Rowland, J. M. and J. R. Reddell 1979. The order Schizomida (Arachnida) in the New World. II. *Simonis* and *brasiliensis* groups (Schizomidae: *Schizomus*). J. Arachnol., 7:89-119.

THE ORDER SCHIZOMIDA (ARACHNIDA) IN THE NEW WORLD. II. *SIMONIS* AND *BRASILIENSIS* GROUPS (SCHIZOMIDAE: *SCHIZOMUS*)[1]

J. Mark Rowland[2] and **James R. Reddell**[3]

The Museum and Department of Biological Sciences
Texas Tech University, Lubbock, Texas 79409

ABSTRACT

A systematic revision of the *Schizomus simonis* and *S. brasiliensis* species groups (Arachnida, Schizomida, Schizomidae) is presented. The following species are described and assigned to the *simonis* group: *S. drakos* n. sp., *S. simonis* Hansen, *S. trinidanus* n. sp., *S. acrocaudatus* n. sp., *S. flavescens* Hansen, *S. tobago* n. sp., *S. mumai* n. sp., and *S. centralis* Gertsch. Two taxa known only from females (*Schizomus* spp., OTU Nos. 1 and 2) are also briefly described and assigned to the *simonis* group. The following species are described and assigned to the *brasiliensis* group: *S. stewarti* Rowland, *S. trilobatus* Rowland, *S. lacandonus* Rowland, *S. cuenca* n. sp., *S. sturmi* (Kraus), *S. brasiliensis* (Kraus), *S. macarensis* (Kraus), *S. cumbalensis* (Kraus), and *S. pallipatellatus* n. sp. Brief descriptions are also provided for six taxa assigned to the *brasiliensis* group that are known only from females (*Schizomus* spp., OTU Nos. 7-12).

INTRODUCTION

This is the second in a series of systematic reports revising the arachnids of the order Schizomida in the New World. The first report (Rowland and Reddell 1979) covered the family Protoschizomidae and the *Schizomus dumitrescoae* group of the family Schizomidae. The present report includes a revision of two primarily South American species groups of the family Schizomidae, the *Schizomus simonis* and *S. brasiliensis* groups. Uniform descriptions are included for previously described species as well as for new species, and include all characters which have been found to be of value in distinguishing taxa (see Rowland and Reddell 1979, for a discussion of the characters used). Table 1 may be used to compare the species groups included here with the remaining groups of New World schizomids. Future reports will revise the remaining species groups of New World schizomids and discuss in detail the zoogeography and phylogeny of the order in the New World.

[1] Supported in part by The Museum, Texas Tech University, and by a Society of Sigma Xi Grant-in-Aid of Research to the senior author.

[2] Present address: Department of Pharmacology and Therapeutics, Texas Tech University School of Medicine, Lubbock, Texas 79409.

[3] Present address: Texas Memorial Museum, The University of Texas at Austin, Austin, Texas 78705.

Several species are described in this report for which males are not available. These taxa are not named, but are included because they are of value in analyzing the phylogenetic and zoogeographic relationships within the order. As we earlier discussed (Rowland and Reddell 1979), the formal taxonomic recognition of species of schizomid known only from females is unwise, since the only completely reliable characters for the recognition of species are the flagellum and secondary sexual characters of males. The females briefly described and illustrated in the present study are certainly distinct taxa as based on study of the spermathecae, but variation in this character is too great to guarantee that specimens from nearby localities could be accurately identified. These taxa are referred to as Operational Taxonomic Units (OTU's) for purposes of phylogenetic and zoogeographic analysis.

Table 1.--Comparisons of the New World species groups of the genus Schizomus. See Rowland and Reddell (1979) for explanation of characters.

CHARACTER	dumitrescoae	simonis	brasiliensis	mexicanus	pecki	goodnightorum	briggsi
DORSAL SETAE	2-3	2-3	3-4	2-3	2-3	3-4	3-4
METAPELTIDIUM	entire	entire	split or entire	entire	entire	entire	split or entire
COLOR	brown or green	brown or green	brown or green	brown or green	brown	brown	brown or green
SPERMATHECAE	M < L	M < L	M = L	M > L	M > L	M > L	multiple
ART. FEM. FLAGELLUM	4	4	3	3	3	3	4
CARAPACE LENGTH	.96-1.37	1.07-1.34	.91-1.48	.98-1.37	1.31-1.74	.89-1.42	1.18-1.52
ABDOMINAL ELONGATION	none	present	none	none	none	present	none or present
ABDOMINAL PROCESS	present	present	present	absent	absent	absent	present
PEDIPALPAL DIMORPHISM	slight to strong	none	slight to strong	none to strong	none	none	none to strong
SHAPE MALE FLAGELLUM	bulbous	long	bulbous	bulbous	bulbous	long	long or bulbous

The present study is based to a large extent on a dissertation prepared by the senior author at Texas Tech University, Lubbock, Texas (Rowland 1975a).

Family Schizomidae

SIMONIS GROUP

Description.–Members of this group are characterized by moderate to great length (1.07-1.34 mm carapacial length). Color is brownish. Eyespots are present, but are usually indistinct. The carapace has two to three pairs of dorsal and two apical setae. Males: abdomen attenuate, the elongation either limited to the pygidial segments or involving segments V-XII; abdominal segment XII with a posterodorsal process, which is usually truncate, but in a few species is rounded; flagellum longer in species with elongated abdomen, but shorter in species with lesser attenuation; a pair of subproximal flagellar elevations, often undercut, present in all species. Females: Flagellum 0.37 to 0.61 mm in length, composed of four articles; spermathecae characterized by elongation of lateral pair, and usually a slight reduction of median pair; apex of the spermathecae, at least of the lateral pair, with sclerotized bulbs. The pedipalps are not sexually dimorphic.

Distribution.–Central America: Costa Rica, Panama. South America: Venezuela, Trinidad, Tobago, British Guiana.

Remarks.–Species which may belong to this group, but which have not been examined include *S. gladiator* Remy, 1961, *S. surinamensis* Remy, 1961, and *S. vanderdrifti* Remy, 1961, from Surinam; and *S. dispar* Hansen (*in* Hansen and Sörensen 1905) from Martinique. Table 2 gives characters used in separating the species of the *simonis* group.

Subordinate taxa.–*Drakos* complex: OTU No. 1, OTU No. 2, *S. drakos* n. sp.; *simonis* complex: *S. simonis* Hansen, *S. trinidanus* n. sp., *S. acrocaudatus* n. sp., *S. flavescens* Hansen; *centralis* complex: *S. tobago* n. sp., *S. mumai* n. sp., *S. centralis* Gertsch.

Schizomus sp., OTU No. 1
(Figs. 1, 21)

Description.–Female. Color brownish. Carapace with three pairs of dorsal setae, the middle pair smallest, and two apical setae. Eyespots indistinct. Anterior sternum with 10 bifid setae, posterior sternum with bifid setae. Abdominal terga I-VIII with two setae, tergum IX with four setae. Vestigial stigmata darker than sterna. Flagellum missing. Pedipalpal trochanter not produced apically; tarsal-basitarsal spur about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 33-4-6-7-7-7-17. Other leg segment measurements given in Table 3. Median and lateral spermathecae about same size; wide basally to apically; no localized sclerotization; laterals bent outward basally; medians convergent, laterals divergent.

Male unknown.

Specimen examined.–Female taken at Atkinson Field, British Guiana, 8 November 1959 (collector unknown) (AMNH).

Distribution.–Known only from Atkinson Field, British Guiana.

Remarks.–This species is most closely related to *Schizomus* sp., OTU No. 2, with which it shares a unique development of the spermathecae. It is best distinguished from OTU No. 2 by its lack of a sclerotized basal portion under the spermathecae.

Schizomus sp., OTU No. 2
(Figs. 1, 19-20)

Description.–Female. Color brownish. Carapace with three pairs of dorsal setae, the middle pair smallest, and two apical setae. Eyespots indistinct. Anterior sternum with 11 bifid setae, posterior sternum with bifid setae. Abdominal terga I-VIII with two setae, tergum IX with four setae. Vestigial stigmata darker than sterna. Flagellum with four sections. Pedipalpal trochanter not produced distally; tarsal-basitarsal spurs about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 35-5-8-8-8-8-17. Other leg segment measurements given in Table 3. Median and lateral spermathecae similar in shape, but laterals longer; both pair wide basally, slightly narrower apically, ending in a small cleft; no special sclerotization; medians convergent, laterals divergent; medians and laterals basally connected to a basal piece.

Male unknown.

Specimens examined.–Female taken in the Bartica District, British Guiana, 6 May 1924 (collector unknown) (AMNH); two females taken in Kartabo 1, British Guiana, 1919 (A. Emerson) (AMNH).

Distribution.–Known only from Bartica District and Kartabo 1, British Guiana.

Table 2.–Comparisons of members of the *simonis* group. See the introduction to Rowland and Reddell (1979) for discussion of characters.

CHARACTER	OTU #1	OTU #2	drakos	simonis	flave-scens	acroca-udatus	trini-danus	tobago	mumai	centralis
DORSAL SETAE	3	3	3	2	2	2	2	2	2	2
STERNAL SETAE	10	11	12	11	11	10	11	11	11	11
ABDOMINAL PROCESS	?	?	round	round	?	small truncate	medium truncate	small truncate	large truncate	large truncate
EYESPOTS	indis-tinct	indis-tinct	indis-tinct	indis-tinct	indis-tinct	indis-tinct	distinct	indis-tinct	distinct	distinct
SPERMA-THECAE	L=M	L=M	?	multiple	L=M	?	L=M	L=M	L 2X M	L ±= M
CARAPACE LENGTH	1.08	1.29	1.34	1.40	1.33	1.14	1.14	1.12	1.14	1.12
LENGTH FEM. FLAGELLUM	?	.38	?	.52	.61	?	.37	.41	.40	.37
ABDOMINAL ELONGATION	?	?	5-12	10-12	?	7-12	10-12	7-12	5-12	7-12
ELEV. MALE FLAGELLUM	?	?	present	present	?	present	present	absent	present	absent
PIT MALE FLAGELLUM	?	?	double	double	?	double	double	single	single	single

Table 3.–Measurements (mm) of species of the *simonis* group: 1, one female, OTU No. 1; 2, one female, OTU No. 2; 3, one male, *S. drakos*; 4, one male, *S. simonis*; 5, one female, *S. simonis*; 6, three males, *S. trinidanus*; 7, three females, *S. trinidanus*; 8, one female, *S. flavescens*. Except as otherwise noted all measurements are of lengths.

	1	2	3	4	5	6	7	8
Carapace	1.08	1.29	1.34	0.95	1.40	1.07-1.07	1.11-1.14	1.33
Flagellum								
Length	-	0.38	0.58	0.40	0.52	0.43-0.45	0.37-0.40	0.61
Width	-	-	0.38	0.19	-	0.22-0.23	-	-
Leg I								
Femur	1.11	1.17	1.78	1.15	1.40	1.03-1.10	1.02-1.05	1.48
Patella	1.30	1.41	2.24	1.44	1.68	1.28-1.35	1.25-1.28	1.78
Tibia	0.96	1.06	1.64	1.06	1.22	0.93-0.97	0.93-0.93	1.43
Tarsus-basitarsus	0.80	0.89	1.14	0.86	1.00	0.79-0.82	0.78-0.78	1.08
Leg II								
Femur	0.75	0.82	1.04	0.65	0.96	0.67-0.71	0.70-0.72	1.00
Patella	0.42	0.49	0.53	0.33	0.50	0.39-0.40	0.41-0.44	0.61
Tibia	0.45	0.50	0.65	0.40	0.55	0.39-0.43	0.42-0.43	0.65
Basitarsus	0.43	0.44	0.56	0.40	0.56	0.36-0.38	0.37-0.37	0.54
Leg III								
Femur	0.66	0.70	0.86	0.56	0.42	0.58-0.60	0.61-0.62	0.87
Patella	0.31	0.35	0.37	0.23	0.40	0.25-0.26	0.28-0.29	0.42
Tibia	0.35	0.39	0.49	0.26	0.41	0.30-0.32	0.30-0.32	0.45
Basitarsus	0.45	0.47	0.63	0.40	-	0.35-0.36	0.37-0.40	0.56
Leg IV								
Femur	1.06	1.14	1.41	1.00	1.32	0.95-0.99	0.97-1.06	0.89
Patella	0.46	0.55	0.58	0.36	0.65	0.44-0.47	0.47-0.52	0.40
Tibia	0.71	0.79	0.93	0.65	0.89	0.61-0.63	0.64-0.67	0.49
Basitarsus	0.64	0.70	0.90	0.53	0.83	0.54-0.57	0.55-0.58	0.54

Variation.–The spermathecae of the three specimens examined show some marked differences. In the specimen from the Bartica District the medians are smaller than the laterals and the basal portion is smaller than either pair of spermathecae. The spermathecae of the Kartabo 1 specimens are larger and the medians and laterals are more clearly equal in size, although there is a marked asymmetry in the size of the laterals; and the basal portion of the spermathecae is larger than either the laterals or medians.

Remarks.–It is possible that these two collections represent different, though closely related species. Without males or additional females from these and other localities, however, it is more convenient to consider them as representatives of a single species.

Schizomus drakos, new species
(Figs. 1, 4)

Description.–Male. Color brownish. Carapace with three pairs of similar dorsal and two apical setae. Eyespots oval, indistinct. Anterior sternum with 12 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; abdominal segments V-XII extremely elongate; segment XII with rounded posterodorsal process. Vestigial stigmata darker than sterna. Flagellum nearly triangular, with a pair of median pits flanked proximally by a pair of lateral swellings. Pedipalpal trochanter not produced

distally; tarsal-basitarsal spurs about 1/5 length of tarsus-basitarsus, claw missing. Tarsal-basitarsal segments of leg I of the following approximate proportions: 49-6-9-10-8-11-21. Other leg segment measurements given in Table 3.

Female unknown.

Type data.—Holotype male taken in Kartabo, Bartica District, British Guiana, 12 October 1920 (collector unknown) (AMNH).

Comparisons.—This species appears to be closely related to OTU Nos. 1 and 2, based on the general morphology, although comparison is difficult due to the absence of a female of *S. drakos* and males of the other two species. It may be readily distinguished from OTU Nos. 1 and 2, however, by the presence of four setae on terga VIII in *S. drakos* and two setae on terga VIII of OTU Nos. 1 and 2. *S. drakos* may be separated from other species of the *simonis* group by the presence of three pairs of dorsal setae, while all other *simonis* group species possess only two pairs.

Distribution.—Known only from the type locality.

Etymology.—*Drakos* is from the Greek word meaning dragon, a name inspired by the elongate abdomen of this species.

Schizomus simonis Hansen
(Figs. 1, 6, 13, 28-29)

Schizomus simonis Hansen (*in* Hansen and Sörensen) 1905:5, 7, 14, 15, 19, 22, 24, 38, 39, 42-44, 71-73; Chamberlin 1922:12; Mello-Leitão 1931:19; Giltay 1935:7; Gertsch 1940:3; Takashima 1943:93; Remy 1961:504; Lawrence 1969:219, 221, 223.

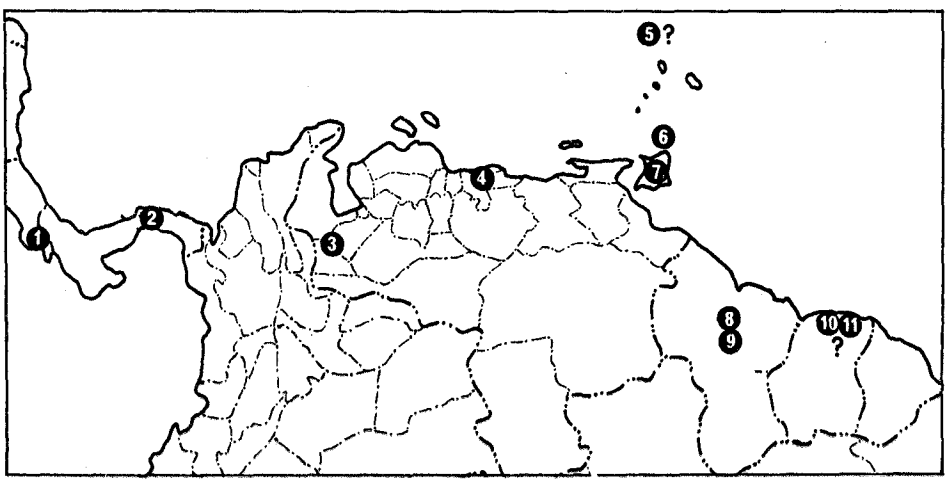


Fig. 1.—Map showing distribution of schizomids of the *simonis* group: 1, *S. mumai*; 2, *S. centralis*; 3, *S. simonis*; 4, *S. flavescens*; 5, *S. dispar*; 6, *S. tobago*; 7, *S. trinidanus*, *S. acrocaudatus*; 8, *S. drakos*; 9, OTU No. 1, OTU No. 2; 10, *S. gladiator*; 11, *S. vanderdrifti*, *S. surinamensis*. Question marks indicate species doubtfully placed in the *simonis* group.

Description.–Male. Color greenish. Carapace with two pairs of dorsal and two apical setae. Eyespots oblong, indistinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; abdominal segments X-XII elongate, tapering, segment XII with slight development of posterodorsal process. Vestigial stigmata nearly indistinguishable from sterna. Flagellum extended distally, apex acute; dorsal surface with two lateral swellings distally undercut by lateral pits. Pedipalpal trochanter produced very slightly; tarsal-basitarsal spurs about 1/6, claw about 1/4 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 33-5-6-7-9-8-14. Other leg segment measurements given in Table 3.

Female. Abdomen not elongate. Flagellum with four articles. Six to eight pairs of spermathecae of varying size.

Type data.–Cotypes: male taken at St. Esteban, Venezuela, by E. Simon (UZMK, examined); female (UZMK, examined) and male and female (NRS, examined), taken at Colonia Tovar, Venezuela, by E. Simon.

Comparisons.–See under *S. trinidanus* and *S. acrocaudatus*.

Distribution.–Known only from Colonia Tovar and St. Esteban, Venezuela.

Remarks.–The morphology of the female spermathecae in this species is unique within the *simonis* group, but it is possible that the female of this species has been misassociated with the male and that this is the female of another species. This may also be indicated by the difference in leg measurements between males and females which in other species of schizomids are usually the same or very similar in both sexes.

Variation.–The male flagellum as figured by Hansen (*in* Hansen and Sörensen 1905) is much longer than that of the cotype examined in this study.

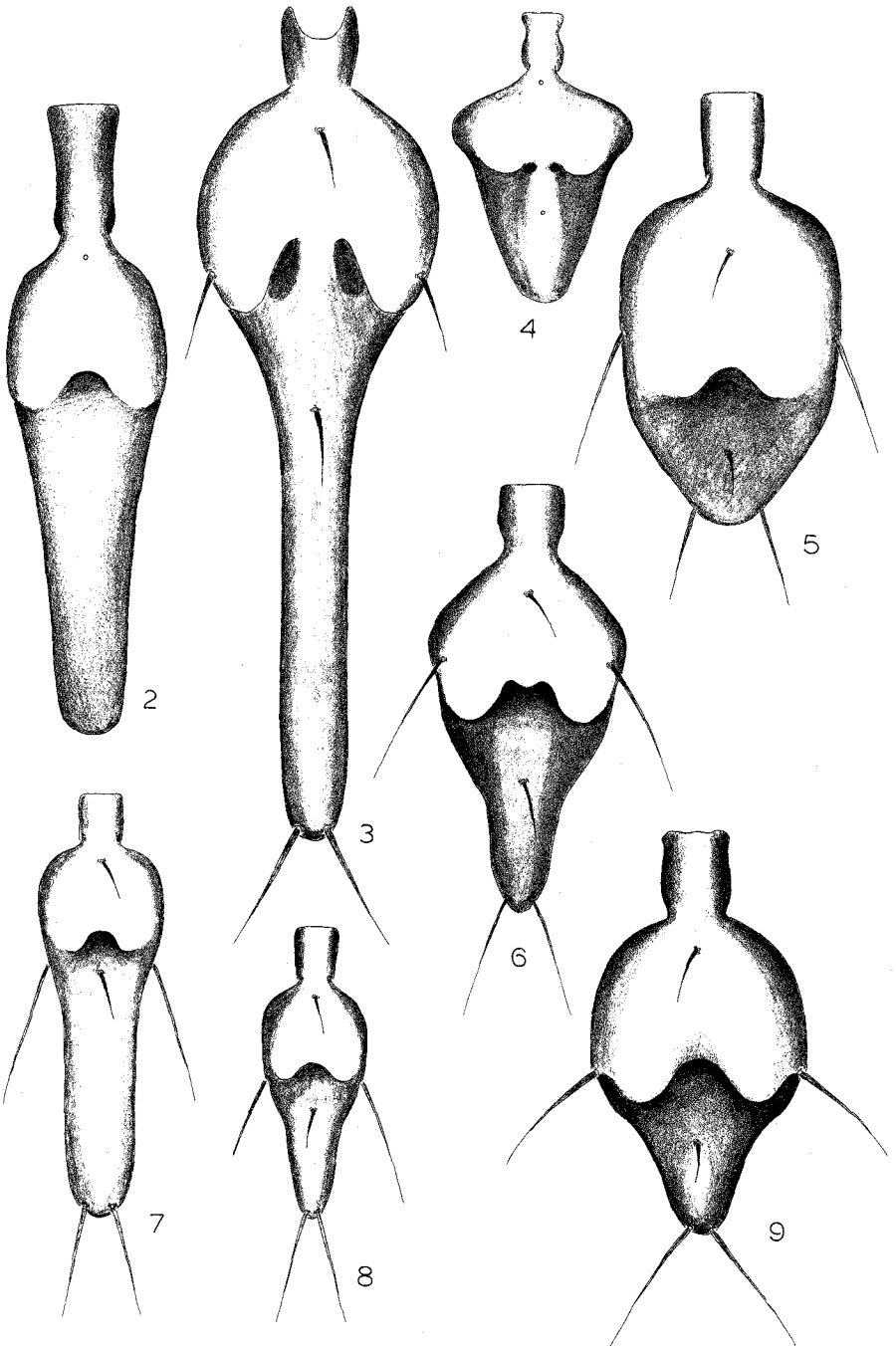
Schizomus trinidanus, new species
(Figs. 1, 9, 14, 16, 31-33)

Description.–Male. Color brownish. Carapace with two pairs of dorsal and two apical setae. Eyespots irregular, distinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; abdominal segments X-XII slightly elongate, segment XII with truncate posterodorsal process. Vestigial stigmata darker than sterna. Flagellum lanceolate, with a pair of median depressions flanked proximally by pair of lateral swellings. Pedipalpal trochanter not produced apically; tarsal-basitarsal spurs about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 30-5-6-6-7-7-11. Other leg segment measurements given in Table 3.

Female. Abdomen not elongate. Flagellum with four articles. Lateral and median spermathecae short, nearly equal in size, terminating in slight sclerotized bulbs.

Type data.–Holotype male, allotype female, paratype male and eight paratype females, taken in Arima Valley, Trinidad (8-1200 ft.), 10-22 February 1964 (P. Wygodzinsky) (MCZ).

Comparisons.–Males of *S. trinidanus*, like *S. simonis*, have only the pygidial segments of the abdomen elongate. The shape of the male flagellum is similar in the two species, but is somewhat more elongate in *S. simonis*. The eyespots are also more distinct in *S. trinidanus* and the posterior abdominal process is truncate in *S. trinidanus*, whereas it is round in *S. simonis*. If the female of *S. simonis* is correctly assigned, it may readily be distinguished from that of *S. trinidanus* in having multiple spermathecae rather than only



Figs. 2-9.–Dorsal views of male flagella of the *simonis* group: 2, *S. tobago*; 3, *S. acrocaudatus*; 4, *S. drakos*; 5, *S. centralis*; 6, *S. simonis*; 7-8, *S. mumai*; 9, *S. trinidanus*.

two pairs. The single dorsal depression in the male flagellum and the long spermathecae of *S. tobago* readily separates it from *S. trinidanus*. The male of *S. acrocaudatus*, which was collected with types of *S. trinidanus*, can be distinguished by the much longer flagellum and elongate abdomen involving abdominal segments VII-XII. Unknown variability in the latter characters, however, may leave the deep dorsal depressions on the flagellum as being a more useful character in distinguishing these two species.

Distribution.–Known only from Arima Valley, Simla, and St. Augustine, Trinidad.

Etymology.–The specific name is an adjectival form of Trinidad.

Variation.–The morphology of the spermathecae is fairly consistent throughout the range of the species. The specimen from Arima Valley has slightly less distinct apical bulbs, apparently because they are somewhat thicker basally. The three males from St. Augustine show only very slight elongation of the pygydial abdominal segments. This variation in secondary sexual characteristics is also known in other species.

Additional records.–Trinidad: Simla, bamboo debris, 26 April 1964 (Chickering), 5 females (MCZ); 23 April 1964 (Chickering), 1 female (MCZ); 18 April 1964 (Chickering), 2 females (MCZ); 20-21 April 1964 (Chickering), 1 female (MCZ); 25 April 1964 (Chickering), 2 females (MCZ); 16 April 1964 (Chickering), 5 females (MCZ); 28 April 1964 (Chickering), 4 females (MCZ); 12 April 1964 (Chickering), 3 females (MCZ); 19 April 1964 (Chickering), 3 females (MCZ). Arima Valley (8-1200 ft.), 10-22 February 1964 (J. Rozen, P. Wygodzinsky), 6 females, 2 immatures (AMNH). St. Augustine, date unknown (Weber), 3 males, 10 females (MCZ).

Schizomus acrocaudatus, new species
(Figs. 1, 3, 12)

Description.–Male. Color brownish. Carapace (length 1.14 mm) with two pairs of dorsal and two apical setae. Eyespots irregular, indistinct. Anterior sternum with 10 setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; abdominal segments VII-XII slightly elongate, segment XII with small, truncate posterodorsal process. Vestigial stigmata darker than sterna. Flagellum extremely long and distally very thin, with a pair of median deep pits flanked laterally by pair of swellings; length, 0.86 mm, width, 0.29 mm. Pedipalpal trochanter not produced distally; tarsal-basitarsal spurs about 1/5, claw about 1/3 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I missing.

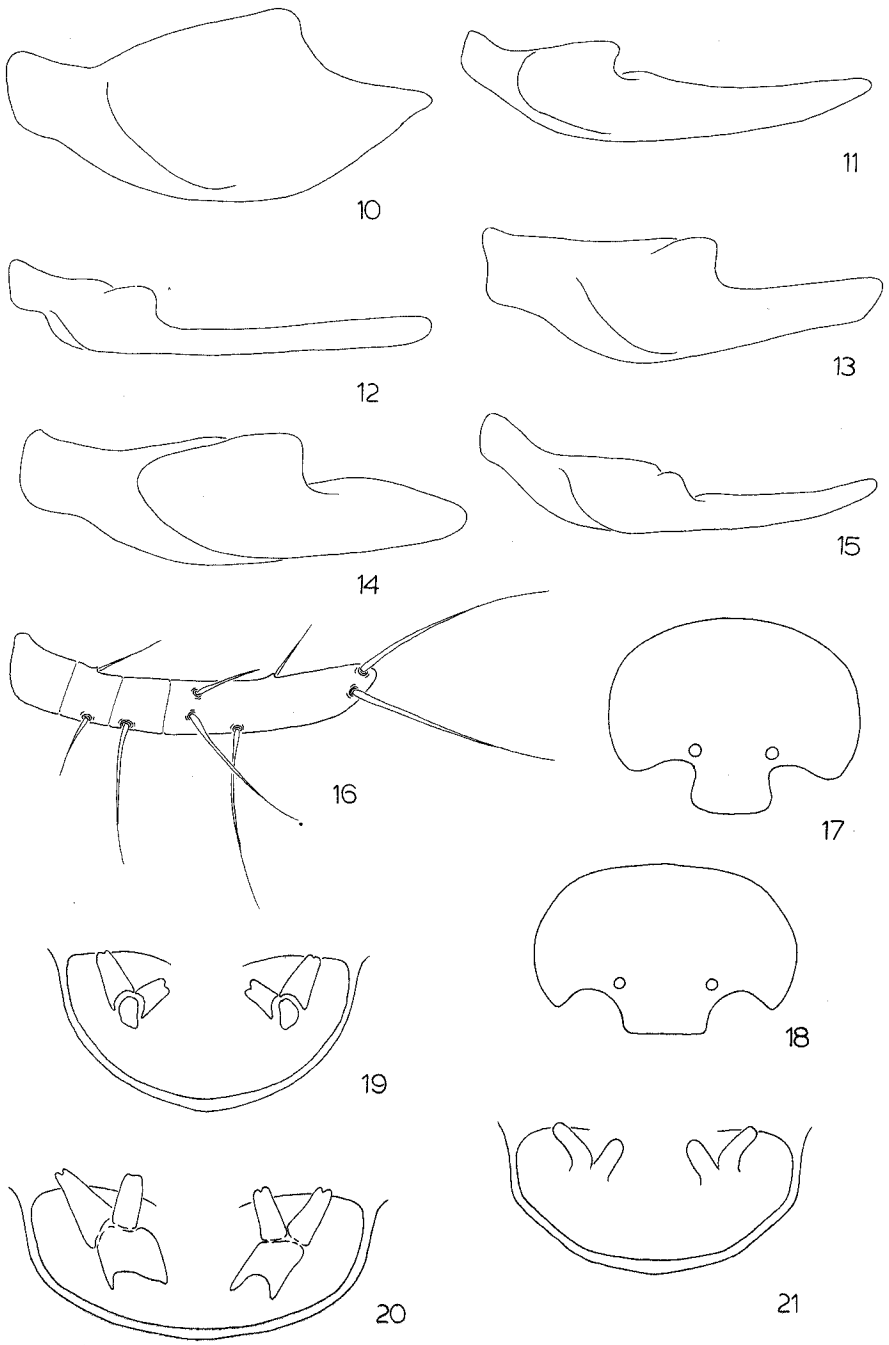
Female unknown.

Type data.–Holotype male taken at St. Augustine, Trinidad, date unknown (M. A. Weber) (MCZ).

Comparisons.–*S. acrocaudatus* is very similar to *S. simonis* in development of the male flagellum. The male cotype of *S. simonis* illustrated by Hansen (*in* Hansen and Sörensen 1905), though not the cotype available to us, shows the flagellum to be very similar to that of *S. acrocaudatus*. The attenuation of the abdomen, however, involves segments VII-XII in *S. acrocaudatus* but only segments X-XII in *S. simonis*. The flagellum of *S. acrocaudatus* is much thicker basally and the pair of dorsal depressions are visible from directly above, while in *S. simonis* the male flagellum is flatter dorsally and the pair of depressions are not clearly visible from above. The posterodorsal abdominal process is round in *S. simonis* and truncate in *S. acrocaudatus*.

Distribution.–Known only from the type locality.

Etymology.–The specific name is taken from the Latin *acr-* meaning sharp and *caud-* meaning tail, describing the morphology of the male flagellum.



Figs. 10-21.–Parts of schizomids of the *simonis* group: 10-15, lateral views of male flagella: 10, *S. centralis*; 11, *S. mumai*; 12, *S. acrocaudatus*; 13, *S. simonis*; 14, *S. trinidanus*; 15, *S. tobago*; 16, lateral view of female flagellum of *S. trinidanus*; 17-18, dorsal views of male posterodorsal abdominal process: 17, *S. centralis*; 18, *S. mumai*; 19-21, female spermathecae: 19-20, OTU No. 2; 21, OTU No. 1.

Remarks.–As in other species with an elongate abdomen and flagellum, the degree of attenuation can be highly variable. It is more reliable to use the basal configuration of elevations and depressions in distinguishing species with elongate abdomens and flagella.

Schizomus flavescens Hansen
(Figs. 1, 27)

Schizomus flavescens Hansen (*in* Hansen and Sörensen) 1905:44-46, 47, 73; Mello-Leitão 1931:17; Hilton 1933:92; Giltay 1935:6; Takashima 1943:93.

Description.–Female. Color brownish. Carapace with two pairs of dorsal and two apical setae. Eyespots indistinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae. Vestigial stigmata not distinguishable from sterna. Flagellum with four articles, extremely long. Pedipalpal trochanter produced slightly distally; tarsal-basitarsal spurs about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 43-8-7-8-9-11-22; other leg segment measurements given in Table 3.

Male unknown.

Type data.–Cotypes: Female (ZMK, examined), two females and an immature (MNHN), taken at Corosul, near Caracas, Venezuela, date unknown (E. Simon); female taken at Corosul, 1888 (E. Simon) (NRS, examined).

Comparisons.–The female of this species is easily distinguished from other species of the *simonis* group by the extremely long flagellum. The species most closely approaching *S. flavescens* in length of the female flagellum is *S. simonis* (0.52 mm as opposed to 0.61 mm in *S. flavescens*). The morphology of the spermathecae is most similar to, and perhaps not distinguishable from, *S. tobago* and *S. centralis*. The extremely long first legs will, however, distinguish *S. flavescens* from *S. tobago*.

Distribution.–Known only from the type locality.

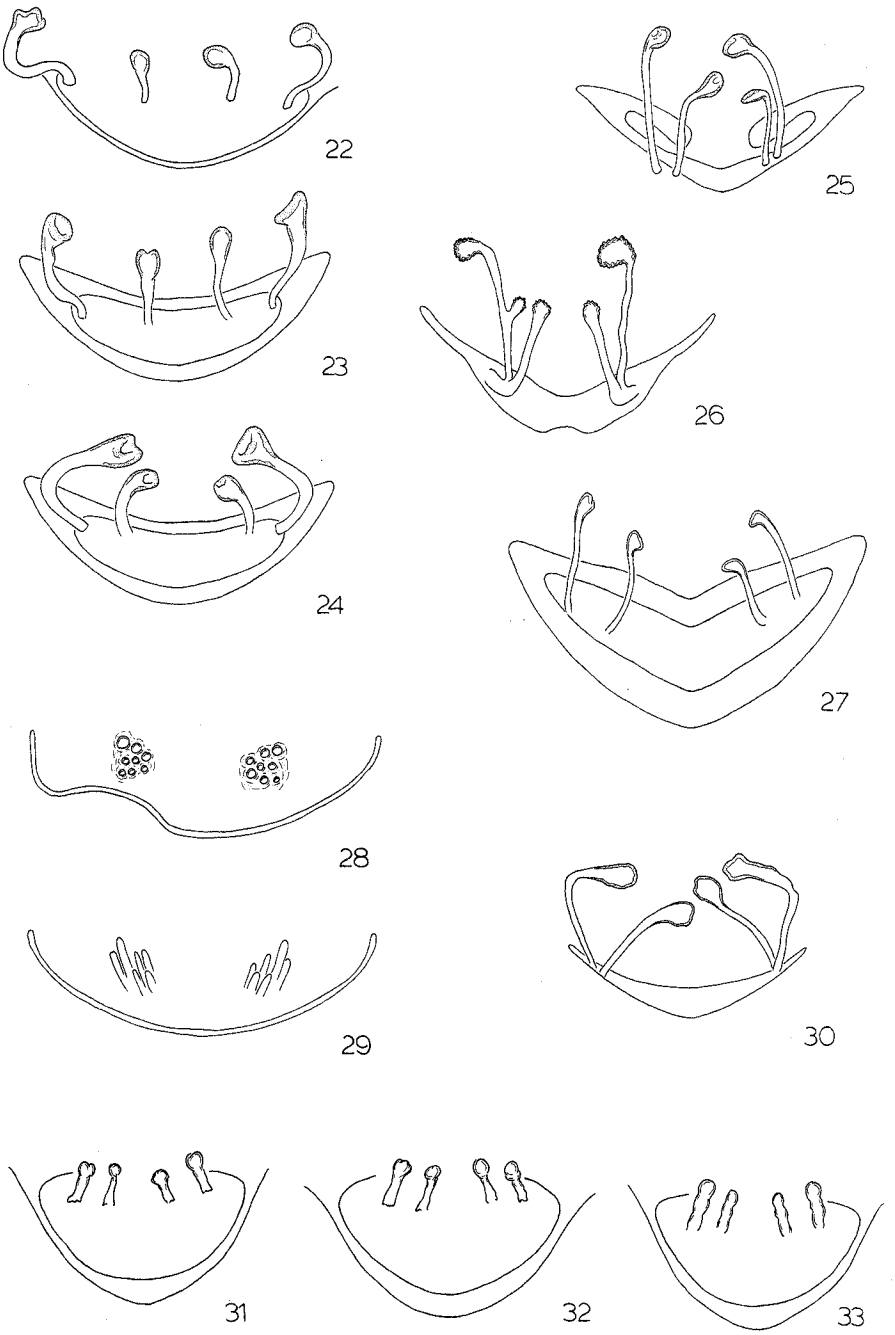
Remarks.–Hansen (*in* Hansen and Sörensen 1905) reports that *S. flavescens* is very similar to *S. dispar*. The latter species, however, was unavailable for study.

Schizomus tobago, new species
(Figs. 1-2, 15, 30)

Description.–Male. Color brownish. Carapace with two pairs of dorsal and two apical setae. Eyespots indistinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segments VII-XII elongate, segment XII with slight truncate posterodorsal process. Vestigial stigmata not distinguishable from sterna. Flagellum elongate, lanceolate, with a single median depression undercutting a pair of lateral ridges. Pedipalpal trochanter produced slightly apically; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 36-6-7-7-8-8-18; other leg segment measurements given in Table 4.

Female. Abdomen not elongate. Flagellum composed of four articles. Spermathecae nearly equal in size, long, terminating in sclerotized bulbs.

Type data.–Holotype male and allotype female taken on Tobago, April 1916, by Th[omas] M[ortensen] (UZMK).



Figs. 22-33.–Female spermathecae of the *simonis* group: 22-24, *S. mumai*: 22, from Golfito; 23-24, from the type locality; 25-26, *S. centralis*; 27, *S. flavescens*; 28-29, *S. simonis*: 28, view from above the perpendicular; 29, view from the perpendicular; 30, *S. tobago*; 31-33, *S. trinidanus*: 31, from St. Augustine; 32, from Simla; 33, from the type locality.

Table 4.–Measurements (mm) of species of the *simonis* group: 1, one male, *S. tobago;* 2, one female, *S. tobago*; 3, two males, *S. mumai*; 4, three females, *S. mumai*; 5, three males, *S. centralis*; 6, five females, *S. centralis*. Except as otherwise noted all measurements are of lengths.

	1	2	3	4	5	6
Carapace	1.23	1.12	1.07-1.24	1.07-1.14	0.92-1.10	1.03-1.12
Flagellum						
Length	0.79	0.41	0.59-0.87	0.39-0.41	0.44-0.45	0.35-0.37
Width	0.22	-	0.23-0.23	-	0.25-0.25	-
Leg I						
Femur	1.32	1.00	1.05-1.34	0.91-0.94	1.00-1.28	0.89-0.98
Patella	1.67	1.23	1.31-1.72	1.10-1.15	1.22-1.65	1.05-1.15
Tibia	1.25	0.89	0.96-1.23	0.83-0.85	0.91-1.15	0.81-0.84
Tarsus-basitarsus	0.90	0.72	0.84-0.95	0.76-0.77	0.82-0.93	0.70-0.76
Leg II						
Femur	0.77	0.65	0.68-0.83	0.65-0.67	0.63-0.80	0.58-0.69
Patella	0.40	0.41	0.41-0.51	0.40-0.41	0.37-0.47	0.38-0.42
Tibia	0.52	0.40	0.44-0.58	0.42-0.44	0.39-0.53	0.38-0.40
Basitarsus	0.43	0.35	0.37-0.46	0.35-0.38	0.35-0.36	0.34-0.38
Leg III						
Femur	0.68	0.61	0.59-0.72	0.59-0.61	0.55-0.65	0.58-0.60
Patella	0.31	0.27	0.26-0.35	0.25-0.28	0.25-0.35	0.26-0.28
Tibia	0.37	0.30	0.30-0.38	0.32-0.33	0.28-0.36	0.28-0.31
Basitarsus	0.43	0.36	0.37-0.44	0.34-0.37	0.34-0.40	0.35-0.38
Leg IV						
Femur	1.09	0.93	0.93-1.03	0.89-0.93	0.93-1.06	0.91-0.96
Patella	0.55	0.45	0.49-0.58	0.43-0.48	0.46-0.52	0.45-0.49
Tibia	0.69	0.61	0.64-0.76	0.63-0.65	0.60-0.75	0.59-0.65
Basitarsus	0.58	0.54	0.55-0.69	0.54-0.55	0.52-0.65	0.53-0.56

Comparisons.–*S. tobago* is similar to *S. mumai* and *S. centralis* in having a single median depression on the male flagellum. The flagellum of *S. tobago*, however, is somewhat more elongate than that of *S. mumai* and much more so than that of *S. centralis*. *S. tobago* may be readily distinguished from *S. simonis* and *S. trinidanus*, which also have elongate flagella, by the presence of one rather than two depressions on the flagellum. The female spermathecae in *S. tobago, S. flavescens*, and *S. centralis* are all very similar and perhaps not distinguishable. The lateral spermathecae of *S. mumai* are twice as long as the medians, whereas in *S. tobago* they are about equal in length.

Distribution.–Known only from the type locality.

Etymology.–The specific name is a noun used in apposition.

Schizomus mumai, new species
(Figs. 1, 7-8, 11, 18, 22-24)

Description.–Male. Color brownish. Carapace with two pairs of dorsal and two apical setae. Eyespots irregular, but distinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with well-developed, truncate posterodorsal process, segments V-XII elongate. Vestigial stigmata slightly darker than sterna. Flagellum elongate, with a median depression flanked by a

pair of proximal elevations. Pedipalpal trochanter slightly produced distally; tarsal-basitarsal spurs about 1/7, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 45-7-7-7-7-9-20; other leg measurements given in Table 4.

Female. Abdomen not elongate. Flagellum composed of four articles. Lateral spermathecae about twice as long as medians, both pairs terminating in sclerotized bulbs, the laterals being much the larger.

Type data.–Holotype male and paratype male, 28 June 1957; allotype female, 11 September 1957; two paratype females, 19 July 1957; two paratype females, 19 July 1957; two paratype females, 13 June 1957; paratype female, 4 September 1957, all taken at Coto, Costa Rica (E. Dixon); paratype female taken at Golfito, Costa Rica, 17 September 1957 (E. Dixon). All specimens deposited in the AMNH.

Comparisons.–*S. mumai* is most similar to *S. centralis* in both sexes. Abdominal attenuation, although somewhat variable, involves segments V-XII in *S. mumai*, but only segments VII-XII are attenuated in *S. centralis*. The flagellum of *S. mumai* is much longer and more attenuate than that of *S. centralis*. The flagellar lateral swellings are well defined in *S. mumai*, while they are undeveloped in *S. centralis*. The spermathecae of these two species are also similar, but the laterals are twice as long as the medians in *S. mumai* and only slightly longer than the medians in *S. centralis*. The abdominal attenuation of the males of *S. mumai* serves to distinguish this species from all others within its range. Females of *S. mumai* are similar to *S. dumitrescoae* Rowland and Reddell, which is also known from Costa Rica, but the latter species possesses four pairs of dorsal carapacial setae as opposed to two in *S. mumai*.

Distribution.–Known only from Coto and Golfito, Costa Rica.

Etymology.–This species is named for Martin H. Muma, who first recognized this species as distinct from existing taxa, in recognition of his many contributions to the study of many groups of arachnids including the Schizomida.

Variation.–The flagellum of the holotype is much longer than that of the single male paratype, but is very similar in the shape of the basal portion of the flagellum and in general morphology.

The female spermathecae show considerable variation even at the same locality. The sclerotized bulbs all are approximately similar, but the spermathecal tubes vary in their configuration.

Schizomus centralis Gertsch
(Figs. 1, 5, 10, 17, 25-26)

Schizomus centralis Gertsch 1941:13-14.

Description.–Male. Color brownish. Carapace with two pairs of dorsal and two apical setae. Eyespots oval, distinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segments VII-XII elongate, tapering; segment XII with well-developed, truncate posterodorsal process. Vestigial stigmata slightly darker than sterna. Flagellum lanceolate, with a distal median depression undercutting a more proximal ridge. Pedipalpal trochanter produced only slightly; tarsal-basitarsal spurs about 1/6, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of unknown proportions.

Female. Abdomen not attenuate. Flagellum composed of four articles. Lateral spermathecae somewhat longer than medians, both terminating in sclerotized bulbs of nearly equal size.

Type data.–Holotype male, 19 July 1938; allotype female, 20 July 1938, both taken on Barro Colorado Island, Panama Canal Zone (E. G. Williams) (AMNH, examined).

Comparisons.–See under *S. mumai*.

Distribution.–Known only from Barro Colorado Island, Panama Canal Zone.

Remarks.–The holotype lacks the flagellum, abdominal segment XII and most of its appendages.

Additional records.–Panama Canal Zone: Barro Colorado Island, 20-24 June 1924 (N. Banks), 1 male (MCZ); 20-21 May 1964 (Chickering), 4 females (MCZ); July 1969 (S. Lawrence, B. and T. Hlavac), 2 females (MCZ); 1943-1944 (J. Zetek), 1 male (MCZ); unknown date (K. W. Cooper), 1 female (AMNH).

BRASILIENSIS GROUP

Description.–Members of this group may be small to large in size (0.91 to 1.48 mm carapacial length). Color is brownish to greenish. Eyespots are always distinct, but may vary in shape from irregular to oval to round. Carapace has three or four pairs of dorsal and two apical setae. Abdomen is never attenuated. Males: abdominal segment XII with a very slightly to well-developed posterodorsal process, which can be round, bifid, or truncate apically; flagellum usually large and nearly globose, often with elaborate dorsal modifications. Females: flagellum usually moderate in length (0.28 mm), but may be long in large species (0.48 mm), composed of three articles; usually with two pairs of spermathecae of similar size; apical portions of spermathecae sometimes extremely large, almost circular, and highly sclerotized, whereas other individuals have considerably smaller unsclerotized bulbs. Pedipalps are usually highly dimorphic, but variably so; a slight elongation is usually manifest, but more often the segments are heavily developed; trochanter is noticeably produced; femur and patella sometimes have a mesal tooth.

Remarks.–Table 5 gives characters used in separating the species of the *brasiliensis* group.

Distribution.–México: Oaxaca, Tabasco, Chiapas. Central America: Costa Rica. South America: Colombia, Ecuador, Brazil, Bolivia.

Subordinate taxa.–*Trilobatus* complex: *S. stewarti* Rowland, *S. trilobatus* Rowland, *S. lacandonus* Rowland; *brasiliensis* complex: *S. cuenca* n. sp., *S. sturmi* (Kraus), *S. brasiliensis* (Kraus), OTU No. 7, OTU No. 8, OTU No. 9, OTU No. 10, OTU No. 11; *pallipatellatus* lineage within the *brasiliensis* complex: OTU No. 12, *S. macarensis* (Kraus), *S. cumbalensis* (Kraus), *S. pallipatellatus* n. sp.

Schizomus stewarti Rowland
(Figs. 34, 35, 46)

Schizomus stewarti Rowland 1973:139-140; Rowland and Reddell 1977:80, 83, 86.

Description.–Male. Color greenish. Carapace with three pairs of dorsal and two apical setae. Eyespots distinct, irregular. Metapeltidium entire. Anterior sternum with nine bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with a slight development of posterodorsal process. Vestigial stigmata darker than sterna.

Flagellum vaguely trilobate, with a pair of slight median elevations. Pedipalpal trochanter produced acutely apically; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of unknown proportions; other leg segment measurements given in Table 6.

Female unknown.

Type data.—Holotype male and paratype immature taken in Cueva del Gúayabo, 12 km NE Valley Nacional, Oaxaca, México, 29 December 1972 (J. Reddell, D. McKenzie, M. McKenzie, and S. Murphy) (AMNH, examined).

Comparisons.—This species may be readily distinguished from all other species by the morphology of the pedipalp and flagellum of the male. The absence of a median depression on the flagellum serves to distinguish this species from all other members of the *brasiliensis* group.

Distribution.—Known only from the type locality.

Schizomus trilobatus Rowland
(Figs. 34, 36, 47, 62)

Schizomus trilobatus Rowland 1975b:11-13; Rowland and Reddell 1977:80, 83, 86, 99.

Description.—Male. Color greenish. Carapace with three pairs of dorsal and two apical setae. Eyespots distinct, irregular. Metapeltidium entire. Anterior sternum with 10 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with slightly rounded posterodorsal process. Vestigial stigmata darker than sterna. Flagellum strongly trilobate, with a pair of medial depressions. Pedipalpal trochanter produced distally; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 42-8-6-8-7-8-15; other leg segment measurements given in Table 6.

Female. Flagellum composed of three articles. Spermathecae composed of a single pair, highly sclerotized, large, on narrow stalks.

Type data.—Holotype male and allotype female taken in Las Grutas del Coconá, Tabasco, México, 24 July 1973 (J. M. Rowland and J. R. Reddell) (AMNH, examined); paratype male and five paratype females with the same data (TTU, examined).

Comparisons.—See under *S. lacandonus*.

Distribution.—Known only from the type locality.

Remarks.—This species was collected from washed-in litter in the twilight zone of Grutas del Coconá; it shows no adaptations for a cavernicole existence. The apparent troglobite, *S. pecki* Rowland, inhabits the dark zone of this cave.

Schizomus lacandonus Rowland
(Figs. 34, 37, 48, 55, 65)

Schizomus lacandonus Rowland, 1975b:16-18.

Description.—Male. Color greenish. Carapace with three pairs of dorsal and two apical setae. Eyespots distinct, oval. Metapeltidium entire. Anterior sternum with nine bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with gently rounded, slightly developed posterodorsal process. Vestigial stigmata darker

Table 5.–Comparisons of members of the *brasiliensis* group. See the introduction to Rowland and Reddell (1979) for discussion of characters.

CHARACTER	stewarti	trilo-batus	lacan-donus	cuenca	sturmi	brasil-iensis	OTU #7	OTU #8	OTU #9	OTU #10	OTU #11	OTU #12	macar-ensis	cumbal-ensis	pallipat-ellatus
DORSAL SETAE	3	3	3	3	3	3	3	3	3	4	3	4	3	3	3
METAPEL-TIDIUM	entire	entire	entire	split	split or entire	split	split	split	split	split	split	split	split	split	entire
STERNAL SETAE	9	10	9	11	11	11	11	11	11	11	11	11	11	11	11
PATELLA I COLOR	brown	brown	brown	brown	brown	brown	brown	brown	brown	brown	brown	white	white	white	white
COLOR	green	green	green	brown	brown	green	green	green	green	green	green	green	green	brown	green
PEDIPALP ARMATURE	none	none	none	femur	femur	femur	?	?	?	?	?	?	femur	femur	femur
ABDOMINAL PROCESS	slight	slight	slight	truncate	round	round	?	?	?	?	?	?	round	truncate	truncate
EYESPOTS	irreg-ular	irreg-ular	oval	oval	oval	irreg-ular	oval	oval	irreg-ular	irreg-ular	irreg-ular	irreg-ular	irreg-ular	oval	round
SPERMA-THECAE	?	1 pair	1 pair	?	M=L	?	M=L	M=L	M=L	M=L	M=L	M 2X L	?	M=L	M=L
CARAPACE LENGTH	1.03	1.07	1.11	1.48	1.33	1.04	.95	.91	1.09	1.33	1.02	1.08	.97	1.48	1.02
LENGTH FEM. FLAGELLUM	?	.24	.28	?	?	.25	.24	.20	.29	.38	.26	.30	?	.47	.26
PIT MALE FLAGELLUM	none	double	double	single	double	single	?	?	?	?	?	?	double	single	single

than sterna. Flagellum triangular, with a pair of median depressions. Pedipalpal trochanter produced acutely apically; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 52-8-7-8-7-8-18; other leg measurements given in Table 6.

Female. Flagellum composed of three articles. Spermathecae composed of a single pair, highly sclerotized, large, on wide stalks.

Type data.–Holotype male taken at Ruinas de Palenque, Chiapas, México, 25 July 1973 (J. M. Rowland and J. R. Reddell) (AMNH, examined); allotype female taken at Ruinas de Palenque, 6 July 1949 (C. J. Goodnight) (AMNH, examined).

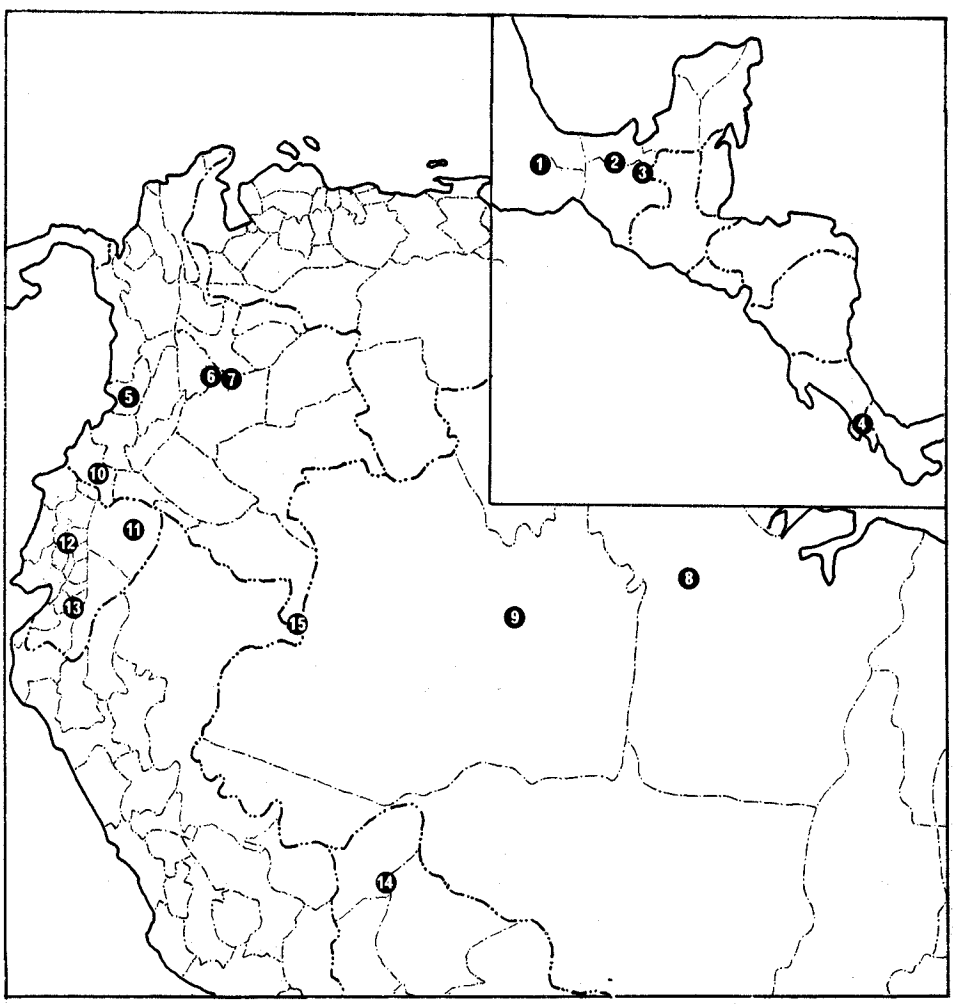


Fig. 34.–Map showing distribution of schizomids of the *brasiliensis* group: 1, *S. stewarti*; 2, *S. trilobatus*; 3, *S. lacandonus*; 4, *S. pallipatellatus*; 5, OTU No. 9; 6, *S. sturmi*; 7, *S. macarensis*; 8, OTU No. 8; 9, *S. brasiliensis*; 10, *S. cumbalensis*; 11, OTU No. 12; 12, OTU No. 10; 13, *S. cuenca*; 14, OTU No. 11; 15, OTU No. 7.

Table 6.–Measurements of the members of the *brasiliensis* group: 1, one male, *S. stewarti*; 2, one male, *S. trilobatus*; 3, one female, *S. trilobatus*; 4, one male, *S. lacandonus*; 5, one female, *S. lacandonus*; 6, one male, *S. cuenca*; 7, one male, *S. sturmi*; 8, one female, *S. sturmi*; 9, one male, *S. brasiliensis*; 10, one female, *S. brasiliensis*. Except as otherwise noted all measurements are of lengths.

	1	2	3	4	5	6	7	8	9	10
Carapace	1.03	1.09	1.07	1.18	1.16	1.48	1.35	1.33	0.95	1.04
Flagellum										
Length	0.37	0.39	0.24	0.44	0.28	0.57	0.53	-	0.38	0.25
Width	0.27	0.40	-	0.31	-	0.54	0.47	-	0.36	-
Leg I										
Femur	-	1.50	1.03	1.73	0.82	1.60	1.55	1.35	0.93	0.85
Patella	-	2.02	1.26	2.31	1.12	1.93	1.90	1.50	1.15	1.00
Tibia	-	1.52	0.91	1.81	1.51	1.39	1.35	1.15	0.80	0.73
Tarsus-basitarsus	-	0.91	0.71	1.08	1.19	1.16	1.10	0.98	0.73	0.68
Leg II										
Femur	0.61	0.83	0.68	0.90	0.80	1.14	1.03	0.93	0.62	0.60
Patella	0.34	0.45	0.41	0.50	0.43	0.61	0.55	0.45	0.35	0.25
Tibia	0.44	0.55	0.42	0.64	0.48	0.68	0.60	0.53	0.35	0.27
Basitarsus	0.41	0.54	0.41	0.53	0.44	0.66	0.57	0.55	0.35	0.32
Leg III										
Femur	0.51	0.64	0.62	0.76	0.68	0.95	0.88	0.85	0.55	0.55
Patella	0.25	0.26	0.30	0.36	0.31	0.48	0.40	0.35	0.25	0.32
Tibia	0.31	0.37	0.31	0.45	0.33	0.50	0.47	0.43	0.30	0.33
Basitarsus	0.40	0.48	0.40	0.55	0.46	0.67	0.62	0.53	0.38	0.35
Leg IV										
Femur	0.98	1.29	1.02	1.49	1.16	1.54	1.43	1.30	0.95	0.90
Patella	0.33	0.55	0.48	0.62	0.49	0.76	0.62	0.55	0.46	0.40
Tibia	0.71	0.91	0.70	1.07	0.80	1.00	0.93	0.80	0.57	0.57
Basitarsus	0.55	0.79	0.61	0.89	0.69	0.96	0.85	0.78	0.50	0.50

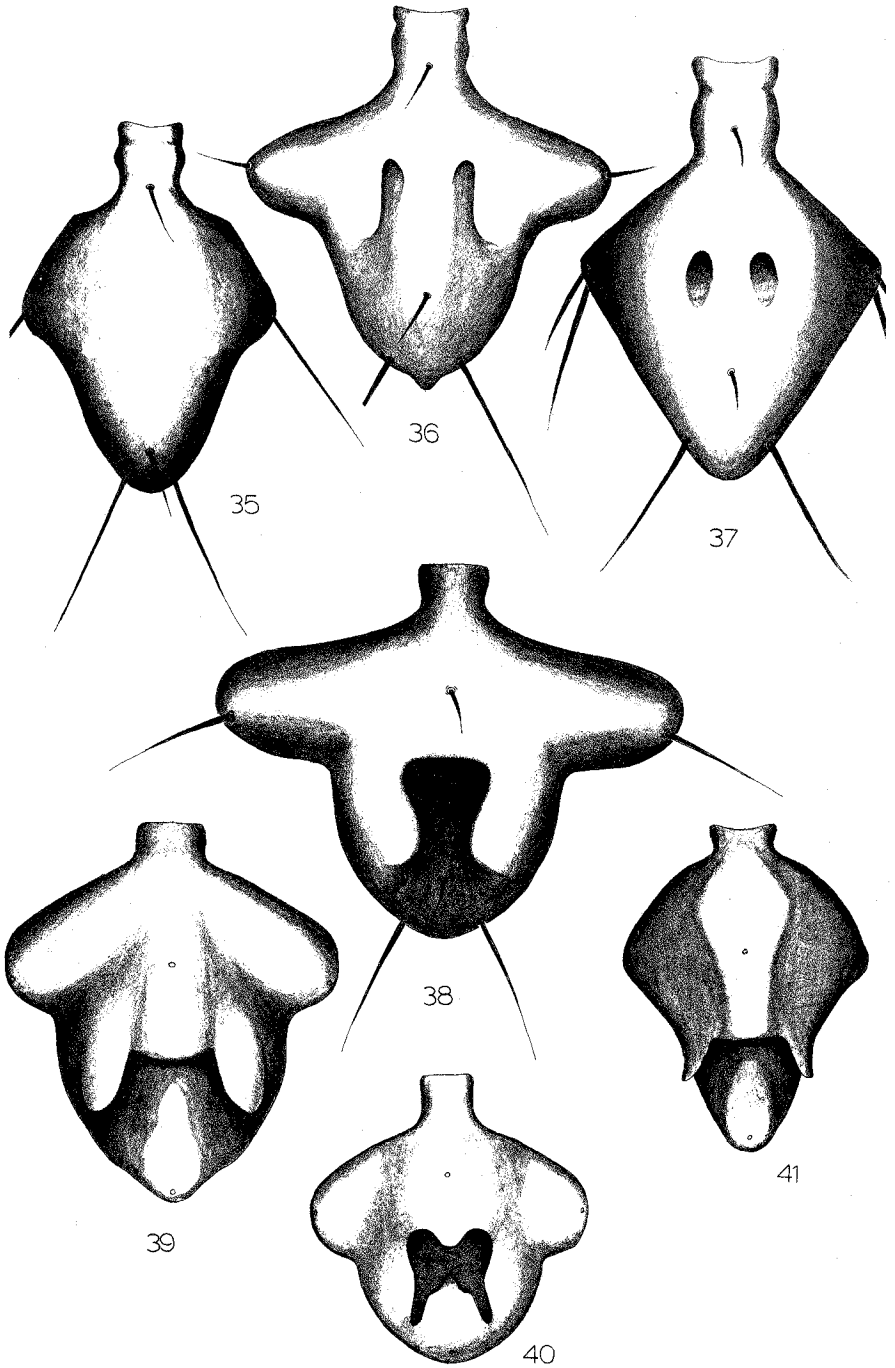
Comparisons.–This species is most closely related to *S. trilobatus*. It may most easily be distinguished from that species by the shape of the male flagellum, which is distinctly trilobate in *S. trilobatus* and triangular in *S. lacandonus*. Females of the two species are very similar but the spermathecal stalks are much wider and less strongly sclerotized in *S. lacandonus*.

Distribution.–Known only from the type locality.

Remarks.–*S. lacandonus* is one of five species known to occur in Ruinas de Palenque. Other species are *S. portoricensis* (Chamberlin), an undescribed member of the *pecki* group, an undescribed member of the *mexicanus* group, and an unplaced species. These species are all readily distinguishable on the basis of male anatomy and by external female characters and spermathecae. The unplaced species is also unique in possessing multiple setae on the abdominal terga.

Schizomus cuenca, new species
(Figs. 34, 40, 50, 53, 58)

Description.–Male. Color brownish. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split. Eyespots oval, distinct. Anterior sternum with 10 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with well-developed, truncate posterodorsal process. Vestigial stigmata darker than sterna.



Figs. 35-41.—Dorsal views of male flagella of the *brasiliensis* group: 35, *S. stewarti*; 36, *S. trilobatus*; 37, *S. lacandonus*; 38, *S. pallipatellatus*; 39, *S. brasiliensis*; 40, *S. cuenca*; 41, *S. cumbalensis*.

Flagellum trilobate, with a deep median depression, deeply sculptured. Pedipalpal trochanter produced acutely apically; femur with a spur; patella curved; tarsal-basitarsal spurs about 1/6, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 49-6-11-10-10-11-19; other leg segment measurements given in Table 6.

Female unknown.

Type data.–Holotype male taken in Cuenca, Ecuador, 3 April 1942 (D. and H. Frizzell) (AMNH).

Comparisons.–*S. cuenca* is most similar in the morphology of the male flagellum to *S. sturmi, S. pallipatellatus*, and *S. brasiliensis* in that they are all trilobate, with large lateral lobes and deep dorsal depressions. *S. sturmi* and *S. brasiliensis*, however, have two dorsal depressions, whereas *S. cuenca* and *S. pallipatellatus* have only one. The posterodorsal abdominal process of *S. pallipatellatus* is bifid, whereas in *S. cuenca* it is broadly truncate, and in *S. sturmi* and *S. brasiliensis* it is gently rounded.

Distribution.–Known only from the type locality.

Etymology.–The specific name is a noun used in apposition.

Schizomus sturmi (Kraus)
(Figs. 34, 42, 52, 56, 59, 68)

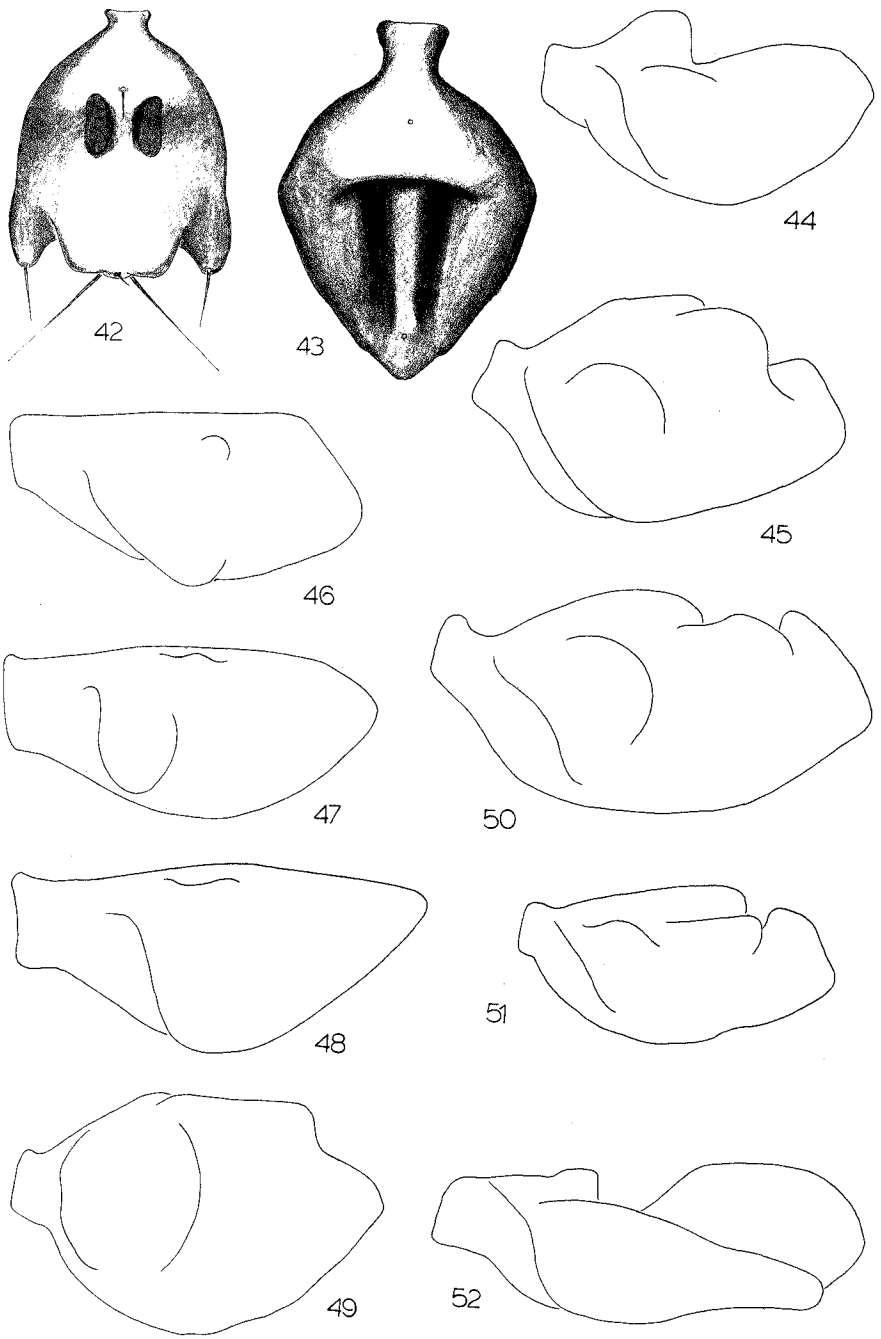
Trithyreus sturmi Kraus 1957:245, 247-249; Sturm 1958:142-143; Kraus and Beck 1967:404-405; Rowland 1972:70; Sturm 1973:113-140.
Schizomus sturmi: Rowland and Reddell 1979:

Description.–Male. Color brownish. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split or entire. Eyespots oval, distinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with gently rounded, distinct posterodorsal process. Vestigial stigmata darker than sterna. Flagellum semicircular, apically trilobate to truncate, with a pair of median depressions. Pedipalpal trochanter produced apically; femur with a spur; tibia curved; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 46-6-9-9-12-11-18; other leg segment measurements given in Table 6.

Female. Flagellum composed of three articles. Median and lateral spermathecae similar, narrow basally, expanded to nearly circular apically, with no concentration of sclerotization.

Type data.–Holotype male taken "Kolumbien: Hang am Ostrand der Hochebene von Bogota, etwa 3 km vom Stadtrand entfernt, 2800-3000 m", November 1955, April, September or October 1956 (H. Sturm) (SMF #9818, examined); six female and eight immature paratypes (SMF #9819-9821, not examined), one male paratype (AMNH, examined), and two male, two female, and one immature paratype (H. Sturm's collection, not examined), all taken with the holotype; one male, four female, and one immature paratype (SMF #9822, not examined), and one female paratype (AMNH, examined), taken "Nahere Umgebung der Stadt, 2900 m".

Comparisons.–See under *S. cuenca* for comparisons of males. The female spermathecae of *S. sturmi* are more expanded than in most species of the *brasiliensis* group, but much less so than in *S. trilobatus* and *S. lacandonus*.



Figs. 42-52.–Male flagella of the *brasiliensis* group: 42-43, dorsal views: 42, *S. sturmi*; 43, *S. macarensis*; 44-52, lateral views: 44, *S. macarensis*; 45, *S. brasiliensis*; 46, *S. stewarti*; 47, *S. trilobatus*; 48, *S. lacandonus*; 49, *S. pallipatellatus*; 50, *S. cuenca*; 51, *S. cumbalensis*; 52, *S. sturmi*.

Distribution.–Known only from near Bogota, Colombia.

Remarks.–Sturm (1958, 1973) contributed significantly to our knowledge of the behavior of schizomids through his studies of this species.

Schizomus brasiliensis (Kraus)
(Figs. 34, 39, 45)

Trithyreus brasiliensis Kraus (*in* Kraus and Beck) 1967:401-404; Beck 1968a:248-249; Beck 1968b:76-78; Rowland 1972:70; Brignoli 1973:3.
Schizomus brasiliensis: Rowland and Reddell 1979:

Description.–Male. Color brownish green. Carapace with three pairs of dorsal and two apical setae. Eyespots irregular, but distinct. Metapeltidium split. Anterior sternum with 11 entire setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with gently rounded, distinct posterodorsal process. Vestigial stigmata slightly darker than sterna. Flagellum trilobate, with a deep median pit, median and lateral swellings, deeply sculptured. Pedipalpal trochanter extremely and acutely produced; femur with a spur; patella curved; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segment of leg I of unknown proportions; other leg segment measurements given in Table 6.

Female. Flagellum composed of three articles. Pedipalps unarmed. Spermathecae not studied.

Type data.–Holotype male taken "Brasilien (Amazonas): bei Manaus, Reserva Ducke des I.N.P.A., Bachsenke oberhalb des Accompamento, Urwald mit dichtem Unterholz aus Palmen," January or February 1966 (L. Beck) SMF #11919, examined); two female and two immature paratypes taken with the holotype (SMF #12467, 12468, examined).

Comparisons.–See under *S. cuenca*.

Distribution.–Known only from the type locality.

Remarks.–Beck (1968a, 1968b) reported on the distribution and behavior of this species.

Schizomus sp., OTU No. 7
(Figs. 34, 70)

Description.–Female. Color brownish green. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae. Vestigial stigmata lighter than sterna. Flagellum composed of three articles. Pedipalpal trochanter produced slightly; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 27-4-4-5-6-5-14. Other leg segment measurements given in Table 7.

Male unknown.

Specimens examined.–Three females and four immatures taken 7 km N Leticia, Amazonas District, Brazil, 20-25 February 1972 (S. Peck) (AMNH).

Comparisons.–This species is distinct from other members of the *brasiliensis* group in that the base of the median spermathecae is much wider than the apex.

Distribution.–Known only from near Leticia, Amazonas District, Brazil.

Table 7.–Measurements of the members of the *brasiliensis* group: 1, one female, OTU No. 7; 2, one female, OTU No. 8; 3, one female, OTU No. 9; 4, one female, OTU No. 10; 5, one female, OTU No. 11; 6, one female, OTU No. 12; 7, one male, *S. macarensis*; 8, one male, *S. cumbalensis*; 9, one female, *S. cumbalensis*; 10, one male, *S. pallipatellatus*; 11, one female, *S. pallipatellatus*. Except as otherwise noted all measurements are of lengths.

	1	2	3	4	5	6	7	8	9	10	11
Carapace	0.95	0.91	1.09	1.33	1.02	1.08	0.97	1.50	1.48	0.94	1.02
Flagellum											
Length	0.24	0.20	0.29	0.38	0.26	0.30	0.35	0.66	0.47	0.38	0.26
Width	-	-	-	-	-	-	0.28	0.50	-	0.49	-
Leg I											
Femur	0.76	0.80	1.04	1.23	0.91	1.07	1.05	1.55	1.35	0.97	0.91
Patella	0.88	0.93	1.12	1.45	1.03	1.26	1.28	1.83	1.60	1.15	1.04
Tibia	0.62	0.65	0.85	1.08	0.72	0.92	0.95	1.38	1.18	0.82	0.76
Tarsus-basitarsus	0.65	0.60	0.78	0.88	0.65	0.77	0.80	1.20	1.02	0.69	0.66
Leg II											
Femur	0.52	0.58	0.74	0.90	0.68	0.74	0.70	1.20	1.07	0.63	0.66
Patella	0.31	0.30	0.40	0.49	0.38	0.42	0.37	0.62	0.60	0.28	0.33
Tibia	0.32	0.32	0.41	0.53	0.40	0.44	0.40	0.72	0.62	0.38	0.38
Basitarsus	0.32	0.33	0.40	0.50	0.39	0.44	0.43	0.70	0.60	0.35	0.35
Leg III											
Femur	0.51	0.50	0.62	0.79	0.59	0.65	0.60	1.05	0.95	0.54	0.57
Patella	0.24	0.25	0.29	0.41	0.29	0.31	0.36	0.50	0.47	0.25	0.25
Tibia	0.24	0.25	0.33	0.40	0.31	0.32	0.30	0.57	0.50	0.28	0.30
Basitarsus	0.33	0.33	0.40	0.56	0.41	0.45	0.43	0.72	0.62	0.37	0.35
Leg IV											
Femur	0.87	0.90	1.05	1.26	0.93	1.07	1.05	1.58	1.45	0.91	0.93
Patella	0.36	0.35	0.48	0.61	0.41	0.47	0.40	0.70	0.68	0.38	0.41
Tibia	0.52	0.55	0.68	0.84	0.63	0.71	0.62	1.05	0.93	0.60	0.59
Basitarsus	0.51	0.47	0.63	0.81	0.58	0.66	0.57	0.98	0.87	0.53	0.56

Schizomus sp., OTU No. 8
(Figs. 34, 61)

Description.–Female. Color brownish green. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split. Eyespots oval, distinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae. Vestigial stigmata lighter than sterna. Flagellum composed of three sections. Pedipalpal trochanter produced distally; tarsal-basitarsal spurs about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 24-4-4-4-5-6-13; other leg segment measurements given in Table 7. Both median and lateral spermathecae very similar in form and shape; slightly divergent, not expanded distally; unevenly sclerotized along most of the length.

Male unknown.

Specimen examined.–Female taken at Santarem, Taperinha, Brazil, 29 October 1970 (S. L. Tuxen) (UZMK).

Comparisons.–This species is very similar in spermathecal morphology to OTU Nos. 9-11, but is distinct in having the spermathecae very narrow.

Distribution.–Known only from Santarem, Taperinha, Brazil.

Schizomus sp., OTU No. 9
(Figs. 34, 69)

Description.–Female. Color brownish green. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split. Eyespots distinct, irregular. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae. Vestigial stigmata lighter than sterna. Flagellum composed of three articles. Pedipalpal trochanter produced distally; tarsal-basitarsal spurs about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 34-4-6-6-7-7-14; other leg segment measurements given in Table 7. Both median and lateral spermathecae of about equal size; medians terminate in bulbs about twice diameter of those of laterals; both sclerotized; stalk of laterals about twice as wide as that of medians, expanded basally.

Male unknown.

Specimen examined.–Female taken at El Saladito, Valle, Colombia, 29 August 1967 (P. Wygodzinsky) (AMNH).

Comparisons.–This taxon appears to be most closely related to OTU No. 12 in having the spermathecal walls slightly thickened apically. The terminal bulbs are more distinct in OTU No. 9 than in OTU No. 12.

Distribution.–Known only from El Saladito, Valle, Colombia.

Schizomus sp., OTU No. 10
(Figs. 34, 63)

Description.–Female. Color brownish green. Carapace with four pairs of dorsal and two apical setae. Metapeltidium split. Eyespots irregular, distinct. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae. Vestigial stigmata darker than sterna. Flagellum composed of three articles. Pedipalpal trochanter produced distally; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 39-4-7-7-8-8-15; other leg segment measurements given in Table 7. Median and lateral spermathecae small, similar, slightly smaller apically in the laterals, but both expanded distally into small circular to oval terminal bulbs.

Male unknown.

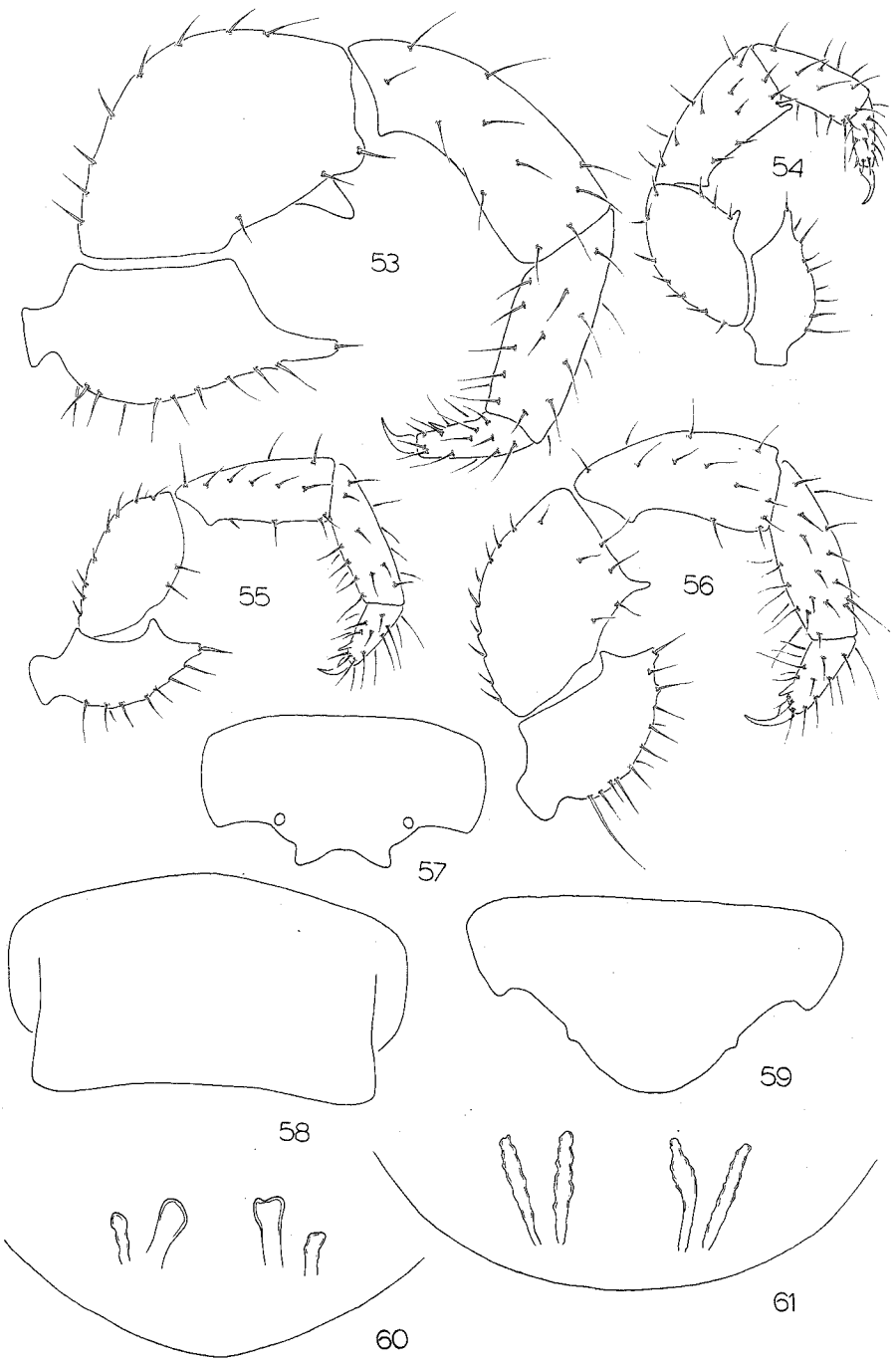
Specimens examined.–Female and immature taken at "Dolline de la grotte de Baños," Baños, Ecuador, April 1965 (J. and N. Leleup) (ISB).

Comparisons.–This taxon is very similar to OTU No. 11 in the development of the spermathecae, but the terminal bulb is somewhat more distinct in OTU No. 10. OTU No. 10 is a much larger species and has a disproportionately longer flagellum than OTU No. 11.

Distribution.–Known only from Baños, Ecuador.

Schizomus sp., OTU No. 11
(Figs. 34, 64)

Description.–Female. Color brownish green. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split. Eyespots irregular, distinct. Anterior sternum with 11 entire setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae.



Figs. 53-61.–Parts of schizomids of the *brasiliensis* group: 53-56, lateral views of male right pedipalps: 53, *S. cuenca*; 54, *S. pallipatellatus*; 55, *S. lacandonus*; 56, *S. sturmi*; 57-59, dorsal views of male posterodorsal abdominal process: 57, *S. pallipatellatus*; 58, *S. cuenca*; 59, *S. sturmi*; 60-61, female spermathecae: 60, OTU No. 12; 61, OTU No. 8.

Vestigial stigmata lighter than sterna. Flagellum composed of three articles. Pedipalpal trochanter produced slightly apically; tarsal-basitarsal spurs about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 26-4-5-5-5-6-14; other leg segment measurements given in Table 7. Median and lateral spermathecae very similar in shape and size, each gradually expanded distally, with no special sclerotization; medians convergent, laterals divergent.

Male unknown.

Specimen examined.–Female taken at Río Benicito, Chacoba, Bolivia, date unknown (W. J. Gertsch) (AMNH).

Comparisons.–See under *Schizomus* sp., OTU No. 10.

Distribution.–Known only from Río Benicito, Chacoba, Bolivia.

Schizomus sp., OTU No. 12
(Figs. 34, 60)

Description.–Female. Color brownish green. Carapace with four pairs of dorsal and two apical setae. Metapeltidium split. Eyespots distinct, irregular. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae. Vestigial stigmata lighter than sterna. Flagellum composed of three articles. Pedipalpal trochanter produced distally; tarsal-basitarsal spurs about 1/4, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 31-5-6-5-8-7-15; distal half of patella white; other leg segment measurements given in Table 7. Median spermathecae about twice as long as laterals, medians slightly convergent, terminating in a sclerotized bulb, laterals lightly sclerotized along distal half, terminating in a slight bulb.

Male unknown.

Specimen examined.–Female taken at Oriente Río Negro, Ecuador, April 1965 (J. and N. Leleup) (ISB).

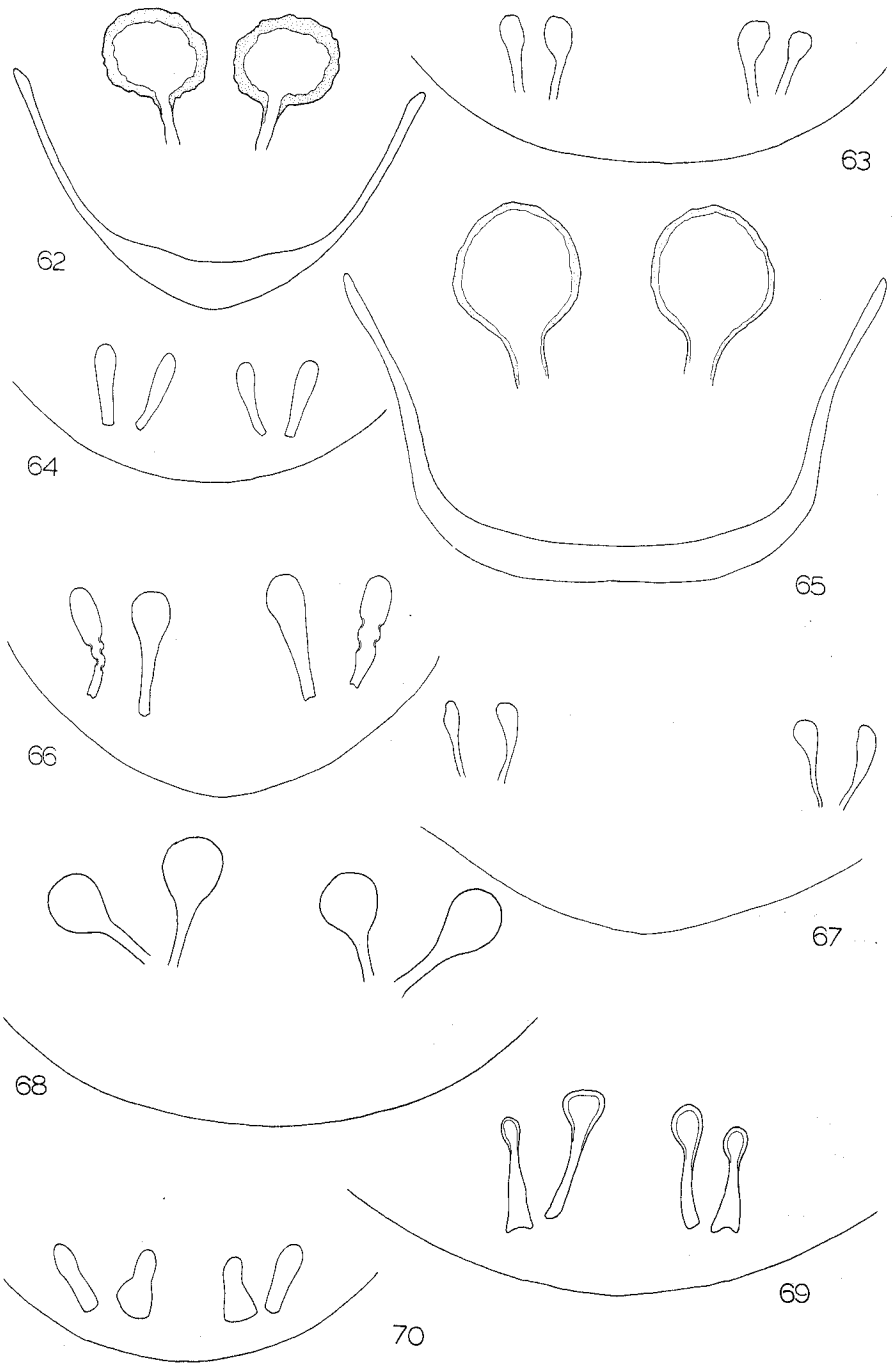
Comparisons.–See under *S. pallipatellatus*.

Distribution.–Known only from Oriente Río Negro, Ecuador.

Schizomus macarensis (Kraus)
(Figs. 34, 43-44)

Trithyreus macarensis Kraus 1957:245, 249-250.
Schizomus macarensis: Rowland and Reddell 1979:

Description.–Male. Color brownish green. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split. Eyespots distinct, but irregular. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with gently rounded, but distinct posterodorsal process. Vestigial stigmata darker than sterna. Flagellum oval, with a pair of median depressions, united mesally, preceded by a distinct ridge. Pedipalpal trochanter distinctly and acutely produced distally; femur with a spur; tibia curved; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 33-5-5-5-7-7-18; distal half of patella white; other leg segment measurements given in Table 7.



Figs. 62-70.–Female spermathecae of the *brasiliensis* group: 62, *S. trilobatus*; 63, OTU No. 10; 64, OTU No. 11; 65, *S. lacandonus*; 66, *S. pallipatellatus*; 67, *S. cumbalensis*; 68, *S. sturmi*; 69, OTU No. 9; 70, OTU No. 7.

Female unknown.

Type data.–Holotype male and paratype immature taken "Kolumbien: Macarena, Gebirgsstock am Fusse der Ostanden s. Villavicencio, nahe der Mundung des Rio Zanza in den Rio Guejar, 400-500 m, in der Laubstreu eines primaren Hochwaldes," 5 March 1956 (H. Sturm) (SMF #9823 and 9824, respectively, examined).

Comparisons.–See under *S. pallipatellatus*.

Distribution.–Known only from the type locality.

Schizomus cumbalensis (Kraus)
(Figs. 34, 41, 51, 67)

Trithyreus cumbalensis Kraus 1957:245, 246-247; Kraus and Beck 1967:402.
Schizomus cumbalensis: Rowland and Reddell 1979:

Description.–Male. Color brownish. Carapace with three pairs of dorsal and two apical setae. Metapeltidium split. Eyespots distinct, oval. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with squarely blunt, well-developed posterodorsal process. Vestigial stigmata darker than sterna. Flagellum triangular, deeply sculptured apically. Pedipalpal trochanter extremely produced apically; femur with spur; tibia curved; tarsal-basitarsal spurs about 1/6, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 54-7-9-10-11-11-20; distal half of patella white; other leg segment measurements given in Table 7.

Female. Flagellum composed of three articles. Median and lateral spermathecae very small, weakly developed, slightly distally expanded and equal in size.

Type data.–Holotype male taken "Südkolumbien: Umgebung des Ortes Cumbal, zwischen Paso und Ipiales, 3100 m," 30 June or 5 July 1956 (H. Sturm) (SMF #9816, examined); two female and four immature paratypes (SMF #9817, examined), and one female and two immature paratypes (H. Sturm's collection, not examined), taken with the holotype.

Comparisons.–See under *S. pallipatellatus*.

Distribution.–Known only from the type locality.

Schizomus pallipatellatus, new species
(Figs. 34, 38, 49, 54, 57, 66)

Description.–Male. Color brownish green. Carapace with three pairs of dorsal and two apical setae. Metapeltidium entire. Eyespots distinct, round. Anterior sternum with 11 bifid setae. Abdominal terga I-VII with two setae, terga VIII-IX with four setae; segment XII with well-developed, truncate posterodorsal process with a pair of lateral projections. Vestigial stigmata lighter than sterna. Flagellum trilobate, with a median depression flanked by a pair of whitish processes. Pedipalpal trochanter produced acutely apically; femur and patella with spurs; tarsal-basitarsal spurs about 1/5, claw about 1/2 length of tarsus-basitarsus. Tarsal-basitarsal segments of leg I of the following approximate proportions: 27-6-5-5-6-6-14; distal half of patella white; other leg segment measurements given in Table 7.

Female. Flagellum composed of three articles. Median and lateral spermathecae distally expanded gradually, the laterals with subdistal constrictions, no areas of concentrated sclerotization.

Type data.—Holotype male, 23 October 1957, allotype female and immature paratype, 12 September 1957, paratype female, 26 October 1957, paratype immature, 25 June 1957, immature paratype, 19 June 1957, female and two immature paratypes, 19 July 1957, all taken at Coto, Costa Rica (E. Dixon); female and immature paratypes taken at Golfito, Costa Rica, 17 September 1957 (E. Dixon). All specimens deposited in the AMNH.

Comparisons.—*S. pallipatellatus* shares with OTU No. 12, *S. macarensis*, and *S. cumbalensis* a white patella I. This character alone separates these four species from all other members of the *brasiliensis* group. Females of *S. pallipatellatus* have much more greatly expanded spermathecae than do those of OTU No. 12. The spermathecae of *S. pallipatellatus* are much larger than are those of *S. cumbalensis*. The shape of the male flagellum readily serves to distinguish *S. pallipatellatus* from *S. cumbalensis* and *S. macarensis*, being distinctly trilobate in *S. pallipatellatus*, while more apically attenuate in *S. cumbalensis* and nearly oval in *S. macarensis*.

Distribution.—Known from Coto and Golfito, Costa Rica.

Etymology.—The specific name is taken from the Latin *palli*-meaning lacking in color and *patella* referring to the distinctive white coloration of the patella of the first pair of legs.

ACKNOWLEDGMENTS

We express our particular appreciation to Dr. Robert W. Mitchell for his assistance during the entire course of this study. The following curators made material available from their respective institutions: Dr. J. A. L. Cooke, American Museum of Natural History, New York (AMNH); Dr. Willis J. Gertsch (AMNH); Dr. M. Grasshoff, Natur-Museum und Forschungs-Institut Senckenburg, Frankfurt, West Germany (SMF); Dr. T. Kronestedt, Naturhistoriska Riksmuseet, Stockholm, Sweden (NRS); Dr. N. Leleup, Institut royal des Sciences naturelles de Belgique, Brussels (ISB); Dr. Herbert W. Levi, Museum of Comparative Zoology, Harvard University, Cambridge, Massachussetts (MCZ); Dr. Robert W. Mitchell, The Museum, Texas Tech University, Lubbock, Texas (TTU); Dr. Norman I. Platnick (AMNH); Prof. S. L. Tuxen, Universitets Zoologiske Museum, Copenhagen, Denmark (UZMK); and Prof. M. Vachon, Musée National d'Histoire Naturelle, Paris (MNHN). Dr. Oscar F. Francke and Mr. Frederick W. Wagner critically read the manuscript and made many helpful suggestions.

LITERATURE CITED

Beck, L. 1968a. Aus den Regenwäldern am Amazonas II. Nat. und Mus., 98:71-80.

Beck, L. 1968b. Sôbre a Biologia de alguns Aracnideos na floresta tropical da Reserva Ducke (I.N.P.A., Manaus/Brasil). Amazonia, 1:247-250.

Brignoli, M. 1973. Note sulla morfologia dei genitali degli Schizomidi e diagnosi preliminari di due nuove specie del Messico (Arachnida, Schizomida). Frag. Entomol., 9:1-9.

Chamberlin, R. V. 1922. Two new American arachnids of the order Pedipalpida. Proc. Biol. Soc. Washington, 35:11-12.

Gertsch, W. J. 1940. Two new American whip-scorpions of the family Schizomidae. American Mus. Novitates, 1077:1-4.

Gertsch, W. J. 1941. Report on some arachnids from Barro Colorado Island, Canal Zone. American Mus. Novitates, 1146:1-9.

Giltay, L. 1935. Notes Arachnologiques Africaines. Bull. Mus. Hist. Nat. Belgique, 11(32):1-8.

Hansen, H. J. and W. Sörensen. 1905. The Tartarides, a tribe of the order Pedipalpi. Ark. Zool., 8:1-78.

Hilton, W. A. 1933. A new whip-scorpion from Cuba. Pan-Pacific Entomol., 9:91-92.

Kraus, O. 1957. Schizomidae aus Kolumbien (Arachnida, Pedipalpi-Schizopeltidae). Senck. Biol., 38:245-250.

Kraus, O. and L. Beck. 1967. Taxonomie und Biologie von *Trithyreus brasiliensis* n. sp. (Arach.: Pedipalpi: Schizopeltidia). Senck. Biol., 48:401-405.

Lawrence, R. F. 1969. The Uropygi (Arachnida: Schizomidae) of the Ethiopian Region. J. Nat. Hist., 3:217-260.

Mello-Leitão, C. 1931. Pedipalpos do Brasil e algumas notas sobre a ordem. Arch. Mus. Nac., 33:7-72.

Remy, P. 1961. Sur l'écologie des Schizomides (Arachn. Uropyges) de mes recoltés, avec description de trois *Schizomus* nouveaux, capturés par J. van der Drift au Surinam. Bull. Mus. Natl. Hist. Nat., Ser. 2, 33(4):406-414, 500-511.

Rowland, J. M. 1972. Brooding habits and early development of *Trithyreus pentapeltis* (Arachnida, Schizomida). Entomol. News, 83:69-74.

Rowland, J. M. 1973. Three new Schizomida of the genus *Schizomus* from Mexican caves (Arachnida). Assoc. Mexican Cave Stud. Bull., 5:135-140.

Rowland, J. M. 1975a. Classification, phylogeny and zoogeography of the American arachnids of the order Schizomida. Ph.D. Dissertation. Lubbock: Texas Tech Univ., 415 pp.

Rowland, J. M. 1975b. A partial revision of Schizomida (Arachnida), with descriptions of new species, genus, and family. Occas. Papers Mus. Texas Tech Univ., 31:1-21.

Rowland, J. M. and J. R. Reddell. 1977. A review of the cavernicole Schizomida (Arachnida) of México, Guatemala, and Belize. Assoc. Mexican Cave Stud. Bull., 6:79-102.

Rowland, J. M. and J. R. Reddell. 1979. The order Schizomida (Arachnida) in the New World. I. Protoschizomidae and *dumitrescoae* group (Schizomidae: *Schizomus*). J. Arachnol., 6:161-196.

Sturm, H. 1958. Indirekte Spermatophorenubertragung bei dem Geisselskorpion *Trithyreus sturmi* Kraus (Schizomidae, Pedipalpi). Naturwiss., 45:142-143.

Sturm, H. 1973. Zur Ethologie von *Trithyreus sturmi* Kraus (Arachnida, Pedipalpi, Schizopeltidia). Zeitschr. Tierpsychol., 33:113-140.

Takashima, H. 1943. Scorpionida and Pedipalpi of the Japanese Empire. Acta Arachnol., 8:5-30. (In Japanese)