurahua:* Baños, elevation 1800–3000 m., Apr. 1939 (W. Clarke-Macintyre, AMNH), 1♂, elevation 2000 m., July 6, 1938 (W. Clarke-Macintyre, AMNH), 1♀.

DISTRIBUTION: Ecuador.

Zimiromus beni, new species
Figures 21–24

TYPES: Male holotype from mouth of Río Baures, Río Iténez, El Beni, Bolivia (September 29, 1964; Bouseman and Lussenhop), and female holotype from Pampa de Meio, Río Iténez, El Beni, Bolivia (September 10–14, 1964; Bouseman and Lussenhop), deposited in AMNH.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: Males of *Z. beni* (a member of the *tropicalis* group) will key out to *Z. lubricus* in our published key (as they are the only known males of the *tropicalis* group that lack a bifid retrolateral tibial apophysis with a long dorsal prong) but may be distinguished by their wider conductor (fig. 21). Females will key out to *Z. eberhardi* but may be distinguished by the smaller spermathecae (fig. 24).

MALE: Total length 3.35. Carapace 1.58 long, 1.22 wide. Femur II 1.48 long. Eye sizes and interdistances: AME 0.14, ALE 0.10, PME 0.10, PLE 0.11; AME–AME 0.13, AME–ALE 0.04, PME–PME 0.14, PME–PLE 0.07, ALE–PLE 0.06. MOQ length 0.29, front width 0.32, back width 0.34. Embolus coiled, conductor wide, with folded tip (fig. 21). Retrolateral tibial apophysis rounded, not bifid (fig. 22). Leg spination: femur III r0-1-1; tibia I p0-0-1.

FEMALE: Total length 5.76. Carapace 2.05 long, 1.60 wide. Femur II 1.66 long. Eye sizes and interdistances: AME 0.11, ALE 0.12, PME 0.13, PLE 0.12; AME–AME 0.14, AME–ALE 0.04, PME–PME 0.08, PME–PLE 0.06, ALE–PLE 0.05. MOQ length 0.31, front width 0.36, back width 0.34. Epigynal scape striated, widest posteriorly (fig. 23). Spermathecae small, connected to coiled ducts (fig. 24). Leg spination: femora III r0-1-1; IV p0-1-1; tibia IV d1-1-0; metatarsi: III v2-1r-1p; IV v1p-2-1p.

MATERIAL EXAMINED: Only the types from Bolivia.

NEW RECORDS

Lygromma dybasi Platnick and Shadab: **Panama**: *Chiriquí:* Hartmann Finca, 15 km. NW Hato del Volcán, elevation 1550 m., dung trap, May 31, 1977 (S. and J. Peck, AMNH), 1♂; 10 km. W Cerro Pando, carrion trap, May 24, 1977 (S. Peck, AMNH), 1♀.

Zimiromus kochalkai Platnick and Shadab: **Colombia**: *Magdalena:* San Sebastián de Rábago, Sierra Nevada de Santa Marta, elevation 2000 m., under stones and logs, Apr. 1–10, 1968 (B. Malkin, AMNH), 1♀.

Zimiromus muchmorei Platnick and Shadab: **British Virgin Islands**: *Tortola:* Long Bay Estate, July 24, 1965 (AMNH), 1♀.

Echemoides penicillatus (Mello-Leitão): **Bolivia**: *Santa Cruz:* San Antonio del Parapetí, July 15–25, 1964 (B. Malkin, AMNH), 1♀.

Echemoides penai Platnick and Shadab: **Peru**: *Arequipa:* S Cocachacra, elevation 500 m., Aug. 6, 1977 (L. E. Peña, AMNH), 1♀; S Tanaca, elevation 250 m., Aug. 8, 1977 (L. E. Peña, AMNH), 1♀.

Echemoides malleco Platnick and Shadab: **Chile**: *Santiago:* Lo Valdés, elevation 2000 m. (G. Mann, AMNH), 2♀.

Echemoides gayi (Simon): **Chile**: *Santiago:* Quilicura, May 1979 (L. E. Peña, AMNH), 4♂, Sept. 1979 (L. E. Peña, AMNH), 1♂.

LITERATURE CITED

Berland, Lucien
1913. Araignées. *In* Mission du Service géographique de l'Armee pour la Mesure d'un Arc Méridien Équatorial en Amérique du Sud. Paris, vol. 10, pp. 79–119, figs. 1–20.

Platnick, Norman I., and Mohammad U. Shadab
1976a. A revision of the spider genera *Lygromma* and *Neozimiris* (Araneae, Gnaphosidae). Amer. Mus. Novitates, no. 2598, pp. 1–23, figs. 1–62.
1976b. A revision of the Neotropical spider genus *Zimiromus*, with notes on *Echemus* (Araneae, Gnaphosidae). *Ibid.*, no. 2609, pp. 1–24, figs. 1–66.
1979. A revision of the Neotropical spider genus *Echemoides*, with notes on other echemines (Araneae, Gnaphosidae). *Ibid.*, no. 2669, pp. 1–22, figs. 1–59.

A Revision of the Genus *Habrocestum* (Araneae, Salticidae) in North America

DAVID B. RICHMAN[1]

ABSTRACT

The five North American species of *Habrocestum* are diagnosed and described. One new species, *H. xerophilum*, is described from Florida. *Habrocestum inscriptum* Schenkel is transferred to *Tylogonus* and placed as a junior synonym of *T. morosus* (Peckham and Peckham).

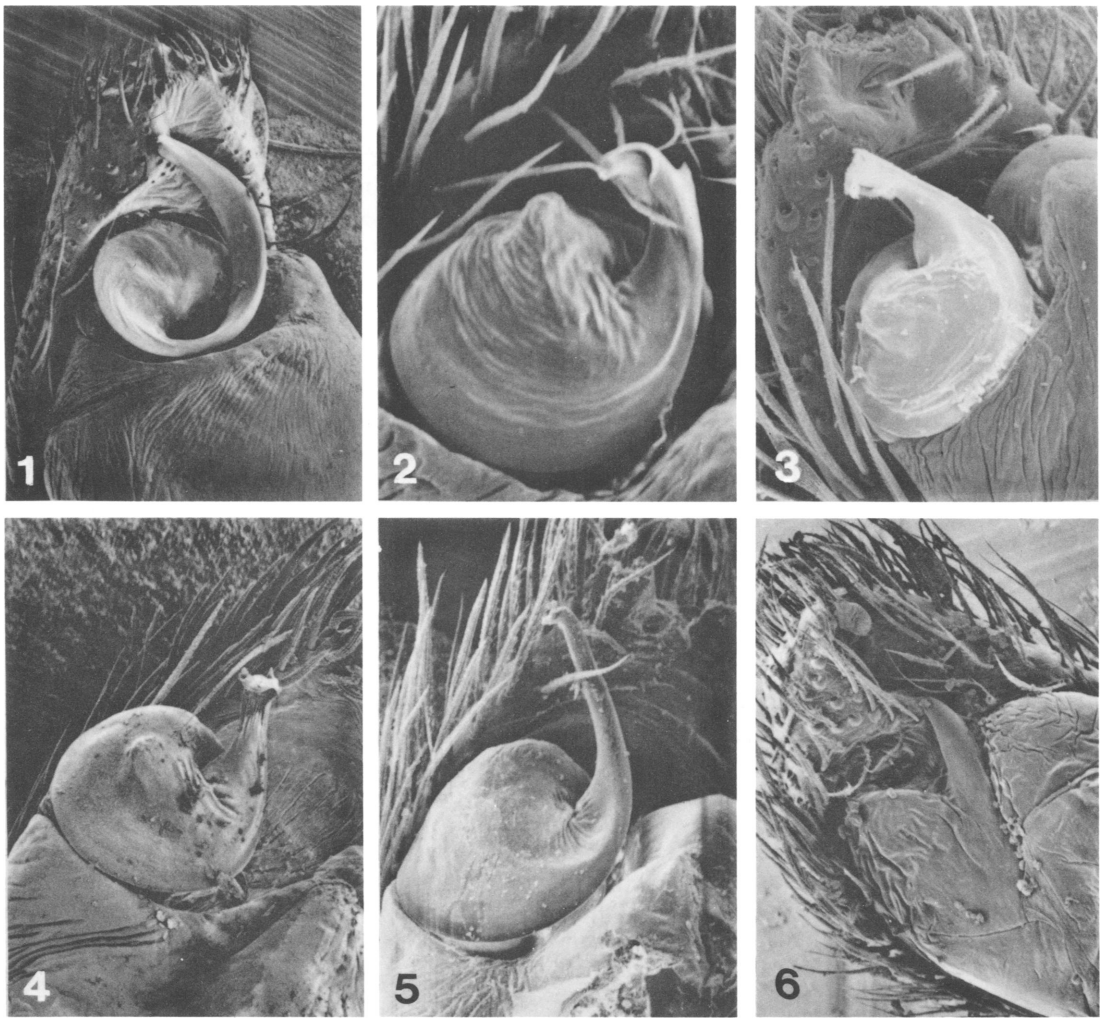
INTRODUCTION

The genus *Habrocestum* Simon (1876) has, like many salticid genera, been poorly defined. Simon and later Peckham and Peckham (1885) characterized the genus as being similar to *Aelurops* (*Aelurillus*) but differing in having tibia plus patella III longer than tibia plus patella IV. Unfortunately, several species which lack this characteristic have been placed in *Habrocestum*. This was noted by Peckham and Peckham in 1909, but the genus was still not well defined. After examination of the species involved, it seems more reasonable to utilize palpal and genitalic structures as defining characters for the genus, with other morphological characteristics used as additional evidence.

Based on both genitalic and other morphological characteristics, it was necessary to remove (to *Tylogonus*) from the genus two North American species that had previously been placed in *Habrocestum* (see Richman and Cutler, 1978). These are *H. belli* Gertsch (1935), which was placed as a junior synonym of *Sidusa arizonensis* Banks (1904) by those authors, and *H. morosum* (Peckham and Peckham, 1888), which is here placed as a senior synonym of *H. inscriptum* Schenkel (1951), based on an examination of the type specimen (new synonymy). These species are closely related (as noted by Gertsch, 1935) to *Tylogonus minutus* (F. O. P.-Cambridge, 1901). All of them differ from *Habrocestum sensu stricto* in having the male embolus (curved or spiral) attaching around a cavity on the distal bulb (fig. 1), in having tibia plus patella III shorter than tibia plus patella IV, in often having the male chelicerae strongly developed and excavate, and in usually having leg I (especially in males) the longest. The known *Habrocestum* from North America all lack the cavity on the distal bulb (figs. 2–6), and have tibia plus patella III equal to, or longer than, tibia plus patella IV. The chelicerae are weak and leg I is always shorter than leg III. After examination of the types of *H. belli, H. inscriptum, H. morosum, Sidusa arizonensis, Tylogonus auricapillus* Simon (1902; the type species of *Tylogonus*), and *Sidusa gratiosa* Peckham and Peckham (1895; the type species of *Sidusa*), the following arrangement of the western U.S. "*Habrocestum*" has been derived:

Tylogonus arizonensis (Banks, 1904), Arizona, New Mexico, northern Mexico.

[1] Research Associate, Department of Entomology and Plant Pathology, New Mexico State University, Las Cruces, New Mexico 88003.



FIGS. 1–6. Scanning electron micrographs of embolar region of male palpi, ventral views. 1. *Tylogonus arizonensis* (Banks), 110×. 2. *Habrocestum pulex* (Hentz), 225×. 3. *H. acerbum* Peckham and Peckham, 250×. 4. *H. xerophilum,* new species, 225×. 5. *H. bufoides* Chamberlin and Ivie, 250×. 6. *H. parvulum* (Banks), 225×.

Tylogonus minutus (F. O. P.-Cambridge, 1901), Arizona, Texas, Mexico.
Tylogonus morosus (Peckham and Peckham, 1888), California.

At least two other species of *Tylogonus* are known from Mexico. *Habrocestum* is thus restricted in North America to five species, *H. pulex* (Hentz), *H. acerbum* Peckham and Peckham, *H. xerophilum,* new species, *H. bufoides* Chamberlin and Ivie, and *H. parvulum* (Banks).

The present study is based largely on the collection of the American Museum of Natural History (AMNH) and the Florida State Collection of Arthropods (FSCA). I am indebted to Drs. Norman I. Platnick of the former and Howard Weems and G. B. Edwards of the latter. Additional material was lent by Dr. H. W. Levi of the Museum of Compar-

ative Zoology (MCZ), the curators of the collections at the Muséum National d'Histoire Naturelle (MNHN), and the Muséum d'Histoire Naturelle Bale (Basel), Mr. Brian Carroll of the University of California at Riverside, Mr. Charles Griswold of the University of California at Berkeley, and Mr. James Cokendolpher of Texas Tech University, Lubbock. Dr. Charles Dondale of the Biosystematics Research Institute, Ottawa, Canada, examined specimens in the Canadian National Collection and sent a list of the data. The scanning electron micrographs were made by Mr. Henry Adams and I am indebted for these to him and to Dr. Joseph LaPointe of the Biology Department of New Mexico State University. I would also like to thank Drs. G. B. Edwards, Jon Reiskind, Bruce Cutler, James Zimmerman, and Ellis Huddleston for suggestions and assistance. All measurements are in millimeters.

HABROCESTUM SIMON

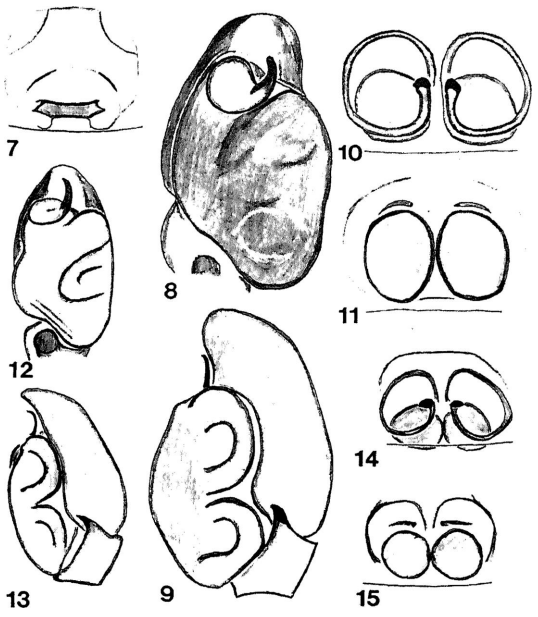
Habrocestum Simon, 1876, p. 131 (type species by original designation *Habrocestum pullatum* Simon). Roewer, 1954, p. 1117. Bonnet, 1957, p. 2063.

DIAGNOSIS: Specimens of *Habrocestum* may be recognized by their characteristic cryptic coloration, the longer third and fourth legs (tibia plus patella III ≥ tibia plus patella IV), and the characteristic emboli of the males (figs. 2–6). Most North American species are small (less than 5 mm. long as adults) and are found in leaf litter, on stones, and on tree trunks.

MISPLACED SPECIES: *Habrocestum belli* Gertsch, *H. inscriptum* Schenkel, and *H. morosum* (Peckham and Peckham) belong to *Tylogonus* (see Introduction and Richman and Cutler, 1978).

KEY TO SPECIES OF *HABROCESTUM* IN NORTH AMERICA

1. Males 2
   Females 6
2. Tibia plus patella III longer than tibia plus patella IV 3
   Tibia plus patella III equal to tibia plus patella IV 5



FIGS. 7–15. 7. *H. pullatum* Simon, epigynum, ventral view (scale *ca.* ½ other figures). 8–11. *H. pulex* (Hentz). 12–15. *H. acerbum* Peckham and Peckham. 8, 12. Palp, ventral views. 9, 13. Palp, retrolateral views. 10, 14. Epigynum, ventral views. 11, 15. Vulva, dorsal views.

3. Embolus of palpus thin and straight (figs. 5, 20); Georgia and Florida ..... *bufoides*
   Embolus of palpus thick and curved 4
4. Dorsum of abdomen with two round bright white spots and a white streak; cephalic area bright red; Florida ..... *xerophilum*
   Dorsum of abdomen with light shoulder patches and two lateral spots or a light bar-shaped marking, no central white stripe; cephalic area dark; Texas and northeastern Mexico ..... *acerbum*
5. Embolus spur-shaped, bulb angulate (figs. 6, 24, 25); eastern North America ..... *parvulum*
   Embolus curved, bulb rounded (figs. 2, 8); eastern North America ..... *pulex*
6. Epigynum with two small lateral openings, no circular rims (figs. 27, 28) ..... *parvulum*
   Epigynum with two circular or oval rims .. 7
7. Epigynal rims terminating midway up center of epigynal plate (figs. 10, 14) 8
   Epigynal rims terminating above spermathecae near anterior edge of epigynal plate (figs. 18, 22) 9

8. Total length less than 4 mm.; Texas, northeastern Mexico ..... *acerbum*
   Total length about 5 mm.; eastern United States as far west as northern Texas .. *pulex*
9. Epigynal rims expanded toward termination (fig. 18); xeric Florida habitats .. *xerophilum*
   Epigynal rims not especially expanded toward termination (fig. 22); mesic southeastern United States habitats ..... *bufoides*

Habrocestum pullatum Simon
Figure 8

Attus agilis (misidentification): Simon, 1868, p. 539.

Habrocestum pullatum Simon, 1876, p. 132, pl. 11, fig. 8 (female holotype from the eastern Pyrenees, France, in MNHN, examined); 1937, pp. 1225, 1267, figs. 1972, 1973. Roewer, 1954, p. 1118. Bonnet, 1957, p. 2067.

Unfortunately only the female of *Habrocestum pullatum,* the type species of the genus, is known and the features of the epigynum (fig. 8) are not too distinct. It appears to have two lateral openings, similar to those of *H. parvulum* (fig. 27), and a trace of the epigynal rims found in the other North American species. Kulczyński (1903) in his illustration of the epigynum of *H. latifasciatum* (Simon) from Crete shows apparent epigynal rims. The general appearance of *H. pullatum* (see Simon, 1937, fig. 1972) is similar to *H. pulex*. The leg formula is 3412 and tibia plus patella III is longer than tibia plus patella IV.

Habrocestum pulex (Hentz)
Figures 2, 8–11; Map 1

Attus pulex Hentz, 1846, p. 361, pl. 22, fig. 3 (male and female syntypes from Alabama, destroyed).

Euophrys offuscata C. L. Koch, 1846, p. 218, fig. 1263 (female holotype from Pennsylvania, not examined).

Amphiraphe obfuscata: C. L. Koch, 1851, p. 67 (*lapsus*).

Cyrba pulex: Keyserling, 1884, p. 509, pl. 13, fig. 15.

Saitis x-notata Keyserling, 1884, p. 510, pl. 13, fig. 16 (holotype female from Kentucky, in MCZ, examined).

Saitis pulex: Peckham and Peckham, 1888, p. 67, pl. 1, fig. 50, pl. 5, fig. 50.

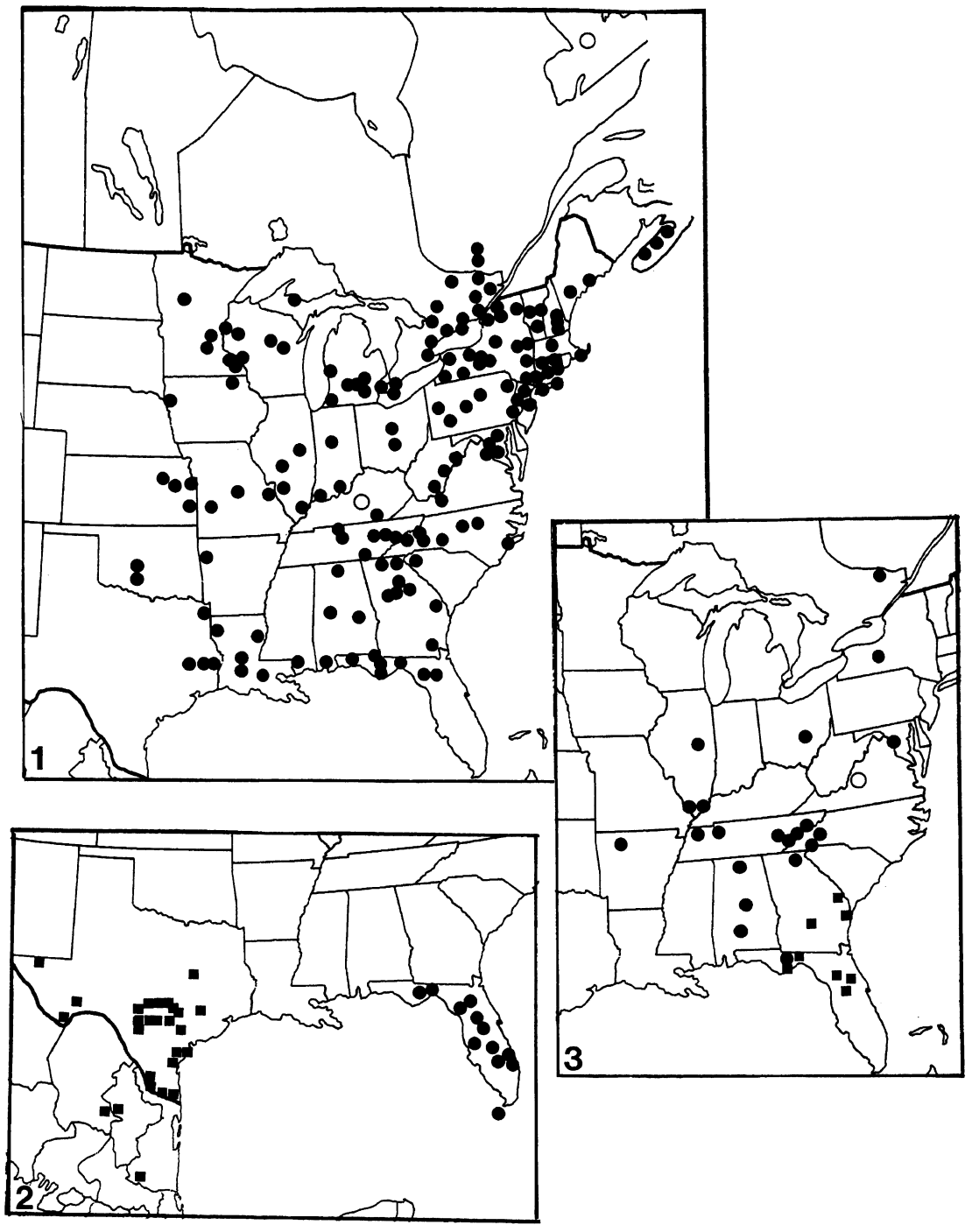
Habrocestum pulex: Simon, 1901, pp. 661, 665. Peckham and Peckham, 1909, p. 525, pl. 42, fig. 11, pl. 43, fig. 11. Roewer, 1954, p. 1120. Bonnet, 1957, p. 2066.

DIAGNOSIS: The larger size and palpal structure with a curved, truncated embolus (figs. 2, 8, 9) are diagnostic. The epigynal structure (figs. 10, 11) is similar to that of *H. acerbum,* from which this species differs by size and pattern.

MALE: Total length 4.03 ± 0.26. Carapace 2.01 ± 0.13 long, 1.45 ± 0.05 wide. Tibia plus patella III 1.41 ± 0.11, tibia plus patella IV 1.41 ± 0.11. Ocular area 0.91 ± 0.04 long, 1.28 ± 0.07 wide anteriorly, 1.18 ± 0.07 wide posteriorly (10 specimens from Pelee Is., Ontario). PME slightly closer to PLE than ALE. Leg formula 4312. Eye region dark, coloration cryptic with yellowish bar-shaped mark *ca.* 0.4 wide posterior to middorsum of abdomen. Sternum usually with longitudinal brown stripe, coxae with ventral brown stripes. Legs spotted and annulate.

FEMALE: Total length 5.36 ± 0.73. Carapace 2.19 ± 0.17 long, 1.53 ± 0.12 wide. Tibia plus patella III 1.48 ± 0.10, tibia plus patella IV 1.48 ± 0.10. Ocular area 0.93 ± 0.04 long, 1.32 ± 0.07 wide anteriorly, 1.26 ± 0.08 wide posteriorly (10 specimens from Pelee Is., Ontario). PME and leg formula as in male. Coloration similar to that of male, but less distinct.

SELECTED RECORDS (* specimens not seen by author): **Canada**: NEWFOUNDLAND?: Labrador (Dar's Inlet). NOVA SCOTIA: Digby*, Greywood*, Kentville*. ONTARIO: Algonquin Prov. Park, Belleville*, Bloomfield*, Burleigh Falls*, Burlington*, Chaffey's Locks*, Chatterton*, Dwight*, Dundas, Fitzroy Township*, Gananoque*, Gley Tay*, Hepworth*, Kemptville*, Kincardine*, Lake Temagami, Newburgh*, Odessa*, Orilla*, Ottawa*, Outlet Prov. Park*, Oxford Mills*, Pelee Island, Port Credit, Port Cunningham*, Poverty Bay, Rednersville*, Rondeau Prov. Park*, St. Lawrence Islands National Park*, Toronto, Trenton*, Winsor*. QUEBEC: Bitobi Lake*, Brekenridge*, Gatineau Park*, Kazabazua*. **United States** (county records only): ALA-



MAPS 1–3. 1. Eastern North America, showing distribution of *Habrocestum pulex* (Hentz); open circles represent state or regional records. 2. Southeastern North America, showing distribution of *Habrocestum acerbum* Peckham and Peckham (squares) and *H. xerophilum*, new species (circles). 3. Eastern North America, showing distribution of *Habrocestum bufoides* Chamberlin and Ivie (squares) and *H. parvulum* (Banks) (circles).

BAMA: Madison, Mobile*, Tallapoosa*, Tuscaloosa*. ARKANSAS: Washington*. CONNECTICUT: Fairfield, Litchfield, Middlesex, New Haven, Tolland. DISTRICT OF COLUMBIA: Washington. FLORIDA: Alachua, Calhoun, Dixie, Gulf, Jackson, Leon, Liberty, Santa Rosa. GEORGIA: Charlton, Clarke, Dekalb, Fulton, Hall, Rabin, Screven, Union. ILLINOIS: Champaign, Madison, Pope, Sangamon. INDIANA: Crawford*, Posey, Tippecanoe. IOWA: Winneshiek*, Woodbury. KANSAS: Bourbon, Douglas, Riley*, Wyandotte. KENTUCKY: Whitley*. LOUISIANA: Caddo*, Evangeline, Madison, Rapides, St. Martin. MAINE: Cumberland, Hancock*. MARYLAND: Cecil, Montgomery, Prince Georges. MASSACHUSETTS: Barnstable, Worchester. MICHIGAN: Berrien, Calhoun, Jackson, Lenawee, Livingston, Marquette*, Muskegan*. MINNESOTA: Anoka, Clearwater, Hennepin, Houston, Winona. MISSISSIPPI: Pearl River*. MISSOURI: Boone, St. Clair, St. Louis. NEW HAMPSHIRE: Belknap, Carroll, Hillsboro. NEW JERSEY: Bergen, Hunterdon, Middlesex, Morris. NEW YORK: Albany, Allegany, Cayuga, Chatauqua, Clinton, Columbia, Cortland, Jefferson, Kings, Monroe, Niagara, Oneida, Orange, Queens, Rensselaer, St. Lawrence, Schuyler, Suffolk, Tomkins, Westchester. NORTH CAROLINA: Buncombe, Carteret, Durham, Haywood, Mecklenburg, Orange, Yancey. OHIO: Hocking, Knox. OKLAHOMA: Caddo, Comanche. PENNSYLVANIA: Allegheny, Bucks, Centre*, Lawrence, Lycoming, Pike. SOUTH CAROLINA: Oconee. TENNESSEE: Anderson, Davidson, Hamilton, Knox, Robertson, Sevier. TEXAS: Bowie, Jasper, Newton, San Jacinto, Tyler. VERMONT: Caladonia, Chittenden, Windham. VIRGINIA: Giles, Fairfax*. WEST VIRGINIA: Mercer, Pendleton, Pocahontas. WISCONSIN: Barron, Burnett, La Crosse, Marathon, Waupaca.

DISTRIBUTION: Eastern North America from Labrador to Florida, west to Minnesota, Kansas, and Texas (map 1).

NATURAL HISTORY: Males have been collected in February and from April through October, females from March through October. Specimens have been collected on stone walls, in grass and litter, on the ground, and on dead and living tree trunks. The courtship is discussed by Richman (in press).

Habrocestum acerbum
Peckham and Peckham
Figures 3, 12–15; Map 2

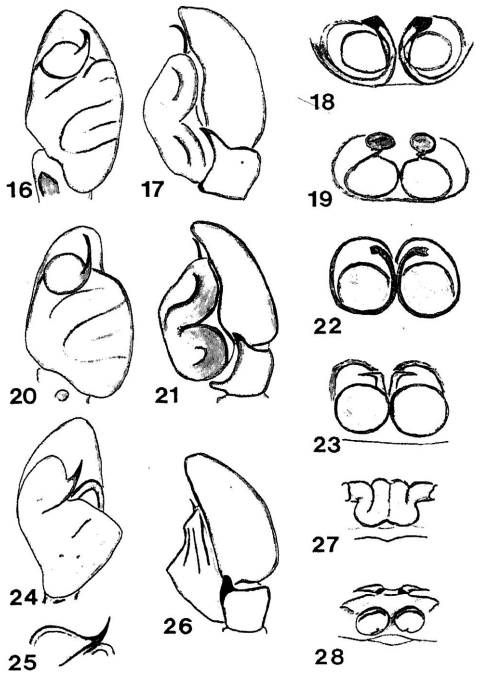
Habrocestum acerbum Peckham and Peckham, 1909, p. 522, pl. 44, figs. 1–1c (male and female syntypes from Austin, Travis County, Texas, in MCA, examined). Roewer, 1954, p. 1120. Bonnet, 1957, p. 2064.

DIAGNOSIS: The embolus of the male (figs. 3, 12) separates this species from all but *H. xerophilum,* from which it differs in lacking white round spots and a white central stripe on the dorsal abdomen. SEM photographs show little difference in the emboli (figs. 3, 4). The female epigynum (figs. 14, 15) separates this species from all but *H. pulex,* from which it differs by its small size and the light patches on the shoulders of the abdomen.

MALE: Total length 2.76 ± 0.12. Carapace 1.45 ± 0.07 long, 1.02 ± 0.06 wide. Tibia plus patella III 0.95 ± 0.04, tibia plus patella IV 0.87 ± 0.03. Ocular area 0.63 ± 0.05 long, 1.01 ± 0.05 wide anteriorly, 0.98 ± 0.05 wide posteriorly (10 specimens from southern Texas). PME slightly closer to PLE than ALE. Leg formula 3412. Eye region dark, abdomen with light cream patches on anterior shoulders, large chevron or bar with dark notch posterior to abdominal midsection; legs banded and spotted.

FEMALE: Total length 3.37 ± 0.25. Carapace 1.61 ± 0.09 long, 1.16 ± 0.06 wide. Tibia plus patella III 1.06 ± 0.08, tibia plus patella IV 1.03 ± 0.11. Ocular area 0.69 ± 0.07 long, 1.08 ± 0.05 wide anteriorly, 1.05 ± 0.05 wide posteriorly (10 specimens from 8 mi. north of Sinton, San Patricio Co., Texas). PME and leg formula as in male. Coloration similar to male, but often less distinct.

RECORDS: **United States** (county records only): TEXAS: Aransas, Bastrop, Brazos, Brewster, Cameron, Comal, Culberson, Dewitt, Hays, Hidalgo, Kendall, Kerr, Kimble,



FIGS. 16–28. 16–19. *H. xerophilum*, new species. 20–23. *H. bufoides* Chamberlin and Ivie. 24–28. *H. parvulum* (Banks). 16, 20. Palp, ventral views. 17, 21, 26. Palp, retrolateral views. 18, 22, 27. Epigynum, ventral views. 19, 23, 28. Vulva, dorsal views. 24. Palp of male from Florida, ventral view. 25. Embolus of male from Tennessee.

Llano, Mason, McLennan, Nueces, Real, San Patricio, Starr, Terrell, Travis, Uvalde, Zapata. **Mexico**: COAHUILA: Gloria. NUEVO LEON: 25 mi. W Monterrey. TAMAULIPAS: San Pedro, Arroyo la Chorena.

DISTRIBUTION: Texas and northeastern Mexico (map 2).

NATURAL HISTORY: Males have been collected in every month but February, females in every month but February and December. The species is apparently associated with oak and juniper woodlands.

Habrocestum xerophilum, new species
Figures 4, 16–19; Map 2

TYPES: Male holotype and female paratypes from open scrub at Central Tower, Ocala National Forest, Marion County, Florida (April 1, 1976; G. B. Edwards), deposited in FSCA; male and female paratypes from Ocala National Forest deposited in AMNH and MCZ.

ETYMOLOGY: The name is derived from the Greek *xeros* (meaning dry) and *philos* (meaning loving), which reflects the habitat preference of this species.

DIAGNOSIS: *Habrocestum xerophilum* resembles *H. acerbum* in palpal structure (figs. 4, 16), but differs in color pattern. The female epigynum (figs. 18, 19), with expanded terminations of the rims, is diagnostic.

MALE: Total length 2.49 ± 0.21. Carapace 1.37 ± 0.05 long, 0.96 ± 0.02 wide. Tibia plus patella III 0.94 ± 0.03, tibia plus patella IV 0.80 ± 0.04. Ocular region 0.64 ± 0.02 long, 0.96 ± 0.02 wide anteriorly, 0.88 ± 0.03 wide posteriorly (10 specimens from Ocala National Forest, Marion Co., Florida). PME slightly closer to PLE than to ALE. Leg formula 3421. Eye region bright red when alive, fading to brownish in alcohol. Dorsal carapace with two lateral white stripes above PLE and central white triangle on last third. Abdomen with white anterior central stripe 0.50 long, ending before middorsum, two lateral bright white spots *ca.* 0.16 in diameter posterior to middorsum. Palpi black with white hairs on dorsum of cymbium and tibia.

FEMALE: Total length 3.32 ± 0.37. Carapace 1.44 ± 0.08 long, 1.10 ± 0.05 wide. Tibia plus patella III 1.12 ± 0.09, tibia plus patella IV 1.03 ± 0.07. Ocular region 0.67 ± 0.04 long, 1.04 ± 0.05 wide anteriorly, 0.97 ± 0.04 wide posteriorly (10 specimens from Marion and Putnam cos., Florida). PME and leg formula as in male. Coloration cryptic, brownish, lacking red on carapace, with yellowish stripe down middle of dorsal carapace. Abdomen with herringbone pattern, or with pattern similar to male, but spots less bright.

RECORDS: **United States** (county records only): FLORIDA: Alachua, Broward, Highlands, Lake, Leon, Levy, Liberty, Marion, Martin, Monroe, Pasco, Polk, Putnam, St. Lucie, Wakulla.

DISTRIBUTION: Florida (map 2).

NATURAL HISTORY: Males have been collected from January through October, females from March through December. This species is found in xeric habitats throughout Florida, Primarily in turkey oak–longleaf pine, sand pine scrub, and mixed scrub. It has usually been collected in leaf litter. The courtship display (under the name *Habrocestum,* new species) is described by Richman (in press).

Habrocestum bufoides Chamberlin and Ivie
Figures 5, 20–23; Map 3

Habrocestum bufoides Chamberlin and Ivie, 1944, p. 196, figs. 214, 215 (male holotype, from 1 m. north of Sylvania, Screven County, Georgia, in AMNH, examined).

DIAGNOSIS: The long thin embolus of the male (figs. 5, 20) and the female epigynal structure (figs. 22, 23) are diagnostic.

MALE: Total length 2.22 ± 0.21. Carapace 1.29 ± 0.07 long, 0.98 ± 0.07 wide. Tibia plus patella III 0.85 ± 0.06, tibia plus patella IV 0.75 ± 0.05. Ocular area 0.57 ± 0.07 long, 0.98 ± 0.07 wide anteriorly, 0.92 ± 0.07 wide posteriorly (10 specimens from northcentral Florida). PME slightly closer to PLE than to ALE. Leg formula 3412. Ocular area black, surrounded with whitish hairs and scales. Abdomen with two white spots posterior to middorsum. Legs spotted, annulate.

FEMALE: Total length 3.06 ± 0.23. Carapace 1.38 ± 0.10 long, 1.04 ± 0.06 wide. Tibia plus patella III 1.02 ± 0.08, tibia plus patella IV 0.92 ± 0.08. Ocular area 0.58 ± 0.07 long, 1.04 ± 0.06 wide anteriorly, 0.96 ± 0.05 wide posteriorly (10 specimens from northcentral Florida). PME and leg formula as in male. Coloration cryptic, duller than male, brownish, mottled. Two patches on abdomen posterior to middorsum, followed by several small chevrons toward spinnerets.

RECORDS: **United States** (county records only): FLORIDA: Alachua, Leon, Liberty, Marion, Putnam. GEORGIA: Chatham, Crisp, Screven.

DISTRIBUTION: Georgia and Florida (map 3).

NATURAL HISTORY: Males were collected in January, March through May, August, and November, females from March through June, August, and November. These have been usually found in mesic leaf litter in Florida. The courtship behavior is described by Richman (in press).

Habrocestum parvulum (Banks)
Figures 6, 24–28; Map 3

Saitis parvulus Banks, 1895, p. 101 (holotype male from a cold swamp at Ithaca, Tompkins County, New York, in MCZ, examined).
Habrocestum parvulum: Peckham and Peckham, 1909, p. 524. Jones, 1946, p. 27, figs. 1–4. Roewer, 1954, p. 1120. Bonnet, 1957, p. 2066.

DIAGNOSIS: The spur-shaped embolus of the male (figs. 6, 24, 25) and the two lateral openings of the female epigynum (fig. 27) are diagnostic.

MALE: Total length 2.50 ± 0.24. Carapace 1.41 ± 0.14 long, 1.08 ± 0.11 wide. Tibia plus patella III 0.88 ± 0.10, tibia plus patella IV 0.88 ± 0.09. Ocular area 0.66 ± 0.04 long, 1.08 ± 0.11 wide anteriorly, 1.00 ± 0.10 wide posteriorly (nine specimens from Torreya Ravine, Liberty Co., Florida). PME slightly closer to PLE than ALE. Leg formula 4312. Ocular area black, white patch behind each PLE, abdomen with white band or spot on dorsal anterior edge and two white spots lateral and posterior to middorsum; sometimes with whitish patches anterior and posterior to these spots. Legs yellowish, except for I and occasionally II, which are slightly darker.

FEMALE: Total length 2.83 ± 0.28. Carapace 1.50 ± 0.10 long, 1.16 ± 0.08 wide. Tibia plus patella III 0.96 ± 0.04, tibia plus patella IV 0.97 ± 0.04. Ocular area 0.69 ± 0.04 long, 1.16 ± 0.08 wide anteriorly, 1.09 ± 0.08 wide posteriorly (10 specimens from Torreya Ravine). PME and leg formula as in male. Coloration similar to male, but lacking white spots.

RECORDS (* specimens not seen by author): **Canada**: ONTARIO: Ottawa*. **United States** (county records only): ALABAMA: Conecuh, Coosa, Madison. ARKANSAS: Newton. DISTRICT OF COLUMBIA: Washington. FLORIDA: Liberty. GEOR-

GIA: Union. ILLINOIS: Champaign, Pope. NEW YORK: Cayuga, Tomkins. NORTH CAROLINA: Buncombe, Macon. OHIO: Hocking. TENNESSEE: Benton, Blount, Cocke, Obion, Roane, Sevier. VIRGINIA: NW part of state.

DISTRIBUTION: Eastern North America, from Ontario to northern Florida, west to Arkansas (map 3).

VARIATION: Males differ somewhat in the shape of the emboli (figs. 23, 24), with Florida specimens having a wider attachment to the bulb. Males also differ, as noted in the description, in the number and shape of spots on the abdomen. Females differ somewhat in the visibility of the spermathecae through the epigynal plate (see Jones 1946, p. 28, fig. 2), most being less distinct than the specimen figured here.

NATURAL HISTORY: Males and females have been collected from April through October and in mesophytic leaf litter at Torreya Ravine, Liberty County, Florida. This species seems to be associated with swamps and swampy areas.

LITERATURE CITED

Banks, Nathan
1895. Some new Attidae. Canadian Ent., vol. 27, pp. 96–102.
1904. New genera and species of Nearctic spiders. Jour. New York Ent. Soc., vol. 12, pp. 109–119.

Bonnet, Pierre
1957. Bibliographia Araneorum. Toulouse, vol. 2, pt. 3, pp. 1927–3026.

Cambridge, Frederick Octavius Pickard-
1901. Arachnida—Araneida. *In* Godman, F. D., and O. Salvin, Biologia Centrali-Americana. London, vol. 2, pp. 193–312.

Chamberlin, Ralph V., and Wilton Ivie
1944. Spiders of the Georgia Region of North America. Bull. Univ. Utah, vol. 35, no. 9, pp. 1–267.

Gertsch, Willis J.
1935. Spiders from the southwestern United States with descriptions on new species. Amer. Mus. Novitates, no. 792, pp. 1–31.

Hentz, Nicholas M.
1846. Descriptions and figures of the Araneides of the United States. Jour. Boston Soc. Nat. Hist., vol. 5, pp. 352–370.

Jones, Sarah E.
1946. Description of *Habrocestum parvulum* (Banks). Psyche, vol. 53, pp. 27–29.

Keyserling, Graf Eugen Von
1884. Neue Spinnen aus Amerika. Teil 6. Verhn. Zool. Bot. Ges. Wien, vol. 34, pp. 489–534.

Koch, Carl L.
1846. Die Arachniden. Nürnberg, vol. 13, pp. 1–234.
1851. Uebersicht des Arachniden systems. Nürnberg, vol. 5, pp. 1–104.

Kulczyński, Wladyslaw
1903. Aranearum et opilionum species in insula Creta a comite dre carola attems collectae. Bull. Acad. Cracovie, pp. 32–58.

Peckham, George W., and Elizabeth G. Peckham
1885. On the genera of the family Attidae. Proc. Nat. Hist. Soc. Wisconsin, vol. 1, pp. 257–342.
1888. Attidae of North America. Trans. Wisconsin Acad. Sci., vol. 7, pp. 1–104.
1895. Spiders of the *Homalattus* group of the family Attidae. Occas. Papers Nat. Hist. Soc. Wisconsin, vol. 2, pp. 159–178.
1909. Revision of the Attidae of North America. Trans. Wisconsin Acad. Sci., vol. 16, pp. 335–646.

Richman, David B.
[In press] Epigamic display in jumping spiders (Araneae: Salticidae) and its use in systematics. Jour. Arachnol.

Richman, David B., and Bruce Cutler
1978. A list of the jumping spiders (Araneae: Salticidae) of the United States and Canada. Peckhamia, vol. 1, pp. 82–110.

Roewer, Carl F.
1954. Katalog der Araneae. Bremen, vol. 2, pt. 2, pp. 927–1751.

Schenkel, Ehrenfried
1951. Spinnentiere aus dem westlichen Nordamerika. Verhandl. Naturf. Gesell., vol. 62, pp. 24–62.

Simon, Eugène
1868. Monographie des espèces européennes

de la famille des Attides (Attidae Sundevall—Saltigradae Latreille). Ann. Soc. Ent. France, ser. 4, vol. 37, pp. 529–726.

1876. Les Arachnides de France. Paris, vol. 3, pp. 1–360.

1901. Histoire naturelle des Araignées, 2nd ed. Paris, vol. 2, pt. 3, pp. 381–668.

1902. Description d'Arachnides nouveaux de la famille des Salticidae (Attidae). Ann. Soc. Ent. Belgique, vol. 46, pp. 24–54.

1937. Les Arachnides de France. Paris, vol. 6, pt. 5, pp. 979–1298.

A Revision of the Spider Genus *Paradamoetas* (Araneae, Salticidae)

BRUCE CUTLER[1]

ABSTRACT

The three known species of *Paradamoetas* are redescribed. The synonymy of *P. cara* (Peckham and Peckham) with *P. formicina* Peckham and Peckham is disclaimed. Natural history data suggest that *P. cara* is associated with *Acacia* and is a predator of *Pseudomyrmex* ants. *Paradamoetas fontana* is a wetland species. The enlarged male chelicerae of *P. cara* do not vary allometrically when compared to carapace length. Scale structure proved useful in associating related genera.

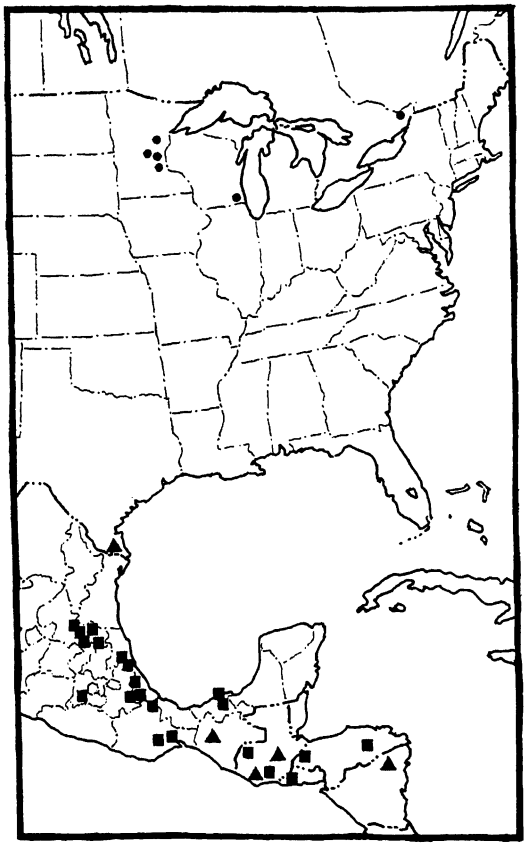
INTRODUCTION

The taxonomy of the Salticidae has long been recognized to be in an unsatisfactory state. In the Americas, the genera structurally similar to *Dendryphantes* are the ones most in need of revision, because of the difficulty of distinguishing among them and because of their overwhelming importance in the salticid fauna of the area, especially in North America. Fully 55 percent of the 293 species listed by Richman and Cutler (1977) belong to this group of genera (including *Eris, Icius, Metaphidippus, Paradamoetas, Phidippus, Poultonella, Sassacus,* and *Tutelina*). One of the smaller genera, exhibiting a derived general appearance, is *Paradamoetas*. In addition to various structural similarities, the three members of the genus have an antlike habitus. Superficially, members of the genera *Sassacus* and *Tutelina* bear the most resemblance to *Paradamoetas*.

In many of the genera in this group there is an excavation on the retrolateral side of the cymbium of the male palpus, in which the tibial apophysis lies. In *Paradamoetas,* the excavation is enlarged, and its ventral edge is extensively rebordered (figs. 6, 8–10), so that it overhangs the distal edge of the tibia in that area. In addition (unlike *Sassacus*), the palpal bulb does not overhang the tibia. The structure of the female copulatory tubes (figs. 12, 14, 16) differs from *Sassacus* and *Tutelina,* being initially lateral with openings facing medially, and opening into a large medial depression. The retromarginal cheliceral tooth in the male of *P. fontana* (Levi) is basal (fig. 24), as in all female *Paradamoetas,* as well as in both sexes of *Sassacus* and *Tutelina*. In male *P. cara* (Peckham and Peckham) (figs. 18–20) and *P. formicina* Peckham and Peckham (fig. 22) the tooth is distal. The female of *P. fontana* (when not gravid or engorged) has an unconstricted opisthosoma (fig. 26), which is constricted in nongravid or nonengorged females of the other two species (fig. 25). The one obvious derived character in *P. fontana,* relative to the other species, is the deeply excavated fang grooves in the male, which also sets the species apart from the male of *Sassacus papenhoei* Peckham and Peckham. *Paradamoetas cara* and *P. formicina* are so similar that no somatic characters could be found to separate them. However, the genitalic characters are distinct, and the two species have not been found at the same localities (map 1).

In this genus, the modified setae, referred

[1] 1747 Eustis Street, St. Paul, Minnesota 55113.



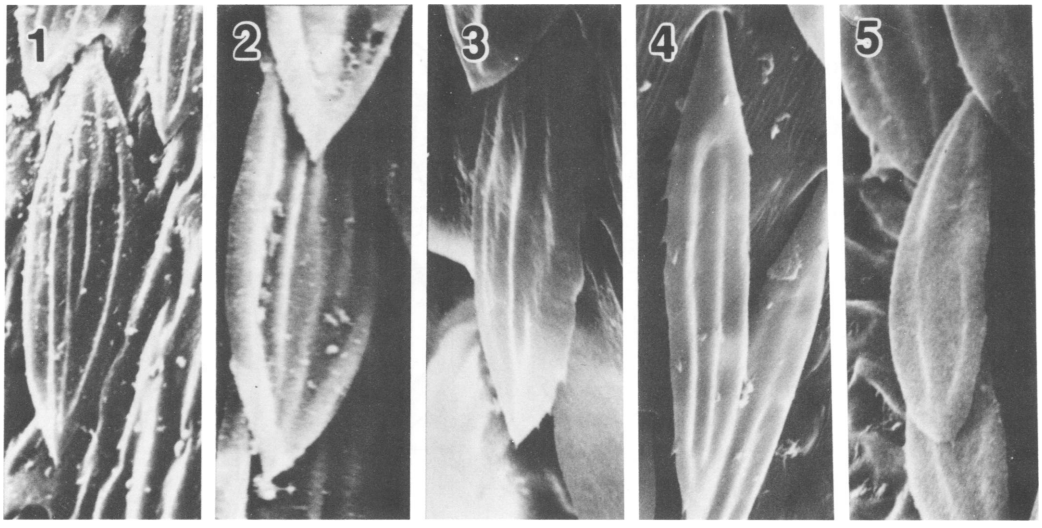
MAP 1. Eastern North America, showing distribution of *Paradamoetas cara* (squares), *P. fontana* (circles), and *P. formicina* (triangles). Several localities could not be found and were not plotted.

to as scales, are white and restricted, for the most part, to the lateral margins of the carapace. Their microstructure indicates a clear affinity with other "dendryphantine" genera. Scales of *P. formicina* (fig. 1) and *P. cara* (fig. 2) resemble those of *S. papenhoei* (fig. 5). The general structure is the same, but the two species of *Paradamoetas* have two lateral keels in addition to the central keel. The scales of *P. fontana* (fig. 3) differ, and resemble the scales of *Tutelina formicaria* (Emerton) (fig. 4) in being slightly serrate at the edge. Unpublished micrographs of scales of *Metaphidippus arizonensis* (Peckham and Peckham) show scales similar in structure to those of *P. fontana,* including the presence of extra keels. There is variability in scale structure, often on a single specimen. The scales of *P. fontana* may have one, two, or three median keels, although one is the most prevalent number. Despite this variability, there is a general similarity in all "dendryphantine" scales (see also Hill, 1979). They are excavated on the upper surface, with a minimum of one keel. This is in contrast to the scales of other antlike salticids I have examined (such as *Myrmarachne, Peckhamia, Synageles,* and *Synemosyna*) which have a much greater length/width ratio, and are not excavated on the upper surface. In the species I have examined, the body scales have the same microstructure in both males and females, but this may not hold for scales of appendages in more sexually dimorphic species. Hill (1979) noted that iridescent scales are relatively uniform, and exhibit few surface features, and the same was noted in this study for the scales which give these spiders their metallic sheen.

In summary, *Paradamoetas* is a genus probably derived from forms similar to *Sassacus* or *Tutelina*. Among its species, *P. fontana* is the most plesiomorphic, and *P. cara* and *P. formicina* are more apomorphic.

It is a privilege to be able to contribute a paper to this festschrift for Willis Gertsch. We first met more than 25 years ago, and during the years I lived in New York City, we were sporadically in contact. While I learned much about spiders and taxonomy from this relationship, looking back, the interruptions must have been a great nuisance to Willis, yet he was always patient, and gave freely of his time. In later years he acted as an intermediary on my behalf, and suggested my thesis topic. Coincidentally, we both received doctorates from the University of Minnesota. It is in memory of the kindness shown to a young arachnologist that this paper is dedicated.

I thank the following for freely providing access to specimens in their care: Dr. Norman I. Platnick of the American Museum of Natural History (AMNH), who also invited



FIGS. 1–5. Marginal carapace scales, scanning electron micrographs. 1. *Paradamoetas formicina* Peckham and Peckham, male, 1000×. 2. *P. cara* (Peckham and Peckham), male, 1400×. 3. *P. fontana* (Levi), male, 1300×. 4. *Tutelina formicaria* (Emerton), immature, 1000×. 5. *Sassacus papenhoei* Peckham and Peckham, male, 1000×.

me to contribute to this Bulletin; Dr. Herbert W. Levi of the Museum of Comparative Zoology (MCZ); and Mr. Wayne Maddison of Burlington, Ontario (WM), who first noted that *Icius fontanus* was more correctly placed in *Paradamoetas*. I also thank Drs. Edwin F. Cook of the University of Minnesota for nomenclatorial help, Daniel H. Janzen of the University of Pennsylvania for biological notes on *P. cara,* and especially Dennis McGinley of the St. Paul Ramsey Medical Center, who gave freely of his expertise and time with scanning electron microscopy. Some of the specimens mentioned below are in my personal collection (BC). All measurements are in millimeters.

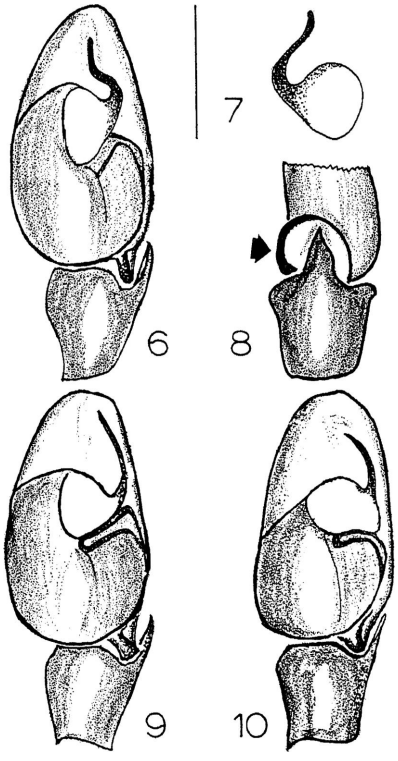
PARADAMOETAS PECKHAM AND PECKHAM

Paradamoetas Peckham and Peckham, 1885, p. 78 (type species by monotypy *P. formicina* Peckham and Peckham). Roewer, 1954, p. 1223. Bonnet, 1958, p. 3324.

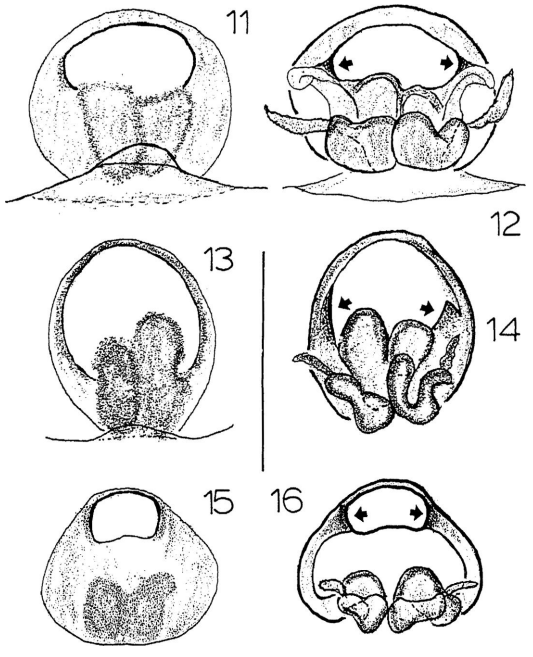
DIAGNOSIS: Specimens of *Paradamoetas* may be recognized by the general antlike appearance and iridescent body coloration with white margins along the lower sides of the carapace. Males have enlarged chelicerae with one retrolateral and two promarginal teeth. The male palpus has the embolus arising distally on the retrolateral side of the bulb, which does not overhang the tibia, and the ventral edge of the cymbial depression on the lower retrolateral side is elaborated. Females have a median depressed area in the epigynum, the entrances to the copulatory tubes facing medially, and the copulatory tubes lateral in position.

Considerable confusion surrounds the type species and *P. cara*. After the original description of *P. formicina,* all subsequent descriptions and illustrations of male *P. formicina* are actually of male *P. cara*. The epigyna illustrated in the literature are of *P. formicina*. *Paradamoetas cara* was originally described in the genus *Keyserlingella*. When Galiano (1971) synonymized *Keyserlingella* with *Fluda,* she transferred *K. cara* to *Paradamoetas,* but considered it a synonym of *P. formicina*.

Bonnet (1958) indicated that the generic name is masculine. However, it is feminine, and the original orthography of the Peckhams is retained.



FIGS. 6–10. 6–8. *Paradamoetas formicina* Peckham and Peckham, male. 6. Ventral view of palpus, specimen from Tumahu, Guatemala. 7. Ventral view of embolus, specimen from south Texas. 8. Retrolateral view of tibial apophysis, specimen from Tumahu; arrow points to reborder ed ventral margin of cymbium opposite tibial apophysis. 9. *P. cara* (Peckham and Peckham), ventral view of palpus, specimen from Temascal, Mexico. 10. *P. fontana* (Levi), ventral view of palpus, specimen from Solana State Forest, Minnesota. Scale line = 0.17 mm.



FIGS. 11–16. 11, 12. *Paradamoetas formicina* Peckham and Peckham, specimen from Tumahu, Guatemala. 13, 14. *P. cara* (Peckham and Peckham), specimen from Temascal, Mexico. 15, 16. *P. fontana* (Levi), specimen from Solana State Forest, Minnesota. 11, 13, 15. External views of epigynum. 12, 14, 16. Internal views of epigynum; arrows point to external openings of copulatory tubes. Scale line = 0.17 mm.

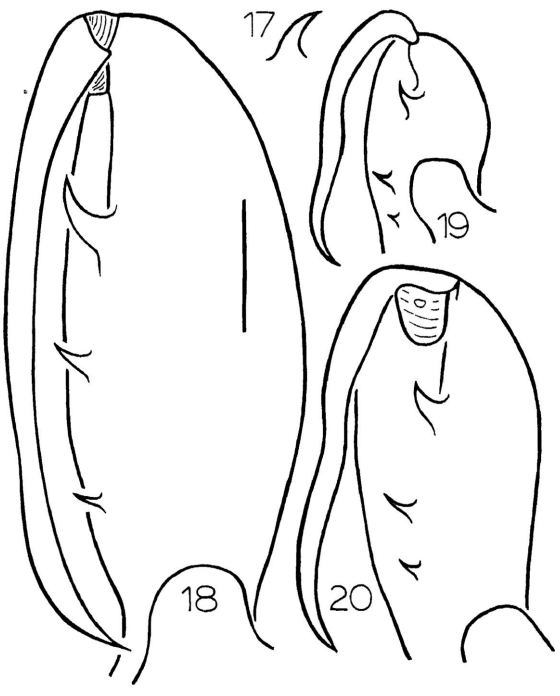
KEY TO SPECIES OF *PARADAMOETAS*

1. Males 2
   Females (best differentiated by internal details of the epigynum) 4
2. Cheliceral fang groove deeply excavated, retromarginal cheliceral tooth basal (fig. 24) ..... *fontana*
   Cheliceral fang groove not deeply excavated, retromarginal cheliceral tooth distal (figs. 18–20, 22) 3
3. Embolus with a simple curve, with one bend (fig. 9) ..... *cara*
   Embolus sinuous, with two bends (figs. 6, 7) ..... *formicina*
4. Epigynum elongated parallel to longitudinal axis of opisthosoma (fig. 13) ..... *cara*
   Epigynum elongated parallel to transverse axis of opisthosoma (figs. 11, 15) 5
5. Epigynum as in figures 11, 12 .... *formicina*
   Epigynum as in figures 15, 16 ..... *fontana*

Paradamoetas formicina Peckham and Peckham

Figures 1, 6–8, 11, 12, 21, 22; Map 1

Paradamoetas formicina Peckham and Peckham, 1885, p. 79, figs. 10, 10a (male holotype from Guatemala, in MCZ, examined); 1892, p. 74, pl. 6, figs. 2a–2c (female only). F. O. P.-Cam-



FIGS. 17–20. Left chelicerae of male *Paradamoetas cara* (Peckham and Peckham). 17. Retromarginal cheliceral tooth of specimen from Temascal, Mexico. 18. Specimen from Tuxpan, Mexico. 19. Specimen from Copan, Honduras. 20. Specimen from Temascal, Mexico. Scale line = 0.17 mm.

bridge, 1901, p. 177, pl. 12, figs. 6–6c (female only). Edwards, 1977, p. 22.

DIAGNOSIS: This species resembles *P. cara* but may be distinguished by the sinuous embolus with two bends in males, and by the form of the epigynum and copulatory tubes in females (figs. 11, 12).

MALE (Tumahu): Total length 2.91, carapace 1.42 long, 1.02 wide. Eyerow I width 0.82, eyerow III width 0.87, eyefield length 0.69. Eye diameters: AME 0.25, ALE 0.13, PME 0.03, PLE 0.12. Distance ALE–PME 0.20, PLE–PME 0.28. Femora lengths: I 0.85, II 0.57, III 0.62, IV 0.84. Leg formula 1432. Spines, leg I: dorsal femoral 4, tibia 3-3, metatarsal 2-2. Range of carapace length in five males 1.49–1.62. Coloration as in *P. cara*.

FEMALE (Tumahu): Total length 3.04, carapace 1.37 long, 1.04 wide. Eyerow I width 0.92, eyerow III width 0.85, eyefield length 0.84. Eye diameters: AME 0.28, ALE 0.15, PME 0.03, PLE 0.12. Distance ALE–PME 0.15, PLE–PME 0.27. Femora lengths: I 0.72, II 0.50, III 0.56, IV 0.85. Leg formula 4123. Range of carapace length in six females 1.25–1.63. Spination and coloration as in male.

MATERIAL EXAMINED: **United States**: *Texas:* southern part of state, nr. Mexico (MCZ), 1♂, 3♀. **Mexico**: *Chiapas:* Tuxtla Gutierrez, June 6, 1955 (R. B. and J. M. Selander, AMNH), 1♀. **Guatemala**: Tumahu, 3000 ft., July 10–11, 1974 (C. and P. Vaurie, AMNH), 1♂, 1♀; Tiquisate, 200 ft., June 26–29, 1947 (C. and P. Vaurie, AMNH), 1♀; Tucuru, July 12–13, 1947 (C. and P. Vaurie, AMNH), 1♂. **Nicaragua**: Musawas, Waspuc River, Oct. 10–31, 1955 (B. Malkin, AMNH), 2♂.

NOTE: The specimens from Texas were collected in the first decade of this century, or the last decade of the nineteenth century. They are separated by about 1500 km. from all other known specimens of the species. No other specimens from Texas have been found. Since all specimens from Mexico north of Chiapas are of *P. cara,* some doubt should be attached to the Texas record. I have examined the Panamanian specimen of Banks (1929), and it does not belong to the genus. Thus, Nicaragua marks the known southern limit of the genus.

Paradamoetas cara
(Peckham and Peckham), new combination
Figures 2, 9, 13, 14, 17–20, 25; Map 1

Keyserlingella cara Peckham and Peckham, 1892, p. 71, pl. 5, figs. 8–8a (male holotype from Guatemala, in MCZ, examined). F. O. P.-Cambridge, 1901, p. 177, pl. 12, figs. 9–9a.

Paradamoetas formicina (misidentification): Peckham and Peckham, 1892, p. 74, pl. 6, fig. 2d (male only); 1909, p. 375, pl. 49, fig. 2d (male only). F. O. P.-Cambridge, 1901, p. 177, pl. 12, fig. 5 (male only). Galiano, 1971, p. 599.

DIAGNOSIS: This species can be distinguished from *P. fontana* by the distal retromarginal cheliceral tooth and less excavated

fang groove in the male, from *P. formicina* males by the simple curve of the embolus (fig. 9) and from the other species, in the female, by details of the epigynum (figs. 13, 14).

MALE (Picolo): Total length 3.27, carapace 1.55 long, 1.09 wide. Eyerow I width 0.87, eyerow III width 0.84, eyefield length 0.67. Eye diameters: AME 0.22, ALE 0.12, PME 0.03, PLE 0.13. Distance ALE–PME 0.20, PLE–PME 0.26. Femora lengths: I 0.78, II 0.70, III 0.65, IV 1.05. Leg formula 4123. Spines, leg I: dorsal femoral 4, tibial 3-3, metatarsal 2-2. Range of carapace length in 47 males 1.25–2.05. Carapace dark brown, thin line of white scales around lower side, sparse scattered white scales in cephalic area. Chelicerae dark brown, palpi light brown. Legs pale brown with brown prolateral stripes on tibia I and II, infuscated ventral and dorsal on all legs from patella to tarsus. Opisthosoma brown.

FEMALE (Picolo): Total length 4.17, carapace 1.70 long, 0.90 wide. Eyerow I width 0.72, eyerow III width 0.80, eyefield length 0.58. Eye diameters: AME 0.23, ALE 0.13, PME 0.03, PLE 0.13. Distance ALE–PME 0.18, PLE–PME 0.25. Femora lengths: I 0.72, II 0.65, III 0.50, IV 0.96. Leg formula and spination as in male. Range of carapace length in 44 females 1.35–1.65. Coloration as in male.

MATERIAL EXAMINED (all specimens in AMNH, unless otherwise specified): **Mexico**: *México:* San Rafael (MCZ). *Oaxaca:* Playa Hati, Río Tonto; Temascal, 5 mi. E Oaxaca. *San Luis Potosí:* 20 mi. E Ciudad del Maíz; Huichichuya; Picolo; 8 mi. W San Joaquín; Tamazunchale, Xilitla. *Tabasco:* Baños de Sulfre, nr. Teapa; east of Frontera. *Veracruz:* Álamo; Conejos; El Tajin; Fortín; Jalapa; Tecolutla; Tuxpan; Veracruz. **Guatemala**: Capetillo; Finca Santa Adelaida, 8 mi. N Santa Bárbara. **El Salvador**: Candelaira. **Honduras**: Chichicaste, Paraíso; Copán.

DISTRIBUTION: Eastern Mexico from San Luis Potosí south to eastern Honduras (map 1).

VARIATION: The large variation in chelicer al size (figs. 18–20) in males of this species raises the possibility of allometric growth. However, after the parameters carapace length without the chelicerae (y-axis) versus cheliceral length (x-axis) were plotted, no evidence of separate peaks was observed and a smooth linear plot was obtained. For 47 specimens, the average carapace length was 1.56, standard deviation 0.13, range 1.25–2.05; the average cheliceral length was 0.93, standard deviation 0.24, range 0.35–1.57. The calculated correlation coefficient of 0.79 indicates a strong correlation between the two parameters measured; using the *r* test, a "validity" of better than 99 percent is obtained. The equation best fitting the data is $y = 0.49x + 1.11$.

NATURAL HISTORY: This information was supplied by Daniel H. Janzen, based on his observations of the species on twigs and thorns of *Acacia cornigera* Linnaeus in old fields at Temascal, near Oaxaca, Mexico. The spiders were collected foraging on these small trees, which were occupied by colonies of the ant *Pseudomyrmex ferruginea* F. Smith, an active, aggressive species. *Paradamoetas cara* was taken with *Pseudomyrmex ferruginea* as prey, and is somehow able to avoid capture by the ants. However, *P. cara* does not resemble *P. ferruginea* in appearance, but is more like an ant of the genus *Paracryptocerus* found on the foliage of other plants in the old fields (but not on *A. cornigera*). The map in Janzen (1967) showing the distribution of swollen thorn acacias—obligate acacia–ant interactions in Central America corresponds roughly to the distribution of *P. cara*. More biological work would be necessary to establish a definite relationship between the ant and the spider.

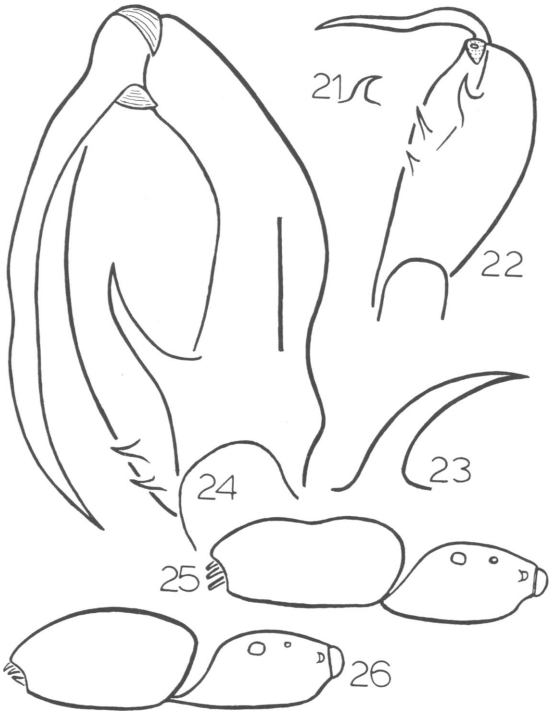
Paradamoetas fontana (Levi)

Figures 3, 10, 15, 16, 26, 27; Map 1

Icius fontanus Levi, 1951, p. 33, figs. 43–45 (male holotype from bog, Lake Geneva outlet at Fontana, Walworth County, Wisconsin, in AMNH, examined).

Paradamoetas fontanus: Richman and Cutler, 1978, p. 91.

DIAGNOSIS: This species is distinguished from others in the genus in both sexes by having serrate white scales on the margin of



FIGS. 21–26. 21, 22. *Paradamoetas formicina* Peckham and Peckham, specimen from Tumahu, Guatemala. 21. Retromarginal cheliceral tooth. 22. Left chelicera. 23, 24. *P. fontana* (Levi), specimen from Solana State Forest, Minnesota. 23. Retromarginal cheliceral tooth. 24. Left chelicera. 25. Lateral view of female *P. cara* (Peckham and Peckham). 26. Lateral view of female *P. fontana* (Levi). Scale line = 0.17 mm. (figs. 21–24 only).

the carapace with a single median keel (fig. 3); also, males have chelicerae with a basal retromarginal tooth and a deeply excavated fang groove, females a distinctive epigynum (figs. 15, 16) and a non-constricted opisthosoma.

MALE (Solana State Forest): Total length 2.92, carapace 1.49 long, 1.20 wide. Eyerow I width 0.99, eyerow III width 1.09, eyefield length 0.73. Eye diameters: AME 0.28, ALE 0.15, PME 0.03, PLE 0.15. Distance ALE–PME 0.25, PLE–PME 0.25. Femora lengths: I 0.92, II 0.72, III 0.68, IV 0.85. Leg formula 1432. Spines, leg I: dorsal femoral 4, tibial 3-3, metatarsal 2-2. Range of carapace length in 25 males 1.40–1.90. Carapace and opisthosoma colored as in *P. cara*. Legs dark brown except tarsi II, III, IV and metatarsus IV light brown.

FIG. 27. Sedge bog habitat of *Paradamoetas fontana* (Levi) in Solana State Forest, Minnesota (East White Pine Truck Trail, facing ESE). Road is roughly 2 m. wide. Shrubs (as at right) are willows (*Salix* sp.). Trees along skyline are spruces (*Picea glauca* Voss.) on higher ground. Standing water about ½ m. deep starts 1 m. to side of road. *Paradamoetas fontana* is taken sweeping forbs and sedges by side of road. Other salticids found in this habitat are *Eris marginata* (Walckenaer), *Metaphidippus protervus* (Walckenaer), *Phidippus clarus* Keyserling, and *Tutelina similis* (Banks).

FEMALE (same locality): Total length 3.51, carapace 1.60 long, 1.19 wide. Eyerow I width 0.95, eyerow III width 0.92, eyefield length 0.75. Eye diameters: AME 0.27, ALE 0.13, PME 0.03, PLE 0.15. Distance ALE–PME 0.17, PME–PLE 0.23. Femora lengths: I 0.80, II 0.63, III 0.58, IV 0.89. Leg formula 4123. Spines, leg I: dorsal femoral 3, tibial 3-3, metatarsal 2-2. Range of carapace length in 13 females 1.40–1.67. Coloration as in male except leg I dark yellow, legs II, III, IV yellow. Dorsal brown stripe on patellae and tibiae of all legs.

MATERIAL EXAMINED: **Canada**: *Ontario:* 3 mi. S Richmond (nr. Ottawa), in calcareous bog, on ground among mosses and dead grasses, and sweeping, June 21, 1978 (D. Maddison, H. Goulet, WM), 2♀, Aug. 2, 1978 (D. Maddison, H. Goulet), 6♂, 5♀. **United States**: *Minnesota:* Aitkin Co.: Solana State Forest, E White Pine Truck Trail, approx, 7 mi. N McGrath, ½ mi. E Highway 65, sweeping forbs and sedges at margin of sedge bog, July 9, 1967 (B. Cutler, AMNH, BC), 12♂, 4♀, Aug. 12, 1967 (B. Cutler, BC), 4♂, July 5, 1980 (B. Cutler, BC), 1♂,

4♀; W White Pine Truck Trail, 1 mi. W Highway 65, sweeping vegetation at margin of bog, July 9, 1967 (B. Cutler, BC), 1♀, July 4, 1971 (B. Cutler, BC), 1♂. Stearns Co.: Rockville Tamarack Bog Nature Conservancy Area, nr. Rockville, on *Symphoricarpos* in old field near *Larix* bog, May 11, 1977 (R. Dana, BC), 1♂. Anoka Co.: Cedar Creek Natural History Area, 2½ mi. E East Bethel, Cedar Bog Lake, Sept. 10, 1977 (B. Cutler, BC), 1 penultimate ♂ on boat dock, matured Nov. 11, 1♀ sweeping bog vegetation. Ramsey Co.: Roseville, sweeping sedges and grasses in marsh, June 25, 1967 (D. Jennings, BC), 1♂. *Wisconsin:* Walworth Co.: bog, Lake Geneva outlet at Fontana, July 3, 1938 (D. C. Lowrie, AMNH), 1♂ (holotype).

NATURAL HISTORY: All collecting records of this species indicate it is associated with wetlands, particularly bogs. Figure 27 illustrates the most productive locality known in Minnesota. However, *P. fontana* has not been found in most of the bogs or sedge marshes collected in Minnesota.

In captivity, females survive well in small vials, with *Drosophila* as prey, and build typical salticid retreats. Collected females were released in pots containing sedges, grasses, and forbs. Most individuals were in active motion soon after release, running over the upper vegetation. The front legs were elevated and waved while running, with minor palpal movements, and minor opisthosomal raising and waggling. Gaps two to three times the length of the spider were readily crossed by jumping. They would pause for variable intervals, up to around 15 minutes, right side up, near a node on a grass blade or on the leaf of a forb near the stem. About half the time they would pause upside down on a grass or sedge blade, so that they were hidden from above.

A typical hunting sequence involved noticing an aphid, about 2 mm. long on the same grass blade roughly 5 cm. away. The aphid was followed, by running up to within about 3–4 mm., then it was pounced on. An interesting interaction occurred when an ant (*Lasius* sp.) worker about 4 mm. long ran up to a spider at rest. The spider struck at the ant with the front part of the body and the first pair of legs. The ant turned and ran off; the spider remained at rest with no attempt at pursuit.

LITERATURE CITED

Banks, Nathan
1929. Spiders from Panama. Bull. Mus. Comp. Zool., vol. 69, pp. 53–96, pls. 1–4.

Bonnet, Pierre
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4230.

Cambridge, Frederick Octavius Pickard-
1901. Arachnida—Araneida. *In* Godman, F. D., and O. Salvin, Biologia Centrali-Americana. London, vol. 2, pp. 173–312, pls. 1–29.

Edwards, G. B.
1977. Comments on some genus and species problems in the Salticidae, including Walckenarian names. Peckhamia, vol. 1, pp. 21–23.

Galiano, María Elena
1971. Salticidae (Araneae) formiciformes. X. Revision del genero *Fluda* Peckham, 1892. Physis, vol. 30, pp. 573–599.

Hill, David E.
1979. The scales of salticid spiders. Zool. Jour. Linnean Soc., vol. 65, pp. 193–218.

Janzen, Daniel H.
1967. Fire, vegetation structure and the ant × *Acacia* interaction in Central America. Ecology, vol. 48, pp. 126–135.

Levi, Herbert W.
1951. New and rare spiders from Wisconsin and adjacent states. Amer. Mus. Novitates, no. 1501, pp. 1–41.

Peckham, George W., and Elizabeth G. Peckham
1885. On some new genera and species of the family Attidae from Madagascar and Central America. Proc. Nat. Hist. Soc. Wisconsin, pp. 23–42, 62–85, pls. I, II.

1892. Ant-like spiders of the family Attidae. Occas. Papers Nat. Hist. Soc. Wisconsin, vol. 2, pp. 3–83, pls. 1–7.
1909. Revision of the Attidae of North America. Trans. Wisconsin Acad. Sci., vol. 16, pp. 355–646, pls. 29–51.

Richman, David B., and Bruce Cutler
1978. A list of the jumping spiders (Araneae: Salticidae) of the United States and Canada. Peckhamia, vol. 1, pp. 82–109.

Roewer, Carl F.
1954. Katalog der Araneae. Brussels, vol. 2, pt. 2, pp. 927–1751.

Three New Species of Salticidae (Araneae)

MARÍA ELENA GALIANO[1]

ABSTRACT

Three new species of Salticidae are described: *Eustiromastix falcatus* from Trinidad and *Tullgrenella gertschi* and *T. corrugata* from Brazil.

INTRODUCTION

Eustiromastix Simon (1902) and *Tullgrenella* Mello-Leitão (1941) have been revised in previous papers (Galiano, 1970, 1979). This note reports the discovery of three new species found among specimens sent to me for study through the courtesy of Dr. Herbert W. Levi (Museum of Comparative Zoology) and Dr. Allen M. Young (Milwaukee Public Museum), whose loan of specimens is gratefully acknowledged.

The measurements and abbreviations are those used in previous papers (Galiano, 1963).

Eustiromastix falcatus, new species

Figures 1–3

TYPES: Male holotype from Port of Spain, Trinidad, deposited in the Museum of Comparative Zoology; six male paratypes from the same locality (three in the Milwaukee Public Museum, three in the Museo Argentino de Ciencias Naturales [no. 7205]).

ETYMOLOGY: The specific name is from the Latin *falcatus* (sickle-shaped), referring to the shape of the cymbium.

DIAGNOSIS: *Eustiromastix falcatus* resembles *E. bahiensis* Galiano (1979) and *E. macropalpus* Galiano (1979) but differs from them in having the palp with a shorter embolus and a flattened tibial apophysis, wider than long.

MALE (holotype): Total length 7.32. Carapace 3.40 long, 2.73 wide, 2.06 high. Clypeus 0.30 high. Ocular quadrangle 1.56 long; first row 2.40 wide; third row 2.23 wide. Small eyes of second row slightly closer to PLE than to ALE. Diameter of AME 0.73. Chelicerae parallel, vertical; two teeth on promargin; single tooth on retromargin. Maxillae: outer corner with small tubercle. Spines typical for genus; patella I with one prolateral; tibia I with one prolateral; tibiae III and IV without dorsal spines. Palp: figures 1–3.

COLOR IN ALCOHOL (specimen badly preserved): Carapace dark brown with light brown patch over thoracic groove. White hairs on both sides and clypeus. Long, erect hairs on thoracic slope, bunch of similar hairs on base of abdomen. Abdomen brown with broad central yellow band. Legs yellow with dark bands and spots as follows: two dark prolateral bands on femora; two prolateral and two retrolateral dark spots on patellae, tibiae, and metatarsi.

FEMALE: Unknown.

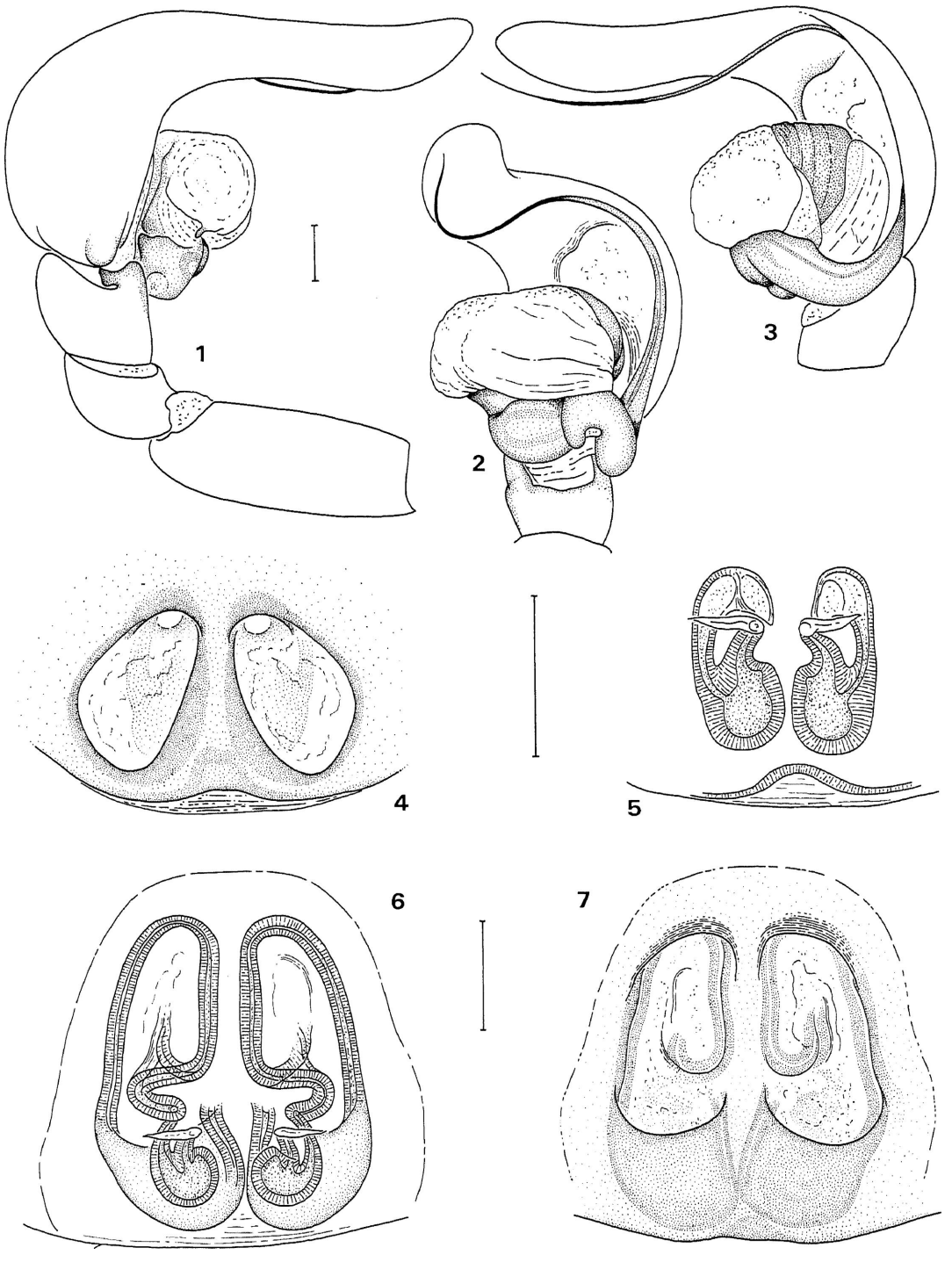
DISTRIBUTION: Known only from the type locality in Trinidad.

Tullgrenella gertschi, new species

Figures 4, 5

TYPES: Female holotype and female paratype from São Paulo, Brazil (Moenkhaus), deposited in the Museum of Comparative Zoology; female paratype from the same locality in the Museo Argentino de Ciencias Naturales (no. 7206).

[1] Consejo Nacional de Investigaciones Científicas y Técnicas, Av. Angel Gallardo 470, 1405 Buenos Aires, Argentina.



FIGS. 1–7. 1–3. *Eustiromastix falcatus,* new species. 1. Palp, retrolateral view. 2. Palp, ventral view. 3. Palp, prolateral view. 4, 5. *Tullgrenella gertschi,* new species. 4. Epigynum, ventral view. 5. Internal genitalia, dorsal view. 6, 7. *T. corrugata,* new species. 6. Epigynum, ventral view. 7. Internal genitalia, dorsal view. Scale lines are 0.25 mm.

ETYMOLOGY: The specific name is a patronym in honor of Dr. Willis J. Gertsch, in recognition of his work on American spiders.

DIAGNOSIS: *Tullgrenella gertschi* is close to *T. lunata* (Mello-Leitão, 1944) but differs from it in having two deep, large epigynal depressions and shorter ducts.

MALE: Unknown.

FEMALE (holotype): Total length 5.60. Carapace 2.86 long, 1.93 wide, 1.30 high. Clypeus 0.16 high. Ocular quadrangle 1.16 long; first row 1.70 wide; third row 1.76 wide. Small eyes of second row about equidistant between ALE and PLE. Diameter of AME 0.36. Chelicerae: two teeth on promargin; single tooth on retromargin. Legs 4312. Spines typical for genus. Epigynum: figures 4, 5.

COLOR IN ALCOHOL: Carapace dark brown with cephalic region black; two narrow stripes of white hairs on thoracic slope. Abdomen badly preserved, creased; dark brown with yellowish basal band which continues laterally nearly to median part of sides. Two pairs of yellowish spots on dorsum; one on middle, other close to spinnerets. Legs light brown, darker on sides. Palpi dark brown with black spots on dorsum of patella, tibia, and metatarsus.

DISTRIBUTION: Known only from São Paulo, Brazil.

Tullgrenella corrugata, new species
Figures 6, 7

TYPES: Female holotype and female paratype from Pará, Brazil (Moenkhaus), deposited in the Museum of Comparative Zoology; two female paratypes from the same locality, one in the Milwaukee Public Museum, one in the Museo Argentino de Ciencias Naturales (no. 7207).

ETYMOLOGY: The specific name is from the Latin *corrugo* (to wrinkle), referring to the creased state of the abdomen of the type specimen.

DIAGNOSIS: *Tullgrenella corrugata* resembles *T. serrana* Galiano (1970) but differs from it in having longer and more curled ducts in the epigynum.

MALE: Unknown.

FEMALE (holotype): Total length 8.38. Carapace 3.80 long, 2.66 wide, 1.73 high. Clypeus 0.20 high. Ocular quadrangle 1.40 long; first row 2.00 wide; third row 2.13 wide. Small eyes of second row about equidistant between ALE and PLE. Diameter of AME 0.63. Chelicerae: two teeth on promargin; single tooth on retromargin. Legs 4312. Spines typical for genus. Epigynum: figures 6, 7.

COLOR IN ALCOHOL (specimen badly preserved): Carapace dark brown with two narrow stripes of white hairs on thoracic slope, some white hairs on sides. Clypeus with white hairs on margin. Abdomen dark brown with brown hairs and narrow basal stripe of yellowish hairs. Two pairs of yellowish spots: one near middle of dorsum, other close to spinnerets.

DISTRIBUTION: Known only from Pará, Brazil.

LITERATURE CITED

Galiano, María E.
1963. Las especies americanas de arañas de la familia Salticidae descriptas por Eugène Simon. Redescripciones basadas en los ejemplares típicos. Physis, vol. 23, pp. 273–470, pls. 1–42.
1970. Revisión del género *Tullgrenella* Mello-Leitão, 1941 (Araneae, Salticidae). *Ibid.*, vol. 29, pp. 323–355, figs. 1–63.
1979. Revisión del género *Eustiromastix* Simon, 1902 (Araneae, Salticidae). Jour. Arachnol., vol. 7, pp. 169–186, figs. 1–25.

Mello-Leitão, Candido F. de
1941. Las arañas de Córdoba, La Rioja, Catamarca, Tucumán, Salta y Jujuy. Rev. Mus. La Plata (Zool.), vol. 2, pp. 99–198, figs. 1–91.
1944. Arañas de la provincia de Buenos Aires. *Ibid.*, vol. 3, pp. 311–393, figs. 1–87.

Simon, Eugène
1902. Descriptions d'espèces nouvelles de la famille des Salticidae (Suite). Ann. Soc. Ent. France, vol. 71, pp. 389–421.

New Central and South American Uloboridae (Arachnida, Araneae)

BRENT D. OPELL[1]

ABSTRACT

The new species *Uloborus metae, U. eberhardi,* and *Philoponella subvittata* are described and *Zosis peruvianus* (Keyserling) and *P. collina* (Keyserling) are redescribed. Males of *Ariston aristus* Opell and *P. vicina* (O. P.-Cambridge) are described for the first time. *Uloborus trilineatus* Keyserling is placed as a senior synonym of *U. penicillatus* Simon.

INTRODUCTION

North American members of the family Uloboridae were last revised by Muma and Gertsch (1964) and the Central and South American members by Opell (1979). Since the latter study was completed, three undescribed tropical species have been discovered, males of two species previously known only from females have been found, and previously unavailable type material has been located, resolving the identities of three species described by Keyserling (1882a, 1882b).

I thank the following colleagues who made this study possible by collecting, locating, and for the loan of material. Dr. William G. Eberhard collected specimens of three species. Dr. Maria E. Galiano collected specimens and lent material from the Museo Argentino de Ciencias Naturales (MACN). Mr. Louis Sorkin located misidentified *P. subvittata* specimens in the American Museum of Natural History (AMNH) collection and Dr. Norman I. Platnick lent these and other specimens. Dr. Herbert W. Levi lent material from the Museum of Comparative Zoology (MCZ) and was responsible for locating previously unavailable Keyserling material in the Polska Akademia Nauk, Instytut Zoologiczny (PAN) and for arranging a loan of these specimens from Drs. Szelegiewicz and Riedel.

Ariston aristus Opell

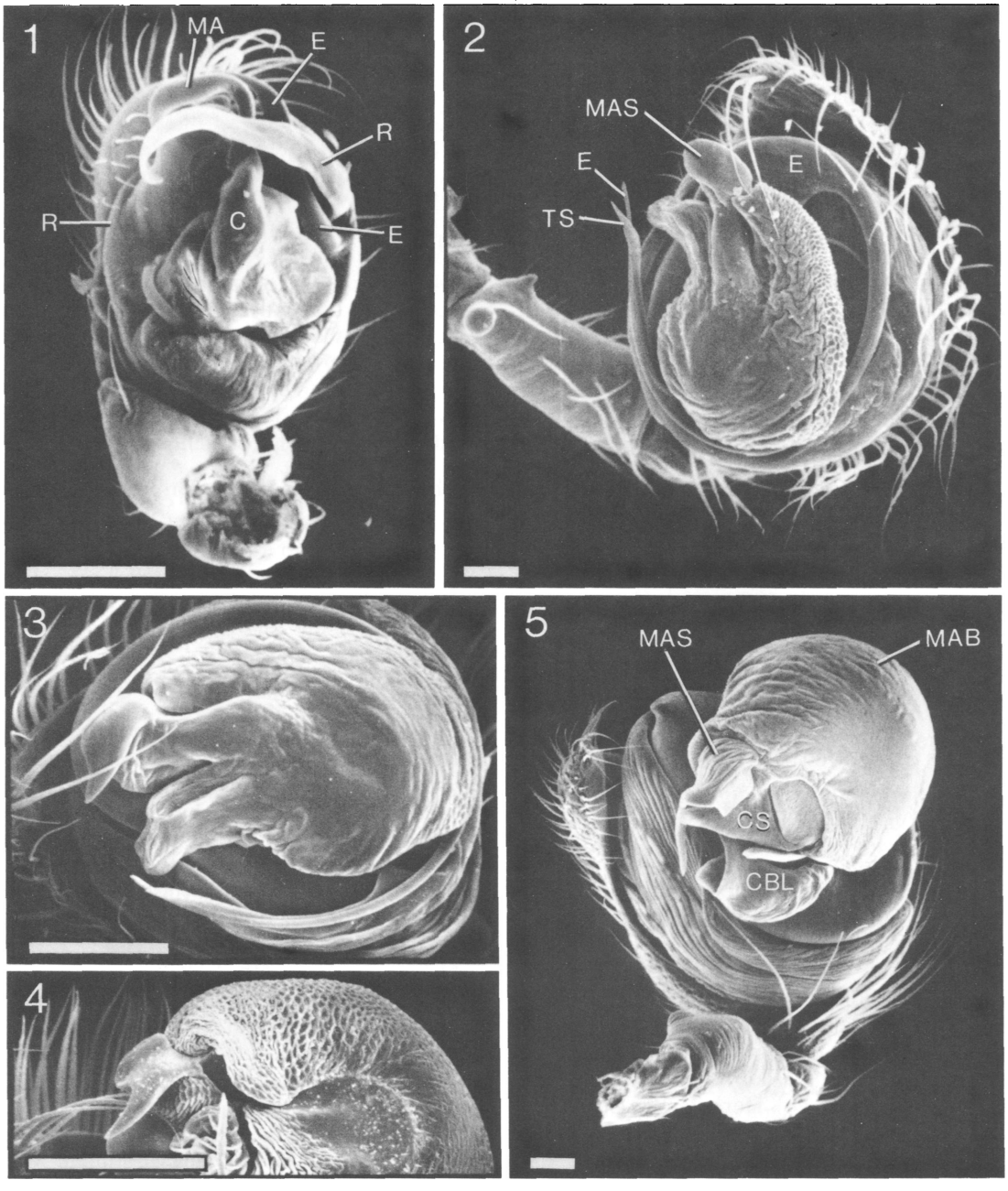
Figures 1, 6

Ariston aristus Opell, 1979, p. 482, figs. 40–45 (female holotype from Barro Colorado Island, Canal Zone, Panama, in MCZ).

DIAGNOSIS: Males are distinguished from those of *A. mazolus* by femur I lacking a row of six short, ventroprolateral macrosetae (Opell, 1979, fig. 39) and having four rather than three dorsoprolateral macrosetae (fig. 6). Tibia I has seven rather than five prolateral macrosetae. The radix (fig. 1) of the palp is not forked as in *A. mazolus* (Opell, 1979, pl. 3-B)

MALE: Total length 1.68 mm., carapace length 0.68 mm., sternum length 0.44 mm. Carapace shape, eye arrangement, and pigmentation as shown in Opell (1979, figs. 40, 41). Anterior median eyes (AME) 1.5 times the diameter of others, situated on mound. Clypeus height equal to one AME diameter. Sternum and abdomen tan, abdomen with scattered guanine spots. Femur I with four prolateral, one central dorsal, and two distal retrolateral macrosetae (fig. 6). Tibia I with

[1] Assistant Professor, Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061.



FIGS. 1–5. 1. *Ariston aristus* Opell, male left palpus, retrolateral view. 2, 3. *Zosis peruvianus* (Keyserling). 2. Male left palpus, retrolateral view. 3. Male left palpus, apical-retrolateral view. 4. *Z. geniculatus* (Olivier), male left palpus, apical-retrolateral view. 5. *Philoponella vicina* (O. P.-Cambridge), male left palpus, retrolateral view. All scale lines 0.05 mm. long. TS = tegular spur. MAB = median apophysis bulb. MAS = median apophysis spur. E = embolus. C = conductor. CBL = conductor basal lobe. CS = conductor spur. R. = radix.

six distal and one proximal prolateral, one distal dorsal, and one median retrolateral macrosetae. Male palpus with narrow, flat, single-pointed radix which originates on prolateral surface of tegulum, then loops apically and ventrally so that its unbranched tip lies ventral to both bent terminal branch of F-shaped median apophysis and pointed conductor tip (fig. 1). Embolus originates on retrolateral surface of palpus and extends ventrally and prolaterally so that its tip rests near and perhaps on that of median apophysis. An unidentified, thin walled, tubular structure extends from near the base of the conductor. Examination of a clove-oil-cleared palpus with a Nomarski equipped compound microscope failed to resolve the origin of this tube. The many sclerotized projections, folds, and internal partitions of this small palp do not allow a sperm reservoir to be clearly identified and traced; however, such a duct appears to enter the sclerite interpreted as the embolus. Opell's (1979) plate 3-B shows a shorter projection which was previously regarded as either a damaged area or a piece of debris, but which must now be considered a homologue of the structure just described.

FEMALE: Described by Opell (1979).

MATERIAL EXAMINED: **Panama**: *Canal Zone:* Barro Colorado Island, June 23–30, 1939 (A. M. Chickering, MCZ), 1♂. This specimen is assigned to *A. aristus* because this is the only species known to occur south of Honduras and because *A. aristus* females are also found at this locality (Opell, 1979).

DISTRIBUTION: Known only from Panama.

Zosis peruvianus (Keyserling), new combination

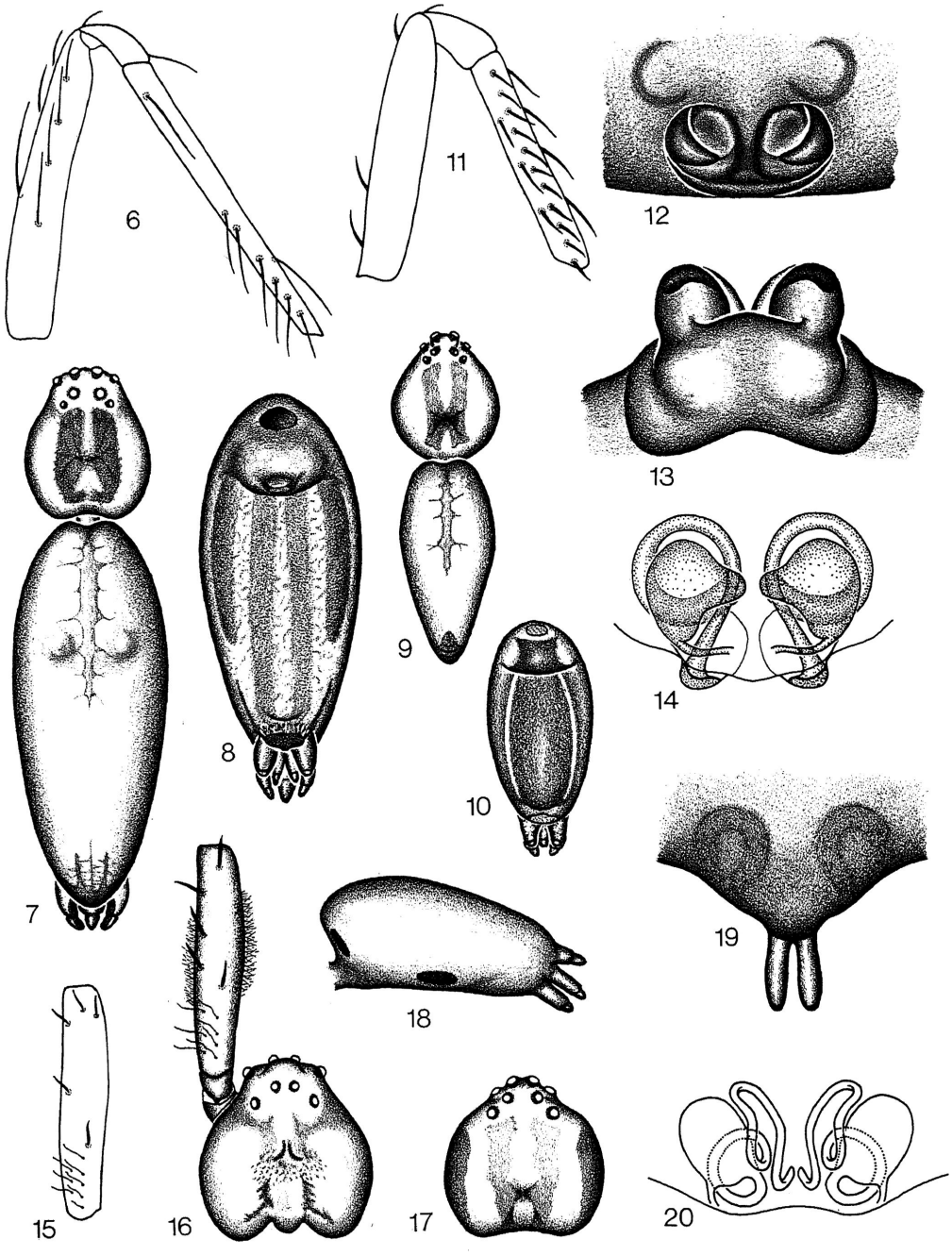
Figures 2, 3, 7–14

Uloborus peruanus Keyserling, 1882a, p. 283, pl. 11, fig. 9 (female holotype No. 63 labeled "*Uloborus peruanus* Keyserling, Amable Maria—Peru, leg. K. Jelski, detm. E. Keyserling" in PAN, examined; collected either Feb. 1871 or Feb. 1872, dept. Junín, prov. Tarma, elev. *ca.* 640 m. [Levi, 1964]).

Uloborus peruvianus: Bonnet, 1959, p. 4766. Justified emendation.

DIAGNOSIS: Females have a maximum total length of 5.3 mm. and a maximum carapace length of 1.5 mm. as compared with respective minimum lengths of 6.3 mm. and 2.0 mm. in *Z. geniculatus*. *Zosis peruvianus* males have a maximum length of 3.4 mm. and a maximum carapace length of 1.2 mm. as compared with respective minimum lengths of 4.0 mm. and 1.6 mm. in *Z. geniculatus*. Both female and male *Z. peruvianus* have a smaller H-shaped gray marking on the carapace and correspondingly wider, paraxial, unpigmented areas and a more slender, elongate abdomen (figs. 7, 9) than do male and female *Z. geniculatus* (Opell, 1979, figs. 162, 163). In *Z. peruvianus* the posterior eye row is more strongly recurved than in Z. *geniculatus*, so that a line across the posterior margins of the PME passes along the PLE anterior margins (figs. 7, 9). The legs of *Z. peruvianus* have much fainter color markings than do those of *Z. geniculatus*. The venter of the female abdomen has two pairs of paraxial gray stripes (fig. 8) not present in *Z. geniculatus*. The epigynal lobes of *Z. peruvianus* have shallow, weakly sclerotized depressions on the anterior median surfaces (fig. 12), unlike *Z. geniculatus* where these depressions are on the posterior median surface of the lobes (Opell, 1979, figs. 169–171). Tibia I of *Z. peruvianus* males has four or five dorsal and at least 14 prolateral macrosetae (fig. 11) as compared with nine and eight, respectively, in *Z. geniculatus*. In addition to its smaller size (maximum bulb diameter of 0.26 mm. as compared with about 0.40 mm. in *Z. geniculatus*), the male palpus of *Z. peruvianus* is distinguished from that of *Z. geniculatus* (fig. 4; Opell, 1979, pl. 7-C) by lacking a distal, dorsal femoral setal brush and by having a more flattened median apophysis bulb and a more slender median apophysis spur (figs. 2, 3).

MALE: Total length 3.4 mm., carapace length 1.2 mm., sternum length 0.3 mm. Carapace tan with light gray paraxial median strips extending to ocular area and connecting medially at thoracic groove. Small gray circles around eyes (fig. 9). Posterior eye row recurved so that line across PME posterior



FIGS. 6–20. 6. *Ariston aristus* Opell, male left first femur, patella, and tibia, prolateral view. 7–14. *Zosis peruvianus* (Keyserling). 7. Female, dorsal view. 8. Female abdomen, ventral view. 9. Male, dorsal view. 10. Male abdomen, ventral view. 11. Male left first femur, patella, and tibia, prolateral view. 12. Epigynum, ventral view. 13. Epigynum, posterior view. 14. Cleared epigynum, dorsal view. 15. *Uloborus trilineatus* (Keyserling), female first femur, dorsal view. 16–20. *U. metae,* new species. 16. Female carapace and first femur, dorsal view. 17. Male carapace, dorsal view. 18. Male abdomen, lateral view. 19. Epigynum, ventral view. 20. Cleared epigynum, dorsal view.

margins passes along PLE anterior margins. Dorsum of abdomen tan with guanine deposits and light gray cardiac area. Venter gray with one pair of narrow paraxial white stripes (fig. 10). First femur with zero or two prolateral, two proximal and one distal dorsal, and one or two distal retrolateral macrosetae (fig. 11). First tibia with 11 to 16 evenly spaced upper and three central lower prolateral, four or five dorsal, and three or four retrolateral macrosetae. Male palpus with large median and small lateral femoral tubercles (fig. 2). Median apophysis bulb flat with slender apical region extending over median apophysis spur's base (figs. 2, 3). Distal region of median apophysis spur (fig. 3) lacks crest found in *Z. geniculatus* (fig. 4). Elongate, slender tegular spur serves as embolus guide but originates more medially, less conspicuous than that of *Z. geniculatus* (Opell, 1979, pl. 7-C).

FEMALE: Total length 4.4 to 5.3 mm. (x = 4.9, N = 9), carapace length 1.4 to 1.5 mm. (x = 1.5), sternum length 0.8 to 0.9 mm. (x = 0.9). Eye pattern and carapace, sternum, and dorsal abdominal color (fig. 7) same as male. Legs with very faint tan markings similar to those of *Z. geniculatus* (Opell, 1979, fig. 174). Femur I with five dorsomedian and three dorsolateral trichobothria in proximal two-fifths of length. Abdomen slender with two small dorsal tubercles (fig. 7). Venter of abdomen white with pair of long central and shorter lateral gray paraxial stripes (fig. 8). Small white guanine spot at anterior epigynal margin. Weakly sclerotized epigynal lobes extend ventrally or slightly posteriorly (figs. 12, 13), each bearing ventrolateral triangular sclerite, anterior to which is shallow depression at whose posterolateral margin an epigynal opening is found. On most specimens anterolateral portions of ducts visible through integument (fig. 12).

EGGSAC: Two females were collected with a thin-walled, unpigmented, cylindrical eggsac 16 mm. long and about 1.6 mm. in diameter.

DISCUSSION: This species shows three previously used generic characters to be features of only *Z. geniculatus*. The posterior eye row may be either slightly or moderately recurved, there may be either 10 or eight dorsal femoral trichobothria, and depressions leading to the epigynal openings may be on either the posterior median or anterior median surfaces of the widely separated epigynal lobes. To accommodate this discovery, those lines describing the eye curvature should be deleted from couplet 9 of Opell's (1979) generic key for uloborid females.

The first alternative of this couplet can be strengthened by adding "Epigynal lobes with or without a small apical sclerite" and the second by adding "Epigynal lobes with a large, lateral, triangular sclerite."

MATERIAL EXAMINED: **Argentina**: *Cordoba:* Missiones General Belgrano, 1965 (M. Galiano, MACN), 1♀. **Brazil**: *Pará:* Belém, Aug. 1970 (M. Galiano, MACN), 1♀. **Colombia**: *Meta:* Puerto Lopez, near Mozambique, Aug. 1980 (W. Eberhard, MCZ), 3♂, 10♀. **Peru**: *Junín:* Tarma, Feb. 1871 (K. Jelski, PAN), 1♀.

DISTRIBUTION: East-central Colombia to north-central Brazil to north-central Argentina.

Uloborus metae, new species
Figures 16–20

TYPES: Female holotype and two male paratypes from 15 km. southwest of Puerto Lopez, elevation 200 m., Meta, Colombia (August 1978; W. G. Eberhard), deposited in MCZ.

ETYMOLOGY: The specific epithet is a noun in the genitive case, derived from the department in which the types were collected.

DIAGNOSIS: This species is similar to *U. trilineatus*, but males and females are distinguished from this and those of all other known *Uloborus* species by the presence of four small, distinct, dark oval spots on the tan abdomen's venter: one pair just anterolateral to the petiole and another pair midway between the epigastric furrow and spinnerets (fig. 18). In females, light setae forming femoral and tibial brushes are denser

than in *U. trilineatus* and the macrosetae are more conspicuous (fig. 16). The epigynal lobes are three times as long as wide (fig. 19), unlike other *Uloborus* species whose lobes are as long as wide (Opell, 1979, figs. 137, 145). Males have one prolateral and 19 dorsal macrosetae on tibia I rather than 10 and 10–12, respectively, as found in *U. trilineatus*.

MALE: Total length 3.40 mm., carapace length 1.46–1.52 mm., sternum length 0.70–0.74 mm. Carapace tan with dark gray lateral margins and light central paraxial gray stripes (fig. 17). Sternum and legs light tan. Femur I with three prolateral, two dorsal, and two retrolateral macrosetae. Tibia I with one, 19, and three, respectively. Abdomen light tan with pair of small, dark gray oval spots adjacent to petiole and second pair midway between epigastric furrow and spinnerets (fig. 18). Abdomen without tubercles or setal tufts. Palpal femur with large retrolateral and small prolateral ventral tubercles (Opell, 1979, fig. 134). Median apophysis bulb (MAB) small, U-shaped conductor lobe (CL) about four times as long as wide (Opell, 1979, fig. 135). In apical view, embolus origin and tegulum visible lateral to MAB. Embolus tip extends only short distance beyond CL, differing from *U. trilineatus* in which embolus extends well beyond CL. However, this may be a preservational difference.

FEMALE: Total length 5.38 mm., carapace length 1.64 mm., sternum length 1.00 mm. Carapace light tan, mottled gray center, with pair of medially directed posterior gray chevrons (fig. 16). Sternum and legs light tan. Legs with dense tufts of light setae, beset with large, dark macrosetae. Femur I with no prolateral, two dorsal, and three retrolateral macrosetae. Tibia I with three, two, and three, respectively. Abdomen color similar to that of male. Abdomen with pair of low, lateral tubercles in anterior quarter of length, behind which are two pairs of small, light paraxial setal patches. Posterior epigynal lobes three times as long as their basal width (fig. 19), each with small, heavily sclerotized cap.

MATERIAL EXAMINED: Only the type specimens.

DISTRIBUTION: Known only from type locality in east-central Colombia.

Uloborus eberhardi, new species

Figures 21–25

TYPES: Female holotype and paratype from Bagaces, Palo Verde, Costa Rica (January 16–22, 1978; W. G. Eberhard), deposited in MCZ.

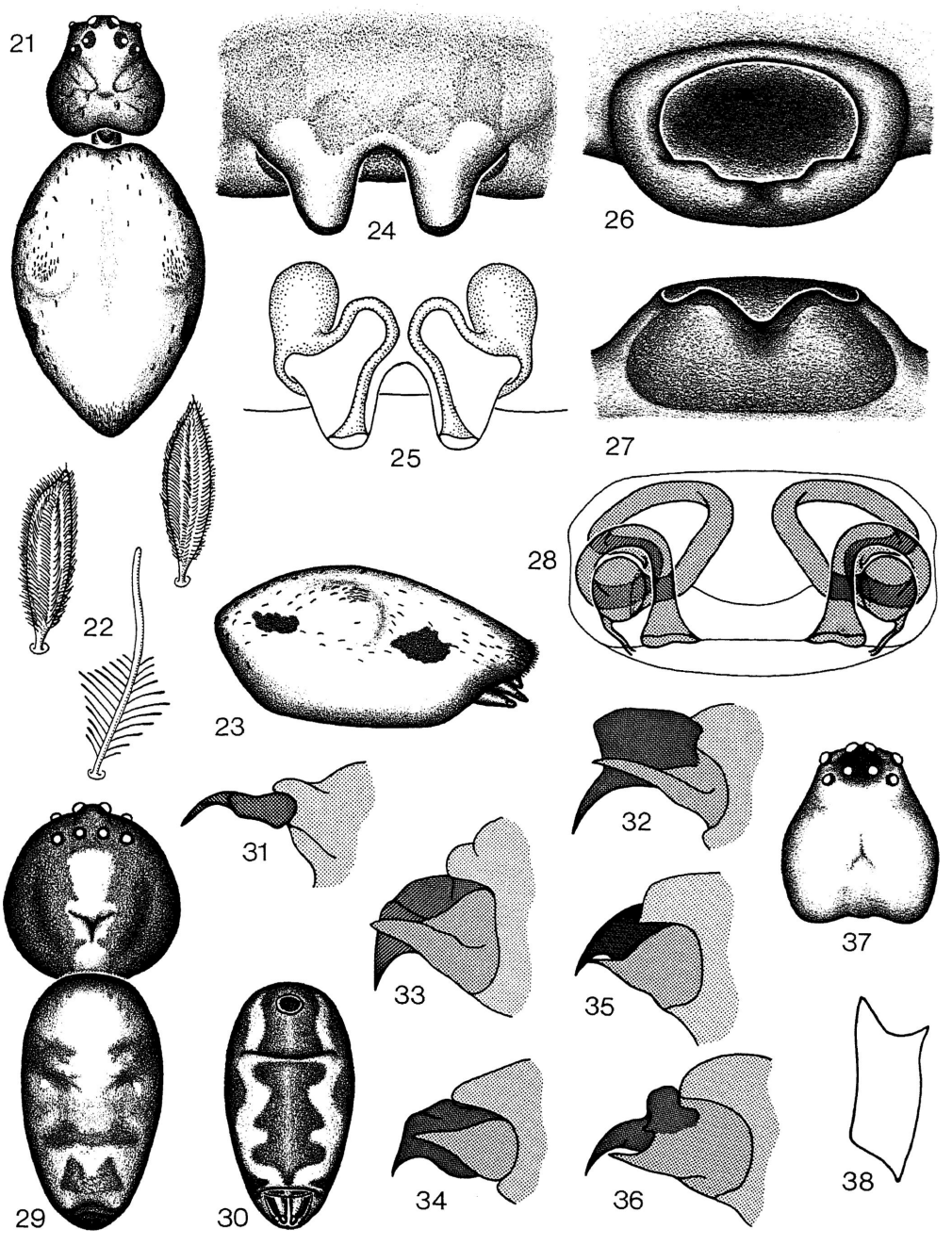
ETYMOLOGY: This species is named for W. G. Eberhard, who collected it.

DIAGNOSIS: This species is characterized by unique, club-shaped setae on the carapace, dorsal and lateral abdominal surfaces, and patellae (figs. 21–23) and by the presence of dark gray anterior and posterior lateral spots on the abdomen.

MALE: Unknown.

FEMALE: Total length 3.4 to 3.7 mm., carapace 1.0 mm. long, sternum 0.7 mm. long. Carapace dark gray brown with laterally facing gray chevrons at shallow thoracic groove, faint gray lines radiating from thoracic groove, and light median cephalic area (fig. 21). Eyes widely encircled by gray pigment. Sternum dark brown. First legs dark brown, others light brown with no prominent color markings. First legs with only sparse tibial brush. Abdomen widest in anterior two-fifths at which point a pair of low, broadly spaced humps is located. Dorsum of abdomen white with light gray cardiac area and light gray, setose posterior tip (fig. 21). Lateral surface white with two gray spots, venter light gray. Cribellar region and anterior spinnerets dark gray. Conspicuous club-shaped setae with numerous small, lineally arranged, lateral extensions (fig. 22) present in posterior half of carapace, dorsal and lateral abdominal surfaces, and patellae of legs I, II, and IV. Other than their concentration on patellae and abdominal humps these setae have no regular arrangement. However, they are easily dislodged and such patterns may have been disrupted. Weakly sclerotized, epigynal lobes widely separated at their bases (figs. 24, 25). Each has small, distal sclerite dorsal to which an epigynal opening is found. Spermathecae and ducts faintly visible through epigynal integument (fig. 24).

EGGSAC: One female was collected with an oval planoconvex eggsac 5.1 mm. long and 3.2 mm. wide. Thick white silk on the convex surface was covered with patches of gray silk.



FIGS. 21–38. 21–25. *Uloborus eberhardi,* new species. 21. Female, dorsal view. 22. Two club-shaped setae and a more typical uloborid plumose seta from dorsum of abdomen, dorsal view. 23. Female abdomen, lateral view. 24. Epigynum, ventral view. 25. Cleared epigynum, dorsal view. 26–28. *Philoponella collina* (Keyserling). 26. Epigynum, ventral view. 27. Epigynum, posterior view. 28. Cleared epigynum, dorsal view. 29–32. *P. vicina* (O. P.-Cambridge). 29. Male, dorsal view. 30. Male abdomen, ventral view. 31. Male palpus, apical view showing a portion of median apophysis bulb (MAB) = light area, and median apophysis spur (MAS) = dark area. 32. MAB and MAS, retrolateral view. 33–36. Retrolateral view of MAB and MAS of male palpi of *P. republicana* species group. 33. *P. republicana* (Simon). 34. *P. divisa* Opell. 35. *P. signatella* (Roewer). 36. *P. tingena* (Chamberlin and Ivie). 37, 38. *P. subvittata,* new species. 37. Female carapace, dorsal view. 38. Male left palpal femur, ventral view.

MATERIAL EXAMINED: Only the type specimens.

DISTRIBUTION: Known only from the type locality in northwestern Costa Rica.

Uloborus trilineatus Keyserling

Uloborus trilineatus Keyserling, 1882b, p. 214, pl. 15, fig. 13 (male holotype No. 53 labeled "*Uloborus trilineatus* Keyserling, Lechugal—Peru, leg. K. Jelski, detm. E. Keyserling" in PAN, examined; collected March 1876, in the dept. Tumbes near Zarumilla [Levi, 1964]).

Uloborus penicillatus Simon: Opell, 1979, p. 504, figs. 131–139, map 2. NEW SYNONYMY.

SYNONYMY: The male holotype of *U. trilineatus* fits the diagnosis of *U. penicillatus* provided by Opell (1979).

Philoponella collina (Keyserling)

Figures 26–28

Uloborus collinus Keyserling, 1882b, p. 212, pl. 15, figs. 12, 12a (female holotype No. 196 labeled "*Uloborus collinus* Keyserling, Montaña di Nancho—Peru, leg. K. Jelski, detm. E. Keyserling" in PAN, examined; collected 1874 in dept. Cajamarca, *ca.* 2700 m. elevation in the Cordilléra Mts. east of the coastal town of Pacasmayo [Levi, 1964]).

NOTE: On the basis of the original description, Lehtinen (1967) made a "preliminary transfer" of this species to the genus *Philoponella*.

DIAGNOSIS: This species belongs to the *P. fasciata* species group, although not all its features comply with the characters of this group. *Philoponella collina* has the prominent posterior epigynal lobes characteristic of the *P. republicana* group, but lacks posterior lateral troughs (Opell, 1979, figs. 208, 239). Unlike members of the *P. semiplumosa* group, with which it shares contiguous anterior and posterior epigynal rims, its epigynal openings are at posterior end of the atrium and not its center (Opell, 1979, figs. 250, 259). As in the *P. fasciata* group (Opell, 1979, fig. 266), its epigynal openings are separated by a distance equal to 0.65 times the width of the atrium and its ducts loop twice before connecting with a spermatheca (fig. 28).

MALE: Unknown.

FEMALE: Total length 2.92 mm., carapace length 1.06 mm., sternum length 0.68 mm. Carapace dark gray with no color markings, sternum and legs tan. Femur I and tibia IV with distal gray ring. Clypeus height equal to AME diameter. Abdomen white with tan cardiac area. Deep epigynal atrium bordered by narrow anterior and broad, rounded lateral and posterior rims (fig. 26). Posterior rim composed of two widely separated lobes (fig. 27). No conspicuous posterior lateral troughs. Epigynal openings not easily visible, but found on anterior margins of the posterior lobes and separated by distance equal to 0.65 times width of the atrium.

MATERIAL EXAMINED: Only the type specimen.

DISTRIBUTION: Known only from the type locality in northwestern Peru.

Philoponella vicina (O. P.-Cambridge)

Figures 5, 29–32

Philoponella vicina: Opell, 1979, p. 532, figs. 241–244.

DIAGNOSIS: *Philoponella vicina, P. republicans, P. divisa, P. tingena,* and *P. signatella* comprise the *P. republicana* species group (Opell, 1979), whose males are characterized by a short, square conductor blade and a conductor spike which is shorter than the median apophysis spur's pointed apical extension (fig. 5). Carapace length of *P. tingena* is 1.0 to 1.2 mm., of *P. divisa* and *P. signatella* 1.2 to 1.4 mm., of *P. vicina* 1.4–1.6 mm., and of *P. republicana* 1.6–1.9 mm. The MAS of *P. vicina* is unique in having a prominent apical crest (figs. 5, 32) and a slender apical profile (fig. 31). The median area of the thoracic region of the carapace is more conspicuously raised than that of other species (fig. 29). A pair of small dorsolateral abdominal guanine spots also distinguish *P. vicina* males.

MALE: Total length 3.32–3.74 mm., carapace length 1.44–1.64 mm., sternum length 0.80–0.85 mm. Carapace dark brown with broad median white stripe extending to posterior eye row (fig. 29). Nearly parallel lateral carapace margins hide tan posterior lateral

markings from dorsal view. Sternum tan with light gray markings near perimeter. Leg I light gray with distal tan ring on femur. Dorsum of abdomen tan with dark gray posterior tip, two posterior gray chevrons, and two central, lateral gray patches at whose posterior margins occur pair of small guanine spots (fig. 29). Venter of abdomen gray with wide undulating, white paraxial stripes (fig. 30). Except for high, narrow MAS crest (figs. 5, 32), male palpus similar to others in *P. republicana* species group. Maximum median apophysis bulb width 0.4 mm.

FEMALE: Described by Opell (1979).

MATERIAL EXAMINED: Description of males based on three specimens from Le Selva, Heredia, Costa Rica, 1979 (O. Fincke, AMNH, Opell collection).

DISTRIBUTION: Southern Mexico and Costa Rica.

Philoponella subvittata, new species
Figures 37, 38

TYPES: Female holotype from upper Essequibo River, near Akaramuka Rapids, Guyana (October 4, 1936), and male paratype from Kuryuwini Lodge, Kuryuwini River, Guyana (November 22, 1937), both collected by W. G. Hassler, deposited in AMNH.

ETYMOLOGY: The specific epithet refers to this species' small size and similarity to *P. vittata*.

DIAGNOSIS: The genitalia resemble those of *P. vittata* (Opell, 1979, figs. 266, 270) but this is the smallest known *Philoponella* species, having male and female carapace lengths of 0.82 and 0.74 mm., respectively. It is the only known uloborid species in which males and females are light tan and have a dark gray median ocular area (fig. 37) and sternum, and black booklung covers, anal tubercle, and posterior lateral spinnerets. Unlike most members of this genus, the female's abdomen lacks conspicuous dorsal humps.

MALE: Total length 2.10 mm., carapace length 0.82 mm., sternum length 0.46 mm. Carapace light tan with dark gray median ocular area (fig. 37). PLE with small, dark median borders. Sternum dark gray, 0.80 times as wide as long. Abdomen light tan, half as wide and high as long, without humps. Venter of abdomen light gray with black booklung covers. Anal tubercle and posterior lateral spinnerets black. Palpi are so similar to those of *P. vittata* (Opell, 1979, fig. 270) that their illustration would be redundant. Like *P. vittata*, the male palpus has a broad, transparent conductor lobe which extends over the tegulum, a long conductor spike, and a domed median apophysis bulb. Unlike this species (Opell, 1979, fig. 269), *P. subvittata* males lack tubercles on the palpal femur (fig. 38).

FEMALE: Total length 2.12 mm., carapace length 0.74 mm., sternum length 0.42 mm. Carapace similar to that of male (fig. 37). Sternum dark gray, 1.0 times as wide as long. Abdomen shape and color similar to those of male. Epigynum similar to that of *P. vittata* (Opell, 1979, fig. 266): shallow epigynal crypt with broad, rounded anterior rim and narrow posterior rim at whose anterior margin a pair of epigynal openings is located.

MATERIAL EXAMINED: Only the type specimens.

DISTRIBUTION: Known only from the type localities in west-central Guyana.

LITERATURE CITED

Bonnet, Pierre
1959. Bibliographia araneorum. Toulouse, vol. 2, pt. 5, pp. 4231–5058.

Keyserling, Graf Eugen
1882a. Neue Spinnen aus Amerika. III. Verh. Zool.-Bot. Ges. Wien, vol. 31, pp. 269–314, pl. 11.
1882b. Neue Spinnen aus Amerika. IV. *Ibid.*, vol. 32, pp. 195–226, pl. 15.

Lehtinen, Pekka T.
1967. Classification of the cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. Ann. Zool. Fennici, vol. 4, pp. 199–468, figs. 1–524, tables 1–53.

Levi, Herbert W.
1964. Nineteenth century South American araneology. Papéis Avulsos Dept. Zool.,

São Paulo, vol. 16, no. 1, pp. 9–19, maps 1–3.

Muma, Martin H., and Willis J. Gertsch
1964. The spider family Uloboridae in America north of Mexico. Amer. Mus. Novitates, no. 2196, pp. 1–43, figs. 1–90.

Opell, Brent D.
1979. Revision of the genera and tropical American species of the spider family Uloboridae. Bull. Mus. Comp. Zool., vol. 148, pp. 443–549, pls. 1–8, figs. 1–288, tables 1–6, maps 1–5.

The Nearctic Species of *Oreonetides* (Araneae, Linyphiidae)

P. J. VAN HELSDINGEN[1]

ABSTRACT

The North American species of the genus *Oreonetides* Strand are revised and illustrations of the genitalia are provided. *Montitextrix* Denis is considered a synonym but retained as a subgenus. The value of the characters used to discriminate *Oreonetides* from *Montitextrix* is discussed. A synoptic table surveying the main characters is provided. The females of *O.* (*O.*) *filicatus* (Crosby), *O.* (*O.*) *rotundus* (Emerton), and *O.* (*M.*) *flavescens* (Crosby) are described for the first time. *Diplocentria corynetes* Chamberlin and Ivie is synonymized with *O.* (*O.*) *rotundus* (Emerton). The synonymy of *O.* (*O.*) *filicatus* (Crosby) with *O.* (*O.*) *vaginatus* (Thorell) is disclaimed. *Oreonetides portoricensis* Petrunkevitch, correctly transferred to *Eperigone* by Saaristo, is newly synonymized with *E.tridentata* (Emerton).

INTRODUCTION

This conspectus of North American *Oreonetides* is dedicated to Dr. Willis J. Gertsch in appreciation of his furthering of arachnology in North America.

Oreonetides has long figured as a European genus. In North America the same genus became known under the name *Aigola,* although several other names have been used. Both genera have the same type species, *Oreonetides vaginatus* (Thorell), which is common in the north temperate regions of Eurasia and North America and demonstrates an arctic-alpine distribution. Saaristo (1972) published a detailed study of the morphology of this species, in particular of the secondary genital structures, and based his concept of the genus largely on this one species.

The only other species of the genus that seems to be common is *O. abnormis* (Blackwall) of Europe. According to Saaristo (1972), *O. abnormis* is not congeneric with *O. vaginatus,* but I have, on an earlier occasion (Van Helsdingen, 1973), expressed my doubts about the correct delimitation of the genus by Saaristo.

The present paper is meant to allow the recognition of the species of the Nearctic Region, where seven species have been found to occur so far. Most species, however, appear to be rare and the material in collections is scanty. The available literature on the group is similarly limited. Apart from the original descriptions there exists one monograph on *Aigola* by Crosby (1937), itself containing the first descriptions of two species. Descriptions and redescriptions in that paper concentrate on the secondary genital organs, but unfortunately the illustrations give details of certain palpal elements only; they are not easily used for species recognition. The females were very superficially diagnosed, if at all. The morphological analysis by Saaristo (1972) was followed by brief comments upon species other than the type species, of which two apparently were overlooked.

Saaristo (1972, p. 69) characterized the genus after studying *O. vaginatus,* being also familiar with other European species. I have now studied all the Nearctic species and as a result my concept of the genus is much less

[1] Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands.

clear-cut, even leaving *O. recurvatus* (Emerton) out of consideration as an aberrant species of doubtful relationship. I can follow Saaristo in many of the characteristics listed by him, but note that:

(1) The shape of the chelicerae is not subject to sexual dimorphism to the same degree in all species; hardly any dimorphism is found in *O. filicatus, O. flavescens, O. flavus,* or *O. rotundus.*

(2) The number of teeth in the dorsal row of the chelicerae varies between three (*O. flavescens*), four (*O. flavus* and *O. rectangulatus*), and five–six in the other species (three in aberrant *O. recurvatus*).

(3) The value of Tm I is given as 0.4 by Saaristo; in most other species it is lower, with 0.27 as the lowest value (0.15–0.20 in aberrant *O. recurvatus*; in the European *O. glacialis* it ranges between 0.65 and 0.75).

(4) A prolateral spine (1′-spine) on tibia I is present in *O. vaginatus, O. flavescens,* and *O. rectangulatus* but not in *O. filicatus, O. flavus,* and *O. rotundus* (and the European *O. glacialis*); 1″ and v-spines are present in aberrant *O. recurvatus.*

(5) The paracymbium bears an isolated hair at about the middle in *O. filicatus, O. flavescens, O. rotundus,* and *O. vaginatus* (and European *O. glacialis*); none could be found in *O. flavus,* nor in aberrant *O. recurvatus.*

In addition to Saaristo's other characters I state the following characters to hold for all species except *O. recurvatus*:

(6) The dorsal tibial spines are thin and weak, but fairly long (up to twice the diameter of the segment).

(7) The palpal tibia lacks a distinct spine.

(8) The cymbium has a lateral lobe on the middle of its outer margin.

(9) The tegulum has an anterolateral extension, curved dorsad toward its tip (this is what Saaristo [1972:73] described as "anterolateral corner of tegulum bulging uncinate"); this feature was found to some extent in all species.

(10) The scape of the epigynum is rigidly folded and probably not flexible; in some cases it is only folded near the tip (*O. vaginatus*) or unfolded (European *O. firmus*); the sperm ducts are broad (thick-walled) and distinct.

The above remarks confirm my earlier statement that some species deviate considerably from Saaristo's diagnosis of the genus. They also lead to the conclusion that *O. recurvatus* is aberrant in a number of characters and may eventually have to be transferred to another genus. However, at present I cannot suggest a better genus to accommodate it.

I thank Dr. J. A. L. Cooke for his kind hospitality during my stay at the American Museum of Natural History (AMNH) in 1970. Dr. H. W. Levi is most warmly thanked for placing the collections of the Museum of Comparative Zoology (MCZ) at my disposal. Dr. I. Valovirta of the Zoological Museum of Helsinki University (ZMHU) has been very helpful with the loan of specimens from Newfoundland. All measurements provided below are in millimeters.

OREONETIDES STRAND

Oreonetides Strand, 1901, p. 29 (described as a subgenus of *Macrargus* Dahl; type species by original designation *Erigone vaginata* Thorell).

Aigola Chamberlin, 1921, p. 36 (type species by original designation *Aigola pauliana* Chamberlin = *Oreonetides vaginatus*).

Labuella Chamberlin and Ivie, 1943, p. 6 (type species by original designation *Labuella prosaica* Chamberlin and Ivie = *Oreonetides vaginatus*).

Montitextrix Denis, 1963, p. 263 [type species by original designation *Linyphia glacialis* (L. Koch)]. NEW SYNONYMY.

DIAGNOSIS: The genus is characterized by the features listed in the Introduction (characters 6 through 10), and also by the characters mentioned by Saaristo (1972), with the exception of those discussed in the Introduction (characters 1 through 5), which are not shared by all species of the genus (see also table 1).

SYNONYMY: *Montitextrix* is here considered a synonym of *Oreonetides,* but is maintained as a subgenus to accommodate the European *O. glacialis* and the North American *O. flavescens.* All other species are here placed in the other, nominate subgenus

TABLE 1
Characters of *Oreonetides* Species

Species	Size range (in mm.)	Male chelicerae modified	Chelicerae		Tm I	Tm IV	Tibia I spines			Isolated hair on para-cymbium
			Frontal row	Posterior row			1′	1″	v	
O. (O.) filicatus	♂ 1.8–2.3 ♀ 1.9–2.5	–	6	4	0.27–0.33	—	—	—	—	+
O. (O.) flavus	♂ 2.0 ♀ 1.65–1.85	–	4	5 (minute)	0.32–0.36	—	—	—	—	–
O. (O.) rectangulatus	2.0–2.35	+	2 + 2	—	0.28–0.29	—	1	—	—	–
O. (O.) recurvatus	2.7–3.0	+	3	2 (♀: 5)	0.15–0.20	—	1	1	2	–
O. (O.) rotundus	1.9–2.2	–	5–6	5	0.32–0.36	—	—	—	—	+
O. (O.) vaginatus	3.0–4.5	–	6	5	0.40	—	1	—	—	+
O. (M.) flavescens	♂ 1.6–1.8 ♀ 1.85–2.0	–	3	1	0.32–0.33	0.32–0.35	1	—	—	+
O. (M.) glacialis	2.0–3.0	–	5(–6)	5	0.65–0.75	0.63–0.68	—	—	—	+

Oreonetides. This view is supported by the following considerations:

(1) *Montitextrix* was created because of the absence of a 1'-spine on tibia I in *M. glacialis*; the present study reveals that this is also the case in *O. filicatus, O. flavus,* and *O. rotundus,* while it is present in *O. flavescens, O. rectangulatus, O. recurvatus* (all North American), and *O. firmus* and *O. abnormis* (both European).

(2) Denis furthermore indicated the presence of a trichobothrium on metatarsus IV in *M. glacialis*; this is indeed the case, but it is also found in *O. flavescens,* whereas it is lacking in all other North American species; however, the position of the trichobothrium on metatarsus I (and IV) is strikingly different in *O. glacialis* as opposed to all other species of *Oreonetides,* North American and European (see the synoptic table below).

(3) Denis also stated the genitalia, especially the epigynum, to be of distinct structure. In my opinion the form of the epigynum of *M. glacialis* (and of *O. flavescens* as well) fit in well with the general form of the epigyna of *Oreonetides*; in the male palpi I cannot detect any basic structural differences (for a description of *O. glacialis,* with many figures of the genital organs, see Wiehle, 1960, pp. 215–217, figs. 28–33).

Thus, none of the characters used by Denis are deemed to be of enough importance to maintain *Montitextrix* as a separate genus. It is here, however, retained as a subgenus for the species which have the trichobothrium on the fourth metatarsus as a shared character. The other species, not having a trichobothrium on the fourth metatarsus, are grouped together in the nominate subgenus *Oreonetides*.

Personally, I do not consider the presence or absence of a trichobothrium on metatarsus IV a useful generic character within the Linyphiidae. In *Macrargus,* for instance, *M. rufus* (Wider) of Europe has no such trichobothrium, but the Nearctic *M. multesimus* (O. P.-Cambridge) does. There are also other examples of instability of this character within one genus.

I have not constructed a key for the Nearctic species because specimens are most easily identified by comparing the epigynum or male palp with the illustrations and confirming the result by checking the diagnosis of the species concerned. A synoptic table is added to provide a quick survey of the major characters of the known Nearctic species (table 1).

MISPLACED SPECIES: *Oreonetides portoricensis* Petrunkevitch (1930) was correctly transferred to *Eperigone* by Saaristo (1972). The holotype female (Peabody Museum, Yale University) is a light specimen but is still readily identifiable as *Eperigone tridenta* (Emerton), which is an older name (see Crosby and Bishop, 1928; new synonymy).

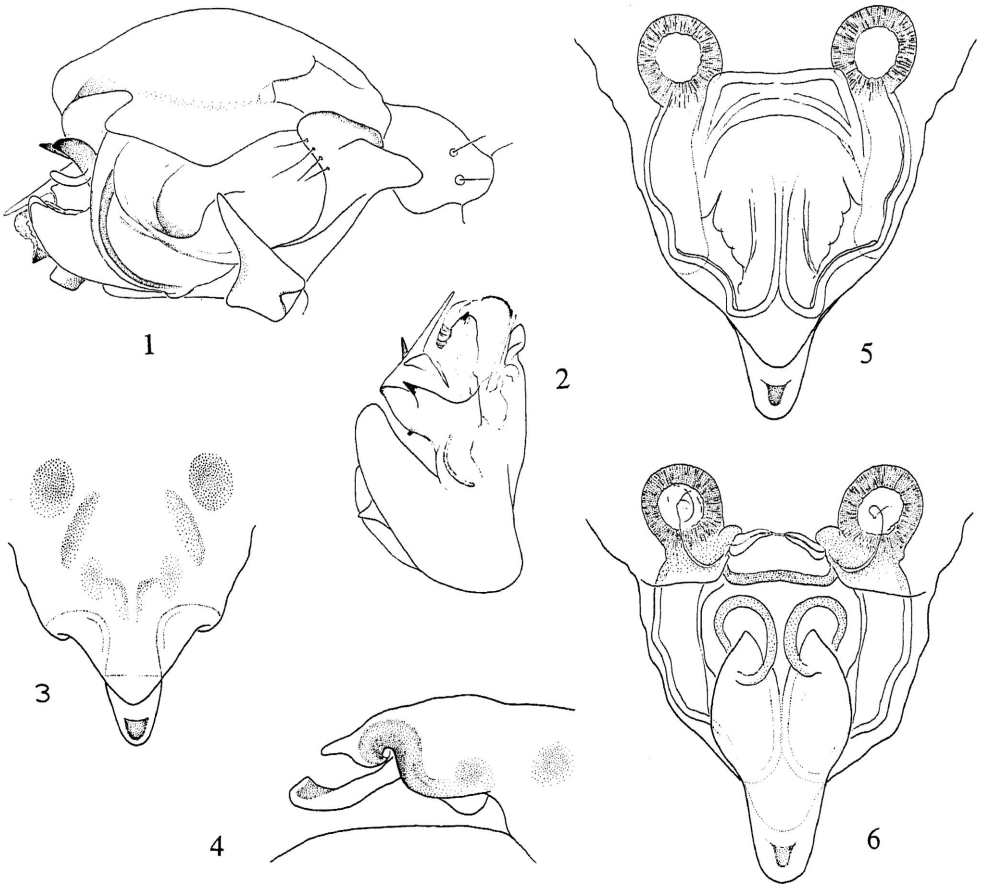
Oreonetides (Oreonetides) vaginatus (Thorell)
Figures 25–28

For the synonymy of this, the type species of *Oreonetides,* see Bonnet (1958) and Saaristo (1972); contrary to Saaristo, I consider *O. filicatus* a distinct species and not a synonym of *O. vaginatus* (see below). A full description of the species with 17 very detailed figures of the secondary genitalia is in Saaristo (1972); I here provide illustrations of the male palp and epigynum so as to allow comparison with the other species.

The species occurs in the north temperate regions of both Eurasia and North America. In Eurasia it is also recorded from arctic-alpine regions (among others, the Pyrenees, Alps, Carpathians, and Tatras), Kamchatka, and Japan. In North America it occurs from Alaska to Newfoundland (and Greenland), south to Utah, Wyoming, Michigan, and New York; I have also seen a single female from the Grand Canyon of Arizona (AMNH). The species inhabits mire in the north and moss, litter, and the lower stratum of the vegetation in more elevated areas in the south.

Oreonetides (Oreonetides) filicatus (Crosby)
Figures 1–6

Aigola filicata Crosby, 1937, p. 37, pl. 1, figs. 3, 4 (male holotype from Skagway, Alaska, in AMNH, examined).

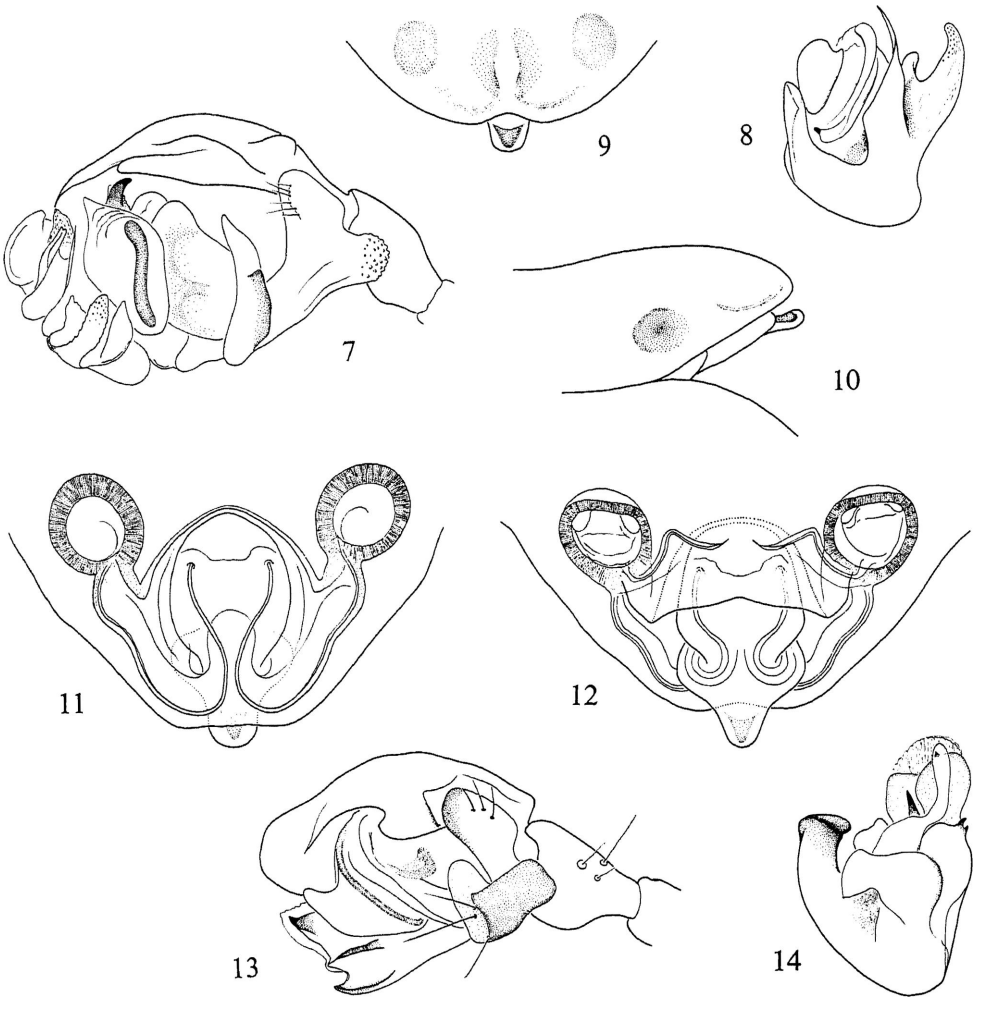


FIGS. 1–6. *Oreonetides* (*O.*) *filicatus* (Crosby), specimens from California. 1. Male palp, lateral view. 2. Male palp, embolic section, ventral view. 3. Epigynum, ventral view. 4. Epigynum, lateral view. 5. Vulva, ventral view. 6. Epigynum, dorsal view. 1, 2: 135×; 3, 4: 128×; 5, 6: 166×.

Oreonetides filicatus: Chamberlin and Ivie, 1947, p. 60.

NOTE: *Oreonetides filicatus* is distinctly different from *O. vaginatus*. The suggestions of the two being conspecific (Chamberlin and Ivie, 1947; Saaristo, 1972) probably were based on the known occurrence of both species in Alaska.

DIAGNOSIS: With the following combination of characters: small species (total length of male 1.8–2.3, of female 1.9–2.5). Cephalothorax, sternum, chelicerae, and legs brown with faint gray suffusion at places. Abdomen whitish, in some specimens with ill-defined grayish bars dorsally, broadly gray ventrally. Femur I distinctly shorter than cephalothorax (ratio 0.82–0.88); tibia slightly shorter than femur. No lateral spines on tibiae. Chelicerae with fine stridulating files; frontal margin with regular row of six teeth, posterior with four. Male palp, figures 1, 2; paracymbium with backward protrusion characteristic for genus; isolated hair present, situated near base of distal branch; tegulum with upcurved tip (lateral aspect); radix U-shaped; embolic complex not studied in detail. Epigynum and vulva, figures 3–6; greatest width at base of scape 0.26–0.31; length, from anterior-most point of receptac-



FIGS. 7–14. 7–12. *Oreonetides* (*O.*) *flavus* (Emerton), male lectotype, female paralectotype. 7. Male palp, lateral view. 8. Male palp, embolic section, ventral view. 9. Epigynum, ventral view. 10. Epigynum, lateral view. 11. Vulva, ventral view. 12. Vulva, dorsal view. 13, 14. *O.* (*O.*) *rectangulatus* (Emerton), male holotype. 13. Male palp, lateral view. 14. Male palp, embolic section, ventral view. 7–10, 13: 130×; 11, 12: 196×; 14: 166×.

ula to tip of scape, 0.30–0.34; tip of ventral plate slightly prolonged, scape with socket; entrances of sperm ducts thought to lie between ventral plate and distal portion of scape, rather far anterad, ducts curving posterad, then ventrad, then laterad and in anterior direction along sides of protruding epigynum until they reach receptacula; fertilization ducts short, running directly from receptacula to dorsal side of complex; exact course of sperm ducts not understood.

MATERIAL EXAMINED: **United States**: *Alaska:* 3 mi. from Skagway, trail to Denver Glacier, June 25, 1936 (AMNH), 1♂ (holotype). *California:* Siskiyou Co.: McCloud, Sept. 2, 1959 (W. J. Gertsch, V. Roth,

AMNH), 3♂, 14♀. *Oregon:* Linn Co.: Tombstone Prairie, Santiam Pass, May 27, 1949 (V. Roth, F. Beer, AMNH), 1♀. *Washington:* Stevens Co.: Cedar Lake, N Leadpoint, May 1962 (W. Ivie, AMNH), 2♀, Sept. 30, 1964 (AMNH), 1♀.

Oreonetides (*Oreonetides*) *flavus* (Emerton)
Figures 7–12

Microneta flava Emerton, 1915, p. 152, pl. 3, fig. 2 (male lectotype here designated from Lake Louise, Alberta, Canada, in MCZ, examined); 1920, p. 319.
Aigola flava: Crosby, 1937, p. 38, pl. 1, figs. 5, 6.
Oreonetides flavus: Van Helsdingen, 1973, p. 57.

DIAGNOSIS: With the following combination of characters: small species (total length of female 1.65–1.85; single male known cannot have been much larger, because cephalothorax measures 0.85). Cephalothorax and appendages orange-brown, abdomen light orange with gray suffusion. Legs short; femur I shorter than cephalothorax (ratio 0.80–0.85). No lateral spines on tibiae. Tm I 0.32–0.36. Chelicerae not constricted near tip, with fine stridulating files; frontal margin with four teeth, posterior row consisting of five minute denticles. Male palp, figures 7, 8; cymbium with lateral lobe; paracymbium has posterior protrusion covered with minute papillae, distal branch bearing chitinized ridge; no special, isolated hair could be found on paracymbium; upturned terminal appendages (lamella and terminal apophysis) of characteristic shape (lateral view). Epigynum and vulva, figures 9–12; tip of stretcher protruding from under broad (much broader than long) basal part of scape; vulva shows folded apical part of scape to lie relatively far anteriad; width of chitinized part of scape 0.25.

MATERIAL EXAMINED: **Canada**: *Alberta:* Laggan (or Louggan, as per collection label), Lake Louise, in moss, Aug. 10, 1905 (J. H. Emerton or N. B. Samson, MCZ), 1♂ (lectotype), 1♀ (paralectotype). **United States:** *New York:* Nassau Co.: Sea Cliff, Long Island (MCZ), 1♀.

Oreonetides (*Oreonetides*) *rectangulatus* (Emerton)
Figures 13, 14

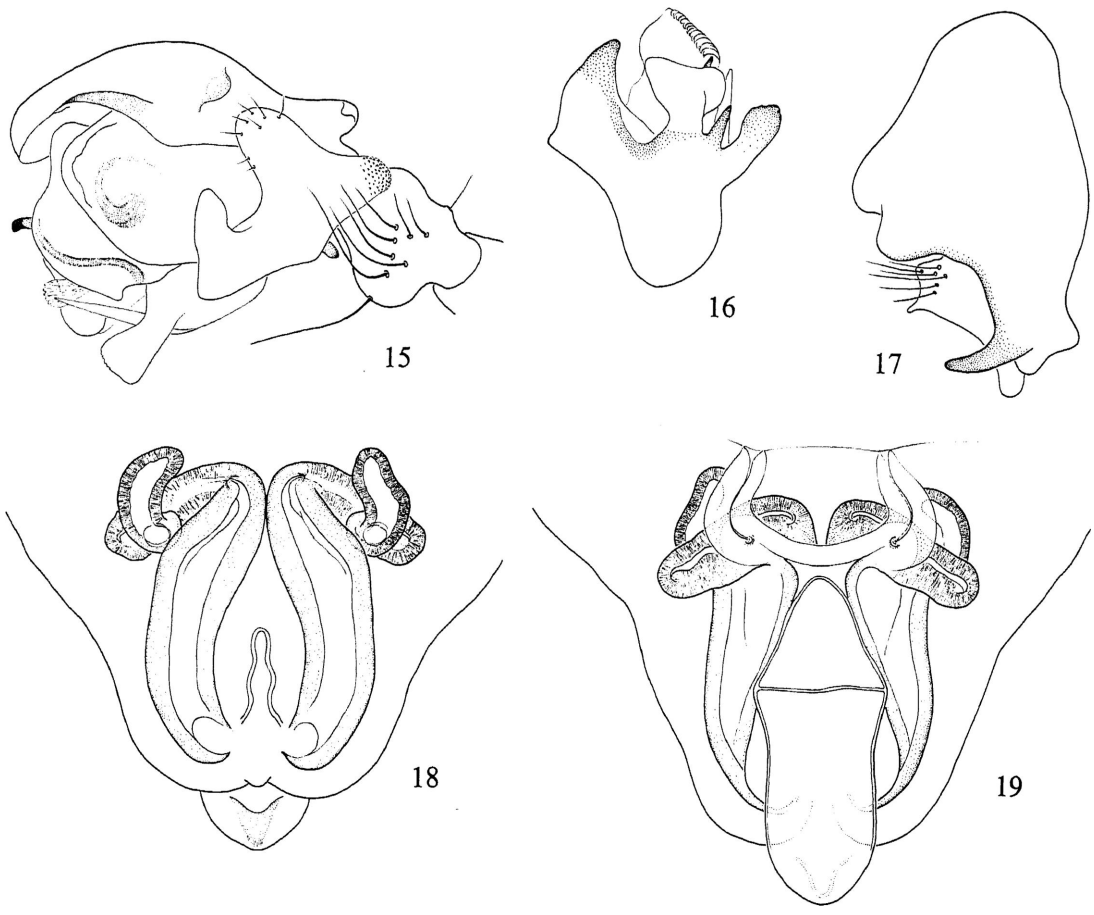
Microneta rectangulata Emerton, 1913, p. 217, pl. 2, fig. 5 (male holotype from Readville, Suffolk County, Massachusetts, in MCZ, examined); 1919, p. 167.
Aigola rectangulata: Crosby, 1937, p. 39, pl. 1, fig. 9. Kaston, 1948, p. 213.
Oreonetides rectangulatus: Van Helsdingen, 1973, p. 57.

DIAGNOSIS: With the following combination of characters: total length 2.0–2.35. Cephalothorax and appendages dark brown, abdomen dark gray. Legs rather stout, femur I about as long as cephalothorax. Tibia I with one 1′-spine. Tm I 0.28–0.29. Chelicerae with strongly convex frontal surface, conspicuously constricted just before tip (especially seen from side); prominent frontal tooth, with single hair on top, at two-thirds of length, slightly nearer to inner margin than to side; frontal row with two distinct teeth, in apical direction followed by two small, wartlike tubercles; posterior row absent (probably a case of sexual dimorphism, but female unknown); stridulating files distinct, coarse. Male palp, figures 13, 14; paracymbium with three hairs near anterior margin of distal part; lateroventral part well-pigmented, squarish; whole element with branches perpendicular to each other (hence the name); no special hair could be found between base and distal branch; tegulum with upcurved anterolateral tip (lateral aspect); base of embolus, at bottom part of U-shaped radix, strongly developed.

MATERIAL EXAMINED: **United States**: *Massachusetts:* Suffolk Co.: Readville, in moss on fence, Nov. 1911 (MCZ), 1♂ (holotype), Nov. 6, 1913 (J. H. Emerton, MCZ), 2♂, Nov. 1918 (J. H. Emerton, MCZ), 2♂.

Oreonetides (*Oreonetides*) *recurvatus* (Emerton)
Figures 15–19

Bathyphantes recurvatus Emerton, 1913, p. 218, pl. 2, fig. 8 (male holotype from Gore Moun-



FIGS. 15–19. *Oreonetides (O.) recurvatus* (Emerton), male holotype, female from Alberta. 15. Male palp, lateral view. 16. Male palp, embolic section, ventral view. 17. Male palp, cymbium, dorsal view. 18. Vulva, ventral view. 19. Vulva, dorsal view. 15–17: 80×; 18, 19: 160×.

tain, Norton, Essex County, Vermont, in MCZ, examined).

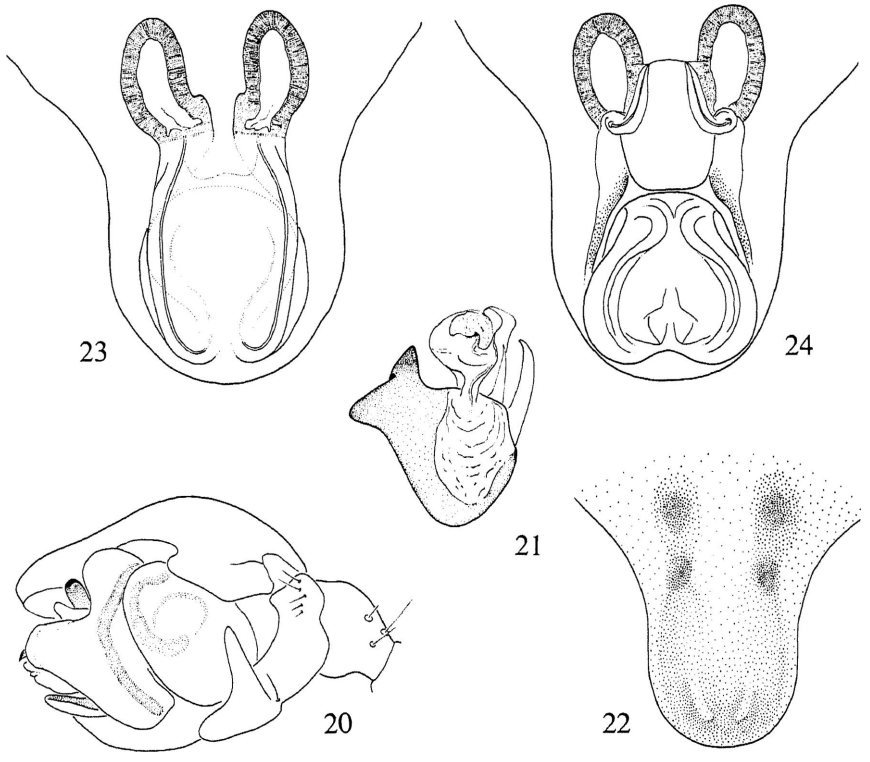
Aigola recurvata: Crosby, 1937, p. 40, pl. 1, fig. 10.

Troglohyphantes kokoko Ivie, 1966, p. 226, figs. 6, 7 (female holotype from Ko-Ko-Ko Bay, Lake Timagami, Ontario, Canada, in AMNH, not examined). First synonymized by Van Helsdingen, 1973, p. 55.

Oreonetides recurvatus: Ivie, 1969, p. 7. Van Helsdingen, 1973, p. 55.

DIAGNOSIS: In 1973, I provided a redescription of this species and depicted the male palp and epigynum. New figures are included here for the sake of completeness. The species is characterized by: long legs (femur I 1.8–1.9 times as long as cephalothorax) with more elaborate spination: femora I–III with one d-spine, femur I with additional 1′-spine, tibia I with one 1′, one 1″, and two v-spines, tibia II with one 1′ and one v-spine, all metatarsi with one d-spine; Tm I 0.15–0.20; chelicerae with reduced number of teeth (three) in frontal row; stridulating files well developed, ridges close together; cymbium of male palp with conspicuous proximolateral hooklike projection (fig. 17); epigynum comparable to that of *O. filicatus,* but broader.

DISTRIBUTION: The species ranges from



FIGS. 20–24. *Oreonetides (O.) rotundus* (Emerton), male holotype, female paratype (of *M. clavata*). 20. Male palp, lateral view. 21. Male palp, embolic section, ventral view. 22. Epigynum, ventral view. 23. Vulva, ventral view. 24. Vulva, dorsal view. 20–22: 144×; 23, 24: 185×.

the East Coast as far as the Rocky Mountains. So far four localities are known, including the type localities of the two synonyms. Crosby (1937) recorded the species from New York; on a previous occasion (Van Helsdingen, 1973) I mentioned specimens from George Lake, Alberta. Ecological data are not available.

Oreonetides (Oreonetides) rotundus (Emerton)

Figures 20–24

Micronetta rotunda Emerton, 1913, p. 216, pl. 2, fig. 4 (male holotype from Moosilauke Mountain, Grafton County, New Hampshire, in MCZ, examined).

Micronetta clavata Emerton, 1917, p. 265 [female only; not male lectotype = *Porrhomma terrestris* (Emerton)]. Bishop and Crosby, 1938, p. 81.

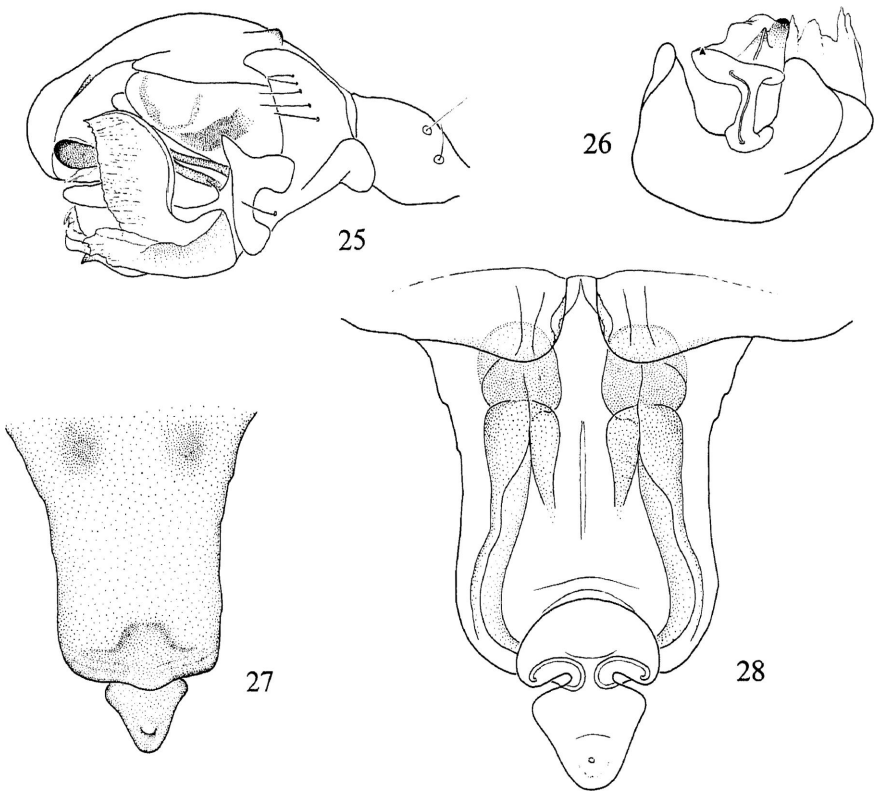
Eulaira clavata: Chamberlin and Ivie, 1933, p. 14.

Aigola rotunda: Crosby, 1937, p. 41, fig. 11.

Diplocentria corynetes Chamberlin and Ivie, 1945, p. 10, fig. 27 (female holotype from McLean, Tompkins County, New York, in AMNH, not examined). Hackman, 1954, p. 57. Vogel, 1967, p. 69. NEW SYNONYMY.

Oreonetides rotundus: Van Helsdingen, 1973, p. 57.

NOTE: *Micronetta rotunda* was described from a single male by Emerton (1913). The female of this species came into his possession a few years later (1917) through C. R. Crosby, but Emerton mistakenly linked it with the male of another species, which he then described as *Micronetta clavata*. The two sexes were correctly disconnected by later authors; the male was selected as the lectotype and synonymized with *Sciastes terrestris* (Emerton), now placed in *Por-*

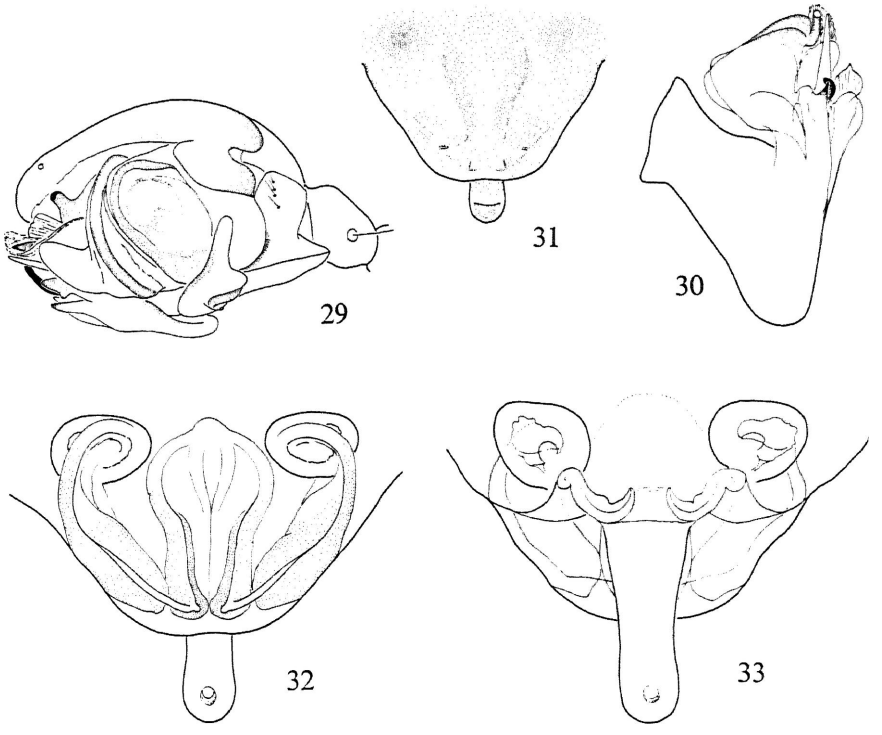


FIGS. 25–28. *Oreonetides* (*O.*) *vaginatus* (Thorell), specimens from Alaska. 25. Male palp, lateral view. 26. Male palp, embolic section, ventral view. 27. Epigynum, ventral view. 28. Vulva, dorsal view. 25–27: 100×; 28: 133×.

rhomma; the female paratype was placed in *Eulaira* and later transferred to *Diplocentria*, but is here placed with *Oreonetides rotundus* (Emerton). I have not examined the holotype of *Diplocentria corynetes*, but the female paratypes of *M. clavata* (examined) were listed by Chamberlin and Ivie as conspecific and the illustration given leaves no doubt about the identity of the species. The female specimen from Newfoundland recorded by Hackman (1954) was examined and found to belong to *O. rotundus*.

DIAGNOSIS: With the following combination of characters: small species (total length 1.9–2.2). Cephalothorax and appendages yellow-brown, abdomen light gray. Legs short, stout, femur I much shorter than length of cephalothorax (ratio 0.7 in male, 0.8–0.9 in female), tibia I 6.5–8 diameters long, without lateral spines. Tm I 0.32–0.36. Chelicerae without constriction above tip, stridulating files coarse; frontal row with five (female) or six (male) teeth, posterior row with five denticles. Male palp, figures 20, 21; cymbium with lateral lobe; paracymbium with anteroventral, lamellate protrusion; posterior extension hardly developed; anterior extension of tegulum well-developed; radix with broad mesal branch. Epigynum and vulva, figures 22–24; epigynum strongly protruding, narrow, rounded at tip; in vulva preparation, folded scape can be discerned as two short, rounded structures; entrances of sperm ducts situated near tip of scape, which is excised in middle.

MATERIAL EXAMINED: **Canada**: *Alberta:*



FIGS. 29–33. *Oreonetides* (*Montitextrix*) *flavescens* (Crosby), specimens from Newfoundland. 29. Male palp, lateral view. 30. Male palp, embolic section, ventral view. 31. Epigynum, ventral view. 32. Vulva, ventral view. 33. Vulva, dorsal view. 29: 133×; 30: 185×; 31: 142×; 32, 33: 200×.

camp nr. Carrot Creek, Aug. 25, 1965 (J. and W. Ivie, AMNH), 1♀. *Newfoundland:* St. John Bay, Doctors Hill, litter in uppermost forest zone, July 29, 1949 (E. Palmén, ZMHU), 1♀. **United States**: *Michigan:* Charlevoix Co.: Beaver Island, northern white cedar–balsam fir forest litter, Sept. 5, 1962 (L. C. Drew, AMNH), 1♂. *New Hampshire:* Grafton Co.: Moosilauke Mt., May 29, 1912 (J. H. Emerton), 1♂ (holotype). *New York:* Essex Co.: Wilmington Notch, Adirondack Mtns. (C. R. Crosby, MCZ), 2♀ (paralectotypes).

Oreonetides (*Montitextrix*) *flavescens* (Crosby)

Figures 29–33

Aigola flavescens Crosby, 1937, p. 39, pl. 1, figs. 7, 8 (male holotype from Wawbeck, Franklin County, New York, not examined).

Oreonetides flavescens: Hackman, 1954, p. 55. Van Helsdingen, 1973, p. 57.

NOTE: I have not seen the original material (collected on October 23, 1934) of this species. Crosby mentioned a holotype, three paratypes from the type locality, and three males from two other localities. None of these specimens could be found in the Cornell University collection housed at the American Museum of Natural History when I visited the institute in 1970. Crosby described the male in detail, but did not mention anything about the characteristics of the female, although he explicitly recorded an "allotype female" from the type locality. The illustrations also concern only the male. Hackman (1954) recorded both sexes from Newfoundland, but again added no particulars about the female. This material is in the Zoological Museum of the Helsinki Univer-

sity. The following diagnosis is based on these specimens.

DIAGNOSIS: With the following combination of characters: small species (total length 1.8–2.0). Cephalothorax, chelicerae, and sternum brown with gray suffusion, legs yellow-brown, abdomen dark gray. Femur I much shorter than cephalothorax (ratio 0.75–0.80), tibia I slightly shorter than femur and only 5–5.5 diameters long. Tibia I with single 1′-spine. Tm I 0.32–0.33, Tm IV 0.32–0.35. Chelicerae with very coarse stridulating files, three teeth in frontal row, one very small denticle in posterior row. Female palp with slightly swollen tarsus, resembling some *Agyneta* species. Male palp, figures 29, 30; paracymbium not much prolonged posteriorly, but with ridge along outside of ventral branch; isolated hair present close to base of distal branch; tegulum with upcurved tip (lateral aspect); radix strongly pointed proximally; tip of embolus visible in ventral view as gray, truncated pipe, lying free. Epigynum and vulva, figures 31–33; in ventral aspect, epigynum resembles that of *O. flavus,* but it is slightly more prolonged; vulva reveals structure similar to the European *O.* (*M.*) *glacialis*; greatest width of scape (at base) 0.27; tip of folded scape with socket; entrances of sperm ducts situated in curve between terminal section of scape and ventral section, far anterad; sperm ducts curve posterad, run parallel toward posterior border of ventral plate of epigynum, thence curve in anterior direction toward receptacula seminis.

MATERIAL EXAMINED: **Canada**: *Newfoundland:* Grandy Brook, litter above high-water line, June 24, 1949 (E. Palmén, ZMHU), 1♂.

DISTRIBUTION: Known only from bogs, swamps, or litter in New York (records published by Crosby) and Newfoundland.

LITERATURE CITED

Bishop, Sherman C., and Cyrus R. Crosby
1938. Studies in American spiders: Miscellaneous genera of Erigoneae, part II. Jour. New York Ent. Soc., vol. 46, pp. 55–96, pls. 1–7.

Bonnet, Pierre
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4230.

Chamberlin, Ralph V.
1921. Linyphiidae of St. Paul Island, Alaska. Jour. New York Ent. Soc., vol. 29, pp. 35–43, pls. 3, 4.

Chamberlin, Ralph V., and Wilton Ivie
1933. Spiders of the Raft River Mountains of Utah. Bull. Univ. Utah, Biol. Ser., vol. 2, no. 2, pp. 1–79, pls. 1–12.
1943. New genera and species of North American Linyphiid spiders. *Ibid.*, vol. 7, no. 6, pp. 1–39, pls. 1–5.
1945. Some Erigonid spiders of the genera *Eulaira* and *Diplocentria*. *Ibid.*, vol. 9, no. 4, pp. 1–19, pls. 1–3.
1947. The spiders of Alaska. *Ibid.*, vol. 10, no. 3, pp. 1–103, pls. 1–11.

Crosby, Cyrus R.
1937. Studies in American spiders: the genus *Aigola* Chamberlin. Proc. Biol. Soc. Washington, vol. 50, pp. 35–42, pl. 1.

Crosby, Cyrus R., and Sherman C. Bishop
1928. Revision of the spider genera *Erigone, Eperigone* and *Catabrithorax* (Erigoneae). New York State Mus. Bull., vol. 273, pp. 1–73, pls. 1–12.

Denis, Jacques
1963. Araignées des Dolomites. Atti Ist. Veneto Sci. Lett. Art., vol. 121, pp. 253–271.

Emerton, James Henry
1913. New England spiders identified since 1910. Trans. Connecticut Acad. Arts Sci., vol. 18, pp. 209–224, pls. 1, 2.
1915. Canadian spiders, II. *Ibid.*, vol. 20, pp. 145–160, pls. 1–3.
1917. New spiders from Canada and the adjoining states. Canadian Ent., vol. 49, pp. 261–272.
1919. The flights of spiders in the autumn of 1918 (Arach., Aran.). Ent. News, vol. 30, pp. 165–168.
1920. Catalogue of the spiders of Canada known to the year 1919. Trans. Roy. Canadian Inst., vol. 12, pp. 309–338.

Hackman, W.
1954. The spiders of Newfoundland. Acta Zool. Fennica, vol. 79, pp. 1–99.

Helsdingen, P. J. Van
1973. Annotations on two species of linyphiid spiders described by the late Wilton Ivie. Psyche, vol. 80, pp. 48–61.
Ivie, Wilton
1966. Two new North American spiders (Araneae: Linyphiidae). Jour. New York Ent. Soc., vol. 74, pp. 224–227.
1969. North American spiders of the genus *Bathyphantes* (Araneae, Linyphiidae). Amer. Mus. Novitates, no. 2364, pp. 1–70.
Kaston, Benjamin J.
1948. Spiders of Connecticut. Bull. Connecticut Geol. Nat. Hist. Survey, vol. 70, pp. 1–874.
Petrunkevitch, Alexander
1930. The spiders of Porto Rico, 2. Trans. Connecticut Acad. Arts Sci., vol. 30, pp. 163–355.
Saaristo, Michael I.
1972. Redelimitation of the genus *Oreonetides* Strand, 1901 (Araneae, Linyphiidae), based on an analysis of the genital organs. Ann. Zool. Fennici, vol. 9, pp. 69–74.
Strand, Embrik
1901. Theridiiden aus dem nördlichen Norwegen. Archiv Mathem. Naturvidensk., vol. 24, no. 2, pp. 1–66.
Vogel, Beatrice R.
1967. A list of new North American spiders 1940–1966. Mem. Amer. Ent. Soc., vol. 23, pp. 1–186.
Wiehle, Hermann
1960. Beiträge zur Kenntnis der deutschen Spinnenfauna. I. Linyphiidae-Theridiidae. Zool. Jahrb., vol. 88, pp. 195–254.

The Erigonine Spiders of North America. Part 5. The Genus *Satilatlas* (Araneae, Linyphiidae)

A. F. MILLIDGE[1]

ABSTRACT

The genus *Satilatlas* is revised, and synapomorphic genitalic characters are identified. The seven known North American species are diagnosed and described; these include five new taxa: *Satilatlas carens* from Saskatchewan, *S. gentilis* from Utah and Wyoming, *S. gertschi* from Alberta, *S. insolens* from Idaho, and *S. monticola* from Colorado. The synonymy of *Perimones* Jackson with *Satilatlas* is confirmed, but the synonymy of *S. (Perimones) britteni* (Jackson), the sole European member of the genus, with *S. arenarius* (Emerton) is rejected.

INTRODUCTION

It is a pleasure to contribute this modest paper as a token of my esteem for Willis J. Gertsch.

The genus *Satilatlas* is one of a large group of erigonine genera in which the male palpal organs have the embolus in the form of a coil with a short tailpiece. *Satilatlas* was established by Keyserling (1886) for the species *S. marxii* Keyserling, and the genus appears to have been largely ignored by subsequent authors. It was not considered by Crosby and Bishop in any of their numerous publications on the North American erigonine spiders, and no additional species have been added to the genus since the original description. Simon (1894) synonymized *Satilatlas* with *Maso* Simon, but this was incorrect, the two genera being quite distinct in their genitalia and in other characters.

Examination of the type of *S. marxii* (AMNH) in the fall of 1977 showed that the palpal conformation (Millidge, 1977) of this species was identical with that of the European species *Perimones britteni* Jackson, and that the generic name *Satilatlas* must therefore be a senior synonym of *Perimones* Jackson (1932). This synonymy was published shortly afterward by Lehtinen (1978), who did not present evidence to support his conclusion. The species *Lophocarenum arenarium* Emerton, subsequently described by Crosby and Bishop (1933) as *Minyriolus arenarius,* was shown by Dondale and Redner (1972) to belong in *Perimones,* and this species must now be transferred to *Satilatlas*. Examination of North American material (mostly labeled "*Minyriolus*") from AMNH, MCZ, and CNC has disclosed the presence of several additional species of *Satilatlas*. It should be mentioned that no true members of the genus *Minyriolus* Simon seem to be present in North America. The genus *Satilatlas* now comprises eight species, seven of which are (so far as is known) endemic to North America.

The distribution of *S. marxii* appears to be anomalous, with most of the records located on the eastern side of the continent but with the type locality in the Aleutian Islands. The type specimen is from the notoriously mislabeled Marx collection, however, and the Alaskan record is probably erroneous. *Satilatlas arenarius* has been confused with *S. marxii* on several occasions, even by Emerton himself; the two species are sympatric in Massachusetts, and possibly elsewhere. The

[1] Little Farthing, Upper Westhill Road, Lyme Regis, Dorset, England DT7 3ER.

European *S. britteni* is not identical with *S. arenarius*, as was suggested by Dondale and Redner (1972). The differences between *S. carens* and *S. britteni* are small (see the description of *S. carens*), but it seems preferable to regard the two species as distinct; these spiders are not synanthropic, and hence the North American and European populations have probably been genetically isolated from one another for a long period. *Satilatlas britteni* is not described in this paper, but figures are given to show the differences from the North American species. The genus is so homogeneous that no division into species groups is necessary.

All the species, both North American and European, favor wet habitats (e.g., marshes, the seashore, and under stones on mountains). The males are adult in spring (from the end of April to June) and occasionally also in the fall.

Definitions of the terms used are given in Part 1 of the series (Millidge, 1980). All measurements are in millimeters; scale lines in figures are 0.1 millimeter.

I am indebted to the following for the supply of material and for help with literature and in other ways: Dr. N. I. Platnick, American Museum of Natural History (AMNH); Prof. H. W. Levi, Museum of Comparative Zoology, Harvard University (MCZ); Dr. C. D. Dondale, Canadian National Collection, Ottawa (CNC); Mr. F. R. Wanless and Mr. P. Hillyard, British Museum, Natural History (BMNH); and Mr. G. H. Locket, Stockbridge, England.

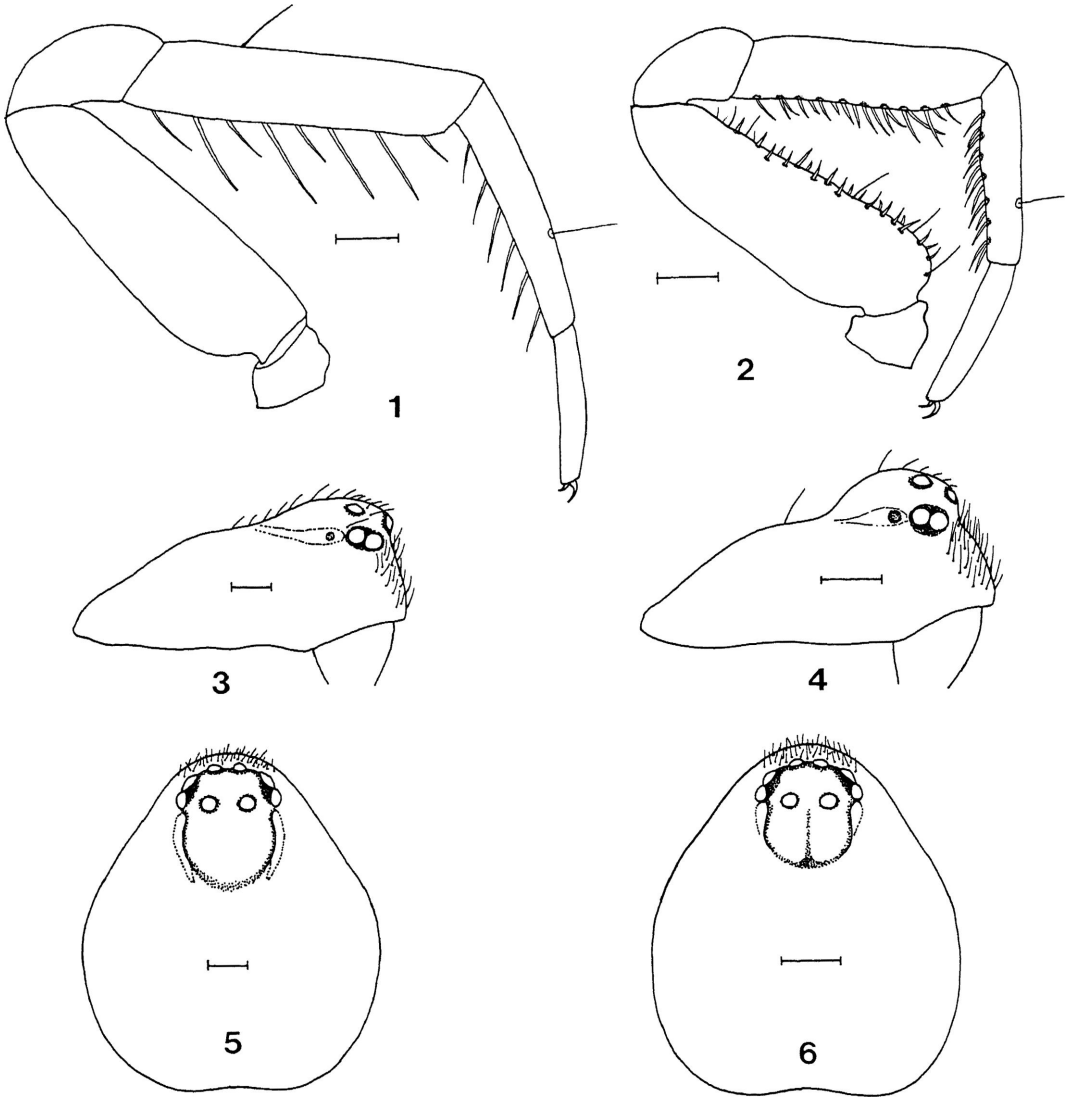
SATILATLAS KEYSERLING

Satilatlas Keyserling, 1886, p. 127 (type species by monotypy *S. marxii* Keyserling). Roewer, 1942, p. 621. Bonnet, 1958, p. 3937. The etymology of name is obscure: it is assumed that the gender is masculine (ICZN Article 30b-ii).

Perimones Jackson, 1932, p. 212 (type species by monotypy *Maso britteni* Jackson). Roewer, 1942, p. 621. Locket and Millidge, 1953, p. 270. Bonnet, 1958, p. 3483. Wiehle, 1960, p. 23.

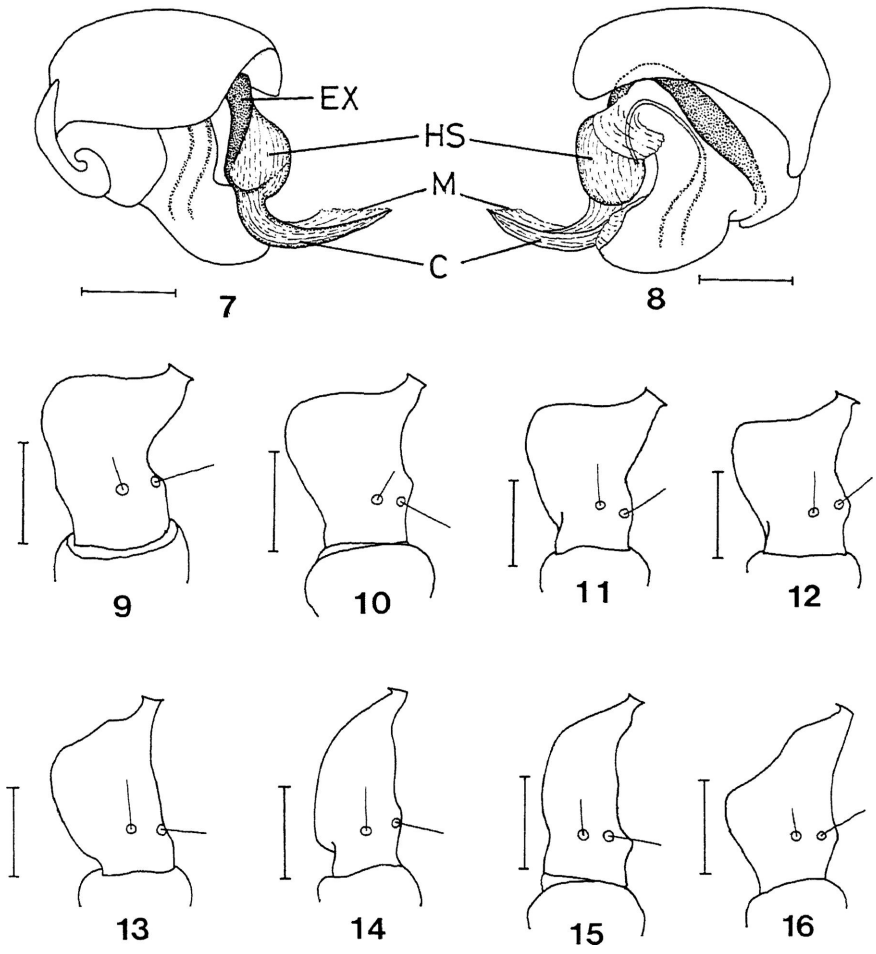
DIAGNOSIS: The males can be diagnosed by the presence of stout ventral spines on the tibiae and metatarsi of legs I–II (fig. 2) in conjunction with the presence on the clypeus of numerous short bristles (figs. 3, 4). Diagnosis can also be based on the form of the palpal organs, and particularly of the suprategular apophysis (figs. 7, 8; see the generic description below). The females can best be diagnosed by the form of the epigynum, which has anterior to the spermathecae a translucent tongue-like process (figs. 32–36). Diagnosis of the female is also possible on the basis of the chaetotaxy, viz. the combination of the ventral spines on the anterior tibiae and metatarsi (fig. 1) with the dorsal tibial spinal formula (1111) and the value of TmI (0.60–0.70)

DESCRIPTION: Total length: female 1.70–2.45, male 1.45–2.10. Carapace broad (figs. 5, 6) with l/w 1.15–1.20; males with shallow lobe, with holes and sulci behind lateral eyes, clypeus carrying fairly dense covering of short bristly hairs (figs. 3, 4). Cheliceral files very weak in both sexes. Sternum at least as wide as long; coxae IV well separated. Abdomen bears dorsally four clear brown impressed dots (muscle attachment points). Legs short, robust, with stout femora, tibia I l/d (female) 4–5. Tibial spinal formula 1111 in female, but in male spines on legs I, II, and often III are very short and inconspicuous, or sometimes absent. In most species, metatarsal trichobothrium absent on leg IV, but present in *S. insolens*; TmI value: female 0.60–0.70, male 0.55–0.70. Legs of male have irregularly paired rows of inclined spines ventrally on tibiae (7–15 pairs) and metatarsi (6–10) of legs I, II, also tibiae I, II somewhat swollen (fig. 2) and irregular spiny bristles on femora I, II. Females with dual rows of ventral spines on anterior tibiae (6–8) and metatarsi (6–10) (fig. 1), but spines usually longer and somewhat less stout than in male. Palpal tibia of male has anteriolaterally a short bicuspidate apophysis (figs. 9–16); mesally a pale-colored, less sclerotized area on tibia (A, fig. 18). Palpal tibia of both sexes with two trichobothria dorsally. Male palpal organs with simple U-shaped paracymbium, basal branch much longer than distal (fig. 17). On mesal side of palp, haematodocha clearly visible (H, fig. 18). Embolic division (ED) comprises spiral embolus



FIGS. 1–6. 1, 3, 5. *Satilatlas marxii*. 2, 4, 6. *S. arenarius*. 1. Female, leg I, lateral view. 2. Male, leg I, lateral view. 3, 4. Male carapace, lateral views. 5, 6. Male carapace, dorsal views.

of about one turn, radical part, and short tailpiece (fig. 18); duct enters ED from suprategulum via stout translucent stalk which covers upper section of radical part on mesal side (S, figs. 8, 18). In all species except *S. carens* and *S. britteni*, radical part extends below junction with embolus. Suprategular apophysis (SA) made up of sclerotized extension (EX, fig. 7) of suprategulum which carries at distal end an almost hemispherical, translucent appendage (HS, figs. 7, 8) from which arises a lightly sclerotized curved process (C, figs. 7, 8) having distally a subsidiary transparent membrane (M, figs. 7, 8). Curved process a shallow U in section, supporting embolus, probably functioning as conductor.



FIGS. 7–16. 7, 8. *Satilatlas marxii,* male palp, ED removed, ectal and mesal views. *Abbreviations:* C, curved process of SA; EX, sclerotized extension of suprategulum; HS, hemispherical translucent part of SA; M, subsidiary membrane. 9–16. Male palpal tibiae, dorsal views. 9. *S. marxii,* type. 10. *S. marxii,* specimen from Minnesota. 11. *S. carens.* 12. *S. britteni.* 13. *S. arenarius.* 14. *S. gentilis.* 15. *S. gertschi.* 16. *S. monticola.*

Epigynum anteriorly with translucent tongue-like process (figs. 32–36) which more or less covers shallow cavity holding openings to sperm ducts; gap around tongue provides access to sperm ducts. Posteriorly, spermathecae visible on either side of two dark-colored longitudinal bars (supporting apodemes): always some intraspecific variation in shape of area enclosed by apodemes. Two sperm ducts run from cavity by more or less S-shaped pathway to enter spermathecae on dorsal side (fig. 37). Epigynum frequently covered anteriorly by reddish brown skin or crust (apparently an exudation around margins of tongue) which obscures form of tongue; crust can be detached with fine needle after immersion of spider for few minutes in cold 5 percent aqueous potash. General form of female genitalia constant for all species, which differ from one another mainly by shape of tongue.

COMPARISONS: The genitalia present syn-

apomorphic characters which support the hypothesis that the genus is monophyletic. The palpal organs of the male differ from those of other erigonine genera which have a coiled embolus in particular by the form of the SA, which seems to be unique to the genus. The female epigynum differs from those of other erigonine genera by the presence, anterior to the spermathecae, of the translucent tongue covering the openings to the sperm ducts. The presence of dual rows of ventral leg spines is not peculiar to *Satilatlas,* but occurs in several erigonine genera, e.g., *Maso* Simon and *Minicia* Thorell. In the BMNH there is a male labeled "*Satilatlas laeviceps* Keys. type: N. Mexico" (the name was never published) which has an armature of ventral spines very similar to that of *Satilatlas,* and the tibia I is similarly swollen; the palp and abdominal pattern of this spider show however that it almost certainly belongs to *Grammonota* Emerton. Some males of the genus *Gonatium* Menge also have numerous short ventral spines on the anterior femora, tibiae, and metatarsi, with tibia I swollen. However, the combination of the two characters: (i) the ventral leg spines, and (ii) the numerous clypeal bristles, is unique to the males of this genus, so far as I know.

KEY TO SPECIES OF *SATILATLAS*

1. Males 2
   Females (those of *S. insolens* and *S. monticola* unknown) 8
2. Trichobothrium present on metatarsus IV ..... *insolens*
   Trichobothrium absent from metatarsus IV 3
3. Carapace elevated anteriorly into very shallow lobe (figs. 3, 5) 4
   Carapace elevated anteriorly into rather higher lobe (figs. 4, 6) 5
4. ED with radical part extending below point of entry of embolus (figs. 18–20) .. *marxii*
   ED with radical part not extending below point of entry of embolus (fig. 22) ..... *carens*
5. Embolic coil large (figs. 28, 30) 6
   Embolic coil small (fig. 25) 7
6. Embolus stout, particularly at junction with radical part (fig. 29) ..... *gertschi*
   Embolus less stout (fig. 31) ..... *monticola*
7. Palpal tibia, viewed dorsally, fairly broad (fig. 13) ..... *arenarius*
   Palpal tibia, viewed dorsally, narrower and tapered (fig. 14) ..... *gentilis*
8. Epigynal tongue long and relatively narrow (figs. 32, 33) ..... *marxii, carens*[2]
   Epigynal tongue broader, with posterior margin arc-shaped (figs. 34–36) 9
9. Tongue very short (fig. 35); TmI 0.68–0.70 ..... *arenarius*
   Tongue longer (figs. 34, 36); TmI 0.60–0.62 10
10. Margin of tongue more or less semicircular (fig. 34) ..... *gentilis*
    Margin of tongue bow-shaped (fig. 36) ..... *gertschi*

Satilatlas marxii Keyserling

Figures 1, 3, 5, 7–10, 17–20, 32, 33; Map 1

Satilatlas marxii Keyserling, 1886, p. 128, fig. 207 (male holotype purportedly from Unalaska, Aleutian Islands, Alaska, probably mislabeled, in AMNH, examined). Roewer, 1942, p. 621.

Satilatlas marxi: Bonnet, 1958, p. 3937.

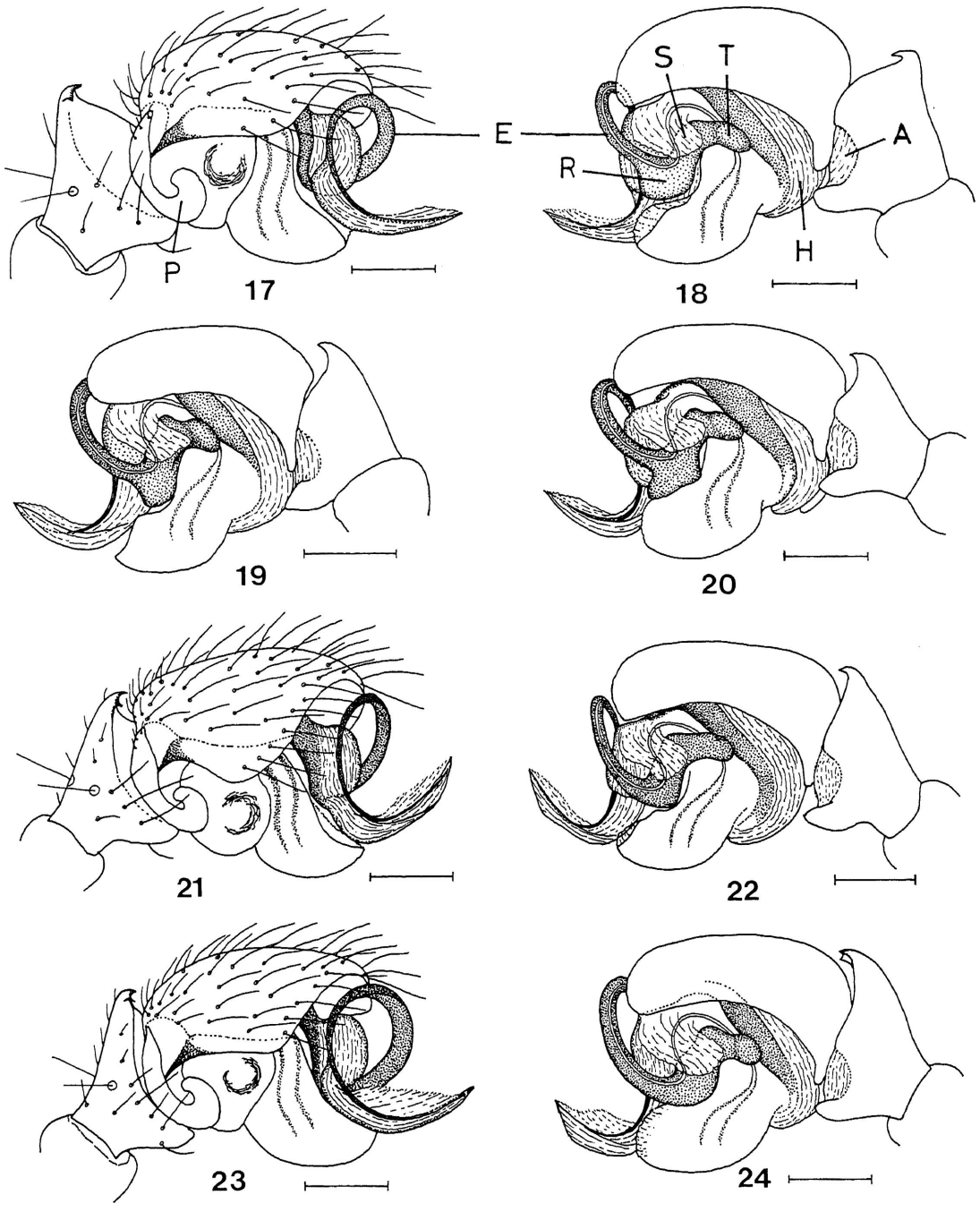
Maso marxi: Petrunkevitch, 1911, p. 256; Chamberlin and Ivie, 1947, p. 46.

Minyriolus arenarius: Crosby and Bishop, 1933, p. 136 (in part; see *S. arenarius*).

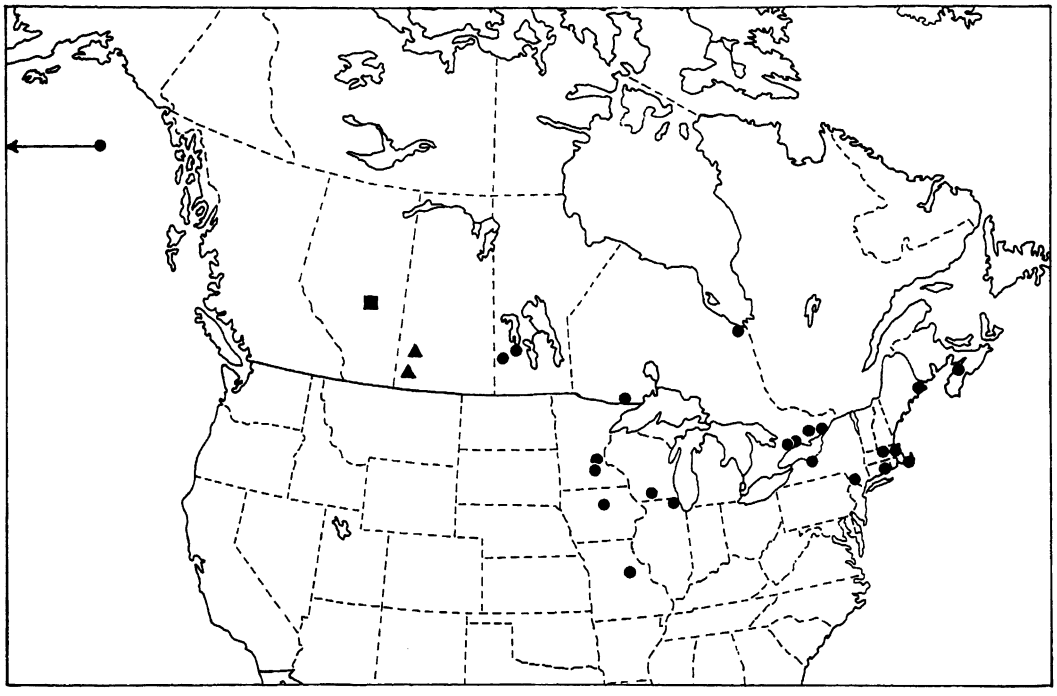
DIAGNOSIS: The male is diagnosed by the relatively shallow carapace lobe (figs. 3, 5) in conjunction with the form of the radical part of the ED, which extends beyond the junction with the embolus (figs. 18–20). The female is diagnosed by the long and relatively narrow tongue of the epigynum (figs. 32, 33), but no means of separating the females of *S. marxii* and *S. carens* is known. *Satilatlas marxii* has frequently been mistaken for *S. arenarius,* but the two species are in fact easily separable.

MALE: Total length 1.80–2.10. Carapace length 0.85–1.0. Carapace brown to dark brown with blackish markings and margins, raised anteriorly into shallow lobe (figs. 3, 5). Abdomen black, sternum brown, heavily suffused with black. Legs yellow to orange-

[2] These two species can be separated at present only by association with the corresponding males.



FIGS. 17–24. Male palpi. 17–20. *Satilatlas marxii*. 21, 22. *S. carens*. 23, 24. *S. britteni*. 17. Type male, ectal view. 18. Type male, mesal view. 19. Male from Minnesota, mesal view. 20. Male from Ontario, mesal view. 21, 23. Ectal views. 22, 24. Mesal views. *Abbreviations:* A, less sclerotized area; E, embolus; H, haematodocha; P, paracymbium; R, radical part of ED; S, stalk; T, tailpiece.

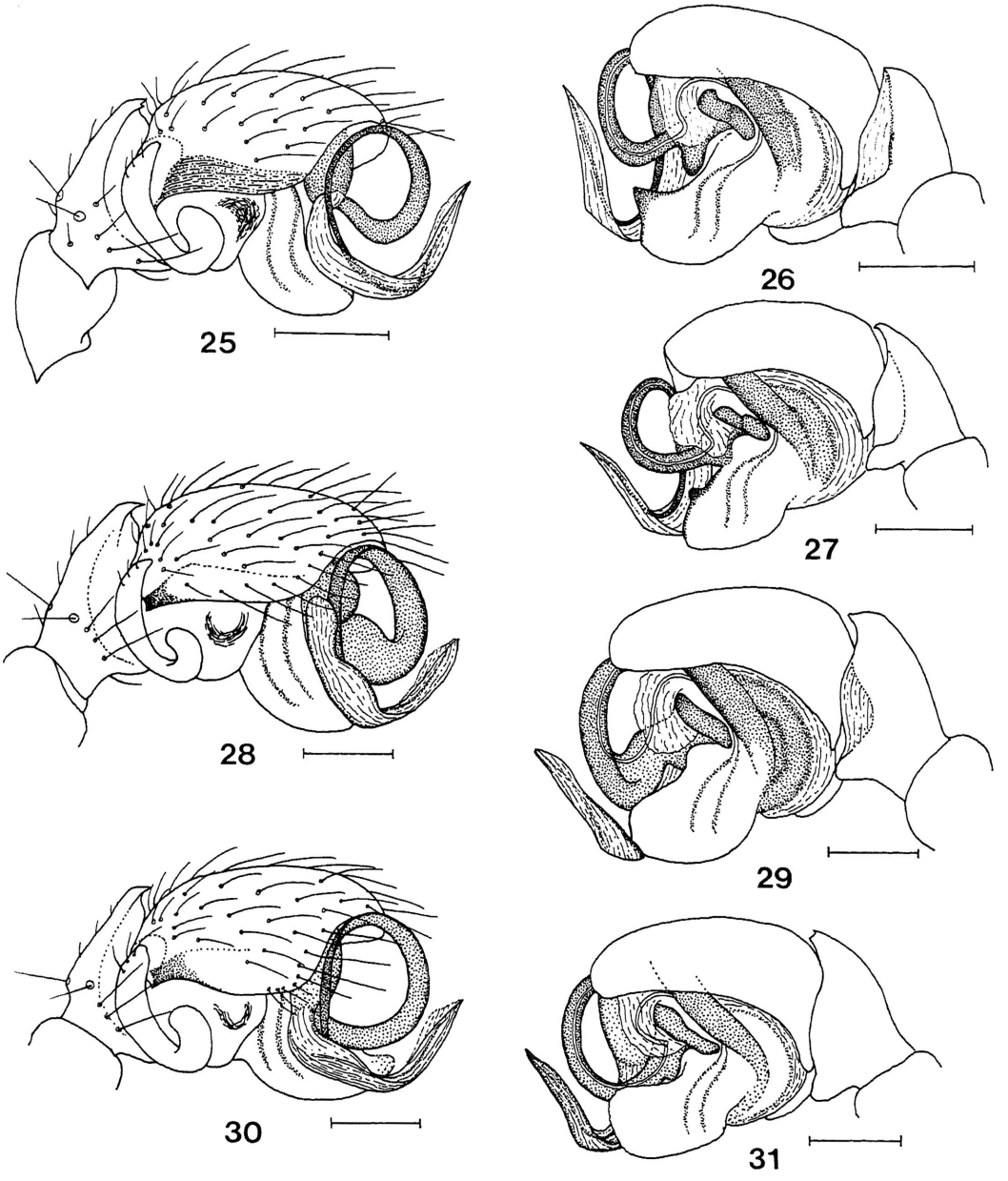


MAP 1. North America, showing distributions of *Satilatlas marxii* (circles), *S. gertschi* (square), and *S. carens* (triangles).

brown, with ventral spines on tibiae I, II rather longer than in *S. arenarius*; TmI 0.56–0.70. Palpal tibia shows small variations (figs. 9, 10) but quite distinct from that of *S. arenarius* (fig. 13); closely similar to *S. carens* (fig. 11) and *S. britteni* (fig. 12). Radical part of ED has basal projection rather variable in form (figs. 18–20); SA projects strongly anteriorly (fig. 17).

FEMALE: Total length 2.00–2.30. Carapace length 0.90–1.0. Color as in male. Ventral spines on tibiae I, II fairly long (fig. 1); TmI 0.60–0.68. Epigynum with fairly long tongue which narrows posteriorly (figs. 32, 33).

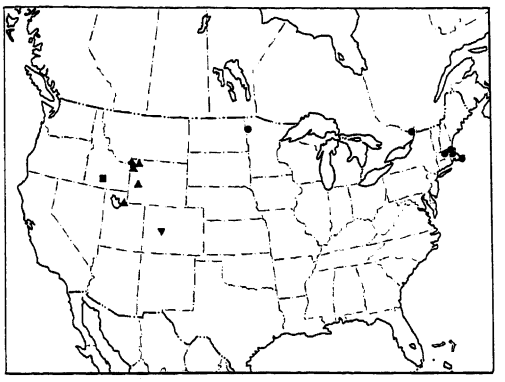
MATERIAL EXAMINED: **Canada**: *Manitoba:* Dauphin Lake, 1919, 1♂; Churchill, June 16, 1937 (W. J. Brown), 1♀; Riding Mountain National Park, May 24, 31, 1979 (D. B. Lyons), 1♂, 6♀. *Nova Scotia:* Wolfville Marsh, Kings Co., June 3, 1977 (O. Krepinsky), 1♀. *Ontario:* Belleville, May 24, 1960 (G. L. Ayre), 1♂; Mack Field, Stirling, Hastings Co., May 21, 1971, 1♂, 1♀; Quetico Provincial Park, June 9–10, 1971, 1♀; Chaffeys Lock, Leeds Co., May 12, 1975 (L. M. Smith), 1♀; James Bay, Mar. 21–25, 1976, 1♀, May 3–June 4, 1976, 1♂, Aug. 1976, 2♀ (all Morrison). **United States**: *Connecticut:* New London Co.: Lyme, Oct. 5, 1913 (Emerton), 1♂ with numerous immatures. *Illinois:* Lake Co.: Volo, Apr. 27, 1935 (M. K. Wood), 1♂. *Iowa:* Hamilton Co.: Jewell (Goose Lake), May 12, 1941 (D. T. Jones), 1♂. *Maine:* Washington Co.: Machias, Aug. 4, 1913 (Emerton), 1♀. *Massachusetts:* Middlesex Co.: near Concord, 1♀ (with *S. arenarius*). Nantucket Co.: Nantucket, May 19, 1928 (Emerton), 1♀, 1♂ (with *S. arenarius*), June 22, 1928 (Emerton), 1♀; Atlantic, Apr. 23, 1913 (Emerton), 1♀ (with *S. arenarius*). *Minnesota:* Anoka Co.: Avery Wildlife Refuge, May 15, 1965 (B. Cutler), 2♂, 1♀. Scott Co.: Savage, May 20, 1932 (W. J. Gertsch), 1♂. *Missouri:* Franklin Co.: Washington, west of St. Louis, Oct. 16, 1963 (J. and W. Ivie), 1♂. *New York:* Orange Co.: Pine Is.,



FIGS. 25–31. Male palpi. 25, 26. *Satilatlas arenarius,* type, ectal and mesal views. 27. *S. gentilis,* mesal view. 28, 29. *S. gertschi,* ectal and mesal views. 30, 31. *S. monticola,* ectal and mesal views.

May 19, 1920 (S. C. Bishop), 1♂. Suffolk Co.: Cold Spring Harbor, Long Island, June 24, 1932 (W. J. Gertsch), 1♀. Wayne Co.: Clyde, April 20, 1921 (S. C. Bishop), 1♂. *Pennsylvania:* Lane Co.: June 29, 1948 (H. W. Levi), 1♀. *Wisconsin:* Dane Co.: Madison, May 25, 1948 (C. Brandt), 1♀.

DISTRIBUTION: The temperate eastern and



MAP 2. North America, showing distributions of *Satilatlas arenarius* (circles), *S. insolens* (square), *S. gentilis* (triangles), and *S. monticola* (inverted triangle).

mid-eastern areas of the continent, and (doubtfully) the Aleutian Islands (map 1). The records show the species to be sympatric with *S. arenarius* in Massachusetts.

Satilatlas carens, new species
Figures 11, 21, 22; Map 1

TYPE: Male holotype from pitfalls in tall grass in low marshy former lakebed 11 miles south of Cypress Hills Provincial Park, Saskatchewan, Canada (June 7–16, 1973; Redner and Starr), deposited in CNC.

ETYMOLOGY: The specific name is a Latin adjective implying "being without," referring to the absence of the basal projection of the radical part of the ED.

DIAGNOSIS: The male is diagnosed by the form of the ED, in which the radical part does not extend below the junction with the embolus (fig. 22). The female is indistinguishable from *S. marxii,* and can be identified only by association with the male.

MALE: Total length 1.80. Carapace length 0.90. Color as in *S. marxii.* TmI 0.70. Palpal tibia (fig. 11) close to that of *S. marxii* and *S. britteni.* Distal end of SA (fig. 21) directed somewhat more upward than in *S. marxii.* Radical part of ED does not project below junction with embolus (fig. 22). Palpal organs very similar to those of *S. britteni* (figs. 23, 24), but with small differences; *S. britteni* also has rather higher carapace lobe than *S. carens,* which in this respect resembles *S. marxii.*

FEMALE: Females taken with the type male, and presumably of this species, and another female from a nearby area, appear to be indistinguishable from *S. marxii.*

MATERIAL EXAMINED: The following paratypes: **Canada**: *Saskatchewan:* Three females taken with the holotype; 12 miles S Cypress Hills Provincial Park, June 7, 1973 (Redner and Starr), 1♂; South Saskatchewan River, Saskatchewan Landing, June 6, 1973 (Redner and Starr), 1♀.

DISTRIBUTION: Known only from southern Saskatchewan (map 1).

Satilatlas arenarius (Emerton), new combination
Figures 2, 4, 6, 13, 25, 26, 35; Map 2

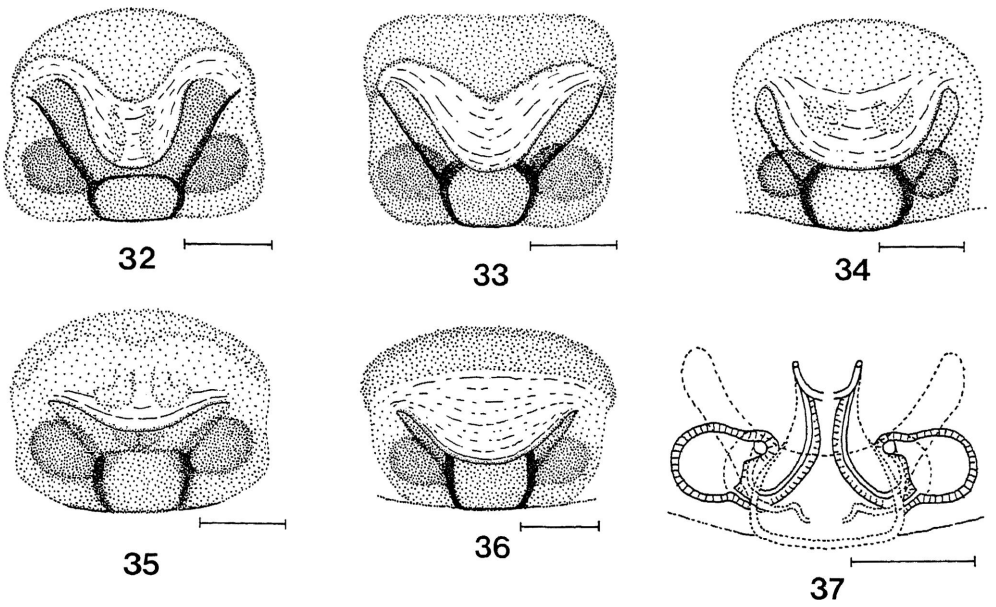
Lophocarenum arenarium Emerton, 1911, p. 391, pl. 2, fig. 4 (male holotype from Lakeman's Beach, Ipswich, Essex County, Massachusetts, in MCZ, examined).

Minyriolus arenarius: Crosby and Bishop, 1933, p. 136 (in part: figs. 110–112 and 115 seem to be *S. arenarius,* but figs. 113 and 114 seem to be *S. marxii*). Roewer, 1942, p. 679. Kaston, 1948, p. 184. Bonnet, 1957, p. 2926.

Perimones arenarius: Dondale and Redner, 1972, p. 1643.

DIAGNOSIS: The male is diagnosed by the carapace lobe (figs. 4, 6), which is somewhat higher and narrower than that of *S. marxii,* coupled with the form of the palpal organs, in which the radical part of the ED is produced basally into a short finger-like lobe (fig. 26) and the distal end of the SA projects upward (fig. 25). The palpal tibia (fig. 13) is broader and more truncated distally than in the closely related *S. gentilis* (fig. 14). The female is diagnosed by the short, broad epigynal tongue (fig. 35).

MALE: Total length 1.45–1.90. Carapace length 0.65–0.90. Carapace brown to dark brown, with blackish margins and markings; raised anteriorly into small lobe (figs. 4, 6). Abdomen gray to black; sternum brown, suffused with black. Legs brown to orange-brown. Ventral spines on tibiae I, II (fig. 2) significantly shorter than in *S. marxii*; TmI 0.68–0.70. Palpal tibia (fig. 13) fairly broad,



FIGS. 32–37. 32–36. Epigyna, ventral views. 32, 33. *Satilatlas marxii*. 34. *S. gentilis*. 35. *S. arenarius*. 36. *S. gertschi*. 37. *S. gentilis*, internal genitalia, dorsal view.

truncated. Distal end of SA directed upward (fig. 25), significantly more so than in *S. marxii*. Radical part of SA produced basally into short, finger-like lobe, sometimes rather shorter than in type (fig. 26), sometimes partially hidden by tegulum.

FEMALE: Total length 2.00–2.20. Carapace length 0.75–0.90. Color as in male. Ventral spines on tibiae I, II long, well developed. TmI 0.68–0.70. Epigynum with broad, very short tongue (fig. 35).

MATERIAL EXAMINED: **United States**: *Massachusetts:* Essex Co.: Oak Island, Lynn, Apr. 27, 1911 (Emerton), under straw on marsh, 10♂, 1♀. Middlesex Co.: near Concord, 10♂, 1♀ (with *S. marxii*). Nantucket Co.: Atlantic, Apr. 23, 1913 (Emerton), 2♂ (with *S. marxii*); Nantucket, May 19, 1928 (Emerton), 2♂, 2♀ (with *S. marxii*). *Minnesota:* Marshall Co.: 8 mi SE Warren, June 12, 1945 (W. Ivie), 4♂, 2♀. **Canada**: *Ontario:* Mer Bleue, Carleton Co., east of Ottawa, June 4, 1974 (Dondale and Redner), by sweeping in sphagnum bog, 1♂.

DISTRIBUTION: The few records indicate that the species is limited to the temperate eastern areas of the continent (map 2). The records from New York (Pine Island and Clyde) given by Crosby and Bishop (1933) are erroneous, and refer to *S. marxii*; I have not seen their specimens from the summit of Mt. McIntyre, New York.

Satilatlas gentilis, new species
Figures 14, 27, 34, 37; Map 2

TYPE: Male holotype from Smith and Morehouse Canyon, Summit County, Utah (June 3, 1934; W. Ivie), deposited in AMNH.

ETYMOLOGY: The specific name is a Latin adjective meaning "belonging to a group."

DIAGNOSIS: The male is diagnosed by the form of the palpal tibia (fig. 14), which is narrower than in *S. arenarius* (fig. 13), and by the relatively small diameter of the embolic coil (fig. 27); the latter character distinguishes *S. gentilis* from *S. gertschi*, which has a very similar palpal tibia. The female is diagnosed by the roughly semicircular form of the epigynal tongue (fig. 34).

MALE: Total length 1.55–1.80. Carapace length 0.75. Color, carapace lobe, and ventral leg spines as in *S. arenarius*. TmI 0.55–0.61. Palpal tibia (fig. 14) relatively narrow.

Palpal organs as in *S. arenarius,* with basal lobe of radical part of ED less developed (fig. 27).

FEMALE: Total length 1.70–2.20. Carapace length 0.75–0.95. Color and ventral leg spines as in *S. arenarius*. TmI 0.60–0.62. Epigynum with broad, more or less semicircular tongue (fig. 34).

MATERIAL EXAMINED: The following paratypes: **United States:** *Utah:* type locality, June 3, 1934 (W. Ivie), 4♂, 3♀. *Wyoming:* Park Co.: Thumb, Yellowstone Lake, June 23, 1938 (W. Ivie), 4♀; Lewis Falls, Yellowstone National Park, June 24, 1938 (W. Ivie), 1♂, 2♀. Teton Co.: Moran, July 3, 1950 (D. C. Lowrie), 1♂; Togwatee Pass, elevation 10,000 ft., Aug. 8, 1950 (D. C. Lowrie), 1♀.

DISTRIBUTION: Known only from Utah and Wyoming (map 2).

Satilatlas insolens, new species
Map 2

TYPE: Male holotype from three miles south of Cedar Creek Reservoir, Twin Falls, Twin Falls County, Idaho (April 17, 1930; J. C. Chamberlin), deposited in AMNH.

ETYMOLOGY: The specific name is a Latin adjective meaning "unusual" or "contrary to custom."

DIAGNOSIS: The male is diagnosed by the presence of a trichobothrium on metatarsus IV; in other respects this species is virtually identical with *S. gentilis*. The female is unknown.

MALE: Total length 1.75. Carapace length 0.85. Color and ventral leg spines similar to *S. arenarius*. TmI 0.60; trichobothrium present on metatarsus IV, TmIV 0.58. Palpal tibia and palpal organs practically identical with those of *S. gentilis*.

MATERIAL EXAMINED: Only the holotype.

DISTRIBUTION: Known only from the type locality in Idaho (map 2).

Satilatlas gertschi, new species
Figures 15, 28, 29, 36; Map 1

TYPE: Male holotype from bog forest at Edmonton, Alberta, Canada (June 1930), deposited in AMNH.

ETYMOLOGY: The specific name is a patronym in honor of Willis J. Gertsch.

DIAGNOSIS: The male is diagnosed by the relatively large diameter of the embolic coil, which is stouter than that of *S. monticola,* particularly at its junction with the radical part of the ED (figs. 28, 29; cf. figs. 30, 31). The female is diagnosed by the form of the epigynal tongue (fig. 36), which is intermediate in size between those of *S. arenarius* and *S. gentilis*.

MALE: Total length 2.00. Carapace length 0.85. Carapace brown, with dusky markings and margins; lobe similar to that of *S. arenarius*. Abdomen black, spiny; sternum yellow, reticulated with black. Legs orange-brown; ventral spines on tibiae and metatarsi I, II more numerous (tibia *ca.* 15, metatarsus *ca.* 10), rather shorter than in *S. arenarius* or *S. gentilis,* while ventral spines on femora I more numerous, longer. TmI 0.60. Palpal tibia (fig. 15) relatively narrow, very similar to *S. gentilis*. Embolic coil large in diameter, stout (fig. 29); basal extension of radical part of ED small.

FEMALE: Total length 2.45. Carapace length 0.87. Color as in male. Ventral spines on tibiae and metatarsi clear but shorter than in *S. arenarius*; TmI 0.60. Epigynal tongue with bow-shaped margin (fig. 36).

MATERIAL EXAMINED: One paratype female taken with the holotype.

DISTRIBUTION: Known only from the type locality in Alberta (map 1).

Satilatlas monticola, new species
Figures 16, 30, 31; Map 2

TYPE: Male holotype taken under stones at an elevation of 12,000 feet at East Maroon Pass, Elk Mountains, Pitkin and Gunnison Counties, Colorado (July 15, 1956; H. and L. Levi), deposited in MCZ.

ETYMOLOGY: The specific name is a Latin noun in apposition, meaning "a dweller in the mountains."

DIAGNOSIS: The male is diagnosed by the relatively large diameter of the embolic coil, with the embolus less stout than in *S. gertschi* (figs. 30, 31; cf. figs. 28, 29). The female is unknown.

MALE: (The unique specimen had barely completed its final molt, and hence is rather pale in color and the leg spines are not erected.) Total length 1.60. Carapace length 0.80. Carapace yellow, with black markings and margins; lobe slightly damaged, but probably similar to *S. arenarius*. Abdomen brown, sternum almost black. Legs yellow-brown; TmI 0.60. Palpal tibia as in figure 16. Embolic coil large in diameter (figs. 30, 31) but less stout than in *S. gertschi*; basal extension of radical part of ED small.

MATERIAL EXAMINED: Only the holotype.

DISTRIBUTION: Known only from the type locality in Colorado (map 2).

LITERATURE CITED

Bonnet, Pierre
1957. Bibliographia araneorum. Toulouse, vol. 2, pt. 3, pp. 1927–3026.
1958. Bibliographia araneorum. Toulouse, vol. 2, pt. 4, pp. 3027–4230.

Chamberlin, Ralph V., and W. Ivie
1947. The spiders of Alaska. Bull. Univ. Utah, vol. 37, no. 10, pp. 1–103, figs. 1–99.

Crosby, Cyrus R., and S. C. Bishop
1933. American spiders: Erigoneae, males with cephalic pits. Ann. Ent. Soc. Amer., vol. 26, pp. 105–182, figs. 1–236.

Dondale, Charles D., and J. H. Redner
1972. A synonym proposed in *Perimones*, a synonym rejected in *Walckenaera*, and a new species described in *Cochlembolus* (Araneida:Erigonidae). Canadian Ent., vol. 104, pp. 1643–1647, figs. 1–16.

Emerton, James H.
1911. New spiders from New England. Trans. Connecticut Acad. Arts Sci., vol. 16, pp. 385–407, pls. 1–6.

Jackson, A. Randell
1932. On new and rare British spiders. Proc. Dorset Nat. Hist. F. Cl., vol. 53, pp. 200–214.

Kaston, Benjamin J.
1948. Spiders of Connecticut. Connecticut State Geol. Nat. Hist. Survey Bull., vol. 70, pp. 1–874, figs. 1–2144.

Keyserling, Eugen
1886. Die Spinnen Amerikas. Theridiidae, pt. 2. Nürnberg, vol. 2, pt. 2, pp. 1–295, pls. 1–11.

Lehtinen, Pekka T.
1978. Definition and limitation of supraspecific taxa in spiders. *In* Merrett, P. (ed.), Arachnology (Proc. Seventh Internatl. Congr. Arachnology). London (Sympos. Zool. Soc. London, no. 42), pp. 255–272.

Locket, George H., and A. F. Millidge
1953. British Spiders. London, vol. 2, pp. 1–449, figs. 1–254.

Millidge, A. Frank
1977. The conformation of the male palpal organs of linyphiid spiders, and its application to the taxonomic and phylogenetic analysis of the family (Araneae: Linyphiidae). Bull. British Arachnol. Soc., vol. 4, pp. 1–60, figs. 1–200.
1980. The erigonine spiders of North America. Part 1. Introduction and taxonomic background (Araneae: Linyphiidae). Jour. Arachnol., vol. 8, pp. 97–107, figs. 1–11.

Petrunkevitch, Alexander
1911. A synonymic index-catalogue of spiders of North, Central and South America with all adjacent islands, Greenland, Bermuda, West Indies, Terra del Fuego, Galapagos, etc. Bull. Amer. Mus. Nat. Hist., vol. 29, pp. 1–791.

Roewer, Carl F.
1942. Katalog der Araneae. Bremen, vol. 1, pp. 1–1040.

Simon, Eugène
1894. Histoire naturelle des araignées. Paris, vol. 1, pt. 3, pp. 489–760, figs. 491–837.

Wiehle, Hermann
1960. Spinnentiere oder Arachnoidea (Araneae). XI: Micryphantidae—Zwergspinnen. *In* Die Tierwelt Deutschlands. Jena, pt. 47, pp. 1–620, figs. 1–1147.

More on the Genus *Araneus* from North America

HERBERT W. LEVI[1]

ABSTRACT

One new species of *Araneus, A. kerr,* is described from Texas. The male of *Araneus calusa* Levi has been found and is illustrated. The name *Neosconella bella* is newly synonymized with *Araneus pegnia*; new records and range extensions are given for 11 species of *Araneus*.

INTRODUCTION

Several genera of araneid spiders include species that are difficult to separate on the basis of the morphology of their very similar genitalia. Among such difficult groups are the many small species of *Araneus*. Specimens of these species are not commonly found in collections. Generally, fresh specimens (showing the characteristic reddish or greenish color pattern) can be separated more easily by the pattern on the abdomen and the shape of the abdomen than can preserved specimens, whose coloring has been rendered a uniform white by storage in alcohol.

Since earlier publications on *Araneus*, specimens of one new species have been found, the unknown male of another discovered, and a synonym found that had been accidentally omitted from my 1973 paper. These and some additional records are reported here, extending the ranges of North American *Araneus* species (Levi, 1971, 1973; some additional records have already been published in Levi, 1975).

This paper is in honor of the seventy-fifth birthday of my mentor and friend, Willis Gertsch. New species in dedicated papers are generally named for the honored person. There is, however, a species of *Conaranea* (a synonym of *Araneus*) already named for Gertsch.

I thank the following for the loan of specimens: Dr. C. Dondale (Biosystematics Research Institute, Ottawa), Dr. N. Platnick (American Museum of Natural History, AMNH). National Science Foundation grant 73-23004 has supported some of the research.

Araneus kerr, new species

Figures 1–4

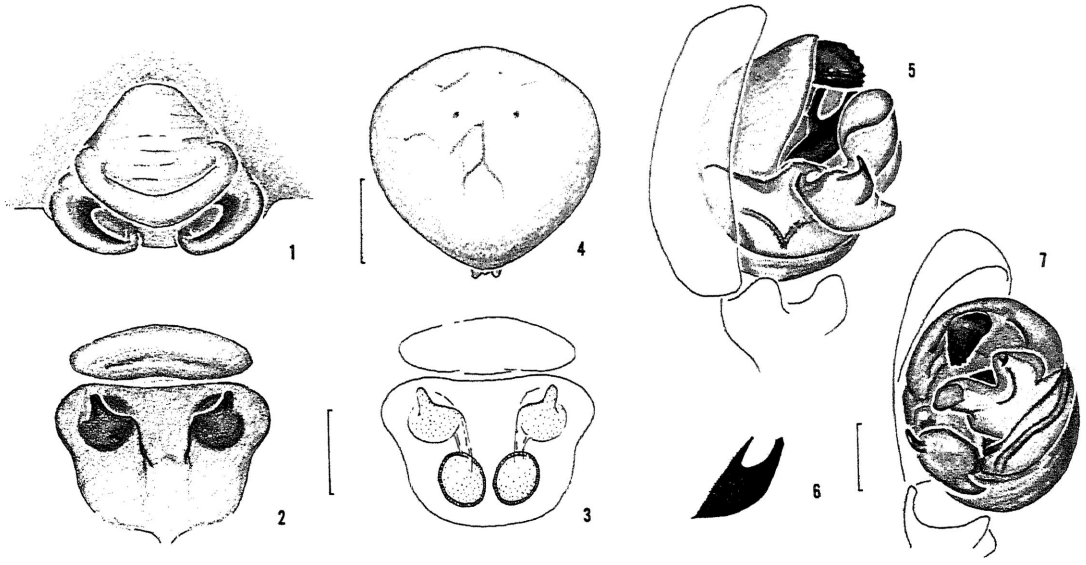
TYPE: Female holotype from Raven Ranch, Kerr County, Texas (June 1941; J. Stillwagon), deposited in the American Museum of Natural History.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

DIAGNOSIS: This species differs from *Araneus alboventris* in lacking the dorsal black spot on the abdomen, the wider scape of the epigynum, and the smaller opening on each side of the scape (figs. 1–3).

DESCRIPTION: Carapace, sternum, legs yellowish white. Dorsum of abdomen with white pigment and greenish streaks. Sides and venter with white pigment, most of green probably washed out in alcohol. Abdomen as wide as long, widest in anterior half (fig. 4). Measurements (mm.): Total length 4.7. Carapace 1.7 long, 1.5 wide. First femur 2.3; patella and tibia 2.7; metatarsus 2.0; tarsus

[1] Alexander Agassiz Professor, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138.



FIGS. 1–7. 1–4. *Araneus kerr*, new species. 1. Epigynum, ventral view. 2. Epigynum, posterior view. 3. Epigynum, posterior view, cleared. 4. Abdomen. 5–7. *Araneus calusa* Levi. 5. Left palpus, mesal view. 6. Embolus of left palpus, mesal view. 7. Left palpus, ventral view. Size indicator 0.1 mm. except figure 4, 1.0 mm.

0.7. Second patella and tibia 2.4; third 1.3; fourth 1.9.

RECORD: One juvenile male collected with the holotype.

Araneus calusa Levi
Figures 5–7

Araneus calusa Levi, 1973, p. 512, figs. 152–157, map 4 (female holotype from Lee County, Florida, in Museum of Comparative Zoology).

DIAGNOSIS: The male of this species was hitherto unknown. It is distinguished from that of other species by the deep notch in the palpal conductor (fig. 7) which divides a longer anterior part from a posterior one that bears a spine (fig. 5).

DESCRIPTION (Male): Carapace, sternum, legs beige. Legs with distinct orange bands. Dorsum of abdomen with white pigment. Venter not pigmented. Shape of abdomen like that of female, with anterior lateral corners drawn out to a point. Measurements (mm.): Total length 2.3. Carapace 1.0 long, 1.0 wide. First femur 1.8; patella and tibia 2.1; metatarsus 1.7; tarsus 0.7. Second patella and tibia 1.7; fourth 1.2.

RECORD: **Florida**: *Highlands Co.:* Archbold Biological Station, Lake Placid, Dec. 3, 1959 (A.M. Nadler, AMNH), ♂.

Araneus pegnia (Walckenaer)

Araneus pegnia: Levi, 1973, p. 546, pl. 10, figs. 5, 426–438, map 6.

Neosconella bella Chamberlin and Ivie, 1942, p. 78, figs. 223, 224 (female holotype from Laguna Beach, Orange County, California, in American Museum of Natural History, examined). NEW SYNONYMY.

SYNONYMY: No significant differences in ventral coloration or epigynal structure have been detected between the holotype of *N. bella* and specimens of *A. pegnia*.

NEW RECORDS

Araneus iviei (Archer): *Alaska:* Matanuska. *Pennsylvania:* Potter Co.

Araneus arizonensis (Banks): *New Mexico:* Lincoln Co.

Araneus mammatus (Archer): *Utah:* Salt Lake Co.: Mill Creek Canyon.
Araneus partitus (Walckenaer): *Oklahoma:* Cleveland Co.: Norman.
Araneus bivittatus (Walckenaer): *Florida:* Highlands Co.: Lake Placid.
Araneus gadus Levi: *Georgia:* McIntosh Co.: Sapelo Island.
Araneus juniperi (Emerton): *Connecticut:* Fairfield Co.: New Canaan.
Araneus niveus (Hentz): *Connecticut:* Fairfield Co.: New Canaan. *Virginia:* Campbell Co.: Lynchburg. *North Carolina:* Stanly Co.: Morrow Mountain State Park. *Florida:* Highlands Co.: Lake Placid.
Araneus guttulatus (Walckenaer): *Minnesota:* Lincoln Co.: Mtn. Prairie area.
Araneus nashoba Levi: *Tennessee:* Henderson and Carroll cos.: Natchez Trace State Park. *Florida:* Highlands Co.: Lake Placid.
Araneus prunus Levi: *Mississippi:* Wilkinson Co.: Centreville.

LITERATURE CITED

Chamberlin, Ralph V., and Wilton Ivie
1942. A hundred new species of American spiders. Bull. Univ. Utah, Biol. Ser., vol. 7, no. 1, pp. 1–117, figs. 1–230.

Levi, Herbert W.
1971. The *Diadematus* group of the orb-weaver genus *Araneus* north of Mexico (Araneae: Araneidae). Bull. Mus. Comp. Zool., vol. 141, pp. 131–179, figs. 1–240.
1973. Small orb-weavers of the genus *Araneus* north of Mexico (Araneae: Araneidae). *Ibid.*, vol. 145, pp. 473–552, figs. 1–474.
1975. Additional notes on the orb-weaver genera *Araneus, Hypsosinga* and *Singa* north of Mexico (Araneae, Araneidae). Psyche, vol. 82, pp. 265–274, figs. 1–21.

Structure of the Male Palpal Organ in *Mimetus, Ero,* and *Gelanor* (Araneoidea, Mimetidae)

WILLIAM A. SHEAR[1]

ABSTRACT

The male palpal organs of *Ero furcata* (Villers), *Mimetus puritanus* Chamberlin, and *Gelanor lata* (Keyserling) are studied as representatives of the three largest genera of the spider family Mimetidae. In each of these species, the palpus consists of four major divisions: subtegulum, tegulum, embolus, and terminal apophysis. In *Mimetus* and *Gelanor* a paracymbium is present that is larger than or equal to the cymbium; in *Ero,* this structure is about half the size of the cymbium. Unique to *Gelanor* is the relatively short, very heavy embolus; this structure is long and thin in the other two genera. *Mimetus* bears an additional sclerite which may be homologous with the araneid conductor; this structure is absent in the other two genera. The palpal organ in the mimetids, while complex, evidently lacks elements found in the palpi of some species of Linyphiidae, Araneidae (*sensu lato*), and the more advanced Theridiidae, suggesting a long separate history for these families.

INTRODUCTION

The importance of the genitalia in spider taxonomy, particularly the male palpal organ, has long been recognized. The range of diversity shown by this structure in spiders as a whole is amazing, and even within single families, organs ranging from simple pyriform bulbs to complex multisclerite assemblages occur (Levi, 1961). Thus, ever since the pioneering studies of Comstock (1910) and Englehardt (1910), controversy has gone on concerning the problems of homologies among the various sclerites found in different families. Should the same names be given these sclerites suggesting homologies, or should we regard such homonymy as simply indicating analogy? Because only a few studies of an experimental nature have been done on the functions of the sclerites (Gering, 1953; van Helsdingen, 1969, 1970), the latter alternative leads to considerable guesswork. On the other hand, the recognition that the numerous sclerites of the complex palpus originate by the subdivision of an originally simple organ (Cooke, 1970), together with the dawning realization that the transition from haplogyne to entelegyne female genitalia in spiders must have taken place several times independently, makes it exceedingly difficult to establish homologies, since the complex palpus might likewise have originated several times, and sclerites that arise in similar positions in palpi of only distantly related families need not be thought of as homologous. Opell (1979) underlined this problem by reporting that several sclerites of evidently entirely different origin serve to support the embolus (the "conductor" function) in species of Uloboridae.

A further complication is introduced in those families in which palpi range from simple to complex (good examples are found in the families Theridiidae, Araneidae, and Linyphiidae). In which direction has evolution proceeded? It might be most parsimonious to consider it as having gone from simple to more complex, but in several lines, the sim-

[1] Research Associate, Department of Entomology, American Museum of Natural History; Associate Professor of Biology, Hampden-Sydney College, Hampden-Sydney, Virginia 23943.

ple palpi are obviously secondary, correlated as they are with other characters that are more derived than those found in relatives with complex palpi. Adaptation to small size seems frequently, but not always, to play a role in the reduction of palpal complexity. Some lines highly advanced in other respects (Salticidae, Thomisidae, Philodromidae, Gnaphosidae, etc.) have retained palpi that do not differ much from the simplest kinds. In other lines (Pholcidae, Leptonetidae, Ochyroceratidae) the bulb has remained simple, but accessory structures like the tibia and tarsus of the palp have become elaborate.

However, in a recent series of papers on the Araneidae, Levi (1971 *et seq.*) has suggested that the palpal configuration found in the members of the araneine subfamily Metinae seems basic to the assemblage of divergent lines now grouped in Araneidae (Levi, 1980). The simple palpus illustrated by Levi for *Meta, Leucauge,* and *Metellina* can indeed serve as a stem from which the palpi of the other "araneids" can be derived by the gradual accumulation of sclerites; in fact even the various linyphiid palpi (see Millidge, 1977) might have arisen from this model, leading to the intriguing possibility that linyphiids may represent an early offshoot from *Meta*-like ancestry, and have lost the orb-web. The theridiids seem to me to be a separate group entirely, but I shall argue this point elsewhere.

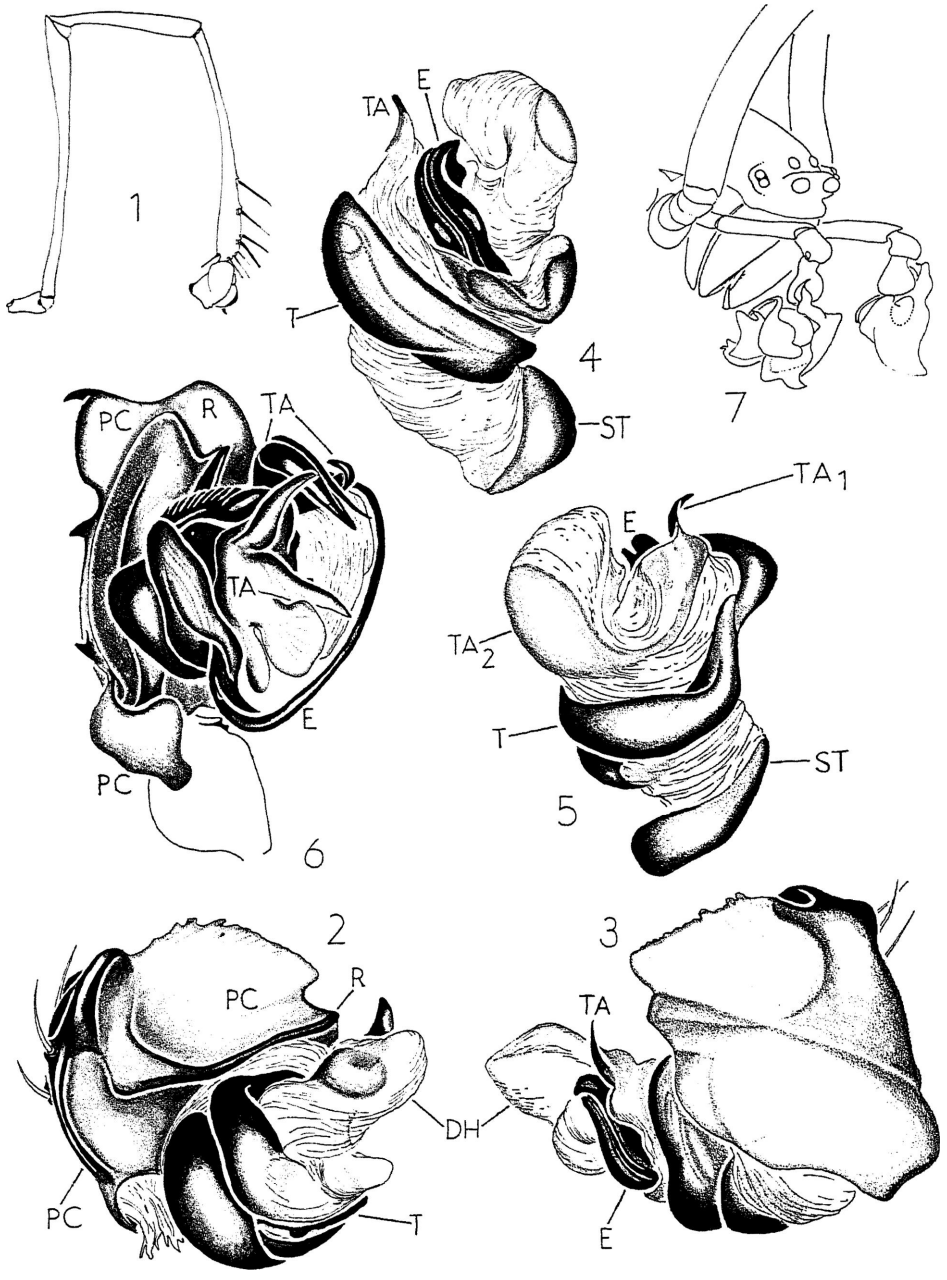
In any case, I would venture to suggest that, as we might have expected, the complex type of palpus has arisen any number of times, not always in the same way, and not always in correlation with other apomorphies. Reasoning from this, it seems futile to expect that the terms used to describe the palp should indicate broad homologies—they do not, in many cases, exist. Therefore, when words such as "median apophysis," "lamella," and "terminal apophysis" are used in anatomical studies of spider male palpi, the reader should constantly be reminded that unless explicitly stated otherwise, they are terms of convenience and may or may not have relevance outside the given study.

In describing mimetid palpi, I have decided to use the terms originated by Comstock (1910) and later adopted by me (Shear, 1967) and now used by Levi (1971 *et seq.*) to describe araneid palpi, because I think that the evidence suggests the mimetids to be a derivative of the metine stem line, and that solid evidence exists for homologies to sclerites in the araneid palpus.

DESCRIPTIONS OF PALPI

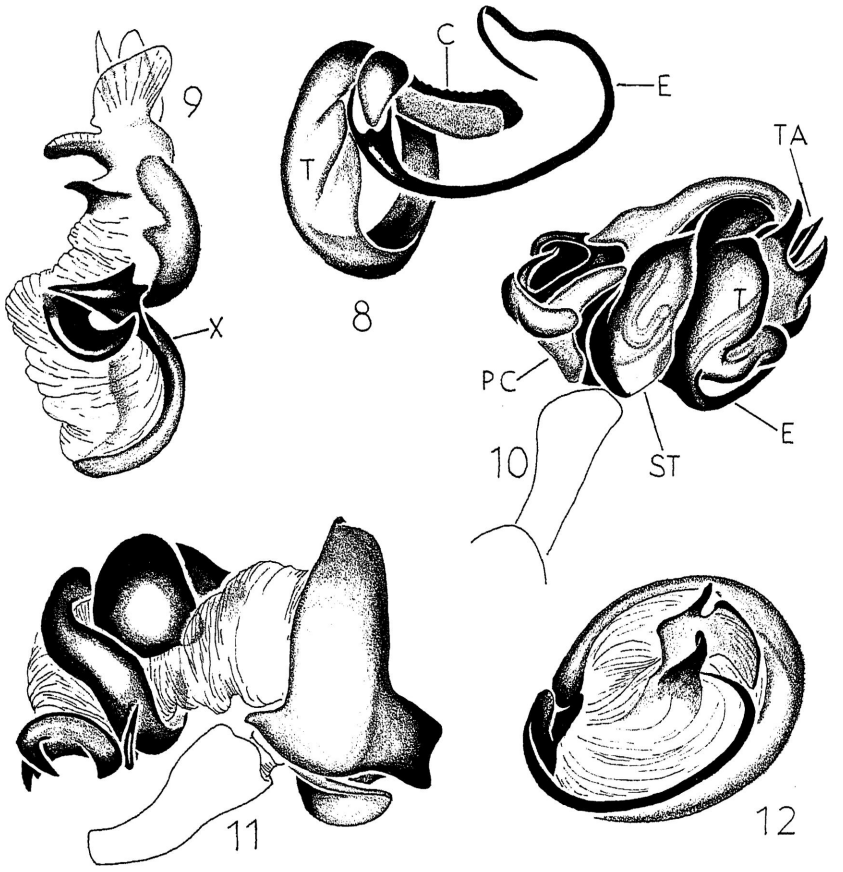
1. *Gelanor lata* (Keyserling). Brazilian specimens of *G. lata* in the collection of the American Museum of Natural History were used in this study. The techniques for expansion of the palpi were those described by me in 1967. The palpi of male *Gelanor* are remarkable in that all the pretarsal segments are much elongated (fig. 1), so that the palpus is actually longer than the spider's body. The mating of *Gelanor* has not been observed, but since, like most mimetids, *Gelanor* females prey on other spiders, the long palpi may allow the male to accomplish his purposes from a safe distance. In a view slightly ventral of lateral (fig. 2) it can be seen that the enormous paracymbium (pc) greatly overbalances the cymbium and is divided from it by a heavily sclerotized dividing ridge (r). The bulb is attached to the cymbium somewhat eccentrically, as observed for the family by Archer (1951). As usual, the subtegulum is rounded and ringlike (st). The tegulum (t) appears to make slightly more than one full turn around the bulb, with the membrane (distal hematodocha, dh) in its center being expanded distally. In mesal view (fig. 3), the heavy embolus (e) is seen, as well as a sclerotized process from the otherwise poorly developed terminal apophysis (ta). When the palpus is expanded and the bulb dissected free of the cymbium (fig. 4), the embolus is seen to take its origin from the distal turn of the tegulum. In another view (fig. 5) the terminal apophysis appears to consist of two parts, one (ta_1) curved and well-sclerotized and the other (ta_2) broad, flat and only slightly differentiated from the surrounding membrane.

2. *Mimetus puritanus* Chamberlin. The specimens of *M. puritanus* used here were



FIGS. 1–7. Mimetid male palpi. 1–4. *Gelanor lata*. 1. Right palpus, mesal view. 2. Right palpus, lateral view. 3. Same, lateral view. 4. Dissected and expanded bulb, posterior view. 5. Same, anterior view. 6, 7. *Mimetus puritanus*. 6. Right palpus, lateral view. 7. Anterior part of male, anteriolateral view.

collected by me in Webster, North Carolina. Figure 7 illustrates that in this species as in mimetids in general the palpus is rotated strongly laterad so that the bulb, morpholog-



FIGS. 8–12. Mimetid male palpi. 8, 9. *Mimetus puritanus*. 8. Dissected tegulum and embolus, lateral view. 9. Terminal apophysis, expanded, dissected and unfolded. 10–12. *Ero furcata*. 10. Right palpus, lateral view. 11. Same, expanded, mesal view. 12. Dissected and expanded tegulum, embolus and terminal apophysis.

ically ventral, becomes functionally lateral. This occurs to some extent in the Araneidae and symphytognathoid families, but is more marked here. The unexpanded palpus is elaborate and complicated; in this lateral view (fig. 6) the cymbium is hardly visible and nearly all that can be seen of the supporting structure of the palpus is the paracymbium (pc), delimited centrally, as in *G. lata,* by a sclerotized ridge (r). The relationship of the subtegulum, tegulum, embolus (e), supposed conductor (c) and terminal apophysis (ta) is not, however, immediately obvious, particularly because of the much greater complexity of the terminal apophysis and the fact that it is folded between its two divisions. However, when the tegulum and embolus are dissected free of the bulb (fig. 8), the ringlike structure of the tegulum (t) can be seen, as well as the origin of the embolus (e) and the broad, rugose sclerite originating near the embolic base and here called the conductor (c). The terminal apophysis (fig. 9) can likewise be dissected and unfolded; in ventral view, its basic bipartite nature is visible. The point of attachment to the distal hematodocha is behind the two heavy, crossing apophyses near the middle of the sclerite; the upper of these apophyses (x) is deeply grooved, and the embolus runs along

this groove with its tip supported by the "bird's head" at the end of the apophysis. The two crossing apophyses are solidly connected at the base of the lower one and just proximal of the tip of the upper one. The folding of the sclerite can be visualized if one thinks of the upper and lower ends of the illustration as being swung nearly together to the viewer's left.

3. *Ero furcata* (Villers). *Ero furcata* males used in this study were collected in Dushore, Pennsylvania. Comparatively speaking, the paracymbium of the *Ero* palpus is smaller (pc, figs. 10, 11). The tegulum (t) and subtegulum (st) are nearly equal in size; in the preceding two species the subtegulum was the smaller of the two sclerites. The embolus (e) is supported by the terminal apophysis (ta). When the palpus is expanded (fig. 11), the relationships of the sclerites change little. In a dissected bulb (fig. 12), the position of the terminal apophysis is clarified in that it definitely originates from the center of the distal hematodochal membrane, and consists of two parts.

CONCLUSIONS

The sclerite I have here called the terminal apophysis appears to be homologous in the three species and its bipartite form characteristic for the family. I would further suspect a close relationship, if not an exact homology, with the terminal apophysis described by Levi (1971) for the palpus of *Araneus* and by van Helsdingen (1969) and Millidge (1977) for *Linyphia* and its relatives. By homology, I mean that I think this sclerite originates in each case not as a subdivision or outgrowth of the tegulum that becomes independent, but by means of progressive sclerotization of part of the membrane in the center of that structure, which meantime expands to form the distal hematodocha. Evidence for this view in the mimetids comes from arranging the palpi in a series from *Gelanor* through *Ero* to *Mimetus,* with the terminal apophysis becoming more heavily sclerotized and more complex as it takes on the function of supporting the embolus.

The embolus itself seems to have become longer and thinner in the same series, going along with the development of the "conductor" function of the terminal apophysis. However, the emboli of the most complex *Araneus* palpi are short and stout.

The great development of the paracymbium in two of the three genera, so that it actually becomes larger than the cymbium proper, is interesting in that the functional meaning of such a development is hard to visualize. Van Helsdingen (1969, 1970) was not able to suggest a function for the linyphiid paracymbium, which, however, is quite small compared to the situation in *Gelanor* and *Mimetus*.

The additional sclerite (c) found in the *Mimetus* palpus is consistent with the hypothesis of increasing complexity, since in this palpus we also find the longest embolus, smallest subtegulum and most complex terminal apophysis. While the real nature of this sclerite is in doubt, it does not appear to *function* as a conductor, though its origin from the tegulum at the base of the embolus suggests homology with that sclerite as found in the araneids. What appears to be a similar development in linyphiids is called the lamella by Millidge (1977).

The overall plan of the mimetid palpus appears to confirm the long-standing hypothesis, based on evidence from eye structure, general appearance, development, and behavior, that the mimetids are close to the Araneidae and Linyphiidae. More detailed study, including revisionary work in the family, is needed before a more exact hypothesis of relationship can be put forward, but for now I reiterate that the derivation of the mimetid palpal organ from the type found in the subfamily Metinae of the Araneidae is entirely feasible. Given the tendency in some lines of araneids to reduce or even lose the orb-web (the genera around *Arcys* having become "sit-and-wait" predators with a remarkably mimetid-like double row of spines on the front legs), one suspects that the Mimetidae may represent an early development from protometines that may have moved through web-parasitism to, in some cases, exclusive araneophagy.

LITERATURE CITED

Archer, Allan F.
1951. Studies in the orbweaving spiders (Argiopidae). 1. Amer. Mus. Novitates, no. 1487, pp. 1–52, figs. 1–82.

Comstock, John H.
1910. The palpi of male spiders. Ann. Ent. Soc. Amer., vol. 3, pp. 161–185, figs. 1–20.

Cooke, John A. L.
1970. Spider genitalia and phylogeny. Bull. Mus. Natl. Hist. Nat., ser. 2, vol. 41, suppl. 1, pp. 142–146, figs. 1–7.

Englehardt, Victor
1910. Beitrage zur Kenntnis der. weiblichen Copulationsorgane einiger Spinnen. Zeitschr. Wiss. Zool., vol. 96, pp. 32–117.

Gering, Robert L.
1953. Structure and function of the genitalia in some American agelenid spiders. Smithsonian Misc. Coll., vol. 121, pp. 1–84, figs. 1–72.

Levi, Herbert W.
1961. Evolutionary trends in the development of palpal sclerites in the spider family Theridiidae. Jour. Morphol., vol. 108, pp. 1–9, figs. 1–17.
1971. The *diadematus* group of the orb-weaver genus *Araneus* north of Mexico (Araneae: Araneidae). Bull. Mus. Comp. Zool., vol. 141, pp. 131–178, figs. 1–240.
1980. The orb-weaver genus *Mecynogea*, the subfamily Metinae and the genera *Pachygnatha, Glenognatha* and *Azilia* of the subfamily Tetragnathinae North of Mexico (Araneae: Araneidae). *Ibid.*, vol. 149, pp. 1–75, figs. 1–305.

Millidge, A. F.
1977. The conformation of the male palpal organs of linyphiid spiders, and its application to the taxonomic and phylogenetic analysis of the family (Araneae: Linyphiidae). Bull. British Arachnol. Soc., vol. 4, pp. 1–60, figs. 1–200.

Opell, Brent D.
1979. Revision of the genera and tropical American species of the spider family Uloboridae. Bull. Mus. Comp. Zool., vol. 148, pp. 443–549, figs. 1–288.

Shear, William A.
1967. Expanding the palpi of male spiders. Breviora, no. 259, pp. 1–27, figs. 1–51.

van Helsdingen, Peter J.
1969. A reclassification of the species of *Linyphia* based on the functioning of the genitalia (Araneida, Linyphiidae), I. Zool. Verhand., no. 105, pp. 1–303, figs. 1–408, pls 1, 2.
1970. A reclassification of the species of *Linyphia* based on the functioning of the genitalia (Araneida, Linyphiidae), II. *Ibid.*, no. 111, pp. 1–86, figs. 1–74.

A Textricellid Spider from Chile (Araneae, Textricellidae)

RAYMOND R. FORSTER[1] AND NORMAN I. PLATNICK[2]

ABSTRACT

A new genus, *Tricella,* is established for a new Chilean spider (*T. gertschi*) representing the first record of the family Textricellidae from the New World.

INTRODUCTION

The family Textricellidae was established by Hickman (1945) for three species of minute moss-dwelling spiders from Tasmania. Forster (1955) described a fourth species from the Auckland Islands to the south of New Zealand, and subsequently (1959) recorded 15 additional species from the Australasian region (11 from New Zealand, three from Australia, and one from New Guinea). While further undescribed species are known in collections from both Australia and New Zealand, until now the distributional range of the family has been strictly Australasian.

The discovery of a representative of this family from Chile is of considerable interest, not only because it confirms earlier suspicions about the Gondwanian distribution of the family, but also because it provides an opportunity to test the validity of the family and the characters used to define it.

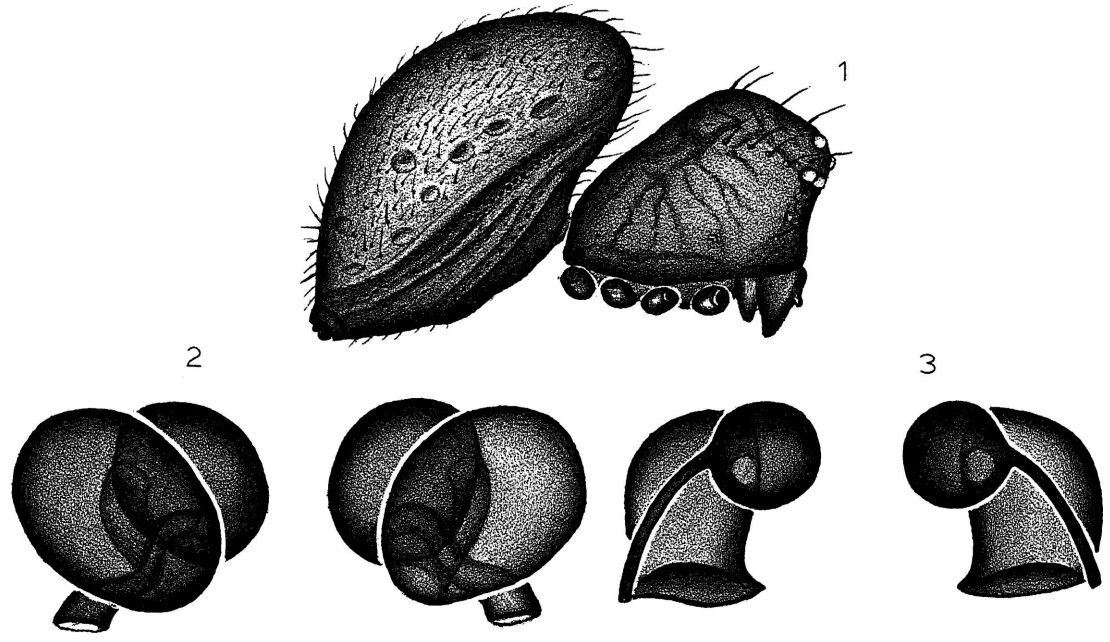
Hickman when establishing the family placed considerable weight on the respiratory system, placing it within the Apneumonomorphae of Petrunkevitch. The apneumone condition in a number of so-called apneumone taxa has subsequently been shown to have been derived within family limits, so that these families include both lungless species and species which have retained the plesiomorphic paired booklungs in the second abdominal segment (examples are the Ochyroceratidae, Anapidae, and Mysmenidae). The facts that the respiratory system of the Chilean textricellid is virtually identical with that of Australasian species, and that this system presents a configuration unique among the apneumone spiders, support the contention that the respiratory system found in representatives of this family to date is synapomorphic for the taxon, and that the family Textricellidae can be considered valid and truly apneumone.

In an earlier review of the apneumone araneoids, Forster (1959) lumped all the known familial taxa (Symphytognathidae, Anapidae, Micropholcommatidae, Textricellidae, and Mysmenidae) into a single family Symphytognathidae. Information acquired subsequently, particularly about web-building habits and the evolution of the respiratory system, has shown that this action was not justified, that all the previously established families are probably valid taxa, and that they probably do not constitute a monophyletic group (Forster and Platnick, 1977).

Previous treatments of textricellid species have been largely uninformative about their interrelationships. All the described forms have been placed in the single genus *Textricella*. With the greater range of species now

[1] Research Associate, Department of Entomology, American Museum of Natural History; Director, Otago Museum, Dunedin, New Zealand.

[2] Associate Curator, Department of Entomology, American Museum of Natural History; Adjunct Professor, Department of Biology, City College, City University of New York.



FIGS. 1–3. 1, 2. *Tricella gertschi*, new species. 1. Lateral view of male. 2. Female, internal genitalia, from above. 3. *Textricella vulgaris* Forster, female, internal genitalia, from above.

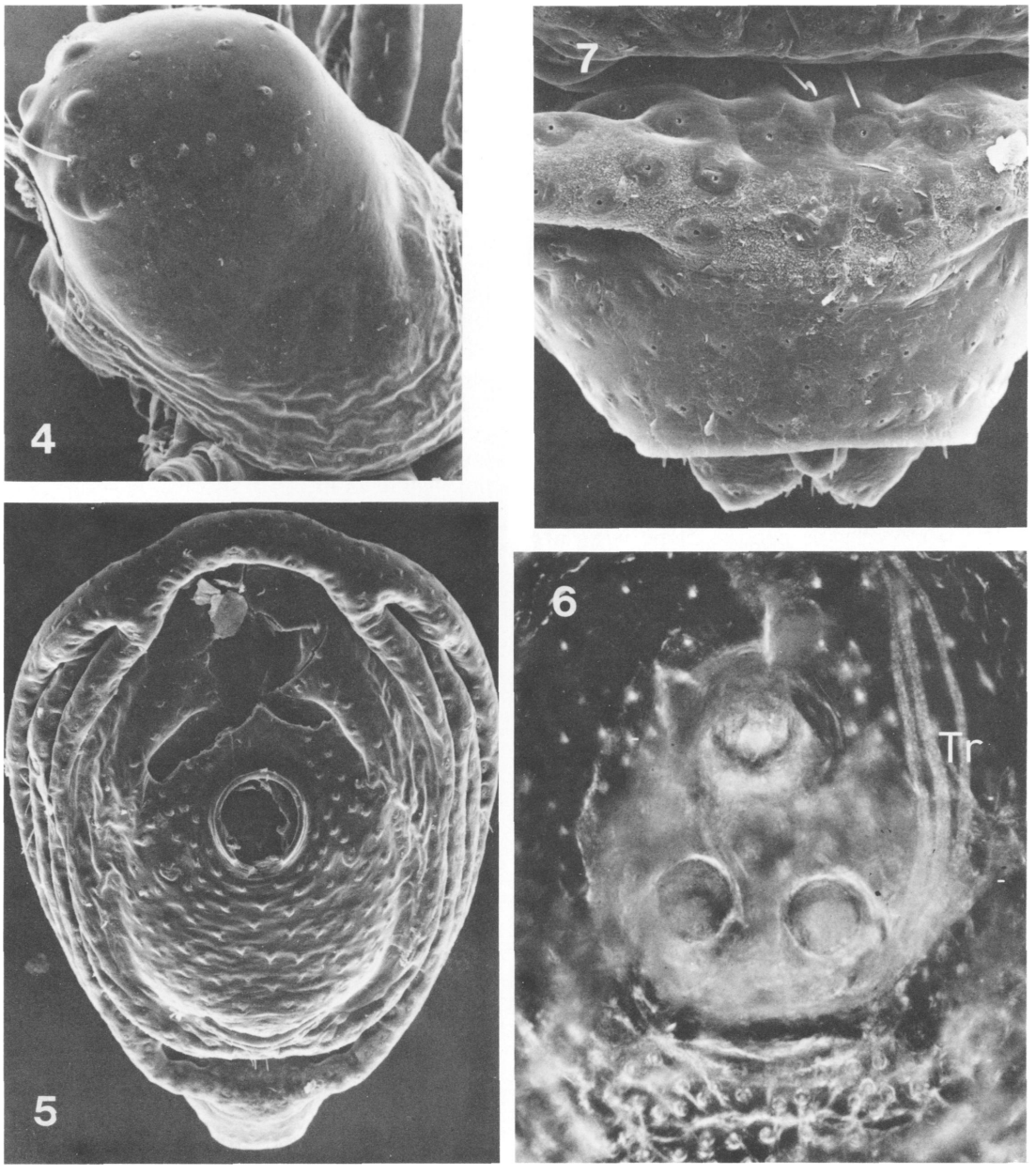
known (although not necessarily yet described) and the extension of the range of the family to include South America, the taxonomy of these spiders would be of greater value to biogeographic analysis if a more fully resolved classification were available. It is quite clear that a number of genera are represented. While, as discussed below, the Chilean species shows close relationship to a number of Australian species, those species are certainly not congeneric with the type species of *Textricella, T. parva* Hickman. We therefore establish a new genus for the Chilean species below, and shall consider the question of whether its Australian relatives should also be included in that genus at a later date.

So far as known, textricellids construct a small sheetweb, usually in moss and litter in shaded, moist habitats. Hickman (1945) found that the eggsacs of *T. parva* were round and decorated with tufts of silk, whereas those of *T. luteola* were biconvex. These spiders often occur in large numbers (particularly in Berlese samples) but there is no indication that they are social in behavior.

We are indebted to Dr. W. J. Gertsch for sending us the Chilean material; our paper is dedicated to him, in recognition of his seminal contributions (1941, 1960) to the study of American apneumone araneoids.

TEXTRICELLIDAE HICKMAN

DESCRIPTION: Minute apneumone spiders with single pair of tracheal spiracles opening at epigastric furrow. Tracheal system consisting of two to five short tubes restricted to anterior portion of abdomen; posterior tracheae absent. Carapace raised, subrectangular in lateral view, without distinct thoracic groove; surface smooth. AME when present always much smaller than other subequal eyes. Bulb of male palp with slender embolus, either short or filiform and coiled; conductor sometimes present but median apophysis always lacking. Female palp slender, with normal number of segments, with-



FIGS. 4–7. *Tricella gertschi,* new species. 4. Cephalothorax of male. 5. Ventral surface of female abdomen. 6. Female genitalia and anterior tracheae (Tr) from above; only three of the five tracheal tubes are in focus. 7. Ventral surface of female abdomen below the epigastric furrow; note absence of a posterior spiracle.

out claw. Chelicerae with peg-teeth in males. Cheliceral glands opening from mound at proximal margin of furrow near tip of fang; mound probably always associated with dis-

tal tooth (figs. 20–27). Abdomen usually coriaceous, with dorsal scute in males; epigastric plate present, encircling petiolus. Six spinnerets and distinct linguaform colulus encircled by sclerotic band. Legs clothed with serrate hairs and bristles but, apart from single spine on leg I of some males, lacking spines. Tarsus much longer than metatarsus, with three claws. Tarsal organ a simple dome. Trichobothrial bases with only slight ridge. Trichobothria present on tibiae, at most a single subdistal one on metatarsi, absent on tarsi.

DISTRIBUTION: Australia, Tasmania, New Zealand, New Guinea, Chile.

TRICELLA, NEW GENUS

TYPE SPECIES: *Tricella gertschi*, new species.

ETYMOLOGY: The generic name is an arbitrary combination of letters formed by a contraction of *Textricella*, and is considered feminine in gender.

DIAGNOSIS: *Tricella* can be readily separated from the type (and closely related) species of *Textricella* by having the anterior median eyes separated by more than their diameter, by the long, coiled embolus of the male palp, and by the different structure of the female genitalia (figs. 2, 3).

DESCRIPTION: Eight eyes; AME smallest, separated by more than their diameter. Embolus filiform, strongly coiled over most of surface of bulb; conductor absent. Palpal patella with flattened distal process but without the stalked sphere characteristic of species congeneric with *Textricella parva*. Internal genitalia of female with paired spherical receptacula of which one is membranous.

DISCUSSION: The species presently placed in *Textricella* belong to at least four distinct genera, none of which are clearly congeneric with the present species. The establishment of *Tricella* at this time is based on comparison with the type species of *Textricella* (*T. parva* Hickman) and those species which are probably congeneric with it. In that group of species (by contrast to *Tricella*) the embolus of the male palp is short, limited to the distal portion of the bulb, and always accompanied by a well-developed conductor (figs. 16–19). The patella of the male palp may have a number of variously shaped processes but a stalked sphere seems to be common to them all; this is not present in *Tricella*.

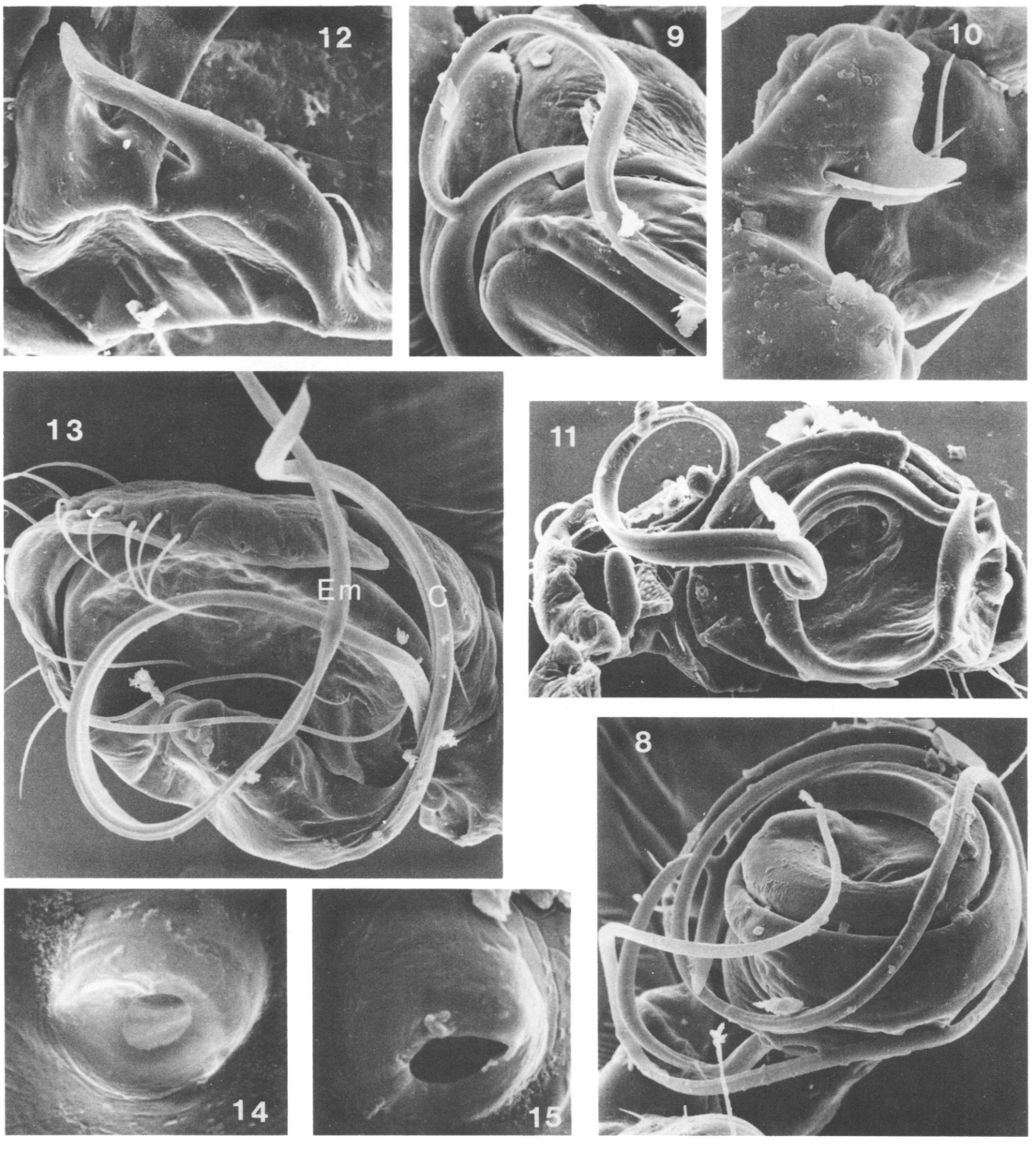
The bilobed internal genitalia found in *Tricella* could represent the plesiomorphic form of genitalia for the family, as the membranous sacs are similar to those found in other araneoids (uloborids, for example; Forster, 1980), where they have apparently evolved from the subdivision of a single median sac before the development of an internal fertilization duct. The fertilization duct has not been distinguished in *Tricella*, whereas it is clearly visible in all other described textricellids. Thus it is possible that the female genitalia of *Tricella* are still in the haplogyne condition; certainly external openings are not visible as in other species.

RELATIONSHIPS: The form of the male palp suggests close relationship with *T. luteola* Hickman and *T. hickmani* Forster from Australia, and perhaps more distantly with the New Guinea *T. tropica* Forster, all three of which are characterized by long coiled emboli. The most striking characteristic of the embolus of *Tricella* is the basal structure where the embolus proper springs from a stout spinous process (figs. 8, 9). It is possible that the more proximal spinous process found in both *T. luteola* (figs. 11, 12) and *T. hickmani* is homologous and represents a synapomorphy of the three species. The structure is not present in this form in *T. tropica* (fig. 13), but the elongate conductor, which is contiguous with the embolus for about one-third of its length, could be interpreted as having been derived from a stout spinous process. There is no comparable structure present in the *parva* group (figs. 16–19), which includes most of the New Zealand species.

It is unlikely that there is only a single species of textricellid extant in Chile and it would not be surprising if further species showing closer affinities with *Textricella* than with *Tricella* are found in the future.

Tricella gertschi, new species
Figures 1, 2, 4–9, 14, 15, 20–22

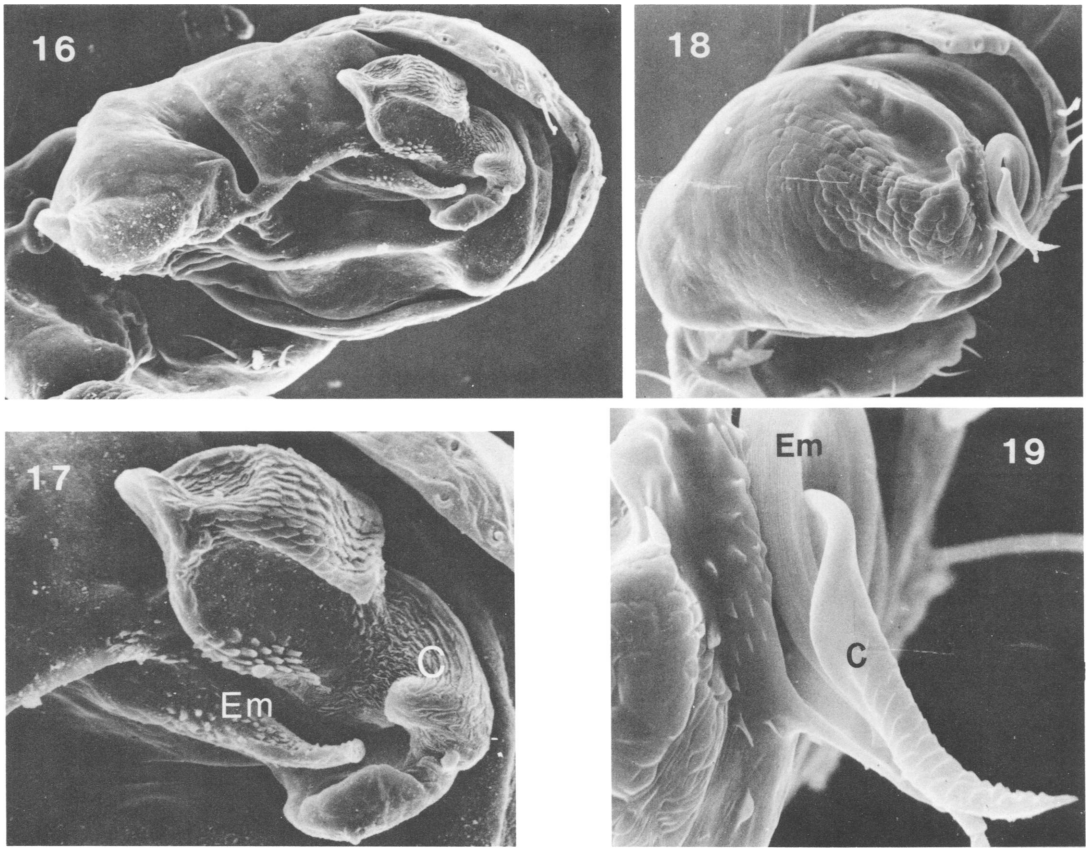
TYPES: Male holotype and female paratype collected from soil and humus 4 km. west of Cherquenco, Cautín, Chile (April 28, 1961;



FIGS. 8–15. 8–10. *Tricella gertschi,* new species. 8. Ventral view of male palp. 9. Base of embolus, showing branching. 10. Patellar process. 11, 12. *Textricella luteola* Hickman. 11. Ventral view of male palp; embolus extended. 12. Base of embolus showing basal projection. 13. *Textricella tropica* Forster, ventral view of male palp, showing embolus (Em) and conductor (C); in the resting position the conductor is contiguous with the embolus. 14, 15. *Tricella gertschi,* new species. 14. Bothrium of trichobothria. 15. Tarsal organ.

L. M. Smith), deposited in the American Museum of Natural History.

ETYMOLOGY: The specific name is a patronym in honor of Dr. Willis J. Gertsch, who has assisted our studies of minute araneoid spiders in many ways and over many years.



FIGS. 16–19. 16, 17. *Textricella parva* Hickman. 18, 19. *T. vulgaris* Forster. 16, 18. Ventral view of male palp. 17, 19. Enlarged view of embolus (Em) and conductor (C).

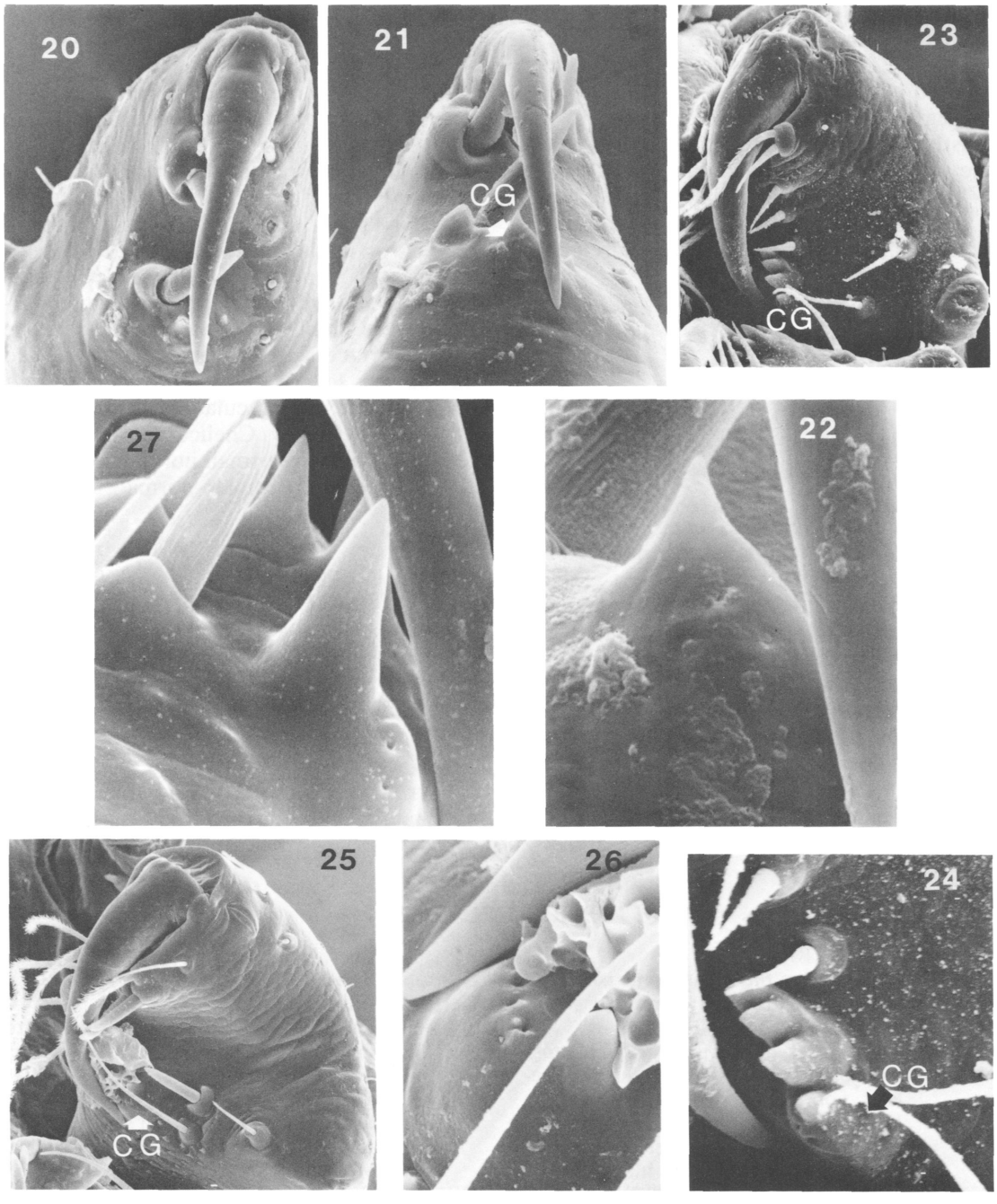
DIAGNOSIS: With the characteristics of the genus and genitalia as in figures 2, 8, and 9.

MALE: Total length 1.08. Carapace 0.52 long, 0.41 wide, 0.40 high. Abdomen 0.81 long, 0.65 wide. Carapace dark brown with distinct reticulate patterning of darker blackish brown (fig. 1). Abdomen orange brown with dorsal and ventral scuta darker brown. Legs reddish brown.

Carapace with shape typical for family, as wide as high, surface smooth, shiny. Two long hairs along median line of dorsal surface of caput, pair of similar hairs at posterior margin, further row of five hairs on each side of caput at level of lateral eyes. Ratio of AME:ALE:PME:PLE, 2:4:3:4. AME separated by 1.5 times their diameter, by 2.5 times their diameter from ALE. Lateral eyes contiguous. PME separated by 2.5, from PLE by 3 times the AME diameter. Clypeus high, equal to eight times the AME diameter. From front, both eye rows straight.

Chelicerae vertical, without lateral boss, with two strong peg-teeth, one near base of fang, one subdistal; single normal tooth adjacent to proximal peg-tooth, close to cheliceral gland mound; mound surmounted with short tooth (figs. 20–22; cf. figs. 23–27); spur present on mid-dorsal surface of each chelicera (fig. 1).

Sternum suboval, slightly wider than long, coarsely punctate; posterior margin broadly rounded; coxae IV separated by more than twice their diameter. Endites slightly more



FIGS. 20–27. Male chelicerae, showing cheliceral gland (CG). 20–22. *Tricella gertschi,* new species. 20, 21. Ventral views. 22. Cheliceral gland mound. 23, 24. *Textricella parva* Hickman. 23. Ventral view. 24. Cheliceral gland mound contiguous with three teeth below the tip of the fang. 25, 26. *Textricella luteola* Hickman. 25. Ventral view. 26. Cheliceral gland mound. 27. *Textricella vulgaris* Forster, cheliceral gland mound.

than twice as long as wide, directed transversely across labium but not meeting at midline. Labium triangular, wider than long in ratio of 5:3, not rebordered.

Legs clothed with fine serrate hairs, few bristles, no spines. Trichobothria: 2–3 on tibiae, one subdistal on metatarsi; bothria (fig. 14) with low ridge indicating proximal hood. Tarsal organ large, subproximal, with transverse oval aperture (fig. 15). Measurements:

	I	II	III	IV	Palp
Femur	0.30	0.28	0.24	0.35	0.13
Patella	0.12	0.10	0.12	0.12	0.07
Tibia	0.25	0.20	0.20	0.26	0.08
Metatarsus	0.12	0.11	0.09	0.12	—
Tarsus	0.22	0.21	0.22	0.27	0.14
Total	1.01	0.90	0.87	1.12	0.42

Abdominal cuticle thickened, ridged laterally, with rows of sclerotic patches between ridges; dorsal surface almost entirely covered with scute bearing row of seven prominent muscle depressions along each lateral margin and four pairs along dorsal surface (fig. 1). Ventral scute well-developed, extending forward from epigastric furrow, enclosing petiolus, reaching nearly to margin of dorsal scute. Six spinnerets encircled by distinct sclerotic ring; colulus a labiate flattened plate with one pair of hairs.

Palp as in figures 8–10. Embolus extremely long, slender, coiled at rest with three turns; duct enters embolus through stout basal portion which terminates as stout spine (fig. 9); basal section curves around surface of bulb approximately one turn before terminating in stout spine; immediately before distal spine a secondary, more slender branch of embolus branches off at right angle to continue as embolus proper. Patella with single flattened process on distal surface (fig. 10).

FEMALE: General appearance as in male but abdomen without dorsal scute, with lateral ridges similar to male and coriaceous dorsal surface. Internal genitalia (fig. 2) do not appear to possess a fertilization duct; openings into receptacula situated at margin of epigastric furrow. Chelicerae without pegteeth but with three small normal teeth; dorsal spur lacking. Pedipalp normal. Measurements:

	I	II	III	IV	Palp
Femur	0.29	0.28	0.26	0.30	0.08
Patella	0.13	0.10	0.10	0.10	0.06
Tibia	0.22	0.18	0.17	0.25	0.06
Metatarsus	0.12	0.10	0.10	0.10	—
Tarsus	0.21	0.21	0.22	0.20	0.07
Total	0.97	0.87	0.85	0.95	0.27

MATERIAL EXAMINED: Four females and one male taken with the types.

DISTRIBUTION: Known only from Chile.

LITERATURE CITED

Forster, Raymond R.
1955. Spiders from the subantarctic islands of New Zealand. Rec. Dominion Mus., vol. 2, pp. 167–203, figs. 1–60.
1959. The spiders of the family Symphytognathidae. Trans. Roy. Soc. New Zealand, vol. 86, pp. 269–329, figs. 1–157.
1980. Evolution of the tarsal organ, the respiratory system and the female genitalia in spiders. Proc. Eighth Internatl. Arachnologen-Kongress, Wien 1980, pp. 269–284, figs. 1–22.

Forster, Raymond R., and Norman I. Platnick
1977. A review of the spider family Symphytognathidae (Arachnida, Araneae). Amer. Mus. Novitates, no. 2619, pp. 1–29, figs. 1–74.

Gertsch, Willis J.
1941. Report on some arachnids from Barro Colorado Island, Canal Zone. Amer. Mus. Novitates, no. 1146, pp. 1–14, figs. 1–33.
1960. Descriptions of American spiders of the family Symphytognathidae. *Ibid.*, no. 1981, pp. 1–40, figs. 1–72.

Hickman, Vernon V.
1945. A new group of apneumone spiders. Trans. Connecticut Acad. Arts Sci., vol. 36, pp. 135–148, figs. 1–14.

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Volume 170
1981

PUBLISHED BY ORDER OF THE TRUSTEES
NEW YORK : 1981

EDITED BY
FLORENCE BRAUNER

CONTENTS OF VOLUME 170

Article 1. Contributions to Arachnid Systematics in Honor of Willis J. Gertsch. Pages 1–270, 137 figures, 12 tables. October 4, 1981 ..... $19.15

INDEX OF AUTHORS

Brignoli, Paolo Marcello 90
Carico, James E. 140
Carico, James E. and Edwin W. Minch 154
Coyle, Frederick A. 64
Cutler, Bruce 207
Dondale, Charles D. and James H. Redner 106
Forster, Raymond R. and Norman I. Platnick 263
Francke, Oscar F. 23
Galiano, María Elena 216
Helsdingen, P. J. Van 229
Kaston, B. J. 7
Kronestedt, Torbjörn 111
Levi, Herbert W. 254
Lowrie, Donald C. and Charles D. Dondale 125
Maury, Emilio A. 29
Millidge, A. F. 242
Murphy, John A. and Norman I. Platnick 46
Opell, Brent D. 219
Peck, William B. 157
Platnick, Norman I. and Mohammad U. Shadab .. 18, 76, 176, 183, 189
Raven, Robert J. 57
Reiskind, Jonathan 170
Richman, David B. 197
Roth, Vincent D. 101
Shear, William A. 257
Stahnke, Herbert L. 34
Valerio, Carlos E. 15, 80