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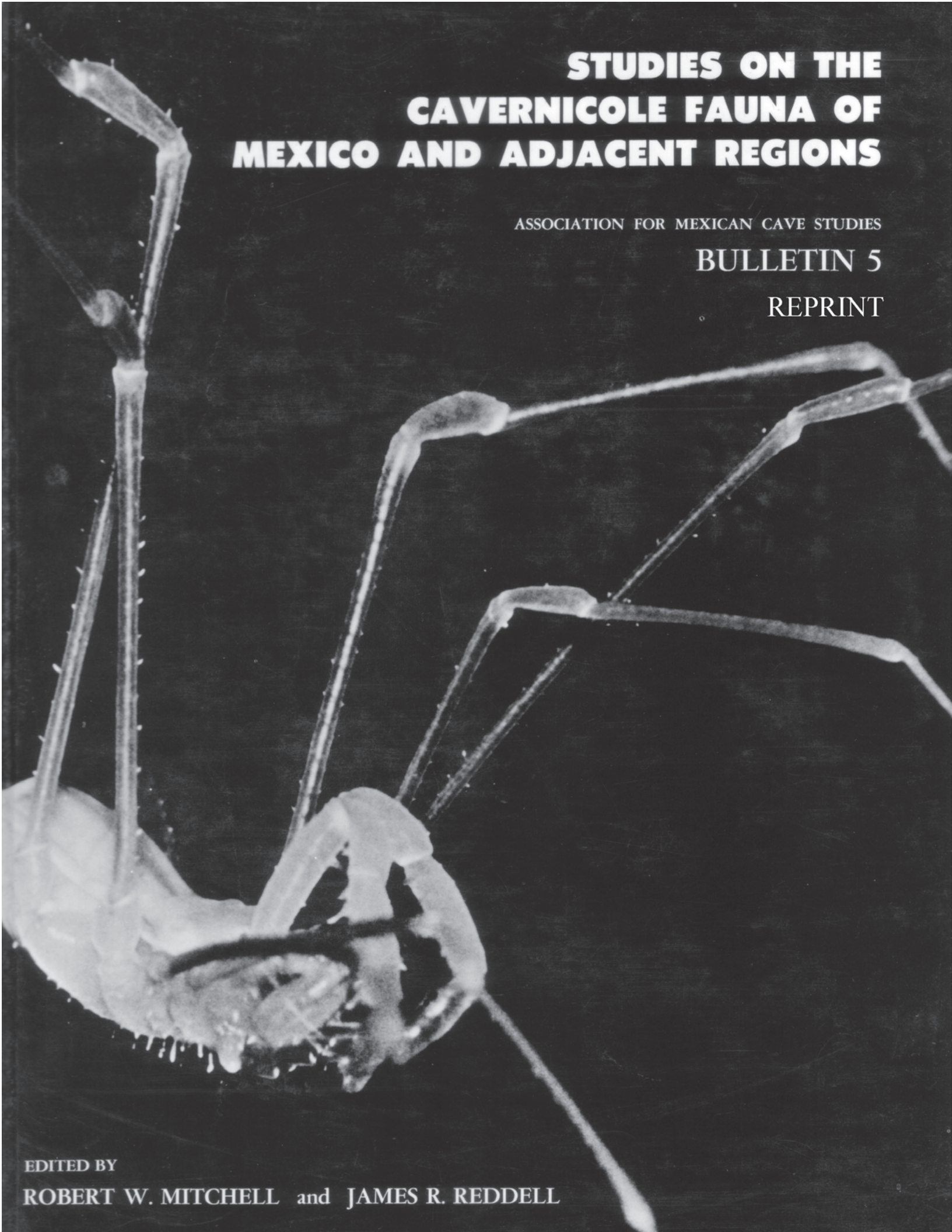

EDITED BY

ROBERT W. MITCHELL and JAMES R. REDDELL

ASSOCIATION FOR MEXICAN CAVE STUDIES

BULLETIN 5

STUDIES ON THE CAVERNICOLE FAUNA OF MEXICO AND ADJACENT REGIONS

EDITED BY

ROBERT W. MITCHELL and JAMES R. REDDELL

DEPARTMENT OF BIOLOGY
TEXAS TECH UNIVERSITY
LUBBOCK, TEXAS

ASSOCIATION FOR MEXICAN
CAVE STUDIES
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The Association for Mexican Cave Studies is a non-profit, volunteer organization whose goals are the collection and dissemination of information concerning Mexican caves. The AMCS publishes a Newsletter, Bulletin, and Cave Report Series which are available to any sincerely interested, conservation-minded person. Prices are available by writing.

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Photographs by Robert W. Mitchell

Cover: *Hoplobunus inops* Goodnight and Goodnight, Cueva de la Capilla, Tamaulipas, México

Frontispiece: *Paracophus caecus* Hubbell, Cueva de la Mina, Tamaulipas, México

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This volume is dedicated to

THE PEOPLE OF MEXICO

who have guided us to caves,
helped us collect many animals, and
given us their friendship

PREFACE

Recent investigations of several karst regions of México have resulted in the discovery of many new species of unusual interest. In addition study of specimens from other areas has added many other species to the known cave fauna of México.

Many of the species described in this volume were obtained during the course of a reconnaisance trip by David McKenzie, Martha Helen McKenzie, Stuart Murphy, and James Reddell in December 1972 and January 1973 to several previously unvisited karst regions in Tamaulipas, Veracruz, and Oaxaca. Of particular interest were the karst regions of Acatlán, Valle Nacional, Apoala, and San Sebastian de las Grutas, all in the state of Oaxaca. Each of these areas contains a unique troglobite and troglophile fauna of interest. Much additional work in each area will be required before the full extent of the fauna can be known. Detailed reports are planned for each area.

The most remarkable new cave discovered in recent years is one from which many new species are herein described. Cueva del Nacimiento del Río San Antonio is located 10 km southwest of Acatlán, Oaxaca, and is an impressive, well-decorated stream system with several kilometers of surveyed passage. The cave contains a remarkable aquatic troglobite fauna, including a blind catfish (being described elsewhere), blind crayfish, mysids, alpheid shrimp, and palaemonid shrimp.

This is the fourth volume in two years to be devoted almost exclusively to the cave fauna of México. The first (Reddell, J.R., 1971, A preliminary bibliography of Mexican cave biology, with a checklist of published records, Assoc. Mex. Cave Stud. Bull., 3) summarized all published knowledge of the cave fauna of México. The second (Reddell, J.R., and R.W. Mitchell, eds., 1971, Studies on the cavernicole fauna of México, Assoc. Mex. Cave Stud. Bull., 4) included description of about 100 new species and added more than 200 species to the known fauna. A third volume (Subterranean Fauna of México. Part I. Some results of the First Italian Zoological Mission to Mexico sponsored by the National Academy of Lincei (October 10–December 9, 1969, Acc. Naz. Lincei, Prob. Att. Sci. e Cultura, 171) contained partial results of an expedition conducted by V. Sbordoni, R. Argano, and V. Parisi. This volume added 17 species to the Mexican cave fauna.

Most of the present volume concerns the cave fauna of México and 61 new species are described from that country and more than 100 additional species are added to the recorded cave fauna. Of the new species 30 are troglobites.

In addition the scope of this volume has been expanded to include areas adjacent to México which contain related fauna and which have received the attention of members of the Association for Mexican Cave Studies. Included are species from Texas, Belize, and Guatemala. The latter two regions have received considerable recent attention by Dr. Stewart B. Peck of Carleton University, Ottawa, Canada, and by Mr. David McKenzie of Austin, Texas.

Many people have made significant contributions to this volume. We must first thank the authors of the papers included for their contributions.

Although many people have contributed specimens or assisted in collections several have been extremely helpful in obtaining material included in this volume. We wish in particular to thank William Elliott, Roy Jameson, David McKenzie, Martha Helen McKenzie, Stuart Murphy, and Stewart B. Peck.

Our very special thanks are due to Jan Lewis, Martha Helen McKenzie, Terry Raines, and J. Mark Rowland for their help in preparing and publishing this volume.

We also wish to thank the following for their help in various phases of publication: Frank Binney, Don Broussard, Pam Lynn, Ron Ralph, Charlotte Rogers, John Steele, and John Williams.

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TWO NEW SPECIES OF THE SUBTERRANEAN AMPHIPOD GENUS *MEXIWECKELIA* (GAMMARIDAE) FROM MEXICO AND TEXAS,

WITH NOTES ON THE ORIGIN AND DISTRIBUTION OF THE GENUS

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INTRODUCTION

The genus *Mexiweckelia* was recently described by Holsinger and Minckley (1971) on the basis of two species *(M. colei* and *M. particeps)* discovered in groundwater habitats of the Bolsón de Cuatro Ciénegas in central Coahuila, northern México. Previous to this description, only one other species of subterranean amphipod crustacean *(Bogidiella tabascensis* Villalobos) had been reported from México[2]. The latter was described from Grutas del Coconá in Tabasco by Villalobos (1960).

During June of 1972, members of the Association for Mexican Cave Studies collected blind, white amphipods from two pools in Cueva de la Siquita in Durango, México. Upon examination these specimens proved to represent an undescribed species of *Mexiweckelia.* The following description of this new species brings the total number of subterranean amphipod species recorded from México to four[3] and the number of cavernicolous species to two. The two species from Cuatro Ciénegas, while of subterranean facies (i.e., blind and depigmented), were collected from groundwater outlets (seeps, springs and spring-fed pools) and not from true cave habitats.

During my continuing investigation of North American subterranean amphipods of the family Gammaridae, I had the opportunity to study four specimens collected by Leslie Hubricht in 1940 from the artesian well at the fish hatchery in San Marcos, Texas. Although these specimens were in poor condition (many of the pereopods were broken off and the third uropods were missing), they represented a new species assignable to *Mexiweckelia.* The following description of this species brings the total number of species in *Mexiweckelia* to four and marks a significant extension of the genus into the southern United States.

Mexiweckelia mitchelli, new species
Figs. 1-3

Material Examined--Cueva de la Siquita, 45 km NW Mapimí, Durango, MEXICO: Holotype female and 84 paratypes collected 13 June 1972 by James Reddell, William Elliott and Edward Alexander. The holotype (USNM 142355) and 6 paratypes (USNM

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[2]The genus *Bogidiella* was previously referred to the family Bogidiellidae by a number of workers, including myself (Holsinger and Minckley, 1971). After careful study, however, I now regard this family as invalid and this genus as a member of the family Gammaridae.

[3]Descriptions of three new species of *Bogidiella* from subterranean waters in México (2 spp.) and Guatemala (1 sp.) were recently prepared by Dr. Augusto Vigna-Taglianti (Rome) and Professor Dr. Sandro Ruffo (Verona) and will be published in the near future (Vigna-Taglianti, in litt., 24 Nov. 1972).

Fig. 1. *Mexiweckelia mitchelli,* new species. Female paratype (4.5 mm): a, b, uropods 1, 2; c, telson; d, abdominal side plates; e, upper region of uronites (lateral view); f, uropod 3; g, maxilliped; h, apices of inner and outer plates of maxilliped; i, left mandible; j, upper lip; k, lower lip; l, maxilla 1; m, maxilla 2.

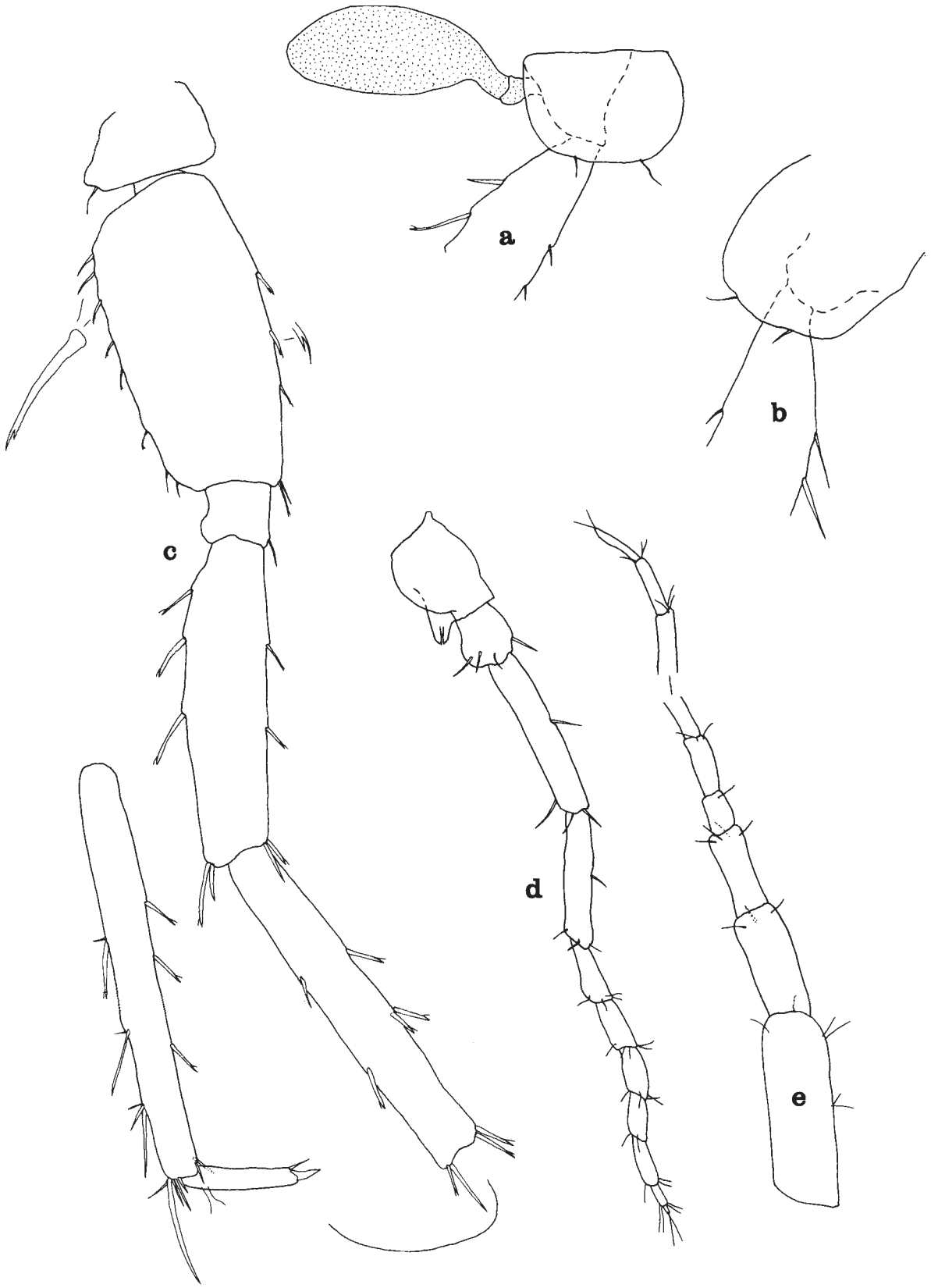

Fig. 2. *Mexiweckelia mitchelli,* new species. Female paratype (4.5 mm): a, upper part of pereopod 3; b, upper part of pereopod 4; c, pereopod 7; d, antenna 2; e, antenna 1.

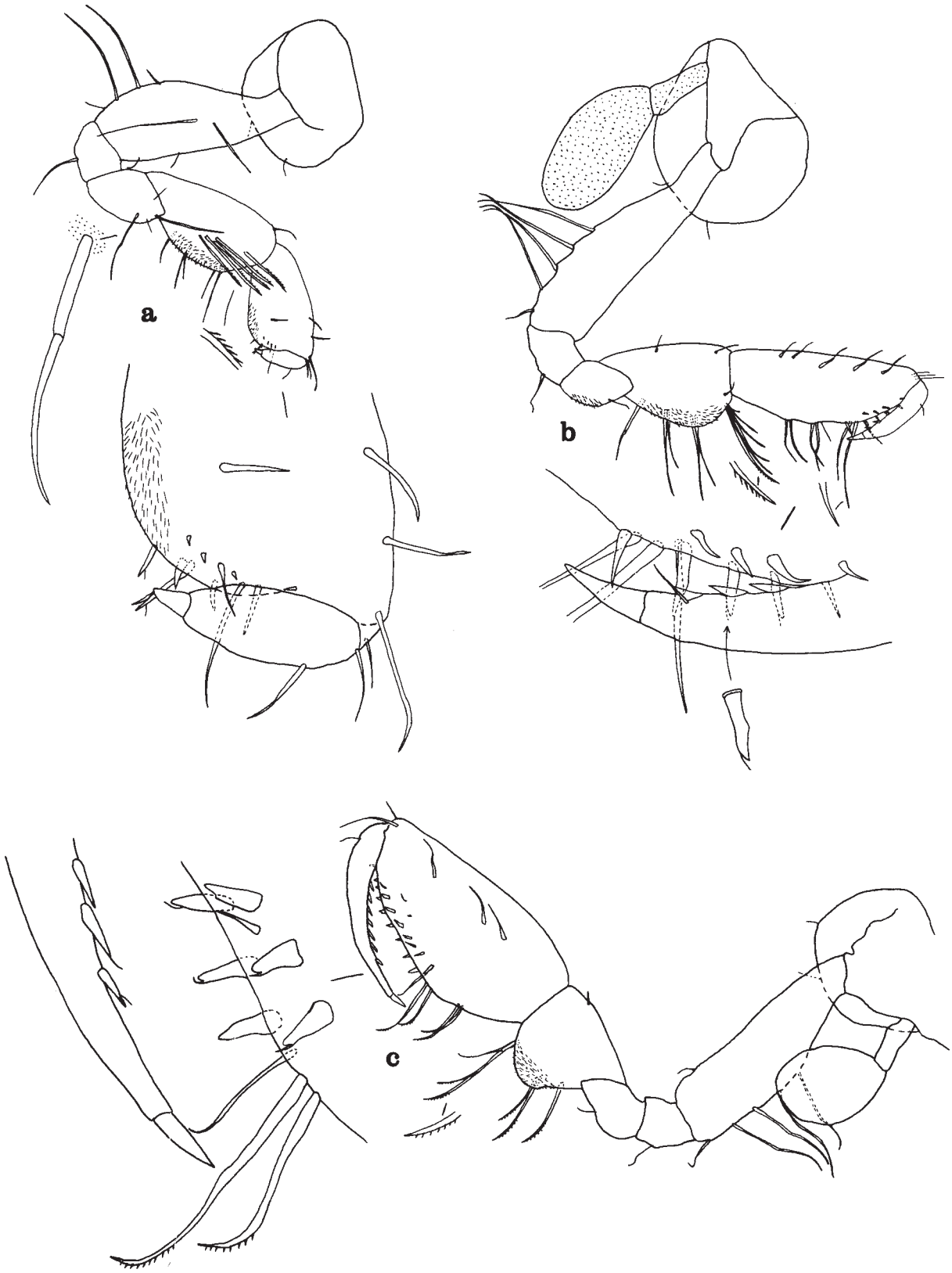

Fig. 3. *Mexiweckelia mitchelli,* new species. Female paratype (4.5 mm): a, b, gnathopods 1, 2. Male paratype (3.5 mm); c, gnathopod 2.

142356) are deposited in the National Museum of Natural History (Smithsonian Institution) and 78 paratypes are deposited in the collection of the author.

Diagnosis—A small, eyeless, depigmented cavernicolous species distinguished from *Mexiweckelia colei,* to which it is closely allied morphologically, by having more setae on the inner plates of maxillae 1 and 2; by the bases of pereopods 5, 6, and 7 which are more narrow and lack defined distoposterior lobes; and by having fewer spines on the apical lobes of the telson and on the lateral margins of the rami of uropod 3. Largest females, 4.5 mm; largest males, 3.5 mm.

Female—Antenna 1 about 45 percent as long as body, about 30 percent longer than antenna 2; primary flagellum with 14 to 15 segments; accessory flagellum absent; slender (tiny) calceoli on some primary flagellar segments. Antenna 2, flagellum with 7 to 8 segments. Left and right mandibles about equal; palp absent; spine row with 3 long, plumose spines; molar without a seta. Maxilla 1, palps of left and right about equal; inner plate with 12 plumose setae apically; outer plate with 7 serrate spines apically; palp with 3 stiff setae (or slender spines?) apically. Maxilla 2, inner plate with oblique row of 17 to 18 long, slender setae. Maxilliped, inner plate with 4 blade-like spines and about 10 coarse setae apically; outer plate with 4 blade-like spines and several setae on inner margin subapically. Lower lip with outer lobes narrowing distally to slender processes, inner lobes absent.

Gnathopod 1: propod a little smaller than segment 5; palm short and with a few stiff setae and small spines, rounding into a rather long posterior margin which lacks setae but is partially pubescent; medial setae few, dactyl short and thick, nail short. Segment 5 of gnathopod 1 with 5 long, comb-like setae on medial surface; posterior margin pubescent. Coxal plate 1 about as broad as long, with 2 short, marginal setae. Gnathopod 2: propod slightly larger than that of gnathopod 1, rather long and narrow, longer than segment 5; palm short, convex, armed with a double row of distally un-notched spine teeth; defining angle with 2 long setae and 1 spine; superior medial setae singly inserted; posterior margin rather long, with 2 groups of long setae; dactyl with 3 blade-like spines on inner margin, nail moderately long. Segment 5 of gnathopod 2, posterior margin convex, pubescent, with 4 groups of long setae. Coxal plates 2, 3, and 4 rather shallow, margins with 2 setae each. Pereopod 7 about 55 percent as long as body, 20 percent longer than pereopod 6, 40 percent longer than pereopod 5. Bases of pereopods 5-7 rather narrow, about as broad proximally as distally, distoposterior lobes indistinct; dactyls about 1/3 lengths of corresponding propods. Coxal gills rather large, present on pereopods 2-6, absent from 7. Sternal processes absent. Brood plates tiny, narrow.

Abdominal side plates generally similar; posterior margins convex, corners rounded, indistinct, each with 1 stiff seta; ventral margins slightly convex without spines. Uronites each with 2 dorsal spines. Uropod 1: peduncle longer than rami, armed with 7 spines; inner ramus longer than outer, armed with 4 unequal distal spines; inner ramus armed with 5 unequal distal spines. Uropod 2: peduncle about equal in length to inner ramus, armed with 3 spines distally, inner ramus longer than outer, armed with 4 distal spines; outer ramus with 3 distal spines. Uropod 3, 20 to 25 percent as long as body; peduncle with 6 spines; inner ramus slightly longer than outer ramus, with several plumose setae laterally and 4 unequal spines apically; outer ramus with several plumose setae and spines laterally and 3 spines and 2 setae apically. Telson rather small, about as long as broad, cleft slightly more than 1/2 the length to base; apical lobes with 1 long spine and 1 or 2 fine setae each.

Male—Differing from the female as follows: Antenna 1, 35 to 40 percent longer than antenna 2; primary flagellum with 12 segments. Propod of gnathopod 1 slightly larger in proportion. Gnathopod 2: propod proportionately larger, about twice as large as propod of gnathopod 1; palm rather long, oblique, armed with a double row of 7 to 8 distally un-notched spine teeth; defining angle with 2 long setae; posterior margin with 1 set of 2 long setae; superior medial setae few in number, singly inserted; dactyl rather long and curved, with a row of blade-like spines on inner margin, nail rather short. Segment 5 of gnathopod 2 about 1/2 as long as propod; posterior margin pubescent, with 3 sets of long setae. Uropod 3, 15 to 20 percent as long as body. Telson proportionately smaller.

Distribution and Ecology—This species is at present known only from its type-locality, Cueva de la Siquita in the state of Durango, México. According to James R. Reddell (pers. comm.), the type-series was collected from two apparently interconnected, probably spring-fed, pools. The pools ranged in depth from 0.3 to 1.5 m and the water temperature was 24.5°C. The amphipods were quite abundant and were associated with many, small, aquatic microdrile oligochaetes. Although the larger females (4.5 mm) appeared to be mature, none had brood plates fringed with setae.

Etymology—It is a pleasure to name this species in honor of Dr. Robert W. Mitchell of Texas Tech University, who has made many important contributions to the study of Mexican and Texas cave biology.

Mexiweckelia texensis, new species
Figs. 4-6

Material Examined—Artesian well at fish hatchery, San Marcos, Hays Co., TEXAS: 4 syntype specimens collected 14 May 1940 by Leslie Hubricht. The syntypes (partly on slide mounts) are deposited in the National Museum of Natural History (USNM 142357).

Diagnosis—A small, eyeless, depigmented subterranean species easily distinguished from other species in the genus by long, attenuated appendages (especially the antennae and pereopods), absence of a lacinia mobilis (accessory plate) on the mandible, greatly expanded coxal plate of gnathopod 1, produced distoposterior corners of the abdominal side plates, and possession of 2 to 3 slender spines (or stiff setae?) on the upper (anterior) margins of the dactyls of pereopods 6 and 7 and possibly 5. Largest specimens, 5.0 mm.

Description—Antenna 1 about as long as body, 50 to 60 percent longer than antenna 2; primary flagellum with 35 segments; accessory flagellum reduced to a tiny, vestigial stub; slender calceoli on some primary flagellar segments. Antenna 2, flagellum with 8 segments. Apical margin of upper lip with a small notch. Left and right mandibles subequal, both lacking palp and lacinia mobilis; spine row with 2 to 3 long, plumose spines; molar large and prominent, right molar with a seta, left without. Maxilla 1: inner plate with 16 to 17 long, apical setae; inner plate with 7 serrate spines; palp with 4 spines and 2 plumose setae apically. Maxilla 2, inner plate with oblique row of about 20 long setae, apex with both plain and plumose setae. Maxilliped: inner plate with 9 spines and 3 coarse setae apically; inner plate with subapical row of 4 spines and 5 setae on inner margin; segment 4 of palp comparatively long and slender, nearly as long as preceding segment. Lower lip with outer lobes narrowing distally to form short lateral processes.

Gnathopod 1: propod comparatively long and narrow, as long as combined lengths of segments 4 and 5; palm oblique, straight, armed with a double row of 3 distally un-notched spine teeth; defining angle with 1 spine and 1 long seta; posterior margin rather long, with 2 setae; medial setae few in number, singly inserted; dactyl with 3 slender spines on inner margin. Segment 5 of gnathopod 1 broadest distally, with 4 long, comb-like setae on inner face; posterior margin pubescent on distal half, with several long setae. Coxal plate 1 broadly expanded, extending the length of segment 2; margin rounded, with 2 short setae. Gnathopod 2: propod longer and more slender than first propod, as long as segment 5; palm short, armed with a few small spine teeth toward the rounded defining angle; posterior margin elongate, with 3 sets of 2 long setae each; medial setae lacking; dactyl short, curved. Segment 5 of gnathopod 2 much broader distally than proximally, distal 1/4 pubescent, anterior and posterior margins with 5 or 6 long setae each. Coxal plates 2 and 3 longer than broad, with 1 or 2 short, marginal setae; plate 4 similar except a little broader. Pereopods 5, 6, and 7 elongate, 7 about as long as body; posterior margins of bases slightly convex, distoposterior lobes rounded and distinct; dactyls of pereopods 6 and 7 and possibly 5 with 2 to 3 slender spines (or stiff setae) on upper (anterior) margins. Coxal gills on pereopods 2-6, sternal processes absent. Structure of brood plates unknown.

Abdominal side plates distinctly produced distoposteriorly; posterior margins oblique; corners with 1 short seta each; ventral margins slightly convex, without spines. Peduncles of pleopods 1 and 2 with 4 coupling hooks and pleopod 3 with 3 coupling hooks on inner margins distally. Uronites each with 2 dorsal spines. Uropod 1: peduncle equal in length to inner ramus, armed with 3 lateral spines and 4 distal spines; inner ramus with 4 unequal, distal spines; outer ramus shorter than inner ramus, with 4 unequal, distal spines. Uropod 2: peduncle about 75 percent as long as inner ramus, with 2 distal spines; inner ramus with 1 lateral and 4 unequal, distal spines; outer ramus shorter than inner ramus, with 4 unequal, distal spines. Structure of uropod 3 unknown. Telson longer than broad, cleft more than 1/2 length to base, apical lobes with 3 slender spines each.

Remarks—Because of the poor condition of the material at hand, it was impossible to accurately determine the sex of the animals or to give a complete description of the arrangement of the pereopods. Moreover, the third uropods were also missing from all four specimens, thus preventing the description of this important structure. If additional specimens are ever found, they will provide the opportunity to prepare a more comprehensive description and to determine the structure of the third uropod.

In order to assign this new species to *Mexiweckelia,* a part of the original diagnosis of the genus (Holsinger and Minckley, 1971, pp. 426-427) should be amended to read as follows: "Upper lip symmetrical, apical margin rounded, with or without a notch. Mandible with well developed incisor and molar; ....." Although the absence of the third uropod makes the generic assignment of this species a bit uncertain, its characters otherwise fit well into the diagnosis of *Mexiweckelia,* i.e., especially the absence of mandibular palps, vestigial accessory flagellum of antenna 1, shape and armature of the gnathopods, presence of dorsal spines on the uronites, and shape and deep cleft of

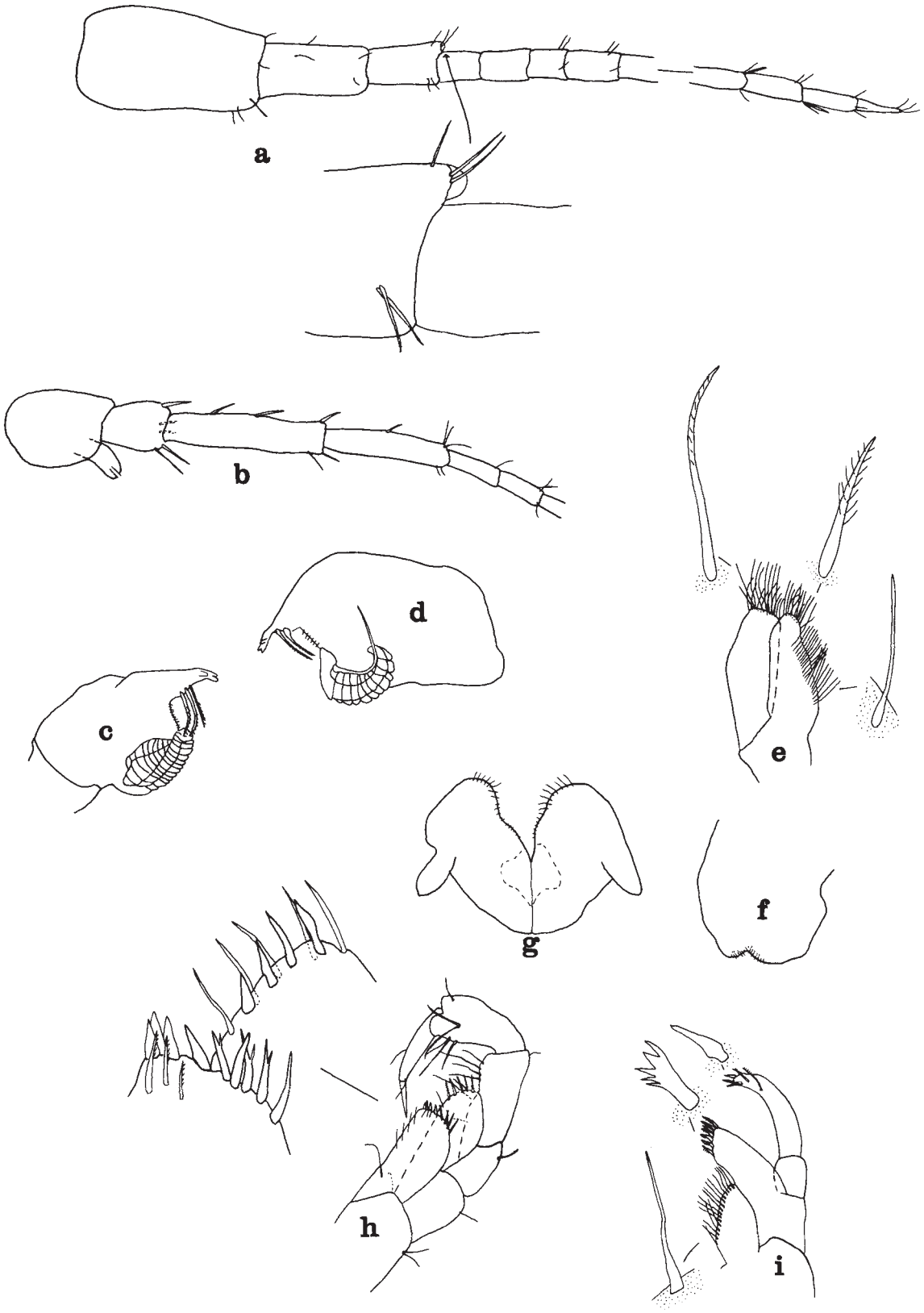

Fig. 4. *Mexiweckelia texensis,* new species. Syntype (4.0 mm): a, b, antennae 1, 2; c, d, left and right mandibles; e, maxilla 2, f, upper lip; g, lower lip; h, maxilliped; i, maxilla 1.

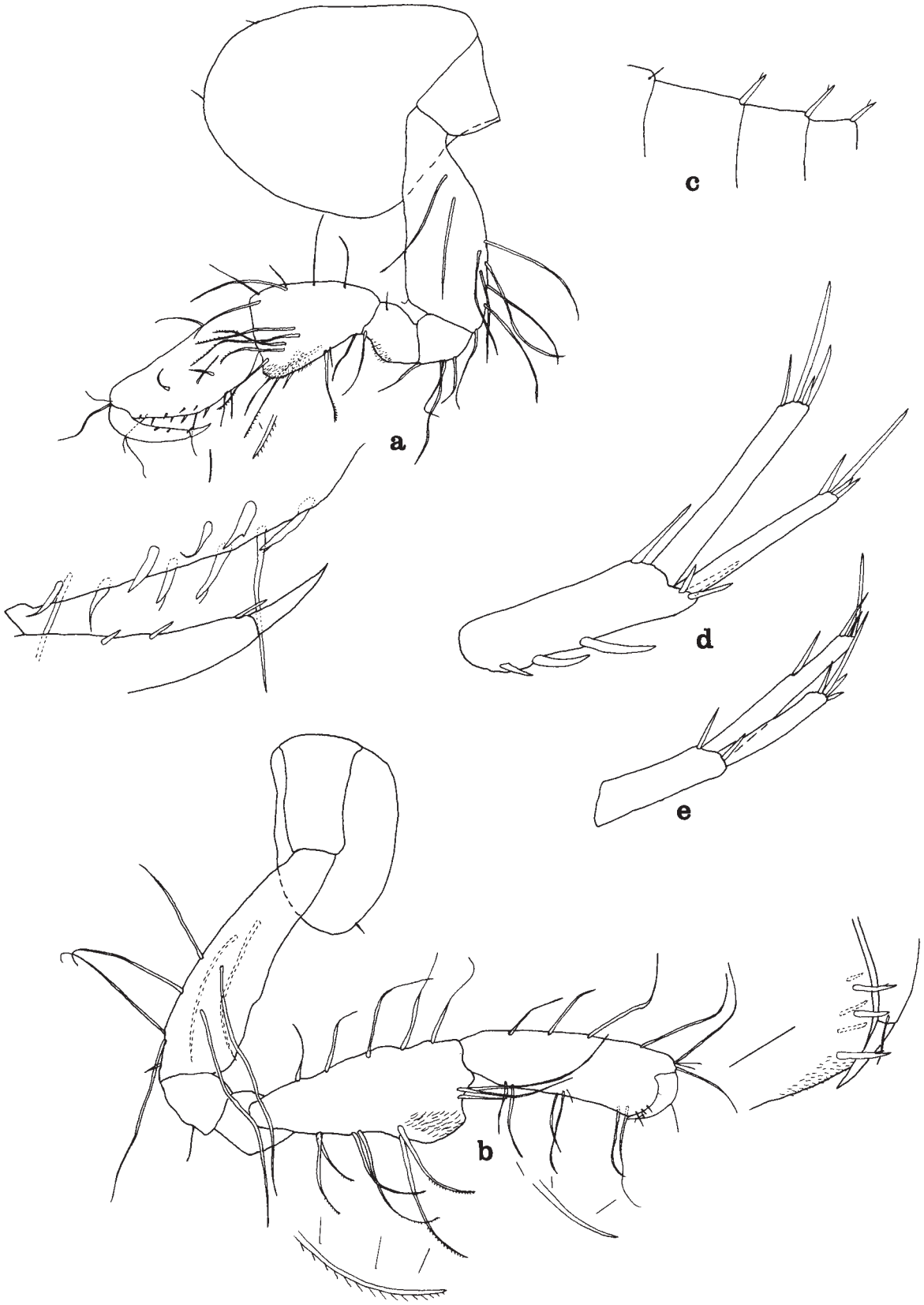

Fig. 5. *Mexiweckelia texensis,* new species. Syntype (4.0 mm): a, b, gnathopods 1, 2; c, upper region of uronites (lateral view; d, e, uropods 1, 2.

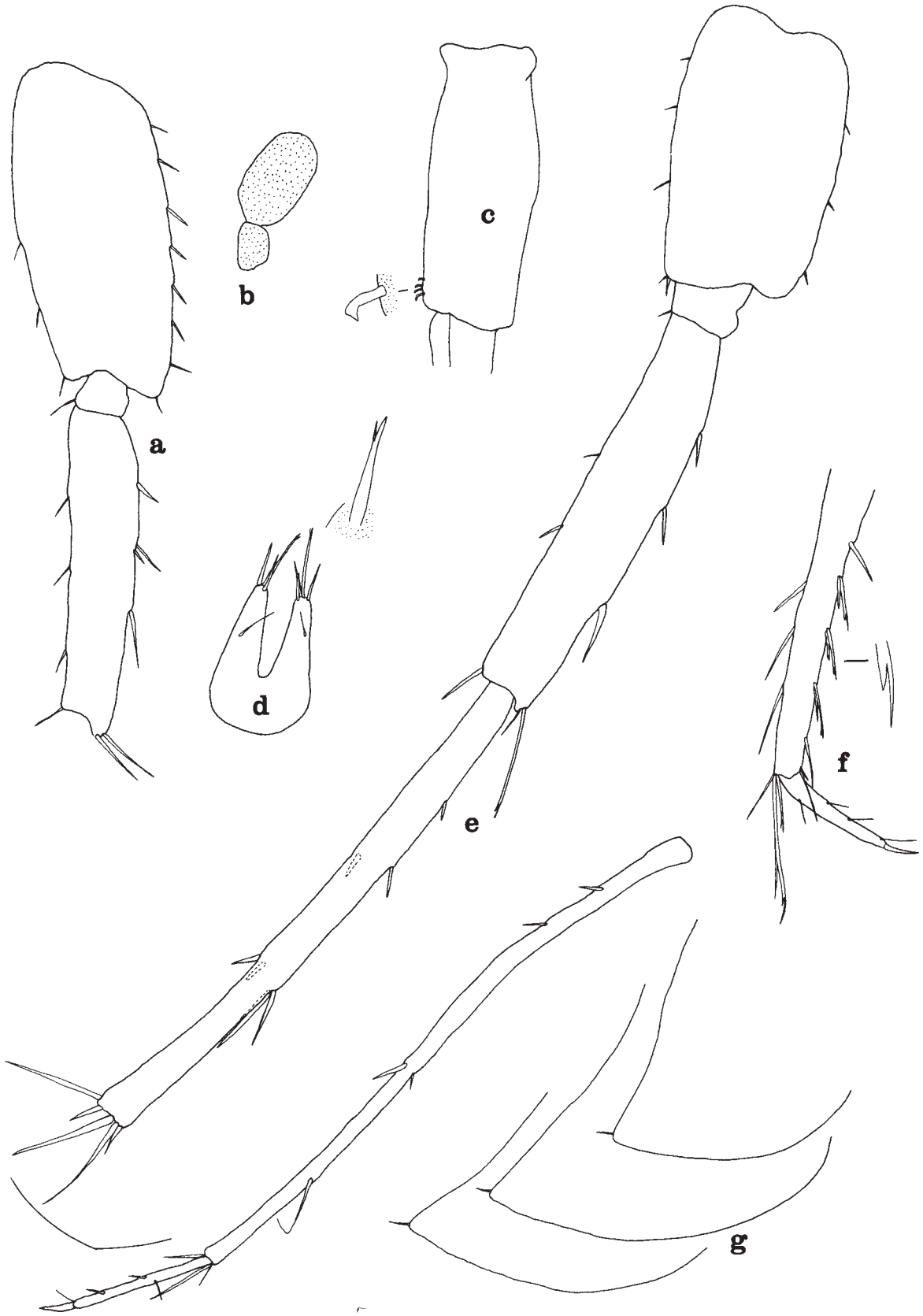

Fig. 6. *Mexiweckelia texensis,* new species. Syntype (4.0 mm): a, upper part of pereopod 5 or 6; b, coxal gill of pereopod 5; c, peduncle of pleopod 2; d, telson; e, pereopod 6 or 7; f, segments 6 and 7 of pereopod 5 or 6; g, abdominal side plates.

the telson.

Distribution and Ecology—This species is at present known only from its type-locality, the artesian well at San Marcos, Texas. The related groundwaters of nearby Ezell's Cave and Johnson's Well have been searched on several occasions by James R. Reddell and other biospeleologists, but to date *M. texensis* has not been found outside of the type-locality. Judging from its long, slender appendages, attenuated body, small size, and apparent absence from nearby Ezell's Cave, this species is almost certainly an interstitial form, presumably an inhabitant of minute spaces beneath the groundwater table. Its appearance in the artesian well was probably fortuitous.

DISCUSSION

The known distributions of the four species of *Mexiweckelia* are shown on the map in Figure 7. The ranges are highly insular and quite disjunct. While *M. colei* and *M. particeps* occur sympatrically (and syntopically) in the Cuatro Ciénegas Basin, the other species are geographically and ecologically well isolated. *M. mitchelli* occupies a cave habitat located 240 km southwest of the ranges of *M. colei* and *M. particeps.* In contrast, *M. texensis* occurs in a groundwater habitat at San Marcos, Texas which is situated 550 km northeast of Cuatro Ciénegas and 790 km northeast of Cueva de la Siquita. In addition to distance barriers, the ranges of these species are physically separated by rugged mountainous terrain. The Cuatro Ciénegas basin is isolated from the region around Cueva de la Siquita by the Sierra del Tlahualilo and other less prominent mountains. San Marcos, located along the Balcones fault zone at the edge of the Edwards Plateau, is separated from the Cuatro Ciénegas basin by the entire width of the Sierra Madre Oriental and a part of the coastal plain of southern Texas.

The ecology of these species is also apparently different. *M. mitchelli* is an inhabitant of cave pools with temperatures of 24 to 25°C. *M. colei* and *M. particeps* inhabit groundwater outlets (presumably fed by water which percolates through shallow interstices) with elevated temperatures of 30 to 33°C. *M. texensis,* on the other hand, is probably the inhabitant of a deep, interstitial groundwater habitat with an approximate temperature of 20°C.

The possible origin of the genus *Mexiweckelia* and its zoogeographic affinities with other genera of the *Hadzia* group of Gammaridae were discussed by Holsinger and Minckley (1971). The *Hadzia* group, as presently defined, is composed of eight genera of predominately interstitial-subterranean forms which inhabit marine, brackish and fresh waters. The group has a curious circumtropical distribution, extending more than two-thirds the distance around the World, but the majority of species are found in the peri-Mediterranean and greater Caribbean regions. Five of the eight genera are known only from freshwater habitats. *Mexiweckelia* shares rather close morphological affinities with the Caribbean, *Hadzia* group genera *Weckelia* (Cuba), *Paraweckelia* (Cuba) and *Alloweckelia* (Puerto Rico), but is more distantly related to *Hadzia* (synonym=*Metaniphargus)* which occurs in mostly brackish water, interstitial habitats of some of the Lesser Antillean islands of the Caribbean and in brackish and freshwater, subterranean habitats (mostly caves) of the Adriatic region of southern Europe (Yugoslavia and Italy). The origin of the freshwater, subterranean genera of Cuba, Puerto Rico and México (and now Texas!) is believed to have resulted from the invasion of newly opened, freshwater niches by brackish water, *Hadzia*-like ancestors during the late Cretaceous or the early Tertiary *(Mexiweckelia)* and the middle to late Tertiary *(Weckelia, Paraweckelia* and *Alloweckelia)* (Holsinger and Peck, 1968; Holsinger and Minckley, 1971).

The ancestral stock of *Mexiweckelia* might have been relicted in the continental freshwaters of México and Texas at the end of the Cretaceous or at the beginning of the Tertiary, following the regression of a marine embayment which covered most of central and eastern México and southern Texas during the middle to late Mesozoic. The transition of a shallow sea into a continental land mass would have been accompanied by the formation of new habitats, thus effectively creating "open niches", theretofore unavailable. Subsequent mountain building in México (for instance, the Laramide Revolution) and other extensive geological changes which have served to shape the present land forms of this area, would have resulted in the isolation of populations followed by speciation, leading to the distributional patterns of contemporary species.

Mexiweckelia is one of several groups of subterranean crustaceans of the greater Caribbean region believed to have evolved from marine relicts and also to show zoogeographic affinities with related groups inhabiting similar biotopes in the peri-Mediterranean region of southern Europe, western Asia and northern Africa (cf., the old Tethyan sea area). Aside from amphipods of the *Hadzia* group, there are a number of other striking parallels between the subterranean crustacean faunas of these two regions (Holsinger and Minckley, 1971; Cole and Minckley, 1972). Some of

the groups which demonstrate these relationships were discussed in detail by Cole and Minckley (1972) and include sphaeromatid and cirolanid isopods and thermosbaenaceans. Additional parallelisms also occur in amphipods of the genus *Bogidiella* (species in the Caribbean region, South America, southern Europe, Africa and western Asia; see Ruffo, 1963, 1970) and asellid isopods of the subfamily Stenasellinae (Cole and Minckley, 1972). This subfamily is represented by several genera and occurs in the subterranean waters of Europe, western Asia, tropical Africa, and northern México. *Mexistenasellus coahuila* is one of only three representatives of this group in the Western Hemisphere and was described by Cole and Minckley (1972) from the same thermal spring basin that is inhabited by *Mexiweckelia colei* and *M. particeps* (see Fig. 7).

It is also interesting that the sole representative of the primitive crustacean order Thermosbaenacea in the Western Hemisphere is known only from Ezell's Cave which presumably contains the same underground water as that of the nearby artesian well locality of *Mexiweckelia texensis.* This order is represented by five subterranean, brackish and fresh water species of the genera *Monodella* (4 spp.) and *Thermosbaena* (1 sp.) in southern Europe and North Africa and one species *(Monodella texana)* in Texas (Rouch, 1964; Maguire, 1965). The North American species, while showing a definite relationship to the European forms, is probably different enough, however, to warrant a separate generic status (Rouch, pers. comm., 1968).

Continued biological investigations of the subterranean biotopes of the greater Caribbean region will undoubtedly lead to additional discoveries of marine relict crustaceans and shed further light on the zoogeographic relationship between the invertebrate fauna of this region and the peri-Mediterranean area.

ACKNOWLEDGMENTS

I am grateful to Edward Alexander, William R. Elliott, Leslie Hubricht and James R. Reddell for making available specimens of the new species for

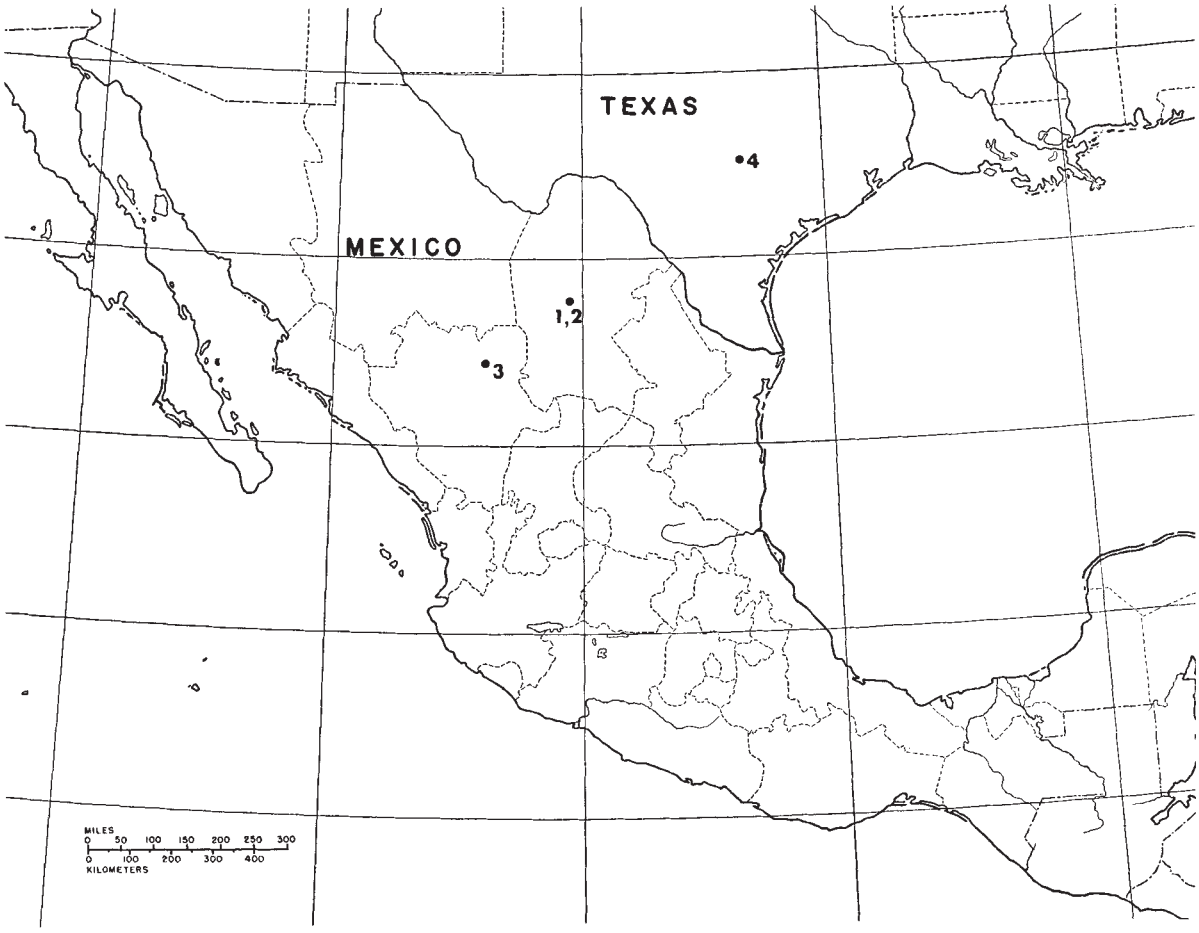

Fig. 7. Distribution of the genus *Mexiweckelia:* 1, 2, *M. colei* and *M. particeps;* 3, *M. mitchelli;* 4, *M. texensis.*

study. I also thank Dr. Thomas E. Bowman for reading the manuscript and making helpful comments and Dr. Robert W. Mitchell and Mr. Reddell for their enthusiastic support of this and other projects dealing with the biospeleology of Texas and México.

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TWO NEW AMERICAN SPECIES OF *SPELAEOMYSIS* (CRUSTACEA: MYSIDACEA) FROM A MEXICAN CAVE AND LAND CRAB BURROWS

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Five species of mysids belonging to the family Lepidomysidae are known from underground habitats in Zanzibar (Fage, 1925), Italy (Caroli, 1924), India (Pillai and Mariamma, 1964), México (Villalobos, 1951), and Cuba (Bacescu and Orghidan, 1971). All are blind, except the Zanzibar species, which, like one of the new American species described below, has a few ommatidia situated at the distolateral corner of the eyestalk. The 2 new species described below bring the known forms to 7, 4 of which inhabit Central and South America.

FAMILY LEPIDOMYSIDAE CLARKE

Lepidophthalmidae Fage, 1924
Lepidopidae Stammer, 1936
Lepidopsidae Villalobos, 1951
Lepidomysidae Clarke, 1961

Type-genus—*Lepidomysis* Clarke, 1961.

Genus *Spelaeomysis* Caroli, 1924

Lepidophthalmus Fage, 1924 [Type-species, by monotypy, *Lepidophthalmus servatus* Fage. Preoccupied by *Lepidophthalmus* Holmes, 1904, Callianassidae].

Spelaeomysis Caroli, 1924.

Lepidops Zimmer, 1927 [Replacement name for *Lepidophthalmus;* preoccupied by *Lepidops* Miers, 1878, Albuneidae].

Typhlolepidomysis Villalobos, 1951. [Type-species, by monotypy, *Typhlolepidomysis quinterensis* Villalobos].

Lepidomysis Clarke, 1961 [Replacement name for *Lepidops*].

Keralomysis Pillai and Mariamma, 1963. [Type-species, by monotypy, *Keralomysis longipes* Pillai and Mariamma].

Type-species, by monotypy—*Spelaeomysis bottazzii* Caroli, 1924.

Diagnosis (modified from Gordon, 1960, and Pillai and Mariamma, 1964)—Body somewhat depressed. Carapace relatively long; anterolateral lobes rounded, reaching beyond rostrum; posterolateral lobes reaching pereonite 7 or beyond; cervical groove absent. Pereonites 6 and 7 exposed dorsally; pleonite 6 produced dorsally into rounded triangular flap extending anteriorly to overlap concave posterior margin of carapace. Pleon relatively long; pleonite 6 slightly longer than pleonite 5. Telson subtriangular or linguiform, spinose on distal half or on entire margin. Eyestalks truncate, without visual elements or with a few ommatidia on distolateral corner. Antenna 1, 2nd segment of peduncle not shortened. Antennal scale with rounded apex, margin setose. Mandible with well developed incisor and molar; 2nd and 3rd segments of palp each with row of strong spines. First maxilla with 2-merous reflexed palp ending in long seta. Maxilliped quite setose; penultimate segment of endopod with broad medial lobe; exopod an unsegmented oval plate; epipod rather long and narrow. Pereopod 1 with exopod longer than endopod; endopod prehensile. Pereopods 2-7 with slender ambulatory endopods; penultimate segments of endopods not subdivided; pereopod 7 of male with internal

coxal lamina. Pleopods biramous, increasing in size posteriorly; endopods 1-merous; exopods 3-merous except 4-merous female pleopod 2; male pleopod 2 with 2nd exopod segment broadened and curved. Pleonites 3-5 with thin transverse lamella extending back from sternum between pleopod bases, not incorporating protopods of pleopods. Protopod of uropod produced on ventral surface into posteriorly projecting medial lobe armed with marginal spines and also usually into lateral tooth underlying base of exopod; exopod 2-merous, with undulate suture between segments, except in *S. bottazzii.* Statocyst absent. Seven pairs of oostegites.

Gordon (1960) placed *Typhlolepidomysis* in synonymy with *Spelaeomysis.* Pillai and Mariamma (1964) suggested the possibility that *Spelaeomysis* and *Lepidomysis* might be synonyms, but felt that further study was needed to justify combining them. While an adequate description of *Spelaeomysis bottazzii* is not yet available, its known characters agree with those in the diagnosis given above, except that it is said by Caroli (1924) to lack the suture on the exopod of the uropod. This suture may be difficult to see; Gordon (1960) states that in *Lepidomysis* it "only shows up well in reflected light", and *S. bottazzii* needs to be reexamined for this character. The absence of this suture, even if confirmed, would not in itself justify separating *S. bottazzii* generically from the other described species and the new one proposed herein. Consequently I am assigning them all to the genus *Spelaeomysis.*

Lepidophthalmus and *Spelaeomysis* were both proposed in 1924, but Caroli indicated clearly that Fage's work appeared earlier, hence *Lepidophthalmus* has precedence over *Spelaeomysis.* In the edition of the International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology in 1958, Article 39 specified that when the type-genus of a family was found to be a junior homonym and replacement names were therefore required for the type-genus and family, the replacement names were to take the date of the name replaced. The effect of this regulation would have been to make *Lepidomysis* a senior synonym of *Spelaeomysis,* but this part of Article 39 was removed from the code by the XVI International Congress, and *Spelaeomysis* therefore has seniority.

A discussion of the rather complex history of the nomenclature of the genus is given by Clarke (1961).

Spelaeomysis olivae, new species
Figs. 1-11, 13-19

Material Examined—Male holotype, about 8 mm (USNM 143339) and female paratype, 8.2 mm (USNM 143340) from Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México. Collected 26 December 1972 by J. Reddell, D. McKenzie, M. McKenzie, and S. Murphy.

Etymology—Named after Dr. Olive S. Tattersall, in recognition of her many notable contributions to the systematics of the Mysidacea.

Diagnosis—Body form very similar to that of *S. quinterensis* (Villalobos, 1951). Carapace with broadly triangular rostrum reaching about halfway along eyestalks; anterolateral lobes reaching slightly beyond rostrum. Eyestalks separate, quadrate, wider than long, without ommatidia. Pleuron of pereonite 7 reaching well ventrad of pleuron of pleonite 1. Sternal lamella of pleonite 3 with slightly concave posterior margin; lamellae of pleonites 4 and 5 with nearly straight margins. Telson linguiform, 1.1-1.2 times as long as width at base; margin of distal half spinose, armed with about 40 spines; median distal spine and 1 or 2 pairs of corner spines longer than others; 1 or 2 pairs of slender spines situated between distal and corner spines.

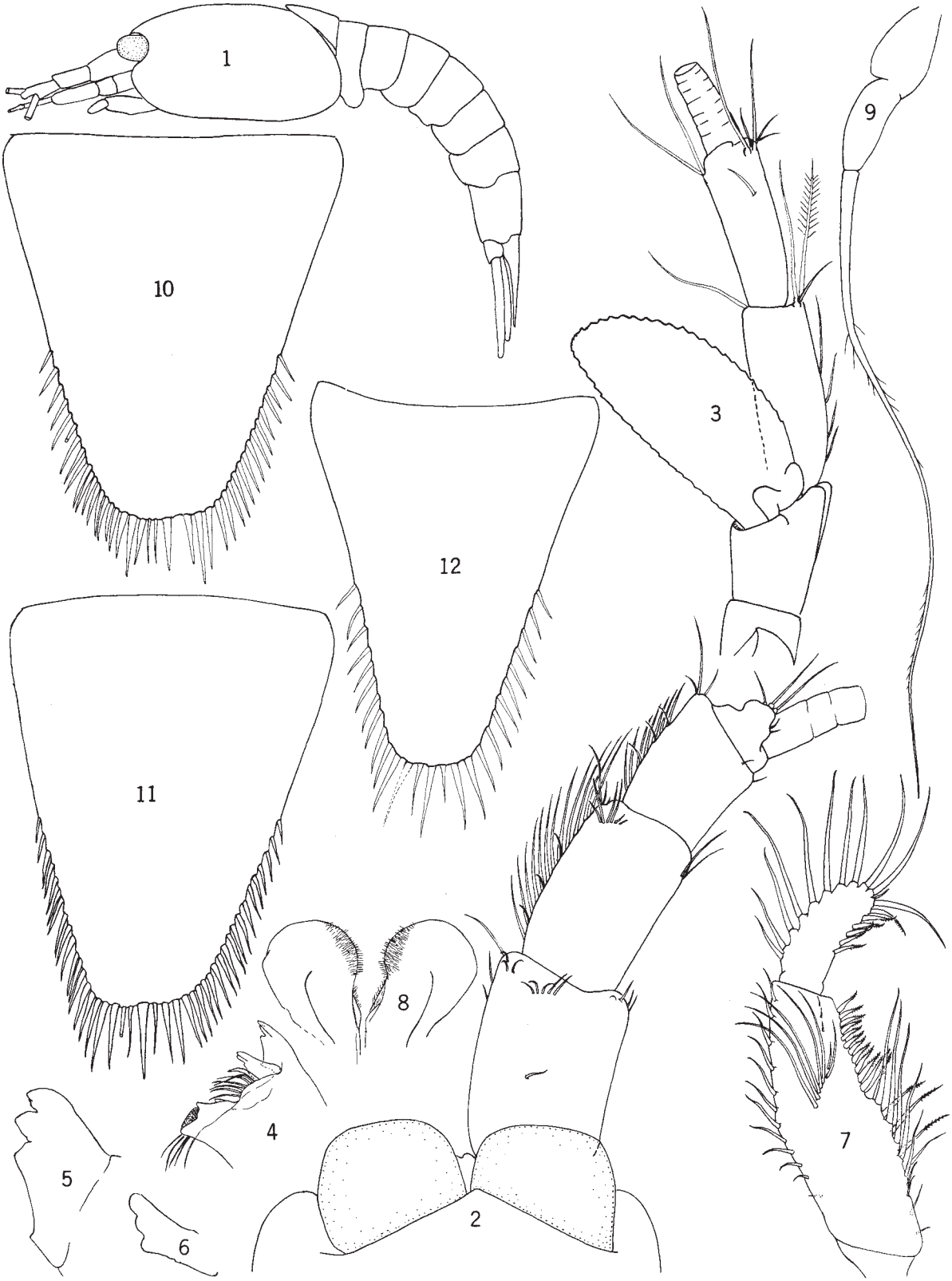
Antenna 1 peduncle, segment 2 about as long as but distinctly narrower than segment 1; segment 3 with distolateral scaliform process bearing 3 setae; flagellum broken, hence length unknown. Antenna 2 scale about twice as long as wide, reaching nearly 1/3 along last peduncle segment; flagellum broken.

Mandible with usual structure for genus; palp well armed with setae of several types (Fig. 7). Labium with inner lobes broadening distally. Maxilla 1 armed as in Figure 13; outer lobe with 15 terminal spines; inner lobe with 4 long, robust and 2 shorter, more slender terminal setae; palp ending in very long slender seta. Maxilla 2 very similar to that of *S. quinterensis* illustrated by Villalobos (1951), but apparently with a few more setae on most parts. Maxilliped similar to that of *S. quinterensis,* but with shorter inner lobe of basipod and shorter setose margin of propus.

Pereopod 1 similar to that of *S. quinterensis,* but with many setae on posterior margins of endopod segments 2 and 3. Pereopods 2-7 similar to those of *S. quinterensis.*

Figs. 1-11. *Spelaeomysis olivae.* 1. Male, lateral. 2. Female head and antenna 1, dorsal. 3. Antenna 2, dorsal. 4-7. Male left mandible: 4. Gnathal surface. 5. Incisor. 6. Lacinia. 7. Palp. 8. Male labium, posterior. 9. Male maxilla 1, palp. 10. Male telson. 11. Female telson.

Fig. 12. *Spelaeomysis quinterensis,* telson.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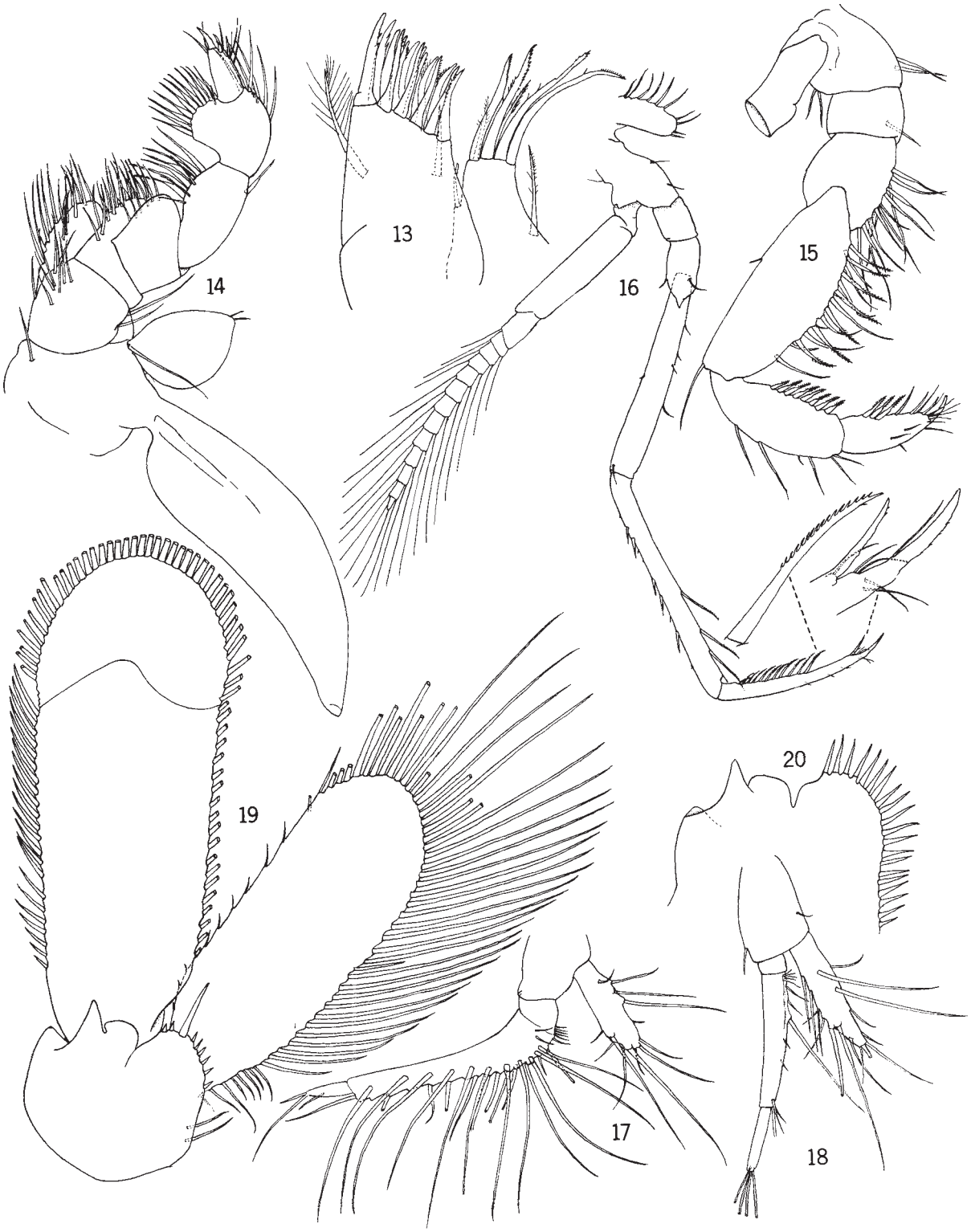


Figs. 13-19. *Spelaeomysis olivae.* 13. Male left maxilla 1. 14. Male left maxilliped. 15. Male pereopod 1 endopod. 16. Male pereopod 7. 17. Male pleopod 2. 18. Male pleopod 3. 19. Male uropod, ventral.

Fig. 20. *Spelaeomysis quinterensis,* apex of protopod of uropod, ventral.

Pleopods resembling those of *S. quinterensis.* Male pleopod 2, segment 3 of exopod short, only about 1/5 length of segment 2 (nearly 1/2 length in *S. quinterensis).*

Uropod protopod, medial lobe not reaching posterior to lateral tooth; margins with few spines. Endopod reaching transverse suture of exopod. Exopod proximal segment with 22 spines on lateral margin, distal spine not more robust than others; distal segment about 0.4 length of proximal segment.

Color. Without pigmentation except black pigment dorsally on distal part of telson, most of uropodal endopod, and lateral part of exopod.

Relationships—Of the known species of *Spelaeomysis,* only *S. bottazzii, S. quinterensis,* and *S. nuniezi* agree with *S. olivae* in having the eyestalks separate and without ommatidia. Among other differences, *S. quinterensis* has a narrower telson with fewer marginal spines (24 in Villalobos' figure 3, 27 in the topotype illustrated herein—Figure 12). In the uropod the medial lobe of the uropod has no long apical spine (Fig. 20), and the endopod reaches beyond the suture of the exopod. The sternal lamellae of pleonites 3-5 all have slightly concave posterior margins. *S. bottazzii* is described in terms having generic rather than specific value, but appears to lack the suture on the exopod of the uropod.

Spelaeomysis cardisomae, new species
Figs. 21-31, 33-38

Material Examined—(All collected by Donald B. Bright, California State University, Fullerton): LCBA (Land Crab Biological Associate) 356: Margin of mangrove, Hooker Bay, Isla San Andrés, Columbia (Caribbean, east of Nicaragua), 1 foot above mangrove HHT line, burrow temperature 30°C; dominant plants, *Avicennia* and *Caesalpinia;* water in burrow brown, high sulfide odor. 8 July 1968. Burrow occupied by crab, *Cardisoma guanhumi* and mosquitoes, adult *Deinocerites pseudes.* 6 males, 1 female.

LCBA 363: Margin of mangrove, Southwest Bay, Isla Providencia, Columbia (Caribbean, east of Nicaragua). 1.2 feet above MHT line, burrow occupied by *Cardisoma guanhumi* and larval and adult *Deinocerites pseudes.* Mud with "rusty" color, numerous burrows covered by high tide during day. 20 July 1968. 1 female.

LCBA 505: Eastern margin of Estero Rojos, Boca del Río Tumbes, Peru. Margin of Estero covered with some *Avicennia* and *Prosopis; Salicornia* common. *Cardisoma crassum* burrows approximately 125 feet from central area of Estero in soft alluvial mud. Burrows flooded approximately 8 hours per day; water table very high, hence burrows do not become dry. Burrow water pH 6.4, salinity 31.6 o/oo. 31 January 1969. 6 males, 4 females, 1 juvenile.

LCBA 508. Same data as 505. 1 male, 1 juvenile.

LCBA 509. Same data as 505. 3 males, 1 juvenile.

LCBA 510. Same data as 505. 2 juveniles.

Holotype—A 6.2 mm male from LCBA 505 (USNM 143332). The remaining specimens in 505 and those in 508, 509, and 510 are paratypes.

Etymology—Named after the land crab genus in whose burrows the mysids were collected.

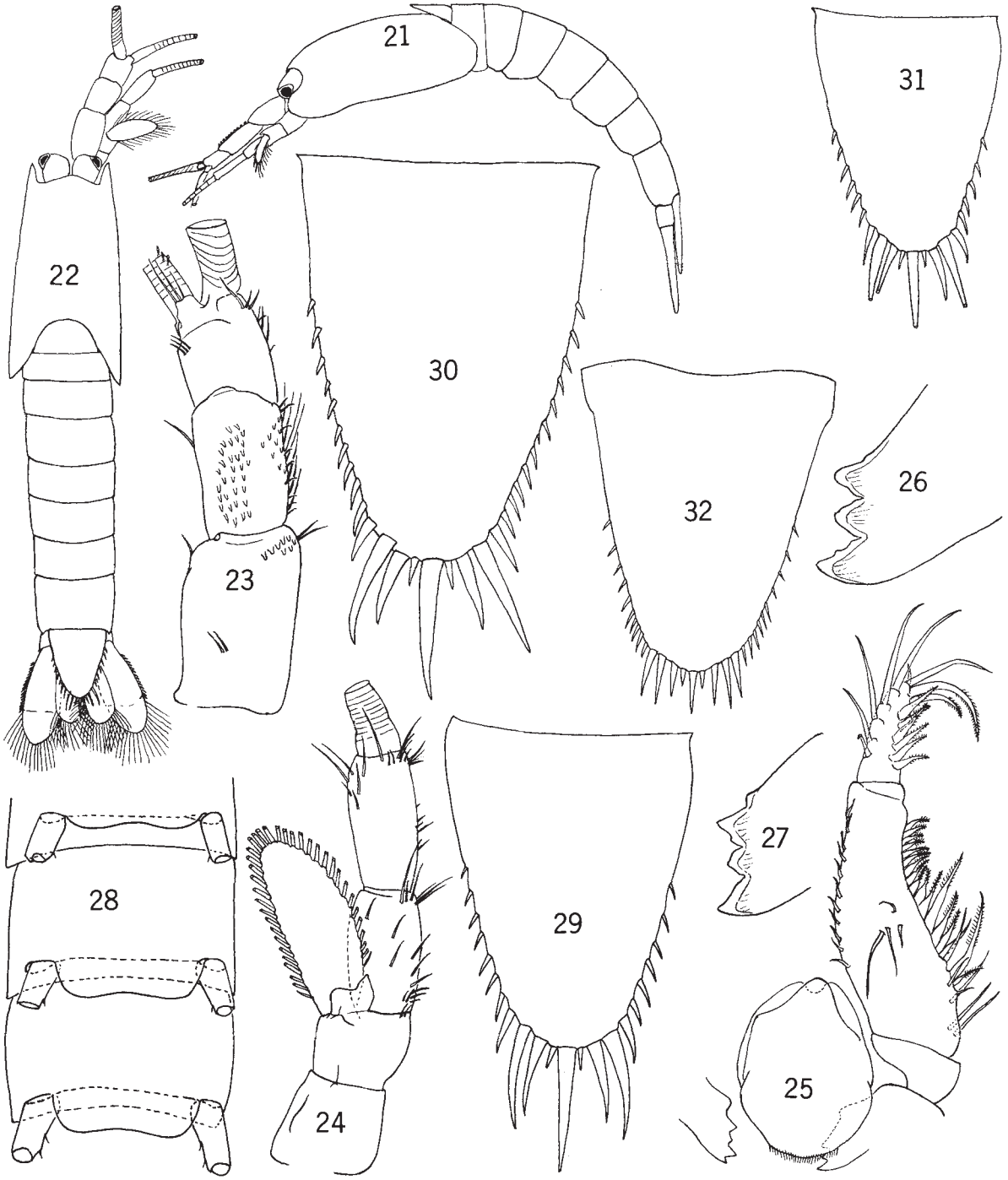
Diagnosis—Length 4.5-6.5 mm. Carapace with rounded rostrum covering only bases of eyestalks; anterolateral lobes reaching almost to distal end of eyestalks. Eyestalks separate, about as wide as long, broader distally, with a few distolateral ommatidia. Pleuron of pereonite 7 not reaching ventrad beyond pleuron of pereonite 1. Sternal lamellae of pleonites 3-5 slightly concave on free margins. Telson spatulate, about 1.3 times as long as width at base; margin of distal 1/2-2/3 armed with spines, the number increasing with size—20 in a 3.7 mm male, 31 in a 6.7 mm male; largest spine at apex, flanked by a pair of short spines, followed by a pair of large spines and then a pair of spines larger than all except apical spine.

Antenna 1 peduncle, segment 2 slightly shorter and distinctly narrower than segment 1; dorsal surface of segment 2 and distomedial part of segment 1 covered with small shingle-like scales; segment 3 with distolateral process bearing 3 setae; inner flagellum reaching nearly to posterior end of pleon; outer flagellum slightly shorter. Antenna 2 scale about 2.5 times as long as wide, reaching more than 1/3 along last peduncle segment; flagellum reaching anterior part of pleon. Mandible similar to that of *S. olivae* but with minor differences in setation of palp. Maxilliped with slender epipodite; carpus with 4 spines on lateral margin. Pereopods similar to those of *S. olivae,* but not so long and slender.

Male pleopod 2, exopod segment 2 broad; medial margin armed with close-set curved spines.

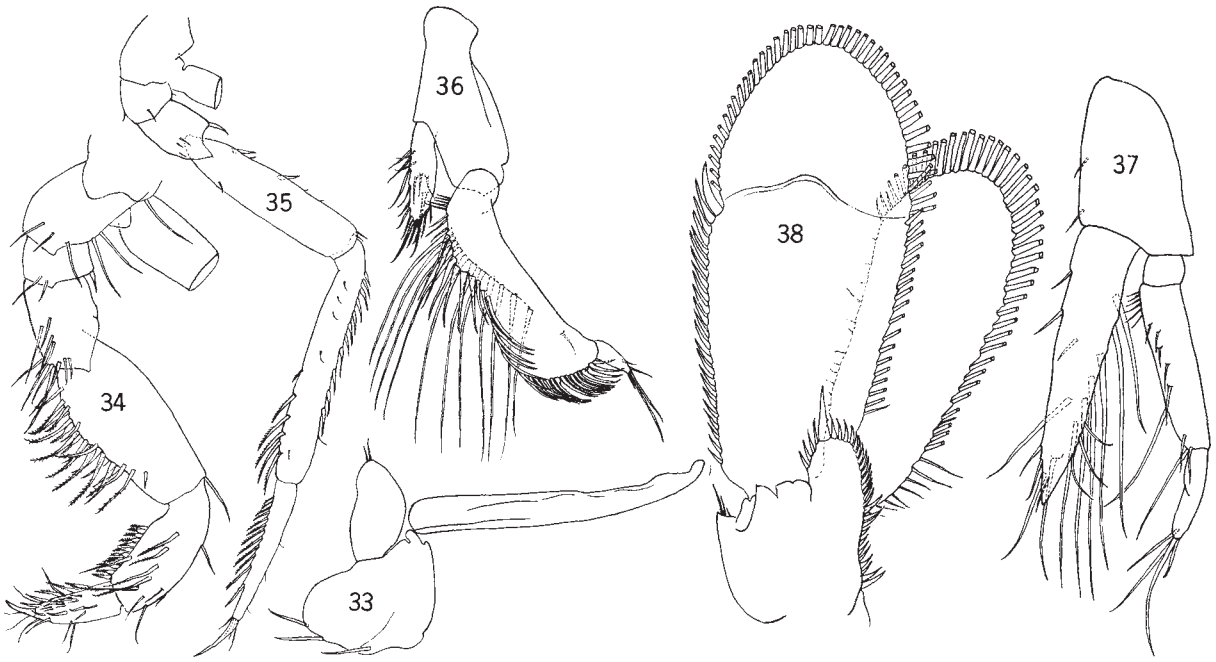
Uropod protopod, medial lobe well developed; margins with numerous curved spines. Endopod reaching well beyond transverse suture of exopod. Exopod proximal segment with about 23 spines on lateral margin; distal spine distinctly more robust than others; distal segment about half length of proximal segment.

Color. Preserved specimens have mottled dark brown pigment on eyestalks, peduncles of antennae 1 and 2, carapace, exposed pereonites, pleon and telson. The uropodal rami are very sparsely pigmented. Ventrally the pereon and pleon are very lightly and



Figs. 21-31. *Spelaeomysis cardisomae.* 21. Male, lateral (509). 22. Male, dorsal (509). 23. Male left antenna 1, dorsal (356). 24. Male left antenna 2 (356). 25. Labrum and mandible, in situ (356). 26. Incisor of male left mandible (356). 27. Lacinia of male left mandible (356). 28. Pleonites 3-5, ventral (356). 29. Male telson (505). 30. Telson of 6.7 mm male (356). 31. Telson of 3.7 mm male(356). Numbers in parentheses are LCBA collection numbers. For explanation see text.

Fig. 32. *Spelaeomysis servatus,* telson (copied from Fage, 1925, Fig. 7).



Figs. 33-38. *Spelaeomysis cardisomae* (356). 33. Maxilliped, proximal part. 34. Male pereopod 1 endopod. 35. Male pereopod 7 endopod. 36. Male pleopod 2. 37. Male pleopod 3. 38. Male uropod, ventral.

the oral region more heavily pigmented.

Relationships—*S. servatus* (Fage), the only other species with ommatidia, is also most similar to *S. cardisomae* in other characters. The 2 species can be distinguished readily by the armature of the apex of the telson. In *S. servatus* the pattern of the apical spines is similar to that of *S. cardisomae,* but the spines are relatively shorter (Fig. 32).

Distribution—The occurrence of *S. cardisomae* in both Atlantic and Pacific localities is rather surprising, but I have not found any clearcut differences between specimens of the 2 populations. The specimens from the Columbian islands were in poor condition, and it was not possible to compare them fully with the Peruvian specimens. When adequate material becomes available, such a study should be made. If the occurrence of *S. cardisomae* in *Cardisoma* burrows is not fortuitous, it is possible that its range will be found to coincide with those of the crabs. *C. guanhumi* occurs in Bermuda, Andros Island (Bahamas), the central east coast of Florida, Louisiana, and Texas south to Florianapolis, Brazil, including the West Indies (Chace and Hobbs, 1969; Bright and Hogue, 1972). The geminate species *C. crassum,* is known from Todos Santos, Baja California, to the Río Chira, Peru (Bright and Hogue, 1972).

Remarks—The presence of ommatidia in *S. servatus* and *S. cardisomae* is related to their occurrence in habitats where light is not completely excluded as it is in the caves occupied by other species of *Spelaeomysis* except *S. longipes.* The latter inhabits subterranean waters in southern India and was collected from a well nearly 15 m in depth penetrating to these waters (Pillai and Mariamma, 1964). An analogous situation is found in the genus *Antromysis. A. cenotensis,* which lives in caves in Yucatán, México, has medially fused eyestalks without visual elements, whereas *A. anophelinae,* which lives in the burrows of *Cardisoma guanhumi* in Costa Rica, has a narrow band of ommatidia (Tattersall, 1951).

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ON MORE EARTHWORMS FROM MEXICAN CAVES

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The proportion of autochthonous, Mexican, megadrile species known only from types secured in caves has been mentioned at least once in previous publications (Gates, 1971). The number of types for each species has been small. A dedicated band of spelunkers now has turned up another new species and in a nice series of 20 well preserved specimens. It is especially fortunate that the series is long enough to enable a description of neural components in the circulatory system, a set of blood vessels different from any hitherto recorded for earthworms.

ACANTHODRILIDAE

Eodrilus albidus, nom. nov.

P. O. Ljungstrom has kindly informed me that *Eodrilus albus* Gates 1970, was preoccupied by *Acanthodrilus albus* Beddard 1895, later transferred to *Notiodrilus* Michaelsen 1899, thence to *Eodrilus* Michaelsen 1907, in 1913 back into *Acanthodrilus* again, with a relapse into a reconstituted *Eodrilus* in 1937, presently, according to one author, in *Diplotrema* as a subgenus of *Notiodrilus*! The American endemic has belonged in none of those classical and neoclassical congeries but until such information as is necessary to enable rational assignment of the species to a properly defined genus, the former generic name is retained though it perhaps should be enclosed in quotation marks. There does seem to be a need for a convention about use of generic names strictly no longer available that cannot be replaced until much additional information (that often cannot be expected for an indefinite period, perhaps of years) is finally available. Further "orphaned species" are to be expected as inadequately characterized type species are reexamined in conditions that will allow genera to be properly defined rather than as in the classical system (and suggested revisions) by relatively unimportant pairs of simple key characters along with derogation of much conservative somatic anatomy.

Eodrilus sp.

Cueva de la Capilla, 13.5 km NW Gómez Farías, Tamaulipas, 11 January 1971, 0-5-0. J. Reddell, S. Wiley, J. Cooke, W. Elliott.

Last hearts, in xii. Holandric, with seminal vesicles in xi,xii. Spermathecae, each with two diverticula, on right and left sides or the two may be united into a dumbell-shaped body transversely placed across ental end of the spermathecal duct.

Nematodes were secured from coelomic cavities of two worms but have not yet been identified.

Immaturity and unsatisfactory preservation contraindicated identification to species.

LUMBRICIDAE

Dendrobaena rubida (Savigny) 1826

Rancho del Cielo, 5 km NW Gómez Farías, Tamaulipas, 12 January 1971, 0-5-0. J. Reddell.

Harrison Sinkhole, Rancho del Cielo, 5 km NW Gómez Farías, Tamaulipas, 12 January 1971, 2-1-8 (and some fragments). J. Cooke, W. Elliott.

Cueva de la Puente, ca. 3000 m, 20 km S San Francisco and 40 km E San Luis Potosí, San Luis Potosí, 15 May 1972, 0-0-1, 16 May 1972, 0-0-1. W.

Elliott, R. Ralph, M. McEachern.

Octolasion tyrtaeum (Savigny) 1826

Sótano del Buque, 20 km N Pinal de Amoles, Querétaro, 2 June 1972, 0-0-2. T. Raines, R. Ralph.

Sótano de la Golondrina, 3000 m elevation, Puerto Altamira, 40 km E San Luis Potosí, San Luis Potosí, 0-0-1. W. Elliott et al.

Cueva de los Otates, 15 km NW Pinal de Amoles, Querétaro, 19 November 1972, 0-0-1. R. Jameson, P. Strickland, C. Bittinger, S. Lozo.

OCTOCHAETIDAE

Trigaster albida, new species

Sótano del Anticlino, Nuevo León, México, September 1971, 1-9-9. Terry Raines per J. Reddell.

External Characteristics—Length, to 130 mm. Diameter, to 7 mm (in clitellum). Segments, 162, 176, 179, 180. Body, circular to transversely and shortly elliptical in cross section. Anal segment, with rugosities like those of the buccal segment, the anus represented by a vertical slit more or less widely open and without visible semi-lunar valves. Prostomium, when clearly defined, shortly epilobous, tongue open or closed. First dorsal pore, at 11/12 (4 specimens), ?12/13 (2), 12/13 (10), ?13/14 (1), 13/14 (3).

Clitellum, annular, red, in xiv-xviii but reaching slightly into xiii, lacking in *AA* of xviii, the postsetal half of xvii, the presetal half of xiv, and in xiii. Seminal grooves (so wide as to be called gutters as by Murchie), straight or nearly so, but with margins more or less irregular, in *AB*/xviii-xx. Three minute pores are just lateral to each end of each groove, the lateral of which is a prostate pore just median to which tiny, black dots (tips of penial setae) are barely visible in the other two openings. The ventrum into *BC* of the postsetal half of vii, all of viii and the presetal half of ix is swollen but without obliterating intersegments which are even deeper in the region involved. Three pairs of genital markings are faintly foreshadowed in *BC*/xviii-xx just lateral to the seminal grooves (one specimen only). Each of such areas is transversely and shortly elliptical, with barely distinguishable indications of demarcation into a central area of greyish translucence and an opaque, rather wide marginal band. Similar but smaller areas are present in the same segments just median to the seminal grooves of two specimens (not recognized in the first examination of the externalia). Locations; at eq/xviii, 18/19, eq/xix, eq/xx. Adumbrations of other markings might possibly be brought out by proper treatments. Several specimens seemed to have a slight, unpaired tumescence in *BB*/xxi, perhaps with an additional smaller one in *AA*/xxii. When the areas just indicated seemed not to be tumescent they sometimes seemed to be very slightly discolored, brownish.

Internal Anatomy—Segments ix and xii, on pinning out the opened worm are readily recognized as each is large and filled by acinous seminal vesicles. Segments x and xi are not at first visible, as all that can be seen is a band of opaque tissue between ix and xii. From that band, septum 9/10 easily can be pulled forward to display the coelom of segment x. Septa 10/11 and 11/12 are closely apposed peripherally and are somewhat adherent even if not united. After their separation coelomic cavities of x-xi (like that of xiii) are recognized as much smaller than those of ix and xii. The special longitudinal muscle band at mD is present but its borders usually are not readily distinguishable. Brain in ii or iii, anteriorly in each case.

Gizzards, in v-vi (12). Esophagus, widened and moniliform through x-xiii, narrower and of uniform width through xiv-xvii, valvular posteriorly in xvii or in region of 17/18. Intestine, beginning abruptly in xviii (8+?) and for several segments deeply, regularly and symmetrically sacculated, followed by a region in which sacculations in the dorsal half of the gut are much more irregular and varied. In the region xxix-xxxi, sacculations may assume (3 specimens) an appearance of a pair of small, dorsally directed and symmetrical caeca. Ingesta, in the first 18-37 or so intestinal segments, enclosed in a transparent (mucus?) sheath like the peritrophic membrane of insects. The sheath is so strong that it can be lifted out by one end intact. The sheath was replaced by a solid column of the same material in a worm with no ingesta in that part of the gut. Typhlosole, none.

Dorsal blood vessel, without chloragogue, single throughout, complete, bifurcating under the brain, the branches reuniting over the subpharyngeal ganglion to become the ventral trunk which also is complete, in a dissected worm often resting on the nerve cord. Supraesophageal, single in xiii-ix. Lateroesophageals, insofar as visible, median to the hearts. Posterior lateroparietals, passing up to dorsal trunk on anterior face of 14/15. Lateroneural trunks, one on each thin lateral face of the nerve cord with numerous transverse connectives between each other, seemingly at regular intervals (one for each segment?) on ventral face of the cord. The two trunks of one worm united in the clitellar region to become a single, rather irregularly looped but still median vessel that disappeared into a plexus on the subpharyngeal ganglion. The trunks of another worm did not unite mesially but continued through the plexus that surrounded the

subpharyngeal ganglion and passed dorsally (to the brain?) adherent to the circumpharyngeal nervous commissures. The trunks passed posteriorly (in a juvenile) into a plexus investing the nerve cord in the last five segments. Hearts, of ix seemingly lateral, of x-xiii latero-esophageal.

A large vertical mass, presumably of nephridial tubules is present on each side of the body in front of the gizzard (presumably in iv though there is no certainty as to location as they always seemed to be in v). Removal of the gut shows that the body wall behind the clitellum is covered by specks of white tissue none of which could be proved to be associated with a nephrostome, preseptal or otherwise.

Testes, seminal vesicles, male gonoducts and male terminalia much as in *T. reddelli* Gates 1971. Prostates, ca. 3-4 mm long, about half as wide and still thinner, with slightly convex but never flat upper and lower surfaces that have a pebbled appearance as if composed of numerous quite small and closely crowded lobules. Structure obviously is not of the simply tubular type but further characterization must await study of microtome sections and of development. Penial setae, with most of the shaft straight, gradually narrowing to a point ectally and with a short ectal portion gently curved (apparently naturally) over to one side and not softened. Ornamentation, not recognized.

Spermathecae, of the juvenile and a slightly older worm, in viii-ix, but in the other specimens reaching forward into vii-viii (forced into those positions by growth of the seminal vesicles?). Duct, much shorter than the ampulla and rather narrow. Diverticulum, single, sessile, covering anterior and lateral faces of the duct, containing several seminal chambers. The diverticulum perhaps should be regarded as nothing more than a rather berry-shaped group of distended intramural seminal chambers bulging out the anterior wall of the spermathecal duct. Ovaries, fan-shaped, with several egg strings.

Reproduction—Spermatozoal iridescence in seminal chambers of the spermathecae and on male funnels, along with the absence of contra-indications, allow an assumption that reproduction is amphimictic.

Growth Stages—Seminal grooves of the (supposedly) youngest worm were represented by an almost linear greyish translucence between equators of xviii and xx exactly at the *B* level. Apertures of the *a* setal follicles of those segments were still at the *A* level but those of the *b* follicles of xviii and xx already were slightly displaced mesially. The *a* apertures in xviii and xx of some presumably older worms still were at the *A* level but had been approximated by the *b* apertures. In other specimens the *a* apertures had moved laterally to approximate those of the *B* rank. A single seta was recognized in xviii and then in one of the older worms. Male pores never were certainly identified though once suspected of being at eq/xix and on another worm of being nearer 18/19 though equally doubtfully.

Parasites—Nematodes were present in coelomic cavities of one worm all the way back to the hind end. They have been sent to a nematologist for identification. Cysts (protozoan) present in the coelom of several worms were ellipsoidal to spindle-shaped and about 1 mm long. Several cysts contained two hemispheroidal white bodies each. More rarely three were crowded into a single cyst.

Remarks—Supposed intestinal caeca easily could have been dismissed as merely fortuitous sacculations were it not for the symmetrical pairing in three different specimens. Absence in other dissections suggests that caecal development has not yet become invariant in the species. Different segments of intestinal origin were recorded for the first specimens. Then a worm was opened that had coelomic cavities of xiv-xvii completely filled with a translucent coagulum. Removal, which was easy, disclosed septal insertions on the gut in almost diagrammatic clarity as well as the equisized coelomic cavities.

The blood of any worm, to emphasize the obvious, never fills all blood-vessel spaces. Almost any vessel, with the possible exception of the dorsal and ventral trunks, may, after preservation, be completely empty and then may be unrecognizable and of course not traceable. Even parts of the two major trunks occasionally may be empty and perhaps also unrecognizable. In fact only rarely do the bifurcations that connect the two major trunks anteriorly contain enough blood so that they can be traced. Considerable variation as to presence or absence of blood in any vessel or part thereof must be expected not only from one worm to another but even from one region to another of a single specimen. Furthermore, experience has shown that certain vessels very often, if not nearly always, may be without blood. Caution accordingly may be advisable regarding acceptance of statements as to absence of a particular vessel, especially if in a description of a single worm or even if based on several consecutive dissections.

One example. Records of the first dissections of *T. albidus* indicated absence of any neural vessels. Then, the nerve cord of the next dissection unexpectedly revealed the most completely blood filled set of neural vessels seen in the more than fifty years of the author's research. Those same vessels were completely invisible in the next two or three dissections but subsequently blood filled vessels occasional-

ly were recognized in one or more limited regions of several nerve cords.

Systematics—In a recent key to species of *Trigaster* (Gates, 1971), the present worms run down to *T. reddelli,* known only from three types (0-2-1). Differences from that species are as follows: fewer segments, more posterior intestinal origin, presence of the two large and paired masses of nephridial tubules in front of the first gizzard, presence of a spermathecal diverticulum or perhaps more accurately, location of the spermathecal seminal chambers in a transverse band across anterior face of the duct rather than in two longitudinal rows. Presence of definite neural trunks in the new taxon at present cannot be regarded as of systematic significance especially in view of the limited information available about the other species as well as about all of the congeners.

Lumbricids long have been known to have three vascular neural trunks, a subneural and two lateroneurals. A subneural vessel has been recorded from various other megadriles but often has been on the body wall rather than on the nerve cord and not associated with lateroneurals (perhaps often overlooked?). Paired lateroneurals, in absence of the much more commonly recorded subneural, hitherto has been unknown.

The neural components of the *Trigaster* vascular system, according to the little information now available, may not yet have acquired an invariant stability of organization.

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THREE NEW TROGLOBITIC DECAPOD CRUSTACEANS FROM OAXACA, MEXICO

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Among the discoveries made during a recent collecting trip into Oaxaca, México, by James R. Reddell, David McKenzie, Martha Helen McKenzie, and Stuart Murphy were the three albinistic decapod crustaceans described below. One of them is a shrimp, a member of the family Palaemonidae, that is assigned to a new genus. Its affinities with members of other American palaemonid genera, although somewhat obscure, are discussed immediately following the diagnosis of the genus. The other two decapods are crayfishes that are closely allied to the troglobitic *Procambarus (Austrocambarus) rodriguezi* Hobbs (1943:203) which is known from a single locality in Veracruz, México.

Prior to the discovery of these crayfishes, only two others have been described from México since Villalobos (1955) published his "Cambarinos de la Fauna Mexicana": *Procambarus (Ortmannicus) gonopodocristatus* Villalobos (1958:279) from Veracruz, and *Procambarus (O.) villalobosi* Hobbs (1969:41) from San Luis Potosí.

I am most grateful to Mr. Reddell for permitting me to describe these new troglobites and to Fenner A. Chace, Jr., and Isabel Pérez Farfante for their counsel and criticisms of the manuscript. Appreciation is also extended to William R. Elliott for the photographs in Figures 4-7.

FAMILY PALAEMONIDAE

Subfamily Palaemoninae

Neopalaemon, new genus

Diagnosis—Rostrum well developed, compressed, and provided with teeth, ventral margin sometimes unarmed. Carapace with antennal and hepatic spines, latter situated some distance posterior to anterior margin of carapace. Branchiostegal groove present. Telson with two pairs each of dorsal and posterior spines; plumose setae present between posteromesial pair of spines. Eye without pigment or faceted cornea. Mandible with two-jointed palp. All maxillipeds with exopods. Pleurobranchs present on somites bearing pereiopods, and two arthrobranchs on that supporting third maxilliped. Last three pereiopods with dactyl simple; posterodistal surface of propodus of fifth pereiopod lacking transverse rows of short setae. First pleopod of male without appendix interna.

Type-species—*Neopalaemon nahuatlus,* new species.

Gender—Masculine.

Remarks—Like all except one *(Brachycarpus,* see below) of the genera of the American Palaemoninae, the monotypic genus *Neopalaemon* appears to have no single conspicuous character that distinguishes it from others that are currently recognized. The combination of antennal and hepatic spines on the carapace is shared only with *Brachycarpus, Macrobrachium,* and *Pseudopalaemon.* A two-jointed mandibular palp is also typical of members of the genera *Creaseria,* and *Leander,* and occasionally occurs in *Palaemon.* Reduced eyes without pigment is a feature of *Creaseria, Troglocubanus,* and some *Palaemonetes.* The absence of one or more transverse rows of setae on the posterodistal surface of the propodus of the fifth pair of pereiopods is a feature shared only with *Leander.* None of the characteristics just mentioned are found in the only other American genus, *Cryphiops.*

In spite of the similarities cited, *Neopalaemon* may

be distinguished from the other American genera of the Palaemoninae as follows: *Brachycarpus* and *Leander* have an appendix interna on the first pleopod of the male, and *Brachycarpus* is unique in possessing biunguiculate dactyls on the third through fifth pereiopods; in *Macrobrachium,* the mandibular palp is three-jointed, and in *Palaemonetes, Pseudopalaemon,* and *Troglocubanus,* the palp is lacking; in the latter four genera, the propodus of the fifth pereiopod bears transverse rows of setae posterodistally; *Creaseria* also exhibits the latter characteristic and possesses a branchiostegal spine on the anterior margin of the carapace, lacking a hepatic spine.

Neopalaemon may be included in the generic key presented by Holthuis (1952:1) in his revision of the American Palaemonidae by altering couplet 3 as follows:

3. Mandible with two-jointed palp. Propodus of fifth leg lacking transverse rows of setae posterodistally . . . . . *Neopalaemon*
3[1]. Mandible without or with three-jointed palp. Propodus of fifth leg with many transverse rows of setae posterodistally .. 3A

3A. "Mandible with three-jointed palp . . . . . *Macrobrachium"*
3A[1]. "Mandible without palp . . . . . *Pseudopalaemon"*

Neopalaemon nahuatlus, new species
Figs. 1, 2

Description—Rostrum (Fig. 1*f-k)* variable in length and height, its tip reaching between midlengths of penultimate and ultimate podomeres of antennular peduncle; dorsal margin slightly arched or almost straight, bearing four to six teeth, and with or without fine setae in intervals between them; ventral margin with one, two, or no teeth but always with fine setae. Carapace armed with prominent antennal and hepatic spines, latter far removed from cephalic margin; branchiostegal groove distinct.

Abdomen (Fig. 1*l*) with pleura of first two somites rounded, third and fourth somites subangular posteroventrally, and fifth with acute posteroventral spine. Sixth somite about 1.5 times as long as fifth and with prominent acute dorsolateral lobes extending posteriorly over lateral bases of telson and with acute posteroventral extensions at ventrolateral base of uropod; posterior margin of sternum entire. Telson (Fig. 1*m,n*) not including marginal spines, approximately 1.4 times length of sixth somite, bearing two pairs of dorsolateral spines in caudal half; posterior margin tapering toward subacute median apex and bearing two or three pairs of small dorsal setae, pair of small lateral spines, latter flanked mesially by pair of much heavier longer spines, and five pairs of plumose setae between longer spines.

Eyes rounded distally, lacking faceted cornea and pigment. Antennular peduncle (Fig. 1*a*) not reaching distal extremity of antennal scale. Stylocerite subspiculiform, extending distally to about midlength of basal segment of peduncle. Distolateral spine of basal segment not reaching beyond midlength of penultimate segment of peduncle. Antennular flagella unequal in length: mesial flagellum approximately three times length of carapace; long ramus of lateral flagellum approximately four times length of carapace, and short ramus about 0.5 as long as carapace; latter two rami fused through five to eight articles.

Antennal peduncle (Fig. 1*f*) reaching midlength of penultimate segment of antennular peduncle and slightly beyond midlength of antennal scale; basal segment with prominent distolateral spine; flagellum 5.2 times length of carapace and extending posteriorly beyond telson by little less than 0.33 of its length. Antennal scale (Fig. 1*b*) with lamella distinctly overreaching distolateral spine.

Gnathal appendages as figured (Figs. 1*c-e,* 2*a-c*). Mandible with incisor process bearing three teeth; palp two-jointed with proximal segment distinctly longer than distal, both bearing fine setae. First maxilla with proximal endite arched, its distal end directed toward apex of distal endite; palp with slender distal lobe. Second maxilla with scaphognathite narrowing anteriorly. First maxilliped with exite lobe inflated, rounded, and somewhat tapered apically; lash arising distinctly proximal to distal extremity of endopodite. Second maxilliped in no way remarkable. Third maxilliped reaching base of distal third of antennal scale; exopodite almost attaining distal end of ischium.

First pereiopod (Fig. 2*d*) overreaching antennal scale by 0.5 length of dactyl; dactyl 1.3 times length of palm; carpus about 1.5 times as long as chela (propodus); and merus only slightly shorter than carpus. Second pereiopod (Fig. 2*e-g*) overreaching antennal scale by slightly more than length of propodus; dactyl approximately 1.5 times length of palm; chela 1.6 times as long as carpus; length of carpus 0.94 that of merus. Third pereiopod (Fig. 2*h*) overreaching antennal scale by length of dactyl and 0.25 that of propodus; length of dactyl approximately 0.42 that of propodus; propodus 1.7 times as long as merus. Fourth pereiopod (Fig. 2*i*) overreaching antennal scale by length of dactyl and 0.5 that of propodus; length of dactyl approximately 0.28 that of propodus;

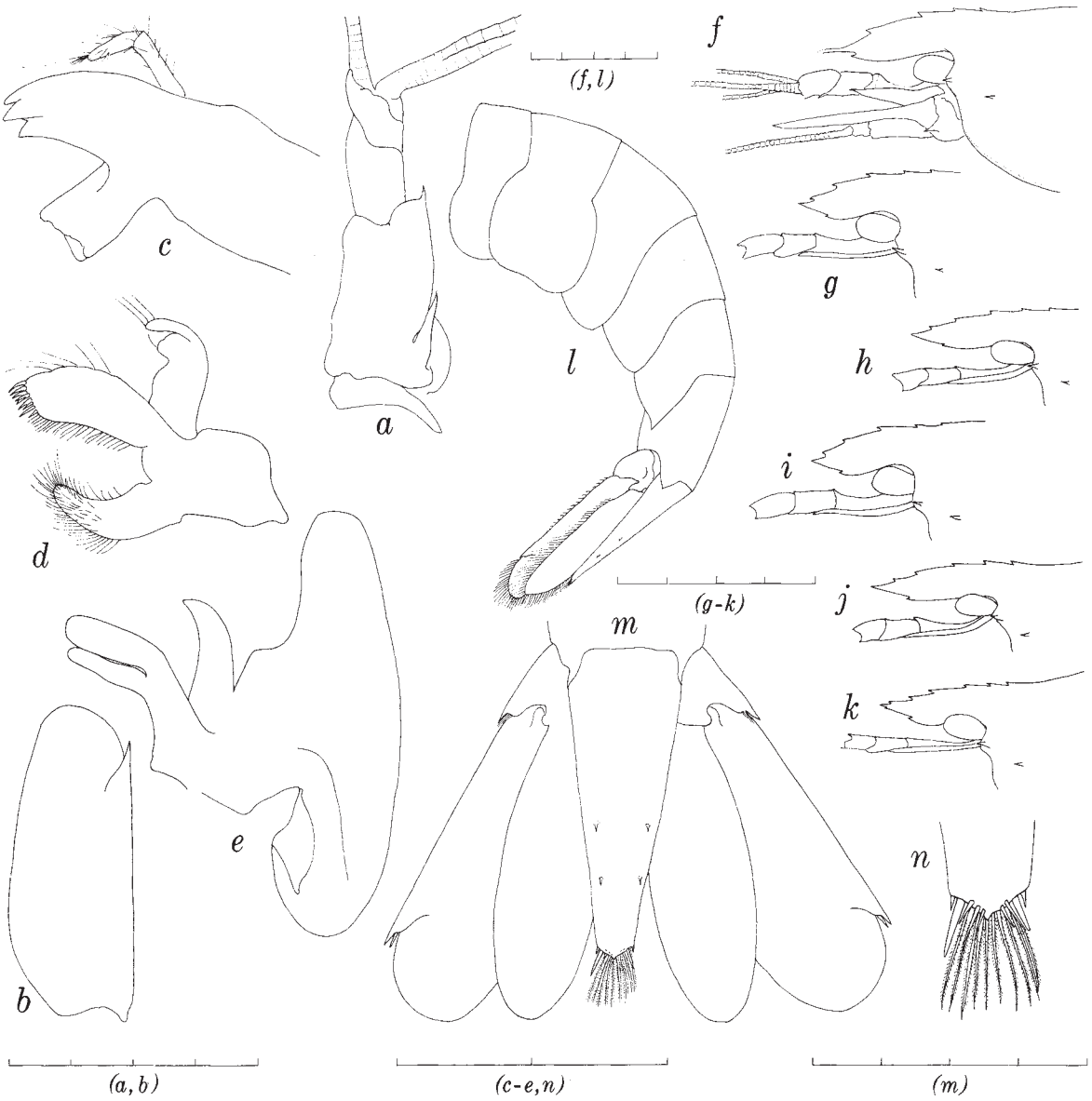
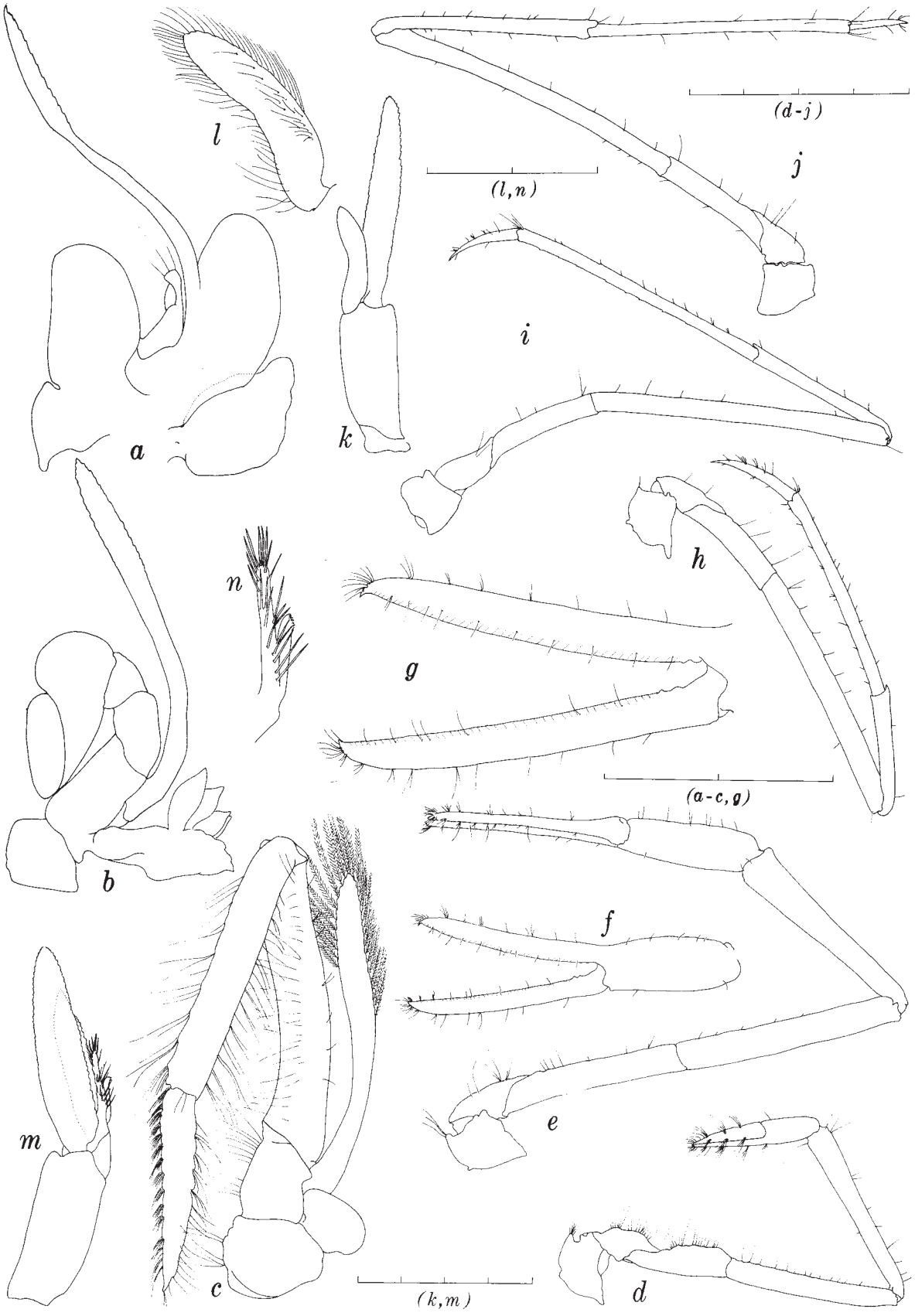


Fig. 1. *Neopalaemon nahuatlus,* new species. *a-f, l-n,* holotype. *a,* Left antennule; *b,* Left antennal scale; *c,* Left mandible; *d,* Left first maxilla; *e,* Left second maxilla; *f,* Lateral view of cephalic region; *g-k,* Lateral view of cephalic region of paratypes; *l,* Lateral view of abdomen; *m,* Dorsal view of telson and uropods; *n,* Dorsal view of posterior part of telson. (Scales in millimeters.)

propodus 1.6 times longer than carpus and 0.91 length of merus. Fifth pereiopod (Fig. 2*j*) overreaching antennal scale by length of dactyl and about 0.5 that of propodus; length of dactyl about 0.22 that of propodus; propodus 1.1 times longer than carpus and 0.83 length of merus.

Endopod of first pleopod of male (Fig. 2*k,l*) almost 0.5 as long as exopod, moderately slender, its least width 0.2 of its total length. Endopod of second pleopod of male (Fig. 2*m,n*) almost reaching base of distal 0.2 of exopodite; appendix interna only slightly longer than 0.5 length of appendix masculina; latter extending distally to base of distal two-fifths of endopodite and armed with approximately 20 long spines. Lateral ramus of uropod (Fig. 1*m*) with conspicuous movable spine situated immediately mesial to spine on lateral margin.

Branchial complement consisting of one pleurobranch on pereiopodial somites, two arthrobranchs at dorsal base of third maxilliped, and one podobranch on second maxilliped; epipodite present on first, second, and third maxillipeds.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Size—Carapace length of males, 8.4 to 10.1 mm (holotype, 9.2 mm); of females, 7.6 to 10.8 mm, and of juvenile males or females, 5.2 to 5.7 mm. No females ovigerous.

Color—Lacking pigment.

Type-locality—Cueva del Guano, 10 km NE Valle Nacional, Oaxaca, México. Five males and 11 females were collected in this cave by James R. Reddell, David McKenzie, Martha Helen McKenzie, and Stuart Murphy on 28 December 1972.

Disposition of Types—The holotypic male (no. 143120), two paratypic males, four females, and three juvenile males or females (no. 143121) are deposited in the National Museum of Natural History, Smithsonian Institution. One paratypic male and two paratypic females are deposited in each the Instituto de Biología, Universidad Nacional Autónoma de México, and The Museum, Texas Tech University, Lubbock, Texas.

Relationships—See the remarks following the diagnosis of the genus *Neopalaemon.*

FAMILY ASTACIDAE

Procambarus (Austrocambarus) oaxacae oaxacae, new species
Figs. 3-5

Diagnosis—Body with markedly reduced pigmentation, virtually albinistic but often with slight tan suffusion on abdomen; eyes reduced in size, with or without traces of facets, frequently with few ommatidia bearing reddish purple pigment but with pigmented area not sharply margined. Rostrum with marginal spines. Areola 3.6 to 4.9 times longer than wide, constituting 35.8 to 37.8 percent of total length of carapace (43.7 to 46.1 percent of postorbital length), and with six to eight punctations across narrowest part. Cervical spine and suborbital angle obsolete. Hepatic region lacking spine on cephalic margin. Postorbital ridge provided with small spine or acute tubercle. Antennal scale approximately 2.2 times longer than wide, broadest distinctly distal to midlength. Mesial surface of palm of chela with irregular row of approximately 20 tubercles, and both fingers with longitudinal ridges on dorsal and ventral surfaces. First pleopod with shoulder on cephalic surface convex distally; distal extremity of appendage bearing slender mesial process directed distolaterally, vestigial cephalic process consisting of very small scalelike lobe at cephalomesial base of mesial process, and corneous acute almost bladelike central projection extending cephalodistally from near distal extremity of cephalomesial surface of slender distal lobe of shaft. Annulus ventralis as figured (Fig. 3*l*).

Holotypic Male, Form I—Body subovate (Fig. 3*a,k*), compressed laterally. Abdomen narrower than thorax (12.9 and 13.8 mm). Width of carapace subequal to height at caudodorsal margin of cervical groove. Areola approximately 4.3 times longer than wide with seven or eight punctations across narrowest part. Cephalic section of carapace 1.8 times as long as areola; latter 4.3 times longer than wide and constituting 36.1 percent of total length of carapace and 43.7 percent of postorbital length. Rostrum excavate dorsally, bearing setiferous punctations; convergent margins not thickened and bearing small spines at base of short acumen, latter not quite reaching proximal end of ultimate podomere of antennular peduncle. Subrostral ridge weak and evident in dorsal aspect only in caudal orbital region. Postorbital ridge prominent, grooved dorsolaterally, and with short acute spines cephalically. Suborbital angle obsolete, branchiostegal spine moderately well-developed. Carapace with setiferous punctations except in ventral portion of branchiostegites and in parts of hepatic areas where replaced by small tubercles; cervical spine, or enlarged tubercle replacing it, lacking.

Abdomen longer than carapace (33.5 and 30.8 mm). Cephalic section of telson with two spines in each caudolateral corner, mesial one movable. Proximal podomere of uropod with both lobes bearing distally directed spine, and mesial ramus with distomedian spine not nearly reaching distal margin of ramus.

Cephalic portion of epistome (Fig. 3*i*) broadly and evenly rounded cephalically, and with short cephalomedian extension; surface subplane; fovea of main body of epistome represented by median longitudinal trough. Antennule of usual form with prominent ventral spine slightly distal to midlength of basal podomere. Antenna extending caudally slightly beyond caudal margin of telson. Antennal scale (Fig. 3*o*) about 2.2 times longer than wide, greatest width distal to midlength, and with lamellar area distinctly broader than thickened lateral portion; latter terminating in moderately strong acute spine. Third maxilliped with mesial half of ventral surface of ischium

←Fig. 2. *Neopalaemon nahuatlus,* new species. (All appendages from left side of holotype except *j* which is from right.) *a,* First maxilliped; *b,* Second maxilliped; *c,* Third maxilliped; *d,* First pereiopod; *e-g,* Second pereiopod; *h,* Third pereiopod; *i,* Fourth pereiopod; *j,* Fifth pereiopod; *k,* First pleopod; *l,* Endopod of first pleopod; *m,* Second pleopod; *n,* Appendices masculina and interna. (Scales in millimeters.)

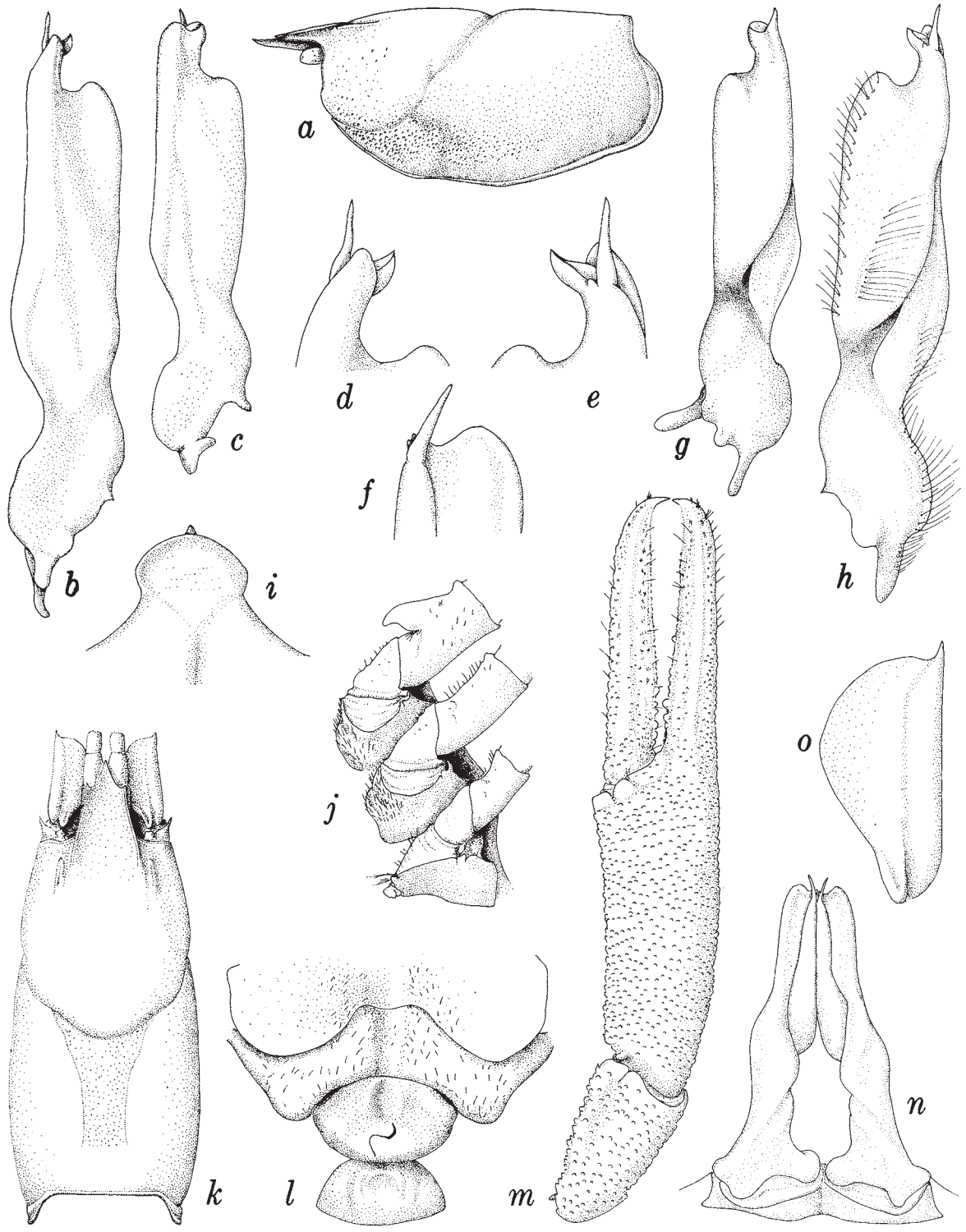

Fig. 3. *Procambarus (Austrocambarus) oaxacae oaxacae,* new species. *a,* Lateral view of carapace of holotype; *b,* Lateral view of first pleopod of holotype; *c,* Lateral view of first pleopod of morphotype; *d,* Lateral view of distal portion of first pleopod of holotype; *e,* Mesial view of same; *f,* Caudal view of same; *g,* Mesial view of first pleopod of morphotype; *h,* Mesial view of first pleopod of holotype; *i,* Cephalic lobe of epistome of holotype; *j,* Basal podomeres of third through fifth pereiopods of holotype; *k,* Dorsal view of carapace of holotype; *l,* Annulus ventralis and adjacent sternites of allotype; *m,* Distal podomeres of cheliped of holotype; *n,* Caudal view of first pleopods of holotype; *o,* Antennal scale of holotype.

Fig. 4. *Procambarus (Austrocambarus) oaxacae oaxacae,* new species. Female from type-locality (William R. Elliott).

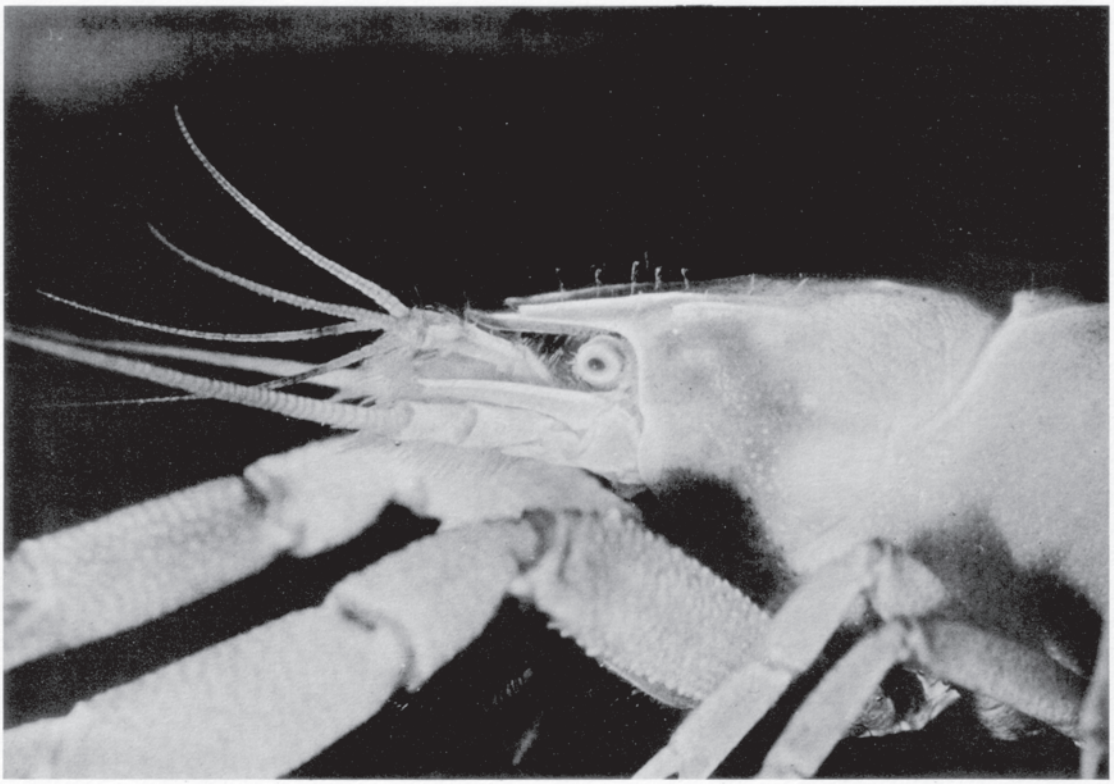

Fig. 5. *Procambarus (Austrocambarus) oaxacae oaxacae,* new species. Female from type-locality (William R. Elliott).

bearing tufts of stiff setae, and lateral half with fine setae.

Right chela (Fig. 3*m*) elongate, slender, subovate in cross-section, moderately depressed. Entire surface of palm studded with thickly set small tubercles; mesial surface with sublinear arrangement of 20 tubercles, lateral surface with tubercles extending almost from base to about midlength of finger; ventral surface with only one tubercle, situated opposite base of dactyl, larger than others. Dorsal and ventral surfaces of both fingers with rounded, submedian, longitudinal ridges flanked along proximal half by tubercles and distally by setiferous punctations. Opposable margin of fixed finger with dorsal row of 24 tubercles, third from base largest, extending from basal seventh to base of distal seventh, and ventral row of 6, proximalmost largest, along middle third; minute denticles studding surface between and distal to tubercles. Opposable margin of dactyl with slightly irregular row of 24 tubercles, seventh from base largest, along proximal three-fourths; tubercles interspersed with minute denticles continuing to corneous tip of finger; mesial surface with tubercles, decreasing in size distally, to base of distal fifth of finger.

Carpus of right cheliped entirely tuberculate with only three conspicuously larger than others: one subspiniform with corneous tip situated on distoventral median margin, another forming ventrolateral articular condyle, and third, smallest of three, on dorsal mesiodistal margin.

Merus of right cheliped entirely tuberculate; dorsal surface with single subacute subdistal tubercle slightly larger than others; those on mesial and lateral surfaces progressively smaller proximally; tubercles on ventral surface somewhat irregularly arranged with approximately 25 in both mesial and lateralmost rows, two distalmost tubercles in lateral row spikelike with sharp corneous tips; ventrolateral margin of podomere lacking spine. Ischium with dorsal and ventral surfaces tuberculate; five larger, subspiniform tubercles in linear series ventromesially.

Hook on ischium of third pereiopod only (Fig. 3*j*); hook simple, extending proximally over distal extremity of basis but not opposed by tubercle on latter. Coxa of fourth pereiopod, as in other members of subgenus, lacking boss on caudomesial surface, that of fifth with small tuberculiform prominence.

Sternum between second, third, and fourth pereiopods moderately shallow, and, while bearing setae, latter fringelike only on ventrolateral margin between coxae of fourth pereiopods.

First pleopods (Fig. 3*b, d-f, h,n*) as described in diagnosis.

Allotypic Female—Differing from holotype in following respects: postcervical groove much more prominent than in holotype; palm of chela with mesial row of only 16 tubercles; opposable margin of fixed finger with dorsal row of 14 tubercles and ventral one rep-

Table 1. Measurements (mm) of *Procambarus (A.) oaxacae oaxacae*

	Holotype	Allotype	Morphotype
Carapace:			
Height	13.9	11.3	10.6
Width	13.8	11.8	10.7
Length	30.8	26.6	24.6
Postorbital length	25.4	21.4	19.7
Areola:			
Width	2.6	2.6	2.5
Length	11.1	9.6	9.0
Rostrum:			
Width	4.8	4.7	4.0
Length	7.3	6.9	6.1
Right Chela:			
Length of mesial margin of palm	13.0	8.1	8.7
Width of palm	6.5	4.9	4.9
Length of lateral margin of propodus	31.8	20.3	21.0(app.)
Length of dactyl	16.9	10.9	11.1
Abdomen:			
Width	12.9	11.1	10.2
Length	33.5	29.5	27.7

resented by only two; tufts of setae near distal extremity of finger more conspicuous than in holotype; opposable margin of dactyl with row of 18 tubercles; carpus of cheliped lacking enlarged tubercle on dorsal mesiodistal margin; merus with mesial row of 20 tubercles much larger than those of lateral row. (See measurements, particularly those of chelae).

Annulus ventralis (Fig. 3*l*) with median trough cephalically; sinus originating at caudal extremity of trough, curving sharply dextrally before turning caudosinistrally, and cutting caudal margin of annulus slightly sinistral to median line. Preannular plate with median longitudinal trough, lateral swollen areas with many short stiff setae, comparatively few in trough. Postannular plate almost as wide as annulus and more than one-half as long; surface not strikingly ornamented. First pleopod rudimentary.

Morphotypic Male, Form II—Differing from holotype in following respects: palm of chela with mesial row of 15 tubercles; opposable margin of fixed finger with 15 tubercles in dorsal row and three in ventral; opposable margin of dactyl with row of 26 tubercles; carpus without enlarged tubercle on dorsal mesiodistal margin; merus with ventromesial row of 18 tubercles conspicuously larger than those in lateral row of 21; hook on ischium of third pereiopod less acute and shorter than those in holotype, not extending proximally so far as distal extremity of basis; tuberculiform prominence on coxa of fifth pereiopod almost as well developed as in holotype.

First pleopods (Fig. 3*c,g*) with cephalodistal extremity of shoulder more truncate than in holotype; mesial process less acute and not bent so strongly laterally; central projection non-corneous and decidedly more bulbous.

Size—The largest specimen available is a female with a carapace length of 30.9 mm (postorbital length 25.4 mm). The largest and smallest first form males have corresponding lengths of 30.8 (25.4) mm and 25.5 (20.8) mm.

Type-locality—Cueva del Guano, 10 km NE Valle Nacional, Oaxaca, México. The specimens were collected on 28 December 1972 by J. R. Reddell, D. McKenzie, M. McKenzie, and S. Murphy.

Types—The holotypic male, form I, allotypic female, and morphotypic male, form II (Nos. 144341, 144342 and 144343, respectively) are deposited together with one paratypic male, form I, and 4 paratypic females, in the National Museum of Natural History, Smithsonian Institution. Two series of paratypes, each consisting of 1 male, form I, and 2 females, are deposited in the Instituto de Biología, Universidad Nacional Autónoma de México, and in The Museum, Texas Tech University, Lubbock, Texas.

Range and Specimens Examined—*Procambarus (Austrocambarus) o. oaxacae* is known only from the type-locality, and the 14 specimens available are all assigned to the type-series. Associated with this crayfish are two entocytherid ostracods: *Entocythere claytonhoffi* Rioja and *Ankylocythere maya* Hobbs.

Variations—The variations noted are primarily those associated with injury and regeneration. Slight differences occur in the numbers of tubercles on the various podomeres of the chelipeds, but none is markedly different from those cited in the above descriptions. Variations are rather marked in the amount of pigment and the size of the pigmented area in the eye. In one specimen, there is not a trace of any pigment; all of the others, however, have a diffusely pigmented spot with concentrations seemingly limited to a few omatidia. There are also slight variations in the sculpture of the annulus ventralis and the pre- and postannular plates with excavations and prominences more prominent in larger specimens.

Relationships—See the discussion of relationships of *Procambarus (A.) o. reddelli.*

Procambarus (Austrocambarus) oaxacae reddelli, new subspecies
Figs. 6, 7, 8

Diagnosis—Body without pigment or with tan suffusion on abdomen; eyes reduced in size, but with small distinct black pigmented faceted area. Rostrum with marginal spines. Areola 3.4 to 5.3 times longer than broad, constituting 33.2 to 35.7 percent of total length of carapace (42.0 to 44.4 percent of postorbital length), and with seven to nine punctations across narrowest part. Cervical spine present, often small and occasionally absent on one side. Hepatic region lacking spine on cephalic margin. Suborbital angle obsolete. Postorbital ridge provided with well developed spine. Antennal scale approximately twice as long as wide, broadest distinctly distal to midlength. Mesial surface of palm of chela with irregular row of approximately 20 tubercles, and both fingers with longitudinal ridges dorsally and ventrally. First pleopod with shoulder on cephalic surface convex distally; distal extremity of appendage bearing terminal elements markedly similar to those of *P. (A.) oaxacae oaxacae.* Annulus ventralis and accompanying sternites as figured (Fig. 8*l*).

Holotypic Male, Form I—Body subovate (Fig. 8*a,k*) compressed laterally. Abdomen narrower than thorax (14.1 and 16.4 mm). Width of carapace slightly greater than height at caudodorsal margin of cervical

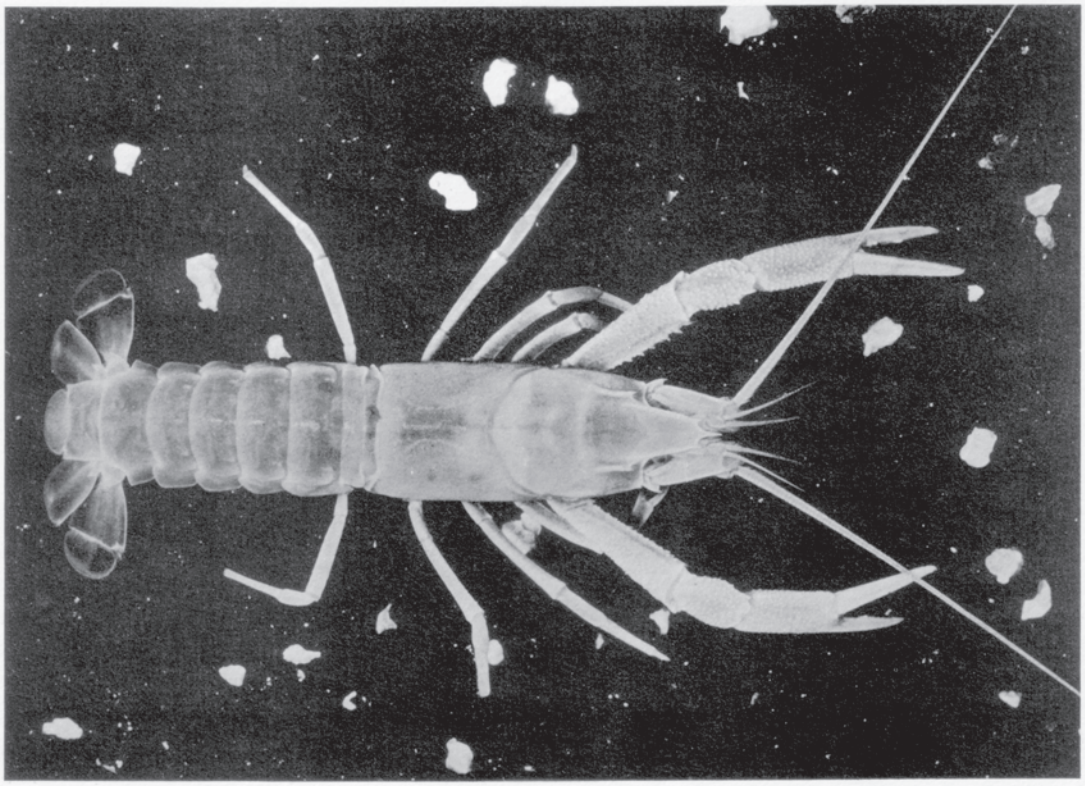

Fig. 6. *Procambarus (Austrocambarus) oaxacae reddelli,* new subspecies. Female from type-locality (William R. Elliott).

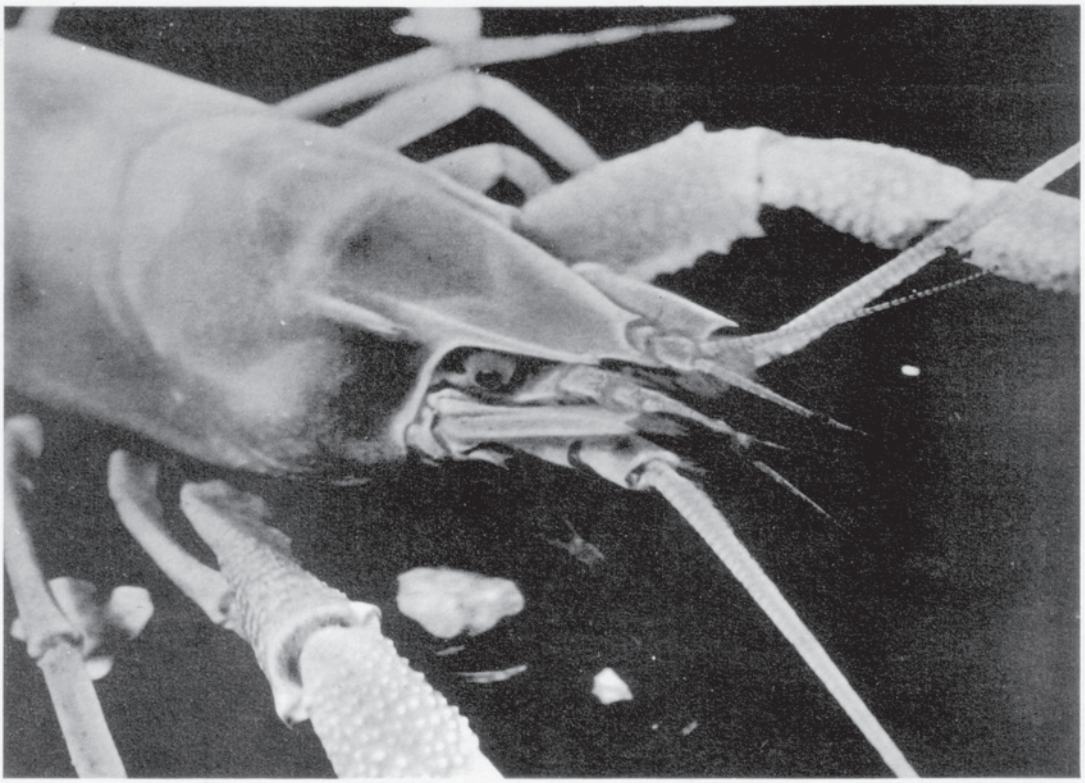

Fig. 7. *Procambarus (Austrocambarus) oaxacae reddelli,* new subspecies. Female from type-locality (William R. Elliott).

groove. Areola 5.8 times longer than wide with eight punctations across narrowest part. Cephalic section of carapace approximately 1.8 times as long as areola and constituting 35.6 percent of total length of carapace and 43.7 percent of postorbital length. Rostrum excavate dorsally, bearing setiferous punctations; convergent margins not thickened and bearing prominent spines at base of acumen, latter almost reaching midlength of ultimate podomere of antennular peduncle. Postorbital ridge prominent, grooved dorsolaterally, and with acute tubercle cephalically. Suborbital angle obsolete, branchiostegal spine rather well developed. Carapace with setiferous punctations except in ventral portion of branchiostegites and in parts of hepatic areas where replaced by small tubercles; cervical spine present.

Abdomen subequal in length to carapace (37.3 and 37.1 mm). Cephalic section of telson with three prominent spines in each caudolateral corner, mesial two movable. Proximal podomere of uropod with both lobes bearing distally directed long spine, and mesial ramus with strong distomedian spine not nearly reaching distal margin of ramus.

Cephalic portion of epistome (Fig. 8*i*) broadly rounded cephalically, although slightly undulating sinistrally, with slight cephalomedian concavity and cephalic dorsomedian projection; surface subplane with weakly elevated cephalic margin; fovea of main body of epistome represented by broad shallow longitudinal depression. Antennule of usual form with prominent ventral spine slightly distal to midlength of basal podomere. Antenna broken but probably extending caudally distinctly beyond midlength of abdomen. Antennal scale (Fig. 8*o*) 2.1 times longer than wide, greatest width distal to midlength, and with lamellar area distinctly broader than thickened lateral portion; latter terminating in long acute spine. Third maxilliped with mesial half of ventral surface of ischium bearing tufts of setae, and lateral half with fine plumose setae.

Right chela of paratypic male (Fig. 8*m*) (both chelae regenerated in holotype) rather slender, subovate in cross-section, moderately depressed. Entire surface of palm studded with small subsquamous tubercles; mesial surface with poorly delineated row of approximately 18 tubercles, lateral surface with tubercles extending from base to about midlength of finger; ventral surface with two tubercles opposite base of dactyl slightly larger than others. Dorsal and ventral surfaces of both fingers with low, rounded, submedian ridges flanked proximally by tubercles and distally by setiferous punctations; dorsal and ventral opposable halves of both fingers with conspicuous plumose setae. Opposable margin of fixed finger with dorsal row of 12 tubercles, third from base largest, along proximal two-thirds, and ventral row of two tubercles near midlength; minute denticles present between and distal to tubercles. Opposable margin of dactyl with row of 12 tubercles along proximal three-fourths, third from base only slightly larger than others nearby, all interspersed with minute denticles continuing to corneous tip of finger; mesial surface with tubercles, decreasing in size distally, extending from base slightly beyond midlength of finger.

Carpus of right cheliped entirely tuberculate with one large tubercle on mesial surface distal to midlength and another on dorsodistal mesial angle; ventral surface with one prominent tubercle on distoventral median margin, another immediately proximal to it and third on ventrolateral articular condyle.

Merus of right cheliped entirely tuberculate; dorsal surface with prominent acute subdistal spine; tubercles on mesial and lateral surfaces progressively smaller proximally; ventral surface with lateral row of 16 spikelike tubercles, and mesial row of about 20 of which those on distal half much more conspicuous than more proximal ones; ventrolateral angle of podomere with strong spine. Ischium with dorsal and ventral surfaces tuberculate; sublinear series of six tubercles ventromesially.

Hook on ischium of third pereiopod only (Fig.8*j*); hook simple, extending proximally over distal extremity of basis but not opposed by tubercle on latter. Coxa of fourth pereiopod lacking boss on caudomesial surface, that of fifth with slight elevation caudomesially.

First pleopods (Fig. 8*b,d-f,h,n*) differing only slightly from those of nominate subspecies.

Allotypic Female—Differing from holotype in following respects: epistome with both cephalolateral margins undulating; telson with only two spines in caudosinistral corner of cephalic section. Cheliped differing from that of paratypic male, form I, as follows: opposable margin of fixed finger with dorsal row of 20 tubercles and ventral of five, with third in dorsal row and two proximal ones in ventral row larger than others on opposable surface; opposable margin of dactyl with 22 tubercles, second and fourth from base largest; tubercles on opposable margins of both fingers extending from base almost to corneous tips; merus with five corneous-tipped spines on subdistal dorsal surface, ventral surface with mesial row of 18 tubercles and lateral row of about 23 with spikelike members interspersed with smaller ones. (See measurements.)

Annulus ventralis (Fig. 8*l*) with median trough cephalically; sinus originating at caudal extremity of trough, curving caudodextrally and making hairpin

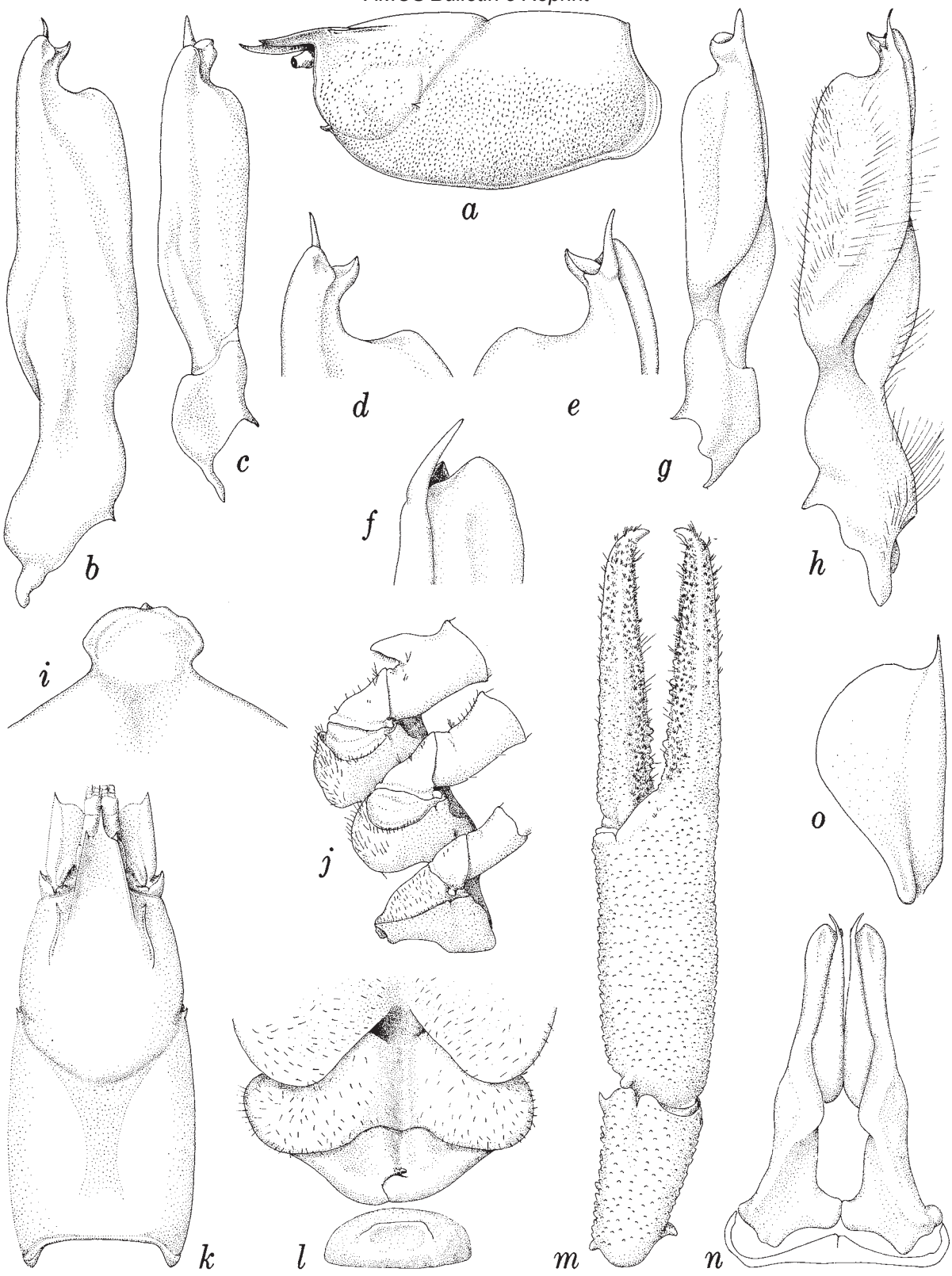

Fig. 8. *Procambarus (Austrocambarus) oaxacae reddelli,* new subspecies. *a,* Lateral view of carapace of holotype; *b,* Lateral view of first pleopod of holotype; *c,* Lateral view of first pleopod of morphotype; *d,* Lateral view of distal portion of first pleopod of holotype; *e,* Mesial view of same; *f,* Caudal view of same; *g,* Mesial view of first pleopod of morphotype; *h,* Mesial view of first pleopod of holotype; *i,* Cephalic lobe of epistome of holotype; *j,* Basal podomeres of third through fifth pereiopods of holotype; *k,* Dorsal view of carapace of holotype; *l,* Annulus ventralis and adjacent sternites of allotype; *m,* Distal podomeres of cheliped of paratypic male, form I; *n,* Caudal view of first pleopods of holotype; *o,* Antennal scale of holotype.

turn before bending sharply caudally to submedian caudal margin of annulus. Preannular plate with median longitudinal trough, lateral swollen areas with short stiff setae. Postannular plate almost as wide as annulus and more than half as long; ventral surface with distinct concavity in elevated central area. First pleopod rudimentary.

Morphotypic Male, Form II—Differing from holotype in following respects: postcervical groove somewhat more clearly defined than in holotype and allotype; epistome without cephalomedian excavation; cephalic section of telson with four spines in dextral and three in sinistral caudolateral corners; hook on ischium of third pereiopod much reduced and not nearly reaching distal margin of corresponding basis. Cheliped differing from that of paratypic male, form I, as follows: mesial margin of palm with row of 17 tubercles; opposable margin of fixed finger with dorsal row of six tubercles, second from base largest, along proximal one-third; ventral row of three tubercles on opposable margin of fixed finger situated near midlength; proximal two-thirds of opposable margin of dactyl with row of nine tubercles; merus with ventrolateral row of 14 tubercles and ventromesial row of 13.

First pleopod (Fig. 8*c,g*) with all elements more inflated and less sharply defined than in holotype; shoulder on cephalic surface sloping cephalically, and oblique juvenile groove prominent in proximal half.

Size—The largest specimen available is the allotypic female which has a carapace length of 37.4 mm (postorbital length of 30.5 mm). The largest and smallest first form males have corresponding lengths of 37.3 (30.2) mm and 28.6(23.1) mm.

Type-locality—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México. The specimens were collected on 26 December 1972 by J. Reddell, D. and M. McKenzie, and S. Murphy.

Types—The holotypic male, form I, allotypic female, and morphotypic male, form II (Nos. 144346, 144347, and 144348, respectively) are deposited in the National Museum of Natural History, Smithsonian Institution. Of the paratypes, one male, form II, and one female are in the Instituto de Biología, Universidad Nacional Autónoma de México, one male, form II, and one female are in The Museum, Texas Tech University, Lubbock, Texas, and one male, form I, one male, form II, two females, one juvenile male, and four juvenile females are in the Smithsonian Institution.

Range and Specimens Examined—*Procambarus (A.) oaxacae reddelli* is known with certainty only from the type-locality, and the 16 available specimens from this cave constitute the type-series. A collection of

Table 2. Measurements (mm) of *Procambarus (A.) oaxacae reddelli*

	Holotype	Allotype	Morphotype
Carapace:			
Height	15.5	15.6	10.4
Width	16.4	15.8	10.9
Length	37.3	37.4	25.8
Postorbital length	30.2	30.5	20.0
Areola:			
Width	2.6	3.1	2.2
Length	13.2	13.1	8.5
Rostrum:			
Width	5.5	5.3	3.5
Length	8.7	8.8	6.5
Right Chela:			
Length of mesial margin of palm	9.2*	13.1**	6.0
Width of palm	6.1*	7.5**	3.9
Length of lateral margin of propodus	23.3*	32.1**	16.3
Length of dactyl	12.3*	17.4**	8.5
Abdomen:			
Width	14.1	14.4	10.1
Length	37.3	38.0	29.9

*Holotype with regenerated chelae, measurements are of paratypic male, form I.
**Left chela of allotype; right chela regenerated.

four first form males, two females, one juvenile male, and two juvenile females from Cueva del Guayabo, 12 km NE of Valle Nacional, Oaxaca, taken by the same collectors on 29 December 1972, is tentatively assigned to this subspecies. On the basis of the proximity of this and the locality from which the nominate subspecies was described, one might anticipate that the crayfish in Cueva del Guayabo would be more closely allied to *P. (A.) oaxacae oaxacae,* particularly in as much as both serve as hosts to the same two species of ostracods, *Entocythere claytonhoffi* and *Ankylocythere maya.* In the type-locality of *P. (A.) oaxacae reddelli* this crayfish harbors *E. claytonhoffi* and *Ankylocythere bidentata* (Rioja).

Variations—As in the nominate subspecies, the most conspicuous variations among the specimens from the type-locality are those associated with injuries and regeneration. Numbers of tubercles on the podomeres of the cheliped, except in regenerated appendages, vary little from the range expressed in the above descriptions. While the size of the pigment spot in the eye is slightly variable, the spot is always sharply defined. In comparing the specimens comprising the type-series with those from Cueva del Guayabo and the type-series of the nominate subspecies, the following were noted. In Cueva del Guano (nominate subspecies), the areola constitutes from 35.8 to 37.8 (Average 36.5) percent of the carapace length and 43.7 to 46.1 (Av. 44.8) percent of the postorbital length. In Cueva del Nacimiento del Río San Antonio *(P. o. reddelli),* the corresponding ranges are 32.9 to 35.6 (Av. 34.3) and 42.0 to 43.7 (Av. 43.0) percent. In Cueva del Guayabo (Atypical *P. o. reddelli),* the ranges are 34.1 to 35.7 (Av. 35.1) and 42.5 to 44.4 (Av. 43.5). In Cueva del Guano, the telson has from one to three (usually two) spines in the caudolateral corner of the cephalic section; none of the individuals has cervical spines; and the reddish purple eye pigment may be absent to moderately abundant, but never is the pigmented area sharply delimited. In contrast, the specimens from Cueva del Nacimiento del Río San Antonio have three spines in at least one of the caudolateral corners of the cephalic section of the telson, a cervical spine is present on at least one side, and the black eye-pigment is sharply margined. Among the specimens from Cueva del Guayabo, only one has three spines in the caudolateral corner of the cephalic section of the telson (usually there are two); two of the specimens lack cervical spines; in all of them, however, the black pigment spot in the eye is sharply outlined.

In view of the intermediate nature of the characters exemplified in the specimens from Cueva del Guayabo between those observed in the specimens from the other two localities, it seems highly probable that the populations in the latter two are capable of interbreeding, if indeed there does not exist a gene-flow between them. Because of the characteristics of the specimens from Cueva del Guayabo, subspecific rank is assigned to these new troglobites.

Relationships—*Procambarus (A.) oaxacae* is more closely allied to *Procambarus (A.) rodriguezi* Hobbs (1943) than to any other described species, and as the troglobitic crayfish fauna in the karst area of Veracruz and Oaxaca becomes better known, it is possible, if not probable, that intergradation will be discovered between all three of the taxa recognized here. The characters that serve to separate the two subspecies of *P. (A.) oaxacae* have been discussed under variations above, and those that serve to distinguish these subspecies from *P. (A.) rodriguezi* are the absence of a prominent corneous caudomesial boss on the fifth pereiopod and the decidedly less flattened mesial process of the first pleopod in the first form male; in the female the annulus ventralis is less protruding, more gently rounded posteroventrally, and the postannular plate does not have a simple transverse row of tubercles. In addition, in the nominate subspecies, there is no cervical spine, and, in *P. (A.) oaxacae reddelli,* there are several distinguishing characteristics: the spines on the cheliped are distinctly more strongly developed, and there is one strong one on the mesial surface of the carpus and another on the distolateral extremity of the merus that are absent in *P. rodriguezi;* furthermore, three spines in the caudolateral corner of the cephalic section of the telson have not been observed in the latter species.

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THE GENUS *SPHAEROMICOLA* (OSTRACODA, ENTOCYTHERIDAE) IN MEXICO

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Chiefly through the diligence and cooperation of those active in surveying the troglobitic fauna of México, the range of the genus *Sphaeromicola* is rapidly becoming more accurately defined. Almost certainly, the occurrence of ostracods of this genus in México is limited by the ranges of their isopod hosts, and collections of these much more conspicuous animals have resulted in the accumulation of specimens of *Sphaeromicola* from some 18 localities in the states of Nuevo León, San Luis Potosí, and Tamaulipas.

All of the localities from which these ostracods are known are reported here together with references to earlier records of their occurrence in each cave. One or both of us have examined specimens from every locality cited except Cueva de El Pachón, Tamaulipas.

The host of the new species described here is not known with certainty, for the ostracods were retrieved from a container in which there were four species of isopods: *Mexistenasellus parzefalli* Magniez, *M. wilkensi* Magniez, an undescribed member of the family Cirolanidae, and another belonging to the genus *Cyathura.* These specimens were collected in Cueva del Huisache, San Luis Potosí.

We should like to thank all of those collectors cited for permitting us to examine the specimens on which this report is based. Special thanks are due James R. Reddell, who sorted and transmitted most of the specimens to the Smithsonian, William R. Elliott, who permitted the removal of specimens from isopods that were in his collection, and Thomas E. Bowman who kindly identified most of the hosts. We are also grateful to Fenner A. Chace, Jr., Margaret A. Daniel, and James E. Peters for their criticisms of the manuscript.

Sphaeromicola cirolanae Rioja
Fig. 1*a, b*

Sphaeromicola cirolanae Rioja, 1951:170.

Hobbs (1971:45-47) reviewed the range of this ostracod, including several new locality records, cited a previously unreported host, and called attention to the two types of clasping apparatus, here designated the angular (Fig. 1*a)* and curved (Fig. 1*b)* types, that occur in the male.

Listed below are all of the known locality records for this ostracod together with the host and the type or types of clasping apparatus represented in each cave. The species is known only from México.

NUEVO LEON:

Cueva La Chorrera, 27.3 km SW Linares, on *Speocirolana guerrai* Contreras, 13 June 1971, Salvador Contreras-Balderas, coll. – curved type.

SAN LUIS POTOSI:

Sótano de Yerbaniz, 21 km NNE Ciudad Valles, on *Speocirolana pelaezi* (Bolívar), 7 January 1970, R.W. Mitchell et al., coll. – curved type.

Sótano del Tigre, 14 km NNE Ciudad Valles, on *S. pelaezi,* 1 February 1968, R.W. Mitchell, coll. – angular and curved types (Hobbs, 1971:46).

Sótano del Arroyo, 12 km NNE Ciudad Valles, on *S. pelaezi,* 24 November 1962, M. Tandy and W. Russell, coll. – angular type (Hobbs, 1971:46).

Sotanito de Montecillos, 9 km NE Ciudad Valles, on *S. pelaezi,* 21 May 1971, C. Bittinger, coll. –

curved type.

Sótano de las Piedras, 8 km NE Ciudad Valles, on *S. pelaezi,* S.B. Peck and W. Elliott, coll. – curved type.

Sótano de Pichijumo, 9 km NE Ciudad Valles, on *S. pelaezi,* 1 June 1968, F. Abernathy, coll. – curved type (Hobbs, 1971:46).

Cueva de la Curva, 8 km E Ciudad Valles, on *S. pelaezi,* 26 May 1971, W. Elliott, M. Brownfield, coll. – curved type.

Sótano de Matapalma, 20 km N Ciudad Valles, on *S. pelaezi,* 29 May 1969, R.W. Mitchell, F. Abernathy, T. Albert, coll. – curved type.

Cueva de la Lagunita, 15 km NNE Ciudad de Maiz, on *S. pelaezi,* 16 April 1965, D. McKenzie, J. Reddell, coll. – angular and curved types (Hobbs, 1971:46).

Cueva de Los Sabinos, 13 km NNE Ciudad Valles (Type-locality), on *S. pelaezi,* date and collector unknown – angular type (Rioja, 1951:178). The only extant part of the type-series are paratypes in the Smithsonian Institution, catalogue number 128952.

TAMAULIPAS:

Sótano de El Molino, 1 km NW Gómez Farías, on *S. pelaezi,* 21-22 October 1971, Terry Raines, coll. – angular type.

Cueva de El Pachón, 18 km SSW Ciudad Mante, on *S. pelaezi,* date and collector unknown – presumably

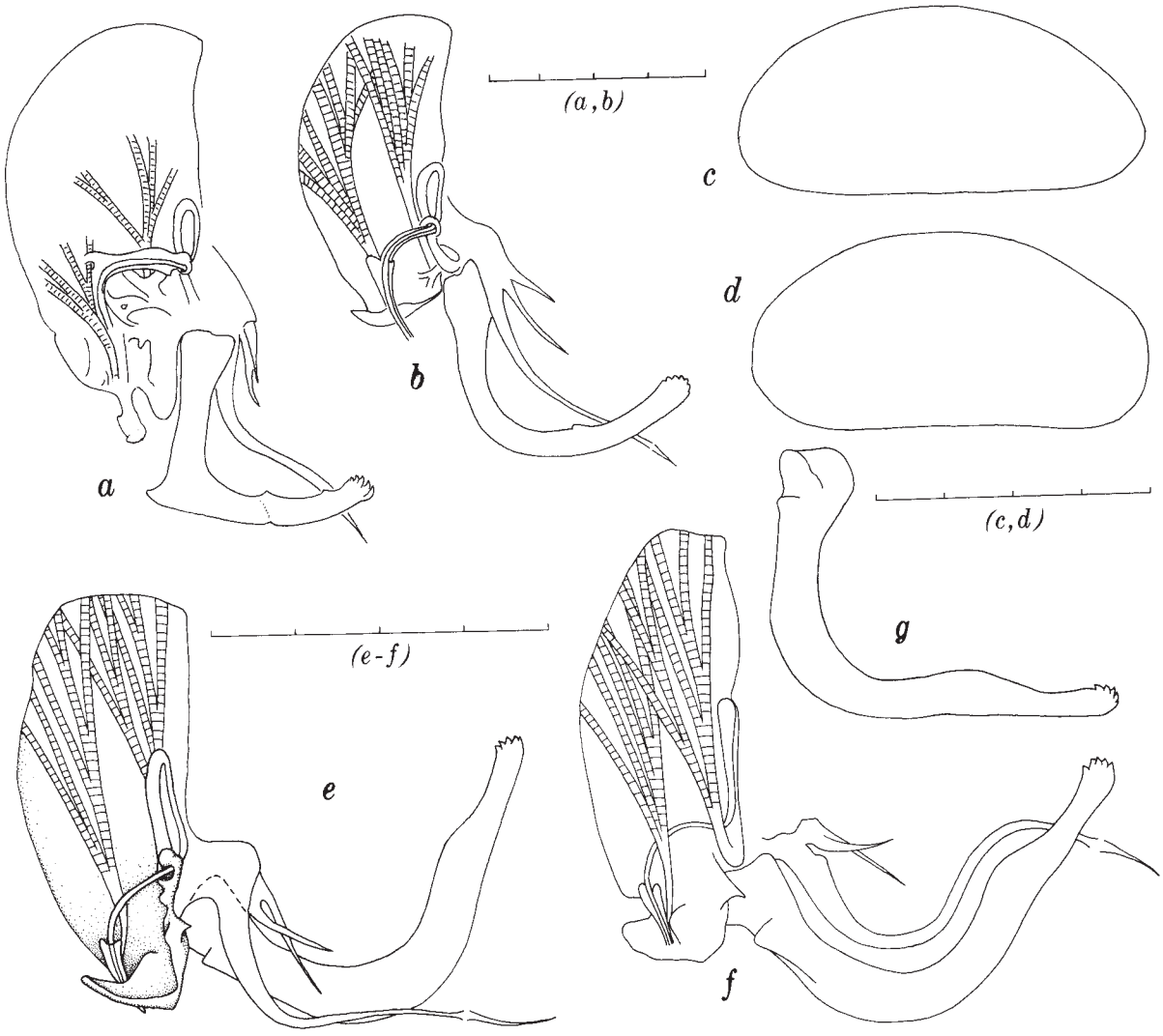

Fig. 1*a, b. Sphaeromicola cirolanae* Rioja. *a,* Copulatory complex of male with angular type clasping apparatus; *b,* Copulatory complex of male with curved type clasping apparatus.

Fig. 1*c-g. Sphaeromicola coahuiltecae,* new species. *c,* Right valve of male; *d,* Right valve of female; *e,* Copulatory complex of holotype; *f,* Copulatory complex of paratypic male; *g,* Clasping apparatus of holotype.

angular type (Rioja, 1951:178).

Grutas de Quintero, 13 km SW Ciudad Mante, on *S. pelaezi* and *S. bolivari* (Rioja), date and collector unknown – angular type (=Cuevas de Quintero, Rioja, 1951:178).

Cueva de la Florida, 16 km SSW Ciudad Mante, on *S. pelaezi,* 16 February 1970, W. Elliott, coll. – angular and curved types (Hobbs, 1971:46).

Bee Cave (=Sótano de las Abejas), 16 km NE Ocampo, 10 July 1969, W. Elliott, D. Broussard, J. McIntire, coll. – angular and curved types.

Sótano de El Venadito, 16 km SE Antiguo Morelos, 22 May 1971, S. Bittinger et al., coll. – angular type.

Variations—Those noted are minor in character and none seems to be regionally restricted. The length of the shell in males ranges from 0.27 mm in specimens from Cueva La Chorrera and Sótano de Matapalma to 0.32 mm in one specimen from Sotanito de Montecillos; the height of the shell varies from 0.15 mm in one individual from Bee Cave to 0.18 mm in others from Sótano del Tigre and Sótano de las Piedras. In females the corresponding ranges are from 0.27 mm in one specimen from Sótano de Matapalma to 0.31 mm in one from Sótano de El Molino, and from 0.15 mm in specimens from Cueva de la Florida and Sótano de El Venadito to 0.19 mm in one from Sótano de El Molino.

Sphaeromicola coahuiltecae, new species
Fig. 1*c-g*

Male—Eye apparently absent, no pigment spot. Shell (Fig. 1*c)* elongate oval with ventral margin nearly straight; greatest height near midlength; posterior end of shell more abruptly vaulted than anterior. Submarginal setae evenly spaced along anterior, ventral, and posterior margins, but absent dorsally.

Copulatory complex (Fig. 1*e-g)* with peniferum short, suddenly contracted posteriorly at base of ventral lobe; latter with anteroventral extremity forming angle of approximately 90 degrees and prolonged posteriorly in conspicuous acute or subacute prominence; mesial surface of ventral lobe grooved vertically, receiving penis from main body of peniferum; anteroventral margin of main body of peniferum with prominent anteriorly directed spine situated immediately proximal to ventral lobe. Penis straight. Muscular elements of peniferum arranged in two bundles; anterior one inserted anteroventrally near base of clasping apparatus; posterior bundle inserted in ventral lobe adjacent to mesial groove. Clasping apparatus (crochet) L-shaped with vertical ramus distinctly shorter than horizontal ramus and extending far ventrally beyond peniferum; external (postaxial) border of vertical ramus with angular lobe near proximal end; internal (preaxial) border of vertical ramus and external border of horizontal ramus entire; internal border of horizontal ramus lacking teeth but undulating, high near midlength but comparatively low along distal third; apex of ramus with five denticles. Dorsal finger bifid and slender, ventral finger (flagellum) undulating, always with strong curve at end of proximal third.

Female—Eye, as in male, apparently absent, no pigment spot. Shell (Fig. 1*d)* markedly similar to that of male, slightly more highly vaulted and with broad, very gentle concavity on ventral margin. Submarginal setae as in male.

Measurements (in mm) of two males and three females—

	Holotype ♂	Paratypic ♂	Allotypic ♀	Paratypic ♀
Length	0.30	0.30	0.28	0.27 0.29
Height	0.15	0.15	0.14	0.14 0.15

Type-locality and Host—Cueva del Huisache, 4 km NW Micos, San Luis Potosí, México, the only known locality for the species. The specimens on which the above description is based were collected by William Russell on 28 November 1972. The identity of the host, as indicated above, is not known; however, inasmuch as all of the American members of the genus have been found only on cirolanids, it is probable that the undescribed member of the family occurring in this cave serves as the host to *S. coahuiltecae.*

Disposition of Types—The holotypic male and allotypic female are deposited in the National Museum of Natural History, Smithsonian Institution, USNM catalogue numbers 143122 and 143123, respectively, as are the paratypes, consisting of 1 dissected male, 2 females, and 3 juveniles.

Relationships—*Sphaeromicola coahuiltecae* has its closest affinities with the Mexican *S. cirolanae.* Only males of the two may be readily distinguished. The clasping apparatus of the former lacks a distinct tooth on the sinuous internal border of the horizontal ramus of the clasping apparatus, and it possesses a subangular lobe on the subproximal postaxial border of the vertical ramus. In *S. cirolanae,* the horizontal ramus always bears a tooth on the internal border, and the vertical ramus lacks a subangular lobe.

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JARMILKA ALBA, N. GEN., N. SP. (DIPLOPODA: SPIROSTREPTIDA: CAMBALIDAE), A NEW MILLIPED FROM A CAVE IN BELIZE

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A small collection of millipeds forwarded to me by Dr. Stewart Peck, Carleton University, Ottawa, Canada, contained the following remarkable new species, a form so unusual that I am departing from my usual practice and describing a monotypic new genus for it.

Because of differences in the gnathochilarium, Schubart (1946) and other authors have considered some genera of American Cambalidae as belonging to their own family Leioderidae, a group at first included in the Oriental Cambalopsidae. Leioderids were to be those species in which the mentum was divided into a mentum and promentum. However, this practice of splitting up families and genera on the basis of a few predetermined characters has rightly fallen out of favor with American diplopodologists. (This branch of arthropod taxonomy now finds itself on the brink of a complete reorganization along more modern lines.) The original Leioderidae contained forms not even close to the Spirostreptida: *Ergene setosus* Chamberlin (1943a) previously regarded as either a leioderid or cambalid (see Causey, 1971) has proven, upon examination of the type, to be a typhlobolelline spirobolellid (Hoffman, pers. comm., see also Hoffman, 1969). Some of the species reported from the United States are probably likewise members of unrelated groups. For the time being, more biological information is imparted by considering the Leioderidae to be at best a poorly defined subfamily of the Cambalidae.

Causey (1971) has summarized the distribution and relationships of the Mexican species of *Cambala* and *Mexicambala.* She also gave some records of *Ergene setosus* from Tamaulipas and San Luis Potosí, but it is not certain that her material is the same as Chamberlin's poorly described holotype. *Morelene mundus* Chamberlin (1943b) was described from Oaxtepec, Morelos, but the description is equivocal and also suggests some typhlobolleline characters. Thus, the distribution of the Cambalidae in Central America appeared to be limited to northern Mexico, and involved mostly troglobitic forms. In view of all this, it is more than a little remarkable that the tiny cambalid described below has been found as far south as Belize (British Honduras).

FAMILY CAMBALIDAE

Cambalidae Bollman, 1893, U. S. Nat. Mus. Bull., 46:157; Loomis, 1938, Proc. U. S. Nat. Mus., 86: 27-31. Type genus, *Cambala* Gray 1832.

Leioderidae Schubart, 1946, Rev. Brasileira, Biol., 6(3):404. Type genus, *Leiodere* Loomis. NEW SUBJECTIVE SYNONYMY.

Genus **Jarmilka,** new

Type Species—*Jarmilka alba,* n.sp.

Diagnosis—Minute cambalid millipeds, mature males with as few as 18 segments and as many as 35, eyes lacking, body not pigmented, closely set with short, fine setae, segments not crested, with meta-

zonites only slightly enlarged. Promentum present. Anterior gonopods two-segmented, coxae bearing relatively short flagella, telopodites with mesal process, lateral spur and various setae. Posterior gonopods basally fused, slender, with two short distal branches, one bearing apically hooked setae. Differs from *Cambala* and *Mexicambala* in the low segment number, minute size, and lack of segmental crests.

The generic name is feminine. The genus is named for Dr. Jarmila Kukalova-Peck, Ottawa, Canada, one of the world's foremost authorities on fossil insects.

Types deposited in Museum of Comparative Zoology, Cambridge, Mass.

Jarmilka alba, new species
Figs. 1-3

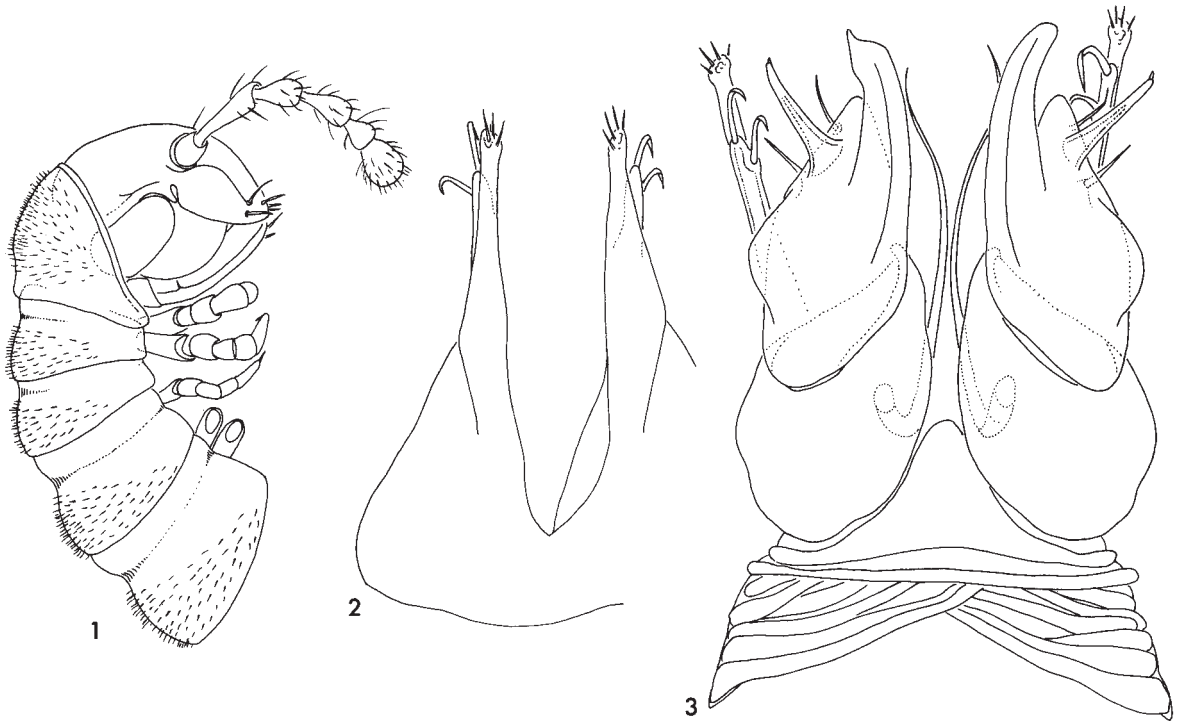
Types—Male holotype and male and female paratypes from Mountain Cow Cave, Caves Branch, Belize (British Honduras), elevation 152 m, taken from guano by S. and J. Peck, 5 August 1972. The species name refers to the lack of pigment.

Description of Male Holotype—Length, 10 mm, width 0.59 mm. 35 postcephalic segments (paratypes: 24 and 18 segments). Head smooth. Eyes completely absent. Antennae clavate (Fig. 1), setose. Gnathochilarium with promentum. Collum partly covering head, faintly rimmed anteriorly, narrowing vertrolaterally, becoming moderately acute (Fig. 1). Trunk segments only moderately constricted, metazonites finely and densely set with short setae. Segments behind collum only a little narrowed, segments 6-7 about the widest. Ozopores not detected. First two pairs of legs enlarged, following legs small and slender (Fig. 1).

Gonopods in situ exposed on ventral surface of body, hardly at all sunk in socket, socket not rimmed, gonopods reflexed posteriorly. Anterior gonopods (Fig. 3) with subtriangular sternum, globular coxae. Telopodites with a mesal bladelike process, acute lateral spur, and two setae just above and below spur and slightly posterior to it. Coxal flagellum rather short. Anterior gonopods (Fig. 2) basally fused, narrowed distally, divided at the apex into two short branches, posteriormost (coxal process?) slightly clubbed, bearing short spicules, anteriormost shorter (telopodite?), with two flattened, hooked setae.

Pigmentation variable, probably due to preservation. Most specimens translucent, but some opaque chalky white, others medium horn brown.

Description of Female Paratype—Size and nonsexual characters as in males. First two pairs of legs enlarged.



Figs. 1-3. *Jarmilka alba.* 1. Anterior end of male, lateral view. 2. Posterior gonopods, posterior view. 3. Gonopods, anterior view.

Distribution—Known only from the type locality.

Notes—This species is remarkable for its small size and the low segment number (18!) in some mature males. The best review of related forms, all of them from the West Coast of the United States, is given by Loomis (1938). *Jarmilka alba* clearly represents a very distinct phyletic line, but a total reworking of the American Cambalidae is needed before its relationships can be definitively discussed.

Despite the lack of eyes and pigment, I doubt if *J. alba* is a troglobite, but probably habitually lives in the soil, as do many other cambalids. As it occurs in guano, it may perhaps be classed as a facultative troglophile.

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NEW AND LITTLE KNOWN PSEUDOSCORPIONS, MAINLY FROM CAVES IN MEXICO (ARACHNIDA, PSEUDOSCORPIONIDA)

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Since the preparation of my recent papers on some pseudoscorpions from Mexican caves (Muchmore, 1972a, b) many new specimens have been collected and sent to me for identification and study. Much of this material pertains to the family Chernetidae, which is in serious need of gross reorganization, and will not be reported on at present. However, many of the new forms belonging to the Chthoniidae, Neobisioidea, and Cheliferidae are described and discussed below (see also Muchmore, 1973). It is becoming more and more clear that the pseudoscorpions of México and Central America, both cavernicolous and epigean, are an extremely interesting and important group of animals.

Types of new species are deposited in the collection of the American Museum of Natural History in New York, except as noted otherwise.

I am exceedingly grateful to Robert W. Mitchell, James R. Reddell, Stewart B. Peck and their associates for sending me their pseudoscorpion material for study. Also, I wish to acknowledge the invaluable assistance of Charlotte H. Alteri in the study of the specimens and preparation of the illustrations for this paper. The research was supported in part by a grant (GB 17964) from the National Science Foundation.

FAMILY CHTHONIIDAE HANSEN

Genus *Aphrastochthonius* Chamberlin

Aphrastochthonius Chamberlin, 1962, p. 307; Muchmore, 1972b, p. 433.

Type Species—*Aphrastochthonius tenax* Chamberlin, 1962.

This genus and the Middle American species assigned to it have been reviewed recently by the author (1972b). Based on knowledge of the new species described below, the generic diagnosis must be emended in one respect, namely, to include species with seven (as well as five or six) setae on the hand of the chelicera.

Aphrastochthonius major, new species

Fig. 1

Material—Holotype female (WM2733.01001) from Cueva de la Capilla, 13.5 km NW Gómez Farías, Tamaulipas, México, on 14 March 1972 (G.D. Campbell).

Diagnosis—With the characteristics of the genus as redefined by Muchmore (1972b) and above. In the key provided by Muchmore (1972b, p. 441) this spe-

cies will run out to *A. verapazanus,* from which it can be distinguished by its larger size, the occurrence of seven setae (rather than six) on the cheliceral hand, and the occurrence of six setae (rather than four) on the fourth tergite.

Description of Female—Carapace with surface scaly; anterior margin straight but with about 10 small denticles near center; no eyes present; chaetotaxy m4m-4-4-2-2=16+2m. Coxal chaetotaxy 1+m-2-1(3m):3m-3-1-CS:3-2-CS:2-5:2-5: maxilla with three microsetae (3m) on dorso-lateral surface; each coxa I and II with seven spines; small bisetose intercoxal tubercle present. Tergal chaetotaxy 4:4:4:6:6:6:6:6:6:4:T2T:0. Sternal chaetotaxy 8:(4)10(4):(4)11(4):12:11:11:11:10:7:0:2.

Chelicera four-fifths as long as carapace. Hand with seven setae, *es* small; fixed finger with eight tall sharp teeth and two small basal denticles; movable finger with 12 similar teeth and two denticles; galea a low elevation; serrula exterior of 15 blades; serrula interior of 12 blades; flagellum of nine pinnate setae, the proximal one quite short.

Palps typically attenuated; femur 1.8 and chela 2.58 times as long as carapace. Proportions of palpal segments shown in Figure 1. Trochanter 1.6, femur 7.6, tibia 2.25, and chela 5.7 times as long as broad; hand 2.3 times as long as deep; movable finger 1.63 times as long as hand. Trichobothria of chela as in other species. Movable finger with marginal row of 10 spaced, acute teeth; fixed finger with 16 similar teeth, and with one small accessory tooth on external surface at distal end. Typical sensory pit just proximal to last marginal tooth and presumed bipolar neuron associated with terminal tooth of movable finger.

Legs of typical facies. Leg IV with entire femur 3.8 and tibia 6.1 times as long as deep; tactile setae on metatarsus 0.58 and on telotarsus 0.45 length of segment from proximal end.

Male—Unknown.

Measurements (in mm)—Body length 1.50. Carapace length 0.465. Chelicera 0.38 by 0.18. Palpal trochanter 0.21 by 0.13; femur 0.835 by 0.11; tibia 0.29 by 0.13; chela 1.20 by 0.21; hand 0.46 by 0.20; movable finger 0.75 long. Leg IV: entire femur 0.68 by 0.18; tibia 0.46 by 0.075; metatarsus 0.21 by 0.06; telotarsus 0.57 by 0.05.

Etymology—This species is named for its relatively large size.

Genus *Mundochthonius* Chamberlin

Mundochthonius Chamberlin, 1929, p. 64.

Type Species—*Mundochthonius erosidens* Chamberlin, 1929.

This genus is represented by a number of species in North America, Europe and Asia. They are characterized by the occurrence on the coxa of each leg II of a single, flat and deeply incised or divided coxal spine and the possession of a small bisetose intercoxal tubercle. Only rarely are representatives found in caves, most forms living deep in forest litter.

Mundochthonius mexicanus, new species
Figs. 2-5

Material—Holotype male (WM1905.01003) and numerous paratypes from Chipinque Mesa, Monterrey, Nuevo León, México, on 22 June 1969 (S. and J. Peck); berlese separation of 176 liters (166 pounds) of forest soil and litter. Paratype female from Crystal Cave, Rancho del Cielo, 5 km NW Gómez Farías, Tamaulipas, México, on 10 January 1971 (J. Reddell, J. Cooke, S. Wiley, and V. Tipton); found in a pile of rat dung.

Diagnosis—Generally similar to northern species of the genus, but with no discernible eyes and chaetotaxy of anterior tergites 4:6:6:6:6:6.

Description—(Based on six mounted specimens, three males and three females.) Males and females essentially similar, but females slightly larger and more robust. Carapace about as long as broad; anterior margin with numerous denticulations and a prominent serrate epistome (Fig. 2); surface smooth dorsally; no eyes or eyespots visible; chaetotaxy 6-4-4-2-2=18. Coxal area typical; chaetotaxy 2-1-2:mmm-2-1:2-4-CS:2-5:1-6; the spine on each coxa II a broad, flat, deeply incised blade (Fig. 3); a small, bisetose intercoxal tubercle present.

Abdomen typical; surfaces of sclerites smooth; pleural membranes longitudinally plicate and covered with minute papillae. Tergal chaetotaxy of both sexes 4:6:6:6:6:6:6:6:6:4:1T2T1:0. Sternal chaetotaxy of holotype male $12:[4\text{-}4]:\frac{14\text{-}13}{(5)10(5)}:(3)8(3):11:11:9:8:8:T1T1T1T:0:2$; sternal chaetotaxy of female 10:(5)11(5):(3)8(3):11:10:8:9:8:T1T1T1T:0:2.

Chelicera distinctly shorter than carapace; hand with six setae; fixed finger with six large and five small teeth; movable finger with an isolated, subterminal tooth and row of nine or ten smaller teeth; spinneret present as a very small elevation in the male, larger in the female; flagellum of ten or eleven pinnate setae; serrula exterior of 12 to 14 blades and serrula interior of 10 or 11 blades.

Palps generally similar to those of other species of the genus. Femur 0.75-0.87 and chela 1.21-1.38 times as long as carapace. Proportions of segments as shown in Figure 4; trochanter 1.7-1.8, femur 3.3-3.6, tibia

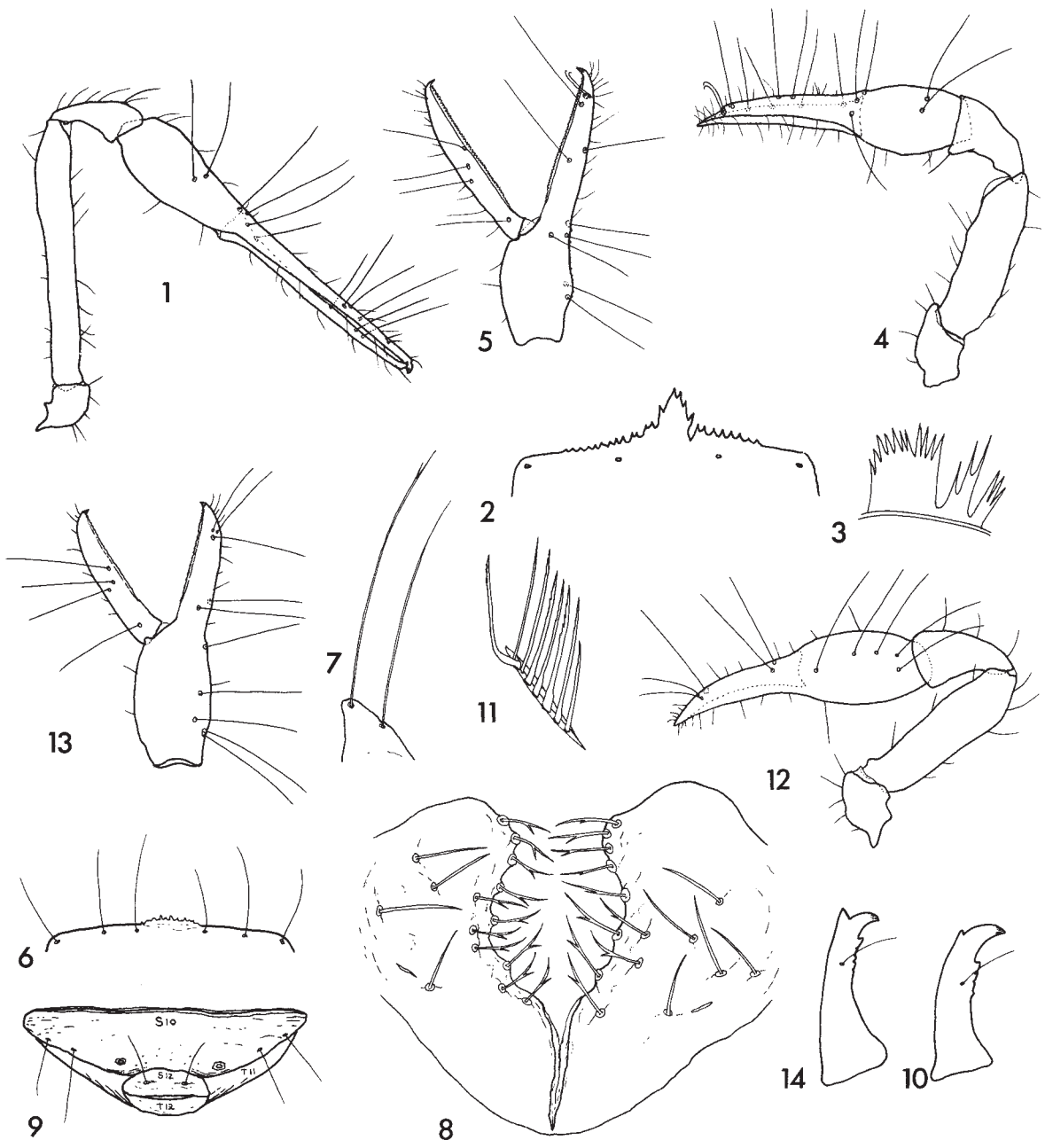


Fig. 1. *Aphrastochthonius major,* new species. Left palp, dorsal view.

Figs. 2-5. *Mundochthonius mexicanus,* new species. 2. Anterior margin of carapace. 3. Coxal spine. 4. Right palp, dorsal view. 5. Left chela, lateral view.

Figs. 6-14. *Lechytia cavicola,* new species. 6. Anterior margin of carapace. 7. Setae on apex of palpal coxa. 8. Posterior genital operculum of male. 9. Posterior end of abdomen, ventral view. 10. Movable finger of chelicera of male. 11. Cheliceral flagellum. 12. Right palp, dorsal view. 13. Left chela, lateral view. 14. Movable finger of chelicera of female.

1.6-1.8 and chela 3.75-4.2 times as long as broad; hand 1.4-1.6 times as long as deep; movable finger 1.68-1.81 times as long as hand; female palps slightly larger and more robust than those of male. Palpal surfaces smooth, except distinctly granulate on dorsum of chelal hand and base of fixed finger. Trichobothria of chela as shown in Figure 5. Fixed finger with marginal row of 48-56 low, basally contiguous

teeth and a tiny accessory denticle on the internal surface alongside the fourth marginal tooth; movable finger with 52-60 similar marginal teeth and with a small elevated sensillum on external surface just proximal to level of *st.*

Legs typical. Leg IV with entire femur 2.2-2.4 and tibia 3.1-3.3 times as long as deep; with long tactile setae on metatarsus 0.21-0.28 and on telotarsus 0.23-0.28 length of segment from proximal end.

Measurements (in mm)—(Ranges for the six mounted types): Body length 1.10-1.40. Carapace length (including epistome) 0.435-0.48. Chelicera 0.33-0.38 by 0.16-0.20. Palpal trochanter 0.17-0.19 by 0.10-0.11; femur 0.34-0.38 by 0.095-0.11; tibia 0.20-0.215 by 0.11-0.13; chela 0.54-0.60 by 0.135-0.155; hand 0.21-0.22 by 0.135-0.155; movable finger 0.355-0.385 long. Leg IV: entire femur 0.33-0.38 by 0.15-0.16; tibia 0.245-0.265 by 0.075-0.08; metatarsus 0.11-0.125 by 0.05-0.06; telotarsus 0.21-0.23 by 0.04-0.045.

Etymology—The species is named *mexicanus* because it is the first *Mundochthonius* known from México.

Remarks—The genus *Mundochthonius* has representatives over much of the Holarctic Region but has not previously been recorded from so far south. It will not be surprising to find it represented in other mountain localities in México. The specimen from Crystal Cave is included among the paratypes of the present species because of its general similarity to the other specimens. However, it is slightly larger and more slender than the other mounted females and may later be found to belong to a distinct species.

Genus *Lechytia* Balzan

Lechytia Balzan, 1891, p. 498; Chamberlin, 1929, p. 77.

Type Species—*Roncus chthoniiformis* Balzan, 1890.

This genus is characterized by the occurrence of four trichobothria on the dorsum of the chelal hand and the complete absence of coxal spines. It is well represented in North and South America, Africa and Asia, but is not well known because of the small size and secretive habits of most forms, which live in forest litter.

Lechytia cavicola, new species
Figs. 6-14

Material—The holotype male (JC1671.01001), paratype male and paratype female from Grutas de Cacahuamilpa, 17 km NE Taxco, Guerrero, México; collected by F. Bonet on 14 December 1939 (Bonet Collection No. 69). These specimens are presently in the J. C. Chamberlin Collection, at Pacific University, Forest Grove,Oregon (Dr. David R. Malcolm, curator).

Diagnosis—Typical of the genus, and generally similar to *L. trinitatis* Beier (1968) but slightly larger and more robust and male with a small but distinct spinneret on the movable finger of the chelicera.

Description of Male—Carapace slightly longer than broad; no epistome, but anterior margin slightly convex at center and with 15-20 distinct denticles (Fig. 6); no eyes evident; chaetotaxy 6-4-4-2-2=18. Coxal area typical; chaetotaxy 2-3-0:1-3-0:2-4:1-6:1-6; medial seta on apex of palpal coxa bifurcate at tip (Fig. 7); no coxal spines or intercoxal tubercle present. Pleural membranes of abdomen with longitudinal rows of tiny granules. Tergal chaetotaxy 6:6:6:6:6:6:6:6:6:4:1T2T1:0. Sternal chaetotaxy 10:[4-4]:$\frac{11\text{-}10}{(3)10(3)}$:(3)8(3):10:8:8:8:8:2TT2:0:2; most setae on posterior operculum flanking the genital opening bifurcate near tips (Fig. 8); eleventh sternite reduced to a very narrow membranous band and bearing no setae (Fig. 9).

Chelicera about three-fourths as long as carapace; hand with five setae; fingers with several distinct teeth; serrula exterior of about 15 blades; spinneret represented by a small, but distinct elevation (Fig. 10); flagellum of eight denticulate setae, the second from the distal end sharply curved near the base and set out ventrally from the others (Fig. 11).

Palps fairly short and stout; femur 0.83 and chela 1.25 times as long as carapace. Proportions of palpal segments as shown in Figure 12; trochanter 1.6-1.7, femur 3.15-3.3, tibia 1.65, and chela 3.6-3.65 times as long as broad; hand 1.55-1.6 times as long as deep; movable finger 1.16-1.19 times as long as hand. Trichobothria of chela as indicated in Figure 13; areoles of *st* and *sb* of movable finger separated by about two-thirds of an areolar diameter; *it* of fixed finger very slightly distal to level of *est.* Fixed finger with five small, distal denticles followed by 20-22 long, low teeth with posteriorly displaced cusps, and with a small, internal accessory tooth at level of second marginal tooth; movable finger with 3-4 small denticles, followed by about 20 long, low teeth without cusps.

Legs typical. Leg IV with femur 1.85 and tibia 3.3-3.4 times as long as deep; telotarsus with a tactile seta 0.45 length of segment from proximal end.

Female—Essentially like male in all features except a few, which are sex related. Sternal chaetotaxy 8:(3)4(3):(3)6(3):8:8:8:7:7:2TT2:0:2. Spinneret represented by much larger elevation than in male (Fig.

14). Teeth of both fingers of palpal chela slightly better developed (or better preserved) than in male.

Measurements (in mm)—Figures given first for the two males followed in parentheses by those for female. Body length 1.33, 1.14(1.35). Carapace length 0.40, 0.39(0.395). Chelicera 0.27(0.295) by 0.15, 0.14(0.15). Palpal trochanter 0.16, 0.155(0.175) by 0.10, 0.09(0.105); femur 0.33(0.34) by 0.105, 0.10 (0.105); tibia 0.20(0.20) by 0.12(0.12); chela 0.52, 0.51(0.51) by 0.14(0.145); hand 0.25, 0.235(0.24) by 0.155, 0.15(0.155); movable finger 0.29, 0.28 (0.27) long. Leg IV: entire femur 0.35(0.36) by 0.19 (0.19); tibia 0.23, 0.255(0.24) by 0.07, 0.075(0.075); metatarsus 0.13, 0.135(0.14) by 0.055, 0.05(0.06); telotarsus 0.23, 0.22(0.22) by 0.03(0.035).

Etymology—The name *cavicola* refers to its occurrence in a cave.

Remarks—Certain morphological features which are unique to the genus *Lechytia,* are reported for the first time, including the bifurcate tip of the median seta on the apex of the palpal coxa, the denticulate nature of the setae in the cheliceral flagellum, the peculiar form of the second flagellar seta, the bifurcate setae on the posterior genital operculum of the male, and the obsolescence of the eleventh sternite. These features and their implications will be described and discussed more fully in another paper on the genus (in preparation).

Like *L. trinitatis,* the present specimens were found in a cave on bat guano. Because it shows no obvious modifications for cave life, it may be a trogloxene. However, this is presently impossible to judge for certain, in the absence of any records of epigean *Lechytia* from México.

SUPERFAMILY NEOBISIOIDEA CHAMBERLIN

Because of growing uncertainties about their present taxonomic placement, the following neobisioid genera will not be assigned to families. They deserve further study, but critical work is hampered by the small numbers of specimens available and by the fact that males are still unknown in several of the genera, specifically *Apohya, Paravachonium, Troglohya* and *Vachonium.* It is confidently expected that as more material becomes available, our concepts of family relations of these genera will change radically.

Genus *Leucohya* Chamberlin

Leucohya Chamberlin, 1946, p. 7; Muchmore, 1972a, p. 271.

Type Species—*Leucohya heteropoda* Chamberlin, 1946.

Study of the two adult specimens of *Leucohya heteropoda* described below provides clarification of some of the problems which arose when the genus was based upon a single nymphal individual. It is now evident that adults of both *L. magnifica* Muchmore and *L. heteropoda* have all tarsi divided, and that the undivided tarsi I and II of *L. heteropoda* are characteristic only of nymphs. Such a situation is now not so remarkable, because similar undivided tarsi are known to occur in nymphs of another neobisioid genus, *Mexobisium* (see Muchmore, 1973). Similarly, it appears that the three flagellar setae reported for the tritonymph of *L. heteropoda* is also a nymphal condition, for the adults have four setae, all finely serrate, as in *L. magnifica.* At present, then, it appears that adults of the genus *Leucohya* may be characterized as having all pedal tarsi divided and four serrate setae in the cheliceral flagellum, while nymphs may have at least some of the tarsi undivided and fewer than four (acuminate?) setae in the flagellum.

For comparison with other related genera, it seems important to note the positions of certain trichobothria on the palpal chela—specifically, in the adult *it* is located proximad of *et, ist* is far proximad of *est,* and *ib* is on the dorsum of the hand proximad of the middle.

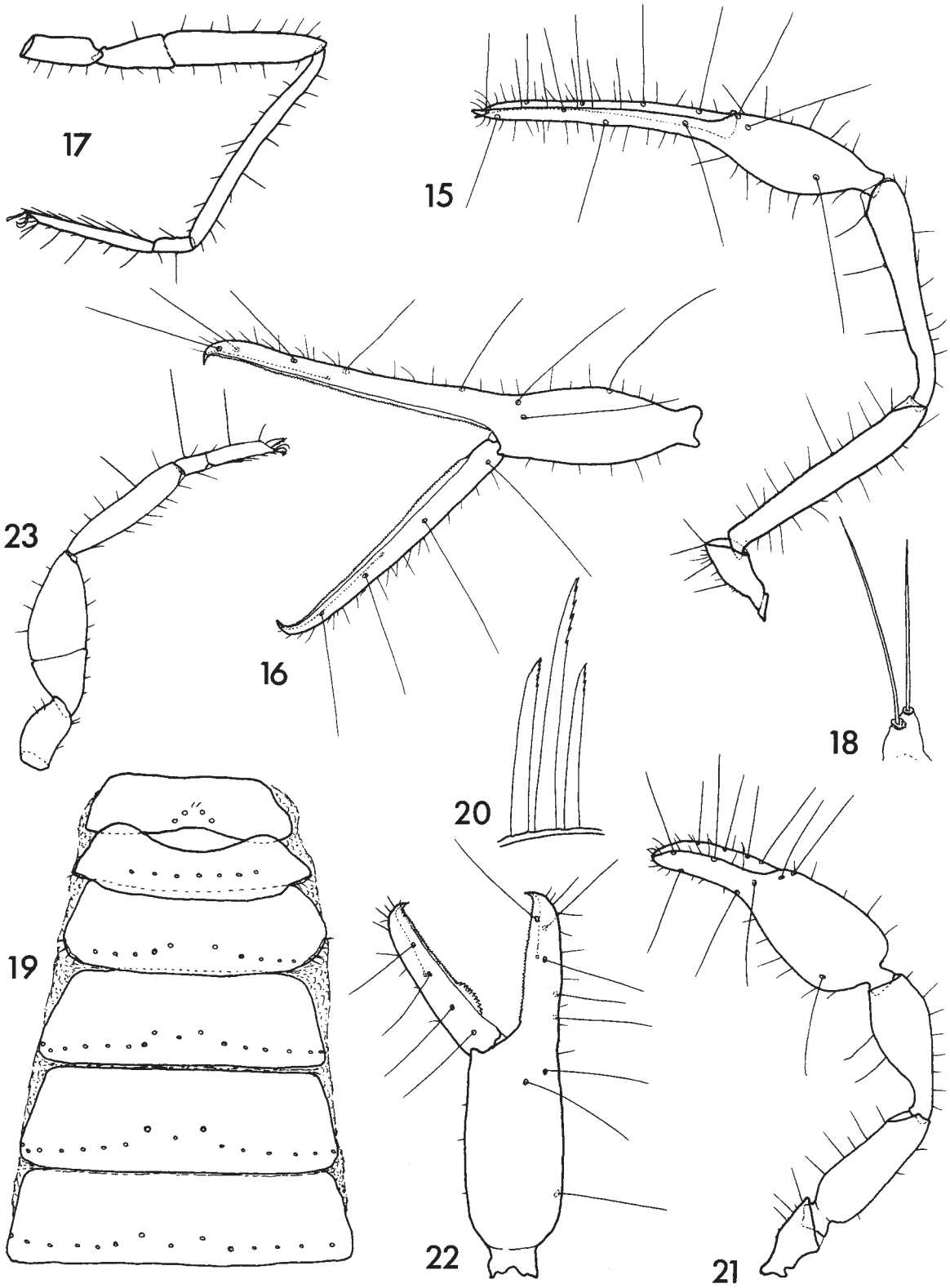
Leucohya heteropoda Chamberlin
Figs. 15-17

Leucohya heteropoda Chamberlin, 1946, p. 8.

This species was described from a tritonymph holotype and until now no other specimens have been available. On 19 February 1972, James Reddell found two adult specimens, a male and a female, at the type locality, Grutas del Palmito, 7 km SW Bustamante, Nuevo León, México.

Information provided by the mature specimens allows us to answer some of the questions posed about the species and the genus (see Muchmore, 1972a, pp. 271-2). The following description applies to both the male and the female unless otherwise specified.

Description—The adults are much like the tritonymph in most respects, but are larger, more darkly colored and have more slender appendages. Carapace 1.6 times as long as broad; with small, triangular epistome; no eyes; about 42 vestitural setae, six at anterior and five or six at posterior margin. Palpal coxa with two large, subequal setae on the apex, set close together, anterior foraminal seta not as long as apical setae. Pleural membranes of female distinctly longitudinally granulo-striate, the granules often conical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and with sclerotic apices. Tergal chaetotaxy of male 8:8:9:9:11:12:11:11:10:7:TT1TT:2; female similar. Sternal chaetotaxy of male $\frac{16}{12}$:[2-2]:(3)$\frac{14}{8}$(3):(4)12(4):16:$\frac{2}{15}$:14:13:13:11:1T1T1:2; of female 11:(3)8(3):(4)12(3):15:$\frac{2}{16}$:16:16:13:10:1T1T1:2; sixth sternite with two large discal setae medially in addition to those of marginal row.

Cheliceral hand with six setae; flagellum of four subequal setae, each denticulate along outer third; galea long and curved; serrula exterior with about 35, and serrula interior with about 30 blades.

Palps very long and slender; femur 1.32-1.40 and chela 2.20-2.30 times as long as carapace. Proportions of segments as shown in Figure 15; trochanter 2.5-2.7, femur 6.7-6.85, tibia 5.1-5.4 and chela (without pedicel) 5.4-6.0 times as long as broad; hand (without pedicel) 1.9-2.25 times as long as deep; movable finger 1.80-1.89 times as long as hand. Trichobothria on chela as shown in Figure 16; *ib* on dorsum of hand, *it* proximad of *et,* and *ist* far proximad of *est.* Fixed finger with 124-140 marginal teeth; movable finger with 125-138 teeth, the last 20 or so raised into a conspicuous crest.

Legs very slender (Fig. 17); leg IV with entire femur 6.75-6.9 and tibia 11.5-13.0 times as long as deep. All tarsi divided; subterminal tarsal setae denticulate; arolia nearly as long as claws, which are long and slender. Legs III and IV with surfaces of femora distinctly scaly, and femoral sutures located about one-third the length of the femur from the proximal end and slightly oblique to the transverse axis.

Measurements (in mm)—Figures are given first for the male, followed in parentheses by those for the female. Body length 5.17(6.34). Carapace length 1.65 (1.67). Chelicera 0.77(0.78) by 0.355(0.355). Palpal trochanter 0.91(0.87) by 0.34(0.35); femur 2.315 (2.20) by 0.34(0.33); tibia 2.22(2.05) by 0.41(0.40); chela (without pedicel) 3.82(3.68) by 0.64(0.68); hand (without pedicel) 1.37(1.26) by 0.605(0.665); pedicel 0.16(0.19) long; movable finger 2.47(2.38) long. Leg I: basifemur 1.235(1.19) by 0.21(0.19); telofemur 0.605(0.55) by 0.17(0.18); tibia 1.26(1.13) by 0.12(0.12); metatarsus 0.41(0.36) by 0.11(0.11); telotarsus 0.87(0.83) by 0.11(0.11). Leg IV: entire femur 1.87(1.79) long; basifemur 0.67(0.66) by 0.27 (0.265); telofemur 1.29(1.22) by 0.27(0.265); tibia 1.945(1.78) by 0.125(0.12); metatarsus 0.385(0.355) by 0.125(0.12); telotarsus 1.04(0.99) by 0.115(0.11).

Apohya, new genus

Type Species—*Apohya campbelli,* new species.

Diagnosis—(Based upon the single female.)Of fairly typical neobisioid facies and apparently closely related to *Leucohya* Chamberlin. Carapace longer than broad; anterior margin without an epistome; antero-ventral corners each with a small conical protuberance; no eyes or eyespots; surface smooth; with about 40 vestitural setae. Palpal coxa with two large, subequal, apical setae, set close together. Abdominal tergites and sternites smooth; pleural membranes with longitudinal rows of small, smoothly rounded elevations. Tergites with 12-16 marginal setae; sternites with about same numbers of setae; sternite 6 unusual in having two large discal setae medially. Anterior genital operculum of female with only four small setae. Cheliceral hand with six setae, *es* rather short; galea long and slender; flagellum of three terminally denticulate setae, the middle one being longer than the other two. Palps only moderately slender; surfaces nearly smooth. Trichobothria fairly evenly spaced along chelal fingers, but with *ib* on dorsum of hand near base; *it* distinctly proximad of *et,* and *ist* far proximad of *est.* Chelal fingers with numerous contiguous marginal teeth, the basal ones on the movable finger raised into a conspicuous crest. Venom apparatus well developed in both fingers, with long ducts. Legs relatively stout; femoral suture of leg IV located about one-third length of femur from proximal end and slightly oblique; all tarsi divided; arolia slender and longer than claws, which are moderately heavy; subterminal tarsal setae denticulate.

Remarks—The genus *Apohya* is quite similar to *Leucohya* in many features. However, *Apohya* differs markedly from *Leucohya* in the following respects: flagellum of three rather than four setae, the middle one being longer than the others; arolia longer than tarsal claws rather than shorter; four small setae on female genital operculum rather than ten or more; the lack of an epistome on the anterior margin of the carapace; and the presence of a prominent conical protuberance on each antero-ventral angle of the carapace. In many of these features *Apohya* also re-

←Figs. 15-17. *Leucohya heteropoda* Chamberlin. 15. Right palp, dorsal view. 16. Left chela, lateral view. 17. Leg IV, anterior view.

←Figs. 18-23. *Apohya campbelli,* new species. 18. Apex of palpal coxa. 19. Sternites 2-7, showing locations of setae. 20. Cheliceral flagellum. 21. Right palp, dorsal view. 22. Left chela, lateral view. 23. Leg IV, anterior view.

sembles *Mexobisium* Muchmore, but it lacks the tarsal spines characteristic of that genus. These three genera are certainly closely related to one another and in turn are probably related to *Paravachonium* Beier, although the latter genus has been considered a member of the family Vachoniidae (Beier, 1956; Muchmore, 1972). The relations of these genera, together with *Vachonium* and *Troglohya,* are of great importance to an understanding of Mexican cave faunas and will be considered in detail at a later time.

Apohya campbelli, new species
Figs. 18-23

Material—Holotype female (WM2731.01001) from El Tinieblo, Tamaulipas, México, on 12 March 1972 (G. D. Campbell); found under a rock.

Description—Female: Carapace, chelicerae and palps reddish-brown, body and legs much lighter. Carapace 1.3 times as long as broad; anterior margin without an epistome; a small conical protuberance at antero-ventral corner; no eyes or eyespots present; surface smooth; with about 42 vestitural setae, seven at anterior and eight at posterior margin. Coxal area without special features; palpal coxa with two large, subequal, apical setae, set close together (Fig. 18).

Abdomen long ovoid; tergites and sternites smooth; pleural membranes with longitudinal rows of smoothly rounded elevations. Tergal chaetotaxy 12:12:12: 13:15:15:16:16:16:12:T2T:2. Sternal chaetotaxy 4: (3) 7 (3) : (4) 12 (4) : 16: $\frac{2}{14}$:15:16:14:11:T2T4T2T:2; sternite 6 with two large discal setae medially (Fig. 19).

Chelicera less than half as long as carapace. Hand with six acuminate setae, *es* rather short; fixed finger with about 12 teeth of varied sizes spread along margin; movable finger with about three moderate-sized teeth and several tiny denticles, all on distal half of margin; galea long, slender, unbranched; serrula exterior with about 25 blades; serrula interior with about 23 blades; flagellum of three setae, the middle one longer than the others, all finely serrate on anterior sides near tips (Fig. 20).

Palps only moderately long and slender; femur 0.90 and chela 1.46 times as long as carapace. Proportions of segments as shown in Figure 21; trochanter 2.1, femur 3.2, tibia 2.45 and chela (without pedicel) 3.0 times as long as broad; hand (without pedicel) 1.95 times as long as deep; movable finger 0.85 as long as hand. Surfaces smooth, except for a few small granules on trochanter, proximal end of femur, and bases of chelal fingers. Trichobothria of chela as shown in Figure 22. Fixed finger with 63 contiguous, retroconical or rounded teeth; movable finger with 55 similar teeth, but with the last 15 or so elevated into a conspicuous crest (see Fig. 22). Venom apparatus well developed in both fingers; nodus ramosus in fixed finger nearly at level of *est,* that of movable finger just proximad of *st.*

Legs relatively stout; leg IV (Fig. 23) with entire femur 2.8 and tibia 4.35 times as long as deep. All tarsi divided; leg IV with long, tactile setae on metatarsus 0.40 and on telotarsus 0.38 length of segment from proximad end. Arolia slender and longer than claws, which are moderately heavy. Subterminal tarsal setae denticulate near tips.

Measurements (in mm)—Body length 3.0. Carapace 0.78 long, greatest breadth 0.605. Chelicera 0.33 long by 0.17 deep; movable finger 0.22 long. Palpal trochanter 0.39 by 0.185; femur 0.70 by 0.22; tibia 0.665 by 0.27; chela (without pedicel) 1.14 by 0.38; hand (without pedicel) 0.605 by 0.31; movable finger 0.51 long. Leg I: basifemur 0.33 by 0.11; telofemur 0.17 by 0.095; tibia 0.325 by 0.075; metatarsus 0.095 by 0.05; telotarsus 0.21 by 0.045. Leg IV: entire femur 0.56 long; basifemur 0.245 by 0.185; telofemur 0.41 by 0.20; tibia 0.48 by 0.11; metatarsus 0.125 by 0.075; telotarsus 0.235 by 0.06.

Etymology—This species is named for G.D. Campbell, who collected it and other interesting pseudoscorpions.

Genus *Troglohya* Beier

Troglohya Beier, 1956, p. 83.

Type Species—*Troglohya carranzai* Beier, 1956.

This genus was described on the basis of only one specimen, a tritonymph, of the species *T. carranzai* from Cueva de Monteflor, 5 km NE Valle Nacional, Oaxaca, México. Until now, no other representatives have been known. Study of the adult female, described below, makes it possible to expand and improve the generic diagnosis. The new specimen was compared directly with the holotype of *T. carranzai,* borrowed through the courtesy of Dr. C. Bolívar y Pieltain and mounted on a microscope slide.

Diagnosis (emended)—Of general neobisioid facies but modified for cave life by increase in size, elongation of appendages and reduction in color. Carapace longer than broad; anterior margin without an epistome; no eyes or eyespots; surface smooth; with small number of vestitural setae (16-22). Palpal coxa with two large, subequal setae positioned in tandem, and some distance apart, on the apex; anterior forami-

nal seta very long. Abdominal tergites and sternites smooth; pleural membranes longitudinally striate, with occasional tiny granules. Tergites with four to six marginal setae, sternites with about ten. Anterior genital operculum of female with 12 small setae. Cheliceral hand with six setae; galea long and slender; flagellum of four or five setae, the distal one short and acuminate, the others long and finely dentate along outer half; movable finger with a large, laterally displaced, subterminal tooth. Palps very long and slender; surfaces mostly smooth; trichobothria fairly evenly spaced along fingers but with *ib* on dorsum of hand proximal to middle, *it* slightly distad of *et*, and *ist* distad of *est*. Chelal fingers with numerous, contiguous marginal teeth, and (in adult female of *T. mitchelli)* fixed finger with a prominent accessory tooth on internal surface near distal end. Both chelal fingers with well developed venom apparatus, ducts long. Legs long and slender; all tarsi divided; legs III and IV with femoral surfaces scaly and with femoral sutures located one-sixth the length of femur from proximal end and strongly oblique to transverse axis; subterminal tarsal setae finely pinnate; arolia shorter than claws, which are long and slender.

Remarks—As Beier has pointed out (1956, p. 83), *Troglohya* bears considerable resemblance to *Leucohya* Chamberlin. On the other hand, there are some marked differences between the two genera, and in some respects *Troglohya* is remarkably like *Vachonium,* which has been placed in a separate family (see Muchmore, 1972a). The relationships among the neobisioid pseudoscorpions of Mexican and Central American caves are probably much more complicated than anyone has realized before now and deserve intensive study. Consideration of these relationships will be the subject of a later paper.

Troglohya mitchelli, new species
Figs. 24-31

Material—Holotype female (WM2943.01001) from Grutas de Zapaluta, 6.5 km SE La Trinitaria, Chiapas, México, on 28 August 1972 (J. Cooke, W.H. Russell).

Diagnosis—The only other species in the genus is *Troglohya carranzai* Beier, which is known only from the tritonymph holotype. The new species is easily distinguished from *T. carranzai* by its much larger size, the greater number of setae on the carapace, and the occurrence of only four setae in the cheliceral flagellum.

Description (based on the holotype female)—Carapace, chelicerae and palps light reddish brown; body and legs much paler. Carapace 1.5 times as long as broad; without epistome; eyeless; surface finely reticulated; vestitural setae 4-4-2-6-5=21, lateral ones in posterior row reduced in size. Coxal chaetotaxy 2-2(3)-7:1-3:2-3(4):2-4(3):2-4(5); the two large setae on the apex of the palpal coxa in tandem and some distance apart, anterior foraminal seta very long (Fig. 24).

Abdomen elongate; tergites and sternites nearly smooth; pleural membranes smoothly longitudinally striate, with only occasional granulations. Tergal chaetotaxy 4:4:6:5:6:5:6:6:6:7:T1T1T1T:2. Sternal chaetotaxy 12:(3)14(3):(2)10(3):11:10:10:11:10:10:T1T:2; genital opercula as in Figure 25.

Chelicera slightly less than half as long as carapace. Palm with six setae; flagellum of four setae, the distal one short and simple, the other three subequal in length and finely dentate along outer half (Fig. 26); serrula exterior with 33 blades; galea a long, slightly curved stylet; fixed finger with 9-10 irregular teeth, the distal one slightly isolated; movable finger with a large, laterally displaced, subterminal tooth, which is continuous with the dental ridge onto base of finger (Fig. 27).

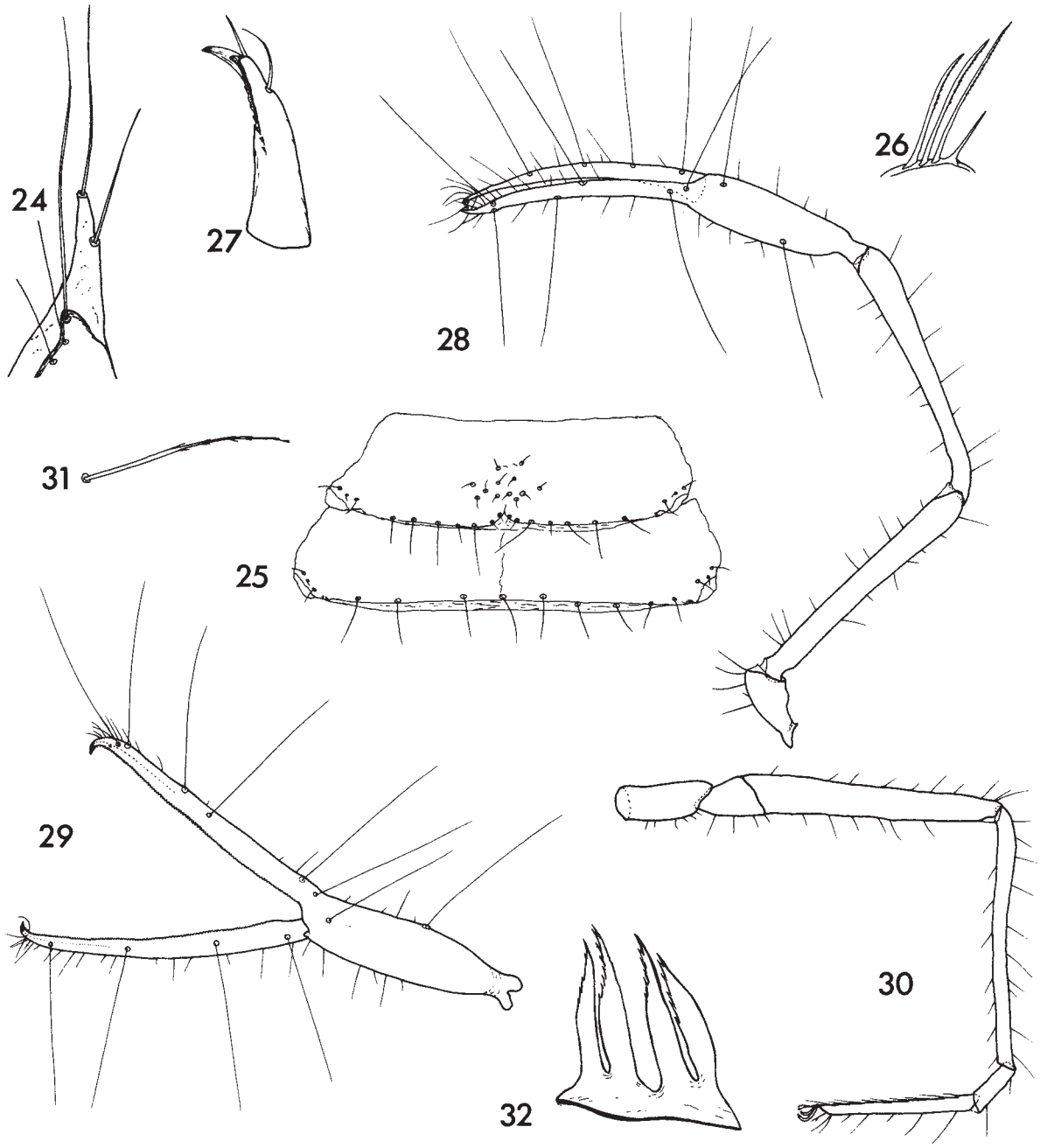
Palps long and very slender; femur 1.80 and chela 2.68 times as long as carapace. Proportions of segments as shown in Figure 28: trochanter 2.15, femur 8.3, tibia 7.4, and chela (without pedicel) 8.2 times as long as broad; hand (without pedicel) 3.2 times as long as deep; movable finger 1.52 times as long as hand. Surfaces smooth except for a few small granules on trochanter and on bases of chelal fingers. Trichobothria on chela as shown in Figure 29. Movable chelal finger with 136 contiguous, rectangular teeth, the outer margins being flat or slightly convex. Fixed finger with 161 contiguous, retroconical teeth having distinct cusps, and with one prominent accessory tooth on the internal surface at the level of the twelfth marginal tooth; the accessory tooth evidently acts as a stop for the end of the movable finger, which overlaps the fixed finger internally upon closing. Venom apparatus well developed in both fingers; ducts quite slender and long, but not reaching to level of *st* in movable finger or to *ist* in fixed finger.

Legs very long and slender; leg IV (Fig. 30) with entire femur 7.75 and tibia 12.8 times as long as deep. Legs III and IV with surfaces of femora conspicuously scaly, and with femoral sutures located one-sixth the length of the femur from proximal end and strongly oblique to the transverse axis. All tarsi divided; subterminal tarsal setae finely pinnate on distal half (Fig. 31); arolia shorter than claws, which are long and slender. Leg IV with several large (tactile?) setae on tibia and tarsi.

Measurements (in mm)—Body length 4.85. Carapace length 1.56. Chelicera 0.865 by 0.36. Palpal

trochanter 0.95 by 0.445; femur 2.805 by 0.34; tibia 2.81 by 0.38; chela (without pedicel) 4.81 by 0.51; hand (without pedicel) 1.665 by 0.52; pedicel 0.22 long; movable finger 2.515 long. Leg I: basifemur 1.56 by 0.22; telofemur 0.59 by 0.185; tibia 1.26 by 0.14; metatarsus 0.35 by 0.11; telotarsus 0.895 by 0.10. Leg IV: entire femur 2.40 long; basifemur 0.50 by 0.295; telofemur 2.07 by 0.31; tibia 2.05 by 0.16; metatarsus 0.445 by 0.14; telotarsus 1.235 by 0.12.

Etymology—This species is named for Robert W. Mitchell, an inspiring leader in the study of Mexican cave creatures.



Figs. 24-31. *Troglohya mitchelli,* new species. 24. Anterior end of palpal coxa, showing apical and foraminal setae. 25. Genital opercula of female. 26. Cheliceral flagellum. 27. Movable finger of chelicera, lateral view. 28. Right palp, dorsal view. 29. Left chela, lateral view. 30. Leg IV, anterior view. 31. Subterminal tarsal seta.

Fig. 32. *Paravachonium bolivari,* Beier, holotype female. Cheliceral flagellum.

Genus *Paravachonium* Beier

Paravachonium Beier, 1956, p. 81; Muchmore, 1972a, p. 268.

Type Species—*Paravachonium bolivari* Beier, 1956.

No new material pertaining to this genus has been found. However, it seems worthwhile to record some further data about the type species.

Paravachonium bolivari Beier
Fig. 32

Paravachonium bolivari Beier, 1956, p. 82.

Contrary to the statements of Beier (1956) and the author (1972a), the holotype is a female, not a male! Though the internal genitalia are not well preserved, the pattern of setae on the genital opercula is clearly of the female type. The complete chaetotaxy of the sternites is 7:(3)10(3):(4)13(3):18:17:19:18:16:13:T1T:2, which is somewhat different from Beier's estimate, "Sternite mit je 12 Marginalborste" (p. 82). Also, Beier's statement concerning tergal setae, "Abdominaltergite in der Mehrzahl mit je 6" is inaccurate, actual tergal chaetotaxy being 6:9:9:9:10:10:11:9:9:7:T1T1T1T:2. It is also pertinent to note that the pleural membranes are longitudinally granulostriate, the individual granules being pointed but without distinct apical spinules. Further, the four setae of the cheliceral flagellum are all strongly serrate along the anterior side on the outer half (Fig. 32); and like the adult, the deutonymph has four setae in the flagellum. Also, it may be noted that in the deutonymph the marginal teeth of the movable chelal finger are not elevated to form a crest or lamella, as they are in the adult.

Genus *Vachonium* Chamberlin

Vachonium Chamberlin, 1947, p. 4.

Type Species—*Vachonium boneti* Chamberlin, 1947.

The genus has been well characterized by Chamberlin (1947). The two new species described below add little to our understanding of the genus except to extend its known distribution somewhat to the south and to show that the tritonymph is not much different from adults (females).

Vachonium kauae, new species
Figs. 33-35

Material—Holotype female (WM2944.01001) from Cueva de Kaua, 1 km S Kaua, Yucatán, México, on 24 August 1972 (W.H. Russell, J.W. Cooke).

Diagnosis—Very similar to *V. maya* Chamberlin but with fewer setae on carapace, more setae on anterior tergites and genital opercula of female, and all appendages less attenuated.

Description of Female—Carapace, chelicerae and palps light brown, other parts much paler. Carapace about one-third longer than broad; without an epistome; surface distinctly reticulated, with no trace of a transverse furrow; no eyes or eyespots; chaetotaxy 6-6-4-2-4=22, the lateral ones in the posterior row reduced in size. Palpal coxa with two stout, but short setae on apex, in tandem and some distance apart; anterior foraminal seta very long. Anterior three or four tergites and sternites slightly reticulated, others smooth; pleural membranes longitudinally smoothly striate, the striae apparently divided into many more segments than are actually present (pseudosegmented). Tergal chaetotaxy 5:5:6:6:6:6:6:6:6:4:TTTT:3; there is obviously an extra seta on the anal plate of this specimen. Sternal chaetotaxy 16:(3)19(3):(2)10(3):9:4mm4:4mm4:4mm4:9:8:1TT1:2. Internal genitalia much like those figured for *V. maya* (Chamberlin, 1947, figs. 34 and 35) but details difficult to make out.

Cheliceral hand with eight setae, two in position of *es;* flagellum of five setae, the distal four subequal and dentate in the outer half, the proximal one short and only sparsely denticulate; galea a long curved stylet.

Palps long and slender; femur 1.68 and chela 2.69 times as long as carapace. All segments completely, but not evenly, covered with heavy granules. Proportions of segments as shown in Figure 33; trochanter 2.35, femur 7.7, tibia 6.55, and chela (without pedicel) 6.7 times as long as broad; hand (without pedicel) 2.05 times as long as deep; movable finger 2.03 times as long as hand. Femoral tubercle well developed, similar in position to that of *V. maya,* apparently with two separate pores near summit. Trichobothria on chela as shown in Figure 34. Fixed finger blunt at tip, with no venedens or trace of venom duct; end of finger broadened and bearing 12 heavily sclerotized denticles in a double row, which is continuous with the marginal row of 131 sharply conical teeth; and with a prominent accessory tooth on the internal side at level of 19th marginal tooth.

Legs slender; leg IV with entire femur 5.6 and tibia 9.6 times as long as deep. All tarsi divided; subterminal tarsal setae denticulate (Fig. 35); arolia shorter than claws, which are rather stout. Legs III and IV with surfaces of telofemora distinctly scaly, and femoral sutures located one-fifth the length of femur from proximal end and distinctly oblique to the transverse axis.

Male—Unknown.

Measurements (in mm)—Body length 4.07. Carapace length 1.37. Chelicera 0.755 by 0.35. Palpal trochanter 0.805 by 0.34; femur 2.30 by 0.30; tibia 2.03 by 0.31; chela (without pedicel) 3.69 by 0.55; hand (without pedicel) 1.095 by 0.53; pedicel 0.14 long; movable finger 2.22 long. Leg I: basifemur 1.035 by 0.185; telofemur 0.46 by 0.16; tibia 1.00 by 0.11; metatarsus 0.185 by 0.09; telotarsus 0.88 by 0.075. Leg IV: entire femur 1.63 long; basifemur 0.34 by 0.25; telofemur 1.375 by 0.29; tibia 1.44 by 0.15; metatarsus 0.22 by 0.12; telotarsus 1.185 by 0.095.

Etymology—This species is named after Cueva de Kaua, where it lives.

Vachonium belizense, new species
Figs. 36-38

Material—Holotype tritonymph (WM2942.01001) from Mountain Cow Cave, Caves Branch, Belize (British Honduras), on 5 August 1972 (S.B. Peck).

Diagnosis—The largest known species of the genus, with palpal chela of tritonymph nearly 4 mm in length. Other diagnostic features impossible to identify in the absence of adults of this species and of tritonymphs of other species.

Description of Tritonymph—Generally like adults of other species in the genus, and with the following notable features. All sclerotized parts light tan, other parts nearly white. Carapace longer than broad; without epistome or transverse furrow; no eyes; chaetotaxy 6-6-2-4-2-4=24. Pleural membranes of abdomen longitudinally smoothly striate and pseudosegmented. Tergal chaetotaxy 4:4:6:6:7:6:6:6:6:6:TTTT:2. Sternal chaetotaxy 3:(2)9(2):(2)8(1):8:4mm4:6mm5:5mm6:11:11:2T1T1:2.

Chelicera with seven setae on hand; flagellum of right chelicera with three setae, that of left chelicera with four setae, all setae subequal in length and finely denticulate in the distal third; galea long, slender, curved and partially recumbent on the surface of the finger.

Palps very long and slender; femur 1.73 and chela 2.82 times as long as carapace. Surfaces smooth, except chelal hands and fingers with small granules. Proportions of palpal segments as shown in Figure 36; trochanter 2.15, femur 8.0; tibia 6.45, and chela (without pedicel) 5.95 times as long as broad; hand (without pedicel) 1.95 times as long as deep; movable finger 1.90 times as long as hand. Femoral tubercle well developed, with a large, reinforced pore at its summit. Trichobothria of chela as shown in Figure 37; *sb* apparently missing from movable finger and *isb* from fixed finger. Both chelal fingers more curved than in other known species of the genus. Movable finger with well developed venedens and long venom duct; marginal teeth numbering 89, the distal ones extremely flattened. Fixed finger blunt at tip; with no venedens, but with a long, very slender venom duct; end broadened and bearing 11 heavily sclerotized denticles in a double row, continuous with marginal row of 109 teeth; with a prominent accessory tooth internally at level of 27th marginal tooth.

Legs very slender; femur 7.95 and chela 12.3 times as long as deep. All tarsi divided (Fig. 38); telotarsi swollen basally; subterminal tarsal setae sparsely denticulate; arolia shorter than claws. Femoral suture of leg IV one-fifth length of femur from proximal end and distinctly oblique to transverse axis.

Male and Female—Unknown.

Measurements (in mm)—Body length 4.76. Carapace length 1.43. Chelicera 0.89 by 0.37. Palpal trochanter 0.835 by 0.39; femur 2.40 by 0.30; tibia 2.13 by 0.33; chela (without pedicel) 3.93 by 0.66; hand (without pedicel) 1.235 by 0.64; pedicel 0.20 long; movable finger 2.35 long. Leg I: basifemur 1.24 by 0.19; telofemur 0.52 by 0.17; tibia 1.17 by 0.12; metatarsus 0.245 by 0.10; telotarsus 1.065 by 0.13; Leg IV: entire femur 1.99 long; basifemur 0.445 by 0.245; telofemur 1.70 by 0.25; tibia 1.725 by 0.14; metatarsus 0.30 by 0.125; telotarsus 1.45 by 0.15.

Etymology—This species is named for Belize (the new name for British Honduras), the country in which it lives.

FAMILY CHELIFERIDAE HAGEN

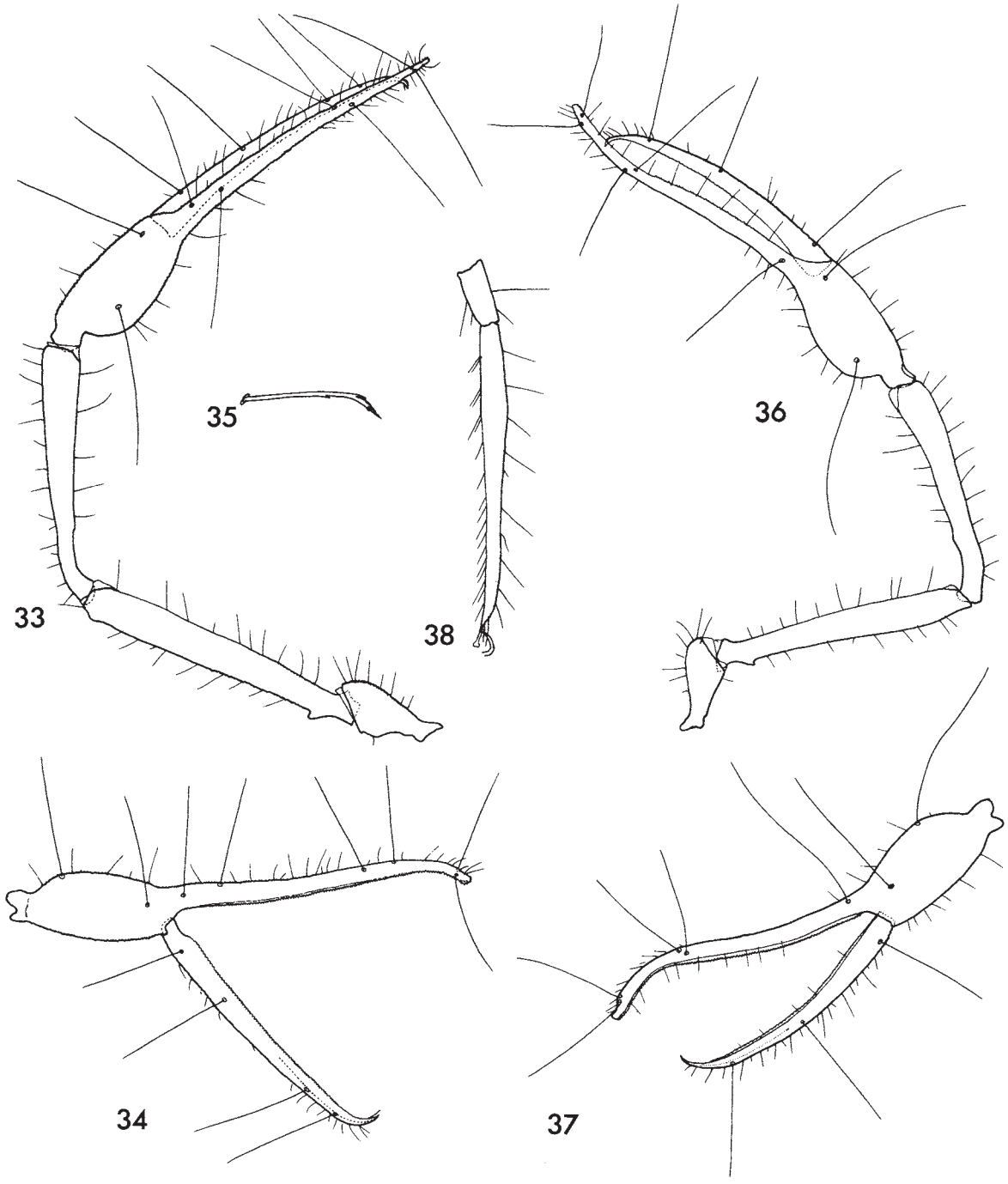
This family of pseudoscorpions is characterized by the following criteria: all legs monotarsate; femora of legs I and II quite different from those of legs III and IV; both chelal fingers with well developed venedens and venom apparatus; absence of accessory teeth from chelal fingers, or at most a single, small denticle on internal surface of fixed finger near the tip.

Mexichelifer, new genus

Type Species—*Mexichelifer reddelli,* new species.

Diagnosis—Of fairly general cheliferid facies. Carapace with numerous (80-100) setiferous tubercles; eyes large, corneate; transverse furrows distinct; no posterolateral keels in male. Tergites and sternites all apparently divided, though halves not widely separated; single discal seta on each half of tergites 5-10, in addition to marginal row. Most setae of dorsal surfaces clavate to denticulate, those of ventral surfaces mostly acuminate. Coxal area not remarkable, except for prominent patches of long setae on posteromedial

corners of coxae III and IV of male. Coxa IV of male without a lateral spur; containing a large coxal sac provided with a prominent atrium. Large ramshorn organs present in male. Statumen convolutum of male genitalia deeply invaginated anteriorly and with a poorly sclerotized median rod. Medial cribriform plates of female indistinct, but certainly paired. Cheliceral hand with four setae, all acuminate, *es* quite



Figs. 33-35. *Vachonium kauae,* new species. 33. Left palp, dorsal view. 34. Right chela, lateral view. 35. Subterminal tarsal seta.

Figs. 36-38. *Vachonium belizense,* new species. 36. Right palp, dorsal view. 37. Left chela, lateral view. 38. Metatarsus and telotarsus of leg IV.

long. Palpal trochanter and femur with prominent setiferous tubercles. Venom apparatus well developed in both chelal fingers, but ducts slender and relatively short, not reaching to levels of trichobothria *t* or *ist* in movable and fixed fingers, respectively. In addition to marginal teeth, fixed finger with one small accessory tooth on inner surface at level of fifth marginal tooth. Pedal claws and subterminal setae simple. Tarsus of leg IV with long, tactile seta near distal end. First tarsus of male modified; outer margin with a conical terminal spine and two or three smaller subterminal projections; posterior claw smaller than anterior and with an inconspicuous lateral ridge.

Remarks—Like several other cheliferid genera, *Mexichelifer* is paradoxical in that it possesses the anteriorly invaginated statumen convolutum of the male and paired medial cribriform plates of the female, usually considered peculiar to the Cheliferini, and at the same time has a distinct atrium on the coxal sac of the male, usually considered peculiar to the Dactylocheliferini. In these and some other respects, this genus resembles *Florichelifer* Hoff (1964) from Florida, *Kashimachelifer* Morikawa (1957) from Japan, *Ancistrochelifer* Beier (1951) and *Metachelifer* Redikortzev (1938) from Indochina, and *Tyrannochelifer* Chamberlin (1932) from the West Indies and Florida. However, *Mexichelifer* is easily distinguished from these other genera by the presence of only four setae on the cheliceral hand and the strong modification of the first tarsus of the male. The relations of these genera to typical members of the Cheliferini and Dactylocheliferini remain to be determined.

Even though it has not been reported prior to this time, the presence of an internal accessory on the fixed chelal finger is probably not unusual among the Cheliferidae. A brief survey of specimens in my collection has revealed one or more small accessory teeth or denticles in representatives of *Chelifer, Parachelifer, Hysterochelifer, Tyrannochelifer* and *Dactylochelifer.* All of these structures were at the distal ends of the fingers and were never of a size comparable to the accessory teeth commonly found in the Chernetidae.

Mexichelifer reddelli, new species
Figs. 39-46

Material—Holotype male (WM1075.01001) and paratype female from Cueva de Carnicerías, Valle de los Fantasmas, 17 km W Sta. Catarina, San Luis Potosí, México, on 4 August 1966 (J.R. Reddell).

Description—Male: Typically cheliferid in general facies. Body and palps reddish-brown, chelicera and legs a little lighter. Carapace heavily granulate; with about 85 clavate setae, each on a prominent tubercle, four setae at anterior and 14 near posterior margin, no keels present at postero-lateral corners. Tergites apparently all divided, but the halves not distinctly separated; no keels present laterally; surfaces heavily granulate anteriorly, changing to scale-like elevations posteriorly. Tergal chaetotaxy 14:18:16:19:21:20:25:23:21:23:18:2; each half of tergites 5 to 10 with one discal seta as well as one or two lateral setae. Sternites divided or nearly so; surfaces finely reticulated; sternal chaetotaxy $\frac{45}{54}$:[4-4]:(0)25(0):(1)17(1):16:19:22:19:20:15:7:2; positions of setae on genital opercula as shown in Figure 39; most setae missing from eleventh tergite and sternite, so that occurrence of tactile setae is uncertain. Coxal area unremarkable, except for large patches of long setae on medial edges of coxae III and IV; coxae IV without lateral spurs, but each with large coxal sac provided with a well defined atrium (Fig. 40). Anterior margin of statumen convolutum with a deep invagination, in which lies a poorly sclerotized rod (Fig. 41). Ramshorn organs well developed.

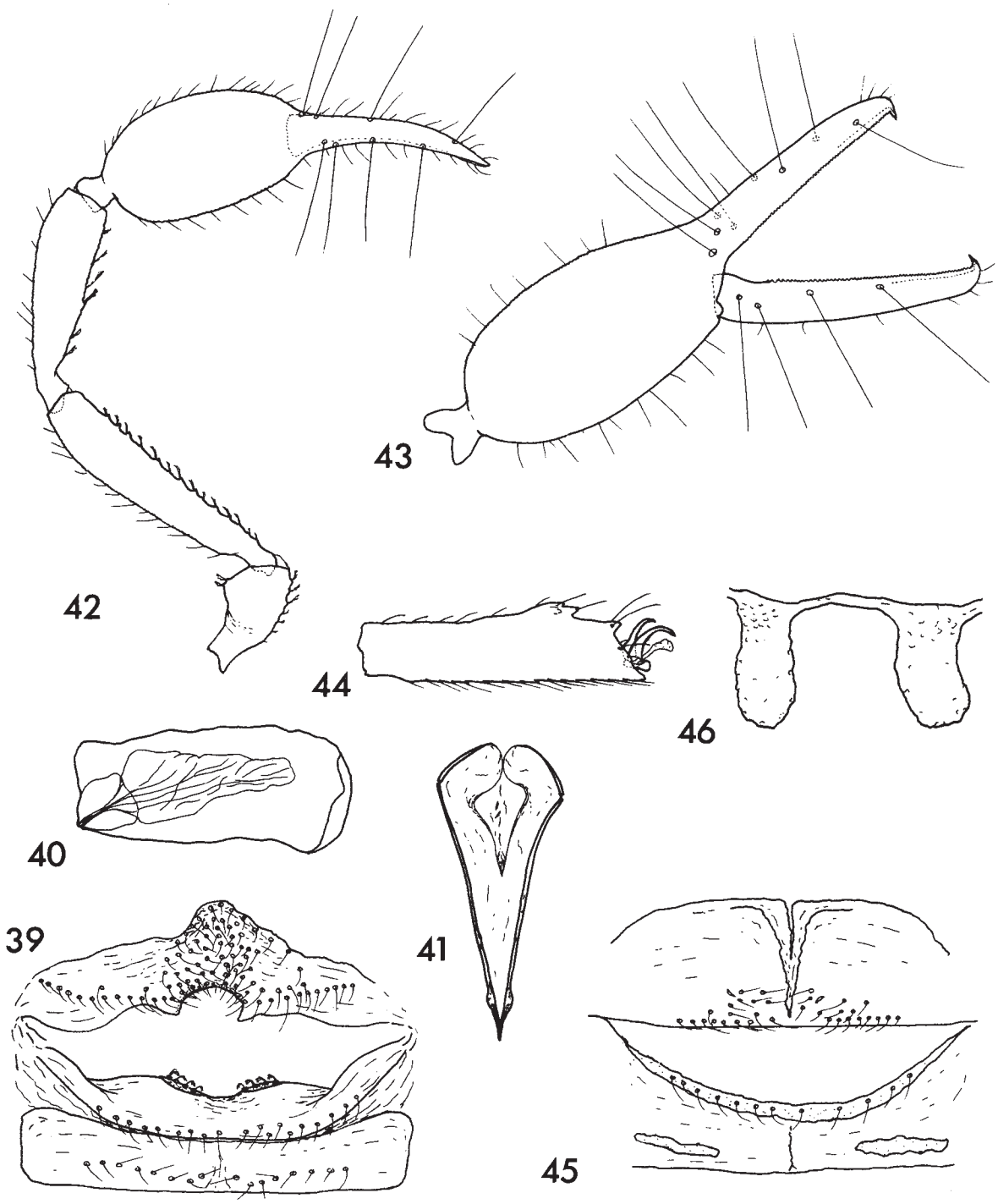
Chelicera about one-third as long as carapace, of general cheliferid facies. Flagellum of three setae, the distal one sparsely dentate on anterior side; hand with only four setae, all acuminate, *es* quite long; serrula exterior of 18 blades; galea long, slender, finely denticulate subterminally.

Palps moderately long and slender; surfaces granulate except for chelal fingers; setiferous tubercles conspicuous on trochanter and inner surfaces of femur and tibia. Proportions of segments as shown in Figure 42; trochanter 1.8, femur 5.15, tibia 3.65, and chela (without pedicel) 3.35 times as long as broad; hand (without pedicel) 1.8 times as long as deep; movable finger and hand of equal length. Trichobothria on chela as in Figure 43. Both fingers with well developed venom apparatus; venom ducts of equal length, relatively short and slender, with nodus ramosus of movable finger distad of *t* and that of fixed finger just distad of *ist.* Movable finger with 66 contiguous, cusped marginal teeth; fixed finger with 58 similar teeth and one small accessory tooth on the internal side at the level of the fifth marginal tooth.

Legs heavily sculptured with scale-like elevations. Tarsus of leg I strongly modified (Fig. 44); outer margin with a conical terminal spine and two or three smaller, subterminal projections; posterior claw distinctly smaller than anterior claw, and with an inconspicuous lateral ridge. Claws of all other legs rather stout, simple. Subterminal tarsal setae curved, simple,

Tarsus of leg IV only, with a long, tactile seta 0.76 length of segment from proximal end.

Female—Like the male in most respects, but slightly larger and with more slender appendages. Carapace with about 100 setae, four at anterior and 16 near posterior margin. Tergal chaetotaxy 17:20:18:20:25:26:24:26:26:26:16:2. Sternal chaetotaxy 33:(0)12(0):(1)12(1):16:20:22:23:22:18:13:2; setae of geni-



Figs. 39-46. *Mexichelifer reddelli,* new species. 39. Genital opercula and fourth sternite of male. 40. Coxa of left leg IV of male, showing coxal sac. 41. Statumen convolutum of male. 42. Left palp of male, dorsal view. 43. Right chela of male, lateral view. 44. Tarsus of leg I of male, anterior view. 45. Genital opercula of female. 46. Spermathecae of female (after treatment with KOH).

tal opercula as in Figure 45. Internal genitalia of specimen treated with KOH as illustrated in Figure 46; medial cribriform plates not well developed, but spermathecae paired.

Chelicera like that of male, with only four acuminate setae on hand, *es* long. Serrula exterior of 20 blades; galea long, with 4-5 small subterminal rami.

Palps like those of male, but segments more slender. Trochanter 2.0, femur 5.15, tibia 3.85, and chela (without pedicel) 3.85 times as long as broad; hand (without pedicel) 2.2 times as long as deep; movable finger 0.92 as long as hand. Venom apparatus as in male, but venom ducts a little shorter. Movable finger with 71 and fixed finger with 60 marginal teeth; fixed finger with a small internal accessory tooth at level of fifth marginal tooth.

Legs unmodified. Claws and subterminal tarsal setae all simple. Leg IV, only, with long tactile seta on tarsus 0.77 length of segment from proximal end.

Measurements (in mm)—Figures for male holotype given first, those for female in parentheses. Body length 3.61(3.99). Carapace length 1.10(1.29), posterior breadth 1.22(1.15); diameter of eye 0.15(0.16) Chelicera 0.34(0.39) by 0.18(0.185). Palpal trochanter 0.635(0.72) by 0.355(0.36); femur 1.49(1.64) by 0.29(0.32); tibia 1.205(1.345) by 0.33(0.35); chela (without pedicel) 2.07(2.265) by 0.615(0.59); hand (without pedicel) 1.06(1.22) by 0.59(0.55); pedicel 0.13(0.14) long; movable finger 1.06(1.12) long. Leg I: basifemur 0.40(0.415) by 0.215(0.22); telofemur 0.58(0.68) by 0.18(0.19); tibia 0.585(0.665) by 0.15 (0.14); tarsus 0.57(0.63) by 0.155(0.10). Leg IV: entire femur 1.10(1.32) long; basifemur 0.32(0.40) by 0.21(0.22); telofemur 0.925(1.06) by 0.32(0.33); tibia 0.925(1.05) by 0.155(0.17); tarsus 0.67(0.73) by 0.11(0.11).

Etymology—This species is named for James R. Reddell, who collected the specimens, and who has done so much to promote an understanding of Mexican cave faunas.

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THE PSEUDOSCORPION GENUS *MEXOBISIUM* IN MIDDLE AMERICA (ARACHNIDA, PSEUDOSCORPIONIDA)

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The genus *Mexobisium* was described recently on the basis of a single specimen found in a cave in Veracruz, México, in 1967 (Muchmore, 1972). In the relatively short time since then, representatives of five new forms belonging to this group have come to light, leading to a somewhat better understanding of the characteristics and distribution of the genus. It is now evident that the individual species may be quite varied in form and that they are widely distributed over México, Central America and the Antilles in both epigean and hypogean habitats.

Types of the new species described below are deposited in the collection of the American Museum of Natural History, except where noted otherwise.

I wish to acknowledge a great debt of gratitude to Robert W. Mitchell, Stewart B. Peck and James R. Reddell for furnishing me with most of the specimens considered herein. I also acknowledge the invaluable assistance of Charlotte H. Alteri in studying the material and preparing the illustrations. The work was supported in part by a research grant (GB 17964) from the National Science Foundation.

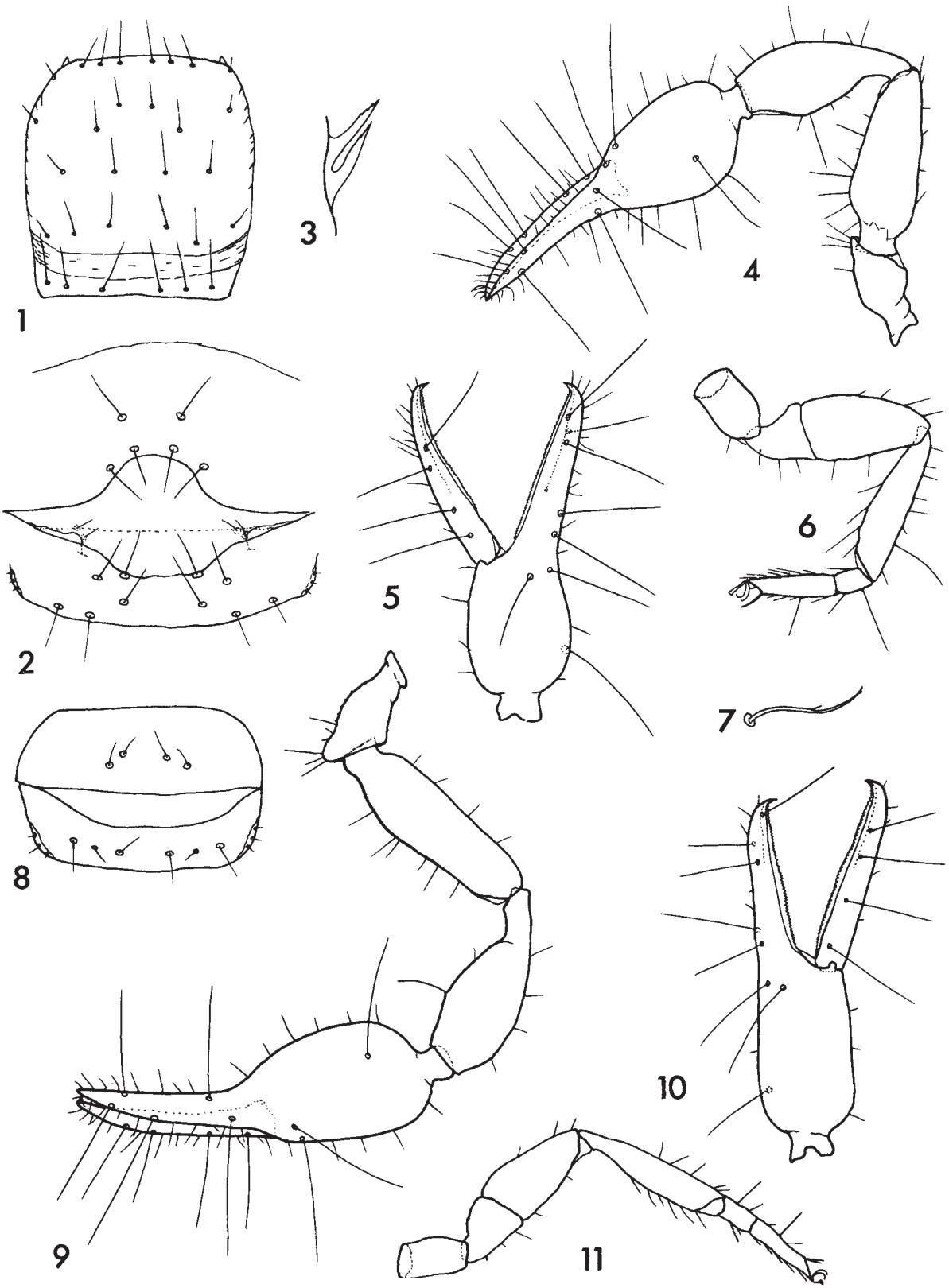
Genus *Mexobisium* Muchmore

Mexobisium Muchmore, 1972, p. 272.

Type-Species—*Mexobisium paradoxum* Muchmore, 1972.

Based on study of the five new species described below, including both sexes and several nymphs, a more satisfactory definition of the genus is now possible.

Diagnosis—A neobisioid genus showing strong similarities to *Leucohya* and *Paravachonium.* Carapace with or without an epistome; each anteroventral corner usually with a small, but prominent, conical protuberance; a distinct transverse furrow or membranous band near posterior edge in most species; no eyes or eyespots present; vestitural setae of carapace numbering 28-38; palpal coxa with two large apical setae set close together; pleural membranes of abdomen longitudinally granulo-striate, each granule usually with an apical spinule; anal operculum with four setae (dorsal and ventral) or only two setae (dorsal); anterior genital operculum of female usually with only four small setae, occasionally with more (eight); chelicera about half as long as carapace; cheliceral flagellum of two (or one) short, sparsely denticulate (or simple) setae; seta *es* of cheliceral hand short; palpal chela with venedens and venom apparatus well developed in both fingers, venom ducts quite long; chela with 12 trichobothria, *ib* on dorsum of hand proximad of middle, *it* proximad of *et,* and *ist* far proximad of *est;* femoral sutures of legs III and IV located about one-third length of femur from proximal end and slightly oblique to transverse axis; tarsi of all legs of adults divided into metatarsus and telotarsus, in tritonymphs (three examples) only tarsi III and IV so divided, and in deutonymphs (one example) none of the tarsi divided; all tarsi of nymphs distinctly swollen basally; telotarsi of legs I, II and III each with a heavy, sharp spine at base of posterior seta on outer distal angle, telotarsus IV with a small,



Figs. 1-8. *Mexobisium pecki,* new species. 1. Carapace. 2. Genital opercula of male. 3. Cheliceral flagellum. 4. Right palp, dorsal view. 5. Left chela, lateral view. 6. Leg IV, anterior view. 7. Subterminal tarsal seta. 8. Genital opercula of female.

Figs. 9-11. *Mexobisium cubanum,* new species. 9. Left palp, dorsal view. 10. Right chela, lateral view. 11. Leg IV, anterior view.

blunt projection in corresponding position; subterminal tarsal setae finely denticulate laterally and terminally (or simple); arolia shorter than claws, which are long and slender.

Remarks—The relations of this genus are still far from clear. It is certainly closely allied to *Leucohya* Chamberlin (1946) and *Apohya* Muchmore (1973), which belong to the Leucohyinae Chamberlin (though the close relationship of these to the Hyinae is dubious). On the other hand, *Mexobisium* also shows many strong similarities to *Paravachonium* Beier (1956), which has been considered a member of the Vachoniidae Chamberlin (see Beier 1956; Muchmore, 1972). A major difference between *Mexobisium* and *Paravachonium* is the striking modification of the tip of the fixed chelal finger in the latter, with concomitant reduction in the venom apparatus. It is conceivable that this modification in *Paravachonium* is closely cave-related and is not of significance at the family level of classification. However, much more study of these and other, related genera is necessary before any firm conclusions can be drawn.

Mexobisium pecki, new species
Figs. 1-8

Material—Holotype male (WM2522.02004) and 18 paratypes (16 males, 2 females) from a locality 10 km S Valle Nacional, Oaxaca, México, 2000 ft elevation, 19 May 1971. Specimens obtained by Berlese separation of 42 liters of leaf litter "from ravine, piles of moist leaves on rock ledges and in deep rock crevices and ravine bottoms, moist while surroundings are dry. The region is one of tropical evergreen forest vegetation. A very good rich sample." (S. Peck). Other pseudoscorpions present were many specimens of an unidentified species of *Tyrannochthonius* and six specimens of an unidentified ideoroncid.

Diagnosis—The smallest known species in the genus, *M. pecki* is further characterized by the lack of an epistome, the lack of setae on the ventral anal plate, and the possession of five setae on the cheliceral hand (see key).

Because this is the first known epigean species of the genus and is represented by relatively abundant material, a complete description is given.

Description of Male—(Based on the holotype and nine paratypes, mounted on slides.) Carapace, chelicerae and palps reddish brown, other parts slightly lighter. Carapace about as long as broad; anterior margin without an epistome and slightly concave at center; each anteroventral corner with a small, but prominent, conical protuberance; a distinct transverse furrow or membranous band near posterior edge (see Fig. 1); surface smooth; chaetotaxy 8-6-4-6-6=30. Coxal chaetotaxy 2-5-2:4-2:4-2:3-2:3-5; palpal coxa with two large apical setae set close together. Tergites and sternites smooth; pleural membranes longitudinally granulo-striate, the granules with prominent apical spinules. Tergal chaetotaxy 9:9:9:9:9:9:9:9:7:T1T:2. Sternal chaetotaxy $\frac{2}{4}$:[2-2]:(3)19(3):(3)10(3):14:15:15:15:14:11:T1T1T1T:0; there is some slight variation in numbers of setae on the sternites and on the spiracular plates; genital opercula as in Figure 2.

Chelicera with five setae on hand; fingers with 8-10 irregular teeth; serrula exterior of 20-21 blades; galea a long straight stylet; flagellum of two short setae, apparently denticulate terminally (Fig. 3).

Palps moderately long and slender; femur 0.82-0.93 and chela 1.36-1.50 times as long as carapace. Proportions of segments as in Figure 4; trochanter 2.25-2.45, femur 2.7-2.95, tibia 2.25-2.4, and chela (without pedicel) 3.0-3.3 times as long as broad; hand (without pedicel) 1.3-1.45 times as long as deep; movable finger 1.38-1.43 times as long as hand; surfaces smooth. Trichobothria on chela as in Figure 5; *ib* on dorsum of hand proximad of middle, *it* proximad of *et,* and *ist* far proximad of *est.* Fixed finger with 51-52 slightly spaced, retroconical marginal teeth; movable finger with 41-46 low, quadrangular teeth. Each finger with well developed venedens and venom apparatus, the ducts long; nodus ramosus in movable finger nearly at level of trichobothrium *sb,* that in fixed finger between *est* and *ist,* but nearer the latter.

Legs relatively stout; leg IV (Fig. 6) with entire femur 2.8-3.1 and tibia 4.4-4.75 times as long as deep; femoral suture of leg IV located about one-third the length of femur from proximal end and slightly oblique to transverse axis. Spines well developed on telotarsi I, II and III, only a small, blunt projection in corresponding position on leg IV. Subterminal tarsal setae finely denticulate laterally and terminally (Fig. 7). Arolia shorter than claws, which are long and slender. Leg IV with long tactile setae on metatarsus 0.33-0.42 and on telotarsus 0.30-0.40 length of segment from proximal end.

Female—(Based on the two mounted paratypes.) Generally similar to male but slightly larger. Genital operculum as in Figure 8; anterior operculum with four small setae, posterior operculum with six, including two small ones. Cheliceral galea longer than that of male and gently curved. Palpal chela larger and stouter than that of male, 2.9 times as long as broad; movable finger 1.31 times as long as hand. Movable finger with 46-47 and fixed finger with

58-59 marginal teeth.

Measurements (in mm)—Male: Body length 1.66-1.84. Carapace length 0.46-0.49. Chelicera 0.235-0.25 by 0.12-0.125. Palpal trochanter 0.235-0.27 by 0.10-0.12; femur 0.385-0.445 by 0.135-0.15; tibia 0.34-0.39 by 0.15-0.17; chela (without pedicel) 0.64-0.725 by 0.205-0.23; hand (without pedicel) 0.28-0.31 by 0.20-0.22; pedicel 0.05-0.06 long; movable finger 0.385-0.445 long. Leg I: basifemur 0.19-0.22 by 0.08-0.09; telofemur 0.13-0.155 by 0.075-0.08; tibia 0.23-0.26 by 0.05-0.06; metatarsus 0.065-0.08 by 0.04-0.045; telotarsus 0.16-0.20 by 0.04. Leg IV: entire femur 0.38-0.42 long; basifemur 0.15-0.16 by 0.12-0.135; telofemur 0.265-0.30 by 0.13-0.15; tibia 0.33-0.37 by 0.075-0.08; metatarsus 0.08-0.10 by 0.05-0.055; telotarsus 0.19-0.21 by 0.045-0.05.

Female: Body length 1.89, 2.04. Carapace length 0.51, 0.52. Chelicera 0.28, 0.29 by 0.14. Palpal trochanter 0.29, 0.30 by 0.125; femur 0.465, 0.47 by 0.16-0.17; tibia 0.42, 0.435 by 0.18, 0.20; chela (without pedicel) 0.78, 0.79 by 0.265, 0.27; hand (without pedicel) 0.35, 0.355 by 0.26, 0.27; movable finger 0.46, 0.47 long. Leg IV: entire femur 0.435, 0.46 by 0.15, 0.155.

Etymology—This species is named for Stewart Peck, who has collected many new and important pseudoscorpions in México.

Mexobisium cubanum, new species
Figs. 9-11

Material—Holotype female (WM1812.01001) from Jatibonico, Cuba, on 22 September 1931 (L.D. Christenson), and two paratype tritonymphs taken at the same place by the same person on 3 September 1931 and 30 October 1931; all found "in sugar cane soil." (Types in collection of National Museum of Natural History, Washington, D. C.)

Diagnosis—A small epigean species distinguished from *M. pecki* by larger size, the presence of six setae on the cheliceral hand, and the presence of two setae on the anal sternite (see key).

Description of Female—With the characteristics of the genus as defined above and with the following noteworthy features. Anterior margin of carapace with a small triangular epistome; each anteroventral corner with a small, but prominent conical protuberance; no eyes; 32 vestitural setae with eight at anterior and six at posterior margin.

Pleural membranes longitudinally granulo-striate, the granules with apical spinules. Tergal chaetotaxy 9:9:9:9:9:11:11:9:9:7:T1T:2. Sternal chaetotaxy 4: (3)9(3):(3)12(2):12:12:11:10:13:9:T1T1T1T:2.

Cheliceral hand with six setae; fingers each with about five marginal teeth; galea long, curved; serrula exterior with 22 blades; flagellum of two small, apparently acuminate setae, set very close together.

Palps moderately slender; femur 0.96 and chela 1.55 times as long as carapace. Proportions of segments as shown in Figure 9; trochanter 2.3, femur 3.3; tibia 2.55, and chela (without pedicel) 3.1 times as long as broad; hand (without pedicel) about 1.5 times as long as deep; movable finger 1.18 times as long as hand. Trichobothria of chela as shown in Figure 10. Fixed finger with 56 contiguous, retroconical teeth, and movable finger with 47 similar, but less pointed, teeth. Both fingers with well developed venom apparatus.

Legs moderately slender (Fig. 11); leg IV with entire femur 3.0 and tibia 5.1 times as long as deep. Spines well developed on tarsi I, II and III, only a small, conical projection in corresponding position of Leg IV. Subterminal tarsal setae apparently acuminate. Arolia slightly shorter than claws. Leg IV with tactile setae on tibia 0.76, on metatarsus 0.42, and on telotarsus 0.33 length of segment from proximal end.

Male—Unknown.

Tritonymph—Generally very similar to female but smaller and with tarsi of legs I and II not divided. Anterior margin of carapace without an epistome and slightly emarginate; transverse furrow not apparent; 32 vestitural setae. Chelicera with six setae on hand; galea long, curved; flagellum of two small, apparently acuminate setae. Palps with no unusual features. Fixed finger with 42-44 and movable finger with 34-35 marginal teeth; both fingers with well developed venom apparatus. Legs unusual only in fact that tarsi of legs I and II are undivided, while those of legs III and IV are divided as in adult, and all tarsi swollen basally.

Measurements (in mm)—Figures given first for female holotype, followed in parentheses by those for the two tritonymphs. Body length 2.18 (1.89-2.06). Carapace length 0.64 (0.48-0.495). Chelicera 0.31 (0.25-0.255) by 0.21 (0.155-0.17). Palpal trochanter 0.35 (0.24-0.25) by 0.15 (0.12); femur 0.615 (0.43-0.44) by 0.185 (0.13-0.14); tibia 0.535 (0.36-0.39) by 0.21 (0.15-0.155); chela (without pedicel) 0.99 (0.68-0.72) by 0.32 (0.22-0.23); hand (without pedicel) 0.465 (0.31-0.32) by 0.265 (0.175); pedicel 0.075 (0.05) long; movable finger 0.55 (0.36-0.395) long. Leg I: tibia 0.315 (0.205-0.22) by 0.07 (0.06); metatarsus 0.09 by 0.05; telotarsus 0.20 by 0.04 (tarsus 0.19-0.21 by 0.05). Leg IV: entire femur 0.485 (0.335-0.35) by 0.16 (0.12); tibia 0.435 (0.28-0.29) by 0.085 (0.07-0.075); metatarsus 0.12 (0.08-0.09) by 0.055 (0.055-0.06); telotarsus 0.225 (0.155-0.17) by 0.055 (0.06-0.07).

Etymology—The species is named for Cuba, the country in which it lives.

Mexobisium maya, new species
Figs. 12-17

Material—Holotype female (WM2726.01001) and paratype tritonymph from Grutas de Coconá, 3 km NE Teapa, Tabasco, México, on 29 December 1971 (D. McKenzie).

Diagnosis—General conformation similar to that of *M. pecki,* but larger and with more attenuated appendages (see key).

Description of Female—Carapace 1.3 times as long as broad; no epistome; surface slightly reticulated; membranous furrow near posterior edge of carapace broad and distinct; vestitural setae 8-4-4-4-6-6=32. Tergal chaetotaxy 8:8:8:8:9:9:9:9:9:6:T1T:2. Sternal chaetotaxy 4:(3)8(3):(3)11(3):16:14:15:17:12:11:T1T1T1T:2; genital opercula as shown in Figure 12.

Chelicera with five setae on hand; flagellum of two small, close-set setae, subterminally denticulate; serrula exterior of 27 or 28 blades; serrula interior of 22 blades; fingers without distinct teeth, but with "dental" margins irregularly roughened.

Palps as in Figure 13. Femur 1.08 and chela 1.75 times as long as carapace. Trochanter 2.5, femur 4.2, tibia 3.35 and chela (without pedicel) 3.75 times as long as broad; hand (without pedicel) 1.75 times as long as deep; movable finger 1.30 times as long as hand. Trichobothria of chela as in Figure 14. Fixed finger with 109 retroconical teeth; movable finger with 105 retroconical and quadrangular teeth. Venom apparatus well developed in both fingers; nodus ramosus in fixed finger about midway between trichobothria *est* and *ist,* that in movable finger just proximad of *st.*

Legs moderately slender (Fig. 15); leg IV with femur 3.9 and tibia 7.2 times as long as deep. Spines well developed on telotarsi I, II and III, only a small, blunt projection in corresponding position on leg IV. Subterminal tarsal setae laterally and terminally denticulate. Leg IV with tactile setae on tibia 0.52, on metatarsus 0.39 and on telotarsus 0.49 length of segment from proximal end.

Male—Unknown.

Tritonymph—Generally similar to female but smaller and lighter and with tarsi of legs I and II not divided. Carapace without a transverse membranous band or furrow; vestitural setae 8-4-4-4-6-5=31. Tergal chaetotaxy 7:8:8:9:9:9:9:9:7:T1T:2. Sternal chaetotaxy 0:(2)4(2):(2)9(2):13:13:13:11:11:10:T1 T1T1T:2.

Cheliceral hand with five setae; flagellum of two short, terminally denticulate setae; galea a long, curved stylet; fingers without distinct teeth, but with "dental" margins irregularly roughened.

Palps with trochanter 2.2, femur 3.75, tibia 2.85, and chela (without pedicel) 3.8 times as long as broad; hand (without pedicel) 1.7 times as long as deep; movable finger 1.34 times as long as hand. Fixed finger without trichobothrium *ist,* and movable finger lacking *sb* (probably). Fixed finger with 82 and movable finger with 78 marginal teeth. Venom apparatus well developed in both fingers.

Tarsi of legs I and II undivided (Fig. 16); those of legs III and IV distinctly divided, as in the adult (Fig. 17). Tarsi swollen near proximal ends. Spines characteristically developed on tarsi I, II and III.

Measurements (in mm)—Figures given first for holotype female, those of tritonymph in parentheses. Body length 3.61 (2.45). Carapace length 1.09 (0.78). Chelicera 0.49 (0.38) by 0.235 (0.185). Palpal trochanter 0.605 (0.41) by 0.245 (0.185); femur 1.175 (0.79) by 0.28 (0.21); tibia 1.09 (0.67) by 0.325 (0.235); chela (without pedicel) 1.915 (1.29) by 0.51 (0.34); hand (without pedicel) 0.86 (0.58) by 0.495 (0.34); pedicel 0.12 (0.08) long; movable finger 1.12 (0.78) long. Leg IV: entire femur 0.95 (0.665) long; basifemur 0.35 (0.265) by 0.23 (0.16); telofemur 0.67 (0.465) by 0.245 (0.17); tibia 0.895 (0.605) by 0.125 (0.10); metatarsus 0.19 (0.14) by 0.09 (0.075); telotarsus 0.48 (0.36) by 0.08 (0.09).

Etymology—The name *maya,* referring to the early people of the region, is used as a noun in apposition.

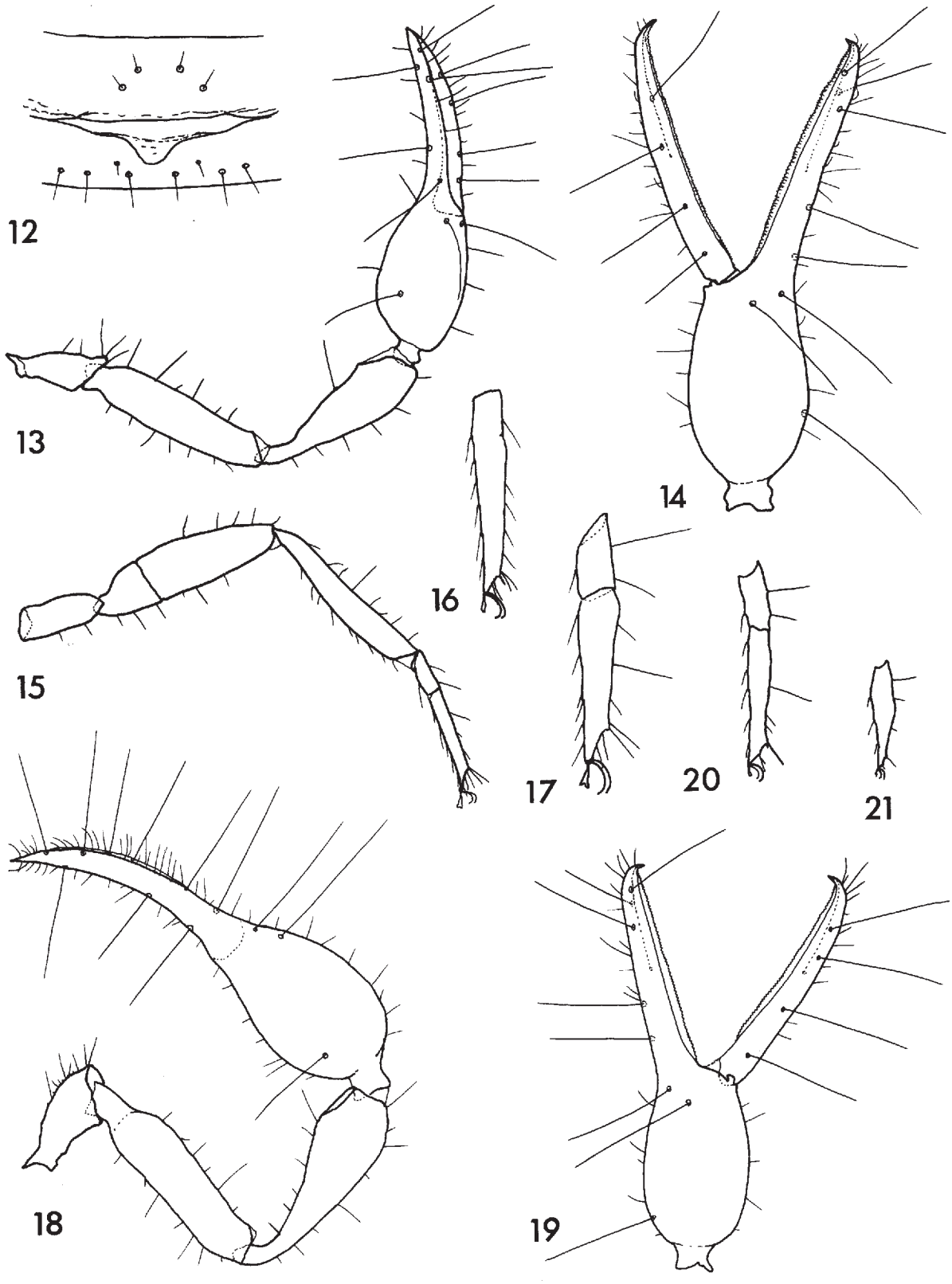
Mexobisium guatemalense, new species
Figs. 18-21

Material—Holotype female (WM1904.01001) and paratype deutonymph from Cueva Lanquin, Alta Verapaz, Guatemala, on 28 August 1969 (S. and J. Peck).

Diagnosis—Moderately large species, with an epistome and with six setae on the cheliceral hand (see key).

Description of Female—With the characteristics of the genus as defined above and with the following noteworthy features. Carapace about 1.3 times as long as broad; anterior margin with prominent triangular epistome; each anteroventral corner with a prominent conical protuberance; no eyes or eyespots; 35 vestitural setae, including eight at anterior and six at posterior margin; transverse furrow indistinct.

Abdominal tergites and sternites smooth; pleural membranes longitudinally granulo-striate, the granules with long, apical spinules. Tergal chaetotaxy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8:8:9:9:9:9:9:9:9:7:TT:2. Sternal chaetotaxy 4:(3) 10(3):(2)12(2):16:17:18:16:14:11:T1T1T1T:2.

Cheliceral hand with six setae; fingers each with about eight teeth of various sizes; galea long, slender and curved; serrula exterior with 33 and serrula interior with 27 blades; flagellum of two small, terminally denticulate setae set close together.

Palps long and rather slender; femur 1.08 and chela 1.73 times as long as carapace. Proportions of segments as in Figure 18; trochanter 2.3, femur 4.3, tibia 3.0, and chela (without pedicel) 3.7 times as long as broad; hand 1.55 times as long as deep; movable finger 1.41 times as long as hand. Surfaces smooth. Trichobothria of chela as shown in Figure 19. Fixed finger with 104 contiguous, retroconical teeth; movable finger with 98 rather similar, but lower, teeth; both fingers with well developed venom apparatus.

Legs slender; leg IV with entire femur 4.2 and tibia 8.7 times as long as deep. All tarsi divided (Fig. 20). Spines well developed on telotarsi I, II and III, only a small, blunt projection in corresponding position on leg IV. Arolia shorter than claws. Leg IV with tactile setae on tibia 0.74, on metatarsus 0.43 and on telotarsus 0.43 length of segment from proximal end.

Male—Unknown.

Deutonymph—Generally similar to the adult, but smaller, less heavily sclerotized and with tarsi of all legs undivided. Carapace without epistome; with anteroventral protuberances; without eyes; 28 vestitural setae, including 6 at anterior and 4 at posterior margin; no transverse furrow evident.

Pleural membranes of abdomen longitudinally granulate, granules with apical spinules. Tergal chaetotaxy 6:6:6:6:7:7:7:7:7:7:TT:1. Sternal chaetotaxy 0:(1)4(1):(1)7(1):9:9:9:9:9:7:TTTT:2.

Cheliceral hand with 5 setae; serrula exterior with 18, and serrula interior with 16 blades; flagellum of 2 small, terminally denticulate setae.

Palps not as long or slender as those of female; femur 0.96 and chela 1.68 times as long as carapace; trochanter 2.25, femur 3.5, tibia 2.9, and chela 4.0 times as long as broad; hand 1.55 times as long as deep; movable finger 1.73 times as long as hand. Movable chelal finger with two and fixed finger with six trichobothria, as is usual for deutonymphs. Movable finger with 51 and fixed finger with 61 marginal teeth.

Legs generally similar to those of adult, but with no division of tarsi; instead, each tarsus is noticeably swollen just distal to point where suture would be expected (Fig. 21). Spines on tarsi as in adult. Leg IV with tactile setae on tibia 0.64, and on tarsus 0.17 and 0.55 length of segment from proximal end.

Measurements (in mm)—Figures for female followed in parentheses by those of deutonymph. Body length 3.55(2.03). Carapace 1.11(0.55) long. Chelicera 0.54(0.29) by 0.26(0.15). Palpal trochanter 0.605(0.28) by 0.26(0.125); femur 1.205(0.525) by 0.28(0.15); tibia 1.07(0.465) by 0.36(0.16); chela (without pedicel) 1.925(0.925) by 0.525(0.23); hand (without pedicel) 0.82(0.34) by 0.525(0.22); pedicel 0.11(0.05) long; movable finger 1.155(0.59) long. Leg I: basifemur 0.58(0.265) by 0.16(0.09); telofemur 0.35(0.155) by 0.15(0.08); tibia 0.71(0.295) by 0.095(0.065); metatarsus 0.20 by 0.07; telotarsus 0.415 by 0.065 (tarsus 0.30 by 0.06). Leg IV: entire femur 0.96(0.465) long; basifemur 0.355(0.18) by 0.215(0.11); telofemur 0.67(0.30) by 0.23(0.11); tibia 0.955(0.39) by 0.11(0.065); metatarsus 0.22 by 0.085; telotarsus 0.435 by 0.08 (tarsus 0.35 by 0.06).

Etymology—This species is named for Guatemala, the country in which it lives.

Mexobisium goodnighti, new species
Figs. 22-25

Material—Holotype female (WM2945.01001) from a cave near Augustine, Belize (British Honduras), on 20 July 1972 (Charles Goodnight).

Diagnosis—A very large species with attenuated appendages and well colored sclerotic parts; no transverse furrow on carapace, and eight setae on anterior genital operculum of female (see key).

Description of Female—With the characteristics of the genus as defined above and with the following special features. Carapace 1.5 times as long as broad; epistome small, triangular; surface distinctly reticulated; no transverse furrow present; vestitural setae 38, with six at anterior and six at posterior margins. Abdominal pleural membranes longitudinally granulostriate, dorsalmost granules with very long apical spinules. Tergal chaetotaxy 8:8:9:9:9:9:9:9:7:TTTT:2. Sternal chaetotaxy 8:(3)10(3):(3)13(3):$\frac{2}{18}$:$\frac{4}{20}$:$\frac{4}{18}$:$\frac{2}{18}$:17:11:TT:2; setae of anterior sternites as shown in Figure 22.

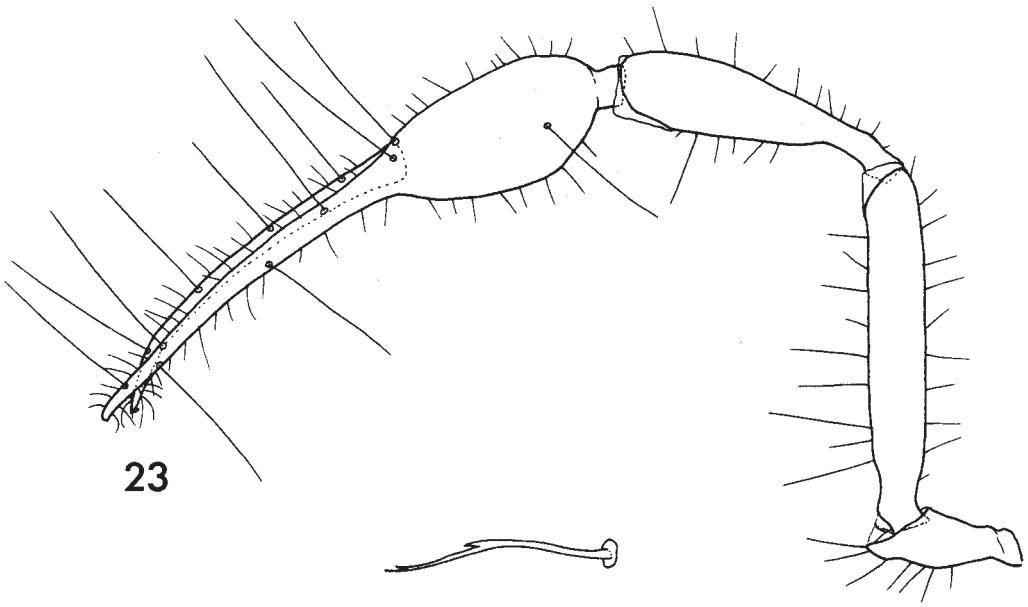
Chelicera with six setae on hand; flagellum of two small, apparently simple, setae, well separated at their

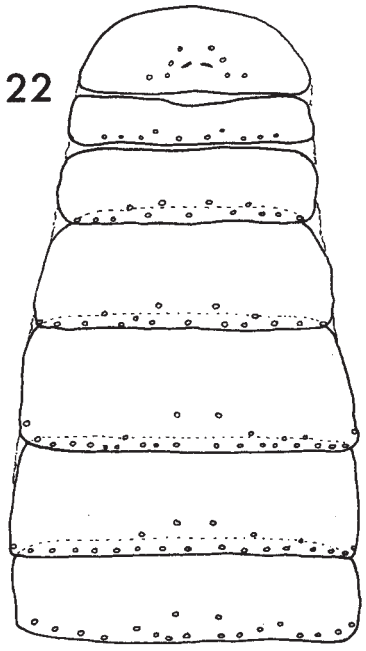
←Figs. 12-17. *Mexobisium maya,* new species. 12. Genital opercula of holotype female. 13. Right palp, dorsal view. 14. Left chela, lateral view. 15. Leg IV, anterior view. 16. Tarsus of leg I of tritonymph. 17. Metatarsus and telotarsus of leg IV of tritonymph.

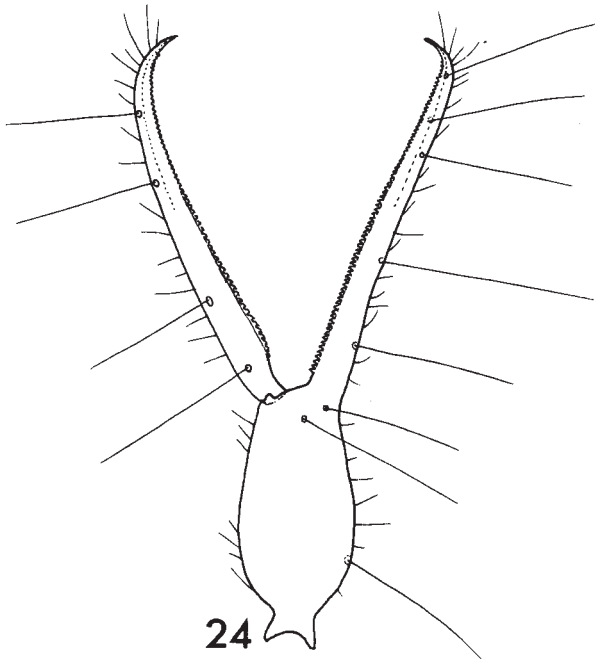
←Figs. 18-21. *Mexobisium guatemalense,* new species. 18. Right palp of holotype female, dorsal view. 19. Right chela, lateral view. 20. Metatarsus and telotarsus of leg IV. 21. Tarsus of leg IV of deutonymph.

bases; serrula exterior with 33 and serrula interior with 26 blades.

Palps as in Figure 23; femur 1.25 and chela 2.11 times as long as carapace. Trochanter 2.6, femur 6.0, tibia 3.85, and chela (without pedicel) 5.1 times as long as broad; hand (without pedicel) 1.9 times as long as deep; movable finger 1.83 times as long as hand. Chela with trichobothria as in Figure 24. Chelal fingers strongly curved at distal ends; fixed finger with 137 retroconical teeth; movable finger with 116







Figs. 22-25. *Mexobisium goodnighti,* new species. 22. Sternites 2-8, showing bases of setae. 23. Right palp, dorsal view. 24. Left chela, lateral view. 25. Subterminal tarsal seta.

teeth, the distal six or seven greatly flattened, the others similar to those of fixed finger but more depressed; venom apparatus well developed in both fingers.

Legs quite slender; leg IV with entire femur 6.65 and tibia 11.7 times as long as deep. Spines well developed on telotarsi of legs I, II and III, only a small projection in corresponding position on leg IV. Subterminal tarsal setae laterally and terminally denticulate (Fig. 25). Tibia and both tarsal segments of legs III and IV with a number of long, heavy setae along outer margins.

Male—Unknown.

Measurements (in mm)—Body length 4.40. Carapace length 1.40. Chelicera 0.68 by 0.31. Palpal trochanter 0.77 by 0.295; femur 1.75 by 0.29; tibia 1.48 by 0.385; chela (without pedicel) 2.96 by 0.585; hand (without pedicel) 1.04 by 0.555; pedicel 0.16 long; movable finger 1.91 long. Leg IV: entire femur 1.46 long; basifemur 0.495 by 0.22; telofemur 1.02 by 0.215; tibia 1.52 by 0.13; metatarsus 0.26 by 0.10; telotarsus 0.805 by 0.095.

Etymology—The species is named for Charles Goodnight, who collected the type specimen.

Remarks—This species is peculiar in several respects which distinguish it clearly from other members of the genus. Though it is large and well sclerotized, it shows no trace of a transverse furrow on the carapace; there are eight setae on the anterior genital operculum of the female rather than four as in other species; there are 38 setae on the carapace, the largest number in the genus; and the large number and placement of setae on the abdominal sternites is unique for the genus. These features might be considered sufficient for generic distinction; but in view of the wide variation in a number of characteristics among other species, it seems best at the moment to place this species in *Mexobisium.*

Mexobisium paradoxum Muchmore

Mexobisium paradoxum Muchmore, 1972, p. 273.

Reexamination of the holotype female in comparison with the species described above reveal some interesting facts. This species is unique in several respects: there is only a single seta in the cheliceral flagellum; the pleural granules do not possess apical spinules, at most a thickening of the apices; there are no protuberances at the anteroventral corners of the carapace. And it shares a couple of peculiar features with other species: as in *M. goodnighti,* there is no transverse furrow on the carapace; and as in *M. pecki,* there are no setae on the ventral anal plate.

It is obvious that there are a considerable number of morphological differences among the several spe-

Key to Species of *Mexobisium* (adults only)

1. Cheliceral flagellum consisting of a single, simple seta; appendages greatly attenuated—palpal femur 7.1 times as long as broad; from a cave in Veracruz, México . . . . . *M. paradoxum* Muchmore

   Cheliceral flagellum consisting of two finely denticulate or acuminate setae; appendages not so slender—palpal femur not more than 6 times as long as broad 2

2. Very large—palpal chela nearly 3 mm long; carapace without a transverse furrow; anterior genital operculum of female with 8 setae; from cave in Belize . . . . . *M. goodnighti,* new species

   Smaller—palpal chela no more than 2 mm long; carapace with a more or less distinct transverse furrow; anterior genital operculum of female with only 4 setae 3

3. Palpal chela about 2 mm long, femur about 1.2 mm long; cavernicolous forms 4

   Palpal chela 1 mm or less in length, femur less than 0.7 mm long; epigean forms 5

4. Carapace with prominent triangular epistome; hand of chelicera with 6 setae; cheliceral fingers with about 8 distinct teeth; from cave in Guatemala . . . . . *M. guatemalense,* new species

   Carapace without epistome; hand of chelicera with 5 setae; cheliceral fingers without distinct teeth; from cave in Tabasco, México . . . . . *M. maya,* new species

5. Ventral anal plate with 2 small setae; hand of chelicera with 6 setae; palpal chela about 1 mm long; from Cuba . . . . . *M. cubanum,* new species

   Ventral anal plate without setae; hand of chelicera with 5 setae; palpal chela less than 0.8 mm long; from Oaxaca, México . . . . . *M. pecki,* new species

cies assigned to the genus *Mexobisium.* At present it seems best to keep all these species in one genus, although it is recognized that further knowledge of them may very well demand separation into two or more genera.

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TWO NEW TROGLOBITIC SHRIMPS (DECAPODA: ALPHEIDAE AND PALAEMONIDAE) FROM OAXACA, MEXICO

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Few caves have a more diverse troglobitic "higher crustacean" fauna than does Cueva del Nacimiento del Río San Antonio, situated 10 km SSW of Acatlán, Oaxaca, México. In addition to the mysid and crayfish described elsewhere in this Bulletin by Bowman and Hobbs, respectively, two shrimps belonging to different families also frequent this cave; thus, four malacostracan families are represented in its waters: Lepidomysidae, Alpheidae, Palaemonidae, and Astacidae.

The two shrimps described herein were first collected by James R. Reddell and others (see below) on 26 December 1972 along with specimens of *Spelaeomysis olivae* Bowman, 1973, and *Procambarus oaxacae reddelli* Hobbs, 1973. The alpheid was represented by a single specimen, that was regurgitated by an undescribed species of albinistic catfish, and the palaemonid by two juvenile specimens. Without additional material neither of these shrimps could have been described. A return to this locality by the original collectors on 9 March 1973 resulted in their obtaining 19 additional alpheids and three adults and one juvenile palaemonid. Mr. Reddell informed me that during his second visit to this cave the temperature of the water in the "shrimp lake" was 23.5°C and 23°C near the entrance. He further indicated that the alpheid "was abundant in the Main Side Passage from 1000-3000 ft. from the entrance. They were seldom found in pools with the catfish or crayfish. The palaemonid was quite rare and seen in the same pools."

To my knowledge, previously only two alpheid shrimps have been reported to inhabit fresh-water; *Alpheopsis haugi* Coutiére, 1906, found in a fresh-water lake in the Ogooué Basin in Gabon, and *A. monodi* Sollaud, 1932, which was collected in a stream in the vicinity of Manoka, Cameroon. No species of the family has been reported heretofore from a subterranean habitat. A list of the previously described species of the genus *Alpheopsis* is appended to the description of this new congener.

Although several species of the genus *Macrobrachium* have been found in subterranean habitats, the species described here is the only member of the genus in which the eyes are without facets and either lack, or have extremely little, pigment.

Both shrimps are known only from this Oaxacan cave.

Acknowledgements—Sincere appreciation is extended to James R. Reddell, David McKenzie, Martha Helen McKenzie, and Stuart Murphy for donating to me the first specimens they collected of these two shrimps and especially for their interest and efforts that resulted in the acquisition of sufficient material upon which to base descriptions. I am also deeply indebted to Fenner A. Chace, Jr., who encouraged and aided me throughout the preparation of this manuscript, including a critical reading of the final draft.

Particularly helpful was his list of the described species of the genus *Alpheopsis* from which the summary of species included here was adapted.

Alpheopsis stygicola, new species
Figs. 1, 2

Description—Rostrum (Fig. 1*a, b*) triangular with strongly acute apex not reaching midlength of proxi-

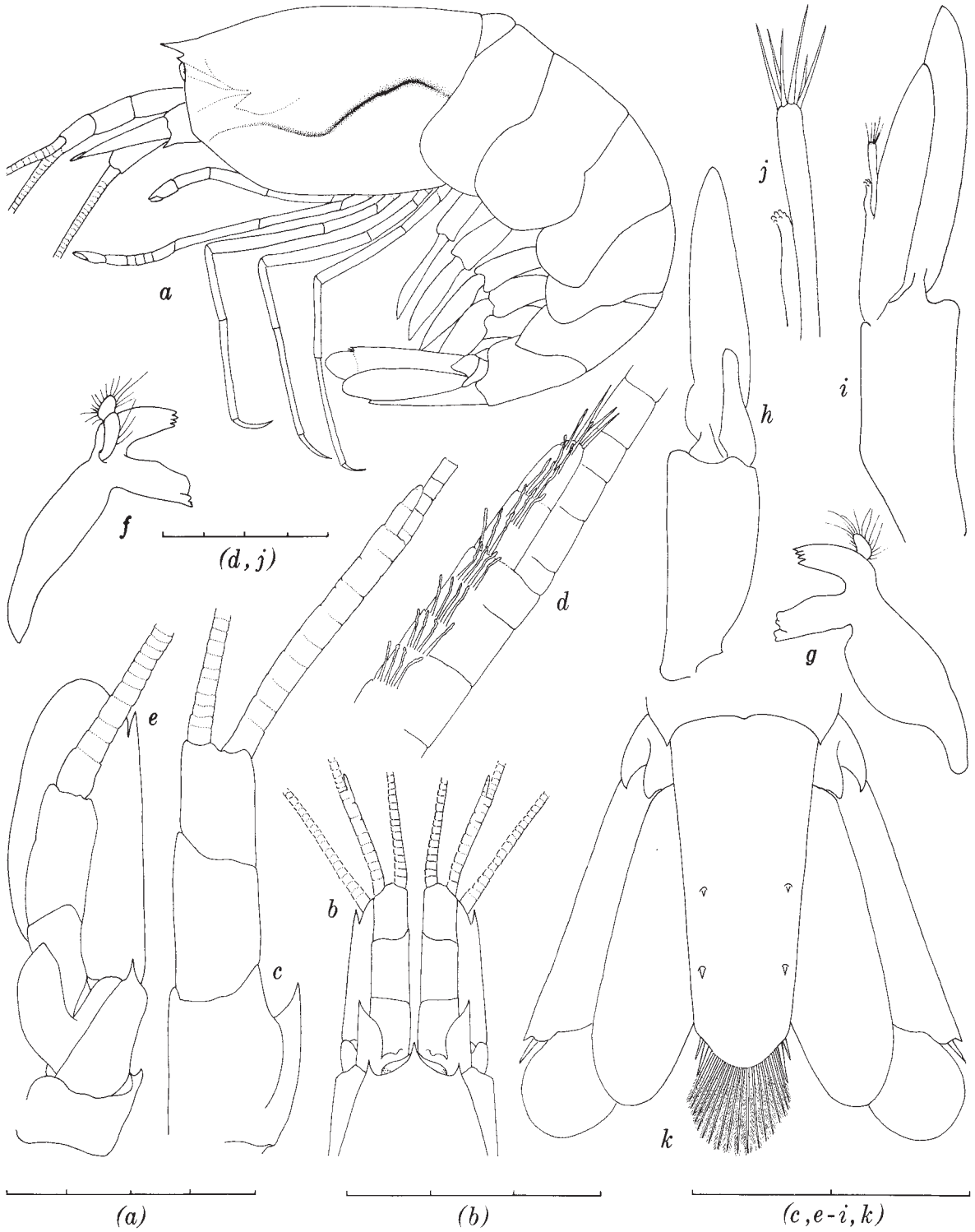

Fig. 1. *Alpheopsis stygicola,* new species, holotypic male. (All appendages from left side). *a,* Lateral view; *b,* Dorsal view of anterior region; *c,* Dorsal view of basal portion of antennule; *d,* Dorsal view of portion of lateral ramus of same; *e,* Ventral view of basal portion of antenna; *f,* Preaxial view of left mandible; *g,* Postaxial view of same; *h,* First pleopod; *i,* Second pleopod; *j,* Appendices masculina and interna; *k,* Dorsal view of telson and uropods. (Scales in mm.)

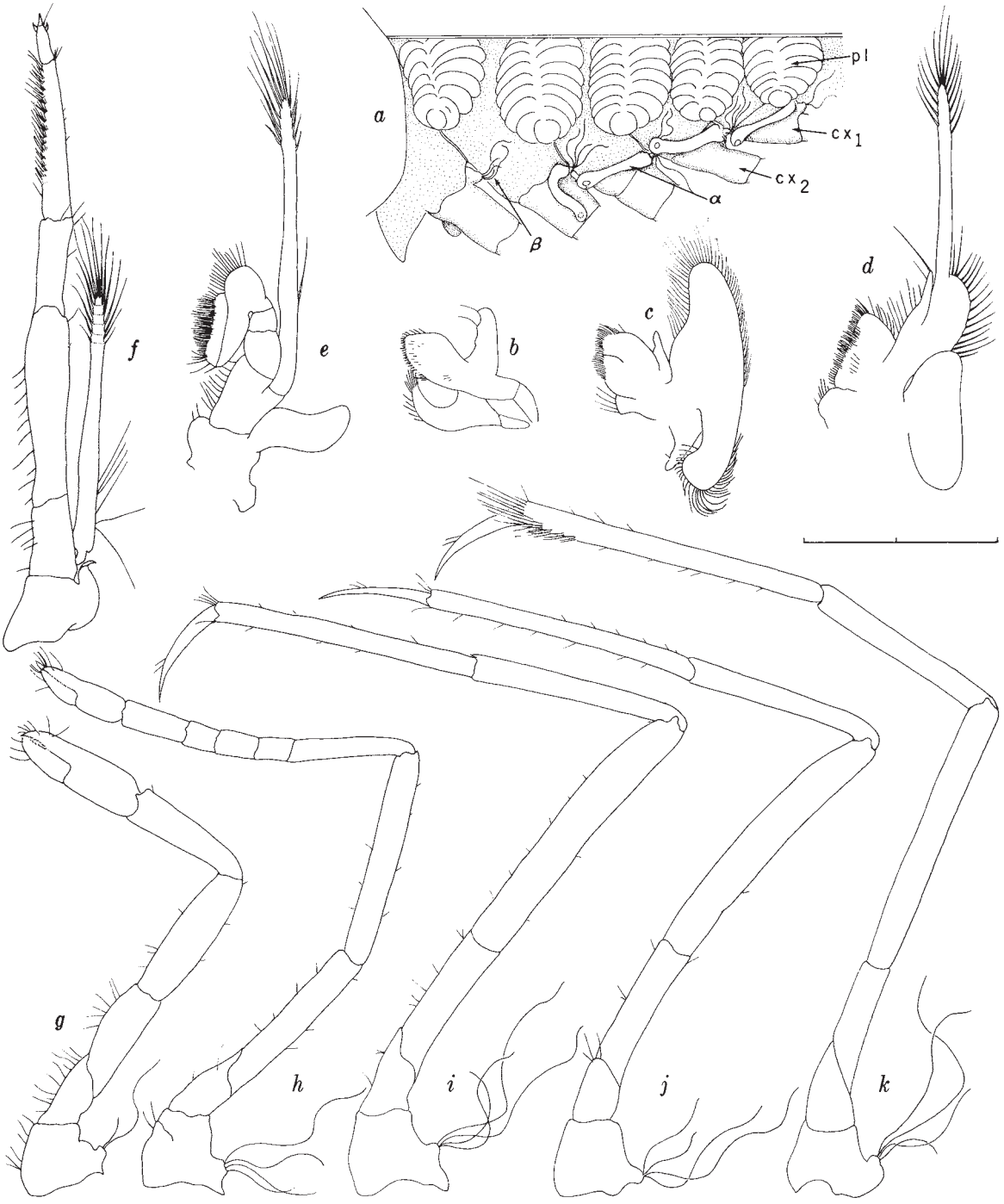

Fig. 2. *Alpheopsis stygicola,* new species, holotypic male. (All appendages from left side except those in *a.*) *a,* Dextral view of pleurobranchs and coxal epipodites of pereiopods 1-5 and associated pleural region (α, alpha element of epipodite; β, beta element of epipodite; cx, coxa; pl, pleurobranch); *b, c,* First and second maxillae; *d-f,* First, second, and third maxillipeds; *g-k,* First through fifth pereiopods, respectively. (Scale in mm.)

mal segment of antennular peduncle, and flanked laterally by pair of acute supraorbital spines. Carapace with pair of incipient carinae diverging posteriorly from lateral bases of supraorbital spines; hepatic region with several complexly arranged grooves and conspicuous, deep, sclerotized hepatic-branchiocardiac groove extending almost entire length of carapace. Pterygostomian margin rounded, lacking spine; posterior margin with moderately prominent cardiac notch at base of branchiostegite.

Four anterior abdominal somites lacking median carina dorsally, all with rounded pleura; pleuron of fifth abdominal somite with acute posteroventral angle. Sixth somite slightly longer than fifth and about three-fourths as long as telson, its posteroventral angle consisting of acute triangular articulated plate, margin rounded at base of telson. Telson (Fig. 1*a, k)* about 2.4 times longer than wide with paired dorsal spines situated at midlength and additional pair at base of distal fourth; rounded posterior margin with two pairs of lateral spines, more mesial pair longer, flanking row of 18 plumose setae.

Eyes (Fig. 1*a, b)* almost covered by carapace, with pigment greatly reduced, fused stalks with anteromedian bulge or with paired submedian anterior bulges.

Antennular peduncle (Fig. 1*a-c)* with acute stylocerite almost reaching distal extremity of proximal podomere; second podomere about 1.3 times longer than third; flagella approximately twice length of carapace, lateral flagellum with nine or 10 articles proximal to bifurcation and short branch consisting of only three articles, distalmost indistinctly delimited basally; sensory setae disposed as illustrated (Fig. 1*d).*

Antenna (Fig. 1*a, b, e)* with peduncle almost reaching base of distal third of scale; proximal segment with small acute distolateral tooth, and second segment with ventrodistal spine; flagellum about three times as long as carapace; antennal scale about 2.2 times longer than broad, with acute distolateral tooth not reaching so far distally as distal margin of blade.

Gnathal appendages as figured (Figs. 1*f, g;* 2*b-f).* Mandible with incisor process terminating in four teeth; two-jointed palp with broadly rounded distal segment.

First pereiopods (Fig. 2*g*), reaching slightly beyond midlength of antennal scale, subequal in size, carpus and chela subequal in length and only slightly shorter than merus; opposable margins of fingers of chela without prominent teeth or spines; coxa with epipodite consisting of α and β components (Coutière, 1899:276) (Fig. 2*a).* Second pereiopod (Fig. 2*h),* overreaching antennal scale by slightly more than length of dactyl, with chela similar to that of first; carpus consisting of five articles, proximalmost longer than combined length of second, third, and fourth, and almost twice as long as distal article; merus distinctly longer than three proximal articles of carpus and also longer than ischium; coxa with epipodite as in first pereiopod. Third pereiopod (Fig. 2*i),* overreaching antennal scale by length of dactyl and half that of propodus, with simple dactyl; propodus 2.7 times longer than dactyl and 1.2 times longer than carpus; merus slightly longer than propodus; ischium distinctly shorter than carpus; coxa with epipodite as in first and second pereiopods. Fourth pereiopod (Fig. 2*j),* overreaching antennal scale by slightly more than length of dactyl, shorter than third; dactyl simple; propodus 2.2 times length of dactyl, 1.4 times that of carpus, and subequal in length to merus; ischium shorter than carpus; coxa with epipodite as in first three pereiopods. Fifth pereiopod (Fig. 2*k),* overreaching antennal scale by about two-thirds length of dactyl, subequal in length to third; dactyl simple; propodus, bearing transverse rows of setae on distal remotor surface, 2.9 times longer than dactyl and 1.1 times longer than merus; ischium much shorter than carpus; coxa with epipodite limited to setiferous (β) element.

First pleopod (Fig. 1*h)* with exopodite 2.8 times longer than endopodite. Second pereiopod (Fig. 1*i, j)* with exopodite approximately 1.2 times longer than endopodite; appendix masculina naked except for six apical spinelike setae. Lateral ramus of uropod (Fig. 1*k)* with entire, straight lateral margin terminating in short acute tooth, and longer movable spine situated immediately mesial to tooth.

Branchial formula. 5 P1b + 1 Artb + 8 ep: five pleurobranchs borne on pereiopod-bearing somites; arthrobranch at base of third maxilliped; usual epipodites on maxillipeds; and compound epipodites (α and β) on coxae of first four pereiopods, and setae-bearing one (β–type) on that of fifth. See Fig. 2*a.*

Size—Carapace length of holotype 5.7 mm, that of eight paratypic males ranging from 4.7 to 6.0 mm (average 5.1 mm); range in 11 paratypic females, 4.5 to 6.2 mm (average 5.2 mm).

Color—Lacking pigment.

Type Locality—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México. The specimens were collected by James R. Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy on 26 December 1972 and 9 March 1973.

Disposition of Types—The holotypic male (no. 143629), six paratypic males and nine paratypic females are deposited in the National Museum of Natural History, Smithsonian Institution. A paratypic male and female are deposited in both the Instituto de Bio-

logía, Universidad Nacional Autónoma de México, and The Museum, Texas Tech University, Lubbock, Texas.

Relationships—The relationships of *Alpheopsis stygicola* to other members of the genus are obscure. At least partially responsible for the uncertainty that exists are the inconsistencies in the descriptions of the previously known species. Characters that were utilized in describing certain of them are neither illustrated nor mentioned in the descriptions of others, sometimes even by the same author. Until such time as a comparative study can be made of all of the described species, little should or could be concluded concerning their interrelationships.

In possessing supraorbital spines, this new Mexican species superficially resembles more than one-half of the members of the genus but may be distinguished from all except six of them in possessing nine or 10 articles in the lateral ramus of the antennule proximal to the bifurcation. Characters that serve to distinguish it from the six remaining species are as follows: in *A. fissipes* the dactyls of the third through fifth pereiopods are bifid instead of simple; in *A. idiocarpus* the carpus of the second pereiopod consists of three articles instead of five; in *A. trispinosus* only three, instead of four, of the pereiopods bear α–type epipodites; in *A. chilensis,* which attains a length of 48 mm, the chelae are asymmetrical and the supraorbital "spines" are broadly rounded instead of being acute; in both *A. monodi* and *A. haugi* the blade of the scaphocerite does not reach so far distally as the distolateral spine instead of exceeding it.

The absence or reduction of pigment and facets from the eyes and the presence of the strikingly deep longitudinal hepatic-branchiocardiac groove on the carapace are believed to be unique within the genus. It seems highly unlikely that previous authors would have failed to mention these two conspicuous features were they present in the specimens they were describing.

Etymology—The name *stygicola* alludes to the troglobitic habit of this shrimp.

List of the Members of the Genus *Alpheopsis*

Alpheopsis aequalis Coutière, 1896:382
Type-locality: Red Sea and Indian Ocean.

Alpheopsis equalis var. *truncata* Coutière, 1903:18
Type-locality: Goifufahendu Atoll (in Maldives or Lackadives). Treated as a synonym of the nominate subspecies by Banner, 1953:15.

Alpheopsis africana Holthuis, 1952b:45
Type-locality: 8°30′S–13°E (20 M. W. Pointa do Dandé) Africa.

Alpheopsis biunguiculata Banner, 1953:18
Type-locality: Halape, Kau Coast, Hawaii.

Alpheopsis chalciope De Man, 1910:306
Type-locality: Malay Archipelago, Siboga Station 154, lat. 0°7′.2N, long. 130°25′.5E.

Alpheopsis chilensis Coutière, 1896:382
Type-locality: Chile.

Alpheopsis consobrinus De Man, 1910:305
Type-locality: Malay Archipelago, Siboga Station 282, lat. 8°25′.2S, long. 127°18′.4E. Anchorage between Nusa Besi and the N.E.-point of Timor.

Alpheopsis diabilus Banner, 1956:325
Type-locality: Saipan.

Alpheopsis fissipes Coutière, 1908:193
Type-locality: Indian Ocean, Percy Sladen Trust Expedition, Providence, Station D4.

Alpheopsis haugi Coutière, 1906:378
Type-locality: Freshwater lake in the Ogooué Basin more than 200 km from the ocean, Gabon.

Alpheopsis idiocarpus Coutière, 1908:194
Type-locality: Indian Ocean, Percy Sladen Trust Expedition, Providence, Station D4.

Alpheopsis labis Chace, 1972:55
Type-locality: Antigua Island, Bredin Station 73-56.

Alpheopsis monodi Sollaud, 1932:377
Type-locality: Cameroon, freshwater stream in the region of the Bay of Monoka.

Alpheopsis sibogae De Man, 1910:307
Type-locality: Malay Archipelago, Siboga Station 49a, lat. 8°23′.5S, long. 119°4′.6E, "Sapeh-strait."

Alpheopsis tetrarthri Banner, 1956:328
Type-locality: Saipan, Locality 2, off west coast.

Alpheopsis trigona (Rathbun, 1901:111)
Type-locality: Puerto Rico, off Vieques, Station 6096.

Alpheopsis trispinosa (Stimpson, 1860:101)
Type-locality: Port Jackson, Australia.

Alpheopsis vietnamensis Tiwari, 1964:314
Type-locality: Vietnam, anchorage of Itu Aba.

Macrobrachium villalobosi, new species
Fig. 3

Description—Rostrum (Fig. 3*a, b*) moderately high and almost straight, only slightly arched immediately anterior to posterior margin of orbit, and its tip reaching slightly beyond distal extremity of antennal scale; dorsal margin with nine to 11 teeth (nine in holotype), one or two, rarely three, (epigastric) of which situated posterior to orbit, and one to three, usually two, on ventral margin.

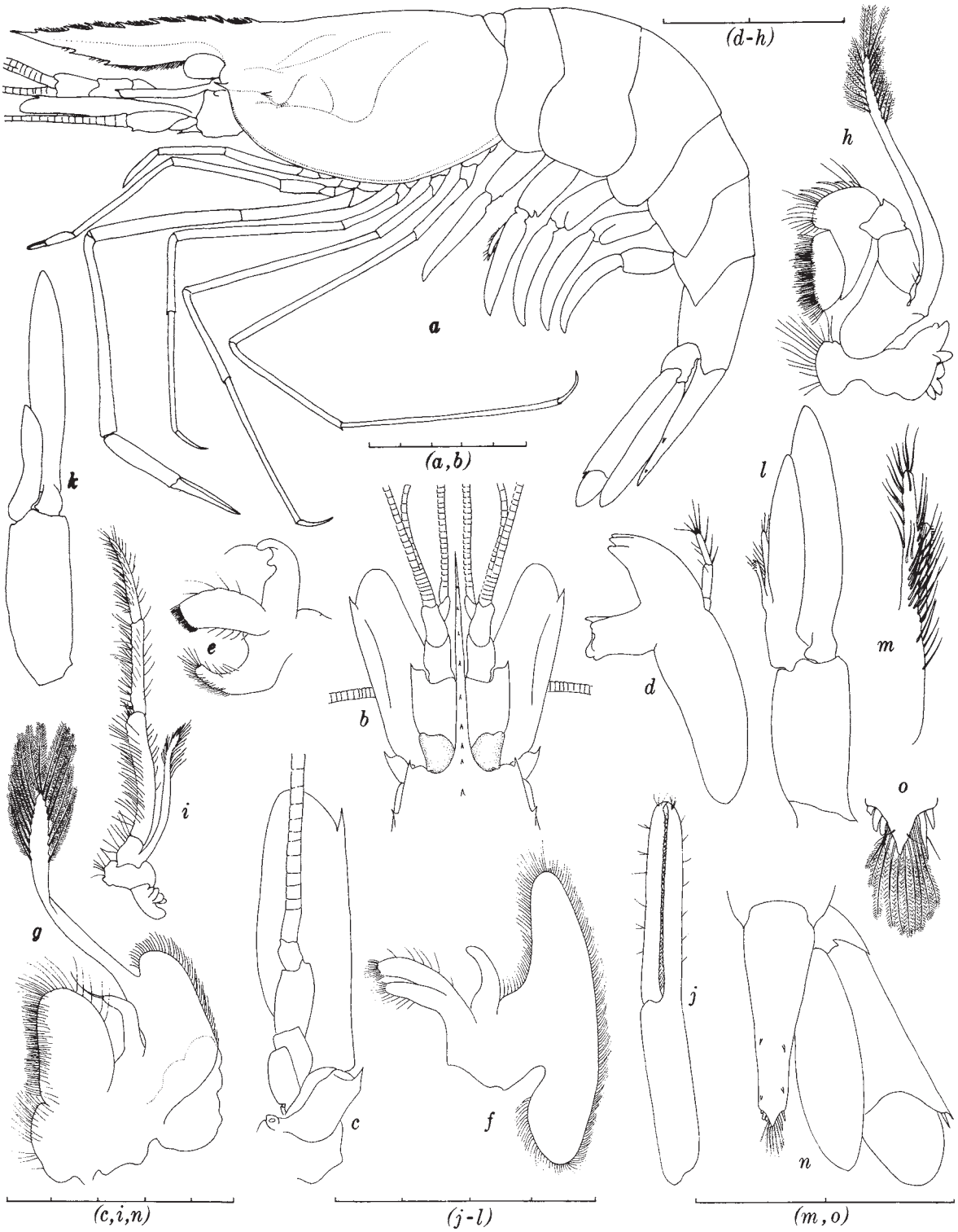

Fig. 3. *Macrobrachium villalobosi,* new species, holotypic male. (All appendages from left side.) *a,* Lateral view; *b,* Dorsal view of anterior region; *c,* Ventral view of basal portion of antenna; *d,* Mandible; *e, f,* First,and second maxillae; *g-i,* First, second, and third maxillipeds; *j,* Chela of second pereiopod; *k, l,* First and second pleopods; *m,* Appendices masculina and interna; *n,* Dorsal view of telson and right uropod; *o,* Posterior extremity of telson. (Scales in mm.)

Carapace (Fig. 3*a*) with antennal and hepatic spines, latter situated on level slightly posterior to basal epigastric spine. Branchiocardiac groove prominent.

Abdomen (Fig. 3*a*) smooth; pleura of fourth and fifth somites with angular posteroventral extremities, that of fifth acute. Sixth somite about 1.4 times longer than fifth, and telson 1.4 times longer than sixth; dorsal surface of telson (Fig. 3*n, o*)with anterior pair of spines situated at base of penultimate fifth and posterior pair nearer posterior margin of telson than to anterior pair of spines; posterior margin of telson, contracted to form acute median tip, bearing two pairs of spines arising ventral to margin, more mesial ones extending posteriorly slightly beyond tip of telson (third spine present on left side in holotype) and row of about 10 plumose setae between mesial pair of spines; single pair of fine submarginal setae present dorsally.

Eyes (Fig. 3*a, b*) moderately large, slightly cleft distally and without facets; distolateral area without trace of pigment or tinted with diffuse reddish purple granules in degenerate corneal area.

Antennule (Fig. 3*b*) with proximal podomere of peduncle longer than combined lengths of distal two podomeres, latter two subequal in length, and distal podomere not quite reaching base of lateral spine on antennal scale; anterolateral spine of first podomere reaching about midlength of second podomere of peduncle; lateral flagellum about five and mesial one about three times longer than carapace. Antenna (Fig. 3*a, b, c*) with peduncle as illustrated, basal segment with ventrolateral spine, flagellum about eight times longer than carapace. Antennal scale slightly less than three times longer than broad with lateral margin almost straight.

Gnathal appendages (Fig. 3*d-i*) as figured. Third maxilliped reaching midlength of antennal scale.

First pereiopod (Fig. 3*a*) overreaching antennal scale by length of dactyl, latter subequal in length to palm of chela; carpus slightly more than twice length of chela, and 1.1 times longer than merus. Second pereiopod (Fig. 3*a, j*) overreaching antennal scale by length of chela and half that of carpus; chela with fingers slightly longer than smooth palm, former without tubercles or denticles on opposable margins, but both fingers with scattered fine setae and subapical clusters of stiff setae; carpus 1.5 times as long as propodus and about 1.5 times longer than merus, and merus 1.3 times longer than ischium. Third pereiopod overreaching antennal scale by length of dactyl and one-fourth that of propodus; propodus slightly more than three times length of dactyl and 1.5 times longer than carpus; latter about one-half as long as merus, and merus 2.6 times longer than ischium. Fourth pereiopod overreaching antennal scale by length of dactyl and three-fifths that of propodus; propodus about 4.2 times as long as dactyl and 1.6 times length of carpus; carpus about one-half as long as merus, and latter slightly more than three times length of ischium. Fifth pereiopod overreaching antennal scale by length of dactyl and almost entire length of propodus; propodus, subequal in length to merus, 5.5 times length of dactyl and 1.5 times that of carpus; carpus 3.1 times as long as ischium.

First pleopod (Fig. 3*k*) with exopodite slightly more than twice as long as endopodite. Second pleopod (Fig. 3*l*) with exopodite 1.2 times as long as endopodite, and latter with appendix masculina (Fig. 3*m*) reaching distinctly beyond its midlength. Lateral ramus of uropod (Fig. 3*n*) with straight lateral margin bearing fixed spine and also with slightly longer movable spine at mesial base of latter.

Branchial formula typical of other members of the genus: 5 P1b + 2 Artb + 1 Podb + 2 ep — five pleurobranchs corresponding to pereiopods, two arthrobranchs at base of third maxilliped, podobranch on coxa of second maxilliped, and epipodites on second maxilla and first maxilliped.

Size—Carapace length of single male (holotype) 8.0 mm; that of three females, 8.1 to 9.0 mm, and that of five juveniles ranging from 3.8 to 4.0 mm. Single ovigerous female with carapace length 9.2 mm.

Color—Lacking pigment.

Type-locality—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México. Two juveniles were collected on 26 December 1972, and the holotypic male, two females, and a juvenile, on 9 March 1973.

Disposition of Types—The holotypic male (no. 143633) and the following paratypes are deposited in the National Museum of Natural History, Smithsonian Institution: one female, one ovigerous female, and three juveniles. Of the remaining paratypes, a female and juvenile female are deposited in the Instituto de Biología, Universidad Nacional Autónoma de México; and a paratypic female and juvenile male are in The Museum, Texas Tech University, Lubbock, Texas.

Relationships—*Macrobrachium villalobosi* has no obviously close relatives among the described members of the genus. The degenerated cornea and the almost complete, or complete, absence of pigment in the eye set it apart from all of the others. The slender second pereiopods, in which the chelae are subequal in size and lack teeth, spines (excluding apical spines) or conspicuous mats of setae on the fingers, also appear to be unique among the American members of the genus. In addition, only a single transverse row of

setae occurs in the distal region of the propodus of the fifth pereiopod. These characteristics serve readily to separate *M. villalobosi* from other American *Macrobrachium* (see Holthuis, 1952a:12).

Etymology—This shrimp is named in honor of my good friend and able carcinologist, Alejandro Villalobos.

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A SECOND TROGLOBITIC *TYRANNOCHTHONIUS* FROM MEXICO (ARACHNIDA, PSEUDOSCORPIONIDA, CHTHONIIDAE)

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In America, representatives of the genus *Tyrannochthonius* Chamberlin are widespread in the litter fauna from the southern United States (Chamberlin and Malcolm, 1960; Malcolm, personal communication) south to Peru (see Hoff, 1959). In several caves in Alabama, a number of forms of this genus have become highly modified as troglobites (Chamberlin and Malcolm, 1960). However, in the numerous caves of México only a single troglobitic species, *T. troglobius* Muchmore (1969) has been found, though several other, apparently troglophilic, forms have also been noted (see Reddell and Mitchell, 1971). Because of the paucity of true troglobites in the Mexican caves, it seems important to describe a second species of troglobitic *Tyrannochthonius* recently collected by J. R. Reddell and T. Raines from a cave in southern San Luis Potosí. The troglophilic forms will be considered in detail at a later time.

This work has been aided by a research grant (GB 17964) from the National Science Foundation.

Tyrannochthonius pallidus, new species
Figs. 1 and 2

Material—Holotype male (WM 2962.01001) from Cueva de El Jobo, 5 km NE Xilitla, San Luis Potosí, México, 28 November 1972 (J.R. Reddell and T. Raines). The type is deposited in the collection of the American Museum of Natural History in New York.

Diagnosis—A troglobitic species, similar in general facies to *T. troglobius* Muchmore but considerably smaller, lighter in color, and with less attenuated appendages.

Description of Male—Pale in color, all sclerotized parts very light brown. Carapace longer than broad; epistome small, irregularly triangular; two corneate eyes present, about one ocular diameter from anterior margin of carapace; chaetotaxy 2-4-2-4-2-2=16. Coxal area typical; chaetotaxy 2-2-1:2-1:2-2-CS:2-3:2-3; each coxa II with a row of 10-11 incised spines essentially like those in *T. troglobius*; no intercoxal tubercle present. Abdomen elongate; tergites and sternites only weakly sclerotized; pleural membranes finely papillose. Tergal chaetotaxy 4:4:4:4:4:4:5:6:7:4:T2T:0. Sternal chaetotaxy 10:[4-4]:(3)$\frac{12\text{-}9}{8}$(3):(3)6(3):7:7:8:8:8:T1T1T1T:0:2.

Chelicera four-fifths as long as carapace; hand with five setae; each finger with about 15 teeth; no galea present, but silk ducts are evident on movable finger; flagellum of eight or nine pinnate setae.

Palps rather long and slender (Fig. 1); femur 1.32 and chela 1.90 times as long as carapace; trochanter 1.75, femur 5.7, tibia 2.1 and chela 6.85 times as long as broad; hand 2.45 times as long as deep; movable finger 1.73 times as long as hand. Placement of trichobothria on chela and of spinelike seta on inner side of fixed finger essentially as in *T. troglobius.* Fixed finger with 23 large, acute macrodenticles and 17 rounded microdenticles alternating; movable finger with 11 similar macrodenticles and 10 similar, alternating microdenticles, followed proximally by 14 very low rounded teeth. On external surface of movable

finger, just distal to 10th macrodenticle, is a small rounded sensillum with a bipolar neuron running from it proximally into finger (Fig. 2).

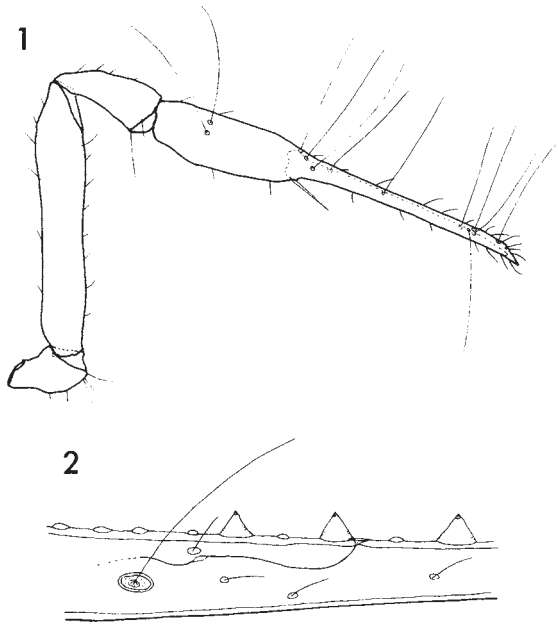
Legs fairly slender; leg IV with entire femur 2.6 and tibia 5.2 times as long as deep. Leg IV with tactile setae on tibia 0.47, on metatarsus 0.37, and on telotarsus 0.31 length of segment from proximal end.

Female—Unknown.

Measurements (in mm)—Body length 1.56. Carapace length 0.56; greatest breadth 0.41. Chelicera 0.445 by 0.21. Palpal trochanter 0.22 by 0.125; femur 0.74 by 0.13; tibia 0.295 by 0.14; chela 1.06 by 0.155; hand 0.38 by 0.155; movable finger 0.66 long. Leg IV: trochanter 0.22 by 0.14; entire femur 0.69 long; basifemur 0.33 by 0.265; telofemur 0.51 by 0.26; tibia 0.47 by 0.09; metatarsus 0.20 by 0.075; telotarsus 0.495 by 0.045.

Etymology—The name *pallidus* refers to the unusually light coloration of the animal.

Remarks—The occurrence of a sensillum on the movable chelal finger of a *Tyrannochthonius* has not been reported previously, though similar structures have been observed in species of *Aphrastochthonius* (Muchmore, 1972, 1973) and *Mundochthonius* (Muchmore, 1973). While a sensillum was not noted in the holotype of *T. troglobius* (Muchmore, 1969), study of a topotype from Cueva de la Mina reveals its presence on the external surface just distal to the 13th macrodenticle. Such a structure can also be found in most, but not all, other specimens of *Tyrannochthonius* in my possession. Whether its presence and placement on the finger will have any taxonomic significance remains to be seen.



Figs. 1 and 2. *Tyrannochthonius pallidus,* new species, holotype male. 1. Left palp, dorsal view. 2. Part of movable finger of chela (lateral view) showing sensillum near 10th macrodenticle, trichobothrium *sb* at left.

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OPILIONIDS (PHALANGIDA) FROM MEXICAN CAVES

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This study is based on a number of specimens collected over a period of years by Mr. James Reddell and Dr. Robert Mitchell and their associates. These field studies involved work in many caves over the entire country of México. An earlier paper (Goodnight and Goodnight, 1971) based on these collections described new species of the family Phalangodidae. This paper describes species and lists records in both the families Phalangodidae and Cosmetidae.

True cave forms have not been noted among the cosmetids, but because of their tendency to congregate in moist areas, they are often found abundantly in caves.

The holotypes of new species are deposited in the arachnid collections of the American Museum of Natural History in New York City. Paratypes are deposited in the collections of the American Museum and in the collections of The Museum, Texas Tech University, Lubbock, Texas.

SUBORDER LANIATORES THORELL

PHALANGODIDAE SIMON

Phalangodinae Roewer

Karos Goodnight and Goodnight

Karos Goodnight and Goodnight, 1944, Amer. Mus. Novitates, no. 1249, p. 3. Goodnight and Goodnight, 1953, Amer. Mus. Novitates, no. 1610, p. 21. Goodnight and Goodnight, 1971, Assoc. Mex. Cave Stud., Bull. 4, p. 33.

Montabunus Goodnight and Goodnight, 1945, Amer. Mus. Novitates, no. 1281, p. 2.

Monterella Goodnight and Goodnight, 1945, Amer. Mus. Novitates, no. 1281, p. 1.

Chapulobunus Goodnight and Goodnight, 1946, Amer. Mus. Novitates, no. 1210, p. 1.

Potosa Goodnight and Goodnight, 1947. Fieldiana: Zool., vol. 32, No. 1, pp. 8, 9.

Members of the family Phalangodidae with a common eye tubercle, with five dorsal areas on the abdominal scute, the first area without a median line. Lateral margins of dorsal scute with enlarged tubercles in the region of the first or second dorsal areas; similar tubercles may or may not be present at the lateral-posterior borders of the fifth area and free tergites. Dorsal scute and free tergites may be unarmed, have low tubercles, or at times have somewhat enlarged spines in the median area. Eye tubercle removed from the anterior margin of the cephalothorax; it may or may not have spines above the eyes, and is at times very low.

Legs without conspicuous spines or tubercles, tarsi of third and fourth legs without scopulae, and with simple untoothed double claws; distitarsus of tarsus of first leg with two segments, distitarsus of tarsus of second leg with three segments. Tarsus of first leg with four segments, remaining tarsi somewhat variable in number of segments. The metatarsi of the legs are not divided into astragali and calcanea. The maxillary lobe of each second coxa without a ventral projection.

Palpus normal in size, armed with spines; chelicera normal in size.

Secondary sexual characteristics of males not conspicuous, but may be present in the form of enlarged

portions of various segments of the legs or in the shape of the fourth femora.

Genotype. *Karos barbarikos* Goodnight and Goodnight, 1951, from Chapulhuacán, Hidalgo, 10 May 1942.

The complex of species within this genus often show close relationships to one another; but because of their relative geographic isolation, it appears wiser to consider them separate species. We are including here, descriptions of two previously described species.

Karos dybasi (Goodnight and Goodnight)
Figs. 1-2

Potosa dybasi Goodnight and Goodnight, 1947, Fieldiana: Zool., vol. 32, no. 1, pp. 8, 9.

Male—Total length of body, 3.5 mm. Cephalothorax, 1.2 mm. Width of body at widest portion, 2.8 mm.

	I	II	III	IV
Trochanter	0.4mm	0.5mm	0.6mm	0.6mm
Femur	1.4	2.4	1.7	2.4
Patella	0.6	0.8	0.7	1.0
Tibia	1.1	1.9	1.5	2.2
Metatarsus	1.6	1.9	1.9	2.6
Tarsus	0.9	2.0	1.2	1.1
Total	6.0mm	9.5mm	7.7mm	9.9mm

Cephalothorax with scattered tubercles. Eye tubercle removed from the anterior margin of the cephalothorax, with a single median spine, and four small hair-tipped spines behind it. First dorsal area without a median line, boundaries of areas distinct, second and third areas each with a median spine, all areas with hair-tipped tubercles. In the region of the first area, on either side, is a large lateral tubercle; similar, though smaller ones, are located at the disto-lateral border of the fifth area and at the lateral margins of the second and third free tergites. The posterior border of the fifth area and the lateral margins of the dorsal scute are bordered with a row of hair-tipped tubercles. Each free tergite with a row of hair-tipped tubercles.

Ventrally, all surfaces are covered with hair-tipped tubercles. Third coxae with low teeth on both anterior and posterior borders. Second coxae with enlarged tubercles at the distal areas. Fourth coxae, slightly visible from above, and thickly covered with hair-tipped tubercles. Spiracles visible.

All segments of the legs, but the tarsi, roughly tuberculate. First metatarsi with proximal enlargements. Third and fourth femora somewhat curved; third coxae slightly enlarged. Tarsal segments: 4-5-6-6. Distitarsus of first tarsus with two segments, second with three.

Palpus: trochanter, 0.4 mm long, femur, 0.9, patella, 0.6, tibia, 0.7, and tarsus, 0.6. Total length, 3.5 mm. Palpus with spines as illustrated.

Entire body yellowish brown, darker mottlings on cephalothorax and on dorsal areas. Lateral borders of scute somewhat darker, with darker mottlings on the legs and palpus.

Type Locality—Male holotype from Huichihuayán, San Luis Potosí, México, 20 June 1941, H.S. Dybas collector. Holotype in the collection of the Chicago Natural History Museum.

Record—Cueva de El Jobo, 5 km NE Xilitla, San Luis Potosí, México, 18 November 1972, collected by James Reddell and Terry Raines.

Karos unispinosus (Goodnight and Goodnight)
Fig. 3

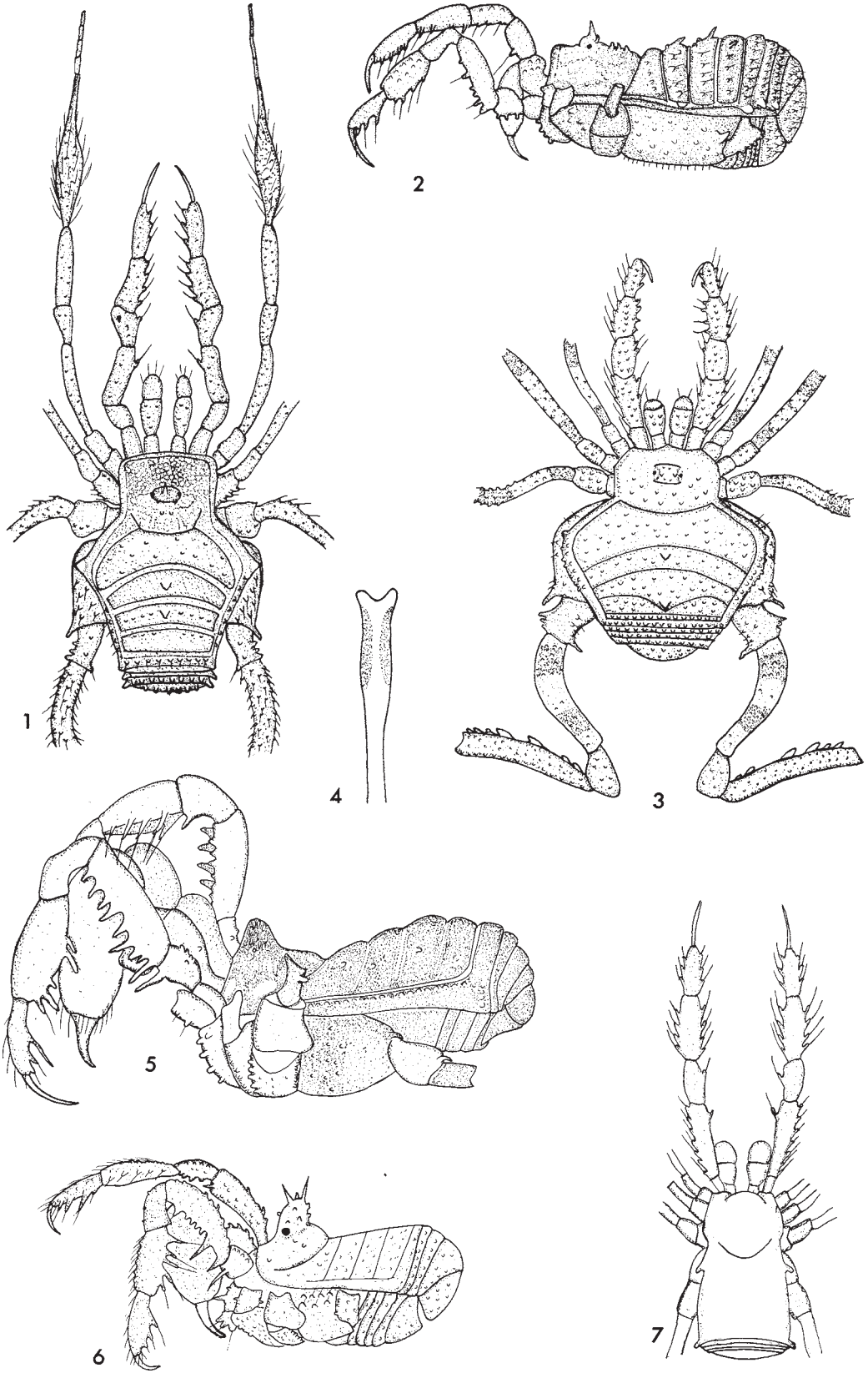
Chapulobunus unispinosus Goodnight and Goodnight, 1946, Amer. Mus. Novitates, no. 1310, pp. 1,2, fig. 6-9.

Male—Total length of body, 5 mm. Cephalothorax, 1.5. Width of body at widest portion, 4.5 mm.

	I	II	III	IV
Trochanter	0.6mm	0.6mm	0.8mm	0.8mm
Femur	2.0	2.8	2.4	3.4
Patella	0.7	1.0	2.4	1.1
Tibia	1.5	2.4	2.2	3.5
Metatarsus	2.8	2.6	2.8	3.8
Tarsus	1.1	1.9	1.3	1.4
Total	8.7mm	11.3mm	10.5mm	14.0mm

Entire surface covered with granulations. The eye tubercle is removed from the anterior surface of the cephalothorax, with dorsal tuberculations and with a very low spine over each eye. Dorsal scute with five clearly defined areas, first without a median line, with a low median spine in the center of the second and third areas. A small lateral tuberculation in the region of the first dorsal area. Free tergites and anal operculum with tuberculations.

Figs. 1-2. *Karos dybasi* (Goodnight and Goodnight). 1. Dorsal view of male; 2. Lateral view of male.
Fig. 3. *Karos unispinosus* (Goodnight and Goodnight). Dorsal view of male.
Figs. 4-5. *Hoplobunus apoalensis,* new species. 4. Male penis; 5. Lateral view of male.
Fig. 6. *Hoplobunus spino-oculorum,* new species. Lateral view of male.
Fig. 7. *Hoplobunus inops* Goodnight and Goodnight. Dorsal view of female.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Ventral surfaces also covered with low tuberculations. All coxae with tuberculations, third coxae, each with anterior and posterior rows of low teeth.

All segments of the legs covered with tuberculations; only exceptions to this are the tarsi. Third femora somewhat curved, fourth femora somewhat enlarged. Fourth tibia with four ventral enlarged tubercles. Tarsal segments: 4-6-6-6. Distitarsus of first tarsus with two segments, second with three.

Palpus: trochanter, 0.4 mm long, femur 1.1, patella, 0.7, tibia, 0.8, and tarsus, 0.6. Total length, 3.6 mm. Palpi armed as in figure, with numerous tuberculations.

Chelicerae not enlarged, first segments with dorsal tuberculations.

Entire body light yellowish brown in color. Trochanters of legs, chelicerae, and palpi somewhat lighter. All femora with proximal and distal shaded areas, lighter in the center, giving a somewhat annulate appearance to the legs.

Type Locality—Female holotype and paratypes from Chapulhuacán, Hidalgo, México, 1100 m, 19 May 1944, collected by C. Bolívar and D. Pelaez.

Record—Male from Chorros de Agua, east of Rayones, 21 km WSW Montemorelos, Nuevo León, México, 19 June 1969, collected by S. and J. Peck.

Hoplobunus Banks

Hoplobunus Banks, 1900, J. New York Ent. Soc., vol. 8, p. 200. Cambridge, 1904, Biologia Centrali-Americana, Arachnids, vol. 2, p. 585. Roewer, 1912, Arch. Naturgesch., vol. 78, sect. A, no. 3, p. 149; 1923, Die Weberknechte der Erde, p. 112. Goodnight and Goodnight, 1942, Amer. Mus. Novitates, no. 1211, p. 1; 1945, Amer. Mus. Novitates, no. 1281, p. 3; 1953, Amer. Mus. Novitates, no. 1610, p. 20; 1967, Amer. Mus. Novitates, no. 2301, p. 1; 1971, Assoc. Mex. Cave Stud. Bull., 4, p. 38.

Phalangodids with a common eye tubercle which is usually slightly removed from the anterior margin of the cephalothorax, variously armed above. Abdominal scute with five areas, the first without a median line. Tarsi of third and fourth legs with untoothed double claws. Femur of first leg normal, not unusually elongate or heavily spined. Tarsus of first leg with five or more segments. Distitarsus of first tarsus with two segments, second with three. Metatarsi not divided into astragali and calcanea. Maxillary lobe of second coxa much reduced without any ventral projection. Robust animal with long heavy legs and with the spiracle widely expanded. Secondary sexual characteristics of the male highly variable.

Genotype. *Hoplobunus barretti,* Banks, from Cuernavaca, Morelos, México.

Hoplobunus apoalensis, new species
Figs. 4-5

Male—Total length of body, 8.7 mm. Cephalothorax, 3 mm. Width of body at widest portion, 5.4 mm.

	I	II	III	IV
Trochanter	1.0mm	1.2mm	1.5mm	0.7mm
Femur	5.0	7.8	6.7	9.0
Patella	1.7	2.1	2.2	2.4
Tibia	4.1	6.6	4.6	6.3
Metatarsus	6.0	13.5	7.8	10.8
Tarsus	2.3	7.6	3.9	4.6
Total	20.6mm	38.8mm	26.7mm	33.8mm

Dorsum quite smooth. Eye tubercle only slightly removed from the anterior margin of the cephalothorax, in the form of a rounded cone, eyes very small, seemingly lacking a retina. Five dorsal areas clearly separated from one another, very small paired tubercles in the median area of the first, third, and fourth areas. A row of tooth-like tubercles on the lateral margins, a few similar tubercles on the posterior lateral margin of the dorsal scute. Free tergites with only a few low tubercles at the posterior borders. Dorsal surfaces of the coxae visible from above, first and second with a few small spines, fourth coxa, each with two small spines, one on the outer surface, one on the inner. Ventral surface smooth, with a few low tubercles on the coxae. First coxae with a few scattered larger ones in addition to the low ones; blunt teeth are arranged along the anterior and posterior surfaces of the third coxae. Fourth coxa, each with a midventral row of low tubercles. Spiracles clearly visible.

Each free sternite with a few scattered tubercles and hairs.

Legs relatively smooth. First trochanter with some tubercles, third trochanters somewhat enlarged, fourth trochanters, each with two small spines. Femora quite straight. Third femora with a small spine on the proximal portion of each one. Fourth femora with a few spines at the distal portion; fourth patella with two distal spines. Tarsal segments 6-15-7-7. Distitarsus of first tarsus with two segments, second with three.

Palpus: trochanter, 1 mm long, femur, 3.6, patella, 2.1, tibia, 3, and tarsus, 2.9. Total length, 12.6 mm. Palpi armed as in figure. Tibia and tarsus armed similarly on both surfaces.

Chelicerae enlarged, with numerous hairs.

Dorsum, free tergites and free sternites quite dark brown, contrasting strongly with the lighter appendages and venter.

Type Locality—Male holotype and male paratype from Cueva de Apoala, Santiago Apoala, 20 km N Asunción Nochixtlán, Oaxaca, México, 2 January 1973. Collected by James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy.

The distinctive form of the eye tubercle and the spination of the palpi distinguish this species from other members of the genus.

Hoplobunus boneti (Goodnight and Goodnight)

Serrobunus boneti Goodnight and Goodnight, 1942, Amer. Mus. Novitates, no. 1211, p. 2, figs. 7-11.
Hoplobunus boneti Goodnight and Goodnight, 1971, Assoc. Mex. Cave Stud. Bull. 4, pp. 38-39, figs. 18-19.

Records—*San Luis Potosí:* Sótano de Coatimundi, 36 km NNE Valles, 2 January 1973, collected by Roy Jameson; Cueva de Tanchipa, 35 km NNE Valles, 10 January 1972, collected by Roy Jameson; Sótano de Matapalma, 20 km N Valles, 30 December 1972, collected by Ronald Fieseler; Sótano de la Tinaja, 11 km NE Valles, 16 March 1972, collected by G.D. Campbell; Cueva (=Sótano) de los Monos, 15 km NE Valles, 30 December 1971, collected by David Honea and Roy Jameson; Sótano de la Pipa, 35 km NNE Valles, 2 January 1973, collected by Frank Binney. *Tamaulipas:* Cueva del Remolino, 8.5 km W Gómez Farías, 19 May 1971, collected by R.W. Mitchell.

Hoplobunus inops Goodnight and Goodnight
Fig. 7

Hoplobunus inops Goodnight and Goodnight, 1971, Assoc. Mex. Cave Stud., Bull. 4, pp. 40-41, fig. 17.

Records—*Tamaulipas:* Sumidero de El Jineo, 1 km NW Gómez Farías, 24 November 1971, collected by T. Raines and L. McNatt; Sótano de Vasquez, 7 km SE Ocampo, 29 December 1972, collected by Roy Jameson and Paul Duncan; Cueva de Tres Manantiales, 23 km NW Limón, 26 November 1971, collected by Steve Bittinger; Cueva de la Capilla, 13.5 km NW Gómez Farías, 14 January 1971, collected by James Reddell, William Elliott, Jerry Cooke, R.W. Mitchell, and Suzanne Wiley. *Oaxaca:* Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, 26 December 1972, collected by James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy, found on wall about 1300 m from the entrance. Inasmuch as there was but a single specimen of this last collection, it appeared wise to place it in this species; possibly additional collections will better clarify its identity. Usually animals from Oaxaca are different from those of northern México.

Hoplobunus oaxacensis, new species
Fig. 8

Male Holotype—Total length of body, 8.2 mm. Cephalothorax, 1.9 mm. Width of body at widest portion, 4.8 mm.

	I	II	III	IV
Trochanter	0.9mm	1.2mm	1.6mm	1.3mm
Femur	4.8	7.6	6.1	9.0
Patella	0.7	1.9	1.9	2.2
Tibia	3.7	6.7	4.5	6.3
Metatarsus	6.2	9.7	7.2	8.5
Tarsus	3.0	7.9	3.4	3.9
Total	19.4mm	33.0mm	24.7mm	31.2

Dorsum quite smooth, somewhat elongate, somewhat more elongate than that of other species of this genus. The eye tubercle is on the anterior margin of the cephalothorax, in the form of a cone with a small spine dorsally. Areas indicated by shallow grooves; each one with a few low tubercles. A row of low tubercles on the lateral and posterior margins of the dorsum, a similar row on the posterior margin of the three free tergites. Ventral surface quite smooth. First coxae, each with a few spine-bearing tubercles on the anterior surfaces; second coxae, each with a row of low spine-bearing tubercles; third coxae, each with a row of low tooth-shaped tubercles on the anterior and posterior surfaces; 4th coxae quite smooth.

Legs relatively smooth, all segments with some hairs. First and second trochanters with a few spine-bearing tubercles on the anterior surfaces. Fourth coxae visible from above, with a few tubercles and a spine at the postero-lateral margin. Fourth femur with several blunt spines on the ventral distal area. Both third and fourth tibiae with low blunt spines at the distal area. Fourth patella with small distal spines at the distal end. Tarsal segments: 7-17-7-7. Distitarsus of first tarsus with two segments, second with three.

Palpus: trochanter, 1.2 mm long, femur, 3, patella, 1.8, tibia, 2.4, and tarsus, 1.8. Total length, 10.2 mm. Palpus armed retrolaterally as in figure; prolaterally, femur without an apical-median spine, tibia and tarsus armed similarly to the retrolateral surface.

Chelicerae: distal segments greatly enlarged.

Dorsum reddish brown with darker markings bordering the areas. Some darker mottlings in the median area of the fifth area and the free tergites, on the palpae, and on the cheliceral segments.

Female—Total length of body, 8.3 mm; cephalothorax, 1.9 mm. Width of body at widest portion, 4.5 mm. Similar to male in appearance, though somewhat darker. Spines of the legs were less pronounced as was the enlargement of the chelicerae. The tarsal segments

of the females examined were 6-15-7-7, differing from the males, whose first tarsi had 7 segments.

Type Locality—Male holotype and female paratypes from Cueva de Llano Grande, 12 km N San Sebastian de las Grutas, 55 km SSE Oaxaca, Oaxaca, México, 16 December 1972, collected by James Reddell, David McKenzie, and Stuart Murphy. Found on walls in darkness throughout cave.

Record—Females from Sótano de los Arboles, 5 km S San Vicente Lachixio, 50 km SSE Oaxaca, Oaxaca, México, 1 January 1973. Collected by David McKenzie, Martha McKenzie, and Stuart Murphy.

H. oaxacensis differs from other members of this genus by the distinctive form of the eye tubercle, its general lack of spination or tuberculation on the dorsum, and the spination of the palpus.

Hoplobunus spino-oculorum, new species
Fig. 6

Male—Total length of body, 3.5 mm. Cephalothorax, 2.1 mm. Width of body at widest portion, 1.2 mm.

	I	II	III	IV
Trochanter	0.4mm	0.4mm	0.7mm	0.6mm
Femur	2.1	3.3	2.3	3.3
Patella	0.7	0.9	0.7	0.8
Tibia	1.8	2.9	1.9	2.4
Metatarsus	2.4	3.6	2.4	2.7
Tarsus	1.3	3.6	1.4	3.3
Total	8.7mm	14.7mm	9.4mm	13.1mm

Cephalothorax with some scattered tuberculations, eye tubercle on the anterior margin, in the form of a rounded cone. The height is greater than the diameter, thus appears much taller than the eye tubercle of other members of this genus. The eyes are at the base, and there are several spines on the surface of the tubercle. The abdominal scute somewhat wider in the region of the fourth coxa, narrowing, then widening again at the posterior margin. The five areas have low tuberculation, though the boundaries are without such tuberculations. First area of dorsal scute without median line; the posterior margin with low granulations. Free tergites with similar, though somewhat larger granulations. Venter covered with low hair-tipped tubercles, a row of toothlike tubercles on both the anterior and posterior surfaces of the third coxae. Free sternites each with a row of low tubercles, spiracles visible.

All segments, but metatarsi and tarsi, of legs with hairs. Fourth coxa visible from above, with some low hair-bearing tubercles on its dorsal surface. Trochanters with some tubercles, most conspicuous on the fourth trochanters. Third trochanters somewhat enlarged. Third and fourth femora, patellae, and tibiae with low hair-bearing tubercles. Metatarsi not divided into astragali and calcanea. Tarsal segments: 5-11-7-6. Distitarsus of first tarsus with 2 segments, of second with 3.

Palpus: trochanter, 0.6 mm long, femur, 1.9, patella, 0.9, tibia, 1.2, and tarsus, 1.2. Total length, 5.8 mm. All surfaces of palpi covered with low tubercles, which are most conspicuous on the trochanters, femora, and patellae. All segments armed as in figure. Chelicerae enlarged, first segment, dorsally with low spine-like tubercles.

Entire animal reddish brown, areas slightly darker, some darker mottling on the palpal segments, all segments of the legs slightly lighter.

Female—Total length of body, 3 mm. Cephalothorax, 1.1 mm. Width of body at widest portion, 2.1 mm.

Similar in appearance to the male, but without the enlarged chelicerae.

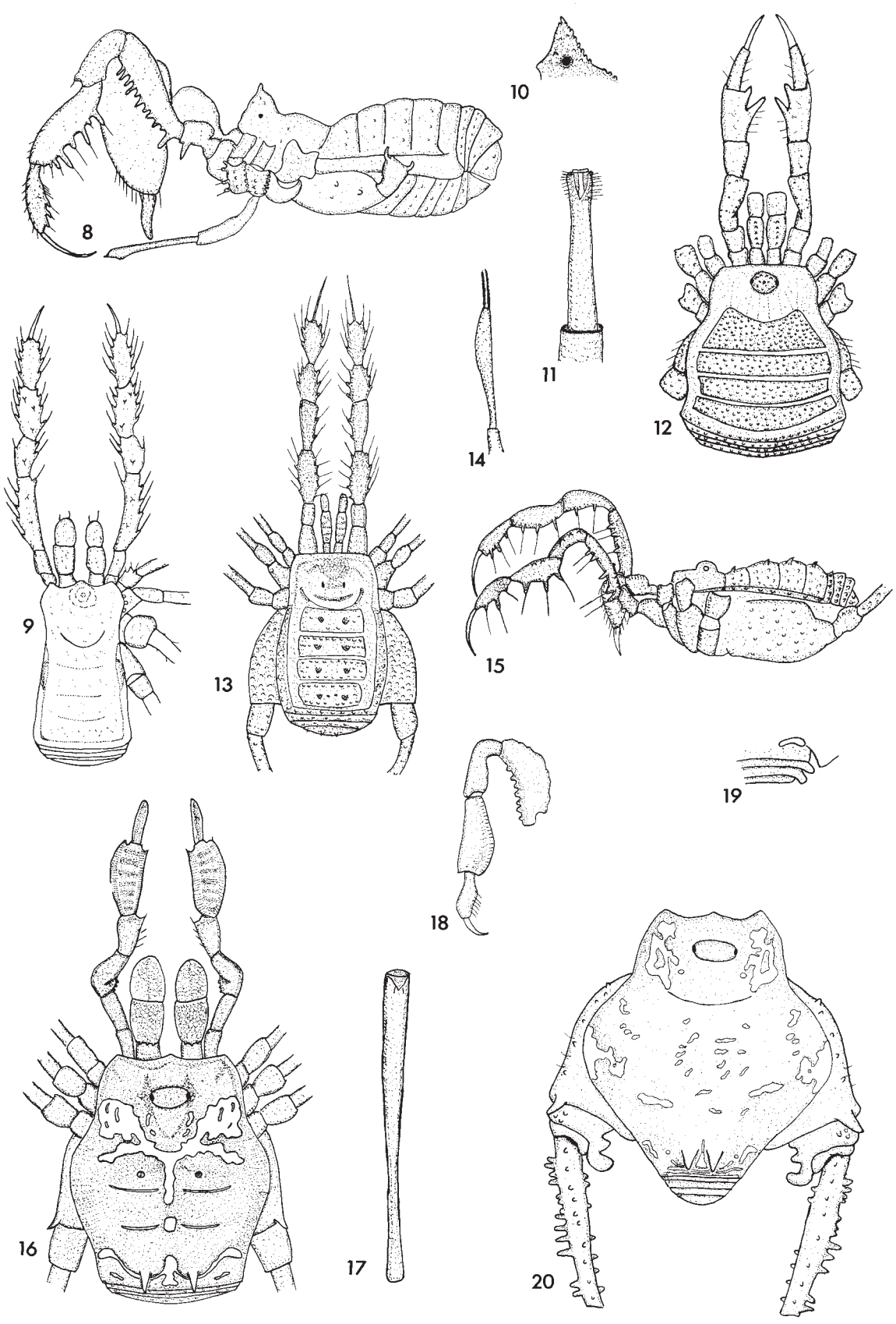
Type Locality—Male holotype and male and female paratypes from Cueva del Guayabo, 12 km NE Valle Nacional, Oaxaca, México, 29 December 1972. Collected by James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy from the floors and walls of the cave in total darkness.

H. spino-oculorum is a very distinctive form with the high eye tubercle with its unusual spination and the spination of the palpal segments.

Hoplobunus planus, new species
Fig. 9

Female Holotype—Total length of body, 2.4 mm. Cephalothorax, 0.9 mm. Width of body at widest portion, 1.6 mm.

→Fig. 8. *Hoplobunus oaxacensis*, new species. Lateral view of male.
→Fig. 9. *Hoplobunus planus*, new species. Dorsal view of female.
→Figs. 10-12. *Paramitraceras granulatus* Cambridge. 10. Lateral view of eye tubercle of male; 11. Male penis; 12. Dorsal view of male.
→Figs. 13-15. *Stygnomma tuberculata*, new species. 13. Dorsal view of male. 14. Metatarsus of third leg of male, illustrating the enlargement of the distal portion; 15. Lateral view of male.
→Fig. 16. *Cynorta guadalupensis*, new species. Dorsal view of male.
→Figs. 17-20. *Paecilaema lucifugum*, new species. 17. Male penis; 18. Lateral view of male palpus; 19. Free sternites, showing position of stigma in relationship to fourth coxa and free sternites; 20. Dorsal view of male.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	I	II	III	IV
Trochanter	0.2mm	0.2mm	0.5mm	0.4mm
Femur	1.8	3.3	2.2	3.3
Patella	0.5	0.7	0.4	0.7
Tibia	1.4	2.9	1.9	2.2
Metatarsus	1.6	2.4	2.0	2.5
Tarsus	1.1	4.1	1.9	2.4
Total	6.6mm	13.6mm	8.9mm	11.5mm

Entire dorsum smooth, with only very fine granulations on the surface. Eye tubercle on the anterior margin, rounded above, without eyes. Posterior boundaries of the cephalothorax and the dorsal areas poorly defined. No tubercles or spines on the dorsum, with small lateral enlargements in the region of the fourth coxae. Venter likewise smooth. Free sternites and anal operculum each with a few scattered tubercles. Spiracles clearly visible.

Legs quite smooth, with occasional scattered hairs. First coxae, each with four small tubercles on the anterior surface, a row of small tubercles on the anterior margin of each of the second coxae. First tarsal segments of the third and fourth tarsi unusually elongate. Tarsal segments: 5-10-6-6. Distitarsus of first tarsus with 2 segments, second with three.

Palpus: trochanter, 0.2 mm long, femur 0.9, patella, 0.5, tibia, 0.8, and tarsus, 0.7. Total length, 3.2 mm. Palpus armed as in figure. Chelicera with a few hairs and some very low granulations.

Entire body and appendages a uniform light yellow.

Type Locality—Female holotype from Cueva de San Nicolas, 10 km SW Aquismón, San Luis Potosí, México, 16 July 1968, collected by John Fish, Dwight Deal, and Duane Faith.

H. planus most nearly resembles *H. inops* Goodnight and Goodnight, but differs in the form of the lateral tubercle on the dorsum and in the number of tarsal segments.

Hoplobunus robustus Goodnight and Goodnight

Hoplobunus robustus Goodnight and Goodnight, 1971. Assoc. Mex. Cave Stud., Bull. 4, p. 42, fig. 21.

Records—*Veracruz:* Cueva de la Cascada, 1 km SW Tequila, 6 August 1967, collected by James Reddell, John Fish, and T.R. Evans. Cueva del Ojo de Agua Grande (=Cueva del Nacimiento Grande), 10 km N Potrero Viejo, 22 August 1965, collected by James Reddell, John Fish, and T.R. Evans.

Paramitraceras Cambridge

Paramitraceras Cambridge, 1904, Biologia Centrali-Americana, Arachnida, vol. 2, p. 575. Roewer, 1912, Arch. Naturgesch., vol. 78, sect. A, no. 3, p. 155 (in part); 1923, Die Weberknechte der Erde, p. 117. Goodnight and Goodnight, 1953, Amer. Mus. Novitates, no. 1610, p. 23.

Panzosus Roewer, 1949, Senckenbergiana, vol. 30, nos. 1-3, p. 12.

Solola Roewer, 1949, Senckenbergiana, vol. 30, nos. 1-3, p. 30.

Phalangodids with a common eye tubercle located on the anterior margin of the cephalothorax. Eye tubercle in the form of a forward-slanting, pointed cone. Abdominal scute with five areas, the first without a median line. On each side of the first area there is a small lateral enlargement. Tarsi of third and fourth legs without scopulae and with untoothed claws. Femur of first leg not enlarged. Tarsus of first leg with three or four segments. Distitarsus of first tarsus with two segments; second also with two. Metatarsi of legs not divided into calcanea and astragali. Maxillary lobes of second coxae without ventral projections. Chelicerae enlarged, palpi usually heavy, with little ventral spination. Secondary sexual characters of the male usually seen in the heavier chelicerae.

Genotype: *Paramitraceras granulatus* Cambridge.

Paramitraceras granulatus Cambridge
Figs. 10-12

Paramitraceras granulatus Cambridge, 1904, Biologia Centrali-Americana, Arachnida, vol. 2, p. 575, pl. 54, figs. 3, 3a, 3b. Roewer, 1912, Arch. Naturgesch., vol. 78, sect. A, no. 3, p. 155; 1923, Die Weberknechte der Erde, p. 117, fig. 117. Goodnight and Goodnight, 1944, Amer. Mus. Novitates, no. 1249, pp. 6, 7, figs. 10-12; 1953, Amer. Mus. Novitates, no. 1610, pp. 23-24, figs. 11, 12.

Paramitraceras chichivaca Goodnight and Goodnight, 1947, Fieldiana: Zool., vol. 32, no. 1, pp. 5-6, fig. 2.

Panzosus hispidulus Roewer, 1939, Senckenbergiana, vol. 30, nos. 1-3, p. 12, pl. 1, figs. 3a-f.

Solola robusta Roewer, 1939, Senckenbergiana, vol. 30, nos. 1-3, p. 30, pl 6, figs. 45a-d.

Male—Total length of body, 4.4 mm. Cephalothorax, 0.8 mm. Width of body at widest point, 3.1 mm.

	I	II	III	IV
Trochanter	0.4mm	0.6mm	0.6mm	0.6mm
Femur	2.0	2.9	2.4	3.2
Patella	0.7	1.1	0.8	1.0
Tibia	1.4	2.7	2.0	2.7
Metatarsus	1.7	2.8	2.4	3.2
Tarsus	0.7	1.8	1.1	1.3
Total	6.9mm	11.9mm	9.3mm	12.0mm

Cephalothorax quite smooth, eye tubercle slightly removed from the anterior margin (see illustration), with many tubercles. The small median spine has tubercles at the base. Dorsal areas, free tergites, and anal operculum thickly covered with tubercles. Boundaries of dorsal areas parallel, first area without a median line. Dorsum strongly arched. All surfaces of the venter with low tubercles, many of which are hair-tipped. First coxae, each with a row of larger tubercles in the median area, third coxae, each with anterior and posterior rows of tooth-like tubercles. Spiracles visible at junction of fourth coxae and first free sternites, several enlarged tubercles at the posterior border.

Legs having all segments but the tarsi with hair-tipped tubercles. Third and fourth femora slightly curved. Tarsal segments: 3-4-5-5. Distitarsi of both first and second tarsi with two segments.

Palpus: trochanter, 0.4 mm long; femur, 1.2; patella, 0.7; tibia, 1; and tarsus, 0.7. Total length, 4 mm. Palpus armed as in illustration. Tibia dorso-ventrally flattened.

Chelicerae with many hairs, otherwise smooth. Median dorsal portion of first segment with a row of tubercles.

Entire animal reddish-yellow in color, appendages somewhat lighter than the dorsum.

Record—Cueva del Guayabo, 12 km N Valle Nacional, Oaxaca, México, 29 December 1972, collected by James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy.

This record represents a new locality for this highly variable animal; former collections from Guatemala, Chiapas, and Tabasco have illustrated the wide range of variations of this widely distributed form.

Pellobunus mexicanus Goodnight and Goodnight

Pellobunus mexicanus Goodnight and Goodnight, 1971, Assoc. Mex. Cave Stud., Bull. 4, p. 44, figs. 14-16.

Records—Sótano Encantado, 3 km W La Ciénega, 20 km NNE Pinal de Amoles, Querétaro, México, 2 June 1972, collected by Ron Ralph.

Stygnomma Roewer Emend. Goodnight

Phalangodes Packard, 1888, Mem. Natl. Acad. Sci. Washington, vol. 4, p. 52 (in part).

Scotolemon Banks, 1901, Amer. Nat., vol. 35, p. 671 (in part).

Neoscotolemon Roewer, 1912, Arch. Naturgesch., vol. 78, sect. A, no. 3, p. 139 (in part); 1923, Die Weberknechte der Erde, pp. 112-113.

Stygnomma Roewer, 1912, Mem. Soc. Sci. Nat. Neuchatel, vol. 5, p. 155; 1923, Die Weberknechte der Erde, p. 144. Petrunkevitch, 1925, Trans. Connecticut Acad. Arts Sci., vol. 17, pp. 62-63. Goodnight and Goodnight, 1951, Amer. Mus. Novitates, no. 1491, p. 3; 1953, Amer. Mus. Novitates, no. 1610, pp. 30-31.

Zygobunus Chamberlin, 1924, Bull. Mus. Comp. Zool., vol. 62, p. 245. Roewer, 1927, Abhandl. Naturwiss. Ver. Bremen, vol. 26, pp. 545-546. Goodnight and Goodnight, 1942, Amer. Mus. Novitates, no. 1198, p. 4.

Stygnommatiplus Roewer, 1927, Abhandl. Ver. Naturwiss. Bremen, vol. 26, p. 543.

Poascola Roewer, 1922, Ann. Naturhist. Mus. Wien, vol. 46, p. 281.

Antagona Goodnight and Goodnight, 1942, Amer. Mus. Novitates, no. 1184, p. 6.

Citranus Goodnight and Goodnight, 1942, Amer. Mus. Novitates, no. 1188, p. 4.

Rula Goodnight and Goodnight, 1942, Amer. Mus. Novitates, no. 1188, p. 13; 1945, Ciencia, vol. 6, no. 1, pp. 62-63.

Flaccus Goodnight and Goodnight, 1937, Fieldiana: Zool., vol. 32, no. 1, pp. 9-10.

Stygnommatidae Mello Leitao, 1949, Bol. Mus. Nac. Rio de Janeiro, no. 94, p. 5.

Members of the family Phalangodidae without a common eye tubercle and with five dorsal areas on the abdominal scute, the first without a median line. Tarsi of third and fourth legs without scopulae and with simple untoothed claws. Femur of first leg normal. Distitarsus of first tarsus with two segments; second with two or three. Metatarsi not divided into astragali and calcanea. Palpus and chelicera somewhat enlarged, varying with individual species. Maxillary lobe of second coxa without a ventral projection. Secondary sexual characters of the male appear as increased spination of the palpus and chelicera and in the enlargement of some portion of the metatarsus of the third leg.

Genotype: *Stygnomma fuhrmanni* Roewer from Colombia.

Stygnomma tuberculata, new species
Figs. 13-15

Male Holotype—Total length of body 2 mm. Cephalothorax, 0.6 mm. Width of body at widest portion, 1.1 mm. Width of body, including expanded fourth coxae, 1.7 mm.

	I	II	III	IV
Trochanter	0.2mm	0.2mm	0.2mm	0.3mm
Femur	0.9	1.4	1.3	1.7
Patella	0.4	0.4	0.4	0.5
Tibia	0.7	1.4	1.1	1.5
Metatarsus	1.0	1.6	1.5	2.1
Tarsus	0.7	1.3	0.9	1.0
Total	3.9mm	6.3mm	5.4mm	7.1mm

Small animals, eyes separated, not on a common eye tubercle on the cephalothorax. All dorsal surfaces, including that of the fourth coxae, covered with tubercles. Five dorsal areas distinct, boundaries parallel, first four areas with many tubercles, the central pairs of these tubercles are somewhat larger on the first four dorsal areas. Free tergites, each, with an enlarged row of tubercles along the individual posterior borders. All ventral surfaces with tuberculations. Spiracle concealed by the 4th coxae, which are much widened laterally.

All segments of the legs, except the metatarsi and tarsi, with low tuberculations. Third metatarsi with distal portion somewhat enlarged. Tarsal segments: 4-6-5-5. Distitarsus of first tarsus with two segments, second with three.

Palpus: trochanter, 0.2 mm long; femur, 0.6; patella, 0.4; tibia, 0.4; and tarsus, 0.4. Total length, 2.0 mm. Palpi armed as in figure. The proximal ventral spines of the femora are median in position. Chelicerae normal in size.

Entire body of animal light yellowish brown, tubercles somewhat darker. Chelicerae very light in color, palpi dorsally with some darker mottling. Venter lighter, some darker mottlings on the cephalothorax.

Type Locality—Male holotype from Cueva de los Cuarteles, 10 km SW Aldama, Tamaulipas, México, 23 December 1972, collected by James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy.

S. tuberculata is most closely related to *S. annulipes* Goodnight and Goodnight, but lacks the typical banding of the legs and possesses a different number of tarsal segments.

COSMETIDAE SIMON

Cosmetinae Cambridge

Cynorta C. L. Koch

Cosmetus Perty, 1833, Delectus animalium articulatorum, fasc. 3, pp. 203-308 (in part). Gervais, 1844, *in* Walckenaer, C.A. and F.L.P. Gervais, Histoire naturelle des insectes, apteres, vol. 3, p. 115 (in part).

Cynorta C.L. Koch, 1839, Ubers Arachniden, vol. 2, p. 2; 1839, *in* Hahn, C.W. and C.L. Koch, Die Arachniden, vol. 7, pp. 100-102. Cambridge, 1904, Biologia Centrali-Americana, Arachnida, vol. 2, p. 557. Roewer, 1912, Arch. Naturgesch., vol. 78, sect. A, no. 10, p. 31; 1923, Die Weberknechte der Erde, p. 310; 1926, Abhandl. Naturwiss. Ver. Bremen, vol. 16, p. 555; 1928, Abhandl. Naturwiss. Ver. Bremen, vol. 16, p. 570. Goodnight and Goodnight, 1953, Amer. Mus. Novitates, no. 1610, pp. 37-38.

The above is a much abbreviated synonymy of this genus. In 1953 Goodnight and Goodnight synonymized many of the Mexican genera into the single genus *Cynorta*. This lengthy synonymy is in that publication.

Members of the genus *Cynorta* have simple untoothed double claws on the third and fourth tarsi, with but six segments in the first tarsus. Distitarsi of both first and second tarsi with three segments. Dorsum with five areas, variously armed with tubercles and spines, without a median large spine on the third area.

Genotype: *Cynorta conspersa* (Perty)

Cynorta jamesoni, new species

Figs. 23-24

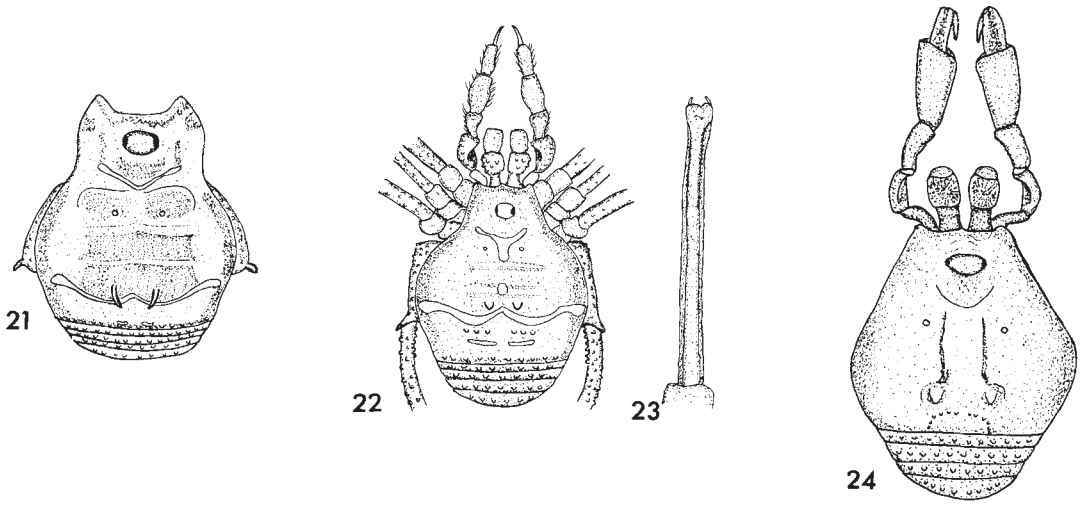
Male—Total length of body, 6 mm. Cephalothorax, 1.7 mm. Width of body at widest point, 4.3 mm.

	I	II	III	IV
Trochanter	0.6mm	0.6mm	0.7mm	0.8mm
Femur	4.0	10.2	6.9	8.8
Patella	1.1	1.7	1.8	1.9
Tibia	2.9	8.1	4.0	6.0
Metatarsus	5.3	11.4	6.3	8.8
Tarsus	2.5	6.3	3.2	3.6
Total	16.4mm	38.3mm	22.9mm	29.9mm

Cephalothorax smooth, eye tubercle removed from the anterior margin, each eye with a single small tubercle above it. Dorsal scute smooth, first area with paired tubercles, third with paired spines. Each free tergite with a row of inconspicuous tubercles along the posterior margin. Ventral surface likewise smooth, first coxae, each with two rows of tubercles on the anterior border; third coxae, each with a row of tooth-shaped tubercles on both anterior and posterior margins, but confined to the lateral areas. Each free sternite with a few small hair-tipped tubercles at the posterior border. Stigma visible between the fourth coxae and first free sternites.

Male penis, a slender chitinized shaft with a slightly enlarged tip which appears not to be sclerotized, but with a few bristle-like hairs.

Legs quite elongate and slender. Femur, patella,



Figs. 21-22. *Vonones ornata* (Wood). 21. Male from 7 km NW Gómez Farías; 22. Female from Gómez Farías.
Figs. 23-24. *Cynorta jamesoni,* new species. 23. Male penis; 24. Dorsal view of male.

and tibia, all with some tuberculations which are quite similar on all legs.

Palpus: trochanter, 0.6 mm long; femur, 1.9; patella, 0.9; tibia, 1.6; and tarsus, 0.8. Total length, 5.8 mm. Chelicerae not enlarged.

Entire animal, including legs, reddish brown, with darker mottlings on lateral borders, central areas, and over and behind the eye tubercle. Legs with some darker markings, palpi with darker areas on the lateral margins, particularly conspicuous on the femur and tibia.

Type Locality—Male holotype from Sótano de la Estrella, 36 km NNE Valles, San Luis Potosí, México, 3 January 1973, collected by Roy Jameson.

Paratypes—*San Luis Potosí:* Sótano de la Cuesta, 36 km NNE Valles, 4 January 1973, collected by Roy Jameson; Sótano de Puerto de los Lobos, 2 km S San Francisco, 16 km W Sta. Catarina, 14 September 1968, collected by William Elliott; *Tamaulipas:* Sótano de Vasquez, 7 km SE Ocampo, 29 December 1972, collected by Roy Jameson and Paul Duncan; Grutas de El Puente, 17 km SE Ocampo, 13 July 1967; Cueva de la Florida, 16 km SSW Mante, 28 May 1968, collected by James Reddell in the Right Hand Passage; Cueva de El Pachón, 18 km SSW Mante, collected 8 June 1967 by Rick Remington and 6 June 1967 by R.W. Mitchell; Cueva de la Mina, 7 km NW Gómez Farías, 14 March 1972, collected by G.D. Campbell.

This species is not very distinctive in its characteristics, yet differs from other Cynortas in the form of the palpus, the tarsal numbers, and the general configuration of the body. Further collections may require a reevaluation of this species; but it appears to be quite widespread and somewhat variable as to shade of brown, degree of tuberculation on the free tergites and dorsum, and in general appearance.

Cynorta guadalupensis, new species
Fig. 16

Male—Total length of body, 5.9 mm. Cephalothorax, 2.1 mm. Width of body at widest portion, 4.8 mm.

	I	II	III	IV
Trochanter	0.6mm	0.8mm	1.0mm	1.2mm
Femur	3.8	7.9	5.6	7.8
Patella	1.2	1.4	1.7	1.9
Tibia	1.6	6.1	3.6	4.8
Metatarsus	4.4	8.4	3.3	7.5
Tarsus	2.7	6.0	3.6	4.2
Total	14.3mm	30.6mm	18.8mm	27.4mm

Dorsum smooth, eye tubercle low, centrally located on the cephalothorax. Dorsal areas clearly visible. Median paired tubercles on the first area, median paired spines on the third. Free tergites with low tubercles on their posterior margins. Ventral surfaces smooth, with scattered hairs. Free sternites with scattered hairs.

Legs all quite similar in appearance; all segments but the metatarsi and tarsi with hair-bearing tubercles.

Palpus: trochanter, 0.9 mm long; femur, 1.8; patella, 1.2; tibia, 1.8; and tarsus, 1.2. Total length, 6.9 mm. Palpi typically flattened femur and tibia. Ventral border of femur with low tooth-like projections. Chelicerae normal in size.

Dorsum dark brownish-red, with white markings as indicated in drawing. Black net-like markings present on the lateral border of the dorsal scute. Chelice-

ral and palpal segments also with black mottlings. Cephalothorax with some darker mottlings. Legs somewhat lighter than the dorsum.

Type Locality—Male holotype from Pozo de Guadalupe, 10.5 km WSW Aquismón, San Luis Potosí, México, 24 November 1972. Collected by James Reddell, Terry Raines, and Eraclio Gonzales from a wall of the overhang above a spring-fed well.

Though related to *Cynorta triangulata* Goodnight and Goodnight, this species has a distinctive dorsal color pattern and tarsal number.

Paecilaema C.L. Koch

Cosmetus Perty, 1833, Delectus animalium articulatorum, fasc. 3, pp. 303, 304 (in part). C.L. Koch, 1839, *in* Hahn, C.W. and C.L. Koch, Die Arachniden, vol. 7, pp. 109-111.

Flirtea (in part) plus *Paecilaema* C.L. Koch, 1839, Ubers Arachniden, vol. 2, pp. 20, 21; 1839, *in* Hahn, C.W. and C.L. Koch, Die Arachniden, vol. 7, pp. 97, 103. Roewer, 1923, Die Weberknechte der Erde, p. 364.

Poecilaema L. Agassiz, 1846, Nomenclator zoologicus, Arachnida, p. 11. Plus *Cynorta* Simon, 1879, Ann. Soc. Ent. Belgique, vol. 22, pp. 191, 200 (in part).

Ortonio Wood, 1869, Trans. Amer. Phil. Soc., vol. 13, no. 2, p. 438.

Erginus Simon, 1879, Ann. Soc. Ent. Belgique, vol. 22, p. 207, 208 (in part).

Cosmetellus Roewer, 1928, Abhandl. Naturwiss. Ver. Bremen, vol. 26, p. 627.

Zarax Sorensen, 1932, K. Danske Vidensk. Selsk, Skr. vol. 29, p. 322 (in part).

Parahauculus Roewer, 1933, Ann. Naturhist. Mus. Wien, vol. 46, p. 291.

Soaresella Goodnight and Goodnight, 1947, Amer. Mus. Novitates, no. 1340, p. 10.

Zaraxes Roewer, 1947, Senckenbergiana, vol. 28, nos. 1-3, p. 32.

Cosmetiplus Roewer, 1947, Senckenbergiana, vol. 28, nos. 1-3, p. 32.

Paecilaema Goodnight and Goodnight, 1953, Amer. Mus. Novitates, no. 1610, p. 55.

Because of the length of the synonymy for this genus, this represents an abbreviated listing. The entire synonymy is in Goodnight and Goodnight, 1953.

Cosmetids with simple untoothed claws on the third and fourth legs, with more than six segments in the tarsus of the first leg. Distitarsi of both first and second tarsi with three segments. Dorsum with five areas, variously armed with tubercles and spines. Secondary sexual characteristics of the male usually present as increased spination of the femur of the fourth leg.

Genotype: *Paecilaema U-flavum* (Perty).

Paecilaema lucifugum, new species
Figs. 17-20

Male—Total length of body, 7.8 mm. Cephalothorax, 2.7 mm. Width of body at widest portion, 6.6 mm.

	I	II	III	IV
Trochanter	0.7mm	0.7mm	0.9mm	1.6mm
Femur	2.7	5.7	4.6	5.5
Patella	1.1	1.4	1.4	1.9
Tibia	1.8	4.2	2.8	4.5
Metatarsus	2.6	4.8	4.1	6.2
Tarsus	1.9	3.9	1.3	2.7
Total	10.8mm	20.7mm	15.1mm	22.4mm

Dorsum widely flared, fourth coxae clearly visible from above. Eye tubercle located in the median portion of the cephalothorax, without dorsal spines. Areas not clearly defined, but very small tubercles in median section of first area; paired spines on fourth area. Dorsal surface relatively smooth. Venter with some small granulations and hairs. First and second free tergites each with a small lateral extension as illustrated.

Legs having all segments with scattered tubercles and hairs. Fourth legs enlarged, with spines and tubercles on fourth femur, patella, and tibia. These are smaller on the patella and tibia. Fourth trochanter with inner heavy spines; fourth coxae with dorsolateral spine. Tarsal segments: 7-11-7-8. Distitarsi of both first and second tarsi, three in number.

Palpus: trochanter, 0.8 mm long; femur, 1.3; patella, 1; tibia, 1.3; and tarsus, 0.8. Total length, 5.2 mm. All segments clothed with small hairs and scattered tuberculations. Chelicerae normal in size.

Entire dorsum reddish brown, darker markings on spines and at lateral borders. A complex white pattern is present on the cephalothorax and the lateral and posterior borders of the dorsum. Scattered yellowish markings also are present in the median area. The first three pairs of legs are somewhat lighter than the dorsum, while the fourth pair are somewhat darker.

Type Locality—Male holotype from 8 km NW Paraje Nuevo, Veracruz, México, 3 August 1967, collected by J. Reddell and J. Fish.

Vonones Simon

Gonyleptes Say, 1821, Jour. Acad. Nat. Sci. Philadelphia, vol. 2, p. 68. Wood, 1870, Proc. Essex Inst.,

vol. 6, p. 37.

Vonones Simon, 1879, Ann. Soc. Ent. Belgique, vol. 11, p. 212. Banks, 1909, Proc. Acad. Nat. Sci. Philadelphia, vol. 61, p. 228; 1909, Rept. Exp. Sta. Cuba, vol. 1, p. 170. Roewer, 1912, Arch. Naturgesch., vol. 78, sect. A, no. 10, p. 22; 1923, Die Weberknechte der Erde, p. 302. Goodnight and Goodnight, 1953, Amer. Mus. Novitates, no. 1610, pp. 59-60.

Inasmuch as there is a very long synonymy for this genus, only a portion has been used here. For a complete synonymy, please see Goodnight and Goodnight, 1953.

Cosmetids with simple untoothed double claws on the third and fourth legs, with five segments in the first tarsus. Distitarsi of both first and second tarsi with three segments. Dorsum with five areas, variously armed with tubercles and spines, without a large median spine on the third area.

Genotype: *Vonones octotuberculatus* Simon.

Vonones ornata (Wood)
Figs. 21-22

Gonyleptes ornatus Wood, 1870, P. Essex Inst., vol. 6, Comm., p. 37.

Cynorta sayi Simon, 1879, Ann. Soc. Ent. Belgique, vol. 22, p. 200.

Cosmetus albolineatus Soerensen, 1884, Naturh. Tidsskr., ser. 3, vol. 13, p. 591.

Cynorta sayi Weed, 1893, Trans. Amer. Ent. Soc., vol. 20, p. 295. Banks, 1900, Proc. Acad. Philadelphia, p. 541; 1901, Amer. Natural., vol. 35, p. 671.

Vonones modestus Banks, 1909, Rep. Exp. Sta. Cuba, vol. 2, p. 171.

Libitioides ornata Roewer, 1912, Arch. Naturg., vol. 78, sect. A, fasc. 10, p. 15; 1923, Die Weberknechte der Erde, p. 196, fig. 317.

Vonones ornata Goodnight and Goodnight, 1953, Systematic Zoology, vol. 2, no. 4, p. 179; 1958, Indiana Acad. Sci., vol. 67, p. 322.

Male—Total length of body, 3.9 mm. Cephalothorax, 1.6 mm. Width of body at widest point, 3.3 mm.

	I	II	III	IV
Trochanter	0.2mm	0.3mm	0.2mm	0.3mm
Femur	1.1	2.2	2.2	2.0
Patella	0.4	0.6	0.6	0.8
Tibia	0.8	1.8	1.8	1.6
Metatarsus	1.1	2.2	2.2	2.4
Tarsus	0.8	2.0	2.0	1.0
Total	4.4mm	9.1mm	9.0mm	8.1mm

Entire dorsum covered with fine granulations which are larger at the posterior portion of the dorsal scute, the free tergites and the free sternites. Eye tubercle removed from the anterior margin of the cephalothorax. Five areas of the dorsal scute clearly defined; with very low paired tubercles on the first area, low spine on the third area, and a row of small tubercles in the median portion of the fourth area. Ventrally the surfaces are finely granulate. The anterior-lateral surface of the fourth coxae each bear a group of small tubercles.

All segments of the legs but the tarsi with granulations. Third and fourth femora somewhat curved. Tarsal segments: 5-10-7-7. Distitarsi of both first and second tarsi with three segments.

Palpus: trochanter, 0.2 mm long; femur, 0.7; patella, 0.4; tibia, 0.7; and tarsus, 0.3. Total length, 2.3 mm. Palpus characteristically flattened; first segment of chelicera dorsally with tuberculations.

General all over coloration of the body is reddish brown, white markings as in illustrations. Some darker mottling is present along the lateral and posterior margins. Legs somewhat darker at distal ends. Palpi slightly lighter than dorsum.

Female—Total length of body, 3.7 mm. Cephalothorax, 0.9; width of body at widest portion, 2.5 mm.

Similar to male, but with somewhat smaller spines on the third area; and in the specimen illustrated, the fourth femora were somewhat squared off at their anterior borders.

Records—*Tamaulipas:* 7 km NW Gómez Farías, 10 January 1971, collected by J. Reddell and S. Wiley; road cut near Gómez Farías, 15 March 1972, collected by R.W. Mitchell; 4 km N Joya de Salas, January 1972, collected by W. Russell; *Nuevo León:* 6 km SW Bustamante, 20 February 1972, collected by James Reddell; Redondo, 40 km S Monterrey, September 1971, collected by P. Strickland and D. Honea.

Members of this species are found in many localities, from Florida, the gulf states, and Texas, and into México. In this large area, the individuals illustrate a wide range of variations, presenting the difficult problem of what constitutes a valid variation or a new species! We have preferred a more conservative approach and have included illustrations of the variations we have recognized. For a more detailed discussion of this problem, please consult Goodnight and Goodnight, 1953a.

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Goodnight, Clarence J., and Marie L. Goodnight. 1953. The opilionid fauna of Chiapas, Mexico and adjacent areas (Arachnoidea, Opiliones). Amer. Mus. Novitates, no. 1610, 81 pp.

Goodnight, Clarence J., and Marie L. Goodnight. 1953a. Taxonomic recognition of variation in Opiliones. Systematic Zoology, 1(4):174-180.

Goodnight, Clarence J., and Marie L. Goodnight. 1971. Opilionids (Phalangida) of the Family Phalangodidae from Mexican caves. Assoc. Mexican Cave Stud. Bull., 4:33-45.

A REVIEW OF THE CAVERNICOLOUS CATOPINAE (COLEOPTERA; LEIODIDAE) OF MEXICO, BELIZE, AND GUATEMALA

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INTRODUCTION

The Leiodid subfamily Catopinae contains a significant percentage of the cave beetle fauna of the World. This is especially true in Eurasia where the tribe Bathysciini, containing 883 species and subspecies (581 species) has 711 of these species and subspecies as troglobites (Lanyrie, 1967). This tribe does not occur in North and Central American caves. Rather, the tribes Ptomaphagini and Nemadini are found in caves in this geographic region, with only Ptomaphagini containing troglobites; and this being the comparatively low number of 16 species.

The purpose of this paper is to bring together all published and new records of Catopinae from caves in México, Belize (British Honduras), and Guatemala. No cave records are known for Catopinae in the rest of Central America. Most of these records are based on my own collections, or materials assembled by various AMCS members. In addition to the cave records I give records for some of the species from epigean habitats to document this aspect of their biology.

Without exception in the geographic region under consideration, the family and subfamily is easily recognized by the antennae with segment 8 being smaller than segments 7 and 9 (Figs. 1 and 2). The other large subfamily of Leiodidae, Leiodinae, is not known from caves in North or Central America, but since one species, *Aglyptinus dimorphicus,* makes up an important part of the guano fauna of caves in Jamaica (Peck, 1972) it may yet appear with further collecting in México or Central America.

At present all specimens except the types are being held in the author's collection. As additional specimens become available through additional collecting, representatives will be placed in the same collections that have received material from me previously. See Peck (1973) for a list of these repositories.

METHODS

Dissections of specimens were made from alcohol or Barber's Fluid preserved material. Drawings were prepared using an ocular grid and squared paper, with the genital pieces held immobile in a dish under a cover slip under alcohol. The scanning electron microscope photomicrographs were made from carbon-gold coated specimens at low Kv (1.5-3.7) (Howden and Ling, 1973).

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graphs. My wife, Jarmila, helped with the field work and figures. Field work and other support has been provided by a Canadian National Research Council operating grant for 1971 and 1972 and the President's Research Grant of Carleton University for 1972-1973.

KEY TO GENERA

The following key is designed to work only for the geographic region under consideration, and has been adapted from Peck (1973).

1a. Apex of hind tibia with two long ventral spurs and an outer fringe of many short and equal spinules (Fig. 3). Pronotum with transverse striae. Tribe Ptomaphagini 2

1b. Apex of hind tibia with two long ventral spurs and four (generally) shorter dorsal spurs (Fig. 4). Pronotum without transverse striae. Tribe Nemadini . . . . . Genus *Dissochaetus*

2a. Front tibia with distinct comb of short spines on outer margin as well as on apex (Fig. 5). Mesepimeron narrow (Fig. 7) . . . . . Genus *Proptomaphaginus*

2b. Front tibia with comb of short spines only on apex (Fig. 6). Mesepimeron broad (Fig. 8). . . . . Genus *Ptomaphagus*

Genus *Proptomaphaginus* Szymczakowski

Diagnosis—Mesothoracic epimeron (Fig. 7) clearly transverse. Male protarsi not expanded. Flattened protibia with row of short equal spines along outer margin (Fig. 5).

These features are illustrated in Szymczakowski (1969a) and Peck (1973). A diagnostic character previously used, a bilobed aedeagal apex, with the orifice on the ventral surface (Peck, 1970) no longer holds for the genus with the inclusion of the following species, which has a dorsal orifice cutting the right side of the aedeagus. This last feature more closely resembles that of some *Ptomaphaginus.*

Only three described species are known in this genus, one from Puerto Rico and two from Cuba (Szymczakowski, 1969a, and Peck, 1970). An undescribed species occurs in the Dominican Republic (personal data). One and one half months of intensive field work in Jamaica has been unable to find the genus there (personal data). The species described below is the only known representative of the genus from the continental mainland, and is probably a relict of a former mainland distribution of the genus.

Proptomaphaginus microps, new species

Holotype male and allotype female in Museum Comparative Zoology, Harvard University. Type locality: Cueva del Salitre, Xilitla, San Luis Potosí, México, 710 m elev. Type data: 20 July 1969, S. & J. Peck. Paratypes: two males and two females with same data, and one male, Sótano de Guadalupe, 10.5 km WSW Aquismón, San Luis Potosí, México, 24 November 1972, T. Raines; all in author's collection.

Diagnosis—The small eyes, long wings, characters of the aedeagus and spermatheca, and occurrence in México clearly separate this species from all others in the genus.

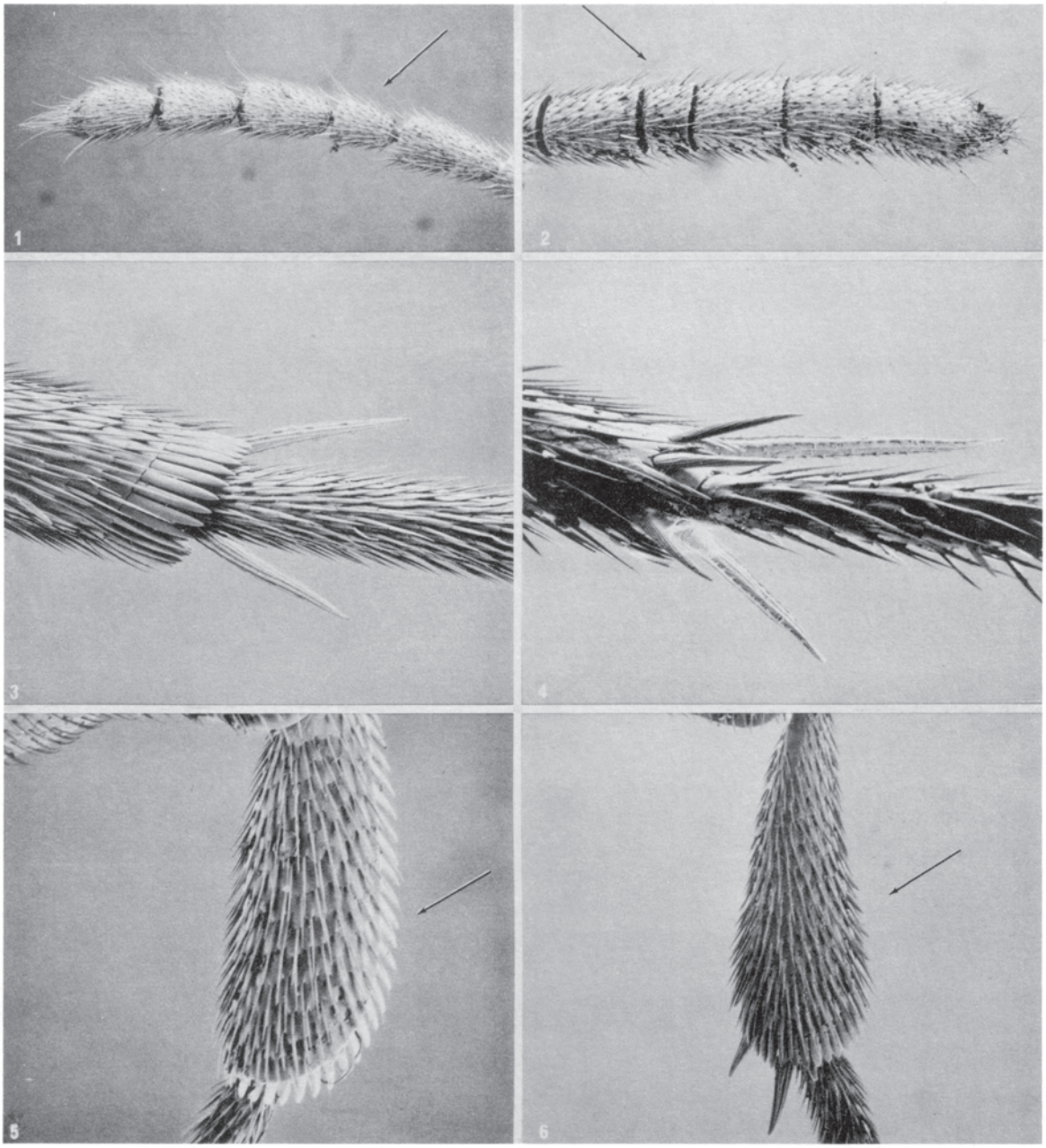
Description—Length 2.2 mm, width 1.0 mm. Color reddish brown. Shape elongate oval, convex. Pubescence short. Eye diameter slightly less than 1/3 of distance between antennal socket and edge of head when measured across eye, about eight facets visible, some pigment detectable. Antennae normal, reaching to base of pronotum when laid back; segment II to VI progressively shorter; VII and IX equal in width, VII longer; VIII transverse. Pronotum width 0.9 mm at base, 0.5 mm long, widest at base, transverse striae distinct and oblique; male and female sutural angle as in Fig. 16. Flight wings fully developed and apparently functional. Mesosternal carina low. Aedeagus tubular, broad, curved in lateral view (Fig. 15) with dorsal orifice cutting right side, without bllobed lateral projections at apex (Fig. 14). Female with thin, highly coiled duct connecting to spermatheca which is curved, and gradually expanding to end (Fig. 13). Genital segment normal.

Etymology—The specific name is used as a noun in apposition, and refers to the reduced eyes.

Discussion—The species should probably be considered an edaphobite, a soil inhabitant, rather than a cave-inhabiting species. The fully developed wings are a peculiarity for a soil species, which almost always have functionless wings. The Cueva del Salitre specimens came from a decaying moist stick at the top of a clay slope at the base of a cliff in the dark zone of the right hand half of the cave. I searched here for more material in 1971 but found none.

Genus *Ptomaphagus* Illiger

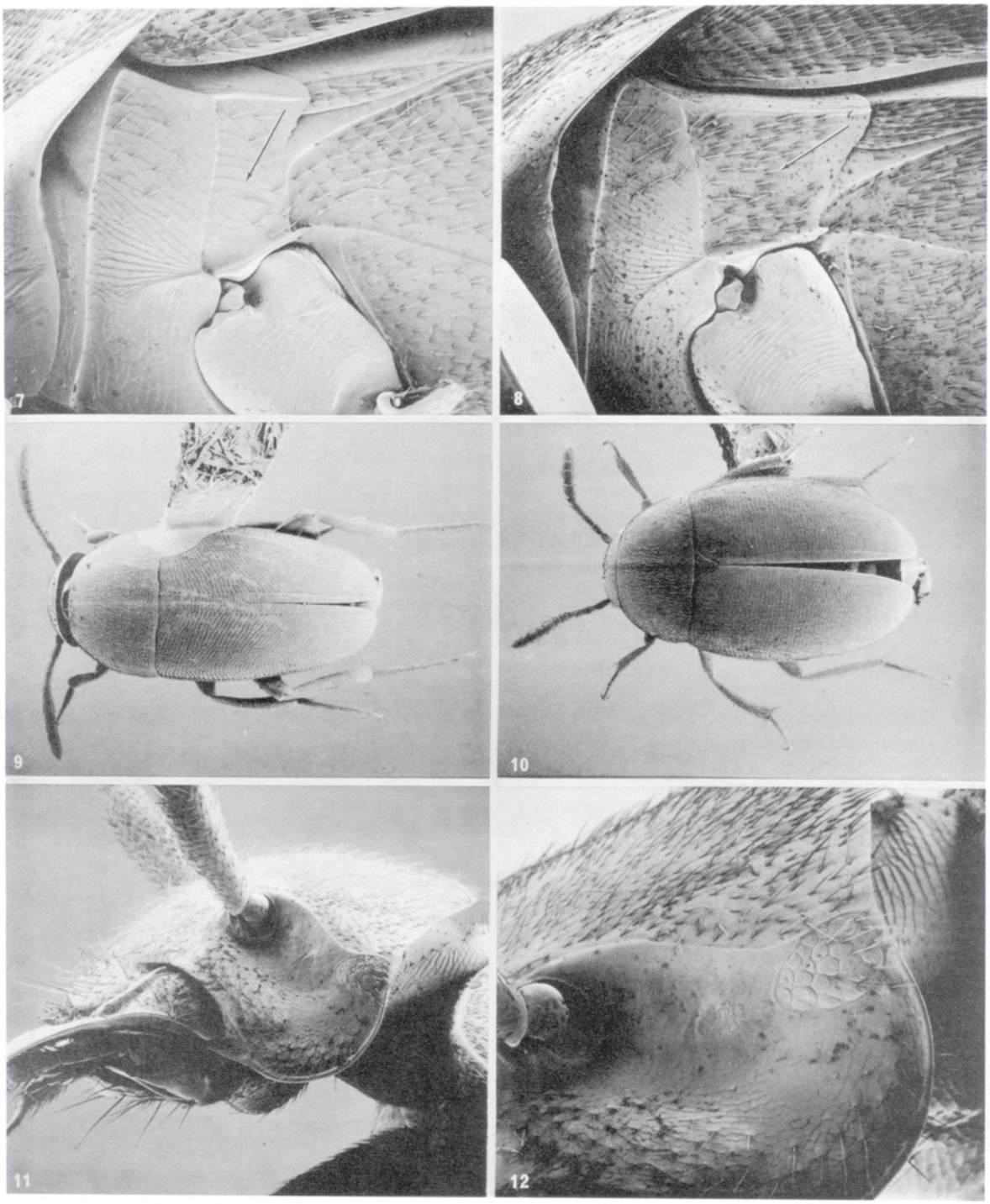
The genus contains two subgenera in the New World. The subgenus *Tupania* has two species described from Brazil and México. The subgenus *Adelops* contains 36 described species in North and Central America. At least seven other undescribed species of



Figs. 1-6. 1. Elongated segments of antenna of *Ptomaphagus troglomexicanus,* with smaller segment seven. 2. Antenna of *Ptomaphagus reddelli,* with smaller segment seven. 3. Dorsal face of apex of hind tibia of *Ptomaphagus reddelli,* showing comb of equal spines. 4. Dorsal face of apex of hind tibia of *Dissochaetus aztecus,* showing large and small spurs. 5. Dorsal face of protibia of *Proptomaphaginus puertoricensis,* showing comb of spines on outer margin. 6. Dorsal face of protibia of *Ptomaphagus consobrinus,* showing absence of comb of spines on outer margin.

Adelops are known to occur in México (Peck, 1973). Twelve troglobitic species of *Adelops* occur in caves in the southeastern United States and another troglobite is known from Arizona. The known and new cave-associated species for México and Central America are given below.

The *Adelops* have been arranged into three species groups on a basis of complexity of the female spermatheca, as well as general characteristics of distribution and ecology (Peck, 1973). The oldest group, the *hirtus* group, contains the troglobitic species of the southeastern United States, and is found only in the United States.



Figs. 7-12. 7. Lateral view of thorax of *Proptomaphaginus puertoricensis,* showing narrow mesothoracic epimeron. 8. Lateral view of thorax of *Ptomaphagus consobrinus,* showing broad mesothoracic epimeron. 9. Male *Ptomaphagus reddelli,* Cueva del Guayabo. 10. Female *Dissochaetus aztecus,* Cueva de la Mina. 11. Head of *Ptomaphagus troglomexicanus,* showing faceted and reduced eye. 12. Close up of eye of *P. troglomexicanus,* and space between head margin and base of antenna.

The *consobrinus* group

Ten species are already known from this group, with a distribution mostly in the United States and Canada. One U. S. species, *P. cocytus,* is a troglobite in Arizona. *P. giaquintoi,* a troglobite from Guatemala, is the only previously known member of the

group from south of the U. S.-Mexican border. It is viewed as a relict of a previously wider range of the group in México and Guatemala (Peck, 1973). The additional species described below in this group support the hypothesis of the former, if not present, wider range of the group.

Ptomaphagus giaquintoi Jeannel

This is the only troglobitic species known from Guatemala. The species is regarded as a troglobite because it is known only from caves, is depigmented, and has reduced eyes, and elongated appendages. This assignment is arguable, however, because the eyes are pigmented, and functional flight wings are present (Peck, 1973).

The species is known from 207 specimens from three caves in the Department of Alta Verapaz, Guatemala: Cueva de Lanquín, Cueva de Seamay, and Cueva Sepacuite No. 2. These caves are at elevations between 1000 and 3500 ft. The beetles were found in association with moist and dryish insectivorous bat guano (Peck, 1973).

Ptomaphagus reddelli, new species

Holotype female and allotype male in Museum Comparative Zoology, Harvard University. Type locality: Cueva del Guayabo, 12 km NE Valle Nacional, Oaxaca, México. Type data: 29 December 1972, J. Reddell, D. McKenzie, M. McKenzie, S. Murphy. Paratypes: 24 with same data, and 4 from Cueva del Guano, 10 km NE Valle Nacional, Oaxaca, México, 28 December 1972, J. Reddell, D. McKenzie, M. McKenzie, S. Murphy; all in author's collection.

Diagnosis—The species is readily distinguished only by the features of the spermatheca, and by the combination of its geographical and ecological characteristics.

Description—Length 2.7 to 3.2 mm. Width 1.1 to 1.3 mm. Color light to dark reddish brown. Form elongate oval (Fig. 9). Eyes large, their diameter greater than space between eye margin and antennal socket. Antennae normal, reaching slightly beyond pronotal base when laid back, apical segments as in Fig. 2. Pronotum with sides parallel and widest in hind one third, striae distinct. Elytra widest one third from base, striae distinct. Elytral tip and sutural angle rounded in female and truncate and rounded in male. Flight wings fully formed. Mesosternal carina low. Aedeagus broad at base, and gradually tapering to point (Fig. 17), blunt at tip in dorsal view (Fig. 18). Genital segment normal, spiculum gastrale slightly less than half enclosed by genital plates. Spermatheca (Figs. 19, 20) with curved, tubular posterior part and curved but flattened anterior part.

Discussion—The species, a troglophile, is known only from the two caves mentioned above. That it is unknown from non-cave habitats is especially significant in light of the several weeks of catopid-seeking field work in lowland and upland forests around Valle Nacional by A. Newton and myself in 1970, 1971, and 1972, using baited pitfall traps and Tulgren-Berlese funnels.

Etymology—The species is named for Mr. James Reddell in recognition of his many collections and contributions to the knowledge of cave-inhabiting catopid beetles from Texas and México.

Ptomaphagus barbarae, new species

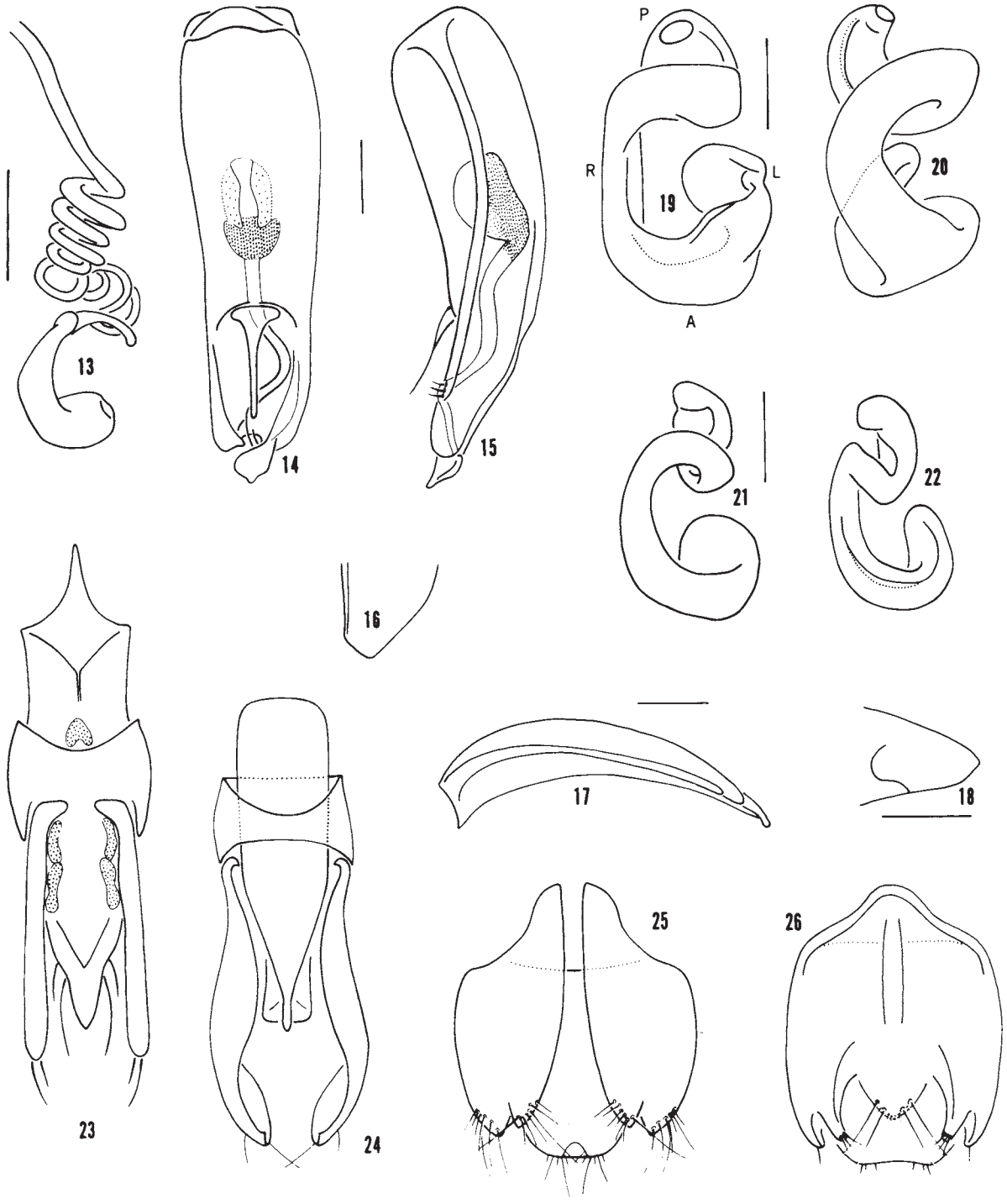
Holotype female and allotype male in Museum Comparative Zoology, Harvard University. Type locality: Mountain Cow Cave, near settlement of Caves Branch, Belize (British Honduras). Type data: 5 August 1972, S. & J. Peck. Paratypes: 16 with same data; 7 from St. Hermans Cave, Caves Branch, 23 July-21 August 1972, S. & J. Peck; 1 from Bucks Bypass Cave, Caves Branch, 14 August 1972, S. Peck; 7 from Rio Frio Cave B, 1500 ft elevation, St. Augustine, Belize, 30 July and 20 August 1972, S. & J. Peck; all in author's collection.

Diagnosis—The species is easily distinguished only by the shape of the spermatheca, and by its distribution and ecology.

Description—Length 2.5 to 2.8 mm. Width 1.1 to 1.3 mm. Color dark reddish brown, antennal bases lighter. Form elongate oval. Head with large eyes, their horizontal diameter occupying about 3/4 of the width between head margin and antennal socket. Antennae normal, reaching only base of pronotum when laid back, segments medium length. Pronotum widest at base, sides not parallel in hind one-third, striae distinct. Elytra widest one third from base, apex rounded in male and female. Flight wings fully developed. Mesosternal carina low to medium-low. Aedeagus similar to that of *P. reddelli.* Spiculum gastrale one half enclosed by genital plates. Spermatheca with posterior end somewhat flattened, and anterior end rounded and flattened (Figs. 21, 22).

Etymology—The species is named for Barbara McLeod of the United States Peace Corps, in recognition of her invaluable aid and assistance, often in the face of discouraging governmental rules and regulations, during our one and one half months of cave and forest field work in Belize in 1972.

Field Notes—The Mountain Cow Cave population was found aggregated in a partly guano-filled moist,



Figs. 13-26. 13. *Proptomaphaginus microps,* spermatheca, scale line 0.1 mm. 14. *P. microps,* aedeagus, ventral view, scale line 0.1 mm. 15. *P. microps,* aedeagus, lateral view. 16. *P. microps,* male elytral apex. 17. *Ptomaphagus reddelli,* aedeagus, lateral view, scale line 0.25 mm. 18. *P. reddelli,* aedeagus, tip, dorsal view, scale line 0.1 mm. 19. *P. reddelli,* spermatheca, dorsal view, P=posterior, A=anterior, R=right side, L=left side, scale line 0.1 mm. 20. *P. reddelli,* same spermatehca as Fig. 19, right lateral view. 21. *Ptomaphagus barbarae,* Mountain Cow Cave, spermatheca, dorsal view, scale line 0.1 mm. 22. *P. barbarae,* same spermatheca as in Fig. 21, right lateral view. 23. *Dissochaetus aztecus,* dorsal view aedeagus, Cueva de Chorros de Agua. 24. *D. hetschkoi,* dorsal view aedeagus, forest at Chorros de Agua. 25. *D. aztecus,* genital segment, ventral view, Cueva de Chorros de Agua. 26. *D. hetschkoi,* genital segment, ventral view, forest at Chorros de Agua.

drip hole in a limestone block in the dark zone at the foot of the cave entrance slope. The St. Hermans Cave specimens were taken at dung and carrion bait stations and traps from 300 to 1000 ft inside the cave. The Rio Frio Cave B specimens were found on dung bait near a moist guano accumulation, 150 ft inside the cave.

Discussion and Additional Records—The species should be categorized as a troglophile. Extensive bait trapping and litter sifting in Belize produced only one epigean record which may be this species. This is one female, from Belmopan, 6 August 1972, S. & J. Peck, from a dung trap in tropical lowland seasonal forest along Roaring Creek at "The Riviera".

Another record which seems to be the above species is one male from Cueva Jobitzinaj, 6 km S Flores, El Petén, Guatemala, 22 January 1972, D. McKenzie. A larger sample, including females, from this population is needed to confirm this determination.

Lastly, two males and a female can be tentatively assigned to this species, from Grutas de Loltun, Oxkutzcab, Yucatán, México, 1 January 1972, D. McKenzie. This female has a spermatheca with a broader shield-like flattening on the anterior end than does the spermatheca of *barbarae*. A larger collection is needed to decide if this Yucatán population is conspecific or not. Whichever is the case, this Yucatán population is probably conspecific with the *Ptomaphagus* previously recorded from Spukil Cave (Actun Spukil), 3 km S Calcehtok, and Sabacha Cave, Tekax, Yucatán (Pearse, 1938). I have not been able to learn of the repository of Pearse's specimens to check this however.

The significance of the above *consobrinus* group records is that they represent occupation by *Ptomaphagus* of cave and forest tropical lowland habitats to a much wider extent than was previously known.

The *cavernicola* group

Ten named and seven recognized but unnamed species are known in the group (Peck, 1973). All species are limited to México or Guatemala except for the troglophile *P. cavernicola,* which is found in much of the southeastern one quarter of the United States. Four troglophilic and two troglobitic species are known from México, and no species in this group are known to commonly associate with caves elsewhere.

Ptomaphagus cavernicola cavernicola Schwarz

This troglophilic subspecies ranges from Nuevo León, México, up across Texas through the Ozarks and Iowa, with other cave populations in Alabama and Florida. One epigean collection has been made in South Carolina (Peck, 1973). The only Mexican locality is Grutas del Palmito, 7 km SSW Bustamante, Nuevo León. A new collection from this cave is here reported of 5 individuals taken on 19 February 1972, by J. Reddell.

Ptomaphagus cavernicola aditus Peck

This subspecies is known only from 76 specimens taken in Cueva de la Boca, 3 km NE Santiago, Nuevo León, México. It is thought to be a population more cave evolved than the rest of the species populations, with measurably reduced eyes (Peck, 1973).

Ptomaphagus gypsum Peck

This troglobitic species, with reduced, unpigmented (but faceted) eyes and reduced wings is known only from one female from the Resumidero de Pablillo, 33 km S Galeana, Nuevo León, México (Peck, 1973). Searching and baiting in the type locality as well as other nearby gypsum caves is highly desirable.

Ptomaphagus troglomexicanus Peck

This is the most cave-specialized *Ptomaphagus* known from outside the United States. It is a large species with tiny unpigmented eyes (Fig. 11, 12) and very elongated antennae segments (Fig. 1). It is known only from three caves located between 1525 and 2135 m in elevation in the Sierra de Guatemala, Tamaulipas, México: Cueva Chica de la Perra, Cueva de la Capilla (=Cueva Capilla de la Perra), and Cueva de la Mina (Peck, 1968, 1973).

A new collection is reported here, taken in Cueva de la Capilla, 14 January 1971, J. Reddell, R. Mitchell, W. Elliott, J. Cooke, and S. Wiley.

Sbordoni and Argano (1972) also report finding this species in Cueva de la Capilla.

Ptomaphagus elabra Peck

This troglophilic species is known only from lowland caves in and near the Sierra del Abra, Tamaulipas and San Luis Potosí, México. Previously (Peck, 1971, 1973), a total of 475 specimens was known from the following caves:

San Luis Potosí: Cueva Chica, Cueva de Puente de Dios, Cueva de Los Sabinos, Cueva de Taninul n. 1, Cueva de Valdosa, Sótano de Manuel, Sótano de Pichijumo (=Sótano de Montecillos), Sótano del Tigre, Sótano de la Tinaja, Ventana Jabalí.

Tamaulipas: Bee Cave, Cueva de la Florida, Cueva del Nacimiento del Río Frío, Cueva de El Pachón, Cueva de los Vampiros, Grutas de El Puente, Grutas de Quintero, Sótano de Gómez Farías, and Sótano de Santa Elena.

The following new collections and localities are reported here for Tamaulipas: Cueva de la Paloma, 1 km NNE Gómez Farías, 18 May 1971, W. Russell, six from vampire guano; and Sótano del León, 2 km S Gómez Farías, 20 May 1971, W. Elliott, nine from vampire guano.

Sbordoni and Argano (1972) collected what is likely this species in Grutas de Quintero, Cueva de Los Sabinos, Sótano de Pichijumo, Cueva de Taninul n. 1, and Cueva Chica.

Ptomaphagus leo Peck

This troglophilic species is known from a small cave (cave number two) at Chipinque Mesa, near Monterrey, and Cueva de Chorros de Agua, as well as the forest at Chipinque Mesa. All are in Nuevo León (Peck, 1973).

A new cave record is presented here with one specimen taken from litter in a sinkhole at 5500 ft elevation near Laguna Colorado, 29 km E of Landa de Matamoros, Querétaro, on 11 June 1971, S. Peck. An additional specimen was taken at carrion in the forest (10-12 June 1971, S. Peck) of the same locality. These two records suggest that the catopid collected in nearby Cueva de Madroño by Sbordoni and Argano (1972) is *P. leo.*

An additional new epigean record is that of three specimens taken in a dung baited pitfall trap in a ravine forest 28 km W of Linares, in Santa Rosa (Iturbide) Canyon, Nuevo León, 21-22 June 1971, S. Peck.

Ptomaphagus spelaeus (Bilimek)

This troglophilic species is known only from caves in the state of Guerrero, and possibly México. These caves are Grutas de Cacahuamilpa, Gruta de Acuitlapán, and Resumidero del Río San Geronimo (Peck, 1971, 1973). The catopids reported by Sbordoni and Argano (1972) from Cueva de Coatepec (México) and Grutas de Cacahuamilpa are probably this species.

Genus *Dissochaetus* Reitter

The genus contains twenty-nine species recognized as valid, and occurs only in the New World, where it is widespread from southern Brazil northwards through Central America and the United States to southern Canada. However, some of these northern species and records are in need of review, because some confusion exists in delimiting this genus from the genus *Nemadus,* which seems to be limited to the United States and Canada in the New World. Secondly, I find that determinations are presently difficult to make for the genus because of inadequate descriptions, and the closeness of some of the species. Nevertheless, *Dissochaetus* is the most commonly collected catopid beetle in carrion and dung baited pitfall traps throughout much of its range. No cave populations are known for the United States, although several *Nemadus* populations are known in caves in the southeastern United States (personal data).

The *Dissochaetus* species treated below should be taken as tentative but likely determinations. Two of the species were originally described from South America, and either few or no intermediate localities are published for the species in Central America or México. The problems of determination and the full range of the species can only be solved after a comprehensive study of large collections from many additional localities in South and Central America and México. Such large collections have now been assembled through my field work and that of Al Newton, amounting now to over 10,000 specimens. However, it was not judged to be efficient to examine all this material to solve the problem at hand, that of the identity of the cave collections of *Dissochaetus* from the region under consideration.

Dissochaetus hetschkoi Reitter 1884

The species is described from the state of Santa Catharina in Brazil, and is also known from the Brazilian states of Bahia and São Paulo, as well as the state of Miranda and the Federal District in Venezuela (Jeannel, 1936; Szymczakowski, 1961, 1963, 1969b).

The specimens listed below do not agree well with the description in the key of Jeannel (1936), but they do agree in the characters of the aedeagus (Fig. 24) including the parameres and their hairs. Likewise, the genital segment agrees well with the figure of Szymczakowski (1969b) except that my material (Fig. 26) has an emargination on the posterior margin of the dorsal tergite, and has the whole segment with a greater width near the apex rather than the base.

The new cave and epigean records are as follows:

MEXICO: *Nuevo León:* Chorros de Agua (21 km WSW Montemorelos), three males and two females

from forest outside of cave, in dogfood bait trap, 19-25 June 1969, S. & J. Peck. *San Luis Potosi:* Cueva del Agua, 5 km NNE Rayón, 8 May 1966, J. Reddell, J. Fish, D. McKenzie, one male. *Tamaulipas:* Gómez Farías, 29 June 1969, S. & J. Peck, dung trap in forest near Nacimiento del Río Frío, one male. *Veracruz:* Grutas de Atoyac, 2 km E Atoyac, 6-9 August 1969, S. & J. Peck, dung trap at base of cave entrance slope, two males.

BELIZE: Rio Frio Cave B, Augustine, 457 m elevation, 30 July and 20 August 1972, S. & J. Peck, two males and five females on dung bait near guano.

Dissochaetus aztecus Szymczakowski

The species was described and known only from the "Sierra de Durango" in the Mexican state of Durango. The material (Fig. 10) listed below agrees well with the description (Szymczakowski, 1971) but some differences exist. The internal sac of *aztecus* is described as unarmed, but my material has two pairs of elongated sclerotized pieces (Fig. 23). The genital segment shown in Fig. 25 gives the appearance of being more broad towards the apex than the figure of Szymczakowski (1971), but this is an artifact of my preparation being somewhat flattened, and the segment having split along the ventral midline.

The following cave collections have been seen:

MEXICO: *Nuevo León:* Cueva de Chorros de Agua, 21 km WSW Montemorelos, 4 October 1966, W. Russell, six males; 19-25 June 1969, S. & J. Peck, one female at guano, four males and five females in dogfood bait trap near guano. *Tamaulipas:* Cueva de El Pachón, 18 km SSW Ciudad Mante, 10 July 1969, S. & J. Peck, one female at vampire guano; Cueva de la Mina, 7 km NW Gómez Farías, 1527 m elevation, 1 July 1969, S. & J. Peck, one male and four females at dung bait inside cave entrance. *San Luis Potosí:* Cueva del Agua, 5 km NNE Rayón, 8 May 1966, J. Reddell, J. Fish, D. McKenzie, one male; Cueva de la Porra, 5 km N Xilitla, 10 July 1969, S. & J. Peck, six males on vampire guano.

Dissochaetus curtus Portevin

The species was described from Bolivia, and is also reported from Caracas, Venezuela, and doubtfully from Lucerna, near Malinaltepec, Guerrero, México (Jeannel, 1936; Szymczakowski, 1961, 1968). The Mexican material has been suggested as being distinct enough to represent a potential new species or subspecies but was not treated as such (Szymczakowski, 1968).

The male specimen at hand agrees well with the illustrations of the aedeagus in the above cited papers, including the thinner median lobe with no hairs at its apex.

Material examined: MEXICO: *Chiapas:* Cueva Cerro Hueco, 3 km SE Tuxtla Gutierrez, 18 August 1967, J. Reddell, J. Fish, M. Tandy, 1 male.

Dissochaetus species

This species is probably undescribed. It is similar to *aztecus,* but with a decidedly broader and shorter median lobe.

Material examined: MEXICO: *San Luis Potosí:* Sótano de las Golondrinas, 10.5 km WSW Aquismón, 24 June 1972, J. White, 2 males.

Dissochaetus species

This species is probably undescribed. It is similar to *aztecus* and *mexicanus,* except that the parameres are distinctly different in side view, and the sclerotized pieces of the internal sac differ in that the apical pair is much longer, and the basal pair is much broader.

Material examined: MEXICO: *San Luis Potosí:* Cueva de Potrerillos, 2 km W Ahuacatlán, 27 November 1972, J. Reddell, T. Raines, one male and one female.

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MILLIPEDES IN THE COLLECTION OF THE ASSOCIATION FOR MEXICAN CAVE STUDIES.
II. KEYS AND ADDITIONAL RECORDS AND DESCRIPTIONS (DIPLOPODA)

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Most of the millipedes studied in the preparation of this paper were collected by Mr. James Reddell and his associates in the Association for Mexican Cave Studies. Other taxa in the collection will be reported on in subsequent papers.

ORDER GLOMERIDA

FAMILY GLOMERIDAE

Genus *Glomeroides* Chamberlin

Glomeroides Chamberlin, 1922, p. 60. Loomis, 1968, p. 7.

The species described here and one described by Shear (in press) from Veracruz bring the known number in this genus to five. They range from Tamaulipas to Guatemala, and with the exception of the type species, *G. centralis* Chamb. 1922, all are from cave collections.

Glomeroides addititius, new species
Figs. 1, 2

Diagnosis—A depigmented troglobite which resembles *G. caecus* Causey, 1971, in lacking ocelli, in that telopodite of legpair 18 consists of 4 articles, and in having a minute rounded lobe on mesial margin of article 3 of gonopods; differs in smaller size, minutely hispid dorsal surface, and in that telopodite of legpair 17 consists of 3 articles rather than of 2.

Description of the Holotype—Male. Length 5.3 mm, width 3 mm, flesh color. Dorsal surface is shining and finely but sparsely hispid. On lateral surface of collum there are 4 submarginal striae; only 2 extend across dorsum. Other somatic features are as described for *G. caecus.*

Telopodite of legpair 17 (Fig. 1) consists of 3 articles, of which last is minute and lacks a claw. Telopodite of legpair 18 consists of 4 articles, of which distal is about twice the length of the penultimate; coxa is slightly contiguous with homologue. Gonopods (Fig. 2) are characterized by shape of apex of lobe of article 2 and transparency of lobe of article 3.

Female Paratype—Length 6.5 mm, width 3.1 mm. A little blackish pigment is on metatergites and below base of antennae.

Type Locality and Specimens—Cueva de Ungurria, about 20 km WSW Tezonapa, Veracruz, México. Five males, including the holotype, three females, and four immatures were collected 25 December 1972 by James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy.

Deposition—Holotype, United States National Museum (USNM); male and female paratypes, The Museum, Texas Tech University, Lubbock, Texas; remaining specimens, author.

Etymology—*Addititius* refers to the additional article on legpair 17.

ORDER POLYDESMIDA

FAMILY RHACHODESMIDAE

Rhachodesmidae, Attems, 1940, pp. 464-481. Loomis, 1968, pp. 35-42.

Characterized by the red or blue-green body color, the high paranota, and the absence of a calcar on the gonopods.

These millipedes are the most conspicuous polydesmoids in Mexican caves. Next to the Stylodesmidae, no other family is as frequently encountered, either as accidentals or as troglobites. Troglobitic rhachodesmids tend to be smaller and brittler than epigean members of the family and to have no or little body pigment. The small bodied, depigmented condition is also characteristic of some species known only from epigean sites.

Range—Nicaragua north to Nuevo León and Yucatán (Loomis, 1968, 1971).

Key to the Genera of the Rhachodesmidae Reported on in This Paper

1. A hook is on mentum of male; paranota of segment 19 are reduced to minute spines . . . . . *Unculabes* Causey

   Mentum of male is unmodified; paranota are varied 2

2. Paranota of segments 5-19 are degenerate and body is cylindrical; color, unless depigmented, is red or pink . . . . . *Acutangulus* Attems

   Paranota are on all segments 3

3. Paranota are elongated, spinous, uptilted; penis is much thickened and elongated; color is reddish . . . . . *Rhachidomorpha* Saussure

   Paranota are varied but mostly squarish and are angular and uptilted only on last few segments; penis is membranous and minute; color, unless depigmented, is blue-green 4

4. Telopodite of gonopods is divided into a thickly setose prefemur and a distal, mostly asetose calyx; sperm canal arises in fundus of calyx 5

   Telopodite is not divided into two regions; sperm canal arises otherwise 6

5. Calyx is thick, lightly chitinized; pore formula is either normal or 5, 7-19; lateral margins of paranota are smooth . . . . . *Ceuthauxus* Chamberlin

   Calyx is thinner, well chitinized; pore formula is normal; in male, lateral margins of poriferous paranota bear two strong teeth; lateral margins in female are uneven but not toothed . . . . . *Rhachodesmus* Pocock

6. Sperm canal arises at apex of either a strong spinous or bladelike solenomerite; metatergites are either smooth or granular . . . . . *Strongylodesmus* Saussure

   Sperm canal arises from an open sperm furrow, and there is no separate solenomerite; metatergites are smooth . . . . . *Tiphallus* Chamberlin

Unless stated otherwise, all determinations of rhachodesmids reported here were based on adult male specimens. Those based on females should be confirmed by males. In most rhachodesmids, there is a highly characteristic body facies, but sexual dimorphism is common, with the female tending to be conservative and often undescribed. Immatures also lack the specific body facies.

Genus *Acutangulus* Attems

Acutangulus Attems, 1940, p. 470. Loomis, 1968, p. 37.

Rhachodesmids characterized especially by depressed paranota of segments 1-4, reduction of paranota behind segment 4 to minute flanges or ridges placed low on body, a thick, conical sternal process adjacent to each leg of segments 5 and 6, and the band across caudal margin of gonopodal opening. Body is small to medium size (13-28 mm long), color is red, pink, or white, pore formula is normal, metatergites are smooth, and apex of anal scale is acute and depressed. Gonopods are slender, have a relatively long coxa and apodeme, sperm fossa is small and asetose, and telopodite is divided apically into two or three pieces, of which one is the solenomerite. Resembles *Sakophallus* in the extreme reduction of the paranota and the cylindrical body; differs in the slenderer gonopods with the divided apex.

Type Species—*Polydesmus coccineus* Humbert & Saussure.

Range—Veracruz and Oaxaca, México.

Species—Five. Two additional undescribed species are represented in the epigean collection by females from Oaxaca. One species, *alius,* is known only from a cave collection and is suspected of being a troglobite.

Key to the Species of *Acutangulus* Based on the Male

1. Apex of telopodite of gonopods is divided into two subequal pieces . . . . . *alius* n.sp.
   Apex is divided into three pieces, which may be equal or unequal 2
2. Apex of solenomerite is acute and simple . . . . . *coccineus* H. & S.
   Apex is blunt and minutely fringed 3
3. All three apical pieces are short. . . . . *neglectus* Carl
   One or two apical pieces are short; solenomerite is short 4
4. Longest piece is narrow its entire length . . . . . *sororius* n.sp.
   Longest piece is broad at the base and narrowed distad . . . . . *pictus* n.sp.

Acutangulus alius, new species
Figs. 3-6

Diagnosis—Gonopods are characterized by two long, subequal terminal pieces, a mesial gutter, and a long, thin marginal piece running from gutter to base of telopodite; resembles *coccineus,* in which telopodite terminates in three long, subequal terminal pieces.

Description of the Holotype—Male. Length 18.5 mm, width 1.7 mm. Colorless in preservative and brittle. Posterior angles of paranota 2-4 are square. Paranota of segments 5-18 are represented by thick (around pores) or thin longitudinal welts (Fig. 3); on segment 19 there is only a pore (Fig. 4). Sternal pegs near legs 4-7 are cylindrical; postgonopodal sterna of middle body segments are bilobed; sterna and pegs are setose. A roughened pleural mound is above all legs except those of last 3-4 segments.

Gonopods are contiguous, slender, and divided apically into two subequal, slender pieces. The lateral, which is the solenomerite, is spinous, and curved mesiad, where it intersects the homologue. The bladelike piece is narrow and straight. These two pieces are homologous with the two largest pieces in *pictus* and *sororius.* A deep gutter is at the base of the solenomerite, and a thin marginal piece parallels the sperm canal to the very base of the telopodite (Figs. 5, 6).

Female Topoparatype—Length 20 mm, width 2 mm.

Type Locality and Specimens—Cueva del Ojo de Agua de Tlilapan, Tlilapan, Veracruz, México. 3 males, including the holotype, and 17 females (of which some may not be conspecific) were collected 8 August 1967 by James Reddell, John Fish, and T.R. Evans

Deposition—Male holotype, USNM; female topoparatype, The Museum, Texas Tech University; remaining specimens, author.

Etymology—*Alius,* meaning different, refers to the somatic and sexual characters which distinguish this species from the congeners.

Acutangulus pictus, new species
Fig. 7

Diagnosis—Gonopods are characterized by three unequal terminal pieces, of which the longest is broad at the base, narrowed in the middle and distad, and sinuously curved mesiad over the homologue; very near *sororius,* in which the long piece is narrow its entire length and the bladelike piece is much longer.

Description of the Holotype—Male. Length 19 mm, width 2.2 mm. Color pinkish, probably reddish in life. Posterior angles of paranota 3 and 4 are produced as short, acute pieces. Paranota of segments 5-19 are represented by narrow flanges ending in minute, acute angles. Sternal pegs at base of legs 7 are blunt; those near legs 4-6 are conical. Pegs and sterna are setose.

Gonopods are typical, that is contiguous, slender, with a sperm fossa in base of telopodite, and divided at apex into three pieces. The most conspicuous piece is posterior, sinuous, and long; much shorter is the anterior, thin, bladelike piece; the solenomerite, which arises between the other two pieces, is short, cylindrical, blunt and minutely fringed at the apex (Fig. 7).

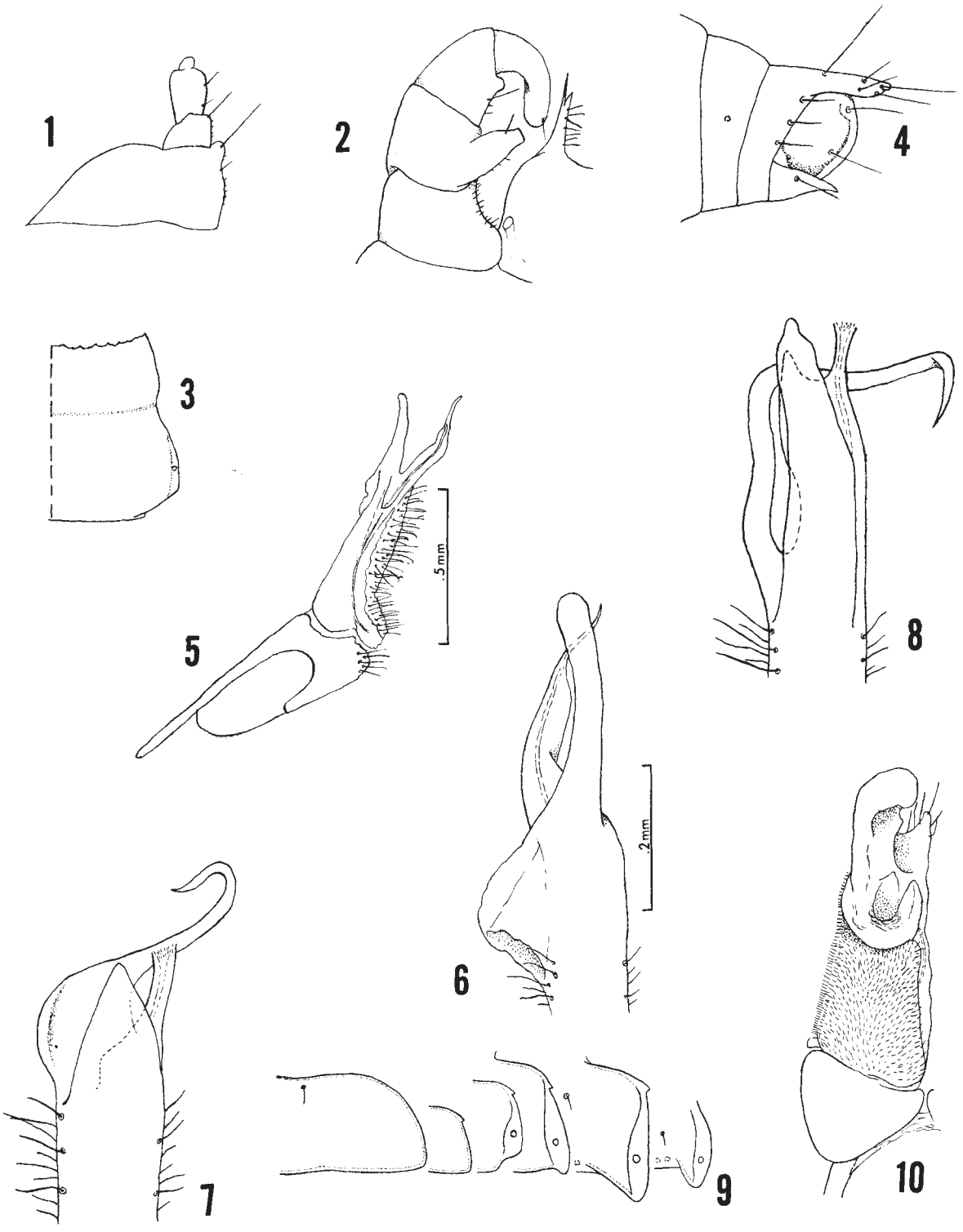
Variations—Females are larger, about 22 mm long and 2.5 mm wide; the paranota of segments 5-19 are reduced more than in the male. Males from sites other than the type locality are smaller, with a length of 16-17 mm.

Type Locality and Specimens—Sótano de Botella Chica, 3 km NW Tequila, Veracruz, México. Five males, including the holotype, and 19 females were collected 4 August 1967 by James Reddell and John Fish.

Other Records—*Veracruz:* Tequila, 7 August 1967. Rock quarry, 8 km SE Tequila on Tequila-Zongolica road, 6 August 1967. Tlilapan, 8 August 1967. All were collected by James Reddell, John Fish, and T.R. Evans.

Deposition—Male holotype, USNM; topoparatypes of each sex, The Museum, Texas Tech University; remainder of specimens, author.

Etymology—*Pictus,* meaning ornamented, refers to the enlarged basal region of the posterior piece of the gonopods.



Figs. 1-2. *Glomeroides addititius* n.sp., topoparatype. 1. Leg 17. 2. Gonopod.

Figs. 3-6. *Acutangulus alius* n.sp., topoparatype. 3. Right half of 7th metatergite. 4. Last two segments. 5. Submesial view of left gonopod. 6. Anterior surface of apical region of left gonopod.

Fig. 7. *Acutangulus pictus* n.sp., topoparatype. Anterior surface of apical region of left gonopod.

Fig. 8. *Acutangulus sororius* n.sp., topoparatype. Anterior surface of apical region of left gonopod.

Figs. 9-10. *Ceuthauxus constans* n.sp., topoparatype. 9. Right half of collum and right paranota of segments 2, 5, 15, 17, and 19. 10. Posterior surface of right gonopod.

Figures 5 and 10 are drawn to the same scale and 6, 7, and 8 to the same scale.

Acutangulus sororius, new species
Fig. 8

Diagnosis—Gonopods are characterized by three unequal terminal pieces, of which the longest is slender its entire length and curved mesiad over the homologue; very near *pictus,* in which the long piece is broad at the base and the bladelike piece is much shorter.

Description of the Holotype—Male. Length 19 mm, width 1.8 mm. Color is faded, probably red in life. Posterior angles of segments 1 and 2 are right and 3 and 4 are prolonged in short, acute pieces. Paranota of segments 5-18 are represented by narrow flanges ending in minute acute angles, and 19 by a blunt ridge. Sternal processes at base of legs 7 are truncated, and those near 4-6 are conical. Sterna and processes are setose.

Gonopods are typical, that is, contiguous, slender, curved a little ventrad, with a small sperm fossa in base of telopodite, and divided apically into three pieces; the most conspicuous piece arises laterally and is long, sinuous, and narrow at the base; much broader, but shorter, is the bladelike piece arising on the anterior surface; the solenomerite is short, posterior blunt, and minutely fringed on the apex (Fig. 8).

Type Locality and Specimens—Coscamatepec, Veracruz, México. Three males, including the holotype, were collected 25 August 1953 by Harriett Frizzell.

Deposition—Male holotype, USNM; 2 male topoparatypes, author and The Museum, Texas Tech University.

Etymology—*Sororius,* meaning sisterly, refers to the close similarity between this species and *pictus.*

Acutangulus spp.

Records—*Oaxaca:* 17 km N and 3 km W Oaxaca, one female, width 3.3 mm, nodules on caudal margin of metatergites, depigmented, 16 June 1966, Larry Wilson. Dolina, 12 km NNW Ixtlán de Juárez, two females, width 1.4 mm, reddish, 30 December 1972, J. Reddell.

Genus *Ceuthauxus* Chamberlin

Ceuthauxus Chamberlin, 1942, p. 12.
Strongylodesmus, Loomis [partim] , 1968, p. 40.

Moderately large to small green rhachodesmids characterized by large, squarish horizontal paranota, dorsal surface of metatergites either smooth or granular, and the pore formula either normal or 5, 7-19. Male usually has a process on third coxae. Telopodite of gonopods, as in *Rhachodesmus,* has the prefemoral region thickly setose and sharply set off from the calyx, on which there are few setae. Differs from *Strongylodesmus* and resembles *Rhachodesmus* in that sperm canal does not arise on apex of telopodite or on a solenomerite. Instead, it arises in the fundus of the calyx and curves down to the large, setose sperm fossa. Calyx is thick, lightly chitinized, and open on the mesial or caudal surface.

Range—Nuevo León, Coahuila, Tamaulipas, Morelos, Oaxaca, and Guerrero. This is west of and sometimes overlapping the range of *Strongylodesmus* and north of the range of *Rhachodesmus.*

Type Species—*C. neuvus* (Chamb. 1941).

Other species are *mediator* Chamb. 1947, *morelos* Chamb. 1943, *galeanae* Chamb. 1943 new combination, *palmitonus* Chamb. 1942, and *constans*, n.sp. I have not examined *C. cruzanus* Chamb., 1941, which was based on a female. The troglobitic species are *palmitonus* and *constans;* the other species are frequent in the twilight zone of caves. In the northern part of the range, species are most numerous and ranges are small. *C. palmitonus* and *C. galeanae,* in Nuevo León, represent the northernmost extension of the Rhachodesmidae.

Ceuthauxus constans, new species
Figs. 9, 10

Diagnosis—Characterized by the presence of a welt on all margins of collum and paranota and by details of calyx of gonopods.

Description of the Holotype—Male. Length about 44 mm, width 5.3 mm, body is loose jointed, exoskeleton is relatively thick, legs are long. Metatergites are smooth except for a pair of minute setal nodules on anterior half of each one and a transverse series of from 2 to 8 indistinct nodules near caudal margin of 5 through 19. Surface of most paranota and middle of metazonites is slightly convex. Paranota are horizontal except on posterior one-third of body, where they are uptilted a little. Pores open on upper surface of thick lateral welts on segments 5, 7-19. Except for prominent denticle on anterior angle of paranota 2-18, lateral margins of paranota are smooth and either straight or slightly convex. Collum is as wide as segment 2; its caudal margin is slightly sinuous and angles are right. Caudal angles of poreless segments are right. Paranota of segments 5, 7-14 have caudal margin prolonged behind caudal angle; paranota of segments 15-17 are prolonged more and more behind caudal margin, and paranota of 18 and 19 are small and acute (Fig. 9). Sterna are thickly setose. An anteriorly directed cylindrical lobe is on third coxae.

Gonopods (Fig. 10) extend in front of legpair 6.

Coxa is short, angle between coxa and telopodite is almost straight, and prefemur is long and thickly setose. Calyx has a few setae on apical margin; its fundus contains a sperm receptacle from which sperm canal arises. Sperm fossa is large and setose.

Female Topoparatype—Length 47 mm, width 6 mm, depigmented.

Type Locality and Specimens—Grutas del Mogote, El Mogote, 15 km NNE Taxco, Guerrero, México, one male in total darkness, 15 February 1958; many specimens, including the holotype, 27 July 1958, Ray de Saussure (CRA); one male, 25 August 1965, J. Reddell.

Other Record—*Guerrero:* Cueva Chica del Mogote, El Mogote, 15 km NNE Taxco, many specimens, 25 August 1965, J. Reddell, J. Fish, and W. Bell.

Deposition—Holotype, USNM; topoparatypes, The Museum, Texas Tech University; other specimens, author.

Etymology—*Constans* refers to the close similarity between the gonopods of this species and those in northern Nuevo León.

Ceuthauxus galeanae (Chamberlin), new combination

Pararhachistes galeanae Chamberlin, 1943, p. 52, figs. 128, 129.

Strongylodesmus galeanae, Loomis, 1968, p. 39.

Pore formula is normal. A thick, cylindrical peg is on third coxae. Metatergites are smooth. Width is 3.5-4.3 mm. Color is blue-green. Gonopods are unusual in that there is a thin, flat, jagged lateral lobe on the calyx.

Chamberlin's drawing of the female holotype, which I have not examined, shows segment 3 as narrower than segment 2. I have not seen specimens which show this character. Other characters agree with his description.

Type Locality—Laguna de Labradores, Galeana, Nuevo León, México.

New Records—*Nuevo León:* Surface collection at Puente de Dios, 7 km N Galeana, female, 5 June 1966, J. Reddell and A.R. Smith; Cueva Yeso Blanco, 10 km W Galeana, 4 June 1965, J. Reddell and A.R. Smith; Pozo de Gavilán, 10 km W Galeana, 4 June 1966, Orion Knox, Jr.

Genus *Rhachodesmus* Cook

Rhachodesmus, Pocock, 1910, p. 176. Attems, 1940, p. 465. Loomis, 1968, p. 39.

Diagnosis—Large bodied green rhachodesmids characterized by marked sexual dimorphism in uptilt and margins of paranota. Acropodite of gonopods is sharply set off from prefemur and is expanded, membranous, and calyx-like; sperm canal opens in fundus of calyx, and a node bearing strong setae is on its convex surface. Nearest *Ceuthauxus,* in which calyx of gonopods is thicker and sexual dimorphism of paranota is slighter.

Body is loose jointed and up to 60 mm long. Paranota are high and squarish except on last few segments, where they are angular; caudal segment is angular and short. Pore formula is normal; pores open dorsally on a thickening; nonporiferous segments lack such thickenings. All paranota have a narrow welt on anterior margin down to lateral denticle. Metatergites are finely and evenly granular above. Sterna are setose. Legs are long. Sexual dimorphism of paranota is marked. *Male.* Collum is about as wide as second segment; most paranota are tilted above dorsum; lateral margins of poriferous segments through 16 have an acute lobe in front of and another behind pores. Third coxae bear a small, cylindrical process; penes are small, membranous, and contiguous; ovoid gonopodal opening has external lateral thickenings. Gonopods have a relatively short apodeme and coxa; prefemur of telopodite is thick, evenly covered with short setae, and the large mesial fossa is setose; acropodite of telopodite is thin and in the form of a shallow two- or three-lobed calyx. *Female.* Collum is narrower than second segment; only last paranota are uptilted; lateral margins of paranota are slightly emarginate but are not acutely lobed, as in the male.

Type Species—*Polydesmus (Rachis) viridis* Saussure.

Range—Veracruz, Oaxaca. Most collections are from caves, but none represent troglobitic species.

Species—Two.

Rhachodesmus digitatus, new species
Figs. 11-14

Diagnosis—Characterized by gonopods; calyx of telopodite is two-lobed and anterior setae are borne on a minute finger-like lobe. Closely related to *R. viridis,* in which calyx is three-lobed and setae are on a much shorter lobe.

Description of the Holotype—Male. Length 56 mm, width 6 mm. Lateral margins of paranota are yellow; remainder of body, head, and legs are medium green. Lateral margins of paranota of segments 2-4 are even, poriferous segments through 16 have two strong, angular lobes on lateral margins (Fig. 12), nonporiferous segments 6, 11, and 14 are rounded, 18 is large and angular, and 19 is small and angular. Coxae of legs 4-7 are thickly setose and produced a little ventrad. Gonopods are directed forward and contiguous at apex; calyx of telopodite is in form of a small mesial lobe and a large lateral lobe; a minute fingerlike lobe bearing 11 straight, stout setae is on anterior

surface of larger lobe; sperm canal opens between a pair of angular ridges in calyx (Figs. 13, 14).

Description of the Female Allotype—Length 65 mm, width 6 mm. Collum is clearly narrower than second segment. Paranota are either horizontal or a little depressed. Beginning with segment 5 lateral margins of poriferous paranota are a little lobed, suggesting the lobes on the male, but they are never as distinctly lobed and sometimes are not lobed at all (Fig. 11).

Variations—There is some variation in the intensity of the yellow lateral areas on the paranota.

Type Locality and Specimens—Milliped Cave, 8 km N Huautla, Oaxaca, México, 12 males, including the holotype, and five females, including the allotype, were collected in June 1965 by William Russell "in darkness, but about half were within 60 feet of entrance, with remainder found throughout cave."

Other Localities—*Oaxaca:* Cueva Bonita del Presidente, 2 km N Huautla, 12 August 1967, J. Reddell, J. Fish, and T.R. Evans; Cueva del Puente de Fierro, 8 km N Huautla, 13 August 1967, J. Reddell, J. Fish, and T.R. Evans; Cueva Arriba del Presidente, 2 km N Huautla, immatures, 12 August 1967, J. Reddell and J. Fish; Cave n. 3, Huautla, female, December 1968, Dave Honea; Cueva Arriba del Río Iglesia, 6 km E Huautla, 5 June 1966, W. Russell and J. Fish.

Deposition—Holotype, USNM; topoparatypes of both sexes, The Museum, Texas Tech University; remaining specimens, author.

Etymology—*Digitatus,* meaning fingerlike, refers to the setose lobe on the anterior surface of the calyx of the telopodite.

Rhachodesmus viridis (Saussure)

R. viridis, Attems, 1940, p. 466.

New Record—*Veracruz:* Cueva de Ojo de Agua Grande, 8 km NW Paraje Nuevo, 2 August 1967, J. Reddell, J. Fish, and T.R. Evans. Epigean.

Rhachodesmus sp.

Record—*Oaxaca:* Cave n. 3, Huautla, female, December 1968, Dave Honea. This specimen has the bright blue-green color, large size, and body facies of *R. viridis.*

Genus *Rhachidomorpha* Saussure

Rhachidomorpha, Attems, 1940, p. 471. Loomis, 1968, p. 39.

Rhachodesmids characterized by elongated caudal angles of metatergites (less so in female than in male), reddish color, and thick, elongated penes. Gonopods have a large secondary branch arising from base of telopodite.

Type Species—*Polydesmus (Rhachidomorpha) tarasca* Sauss.

Rhachidomorpha adunca (Sauss. & Humb.)

R. adunca, Attems, 1940, p. 472. Loomis, 1968, p. 39.

New Record—*Veracruz:* Sótano del Relicario, 3 km N Tequila, 7 August 1967, J. Reddell, J. Fish, and T. R. Evans.

Genus *Strongylodesmus* Saussure

Strongylodesmus, Attems, 1940, p. 478. Loomis [partim], 1968, p. 40.
Ceuthauxus, Loomis, 1966, p. 13; 1968, p. 40.

Large to moderate size green (unless troglobitic) rhachodesmids with large, squarish paranota, metatergites granular on dorsal surface, and pore formula either normal or 5, 7-19. Characterized by telopodite of gonopods, of which prefemoral region is long and thickly setose and shorter acropodite is sparsely setose, and well chitinized. Sperm canal opens from a stout solenomerite which is either spinous or bladelike; sperm fossa is large and setose. *Ceuthauxus,* which has similar body facies, differs in that male usually has a process on coxae of third legs and sperm canal arises in fundus of convex, lightly chitinized apical region of telopodite.

Range—Tamaulipas, San Luis Potosí, Hidalgo, and Veracruz. This is east of but occasionally overlapping the range of *Ceuthauxus.*

Type Species—*S. cyaneus* Saussure.

Other species are *geddesi* Pocock, *cruzanus* Chamb., *conspicuus* n.sp., *granulatus* Loomis, *harrisoni* Causey, *potosinus* (Chamb., 1943) new combination, and *potosianus* (Chamb., 1947). *S. potosinus,* which was based upon female specimens, is suspected of being a junior synonym of *S. geddesi.*

Strongylodesmus conspicuus, new species
Figs. 15, 16

Diagnosis—Characterized by the large blue-green body, the slightly uneven condition of the lateral margin of some paranota, and the gonopods in which the sperm canal opens from a blade rather than a spine, as in the congeners.

Description of the Holotype—Male. Length 67 mm, width 9 mm. Lateral margins and caudal angles of paranota are pale yellow; all other surfaces are a strong blue-green. Body is close jointed anteriorly and loose jointed at middle and beyond. Except for para-

nota 18 and 19, which are somewhat uptilted, all paranota are more or less horizontal. Pores are on segments 5, 7, 9, 10, 11, 12, 13, 15-19; they open on the dorsal surface of a lateral thickening, which continues across the anterior and posterior margins of the paranota (Fig. 15). Nonporiferous segments have a narrow thickening on these margins. Dorsal surface of metazonites is uniformly and closely granulated, with the exception of the marginal and pore thickenings. Collum is as wide as segment 2; its anterior and posterior margins are a little concave. Paranota of segments 2 through about 16 tend to be squarish, but posterior paranota are directed more and more backward. Anterior angle of all metatergites is rounded; a denticle is on 2-4; posterior angle of 2-5 is rounded, on 6 and beyond it is right, and on more posterior segments it is slightly to moderately acute. Anal tergite is triangular and relatively short. Anal scale is broadly triangular. Sterna are setose. Sternum of legs 7 is excavated. Sternum of legs 6 is bilobed. Penes are membranous and small. Gonopods are contiguous at apex; their asetose acropodite bears a thick, flat blade through which the seminal canal opens, and a larger, thin mesial lobe (Fig. 16); prefemoral region is thickly setose, as usual, and the setae, except for a conspicuous long tuft on the anterior surface, tend to be uniformly short; sperm fossa is setose.

Description of a Female Topoparatype—Length 70 mm, width 9.5 mm. Agrees in general with the male as to somatic characters; differs in that the anterior margin of the collum is straight rather than slightly concave, and the lateral margins of the paranota are a little more uneven. As in the congeners, the middle piece on the vulvar opening is weak.

Variations—Body width varies from 6.5 to 10.5 mm. Size and intensity of the yellow areas on the paranota is variable. Specimens from caves are as deeply pigmented and as large as epigean specimens.

Range—Tamaulipas and San Luis Potosí, from the vicinity of Gómez Farías south to Xilitla. *S. conspicuus* is the largest green rhachodesmid in this area.

Type Locality and Specimens—Rancho del Cielo, 7 km NW Gómez Farías, Tamaulipas, México, 1100-1200 m elevation. Four males, including the holotype, one female, and one immature, were collected 3-5 June 1964 by J. Reddell, D. McKenzie, and L. Manire.

Other Localities—*Tamaulipas:* San José, 8 km W Gómez Farías; La Gloria, 9 km W Gómez Farías; Sierra de Guatemala, 15-20 km NW Gómez Farías, pine-oak forest, 1500-2000 m elevation; Sótano de El Refugio, 21 km SW Gómez Farías; Cueva del Rancho del Cielo n. 7, 6 km NW Gómez Farías; 18 km NW Chamal, female; Sótano de El Venadito, 17 km SE Antiguo Morelos, female; *San Luis Potosí:* El Salto, 11 km N El Naranjo, on Río Naranjo; Cave under El Salto, 11 km N El Naranjo; Sótano de la Tinaja, 11 km NE Valles, in darkness; Sótano del Tigre, 19 km NE Valles; Sótano de Yerbaniz, 22 km NNE Valles, female; Miramar, near Xilitla, female; Cueva de Poca Ventana, 1 km W Xilitla, female; Sótano de Tlamaya, 5 km N Xilitla, female; Los Sabinos, 12 km NNE Valles.

Deposition—Holotype, USNM; male and female paratypes, The Museum, Texas Tech University; remaining specimens, author.

Strongylodesmus geddesi Pocock

S. geddesi Pocock, 1909, p. 173, pl. 13, fig. 5. Loomis, 1966, p. 13; 1968, p. 41.

New Records—*San Luis Potosí:* Tamazunchale, 10 July 1971, R.O. Albert; *Veracruz:* Tuxpán, 5 July 1966, L. Wilson; *Hidalgo:* About 48 km N Jacala in thinly wooded mountains, 24 June 1954, N. Causey.

Strongylodesmus harrisoni Causey
Figs. 17, 18

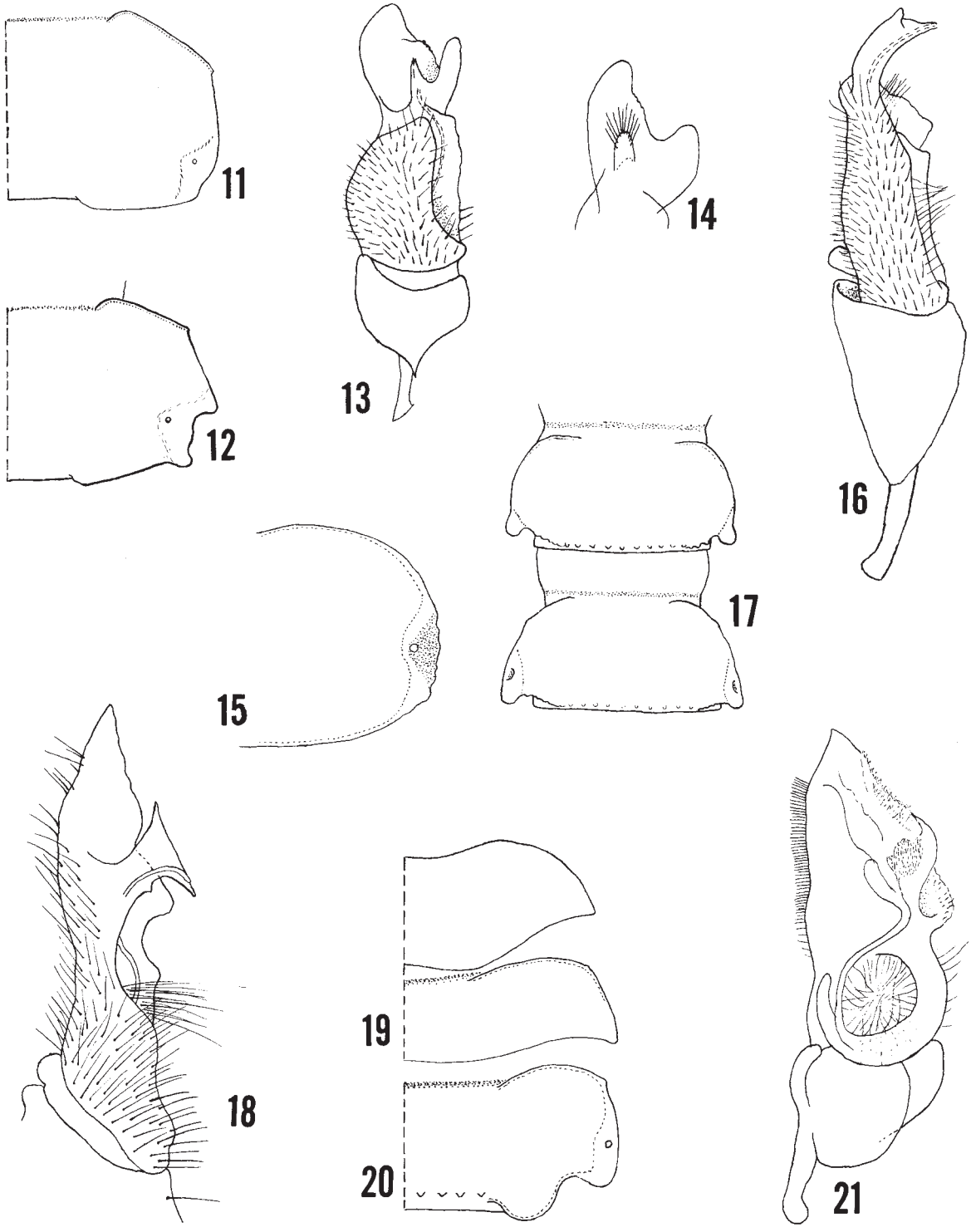
S. harrisoni Causey, 1971a, p. 31.

Body is about 45 mm long, relatively narrow, partially depigmented, and metatergites are finely granular. Pore formula is normal. Pores open on prominent thickenings on posterior angles of paranota. Nonporiferous paranota have similar but small thickenings (Fig. 17). Posterior thickenings of all paranota behind 5 are prolonged a little behind margin of paranota. On many paranota behind 5, caudal margins are minutely serrated. Paranota between 3 and 11 are tilted upward slightly; between 12 and 18 the upward tilt is greater. These characters of the paranota (except the pore formula) vary somewhat from one cave to another. They are adequate for determination of the female.

Gonopodal opening is ovoid and margined, except across the front, by a vertical rim. Gonopods are directed forward, and their spinous solenomerites are contiguous. Gonopods (Fig. 18) are characterized by the stout, bifid, subapical piece, of which the inner prong serves as the solenomerite. Sperm canal leads into the shallow, setose sperm fossa. Distal region of telopodite is broad, thin, and apically acute. Setae are straight, of moderate length, and abundant on the ectoventral surface from the base almost to the apex.

Range—Caves in the Sierra de Guatemala, vicinity of Gómez Farías, Tamaulipas.

Type Locality—Cueva del Rancho del Cielo no. 7, Rancho del Cielo, 6 km NW Gómez Farías, Tamaulipas, México.



Figs. 11-14. *Rhachodesmus digitatus* n.sp., topoparatypes. 11. Right half of segment 14, female. 12. Right half of segment 14, male. 13. Posterior surface of right gonopod. 14. Anterior surface of apical region of left gonopod.

Figs. 15-16. *Strongylodesmus conspicuus* n.sp., topoparatypes. 15. Paranotum of 9th segment, female. 16. Posterior view of right gonopod.

Figs. 17-18. *Strongylodesmus harrisoni* Causey, topoparatype. 17. Segments 14 and 15, male. 18. Posterior view of right gonopod.

Figs. 19-21. *Tiphallus alberti* n.sp., male holotype. 19. Right half of 1st and 2nd metatergites. 20. Segment 12. 21. Mesial view of left gonopod.

New Records—Caves not previously reported and their distance from Gómez Farías: Sumidero de El Jineo, 1 km NW; Cueva de Tres Manantiales, 17 km SW; Cueva de las Perlas, 13.5 km NW; Sótano del León, 2 km S; Sótano de Tres Cerritos, 20 km NNW.

A fine photograph of *harrisoni* from Cueva de la Mina was published by Reddell and Mitchell (1971, p. 207).

Strongylodesmus potosianus (Chamberlin, 1947)

Ceuthauxus potosianus Chamberlin, 1947, p. 32, fig. 21.
S. potosianus, Loomis, 1968, p. 41.

Type Locality—Alverez, San Luis Potosí, México.

New Records—*San Luis Potosí:* Sumidero de Fantasmas, Valle de los Fantasmas, 17 km W Sta. Catarina.

This species and at least four other closely related species, including *S. granulatus* Loomis 1966 from near Tamazunchale, Hidalgo, comprise the *potosianus* superspecies. Other collection sites, both epigean and cavernicolous, are in the vicinity of Pinal de Amoles and Río Blanco, Querétaro.

Genus *Tiphallus* Chamberlin

Tiphallus, Chamberlin, 1952, p. 566. Loomis, 1968, p. 42.

Pore arrangement is normal. Poriferous thickenings are wide. Body is loose-jointed and green. Dorsal surface is smooth and horizontal except on the last 2-3 segments, where the paranota are uptilted a little.

In the gonopods, an open sperm furrow leads from the apex of the telopodite to the sperm canal, which leads to the setose sperm fossa. Setae extend almost to the apex of the telopodite, and there is no sharp division between a setose basal region and a distal asetose region, as in *Ceuthauxus.*

Type Species—*T. aberrans* Chamberlin, 1952.

Tiphallus alberti, new species
Figs. 19-21

Diagnosis—A conspicuous lobe is on the caudal margin of many paranota, and the apex of the telopodite of the gonopods is acute.

Description of the Holotype—Male. Length about 40 mm, width 6 mm. Uniformly colorless in alcohol, but probably blue-green in life. Metatergites are smooth above. Pores open dorsally through wide marginal thickenings on segments 5, 7, 9, 10, 12, 13, 15-19. Caudal margin of collum and the following three segments are weakly sinusoid (Fig. 19). On segments 4 through 16 the curve on the caudal margin of the paranota is strongly developed (Fig. 20). Anterior angles are rounded and the denticle is obscure, all lateral margins are smooth, and the lateral thickenings are prolonged a little behind the caudal margin. Posterior angles of segments 17-19 are acute. Sterna are setose. Sterna of legs 6 and 7 are excavated. No pregonopodal legs are lobate. Penes are membranous and the usual length for the family.

Gonopods (Fig. 21) are contiguous at base and middle. A sinuous sperm canal connects the sperm furrow and the sperm fossa. Short, thickly spaced setae extend almost to the thin, angular apex.

Type Locality and Specimens—26 km SW Cd. Victoria, Tamaulipas, México, 1128 m elevation, two males, including the holotype, were collected 18 July 1967 by R. O. Albert.

Other Record—*Nuevo León:* 4 km N Zaragosa, one male, 8 September 1965. This specimen is small (width 4 mm) but otherwise agrees with the specimens from the type locality.

Deposition—Holotype, USNM; male topoparatype, The Museum, Texas Tech University; male paratype, author.

Etymology—This species is dedicated to Dr. R.O. Albert, in recognition of his aid to the AMCS.

Tiphallus frivolus, new species
Fig. 22

Diagnosis—Distal region of telopodite of gonopods is a squarish, hard lamina with a sperm gutter running from the apex to an open sperm sinus, which connects by a short sperm canal to the seminal fossa. Differs from *T. aberrans* in the much shorter sperm canal.

Description of the Holotype—Male. Length 40 mm, width 4.8 mm. Color is bright blue-green. Shape of body is as in *T. aberrans.* Metatergites are smooth above. Pores are on segments 5, 7, 9, 10, 11, 12, 13, 15-19. Legs are long and slender. Sterna are setose. Coxae of legs 5-7 are thickly setose and swollen ventrad. Coxae of legs 3 have a small cylindrical lobe directed mesiad. Penes are membranous and wider than is usual in the family. Gonopodal opening is ovoid, with the thin lateral margins abruptly lengthened.

Gonopods (Fig. 22) are parallel, contiguous only at the base, directed forward. The usual mesial sperm fossa is small; just beyond it is a small depression guarded by two lobes into which the long sperm furrow drains.

Type Locality and Specimens—Cuevacita de Nopales, 7 km S San Francisco, 17 km W Sta. Catarina, San Luis Potosí, México. Male holotype and 2 immatures were collected 29 November 1968 by J. Jarl.

Deposition—Holotype, USNM; immatures, author.

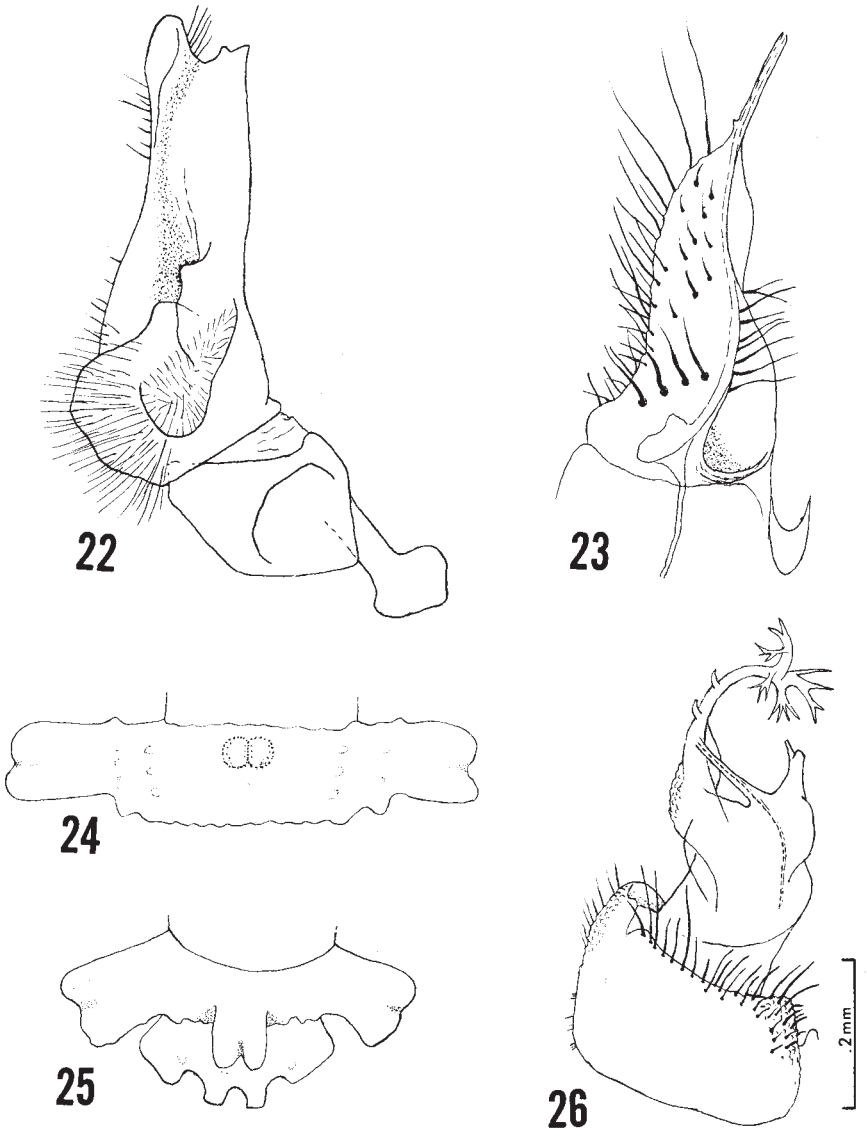


Fig. 22. *Tiphallus frivolus* n.sp., holotype. Mesial surface of right gonopod.
Fig. 23. *Unculabes columbinus* n.sp., paratype. Subcaudal view of right gonopod.
Figs. 24-26. *Gibberdesmus amplus* n.sp., holotype. 24. Segment 10. 25. Segments 18 and 19. 26. Posterior surface of right gonopod.

Etymology—*Frivolous,* meaning trifling, refers to the small sperm fossa.

Genus *Unculabes* Causey

Unculabes Causey, 1971a, p. 31.

Small to medium size (16-38 mm long) rhachodesmids characterized by a hook on the mentum of the male and by the paranota, which on segments 5-19 are progressively smaller, more acute and closer to the body. Paranota of segment 19 are minute and spinous. On the paranota of segment 18 they are a little larger. Caudal angles of middle body paranota are a little uptilted. Anterior paranota are high, wide, and squarish. Body is either depigmented or reddish, brittle, and behind the middle is loose jointed. Body surface is shining and smooth except for a few minute setae in a transverse row. Paranota have a denticle on the anterior angle, a minute setae on the middle of the lateral margin, and the posterior angle of all except the most anterior segments are acutely angular. Pores open, mostly laterally, on narrow lateral welts on segments 5, 7, 9, 10, 12, 13, 15-18. Nonporiferous paranota have no marginal welts. Anal scale is acute. Sterna are setose and lack lobes. Legs are long. Penes are small, slender, and conical.

Gonopods are varied and difficult to characterize. They always consist of a relatively long coxal region and a telopodite of moderate length with a sperm fossa in its base and a spinous solenomerite in its apical region. Apical region of telopodite may bear one or two long or short pieces in addition to the solenomerite. Setae on telopodite tend to be long and varied as to texture, number, and position. Coxae are connected by a thickened arthrodial membrane. Gonopodal opening bears a subvertical margin behind and at sides.

Range—Caves in the Sierra Madre Oriental in Tamaulipas, San Luis Potosí, and Querétaro.

Type Species—*U. crispus* Causey.

Other species are *columbinus* n.sp. and three described by Shear (in press). Ranges are small. In species known from more than one site, somatic and sexual variations are clearly evident (as in the populations of *crispus* originally described as *versatilis).* Such minor differences in adjacent populations are often seen in troglobitic millipedes and do not warrant taxonomic designation.

Unculabes columbinus, new species
Fig. 23

Diagnosis—Characterized by the red body color and simple gonopods, which terminate in one simple, straight prong, the solenomerite.

Description of the Holotype—Male. Length 16 mm, width 1.7 mm. Head and metatergites are medium red; protergites, legs, and antennae are whitish. Other somatic characters are as described for *crispus* except that anterior angle of the paranota of more posterior segments is almost oblique rather than broadly rounded. All paranota bear the usual denticle on anterior angle and behind it a single lateral seta. Hook of mentum is thick, diamond shaped from ventral view and covered, except at apex, with short recurved setae. Sterna are excavated between legpairs 6 and 7.

In situ, gonopods are contiguous in region of fossa and at apex. Fossa is subtended by a broad transparent margin. Setae are longest and most abundant on distad and lateral surfaces (Fig. 23).

Female Paratype—Width 2.2 mm. Head and anterior segments are yellowish and middle and posterior segments are red.

Type Locality and Specimens—Sótano de las Golondrinas, 10.5 km SW Aquismón, San Luis Potosí, México. Two males, of which one is the holotype, and a fragment of a female were collected 24 November 1972 by Jack White; four gravid females were collected September 1967 by John Fish.

Deposition—Holotype, USNM; female paratype The Museum, Texas Tech University; remaining specimens, author.

Etymology—*Columbinus,* meaning dove, refers to the type locality.

Unculabes crispus Causey

U. crispus Causey, 1971a, pp. 31-32, figs. 18-20.
U. versatilis Causey, 1971a, p. 32. NEW SYNONYMY.

A reexamination of the specimens described as *versatilis* has shown that they are *crispus.* The mentum bears a hook, not a node, which is smaller than the one in typical *crispus.* The solenomerite is slightly longer, also. Variations of this and even greater magnitude are common in troglobitic millipedes.

New Record—*San Luis Potosí:* Sótano de Guadalupe, 10.5 km SW Aquismón.

Unculabes sp.

Record—*Tamaulipas:* Cueva de la Mina, 7 km NW Gómez Farías, immatures.

FAMILY STYLODESMIDAE

Genus *Gibberdesmus* Causey

Gibberdesmus Causey, 1971a, p. 24.

Stylodesmids characterized by unpaired mesiodorsal pegs on segments 2-19. The last immature stadium and some adults have some or all of the pegs in a bipartite condition. Earlier immatures have the 3 + 3 tubercle arrangement on the dorsum which characterized so many adult stylodesmids.

In the male, the femur of leg 3 is swollen on all surfaces, but mostly ventrally; *obscurus* and *analagous* have not been examined for this character.

Key to the Species of the Genus *Gibberdesmus* Based on the Male

1. Having stink pores opening through cones 2
   Lacking stink pores and cones 3
2. Having pores on segments 5, 10, 13, 16 . . . . . *obscurus* Causey
   Having pores on segments 5, 7, 10, 13, 15 . . . . . *gelidus* Causey
3. Most paranota are indistinctly lobed laterad; lateral branch of gonopods lacks minute prongs . . . . . *analagous* Causey
   Most paranota are moderately to distinctly lobed laterad; lateral branch of gonopods

bears several minute prongs 4

4. Dorsal peg of segment 19 is undivided apically; caudal margin of segment 20 is divided into 5 shallow lobes and extends beyond segment 19 . . . . . *egenus* Causey

   Dorsal peg of segment 19 is bifid apically; caudal margin of segment 20 is divided into 6 shallow lobes and is completely covered by tergite of segment 19 . . . . . *amplus* n.sp.

Gibberdesmus amplus, new species
Figs. 24-26

Diagnosis—Similar to *egenus* and *analagous* in absence of pore cones and openings; characterized by larger body size, greater width of the tergite of segment 19, and gonopods, which have distal region of the lateral branch highly branched.

Description of the Holotype—Male. Length 11 mm, width 2.5 mm, 20 segments, loose jointed, moderately flattened as usual for the genus. Metatergites above and below to legs and head down to antennae are grayish yellow color because of adhering soil particles. All other parts of body are whitish except apices of pegs, which are blackish. Honeycombed pattern of dorsum is largely obscured by soil layer, but many spicules protrude through soil. Collum has 10 equal marginal lobes, which are much shallower than marginal lobes of typical segments. Segment 2 has 3 equal lateral lobes, segments 3 through 18 have 2 (Fig. 24, segment 10, a typical segment), 19 (Fig. 25) lacks lateral incisions, and 20, which is minute and covered entirely by 19, has 6 small marginal lobes. Pegs are slenderer than in congeners. The two components of some of the pegs (2, 3, 4, and 15-19) are spread apart slightly at the apex. On typical segments, there are 4 series of 3 small tubercles; some in the outer series are indistinct. No tubercles are visible on paranota or on collum. Article 3 of leg 3 is swollen on all surfaces; the adjacent articles are not swollen. Behind gonopods, legs extend slightly beyond lateral margin of paranota.

Coxa of gonopods is large, and telopodite is contiguous with homologue along mesial surface. Mesial branch of telopodite is divided into 2 unequal prongs, of which outer and larger is the solenomerite. Lateral branch is long, directed down and then mesiad; distally it has an antler-like aspect, being divided into some 16 or 17 minute prongs (the homologues are slightly different), somewhat resembling *egenus.* Unlike *egenus,* however, there are 4 thin, longitudinal lobes on subapical region of the telopodite (Fig. 26).

Variations—Females are up to 13 mm long and 3 mm wide. Specimens of the last immature stadium show clearly the components of the dorsal pegs, i.e., the 6 tubercles of the 2 mesial series of tubercles. Younger immatures have the 4 equal series of 3 tubercles which are typical of so many stylodesmids. Younger specimens usually lack the clay layer, revealing deep lateral and caudal invaginations on the paranota.

Type Locality and Specimens—Cueva del Guano, 10 km NE Valle Nacional, Oaxaca, México. Male holotype was collected 28 December 1972 by James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy.

Other Records—*Oaxaca:* Grutas de Monteflor, 6 km NE Valle Nacional, two males, five females, many immatures, 28 December 1972, James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy. Cueva del Guayabo, 12 km NE Valle Nacional, many specimens, 29 December 1972, James Reddell, David McKenzie, Martha McKenzie, and Stuart Murphy.

Deposition—Holotype, USNM; paratypes of both sexes, The Museum, Texas Tech University; other specimens, author.

Etymology—*Amplus,* meaning broad, refers to the greater width and length of the tergite of segment 19, which distinguishes this species from the congeners.

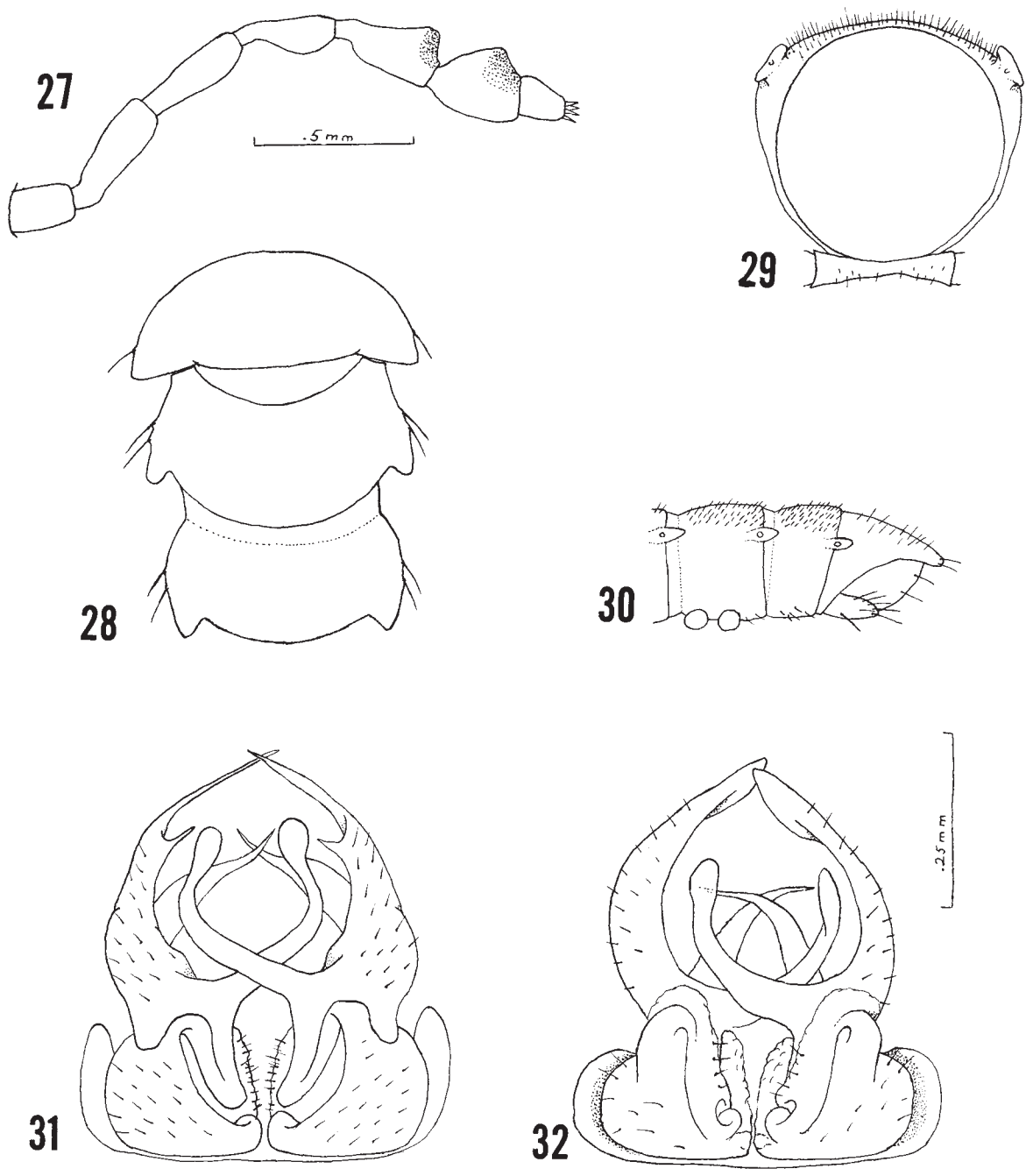
FAMILY TRICHOPOLYDESMIDAE

Collections of this family made by the AMCS are small but varied. In addition to the two species described here, there are specimens of several others. I know of no epigean collections from México.

Genus **Tylogoneus** new

Diagnosis—Troglobitic trichopolydesmids characterized by the reduction of all paranota behind segment 2 to minute angular pieces. Telopodite of gonopods is divided into three simple branches, each of them curved mesiad across its homologue.

Depigmented, 20 body segments, 13 mm or less in length and about one-fifteenth as thick, strongly moniliform, with the prozonites much exposed. Pore formula is normal, with pores opening on elongated, slightly raised areas which cover the paranota. Frons and vertex of head are setose. Articles 5 and 6 of antennae are thickened. Collum is narrower than the head, semicircular, and the margins are smooth. Metatergite of segment 2 is almost as wide as the collum when viewed from above; its paranota are small, with the lateral margins smooth except for two strong setae, and the caudal margin is convex. Paranota of the remaining segments are minute and angular; those bearing pores are raised, and when viewed from be-



Figs. 27-31. *Tylogoneus rainesi* n.gen. & n.sp., holotype. 27. Antenna. 28. Collum and segments 2 and 3; only the lateral setae are shown. 29. Outer profile of caudal surface of segment 7. 30. Hind end of body. 31. Caudal view of gonopods. Figs. 27-29 are drawn to the same scale.

Fig. 32. *Tylogoneus minus* n.sp., holotype. Caudal view of gonopods.

hind appear slightly fungiform; nonporiferous paranota are slightly smaller. Caudal margin of preanal scale is broadly rounded and bears several long setae. Similar long setae are on mesial margins of anal valves and anal apex of tergite. Setae on metatergites are short, acute, borne on minute nodules, and are either abundant or sparse. Legs are thin and long. Sterna are sparsely setose.

Coxal segment of gonopods is small for the family. Telopodite consists of a long lateral branch which is minutely setose most of its length and of two shorter mesial branches, of which the posterior is slightly

clavate apically and the anterior carries the sperm canal. Gonopodal opening is conspicuously rimmed laterad and less so caudad.

Type Species—*T. rainesi* n.sp.

Range—Caves in the mountains of Tamaulipas and San Luis Potosí.

Etymology—The Greek noun *tylo,* meaning knot and referring to the appearance of the poriferous paranota, is combined with the Greek noun *goneus,* meaning parent. Masculine gender.

Tylogoneus rainesi, new species
Figs. 27-31

Diagnosis—Characterized by the abundant setae which cover the metatergites, and by the acutely narrowed distal region of the lateral branch of the gonopods.

Description of the Holotype—Male. Length 13 mm, width 0.8 mm. Antennae are clavate, as shown in Fig. 27; articles 5 and 6 bear a few especially long setae; the remaining setae are shorter; pits on articles 5 and 6 are lined with very short, thin sensilla. Collum and segments 2 and 3 are shown in Fig. 28. On the remaining segments, the paranota are reduced to high, acute angles (Figs. 29, 30); pores open laterad on these angular pieces. Setae on metatergites are shorter than on anal region, numerous, and uniformly distributed. Preanal scale is semicircular, with several long marginal setae and two in a more central position.

Each of the three branches of the gonopods crosses its homologue; the long lateral branch is sparsely setose most of its length, spinous at the apex, and bears a subapical process on the mesial surface (Fig. 31).

Type Locality and Specimens—Cueva de Poca Ventana, 1 km W Xilitla, San Luis Potosí, México. One male, the holotype, was collected January 1968 by Terry W. Raines, for whom the species is named.

Deposition—Male holotype, USNM.

Tylogoneus minus, new species
Fig. 32

Diagnosis—Characterized by the setae on the metatergites, which are very short, sparse, and arranged in three transverse rows; also by the distal region of the lateral branch of the gonopods, which is bladelike, wider than in *T. rainesi,* and lacks a subapical process.

Description of the Holotype—Male. Length 11 mm, width 0.7 mm. With the exception of the almost invisible setae on the metatergites, the somatic characters are as described for the genus and for *T. rainesi.* Gonopods are very close to *rainesi,* differing in the wider apical region and the absence of a subapical process on the lateral branch, and in the slenderer anterior branch.

Female Topoparatypes—Gravid. Size of paranota and other somatic characters of segments 7-20 are as described for the holotype.

Type Locality and Specimens—Cueva de Tres Manantiales, Sierra de Guatemala, 17 km SW Gómez Farías, Tamaulipas, México. One entire male, the holotype, and a specimen of each sex, both lacking the first 7 segments, were collected in November 1971 by W. Russell and D. McKenzie.

Deposition—Male holotype, USNM; fragment of female topoparatype, The Museum, Texas Tech University; fragment of male topoparatype, author.

Etymology—*Minus* refers to the scantily setose condition of the dorsum, in contrast to the thickly setose dorsum of *rainesi.*

ORDER CAMBALIDA

FAMILY CAMBALIDAE

Genus *Mexicambala* Causey

Mexicambala Causey, 1971b, pp. 273-276.

Type Species—*M. russelli* Causey.

Species—Four.

Range—Caves in mountains of Tamaulipas, San Luis Potosí, and Oaxaca.

Mexicambala blanda Causey

M. blandus Causey, 1971b, pp. 276, 278, figs. 1c, 2b, 3.

Type Locality—*Tamaulipas:* Harrison Sinkhole, Rancho del Cielo, 5 km NW Gómez Farías.

New Records—*Tamaulipas:* Sumidero de El Jineo, 1 km NW Gómez Farías; Sótano del León, 1 km S Gómez Farías; Cueva de la Paloma, 1 km NE Gómez Farías; Sótano de El Molino, 1 km NW Gómez Farías, Sótano de Tres Cerritos, 20 km NNW Gómez Farías, female; Cueva de Tres Manantiales, 17 km SW Gómez Farías; Sótano de Vasquez, 7 km SE Ocampo.

Mexicambala russelli Causey

M. russelli Causey, 1971b, p. 279, figs. 1d, 2c.

Type Locality—*San Luis Potosí:* Cueva de la Porra, 3 km N Xilitla.

New Record—*San Luis Potosí:* Cueva de la Laja, 2 km N Ahuacatlán.

Mexicambala inopis Causey

M. inopis Causey, 1971b, p. 276, fig. 1b.

Type Locality—*Tamaulipas:* Sótano de la Joya de Salas, 22 km NW Gómez Farías.

New Record—*Tamaulipas:* Cueva de la Capilla, 13.5 km NW Gómez Farías.

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TWO NEW TROGLOBITIC AMBLYPYGIDA OF THE GENUS *TARANTULA* FROM MEXICAN CAVES (ARACHNIDA)

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INTRODUCTION

This paper is concerned with the description of two very interesting new species of troglobitic Amblypygida from southern México, one from Tabasco, another from Yucatán. These are the first troglobites of this order of arachnids reported from the family Tarantulidae, and from the New World. *Charinus diblemma* (Simon) is the only other known troglobite.

Chamberlin and Ivie (1938) report *T. fuscimana* (C.L. Koch) from a number of caves in Yucatán. It is interesting to note that they record this species from the very caves in which one of the new troglobites occurs. It is possible that they collected specimens of the troglobitic species, but failed to notice them in their collections, or passed them off as immature or freshly molted specimens without thorough examination. In still other collections from the type locality of the new Yucatán species I have seen fully eyed and pigmented amblypygids which are perhaps referable to *T. fuscimana.*

While amblypygids have long excited interest, as a taxonomic unit they remain generally imperfectly known, although Weygoldt (1972) has made great progress in the genus *Charinus.* Our poor knowledge is due largely to their reclusive habits which allow them to escape the general collector. They are relatively modestly represented in collections both in numbers of species and specimens. Unfortunately there is little hope of accurately identifying immature specimens, which further obscures our knowledge of this group.

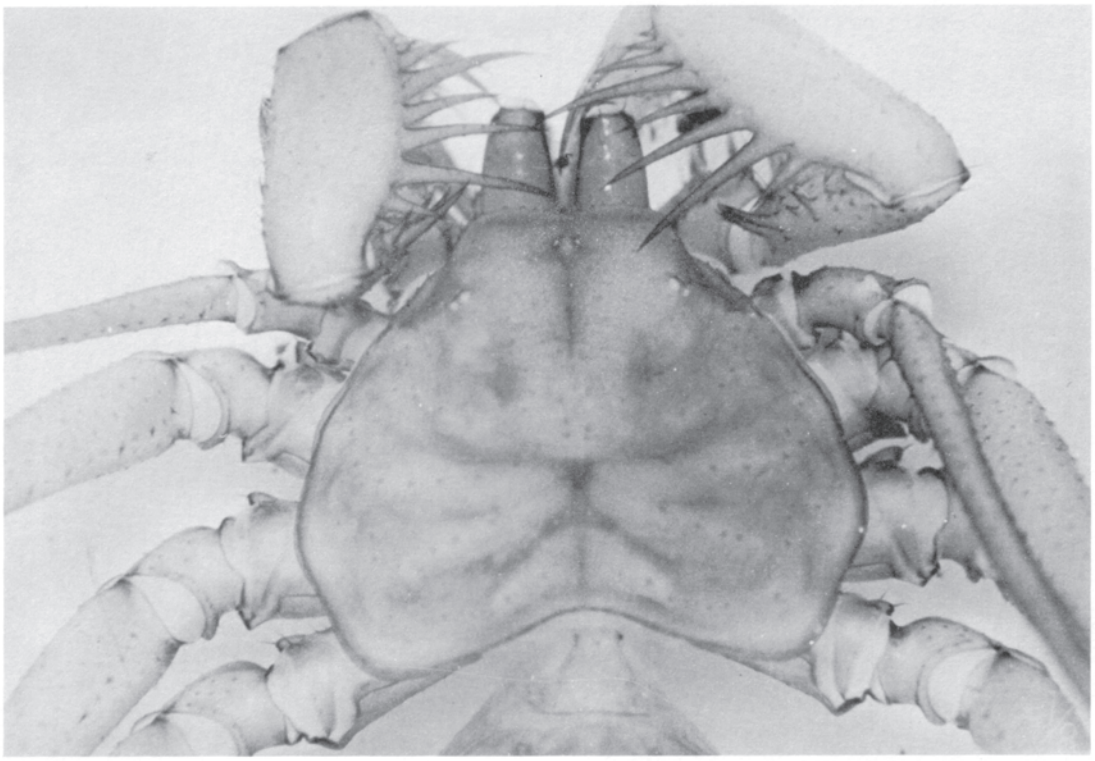
The order Amblypygida in México is represented in the literature by only four described species: *Tarantula crassimana* (C.L. Koch), *T. whitei* (Gervais), *T. fuscimana* and *Acanthophrynus coronatus* (Butler). Reddell (1965, 1971) and Reddell and Mitchell (1971a, 1971b) gave the most thorough account of the records of these species, though they list cave records only. Other records of amblypygids in México are given by Chamberlin and Ivie (1938) and Ryckman (1956). Recent advances in the study of this order (Weygoldt and Levi, pers. comm., and Quintero, indirect pers. comm.) show, however, that traditionally used characters may not be entirely adequate to correctly distinguish species. This information might shed doubt on current methods of distinguishing Mexican species and further complicates the problem of identifying the considerable array of forms occurring in México.

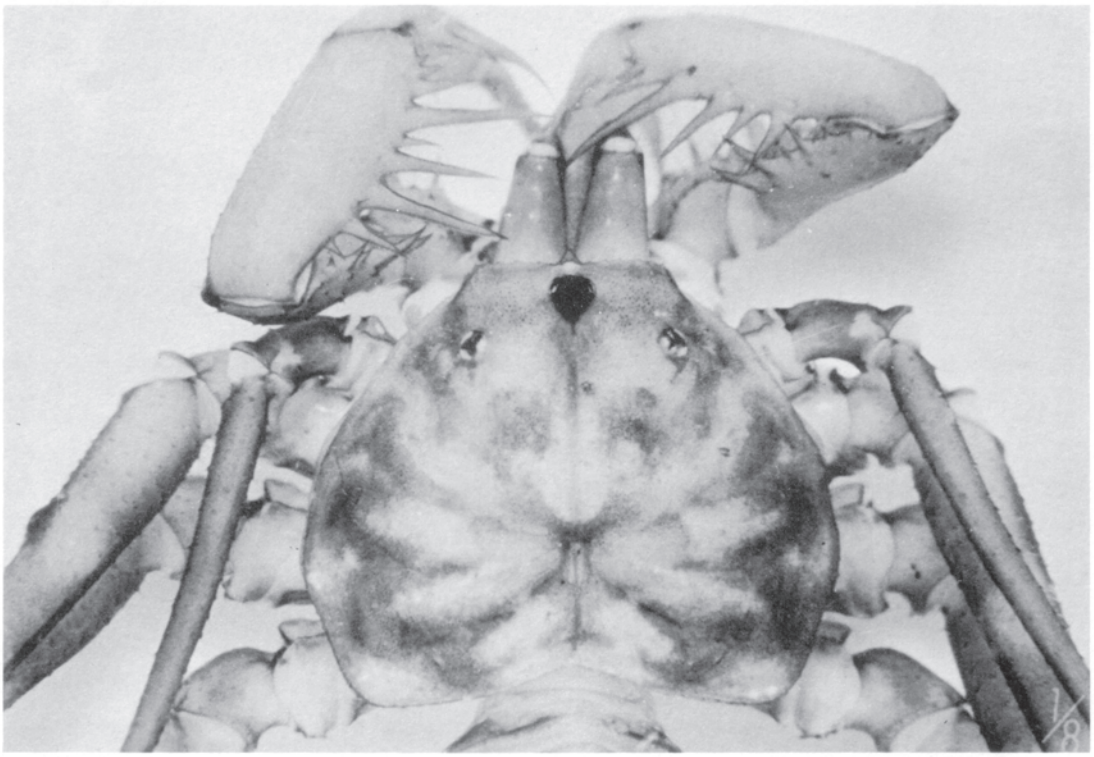
Once again I must tender my thanks to Dr. and Mrs. Clarence Goodnight and Mr. James Reddell for providing excellent collections, and to Dr. Robert W. Mitchell for his continued support.

FAMILY TARANTULIDAE

Tarantula chacmool, new species

Holotype—An adult male, taken in Actun Kaua, Yucatán, México, on 23 August 1972 by R.W. Mitchell and J.W. Cooke, and deposited in the American Museum of Natural History, New York, New York.





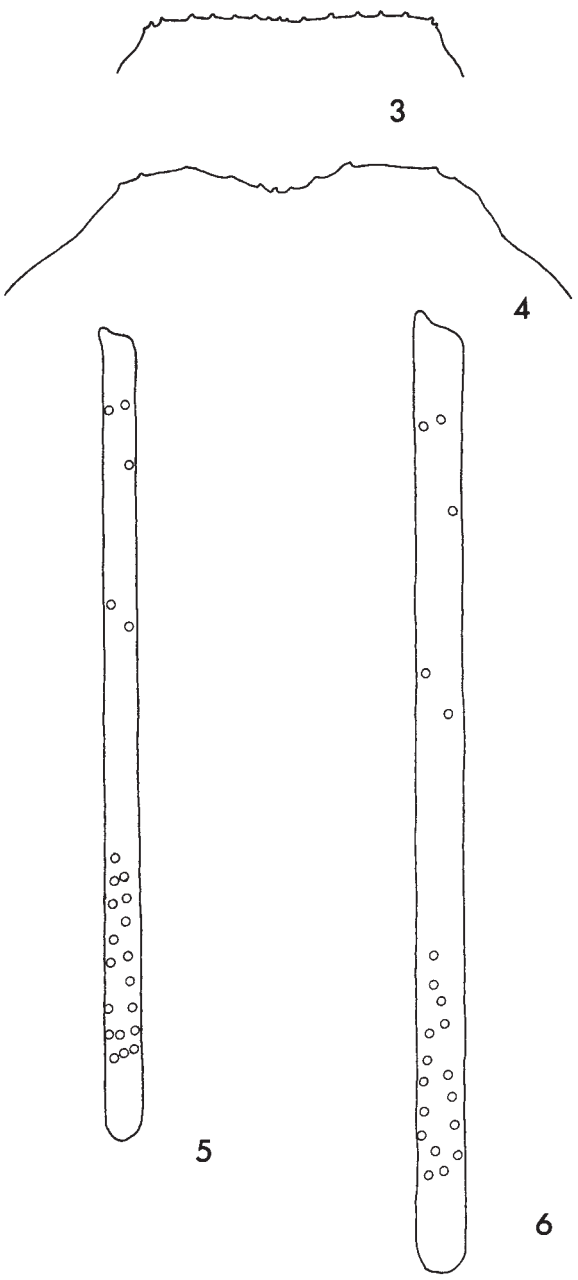
Figs. 1-2. Dorsal view of carapace: 1, *Tarantula chacmool,* showing reduced eyes; 2, *Tarantula* sp. of similar size, showing normally developed eyes. Note also relative pigmentation.

Paratypes—One juvenile taken at the same locality, on the same date by the same collectors as the holotype, deposited in The Museum, Texas Tech University, Lubbock, Texas; one specimen of undetermined age and sex and one juvenile, taken in Grutas de Balankanche (Balaam Canche), Chichén Itzá, Yucatán, México, in July 1948, by C. and M. Goodnight, and both deposited in the American Museum of Natural History.

Description—Cephalothorax. Carapace with very fine, widely scattered granulations, 1.3 times wider than long; epirostrum visible from above, anterior margin of carapace between the limits of the lateral eye groups nearly straight, with 18 setae mounted on short, but well defined tubercles, the three outermost on each side pointing diagonally inward, the next internal four on each side pointing diagonally outward, and the middle two pointing nearly straight ahead, similar setae border remainder of carapace, but not as closely associated; emarginate posteriorly; eyes reduced in size and completely lacking pigmentation, median eyes separated by more than three times their diameter, ocular mound nearly obsolete, with two median setae longitudinally in line, all lateral eyes slightly larger than median eyes, none contiguous, no evidence of tapetum; tritosternum about three times longer than basal width, with 12 paired and one median setae; tetrasternum and pentasternum nearly equal in dimensions, with four and two setae respectively; metasternum with four setae.

Abdomen more sparsely granular than carapace; dorsoventral muscles and heart visible through cuticle; terga III-VIII with median edges produced anteriorly and emarginate posteriorly; terga IV-VIII decreasing slightly in width and increasing slightly in length posteriorly; tergum XII (anal plate) not incrassate. Sternum II (genital sternum) produced distally; sterna III and IV emarginate anteromedially, produced posteromedially; sterna V-VIII decreasing slightly in width and increasing slightly in length posteriorly.

Pedipalps. Anterodorsal margin of femur with six spines of the following proportions (numbered from proximal to distal) $3>2>1, 5>4, 6$, tubercle follows 6 (tubercles have apical setae, spines do not); anteroventral margin of femur with seven spines of the following proportions, $1>2>6>3>4, 7>5$, tubercles follow 6 and 7; anterodorsal margin of patella with nine spines of the following proportions, $3, 6>4>5, 7>2>8>1, 9$, tubercle follows 9; anteroventral margin of patella with 11 spines of the following proportions $7>3>5>9>1>4>10>6, 8>2>11$; anterodorsal margin of tibia with seven spines of the following proportions, $2>1>5>4>3>7>6$; anteroventral margin of tibia with six spines of the following proportions, $3>2>6>5>4>1$, tubercles follow 2 and 3.



Figs. 3-4. Anterior margin of carapace: 3, *T. chacmool,* showing nearly straight margin; 4, *T. chiztun,* showing lobed margin.

Figs. 5-6. Dorsal view of tibia of right leg IV, showing position of trichobothria: 5, *T. chacmool;* 6, *T. chiztun.*

Legs. Segments elongate, more densely granular than carapace; patella of all legs somewhat darker than other segments; femur of leg I 3.5 times longer than carapace; length of segments given in Table 1.

Comparisons—See under *T. chiztun.*

Measurements—Total length of the holotype is

20.1. The carapacal length and width is 7.3 and 10.1 respectively. See also Table 1. All measurements are in millimeters.

Variation—Specimens from Grutas de Balankanche differ most significantly from those of the type locality in retaining some evidence of the tapetum in the lateral eyes. Also, Balankanche paratypes have 15 and 16 tritosternal setae and four pentasternal setae, and a few other minor setational differences exist.

Distribution—*Tarantula chacmool* is known only from Actun Kaua and Grutas de Balankanche, though it is undoubtedly distributed through many caves of the area.

Etymology—The specific name is taken from Chac Mool, the reclining Toltec-Itzá figure which decorates several edifices at the nearby archeological site of Chichén Itzá.

Table 1. *Tarantula chacmool.*

	Pedipalp	I	II	III	IV
Coxa	1.4	1.5	2.0	2.3	2.5
Trochanter	0.7	0.7	1.0	1.3	1.3
Femur	2.5	12.8	7.8	9.0	7.5
Patella	2.6	0.9	0.9	1.0	1.0
Tibia	1.6	30.8	11.6	—	12.9
Basitarsus	1.9	38.6	1.0	—	1.1
Tarsus			1.0	—	1.1

Tarantula chiztun, new species

Holotype—An adult, taken in Las Grutas de Cocona, Teapa, Tabasco, México, on 1 August 1948, by C. and M. Goodnight and deposited in the American Museum of Natural History.

Description—Cephalothorax. Carapace with very fine, widely scattered granulations, 1.2 times wider than long; epirostrum not visible from above, anterior margin of carapace between the limits of the lateral eye groups emarginate medially, forming two lateral lobes over the chelicerae, with 14 setae mounted on short, poorly defined tubercles, the left outermost and right three outermost pointing diagonally inward; the left five next outermost and right four next outermost pointing diagonally inward; the middle two pointing nearly straight ahead, similar setae border remainder of carapace at about same density; emarginate posteriorly; eyes reduced in size and completely lacking pigment, median eyes separated by more than three times their diameter, ocular mound nearly obsolete, with two lateral setae, all lateral eyes slightly larger than median eyes, none contiguous, the medianmost the smallest, tapetum clearly visible in some; tritosternum slightly less than four times longer than basal width, with 16 paired and one median setae; tetrasternum and pentasternum nearly equal in dimensions, with four and two setae respectively; metasternum with six setae.

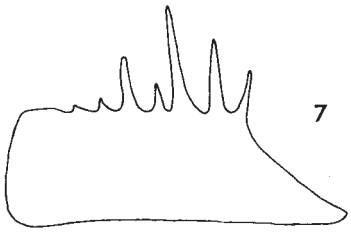
Abdomen much more sparsely granular than carapace; dorsoventral muscles and heart visible through cuticle; terga III-VIII with median edges produced anteriorly and emarginate posteriorly; terga IV-VIII decreasing slightly in width and increasing slightly in length posteriorly; tergum XII (anal plate) incrassate. Sternum II (genital sternum) produced distally; sternum III and IV emarginate anteromedially, produced posteromedially, sterna V-VIII decreasing slightly in width and increasing slightly in length posteriorly.

Pedipalps. Anterodorsal margin of femur with six spines of the following proportions (numbered from proximal to distal), $3>2>1>5>4>6$, tubercles follow 2, 5 and 6; anteroventral margin of femur with nine spines of the following proportions, $1>2>3>6>4, 5>8>7>9$, tubercles follow 3 and 5; anterodorsal margin of patella with nine spines of the following proportions, $3>6>4>5>2, 7>8>9>1$, tubercle follows 9; anteroventral margin of patella with 11 spines of the following proportions, $8>3>6>10>2, 5>11>4>9>1$, tubercles follow 2, 5 and 11; anterodorsal margin of tibia with seven spines of the following proportions, $2>1>6>5>4>7>3$; anteroventral margin of tibia with five spines of the following proportions, $2>1>5>4>3$.

Legs. Segments long and more densely granular than abdomen, but more sparsely granular than carapace; patella of all legs much darker than other segments, femur of leg I slightly less than 3.5 times longer than carapace; length of leg segments given in Table 2.

Comparisons—*Tarantula chiztun* and *T. chacmool* are easily distinguished from all other New World amblypygids by their extremely reduced eyes, and depigmentation. They are quite small, being about half the size of epigean Mexican species of the genus *Tarantula.* The limbs, notably the first walking legs, are also proportionately longer.

→Figs. 7-18. Spination of left pedipalp: 7, anterodorsal margin of femur of *T. chacmool;* 8, anterodorsal margin of femur of *T. chiztun;* 9, anteroventral margin of femur of *T. chacmool;* 10, anteroventral margin of femur of *T. chiztun;* 11, anterodorsal margin of patella of *T. chacmool;* 12, anterodorsal margin of patella of *T. chiztun;* 13, anteroventral margin of patella of *T. chacmool;* 14, anteroventral margin of patella of *T. chiztun;* 15, anterodorsal margin of tibia of *T. chacmool;* 16, anterodorsal margin of tibia of *T. chiztun;* 17, anteroventral margin of tibia of *T. chacmool;* 18, anteroventral margin of tibia of *T. chiztun.*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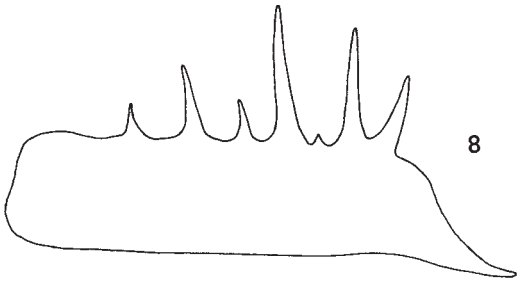
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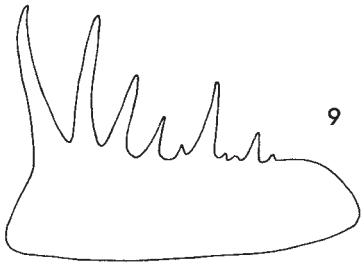
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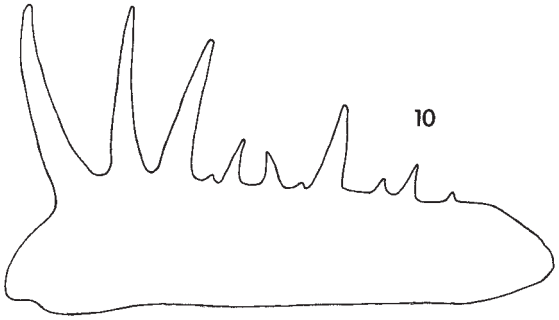
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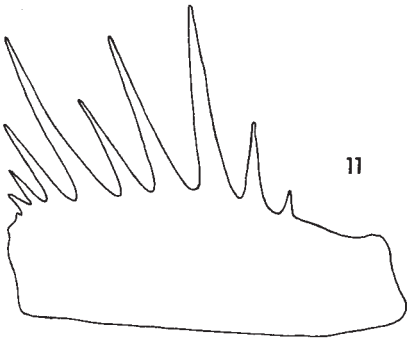
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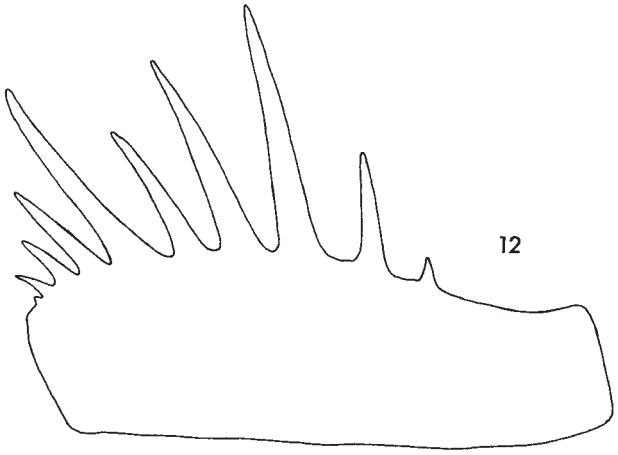
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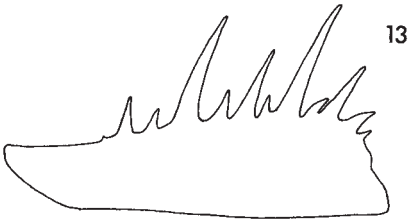
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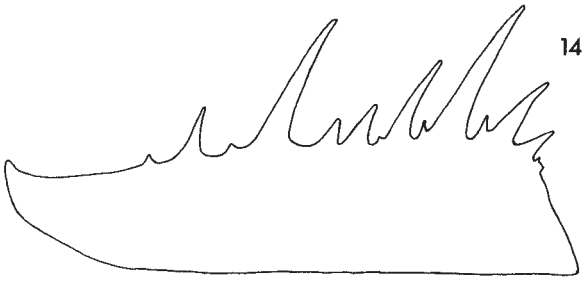
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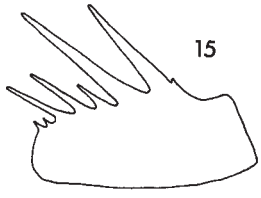
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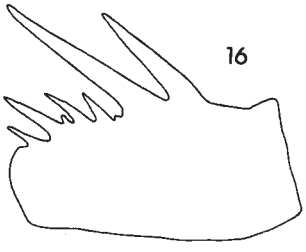
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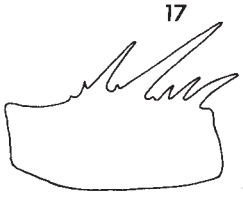
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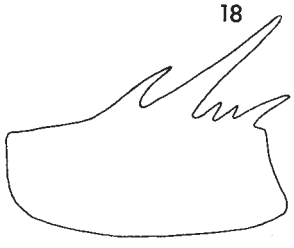
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The most distinctive and probably the most significant differences between *T. chiztun* and *T. chacmool* are the structure of the anterior margin of the carapace, and the epirostrum. In *T. chacmool* the anterior margin is nearly straight, but in *T. chiztun* it is characteristically lobed over the chelicerae and deeply emarginate medially. The epirostrum is not visible from above in *T. chiztun,* but is in *T. chacmool.* Other characters distinguishing these species are the spinations of the pedipalps. The anterodorsal and anteroventral spination of most pedipalpal segments are different, however the most obvious differences are apparent in the spination of the anteroventral margin of the femurs.

Measurements—Total length of the holotype is 22.7. The carapacal length and width is 8.7 and 12.5 respectively. See also Table 2.

Variation—Only one specimen of this species was available for study.

Distribution—*Tarantula chiztun* is known only from Las Grutas de Cocona, Teapa, Tabasco, México.

Etymology—The specific name is the Mayan word for amblypygid, used as a noun in apposition.

Remarks—The case of two closely related animals, one a troglophile, the other a troglobite, occuring in the same cave provides an extremely interesting problem for study. *Tarantula fuscimana* and *T. chacmool* present such a problem. The likely general explanation of this situation may appear relatively simple. The period of original colonization of the caves could have been followed by a period of unfavorable climate or topographic change that forced the colonizing species out of the area, except for isolated pockets such as in caves. With amelioration of climate the original colonizing species then could have reinvaded the area. Enough divergence on the part of either or both the original (ancestral) and relict populations would be necessary to establish reproductive isolation in order to maintain genetic integrity of both populations once they came into contact.

Table 2. *Tarantula chiztun.*

	Pedipalp	I	II	III	IV
Coxa	2.0	2.5	2.3	2.5	2.9
Trochanter	0.7	1.3	1.0	1.1	1.3
Femur	4.2	13.6	9.8	11.1	9.3
Patella	4.2	1.0	1.4	1.1	1.2
Tibia	2.1	28.6	14.0	16.2	15.4
Basitarsus	2.3	—	1.0	1.3	1.1
Tarsus			1.4	1.6	1.4

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THE GENUS *PSEUDOSINELLA* IN MESOAMERICAN CAVES

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Over the past eight years, a number of people have been sending me collembola from the caves of México and Guatemala. Most of these have been sent by J. Reddell, P. Strinati, and S. Peck. A number of interesting new species have turned up. In this and a subsequent paper (presently in preparation by Dr. Mitra) the new species of the Entomobryinae and Paronellinae will be described. All of the new Entomobryinae belong to the genus *Pseudosinella* and represent a closely linked series of species.

As would be expected the members of this genus have evolved a considerable number of cave forms in Mesoamerica. The forms I examined belonged to the widespread *P. violenta* (Folsom) and four and probably five undescribed species. All the species probably share a common ancestry since they all display the same rather unusual chaetotaxy on the labial triangle and have basically the same second abdominal chaetotaxy. The form herein described as *P. reddelli* probably is close to the ancestral stock for all species.

The table below summarizes some of the major features of the different species found in Mesoamerica so far. The form indicated as *P.* sp.? is represented by a single specimen and is thus not being presently described.

Pseudosinella bonita, new species
Fig. 1

Description—Color: white, without trace of eyes or pigment. Tenent hair short and acuminate. Unguis elongate scoop shaped, without lateral or external teeth, but with a cluster of three small internal teeth near base. Antennae without scales. Apical sense organ of third antennal segment with two apparently flattened and ciliate or striate blades, Gisin's chaetotaxy formula as follows: head: R, 1(0), 0(1); second

Name	Inner Ungual Teeth	Tenent Hair	4th Abdominal Macrochaetae	Eyes	Cephalic Macrochaetae	Localities
P. violenta	4	clavate	0+2	0	R-0-0	México: Durango, Chihuahua, Coahuila
P. reddelli, n.sp.	3	weakly clavate	1+2	2+2—4+4	R-0-0	México: Nuevo León, Coahuila, San Luis Potosí, Tamaulipas
P. bonita, n.sp.	2-3	acuminate	1+2	0	R-1-0	México: Oaxaca
P. strinatii, n.sp.	3-4	truncate to clavate	0+2	0	R-1-1	México: Tamaulipas, San Luis Potosí
P. finca, n.sp.	3	acuminate	1+2	0	R-1-1	Guatemala: Alta Verapaz
P. sp.?	3	clavate	1+2	0	R-0-1	México: Veracruz

abdominal segment: p absent, A, q; fourth abdominal segment: 1=2, S present; labial triangle: m_1, m_2, r (minute with no visible seta), e, 1_1, 1_2. The cephalic chaetotaxy is quite variable with the typical formula being R, 1, 0; however R, 0, 1, and R, 1, 1 also occur. Mucro bidentate with apical tooth very long. Dens with slender spines in from 1 to 3 rows along basal fourth of dens. Maximum size 3.6 mm (See Table 1.)

Remarks—This striking species shows strong convergence with *P. spinosa* from the United States but differs in the absence of a median inner ungual tooth, the structure of the mucro and the chaetotaxy. It is the most highly evolved cave species so far seen from México. The extremely elongate antennae allows immediate identification.

Localities—MEXICO: *Oaxaca:* Cueva Bonita del Presidente, 2 km N Huautla (Type Locality).

Pseudosinella strinatii, new species
Fig. 2

Description—Color: White to yellowish without trace of pigment. Eyes and cornea absent. Tenent hair acuminate to strongly clavate. Unguis variable but with at least three inner teeth and external and lateral teeth. Antennae without scales. Apical sense organ of third antennal segment with two slightly swollen setae and the usual accessory setae. Gisin's chaetotaxy formula as follows: head: R, 1, 1; second abdominal segment: p absent, A, q; fourth abdominal segment: 0+2, S present; labial triangle: m_1,m_2, r (minute with no visible seta), e, 1_1, 1_2. Mucro bidentate with subapical tooth median in position and basal spine well developed. Dens without spines or spine-like setae. Maximum size 1.6 mm. (See Table 2.)

Remarks—The 0+2 macrochaetae on the fourth abdominal segment is shared by very few non-Mexican *Pseudosinella* species. It may be readily separated from all of these by the absence of ciliated setae on the labial triangle.

The specimens of this species fall into three relatively well-marked forms on the basis of the foot complex and cephalic chaetotaxy. These are: Form A: Cephalic chaetotaxy R, 1, 1, and with a truncate or acuminate tenent hair and three inner ungual teeth; Form B: Cephalic chaetotaxy R, 1, 1, and with a strongly clavate tenent hair and four inner ungual teeth; and Form C: Cephalic chaetotaxy variable, usually R, 0, 0, but sometimes R, 0, 1, or R, 1, 1 and with a strongly clavate tenent hair and three inner ungual teeth. While it may prove that these are best considered as separate species the existence of some intermediacy in these conditions and the general similarity of the three forms makes me consider them at present as a single variable species.

Localities—MEXICO: *San Luis Potosí:* (Form A)—Sótano del Tigre, 14 km NNE Valles; Cueva de Taninul n. 1, 13 km SE Valles; (Form B)—Cueva Pinta, 12 km NE Valles; Cueva Chica, 16 km SE Valles; Cueva de la Lagunita, 15 km NNE Ciudad del Maíz; *Tamaulipas:* (Form A)—Cueva de El Pachón, 18 km SSW Ciudad Mante; Cueva de la Florida, 16 km SSW Ciudad Mante; (Form C)—Crystal Cave, Rancho del Cielo, 5 km NW Gómez Farías (Type Locality).

Pseudosinella reddelli, new species
Fig. 3

Description—Color: Background white to pale yellow with blue pigment. Pigment varies from being only lightly scattered over body and on eye patches to moderately heavy over dorsum except intersegmental membranes. Legs and antennae usually darker than body. Eyes 2+2 or 4+4 on a single eyepatch. Tenent hair weakly clavate. Unguis with two basal external teeth and three relatively small inner teeth and two pairs of small clear lateral teeth. A relatively large species, the adults range from 2.5 to 3.1 mm. Antennae without scales. Gisin's chaetotaxy: m, m, r (minute with no visible seta), e, 1_1, 1_2. Mucro bidentate with anteapical tooth generally close to apical tooth. Basal spine weakly developed. Dens without spines or spine-like setae. (See Table 3.)

Remarks—This species breaks down into two apparent geographic variations: a smaller form with 4+4 or 3+3 eyes from Nuevo León and Coahuila, and a generally larger 2+2 eyed form from Tamaulipas and San Luis Potosí. The species can be readily separated from all the well-known reduced eye species by the total lack of ciliate setae on the labial triangle. Known only from caves, it will probably be found to have surface specimens.

Localities—MEXICO: *Coahuila:* Gruta de la Cuevacillas, 18 km E Arteaga; *Nuevo León:* Resumidero de Pablillo, Pablillo, 33 km S Galeana; *Tamaulipas:* Cueva de la Mina, 7 km NW Gómez Farías; Bee Cave, 16 km NE Ocampo (Type Locality); Cueva del Infiernillo, 8 km W Gómez Farías; Cueva del Remolino, 8.5 km W Gómez Farías; Cueva de la Capilla, 13.5 km NW Gómez Farías; Cueva de Tres Manantiales, 23 km NW Limón; *San Luis Potosí:* Sótano de Ojo de Agua, 4 km S San Francisco, 30 km ESE San Luis Potosí; Sótano de la Golondrina, Valle de los Fantasmas, 30 km ESE San Luis Potosí.

Pseudosinella finca, new species
Fig. 4

Description—Color: White, without trace of pigment or eyes. Apical organ of third antennal segment with two clearly swollen oval setae. Tenent hair slen-

der and acuminate. Unguis usually with small but clear outer and paired lateral teeth and with three inner teeth. The basalmost inner tooth is long and wing-like, projecting laterally. Antennae without scales. Gisin's chaetotaxy formula: head: R, 1, 1; second abdominal segment: p absent, A, q; fourth abdominal segment: 1+2, S present; labial triangle: m, m, r (minute with no visible seta), 1_1, 1_2. Mucro bidentate with apical tooth clearly longer than anteapical and basal spine not exceeding apex of anteapical tooth. Maximum size 1.8 mm. (See Table 4.)

Remarks—This species is closely related to *P. strinatii,* but may be readily separated on a basis of the presence of an anterior macrochaeta on the fourth abdominal segment and the much longer empodial appendage. The localities vary considerably in the structure of the wing tooth of the unguis. Further analysis may show that a cluster of species is involved.

Localities—GUATEMALA: *Alta Verapaz:* Cueva Sepacuite (Type Locality), Cueva Seamay, Cueva Lanquín.

ACKNOWLEDGEMENTS

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Table 1. Measurements (in mm) of *Pseudosinella bonita,* new species.

Locality	Antennal Segments				Cephalic Diagonal	H. tibio-tarsus	Hind Claw		Furcula	
	1	2	3	4			Unguis	EA	Manub.	Dens
Oaxaca:										
Cueva Bonita	—	.46	.675	2.66	.74	.756	.154	.098	.77	.952
Cueva Bonita	—	.42	.630	2.65	.658	.70	.105	.07	.67	.84
Cueva Bonita	—	.462	.672	—	.658	.756	.133	.077	.76	.84
Cueva Bonita	—	.39	.60	2.65	.63	.658	.147	.084	.602	.882
Cueva Bonita	—	.315	.49	1.68	.518	.546	.140	.06	.504	.588
Cueva Bonita	—	.378	.532	—	.588	.532	.126	.065	.602	.770
Cueva Bonita	—	.336	.588	—	.574	.602	.133	.070	.56	.798
Cueva Bonita	—	.476	.700	2.91	.700	.756	.140	.087	.67	.910
Cueva Bonita	—	.322	.504	—	.560	.588	.119	.070	.56	.714
Cueva Bonita	—	.364	.546	1.82	.658	.686	.130	.084	.63	.80
Cueva Bonita	—	.266	.35	1.44	.504	.546	.105	.070	.504	.672
Cueva Bonita	.280	.476	.700	2.03	.63	.560	.112	.070	.532	.700

Table 2. Measurements (in mm) of *Pseudosinella strinatii,* new species

Locality	Antennal Segments				Cephalic Diagonal	H. tibio-tarsus	Hind Claw		Furcula	
	1	2	3	4			Unguis	EA	Manub.	Dens
					Form A					
San Luis Potosí:										
Sótano del Tigre	.12	.154	.196	.259	.329	.287	.0315	.0175	.257	.274
Sótano del Tigre	.098	.175	.186	.259	.378	.315	—	—	.280	.330
Sótano del Tigre	.084	.154	.168	.238	.280	.280	.0385	.021	.294	.308
Cueva Taninul n.1	.077	.161	.168	.259	.350	.266	.0335	.0175	.294	.385
Tamaulipas:										
Cueva del Pachón	.042	.084	.084	.147	.224	.168	.0175	.0105	.175	.175
Cueva de la Florida	.084	.154	.161	.231	.315	.280	.0315	.0175	.273	.301
Cueva de la Florida	.091	.105	.105	.189	.280	.231	.028	.015	.196	.231

					Form B					
San Luis Potosí:										
Cueva Pinta	.105	.21	.224	.301	.420	.357	.035	.015	.322	.385
Cueva Chica	.049	.119	.126	.196	.259	.252	.0245	.012	.196	.308
Cueva Chica	.049	.084	.091	.161	.245	.189	.0175	.011	.182	.203
Cueva Chica	.084	.168	.175	.259	.336	—	—	—	—	—
Cueva Chica	.077	.161	.196	.252	.329	.315	.0315	.021	.308	.350
Cueva Chica	.056	.147	.161	.259	.329	.294	.035	.0245	.280	.343
Cueva Chica	.084	.189	—	—	.406	.329	.035	.021	.315	.392
Cueva Chica	.049	.105	.119	.175	.245	—	—	—	.175	.231
Cueva Chica	.063	.098	.077	.147	.259	.231	.035	.021	.203	.259
Cueva Lagunita	.126	.259	.217	.273	.392	.371	.0385	.035	.357	—
Cueva Lagunita	.063	.133	.133	.182	.301	.259	.028	.011	.196	.252
Cueva Lagunita	.105	.196	.231	.266	.329	.336	.033	.0175	.308	.413
Cueva Lagunita	—	—	—	—	.329	.266	.028	.014	.280	.301
					Form C					
Tamaulipas:										
Crystal Cave	.049	.084	.105	.175	.217	.224	.028	.014	.224	.245
Crystal Cave	.049	.098	.105	.189	.259	.224	.0245	.0175	.217	.252
Crystal Cave	.035	.098	.112	.217	.315	.257	.033	.021	.245	.301

Table 3. Measurements (in mm) of *Pseudosinella reddelli,* new species

Locality	Antennal Segments				Cephalic	H. tibio-	Hind Claw		Furcula	
	1	2	3	4	Diagonal	tarsus	Unguis	EA	Manub.	Dens
Coahuila:										
Gruta Cuevacillas	.063	.119	.126	.189	.378	.226	.028	.0175	.294	.287
Gruta Cuevacillas	.028	.0595	.0595	.105	.192	.140	.019	.0105	.15	.14
Gruta Cuevacillas	.028	.0525	.0595	.0945	.196	.0145	.0175	.01	.133	.13
Gruta Cuevacillas	.0385	.0735	.07	.108	.196	.154	.028	.012	.168	.164
Gruta Cuevacillas	.0455	.084	.0735	.115	.217	.178	.0245	.012	.192	.192
Gruta Cuevacillas	.0385	.084	.0665	.115	.203	.164	.023	.012	.196	.164
Gruta Cuevacillas	.038	.077	.066	.112	.21	.112	.019	.0085	.171	.157
San Luis Potosi:										
Cueva Lagunita	.098	.175	.112	.224	.413	.294	.0385	.021	.343	.364
Cueva Lagunita	.077	.182	.189	.245	.336	.259	.0245	.016	.301	.364
Sótano Golondrina	.084	.203	.196	.301	.406	.434	.0525	.0315	.448	.511
Sótano Golondrina	.035	.14	.105	.224	.42	.42	.047	.021	.427	.504
Sótano Golondrina	.084	.168	.154	.259	.399	.399	.0525	.025	.399	.504
Sótano Golondrina	.056	.105	.098	.182	.312	—	—	—	.245	.259
Sótano Golondrina	.052	.087	.077	.147	.280	.224	.026	.015	.252	.280
Sótano Golondrina	.056	.182	.161	.245	.392	.385	.0455	.024	.336	.427
Sótano Golondrina	.045	.091	.091	.168	.273	.231	.028	.018	.280	.252
Sótano Ojo de Agua	.112	.238	.280	.336	.518	.546	.0525	.0245	.532	.616
Sótano Ojo de Agua	.126	.238	.252	.336	.518	.532	.0595	.035	.630	.630
Sótano Ojo de Agua	.112	.280	.280	.364	.560	.588	.0665	.0385	.588	.630
Sótano Ojo de Agua	.098	.252	.182	.322	.518	.56	.0595	.0385	.49	.658

→Fig. 2. *P. strinatii,* n.sp. a, hind unguis, form B, 1000X; b, hind unguis, form A, 600X; c, hind unguis, form C, 600X; d, mucro, form B, 1000X; e, mucro, form A, 600X; f, chaetotaxy, form A.

→Fig. 3. *P. reddelli,* n.sp. a, mucro, 400X; b, apical organ of third antennal segment, 1000X; c, hind unguis, 400X (abnormal specimen); d, hind unguis, 400X (normal specimen); e, chaetotaxy; f, eyes, right side, specimen from San Luis Potosí, 200X; g, eyes, left side, specimen from Coahuila, 400X.

→Fig. 4. *P. finca,* n.sp. a, hind unguis, 1000X, specimen from Cueva Sepacuite; b, fore unguis, 1000X, specimen from Cueva Seamay; c, chaetotaxy.

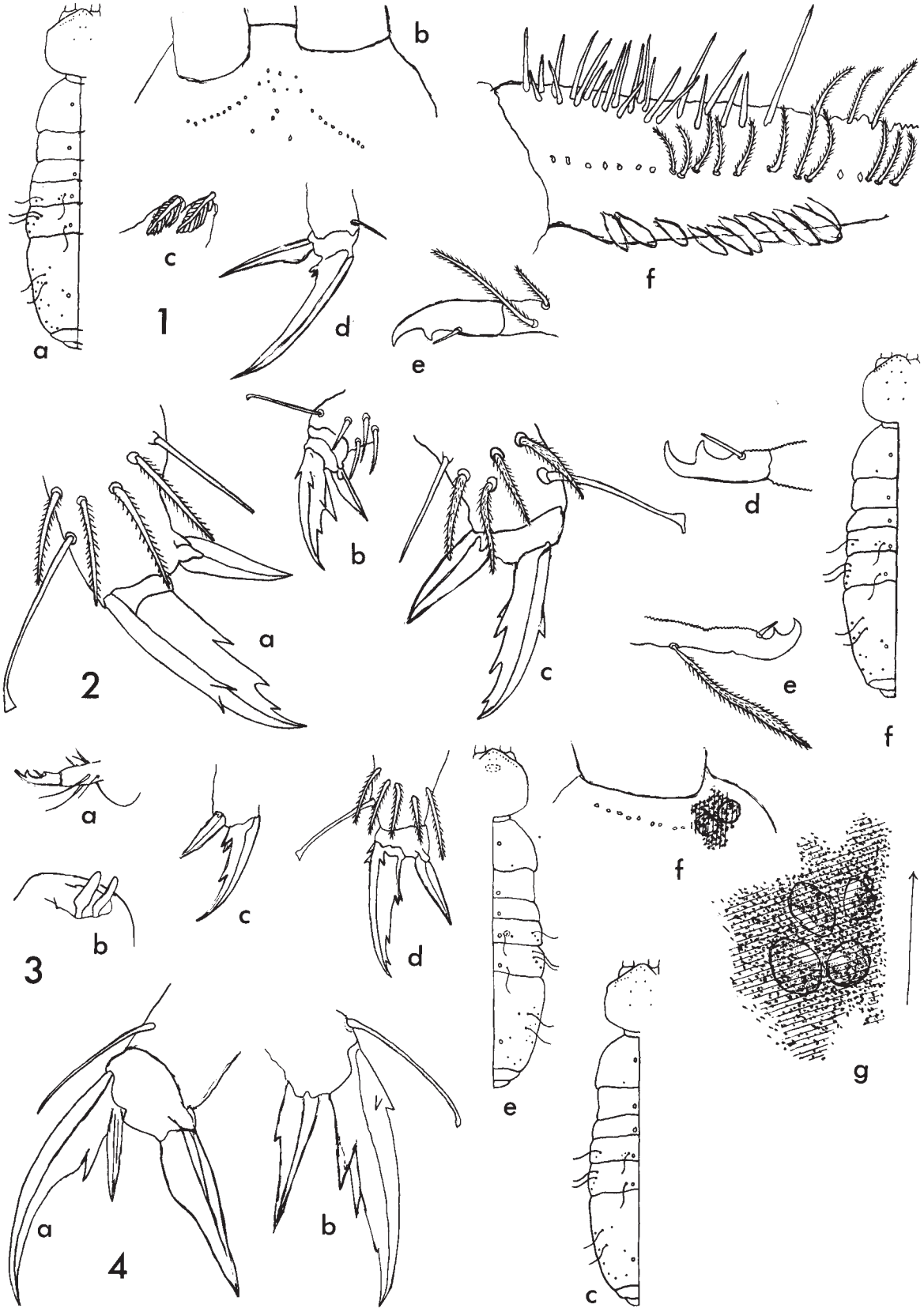

Fig. 1. *P. bonita,* n.sp. a, chaetotaxy; b, anterior of head showing antennal bases, macrochaetae, and antennal setae, 100X; c, apical organ of third antennal segment, 1000X; d, hind unguis, 200X; e, mucro, 400X; f, base of dens showing distribution of spines, 200X.

Tamaulipas:										
Cueva Infiernillo	.098	.210	.238	.392	.49	.462	.0525	.03	.518	.812
Cueva Infiernillo	.126	.224	.266	.434	.49	.462	.0525	.03	.504	.798
Cueva Infiernillo	.126	.238	.252	.448	.56	.49	.063	.035	.462	.756
Cueva Infiernillo	—	—	—	—	.42	.441	.0525	.0315	.462	.672
Cueva Infiernillo	.098	.224	.168	.392	.56	.490	.063	.035	.532	.742
Cueva Remolino	—	—	—	—	.504	.476	.06	.035	.518	.728
Cueva Remolino	—	—	—	—	.462	.420	.0525	.0315	—	—
Cueva Capilla	.077	.161	.154	.231	.364	.273	.035	.0245	.280	.511
Cueva Capilla	—	—	—	—	.336	.301	.0385	.021	.322	.42
Cueva Capilla	.049	.098	.098	.182	.266	—	—	—	.245	.294
Cueva Capilla	.049	.119	.126	.238	.315	.252	.0315	.0175	.266	.364
Cueva Capilla	.056	.126	.140	.231	.315	.266	.035	.018	.273	.434
Cueva Capilla	—	—	—	—	.259	.203	.0245	.014	.210	.280
Cueva Capilla	.042	.112	.119	.205	.266	.231	.0315	.0175	.245	.371
Cueva Capilla	.084	.182	.189	.315	.427	.378	.0455	.028	.378	.581
Cueva Capilla	.049	.098	.098	.189	.266	.196	.0245	.014	.189	.294
Cueva de la Mina	.063	.161	.126	.238	.385	.28	.042	.0245	.315	.609*
Cueva de la Mina	.056	.112	.119	.273	.329	.266	.0315	.0175	.315	.406
Cueva de la Mina	.035	.077	.077	.14	.219	.168	.0245	.014	.196	.252
Cueva de la Mina	.063	.112	.091	.224	.371	.301	.035	.018	.35	.42
Cueva de la Mina	.105	.196	.161	.245	.399	.315	.0385	.0245	.322	.371
Cueva de la Mina	—	—	—	—	.392	—	—	—	.392	.54
Bee Cave	.098	.217	.168	.259	.392	.350	.0455	.028	.370	.546
Bee Cave	.063	.175	.175	.266	.350	.329	.0285	.0245	.315	.567
Bee Cave	.133	.259	.238	.329	.490	.392	.059	.035	.497	.72
Bee Cave	.105	.217	.238	.350	.448	.378	.056	.035	.462	.714
Bee Cave	.119	.224	.245	.350	.490	.399	.059	.032	.504	.728
Bee Cave	.126	.266	.224	.322	.518	.434	.056	.031	.532	.728
Cueva Manantiales	.077	.161	.147	.273	.441	.227	.0525	.0245	.399	.595
Cueva Manantiales	.084	.217	.224	.294	.441	.364	.0525	.032	.455	.497

*Molting

Table 4. Measurements (in mm) of *Pseudosinella finca,* new species

Locality	Antennal Segments				Cephalic Diagonal	H. tibio-tarsus	Hind Claw		Furcula	
	1	2	3	4			Unguis	EA	Manub.	Dens
Guatemala:										
Cueva Sepacuite	.091	.196	.210	.301	.294	.259	.0385	.0245	.231	.322
Cueva Sepacuite	.077	.161	.126	.231	.294	.273	.0385	.021	.262	—
Cueva Sepacuite	.077	.175	.182	.294	.399	.301	.042	.028	.287	.287
Cueva Sepacuite	.070	.147	.161	.238	.259	.238	.0385	.0245	.245	.231
Cueva Sepacuite	.091	.196	.175	.301	.364	.287	.047	.0245	.259	.308
Cueva Lanquin	.0385	.059	.063	.112	.175	.112	.016	.007	.126	.133
Cueva Seamay	.077	.161	.175	.266	.336	.289	.028	.014	.287	.329
Cueva Seamay	—	—	—	—	.301	.273	.035	.021	.266	.273
Cueva Seamay	—	—	—	—	.350	.273	.035	.021	.274	.315
Cueva Seamay	.084	.154	.175	.259	.378	.287	.0385	.021	.329	.350
Cueva Seamay	.091	.217	.224	.336	.392	.350	.042	.0245	.364	—
Cueva Seamay	.091	.210	.161	.294	.378	.343	.042	.021	.308	.371

THREE NEW SCHIZOMIDA OF THE GENUS *SCHIZOMUS* FROM MEXICAN CAVES (ARACHNIDA)

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INTRODUCTION

Since 1938, when Chamberlin and Ivie described the first Mexican schizomid, a new subfamily, two new genera, and nearly a score of new species have been reported from México, mostly from caves. The descriptions of these species are fortunately distributed through a relatively few titles. These are Chamberlin and Ivie (1938), Gertsch (1940), Rowland (1971a, 1971b, 1973) and Brignoli (1973).

Descriptions became fairly well standardized with Gertsch's work, however, considerable confusion has recently been introduced. Brignoli (1973) attempted to introduce the spermatheca as a new means of utilizing the normally taxonomically useless females. Börner (1902) first described the spermatheca of a schizomid, but no subsequent taxonomic use was made of this character. Some time ago I also became interested in using the spermatheca as a taxonomic tool. After considerable comparative work, however, I found intraspecific variation in this character relatively great and interspecific variation relatively small. I found, for example, that the spermatheca of *S. longimanus* Rowland and *S. floridanus* Muma were inseparable. Brignoli showed marked differences between *S. sbordonii* Brignoli and *S. arganoi* Brignoli which are probably significant, however the former's spermatheca is in my eyes indistinguishable from *S. longimanus*.

It is my belief that upon a thorough study of considerable comparative material the spermatheca can be put to some use. At this time, however, I am unable to place Dr. Brignoli's schizomids. I am further at a loss to understand how Dr. Brignoli decided that his new species were different from previously described species, having no males of *S. sbordonii* and *S. arganoi,* or females of all the other Mexican species for comparison.

Until the males of *S. sbordonii* and *S. arganoi* are described I will not certainly know if I am creating synonyms. My efforts to describe and relate new species coming to my attention will not, however, stop. In my future revisionary work on Mexican schizomids I will fully deal with the spermatheca and will attempt to place Brignoli's schizomids.

The species currently reported from México, including the species described herein, are as follows:

Family Schizomidae Hansen & Sorensen, 1905
- Subfamily Schizominae Hansen & Sorenson, 1905
  - Genus *Schizomus* Cook, 1899
    1. *S. cavernicolens* Chamberlin & Ivie, 1938
    2. *S. davisi* Gertsch, 1940
    3. *S. mexicanus* Rowland, 1971
    4. *S. longimanus* Rowland, 1971
    5. *S. mitchelli* Rowland, 1971
    6. *S. cookei* Rowland, 1971
    7. *S. reddelli* Rowland, 1971
    8. *S. bartolo* Rowland, 1973
    9. *S. orthoplax* Rowland, 1973

10. *S. pecki* Rowland, 1973
11. *S. firstmani* Rowland, 1973
12. *S. sbordonii* Brignoli, 1973
13. *S. arganoi* Brignoli, 1973
14. *S. lukensi,* new species
15. *S. moisii,* new species
16. *S. stewarti,* new species

Genus *Heteroschizomus* Rowland, 1973

17. *H. goodnightorum* Rowland, 1973

Subfamily Megaschizominae Rowland, 1973

Genus *Agastoschizomus* Rowland, 1971

18. *A. lucifer* Rowland, 1971
19. *A. pachypalpus* Rowland, 1973

The main purpose of this paper is to describe three new species of schizomids of some interest. One is a troglobite from Tamaulipas, the others are probably troglophiles from caves in Oaxaca, the first schizomids described from that state.

Thanks are due Mr. Gil Ediger, Mrs. Jill Ediger, Mr. David McKenzie, Ms. Martha McKenzie, Mr. Stuart Murphy, Mr. James Reddell, and Mr. William Russell for providing the excellent collections on which this study is based. Appreciation is also expressed to Dr. Robert W. Mitchell for his continued support.

Schizomus lukensi, new species

Holotype—An adult male, taken in Cueva del Agua, 50 km SW Soto la Marina, Tamaulipas, México, on 31 October 1970 by W. Russell, G. Ediger, and J. Ediger, and deposited in the American Museum of Natural History, New York City.

Allotype—An adult female, taken at the same locality, on the same date, by the same collectors as the holotype, and also deposited in the American Museum of Natural History.

Paratypes—An adult male and two adult females, taken at the same locality, on the same date, by the same collectors as the holotype and allotype, and deposited in The Museum, Texas Tech University, Lubbock, Texas.

Description—The following, except for the last paragraph under this heading, describes the male.

Cephalothorax. Carapace (propeltidium, first cephalothoracic tergum) with three pair of dorsal and two apical setae, more than twice as long as wide, extremely convex, lateral margins nearly vertical, produced anteromesally as a blunt, conical process; eye spots absent; mesopeltidia (second pair of cephalothoracic tergites) acutely triangular, vaguely curved, pointing diagonally toward midline; metapeltidium (third cephalothoracic tergum) undivided, slightly emarginate posteriorly, not as deep medially as laterally, anterior margin parallel with posterior margin of mesopeltidium; anterior sternum with nine setae, triangular, apex extending just beyond caudal limit of coxae II, anterolateral margins gently curved; posterior sternum (metasternum) with six setae, vaguely triangular.

Abdomen. First abdominal tergum located closer to metapeltidium than second abdominal tergum, chevron shaped; terga II to VII with two setae, terga VIII and IX with four setae; segment X with seven setae; segment XI with seven setae; segment XII with two dorsal, six lateral, five ventral setae; spiracles oval on second abdominal sternum; terga III to VII bearing darkened apodemes of dorsoventral muscles; vestigial stigmata appearing as slightly darkened areas on sterna V to VII.

Flagellum. Spade shaped, horizontally compressed, bearing 16 setae; dorsal surface without relief.

Chelicerae. Lateral aspect of basal segment bearing three setae, vertical group of two long, feathered setae flanking movable finger (second cheliceral segment), group of three shorter setae arranged basally on fixed digit, horizontal group of seven setae arising on or near ventral margin; mesal surface of basal segment bearing group of four setae arranged horizontally, lower group of two setae arranged vertically, another two short, stout setae below these, arranged in a vertical line, three setae directly below large dorsal seta, movable finger flanked by another vertical group of three long, feathered setae as on lateral surface, three large, elongate, distally enlarged setae originating just below previous group, fixed digit bearing seven closely situated, feathered setae; movable finger laterally destitute of setae, mesal aspect bearing vertical row of 19 long, feathered, distally curled setae near outer margin, another vertical row of 16 short setae or teeth near inner surface.

Pedipalps. Trochanter distinctly produced distally; femur and patella narrow proximally, expanded distally; tibia without mesal, subapical spur; tarsus-basitarsus with two small spurs just above claw; length of segments given in Table 1.

Legs. Tarsal segments of leg I of the following proportions $1 > 7 > 6 > 3, 4, 5 > 2$; anterolateral spur of coxa of leg II 30 per cent as long as coxa proper; patella of leg III 65 per cent as long as tibia; length of segments given in Table 1.

Females differ from males in following respects: First legs proportionately shorter than in male; lengths of segments given in Table 1. Flagellum long, rod-shaped, with two annulations, the terminal section longer than the previous two; abdominal sternum II strongly emarginate posteriorly.

Comparisons—This singular species shows some similarities to *Schizomus mexicanus* Rowland, 1971, and *S. bartolo* Rowland, 1973. The shape of the male flagellum is very similar to that of *S. mexicanus,* but differs from the latter in having no dorsal relief. In the latter respect *S. lukensi* is more similar to *S. bartolo.* The latter two species are also similar in their extreme reduction in pigmentation. They are probably both troglobites.

Measurements—The total length of the male holotype and the female allotype, both from the type locality, is 4.2, and 4.7, respectively. See Table 1.

Variation—No variation disproportionate to variation in body length was noticed.

Distribution—*S. lukensi* is known only from Cueva del Agua, 50 km SW Soto la Marina, Tamaulipas, México.

Remarks—*S. lukensi,* like *S. bartolo* shows evidence of cave adaptation. Adults are very pale, notably paler than epigean species. The front legs are longer than most epigean species, though not as long as in *S. longimanus* Rowland, 1971. Also as in *S. bartolo* all ventral setae are bifid. See Rowland (1971b, 1973).

On the basis of morphology of the male flagellum *S. lukensi* seems closest related to *S. mexicanus,* a widely distributed species.

Etymology—The specific name is a patronym, given in honor of Mr. Loren Lukens, Banning, California.

Table 1. *Schizomus lukensi*

Male Holotype

	Pedipalp	I	II	III	IV
Coxa	.49	.53	.40	.34	.29
Trochanter	.29	.29	.16	.20	.29
Femur	.28	1.50	.90	.79	1.22
Patella	.38	1.94	.32	.35	.47
Tibia	.40	1.49	.57	.53	.90
Basitarsus	.20	.97	.51	.54	.79
Tarsus			.44	.46	.54

Female Allotype

	Pedipalp	I	II	III	IV
Coxa	.56	.58	.43	.38	.35
Trochanter	.30	.26	.18	.25	.32
Femur	.31	1.30	.90	.78	1.19
Patella	.40	1.16	.41	.34	.42
Tibia	.41	1.25	.62	.53	.81
Basitarsus	.21	1.00	.45	.53	.74
Tarsus			.42	.45	.48

Schizomus moisii, new species

Holotype—An adult male, taken in Grutas de Monteflor, 6 km NE Valle Nacional, Oaxaca, México, on 28 December 1972 by J. Reddell, D. McKenzie, M. McKenzie, and S. Murphy, and deposited in the American Museum of Natural History.

Allotype—An adult female, taken at the same locality, on the same date, by the same collectors as the holotype, and also deposited in the American Museum of Natural History.

Paratypes—Five adult males, five adult females and one juvenile, taken at the same locality, on the same date, by the same collectors as the holotype, and deposited in The Museum, Texas Tech University, Lubbock.

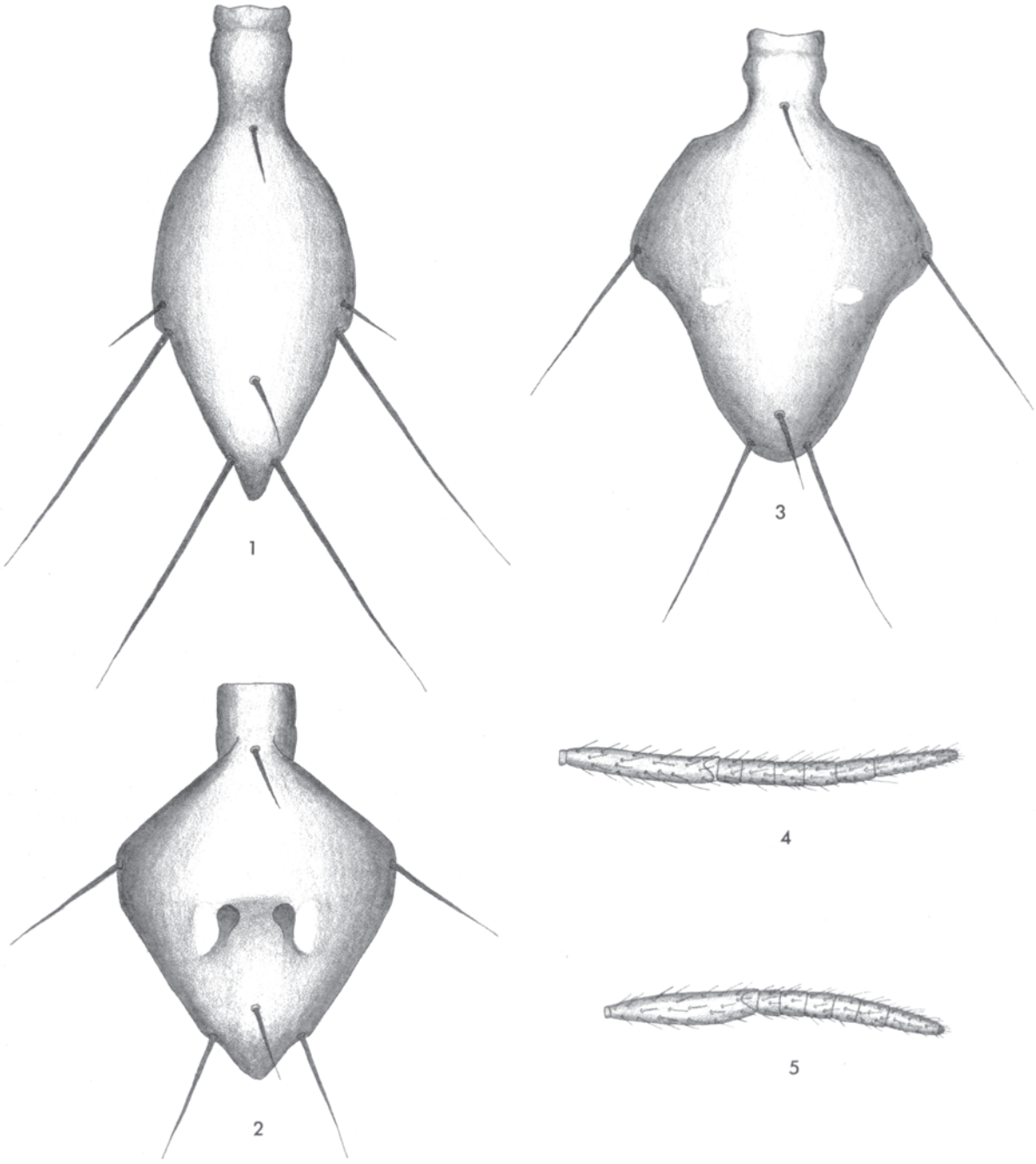
Description—The following, except for the last paragraph under this heading, describes the male.

Cephalothorax. Carapace (propeltidium, first cephalothoracic tergum) with three pair of dorsal and two apical setae, one and one half times as long as wide, gently convex, lateral margins nearly vertical, produced anteromesally as a blunt, conical process; eye spots distinctly oval, pale areas on anterolateral surface of carapace; mesopeltidia (second pair of cephalothoracic tergites) acutely triangular, vaguely curved, pointing diagonally toward midline; metapeltidium (third cephalothoracic tergum) undivided, emarginate posteriorly, not as deep medially as laterally, anterior margin parallel with posterior margin of mesopeltidium; anterior sternum with nine setae, triangular, apex extending just beyond caudal limit of coxae II, anterolateral margins gently curved; posterior sternum (metasternum) with six setae, vaguely triangular.

Abdomen. First abdominal tergum located much closer to metapeltidium than second abdominal tergum, triangular; terga II to VII with two setae, terga VIII and IX with four setae; segment X with seven setae; segment XI with seven setae; segment XII with two dorsal, six lateral, five ventral setae; spiracles oval on second abdominal sternum; terga III to VII bearing vaguely darkened apodemes of dorsoventral muscles; vestigial stigmata appearing as oval, darkened areas on sterna V to VII.

Flagellum. Diamond shaped, horizontally compressed, bearing 16 setae; dorsal surface with two deep depressions each with a lateral swelling.

Chelicerae. Lateral aspect of basal segment bearing three setae, vertical group of three long, feathered setae flanking movable finger (second cheliceral segment), group of three shorter setae arranged basally on fixed digit, horizontal group of seven setae arising



Figs. 1-3. Dorsal view of male flagellum: 1, *Schizomus lukensi;* 2, *S. moisii;* 3, *S. stewarti.*
Figs. 4-5. Lateral view of basitarsus-tarsus: 4, *S. lukensi;* 5, *S. moisii.*

on or near ventral margin; mesal surface of basal segment bearing group of four setae arranged horizontally, lower group of two setae arranged vertically, another two short, stout setae below these, arranged in a vertical line, two setae directly below large dorsal seta, movable finger flanked by another vertical group of three long, feathered setae as on lateral surface, three large, elongate, distally enlarged setae originating just below previous group, fixed digit bearing six closely situated, feathered setae; movable finger laterally destitute of setae, mesal aspect bearing vertical row of 20 long, feathered, distally curled setae near outer margin, another vertical row of 18 short setae or teeth near inner surface.

Pedipalps. Trochanter not distinctly produced distally; femur and patella narrow proximally, expanded distally; tibia without mesal, subapical spur; tarsus-basitarsus with two small spurs just above claw; length of segments given in Table 2.

Legs. Tarsal segments of leg I of the following proportions 1 > 7 > 6 > 2, 3, 4, 5; anterolateral spur of coxa of leg II 35 per cent as long as coxa proper; patella of leg III 80 per cent as long as tibia; length of segments given in Table 2.

Females differ from males in the following respects: First legs proportionately much shorter than in male; lengths of segments given in Table 2. Flagellum long, rod shaped, with two annulations, the terminal section longer than previous two; abdominal sternum II strongly emarginate posteriorly.

Comparisons—*S. moisii* superficially resembles *S. cookei* Rowland, 1971, in having a pair of swellings lateral to the median depressions on the dorsal surface of the male flagellum. The general morphology of the flagellum is similar to *S. stewarti,* new species, but the latter lacks the deep median depressions of *S. moisii.* This species is rather distinct from any other known Mexican schizomid.

Measurements—The total length of the male holotype and the female allotype, both from the type locality, is 4.1, and 4.6, respectively. See Table 2.

Variation—The apex of the carapace (propeltidium) of the holotype is typical of most other schizomids, however two of the paratypes show variation in this character unlike any I have seen before. Two of the male paratypes have no conical process at the apex of the carapace, but merely a truncated margin, which is nearly straight from the right to the left side. The two setae usually present at the apex are reduced to one, the distal setae probably being lost. I cannot speculate on the significance of this phenomenon. No other variation disproportionate to variation in body length was noticed.

Distribution—*S. moisii* is known only from Grutas de Monteflor, 6 km NE Valle Nacional, Oaxaca, México.

Remarks—This species represents the first of a quite distinct new species group of Mexican Schizomida. It is easily distinguishable from all previously described Mexican species, but shows some similarities to *S. stewarti,* new species. *S. moisii* and the latter species are undoubtedly properly placed in the same species group, which will probably expand when more collections are available from Oaxaca and adjacent states.

Etymology—The specific name is a patronym, given in honor of Mr. Thomas Moisi, Rosemead, California.

Table 2. *Schizomus moisii.*

Male Holotype

	Pedipalp	I	II	III	IV
Coxa	.44	.58	.37	.32	.36
Trochanter	.24	.26	.17	.18	.30
Femur	.29	1.32	.78	.62	1.18
Patella	.31	1.78	.42	.28	.51
Tibia	.30	1.30	.52	.35	.82
Basitarsus	.20	.95	.50	.40	.67
Tarsus			.38	.33	.53

Female Allotype

	Pedipalp	I	II	III	IV
Coxa	.51	.58	.40	.38	.34
Trochanter	.25	.25	.19	.20	.30
Femur	.26	1.11	.70	.67	1.06
Patella	.34	1.42	.37	.31	.43
Tibia	.33	1.00	.46	.41	.80
Basitarsus	.19	.86	.44	.42	.65
Tarsus			.32	.34	.40

Schizomus stewarti, new species

Holotype—An adult male, taken in Cueva del Guayabo, 12 km NE Valle Nacional, Oaxaca, México, on 29 December 1972 by J. Reddell, D. McKenzie, M. McKenzie, and S. Murphy, and deposited in the American Museum of Natural History.

Paratype—A juvenile, taken at the same locality, on the same date, by the same collectors as the holotype, and also deposited in the American Museum of Natural History.

Description—Cephalothorax. Carapace (propeltidium, first cephalothoracic tergum) with three pair of dorsal and two apical setae, nearly twice as long as wide, acutely convex, lateral margins nearly vertical, produced anteromesally as a blunt, conical process; eye spots distinct as irregular, pale areas on anterolateral surface of carapace; mesopeltidia (second pair of cephalothoracic tergites) acutely triangular, vaguely curved, pointing diagonally toward midline; metapeltidium (third cephalothoracic tergum) undivided, emarginate posteriorly, not as deep medially as laterally, anterior margin parallel with posterior margin of mesopeltidium; anterior sternum with nine setae, triangular, apex extending just beyond caudal limit of coxae II, anterolateral margins gently curved; posterior sternum (metasternum) with six setae, vaguely triangular.

Abdomen. First abdominal tergum located closer to metapeltidium than second abdominal tergum, triangular; terga II to VII with two setae, terga VIII and IX with four setae; segment X with seven setae; segment XI with seven setae; segment XII with two dor-

sal, six lateral, five ventral setae; spiracles oval on second abdominal sternum; terga III to VII bearing vaguely visible apodemes of dorsoventral muscles; vestigial stigmata appearing as darkened areas on sterna V to VII.

Flagellum. Bulbous, horizontally compressed, bearing 16 setae; dorsal surface with two, small, lateral swellings.

Chelicerae. Lateral aspect of basal segment bearing four setae, vertical group of three long, feathered setae flanking movable finger (second cheliceral segment), group of three shorter setae arranged basally on fixed digit, horizontal group of seven setae arising on or near ventral margin; mesal surface of basal segment bearing group of four setae arranged horizontally, lower group of two setae arranged vertically, another two short, stout setae below these, arranged in a vertical line, two setae directly below large dorsal seta, movable finger flanked by another vertical group of three long, feathered setae as on lateral surface, three large, elongate, distally enlarged setae originating just below previous group, fixed digit bearing six closely situated, feathered setae; movable finger laterally destitute of setae, mesal aspect bearing vertical row of 19 long, feathered, distally curled setae near outer margin, another vertical row of 18 short setae or teeth near inner surface.

Pedipalps. Trochanter distinctly produced distally; femur and patella narrow proximally, expanded distally; tibia without mesal, subapical spur; tarsus-basitarsus with two small spurs just above claw; length of segments given in Table 3.

Legs. Tarsal segments of leg I missing; anterolateral spur of coxa of leg II 30 per cent as long as coxa proper; patella of leg III 80 per cent as long as tibia; length of segments given in Table 3.

Comparisons—*S. stewarti* is most closely related to *S. moisii,* but differs in the morphology of the male flagellum. *S. stewarti* has no depressions on the dorsal side of the flagellum as in *S. moisii,* and the lateral swellings are much smaller in the former than in the latter.

Measurements—The total length of the male holotype is 3.5. See Table 3.

Variation—Only one adult specimen of this species was available for study.

Distribution—*S. stewarti* is known only from Cueva del Guayabo, 12 km NE Valle Nacional, Oaxaca, México.

Remarks—See remarks under *S. moisii.*

Etymology—The specific name is a patronym, given in honor of Dr. Glenn Stewart, California State Polytechnic University, Pomona.

Table 3. *Schizomus stewarti.*

Male Holotype

	Pedipalp	I	II	III	IV
Coxa	.53	.50	.33	.32	.28
Trochanter	.22	.29	.18	.17	.25
Femur	.32	—	.61	.51	.98
Patella	.34	—	.34	.25	.33
Tibia	.28	—	.44	.31	.71
Basitarsus	.17	—	.41	.40	.55
Tarsus			.33	.32	.40

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A REPORT ON CAVE SPIDERS FROM MEXICO AND CENTRAL AMERICA[1]

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About one hundred species of spiders have so far been reported from cave habitats in México and intensive collecting surveys will eventually enlarge this list several times. In an earlier paper Gertsch (1971) cited 86 species, most of them new, and the present report further enlarges the Mexican fauna by addition of 20 species of which 16 are herein described for the first time. In addition, eight new species are reported from caves in Guatemala, Belize (British Honduras), and Panama of Central America, the larger area considered in this paper. Additional records with full collecting data are presented for some species noted on earlier lists, and I look forward to future consideration of spider families not mentioned here.

Spiders are important predators of crawling and flying invertebrates and penetrate into all parts of caves where prey is present. The regional cave fauna is derived from local taxa and comprises distinctive elements. Some big-eyed vagrants that depend on sight for hunting cannot exist very long in caves. Most cave dwellers have been derived from available cryptic types of both primitive and specialized groups. The majority are sedentary and spin webs in crevices on cave walls and under detritus on the floor. Within these webs such spiders have no need for sight and substitute keen chemotactic senses centered in receptors on their appendages. The few hunting spiders living exclusively in caves long ago deemphasized sight as a requirement of life activities. Representatives of all kinds live in Mexican and Central American caves.

The obligate cavernicoles are always of special interest because of deep commitment to cave existence. Six additional species from México and Central America enlarge this total to 19 from the 13 Mexican taxa noted in the earlier paper. Two additional families, Telemidae and Ochyroceratidae, are now represented as listed below.

Family Dipluridae
- *Euagrus anops,* new species
  - Cueva de la Porra, San Luis Potosí, México.

Family Theraphosidae
- *Schizopelma reddelli,* new species
  - Cueva del Nacimiento del Río San Antonio, Oaxaca, México.

Family Pholcidae
- *Metagonia martha,* new species
  - Cueva del Nacimiento del Río San Antonio, Oaxaca, México.
- *Metagonia jarmila,* new species
  - Bucks Bypass Cave, Belize

Family Telemidae
- *Telema mayana,* new species
  - Cueva Sepacuita, Guatemala

Family Ochyroceratidae
- *Theotima pura,* new species
  - Cueva de los Vampiros, Tamaulipas, México.

This paper could not have been realized without the aid of colleagues and friends dedicated to biological and systematic studies of caves and their faunas. Mr. James Reddell and Professor Robert Mitchell, both of Texas Tech University in Lubbock, Texas, outstanding students of Texas and Mexican caves, are responsible for most of the material of the present report. New material from Central American caves

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and much also from those in México were made available to me by Dr. Stewart Peck of Carleton University, Ottawa, Canada. To these students and to their assistants and to all others who have contributed to the project, I offer my gratitude. All the material will be deposited in the collections of the American Museum of Natural History in New York and The Museum, Texas Tech University in Lubbock.

SUBORDER MYGALOMORPHAE

Few mygalomorph spiders have become obligate cavernicoles so discovery of two additional ones from Mexican caves is of special interest. A completely eyeless *Euagrus* from San Luis Potosí differs strikingly from *cavernicola* of Tamaulipas caves and presents several derivative features. A pallid, long-legged theraphosid from Oaxaca with evanescent eyes is related to *stygia* of San Luis Potosí and both are herein assigned tentatively to the genus *Schizopelma.* In Bulletin 4 of this journal (Gertsch, 1971, p. 48) I listed the few then known troglobite mygalomorphs from the world but failed to record a blind diplurid from Australia, described by Dr. Barbara Main (1969, pp. 9-11) on the basis of fragments from Roaches Rest Cave, one of the Nullarbor Caves. The four diplurids are all whitish spiders without eyes and they are presumably restricted to cave habitats. The Cuban *Troglothele* was based by Fage on a probably young specimen with all eyes totally absent. The status of the two Mexican theraphosids claimed to be troglobites is discussed below. Both have the eye tubercles mostly obsolete and the eyes reduced to pale spots. The revised list of world mygalomorph troglobites follows:

Family Dipluridae

Accola caeca Simon, 1892, caves, Phillipine Islands.

Euagrus cavernicola Gertsch, 1971, caves, Tamaulipas, México.

Euagrus anops, new species, Cueva de la Porra, San Luis Potosí, México.

Troglodiplura lowryi Main, 1969, Roaches Rest Cave, Australia.

Family Barychelidae

Troglothele coeca Fage, 1929, Gruta Bellamar, Cuba.

Family Theraphosidae

Schizopelma stygia (Gertsch), 1971, Cueva de los Potrerillos, San Luis Potosí, México.

Schizopelma reddelli, new species, Cueva del Nacimiento del Río San Antonio, Oaxaca, México.

FAMILY THERAPHOSIDAE

The taxon *stygia* was based on a pale immature specimen from Cueva de los Potrerillos with eye tubercle and eyes greatly reduced in size. A mature female from the same cave has provided additional features that make desirable its assignment to the genus *Schizopelma.* This is only a tentative placement and cannot be regarded as definite without evidence from the male and deeper study of this difficult group. In this paper two additional species are described from cave habitats. One is a troglophile with eye tubercle of medium height, black eye rings, and legs of medium length. The second one, named *Schizopelma reddelli* and taken from a mile deep inside a cave in Oaxaca, has paler coloration and longer legs than those of *stygia.* Both *stygia* and *reddelli* are presumed to be troglobites but more information and material are necessary before that status can be verified. An unusual feature of both species is absence of urticating hairs on the dorsum of the abdomen, a distinct patch usually being present in American genera of this family.

Schizopelma stygia (Gertsch)

Aphonopelma stygia Gertsch, 1971, p. 49.

Diagnosis—Probable troglobite with eye tubercle and eyes reduced in size; anterior median eyes pale, much smaller than anterior lateral eyes; scopulae on all tarsi divided below by long row of setae; legs of medium length, first leg 3.7 times as long as carapace; only simple hairs present on dorsum of abdomen; receptacles of epigynum (Fig. 2a) separated at base by about width of one.

Female—Total length 22 mm, not including chelicerae. Carapace 9.5 mm long, 8.3 mm wide. Abdomen 12 mm long, 6.5 mm wide.

Carapace oval, truncated in front and behind, covered thinly with procumbent hairs and weak setae but frontal margin with row of about forty stouter setae. Pars cephalica subtriangular, as wide as long, demarked by shallow cephalic grooves; cervical groove deep transverse depression; pars thoracica with shallow radiating grooves. Eye tubercle obsolete, not fully third of frontal width. Eight small eyes present, ratio in millimeters: ALE:AME:PLE:PME = 0.30:0.13: 0.19:0.15. Front eye row moderately procurved; anterior median eyes separated by diameter, farther from lateral eyes (20/13). Posterior eye row straight; oval median eyes separated by more than three diameters (19/70), diameter from lateral eyes. Front of

carapace and eyes as shown in Fig. 1. Median ocular quadrangle broader than long (88/18), narrowed in front (88/23). Sternum 4.5 mm long, 3.7 mm wide, clothed with erect black hairs; four pairs of sigilla clearly evident. Labium 1.5 mm long and broad, armed at tip with 16 small cuspules. Endite 3.8 mm long, 2 mm wide, with cluster of cuspules in basal third. Chelicerae robust, evenly rounded; promargin with 15 subequal black teeth; retromargin with thick band of reddish hairs.

	I	II	III	IV
Femur	9.15	8.15	8.00	10.50
Patella	5.20	4.75	4.10	4.50
Tibia	8.50	8.00	7.50	10.10
Metatarsus	7.50	7.15	8.70	12.50
Tarsus	5.10	4.90	5.15	6.40
Total	35.35	32.95	33.45	44.00

Leg formula 4132. First leg 3.7 times, first femur 0.96 times as long as carapace. Legs long, relatively slender, with thin black spines. First tibia with 1-1-2 ventral spines; first metatarsus with 0-1-1 ventral spines. First and second tarsi and metatarsi scopulate throughout their lengths. Palpal and tarsal claws smooth, without teeth. All tarsal scopulae divided by long row of setae most numerous and broadest on fourth tarsi. Promargin of first coxa and retromargin of palpal coxa clothed with fine hairs, on those faces lacking heavy spines or spinules. Palpus: femur 7 mm, patella 4.1 mm, tibia 5.5 mm, tarsus 4.6 mm, total 21.2 mm.

Abdomen suboval, covered evenly with suberect black hairs, with thin brush of coarse setae at base above pedicel but lacking scattered or formal patch of urticating hairs anywhere on dorsum. Middle spinneret 0.75 mm long. Lateral spinneret three-segmented, with measurements from base to apical segments 1.6 mm, 1.3 mm, 2 mm, respectively, totalling 4.9 mm.

Epigynum (Fig. 2a) broad basal atrium opening into pair of apically rounded pouches separated at base by width of one.

Type Data—Immature holotype from Cueva de los Potrerillos, 2 km W Ahuacatlán, San Luis Potosí, México, 12 July 1967 (J. Reddell, J. Fish, W. Russell) in American Museum of Natural History.

Distribution—Known only from above cave.

Other Record—MEXICO: *San Luis Potosí:* Cueva de los Potrerillos, same data as above, female; 27 November 1972 (J. Reddell, T. Raines), female.

Schizopelma reddelli, new species

Diagnosis—Near relative of *stygia,* probable troglobite distinguished by following features; anterior median eyes dark, much larger than anterior lateral eyes; anterior tarsi lacking conspicuous ventral rows of setae; legs proportionately longer, first leg 4.5 times as long as carapace; receptacles of epigynum widely separated at base (Fig. 2a).

Etymology—Named for Mr. James Reddell.

Female—Total length 18 mm, not including chelicerae. Carapace 10 mm long, 8.3 mm wide. Abdomen 12.5 mm long, 6 mm wide.

Entire spider orange to light brown; hairs mainly dusky and spines black; chelicerae and fangs dark reddish brown.

Structure like that of *stygia* unless otherwise noted. Carapace truncated in front and margin with row of about 24 stout setae. Eye tubercle mostly obsolete; eye group occupying fourth of width of pars cephalica. Eight small eyes present, pale except dark anterior median eyes lying on trivial elevation; ratio of eyes in millimeters: ALE:AME:PLE:PME = 0.15: 0.20:0.13:0.11. Front eye row moderately recurved; dark anterior median eyes subcontiguous, full diameter from lateral eyes. Posterior eye row slightly recurved; subround median eyes separated by about five diameters (60/11), about radius from lateral eyes. Median ocular quadrangle much broader than long (80/11), narrowed in front (80/45). Sternum 4.5 mm long, 4.2 mm wide, clothed with erect black setae; four pairs of sigilla well marked, suboval first pair large, lying in labial furrow. Labium 1.7 mm long, 1.4 mm wide, provided at tip with seven small cuspules. Endite 3.6 mm long, 2 mm wide, with cluster of numerous small cuspules in basal half. Chelicerae: promargin of right one with 11 black teeth, three much smaller; promargin of left one with nine black teeth, sixth one from apex fragmented to four denticles; retromargin with thick band of reddish hairs.

	I	II	III	IV
Femur	11.40	11.30	10.60	12.75
Patella	5.50	5.10	4.50	4.65
Tibia	11.00	10.35	9.75	12.80
Metatarsus	11.40	10.75	12.00	16.50
Tarsus	6.50	6.60	6.60	8.50
Total	45.80	44.10	43.45	55.20

Leg formula 4123. First leg 4.5 times, first femur 1.14 times as long as carapace. Legs quite long, relatively slender, with thin black spines. First tibia with 1 (or 2)-1-2 ventral spines; first right metatarsus with single basal spine, first left metatarsus with four spines, one at apex and three in basal half. First and second tarsi and metatarsi scopulate their length; third tarsus and apical half of metatarsus scopulate; fourth tarsi scopulate. Palpal and tarsal claws smooth. Venters of first and second tarsi with few apical setae;

third tarsi with row in apical half; fourth tarsi with row of setae whole length. Palpus: femur 8.5 mm, patella 4 mm, tibia 7 mm, tarsus 7.3 mm, total 26.8 mm.

Abdomen suboval, covered evenly with pale hairs and suberect dusky setae, with thin brush of setae above pedicel but completely lacking urticating hairs. Middle spinneret 1 mm long. Lateral spinnerets seemingly deformed, with measurements of left one from base to apical segment 1.5 mm, 0.5 mm, 0.75 mm, totalling 2.75 mm.

Epigynum (Fig. 2b) presenting pair of subparallel pouches widely separated at base.

Type Data—Female holotype from Cueva del Nacimiento del Río San Antonio, Oaxaca, México, 9 March 1973 (J. Reddell, S. Murphy, D. McKenzie, M. McKenzie, M. Butterwick), "found wandering over a clay bank deep in the cave one mile from mouth, probably in search of troglobitic thysanurans, which probably comprise an important part of the diet of this kind of spider."

Schizopelma elliotti, new species

Diagnosis—Troglophile species related to *stygia* with eye tubercle and eyes of medium development; dark anterior median eyes separated by diameter, smaller than anterior lateral eyes; scopulae of third and fourth tarsi divided by row of setae; legs of medium length, first leg about four times as long as carapace; receptacles of epigynum widely separated at base, directed laterad (Fig. 2c).

Etymology—Named for Mr. William Elliott.

Female—Total length 20 mm, not including chelicerae. Carapace 9.5 mm long, 8.5 mm wide. Abdomen 12 mm long, 6 mm wide.

Carapace and appendages dusky reddish brown; hairs and setae black; chelicerae and fangs dark reddish brown; abdomen dark brown with large patch of pale silky hairs covering posterior half of dorsum.

Structure like that of *stygia* unless otherwise noted. Carapace truncated in front and margin with row of about 30 stout setae. Eye tubercle of medium development, prominently raised in center; eye group occupying fourth of width of pars cephalica at front. Eyes of medium size; anterior median eyes dark and eyes ringed with black; ratio of eyes in diameters: AME:ALE:PLE:PME = 0.32:0.23:0.30:0.20. Front eye row essentially straight; round anterior median eyes separated by diameter, nearer lateral eyes (23/14). Posterior eye row moderately recurved; posterior median eyes separated by four diameters (80/20), about radius from posterior lateral eyes. Median ocular quadrangle twice as broad as long (110/55), narrowed in front (110/63). Sternum 4.10 mm long, 3.8 mm wide; all sigilla distinct. Labium 1.3 mm long, 1.5 mm wide, provided at tip with 11 cuspules. Endite 3.3 mm long, 1.7 mm wide, with cluster of cuspules mostly confined to basal third of segment. Chelicera: promargin with nine subequal teeth; retromargin with band of reddish hairs.

	I	II	III	IV
Femur	10.00	9.30	8.75	11.40
Patella	5.35	5.00	4.50	4.70
Tibia	8.35	7.60	7.15	9.70
Metatarsus	8.15	8.00	9.20	12.50
Tarsus	5.75	5.55	5.70	6.70
Total	37.60	35.45	35.30	45.00

Leg formula 4123. First leg about four times, first femur only slightly longer than carapace. Legs of medium length with thin black spines; first tibia with 2-2-2, first metatarsus with 0-1-1 ventral spines. First and second tarsi and metatarsi scopulate to base; third and fourth tarsi scopulate but their metatarsi scopulate only beyond middle. Venters of first and second tarsi with few setae in middle line; third and fourth tarsi with row of setae whole length. Palpus: femur 7 mm, patella 4 mm, tibia 5.8 mm, tarsus 5.3 mm, total 22.1 mm.

Abdomen suboval, covered thickly with fine hairs and scattered long setae; dorsum with thin brush of black setae above pedicel and thick patch of silky hairs covering two-thirds length (these representing long, somewhat atypical, Type II hairs). Middle spinneret 0.65 mm long. Lateral spinneret three-segmented with measurements from basal to apical segments 1.5 mm, 1.5 mm and 2 mm respectively, totalling 5 mm.

Epigynum (Fig. 2c) with pair of widely separated seminal receptacles directed laterad.

Type Data—Female holotype and small female from Cueva de la Laguna, 5 km N Valle de los Fantasmas (40 km ESE San Luis Potosí), San Luis Potosí, México, 3000 m, 20 May 1972 (W. Elliott, P. Lynn, R.M. McEachern).

FAMILY DIPLURIDAE

The discovery of a second eyeless *Euagrus* from a cave in México is an exciting event. *Euagrus anops* is a derivative type which has modified its features in several ways. The typical series of teeth on the promargin of the chelicera is greatly reduced in numbers and distribution of the elements. The complete lack of teeth on the tarsal claws is similarly unusual and demonstrates that the cave habitat for no obvious reason can profoundly affect characters often given high systematic importance. No males are known for

the two blind Mexican *Euagrus* but the expectation is that they likely will exhibit typical features of the genus.

The typical *Euagrus* is a darkly pigmented animal with dark brown or banded abdomen and fairly large eyes on a low transverse tubercle. Abundant in México, the various species spread their sheet webs under ground objects and in the entrances of caves. A pallid species from caves in Querétaro known only from a few females is also described below because it seems to show some cave adaptation. Other species from caves in various parts of México are not considered in the present paper and are listed in another place merely under the generic heading.

Euagrus anops, new species

Diagnosis—Pale, eyeless troglobite differing from *Euagrus cavernicola* as follows: lateral spinnerets much shorter than carapace; promargin of chelicera with few tiny teeth in basal half instead of formal long series of large teeth; tarsal claws without teeth.

Etymology—Specific name from Greek *a,* without, and *ops,* eyes, without eyes.

Female—Total length 5 mm. Carapace 2.2 mm long, 1.8 mm wide. Abdomen 2.7 mm long, 2 mm wide.

Entire spider whitish to faintly yellow, with sparse covering of dusky hairs and spines; carapace and chelicerae shiny; abdomen dull white.

Carapace elongate oval, evenly rounded on sides and in front, covered thinly with suberect dusky hairs. Pars cephalica subtriangular, with lateral grooves shallow, yellowish in color; cervical groove inconspicuous pit situated back three-fifths distance to posterior margin. Eyes and eye tubercle obsolete, its position indicated by suboval area of subintegumental spotting. Pars thoracica low, with three dark lateral striae on each side. Pedicel 0.3 mm long, exposed from above. Sternum cordate, 1 mm long, 0.95 mm wide, thinly covered with erect dark hairs, without obvious sigilla but usual front pair incorporated into transverse labial groove. Labium 0.18 mm long, 0.4 mm wide, with row of about eight dusky hairs along front edge. Endites set obliquely, 0.7 mm long, 0.5 mm wide, with erect hairs but no cuspules. Chelicera 1.7 mm long, projecting forward, as seen from above more than half as long as carapace, smooth above, covered thinly with inconspicuous hairs; promargin with six tiny teeth deep in furrow toward base, lacking close-set row of large brown teeth of genus; inner furrow with half dozen denticles opposite small teeth; retromargin unarmed, set with row of brown hairs; fang brown, curved, thin at end.

	I	II	III	IV
Femur	2.20	2.15	2.00	2.65
Patella	0.95	0.80	0.85	0.95
Tibia	2.00	1.95	1.70	2.65
Metatarsus	2.10	2.15	2.20	2.85
Tarsus	1.35	1.35	1.35	1.60
Total	8.60	8.40	9.10	10.70

Leg formula 4312. Legs longer and thinner than those of epigean species; first leg about four times, fourth leg about five times as long as carapace; fourth tibia longer than carapace. Legs clothed with fine, subprocumbent dusky hairs and few longer bristles and weak spines; those on posterior pairs more numerous; palpal claw with series of fine teeth in basal half; paired and unpaired claws of all legs essentially smooth. Palpus: femur 1.3 mm, patella 0.5 mm, tibia 0.7 mm, tarsus 1.1 mm, total 3.6 mm.

Abdomen suboval, covered evenly with fine dusky hairs and few longer setae. Spinnerets four, subapical in position, leaving short space between them and anal tubercle; median spinnerets one-segmented, 0.28 mm long, with six spinules at apex; lateral spinneret three-segmented, with measurements from basal to apical segments 0.65 mm, 0.65 mm, 0.85 mm respectively, totalling 2.15 mm; lateral spinnerets thin and flexible, much shorter than abdomen.

Epigynum (Fig. 4) consisting of small tube on each side running into suboval receptacle; opening small and lying in shallow atrium.

Type Data—Female holotype from Cueva de la Porra, 5 km N Xilitla, San Luis Potosí, México, 19 July 1969 (W. Elliott, S. & J. Peck, D. Broussard).

Euagrus luteus, new species

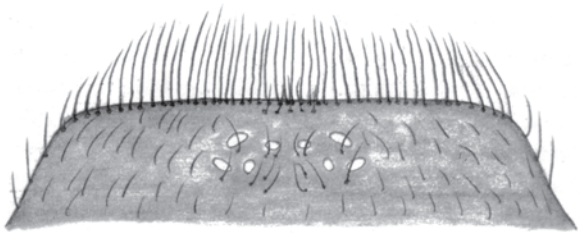
Diagnosis—Golden brown troglophile species related to *ritaensis* of southern Arizona, distinguished as follows: more slender, with thinner legs and much longer spinnerets; eye tubercle and eyes small with posterior median eyes smaller and separated by far more than two diameters.

Etymology—Specific name from Latin *luteus,* yellow, pallid.

Female—Total length 9 mm. Carapace 4 mm long, 3 mm wide. Abdomen 5 mm long, 2.7 mm wide.

Entire spider golden yellow brown; eyes enclosing black field; abdomen with grayish tint; spines and hairs dusky.

Carapace elongate oval, narrowed and subtruncated in front and behind, covered thinly with procumbent dark hairs and few inconspicuous bristles; two long bristles in cervical groove. Pars cephalica subtriangular, longer than broad, delimited by fairly conspicuous



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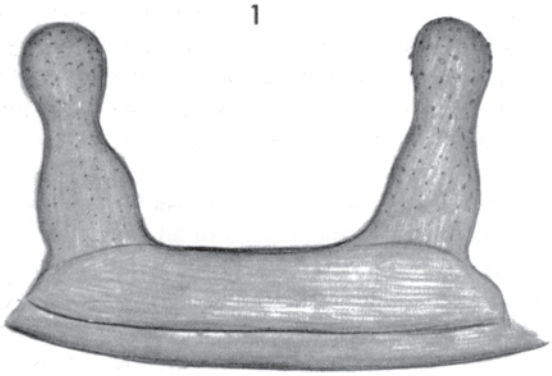

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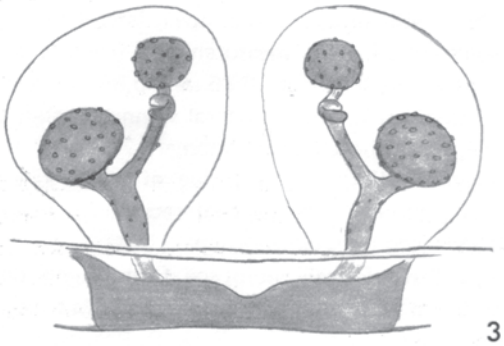

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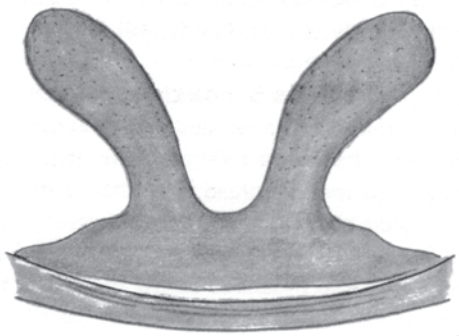

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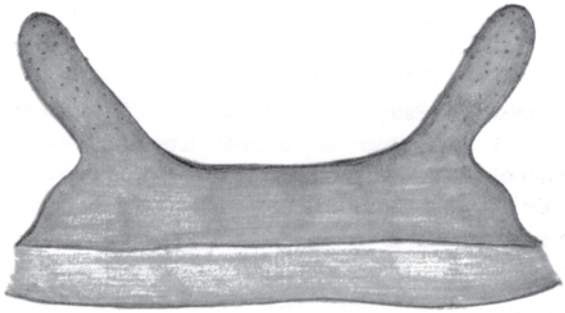

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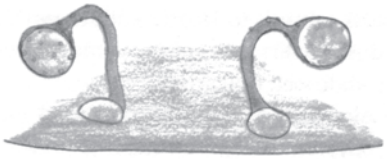

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Fig. 1. *Schizopelma stygia* (Gertsch), female, front of carapace.

Figs. 2a-2c. Epigyna of *Schizopelma,* ventral views. 2a. *Schizopelma stygia* (Gertsch). 2b. *Schizopelma reddelli,* new species. 2c. *Schizopelma elliotti,* new species.

Fig. 3. *Euagrus luteus,* new species, epigynum, ventral view.

Fig. 4. *Euagrus anops,* new species, epigynum, ventral view.

cephalic grooves; cervical groove deep pit situated back slightly beyond middle of length. Eye tubercle low, about third of width of head in front. Front eye row moderately procurved as seen from in front, nearly straight from above; anterior median eyes dark, fairly large, two-thirds size of lateral eyes (13/20), separated by radius, nearer lateral eyes. Posterior eye row moderately recurved; posterior median eyes separated by more than two diameters (11/26), nearly touching subequal lateral eyes. Median ocular quadrangle much broader than long (46/24), narrowed in front by about same ratio; anterior median eyes larger (13/11). Sternum subcordate, 1.75 mm long, 1.5 mm wide; three pairs of small sigilla present on side margins and front pair enlarged, lying in lateral groove. Labium 0.3 mm long, 0.7 mm wide, clothed with dark hairs but cuspules lacking. Chelicerae 2 mm long, as visible from above less than third as long as carapace; promargin with 12 to 14 dark teeth of which four are larger; retromargin flanked by even row of hairs.

	I	II	III	IV
Femur	3.10	3.00	3.00	3.60
Patella	1.75	1.65	1.60	1.80
Tibia	2.45	2.20	2.35	3.30
Metatarsus	2.55	2.50	3.10	4.20
Tarsus	1.70	1.75	1.75	2.15
Total	11.55	11.10	11.80	15.05

Leg formula 4312. Legs of medium stoutness; first leg 2.88 times, fourth leg 3.76 times as long as carapace; fourth tibia much shorter than carapace. Legs clothed with few subprocumbent dark hairs and erect bristles and few heavier spines most numerous on posterior legs; first tibia with 1-1-2 ventral spines; first metatarsus with 2-2-2 ventral spines. Palpal claw with row of fine teeth for two-thirds length. Paired claws of tarsi with single row of 10 to 20 fine teeth in basal half; unpaired claw with two to five small teeth near base. Palpus: femur 2.15 mm, patella 0.65 mm, tibia 1.5 mm, tarsus 1.75 mm; total 6.05 mm.

Abdomen suboval, covered evenly with fine procumbent dark hairs and with scattered erect bristles; base of abdomen with thin brush of erect bristles. Median spinnerets 0.75 mm long, with few scattered spinules. Lateral spinneret three-segmented, with measurements from base to apical segments, 1.7 mm, 2 mm, 2.5 mm, respectively, totalling 6.2 mm; lateral spinneret thin, flexible, longer than abdomen.

Epigynum (Fig. 3) with lightly sclerotized, transverse atrium leading to assymmetrically bifid receptacle on each side.

Type Data—Female holotype and immature female from iron mine at road, 2 km E Pinal de Amoles, Querétaro, México, 17 July 1969 (S. Peck).

Distribution—Caves of Querétaro.

Records—MEXICO: *Querétaro:* Sótano de El Tigre, 12 km SW Jalpan, 11 July 1967 (J. Fish), female, three subadult. Cueva de Tejamanil, Tejamanil, 2 km SW Pinal de Amoles, 9 August 1969 (D. McKenzie, J. Reddell), female, three immature. Cave n. 29, 200 m S Sótano del Buque, 20 km N Pinal de Amoles, 6 June 1972 (W. Russell), three females. Cueva de los Riscos, 5 km SW Jalpan, 10 August 1966 (J. Reddell, J. Fish, D. McKenzie), eight females, immature.

SUBORDER ARANEOMORPHAE

FAMILY PHOLCIDAE

The cave pholcids of México were shown in an earlier paper (Gertsch, 1971) to be a rich and varied fauna of generalized, lucifugous types especially attracted to cave habitats. Five eyeless species were classified as troglobites; a few others with reduced or rudimentary eyes quite likely also may be obligative cavernicoles; most of the remaining ones show few differences or none at all from epigean relatives and are regarded as troglophiles. In the present paper eleven new species are described from México and Central America and two of these with rudimentary eyes, *Metagonia martha* and *jarmila,* are claimed to be troglobites.

The systematics of the family must be largely centered in study of the genitalia, the special features of which were reviewed for each genus in the paper above, making repetition here unnecessary. The distinctive spurs on the chelicerae of the males are usually diagnostic for the taxa. Although basically a very generalized organ, the male palpus presents striking specializations of tarsus and bulb for each of the species. The haplogyne epigynum of the female consists of weakly sclerotized internal pouches offering little for identification. The most instructive features are the shape and modification of the sclerites and the general pattern of the external facies.

Coryssocnemis abernathyi Gertsch

Coryssocnemis abernathyi Gertsch, 1971, p. 56.

Records—MEXICO: *San Luis Potosí:* Cueva de los Caballos, 30 km ESE San Luis Potosí, 18 May 1972 (W. Elliott), two immatures. *Oaxaca:* Cueva de Apoala, Santiago Apoala, 20 km N Asunción Nochixtlán, 2 January 1973 (J. Reddell, D. McKenzie, M. McKenzie, S. Murphy), male probably this species.

Coryssocnemis iviei Gertsch

Coryssocnemis iviei Gertsch, 1971, p. 60.

Records—MEXICO: *Querétaro:* Sótano Encantado, 3 km W La Ciénega, 20 km NNE Pinal de Amoles, 2 June 1972 (R. Ralph), two males, female. *San Luis Potosí:* Cueva de Potrerillos, 2 km W Ahuacatlán, 27 November 1972 (J. Reddell, T. Raines), two males, three females.

Physocyclus globosus (Taczanowski)

Physocyclus globosus: F. P.-Cambridge, 1902, p. 368.

Records—MEXICO: *San Luis Potosí:* Sótano de la Tinaja, 11 km NE Valles, 1 December 1968 (J. Hallan), female.

Psilochorus concinnus, new species

Diagnosis—Small, dusky, long-legged troglophile similar to *fishi* and related species, readily separated by following genitalic features: femur stout, with small ventral process at apex; both embolus and tibial spur bifid at apex; epigynal ridges prominent, with anterior one produced to rounded lobe above genital groove.

Etymology—Specific name from Latin *concinnus,* pleasing.

Female—Total length 2.7 mm. Carapace 1.1 mm long, 1 mm wide. Abdomen 1.7 mm long, 1.4 mm

wide.

Sides of carapace whitish; pars cephalica and clypeal extension dusky; eyes ringed with black, sternum dusky and chelicerae brown; legs dusky their whole lengths, without darker annulae or spots. Abdomen gray; epigynal ridges brownish.

Structure typical of genus (Gertsch, 1971, p. 72), with pars cephalica well elevated and eyes well developed. Clypeus long, inclined, 0.46 mm long. Ratio of eyes: ALE:AME:PLE:PME = 10:4.5:9:8.5. Front eye row essentially straight; anterior median eyes separated by about half their radius, about as far from anterior lateral eyes. Posterior eye row essentially straight to faintly procurved; posterior median eyes separated by more than diameter (12/8.5), nearly touching lateral eyes. Sternum 0.61 mm long, 0.8 mm wide, subtruncated between and separating posterior coxae by length. Abdomen subglobose, moderately elevated and produced above spinnerets

First leg: femur 6.1 mm, patella 0.5 mm, tibia 6.5 mm, metatarsus 8 mm, tarsus 1.75 mm; total 22.85 mm. First leg 20.7 times, first femur 5.5 times as long as carapace.

Epigynum (Fig. 7) with prominent, transverse ridges behind and in front of genital groove of which front ridge produced behind to bluntly rounded lobe.

Male—Total length 2.8 mm. Carapace 1.3 mm long, 1 mm wide. Abdomen 1.5 mm long, 1.3 mm wide.

Coloration and structure like those of female except as noted. Posterior eye row faintly procurved. Chelicera (Fig. 6) with short, sharp spur near base of segment differing in details from that of *fishi.*

First leg: femur 6.35 mm, patella 0.50 mm, tibia 6.8 mm, metatarsus 8.5 mm, tarsus 1.8 mm; total 23.95 mm. First leg 18.5 times, first femur about five times as long as carapace.

Male palpus (Fig. 5) distinct from that of *fishi* as follows: femur stouter, broader at apex, with short curved ventral process; long tarsal process notched at apex; embolus with tiny notch at apex.

Type Data—Male holotype, two males, three females and immature from Cueva de Cinquenta y Ocho, 5 km S San Francisco, 30 km ESE San Luis Potosí, San Luis Potosí, México, 18 May 1972 (W. Elliott, R. Ralph, P. Lynn); cave at about 3000 m elevation.

Psilochorus murphyi, new species

Diagnosis—Small, long-legged troglophile related to *concinnus,* distinguished by following features: chelicera of male with small triangular spur in apical half; epigynum with small nodule at middle of transverse ridge in front of genital furrow.

Etymology—Named for Mr. Stuart Murphy.

Female—Total length 2.6 mm. Carapace 1.1 mm long, 1 mm wide. Abdomen 1.5 mm long, 1.2 mm wide.

Coloration and structure like those of *concinnus.* Clypeus 0.43 mm long. Ratio of eyes: ALE:AME: PLE:PME = 10:4:10:9. Front eye row gently procurved, median eyes lying above centers of lateral eyes; anterior median eyes separated by radius, as far from lateral eyes. Posterior eye row gently procurved; posterior median eyes separated by long diameter, touching lateral eyes. Sternum 0.75 mm long, 0.6 mm wide.

First leg: femur 5.2 mm, patella 0.4 mm, tibia 0.52 mm, metatarsus 7.3 mm, tarsus 1.7 mm; total 19.8 mm. First leg 18 times, first femur 4.8 times as long as carapace.

Epigynum (Fig. 10) with brownish ridges behind and in front of genital groove; front ridge with small nodule at middle.

Male—Total length 2.7 mm. Carapace 1.2 mm long, 1.15 mm wide. Abdomen 1.5 mm long, 1.2 mm wide.

Coloration and structure like those of female. Chelicera (Fig. 8) with small triangular spur on side in apical half.

First leg: femur 7 mm, patella 0.5 mm, tibia 7.2 mm, metatarsus 10.6 mm, tarsus 2 mm; total 27.3 mm. First leg 23 times, first femur about six times as long as carapace.

Male palpus (Fig. 9) like that of *concinnus* but differing in details of bulbal elements.

Type Data—Male holotype, two males, three females and immature from Cueva de Apoala, Santiago Apoala, 20 km N Asunción Nochixtlán, Oaxaca, México, 2 January 1973 (J. Reddell, D. McKenzie, M. McKenzie, S. Murphy).

Pholcophora quieta, new species

Diagnosis—Small, dusky troglophile with legs of medium length related to *mitchelli,* distinguished by shorter legs, more widely spaced eyes and by broad epigynal band in front of genital groove.

Etymology—Specific name from Latin *quietus,* quiet, resting.

Female—Total length 1.75 mm. Carapace 0.75 mm long, 0.65 mm wide. Abdomen 1 mm long, 1 mm wide.

Cephalothorax and appendages dusky yellow; eyes narrowly ringed with black; legs without darker rings; abdomen green.

Structure typical of six-eyed group *(Pholcophorina);* six eyes in two triads separated by width of one. Ratio of eyes: ALE:AME:PLE:PME = 7:0:6:6. Anterior lateral eyes separated by more than diameter (11/7). Posterior eye row moderately procurved; posterior median eyes separated by more than two diameters (16/6), contiguous with lateral eyes. Sternum as broad as long. Abdomen globose, strongly elevated.

First leg: femur 1.7 mm, patella 0.3 mm, tibia 1.8 mm, metatarsus 2.1 mm, tarsus 1 mm, total 6.9 mm. First leg eight times, first femur 2.2 times as long as carapace.

Epigynum as shown in Fig. 11.

Type Data—Female holotype, four females from Gruta de Silvino, Izabal, 34 km W Puerto Charrios, Guatemala, 20-22 August 1969 (S. & J. Peck).

Modisimus iviei, new species

Modisimus inornatus: Chamberlin & Ivie, 1938, p. 133 (not *inornatus* O. P.-Cambridge).

Diagnosis—Small troglophile of typical design, lacking anterior median eyes present in *inornatus,* related to that and similar species, separable by details of genitalia.

Etymology—Named for the late Mr. Wilton Ivie.

Female—Total length 2 mm. Carapace 0.65 mm long, 0.55 mm wide. Abdomen 1.5 mm long, 1.2 mm wide.

Cephalothorax and appendages dusky yellow; cephalothorax and median grooves blackish; eyes ringed with black; legs without darker rings or spots. Abdomen gray, with series of small bluish spots above, unmarked below.

Clypeus 0.32 mm long, inclined forward, as high as more than four diameters of anterior lateral eye. Carapace as long as broad, of average height; ocular tubercle prominent, with triads of eyes close together; anterior median eyes obsolete and eyes in following ratio: ALE:AME:PLE:PME = 7:0:6:6. Anterior lateral eyes separated by diameter. Posterior eye row straight; posterior median eyes separated by diameter, half as far from lateral eyes. Abdomen subglobose, about as high as broad.

First leg: femur 3.2 mm, patella 0.3 mm, tibia 3.5 mm, metatarsus 4.2 mm, tarsus 0.8 mm, total 12 mm. First leg 18 times, first femur 4.9 times as long as carapace.

Epigynum (Fig. 14) medium sized plaque with truncated posterior margin and sclerotized pattern of internal structures most distinct on each corner above genital groove.

Male—Carapace 0.6 mm long, 0.6 mm wide.

Coloration and structure like those of female. Chelicera with small tubercle near base bearing several spinules and small lateral series on outer margin of face.

Male palpus (Figs. 12-13) with slender elements; femoral spur small, sharp process near base; tarsal process elongated, apically truncated; embolus rather short rounded process.

Type Data—Female holotype and damaged male from Xmahit Cave, Tekax, Yucatán, México, 31 July 1936 (A.S. Pearse) from six meters deep in cave.

Modisimus propinquus O.P.-Cambridge

Modisimus propinquus O.P.-Cambridge, 1896, p. 223.

Record—MEXICO: *Chiapas:* Cueva Chica del Camino, 17 km E Tuxtla Gutiérrez, 19 August 1967 (J. Reddell, J. Fish, T.R. Evans), two males.

Modisimus texanus Banks

Modisimus texanus Banks, 1906, p. 94.

Record—MEXICO: *San Luis Potosí:* Sótano de la Tinaja, 11 km NNE Valles, 1 December 1968 (J. Hallan), four females.

Modisimus pusillus Gertsch

Modisimus pusillus Gertsch, 1971, p. 72.

Record—MEXICO: *Nuevo León:* Chevy Sink, 10 km W Galeana, 3 June 1969 (J. Reddell), female.

Modisimus boneti Gertsch

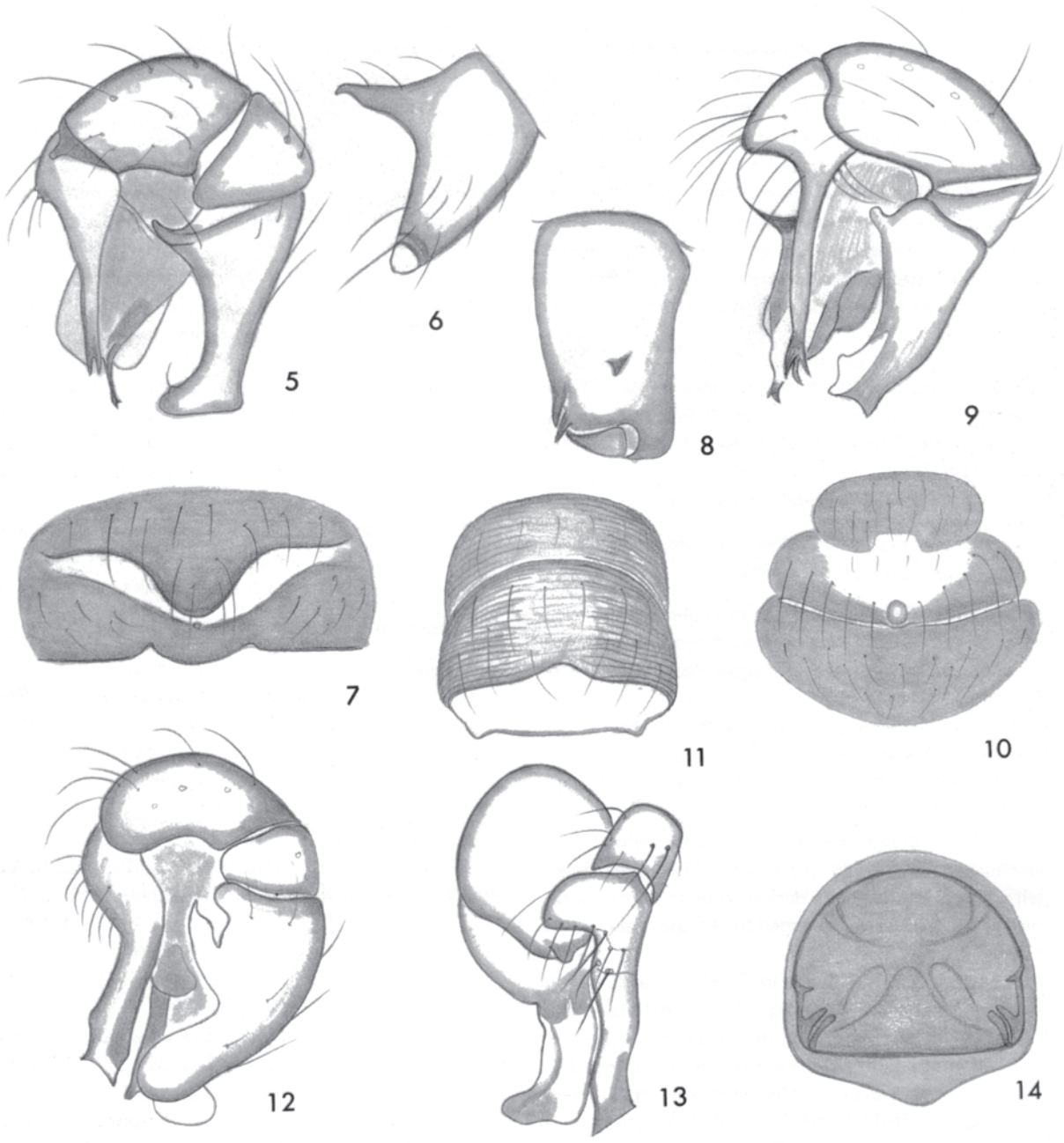
Modisimus boneti Gertsch, 1971, p. 66.

Record—MEXICO: *San Luis Potosí:* Cueva (=Sótano) de los Monos, 15 km NE Valles, 30 December 1971 (D. Honea, R. Jameson), female. Cueva de Taninul n. 1, 13 km SE Valles, 29 December 1970 (J. Hallan), female. Cueva de Puente de Dios, 22 km SSW Valles, 9 April 1968 (T. Raines), immature female.

Modisimus mckenziei Gertsch

Modisimus mckenziei Gertsch, 1971, p. 71.

Records—MEXICO: *Tamaulipas:* Bee Cave, 17 km NE Ocampo, 10 April 1966 (J. Fish, E. Alexander, D. McKenzie, R. Felton), female. Cueva de la Paloma, 1 km NE Gómez Farías, 18 May 1971 (W. Russell), immature female.



Figs. 5-7. *Psilochorus concinnus,* new species. 5. Left male palpus, retrolateral view. 6. Left male chelicera, retrolateral view. 7. Epigynum, ventral view.

Figs. 8-10. *Psilochorus murphyi,* new species. 8. Left male chelicera, frontal view. 9. Left male palpus, retrolateral view. 10. Epigynum, ventral view.

Fig. 11. *Pholcophora quieta,* new species, epigynum, ventral view.

Figs. 12-14. *Modisimus iviei,* new species. 12. Left male palpus, retrolateral view. 13. Left male palpus, subdorsal view. 14. Epigynum, ventral view.

Modisimus gracilipes, new species

Diagnosis—Small troglophile with eyes well developed and long, thin legs, those of male 50 times as long as carapace, further distinguished from *inornatus* and relatives by distinctive genitalia.

Etymology—Specific name from Latin *gracilis,* thin, and *pes,* foot.

Female—Total length 1.8 mm. Carapace 0.7 mm long, 0.7 mm wide. Abdomen 1.1 mm long, 0.93 mm

wide.

Cephalothorax and appendages dusky yellow; carapace pale except for narrow median subintegumental dark band from behind eyes to near posterior margin, broad black rings around eyes and dusky clypeus; legs more dusky apically. Abdomen grayish, covered with many small bluish flecks above and on sides; epigynal ridges brown.

Clypeus 0.3 mm high, subvertical, equal to about three diameters of anterior lateral eye. Carapace as broad as long, of average height; pars cephalica marked by deep linear fissures; ocular tubercle prominent with triads of eyes close together; anterior median eyes obsolete and eyes in following ratio: ALE:AME: PLE:PME = 10:0:9:9. Anterior lateral eyes separated by radius. Posterior eye row moderately recurved; posterior median eyes separated by diameter, third as far from lateral eyes. Abdomen subglobose, as high as broad.

First leg: femur 3.9 mm, patella 0.3 mm, tibia 3.2 mm, metatarsus 4.7 mm, tarsus 1 mm; total 13.1 mm. First leg 18.7 times, first femur 5.6 times as long as carapace.

Epigynum (Fig. 17) large, half width of venter, slightly convex plaque in front of genital groove with truncate posterior margin and sclerotized angle on each side; narrower band behind genital groove.

Male—Total length 2.4 mm. Carapace 0.6 mm long, 0.6 mm wide. Abdomen 1.8 mm long, 0.9 mm wide.

Coloration and structure like those of female. Chelicera with small, rounded angle just below base bearing small cluster of spinules and front face with about 22 scattered spinules over most of surface.

First leg: femur 7.3 mm, patella 0.3 mm, tibia 7.8 mm, metatarsus 13 mm, tarsus 1.6 mm; total 30 mm. First leg 50 times, first femur 12.1 times as long as carapace.

Male palpus (Figs. 15-16) with segments short and thickened; femoral spur sharp, pointed toward apex; tarsal process thickened at apex; bulb with subapical transverse spur and short embolus.

Type Data—Male holotype, male and female and immature from Cueva Lanquin, Lanquin, Alta Verapaz, Guatemala, 28 August 1969 (S. & J. Peck).

Modisimus beneficus, new species

Diagnosis—Small troglophile with dark-ringed legs like those of *maculatipes,* distinguished by epigynum of different form.

Etymology—Specific name from Latin *beneficus,* kind, generous.

Female—Total length 2.2 mm. Carapace 0.8 mm long, 0.75 mm wide. Abdomen 1.7 mm long, 1.3 mm wide.

Carapace with pale base color overlaid by brown markings covering most of dorsum and all of clypeus; eyes widely ringed with black; sternum dusky brown; legs yellowish with small brown rings at distal ends of femora, at base and near distal ends of tibiae. Abdomen blackish above and on sides; venter gray.

Structure typical, like that of *inornatus;* pars cephalica set off by deep grooves; clypeus 0.35 mm high, only moderately inclined forward. Ocular tubercle prominent, with triads of eyes close together; anterior median eyes essentially obsolete and eyes in following ratio: ALE:AME:PLE:PME = 11:0:9:9. Anterior lateral eyes separated by less than diameter (8/11). Posterior eye row weakly recurved; posterior median eyes separated by full diameter, half as far from lateral eyes. Abdomen subspherical, as high as broad.

First leg: femur 2.65 mm, patella 0.5 mm, tibia 2.2 mm, metatarsus 3.2 mm, tarsus 0.75 mm; total 9.3 mm. First leg 11.6 times, first femur 8.8 times as long as carapace.

Epigynum (Fig. 18) simple rectangular plaque truncated behind, similar to that of *inornatus.*

Type Data—Female holotype and female from Sótano de Botella Chica, 3 km NW Tequila, Veracruz, México, 5 August 1967 (J. Reddell, J. Fish).

Modisimus chickeringi, new species

Diagnosis—Troglophile species related to *pulchellus* Banks (1929) distinguished by epigynum (Fig. 19) with truncated posterior margin instead of deep emargination.

Etymology—Named for Dr. Arthur M. Chickering, specialist on spider fauna of Panama.

Female—Total length 3 mm. Carapace 1.5 mm long, 1.5 mm wide. Abdomen 2 mm long, 1.5 mm wide.

Base color of cephalothorax and abdomen dusky orange; pars cephalica in part blackish, with broad dusky band on clypeus and eyes broadly ringed with black; pars thoracica with narrow black line from cervical groove back to posterior margin; legs with blackish rings at distal ends of femora and tibiae. Abdomen mostly blue above and on sides, with central and lateral pale streaks; venter whitish.

Pars cephalica set off by deep grooves; clypeus 0.45 mm long. Ocular tubercle massive, prominently elevated; anterior median eyes obsolete, other eyes large in following ratio: ALE:AME:PLE:PME = 16:0: 13:13. Anterior lateral eyes separated by less than diameter (11/16). Posterior eye row weakly recurved; posterior median eyes separated by diameter, half as

far from lateral eyes. Abdomen suboval, about as high as broad; anal portion drawn to short tubercle.

First leg: femur 6.3 mm, patella 0.5 mm, tibia 6.4 mm, metatarsus 10.3 mm, tarsus 1.7 mm; total 25.2 mm. First leg 17 times, first femur 4.2 times as long as carapace.

Epigynum (Fig. 19) rounded plaque with posterior margin truncate and with elongated groove on each side.

Type Data—Female holotype from Chilibrillo Caves, Buenos Aires, Canal Zone, Panama, 8 April 1945 (H. Trapido).

Metagonia blanda, new species

Diagnosis—Troglophile species with eyes of average size, similar to *tinaja* and related species, easily separated by details of epigynum (Figs. 20-22).

Etymology—Specific name from Latin *blandus,* flattering.

Female—Total length 3.3 mm. Carapace 1.25 mm long, 1.2 mm wide. Abdomen 2.2 mm long, 1.5 mm wide.

Carapace white to pale yellow with dusky triangle beginning at cervical groove and running back to near margin; pars cephalica and clypeus whitish; eyes narrowly ringed with black; sternum and appendages slightly dusky; patellae brown and apices of tarsi with brown rings; abdomen uniform white.

Structure typical (Gertsch, 1971, p. 82). Carapace broad, convex, with clypeus 0.22 mm long, rounded in front. Ocular tubercle of average height; triads of eyes separated by less than width of one; ratio of eyes: ALE:AME:PLE:PME = 11:0:10:10. Anterior lateral eyes separated by two diameters. Posterior eye row procurved; posterior median eyes separated by more than diameter (13/10), slightly separated from lateral eye. Abdomen elongate oval, as high as broad.

First leg: femur 6.1 mm, patella 0.4 mm, tibia 6.3 mm, metatarsus 8 mm, tarsus 3.8 mm; total 24.6 mm. First leg 20 times, first femur about five times as long as carapace.

Epigynum (Figs. 20-22) borne on inflated tubular appendage, subspherical, with rounded sclerotized rim behind bearing median notch.

Type Data—Female holotype from Gruta de Silvino, Izabal, 34 km W Puerto Charrios, Guatemala, 20-22 August 1969 (S. & J. Peck).

Other Records—GUATEMALA: *Izabal:* Cueva de la Coche, 2 km W Livingston, 21 August 1969 (S. & J. Peck), three females. *Alta Verapaz:* Cueva Seamay, Finca Seamay, Senahu, 24-26 August 1969 (S. & J. Peck), female. Cueva Lanquin, Lanquin, 28 August 1969 (S. & J. Peck), two females.

Metagonia tinaja Gertsch

Metagonia tinaja Gertsch, 1971, p. 83.

Records—MEXICO: *San Luis Potosí:* Sótano de la Tinaja, 11 km NE Valles, 16 October 1972 (V. Roth, B. Firstman), males, females, immature near pool. Sótano de Matapalma, 20 km N Valles, 30 December 1972 (R. Fieseler), four females, immature. *Tamaulipas:* Sótano de Venadito, 17 km SE Antiguo Morelos, 7 April 1971 (D. Honea), female, immature from new lower section, about 113 m below surface.

Metagonia atoyacae Gertsch

Metagonia atoyacae Gertsch, 1971, p. 87.

Records—MEXICO: *Veracruz:* Grutas de Atoyac, 2 km E Atoyac, 24 December 1972 (D. McKenzie), female.

Metagonia placida Gertsch

Metagonia placida Gertsch, 1971, p. 91.

Record—MEXICO: *Nuevo León:* Cueva de Chorros de Agua, 21 km WSW Montemorelos, 19 June 1969 (S. & J. Peck, R. Norton), male, five females.

Metagonia suzanne, new species

Diagnosis—Troglophile species with eyes of average size similar to *tinaja* and related species, separated by details of epigynum (Fig. 23).

Etymology—Named for Suzanne Wiley.

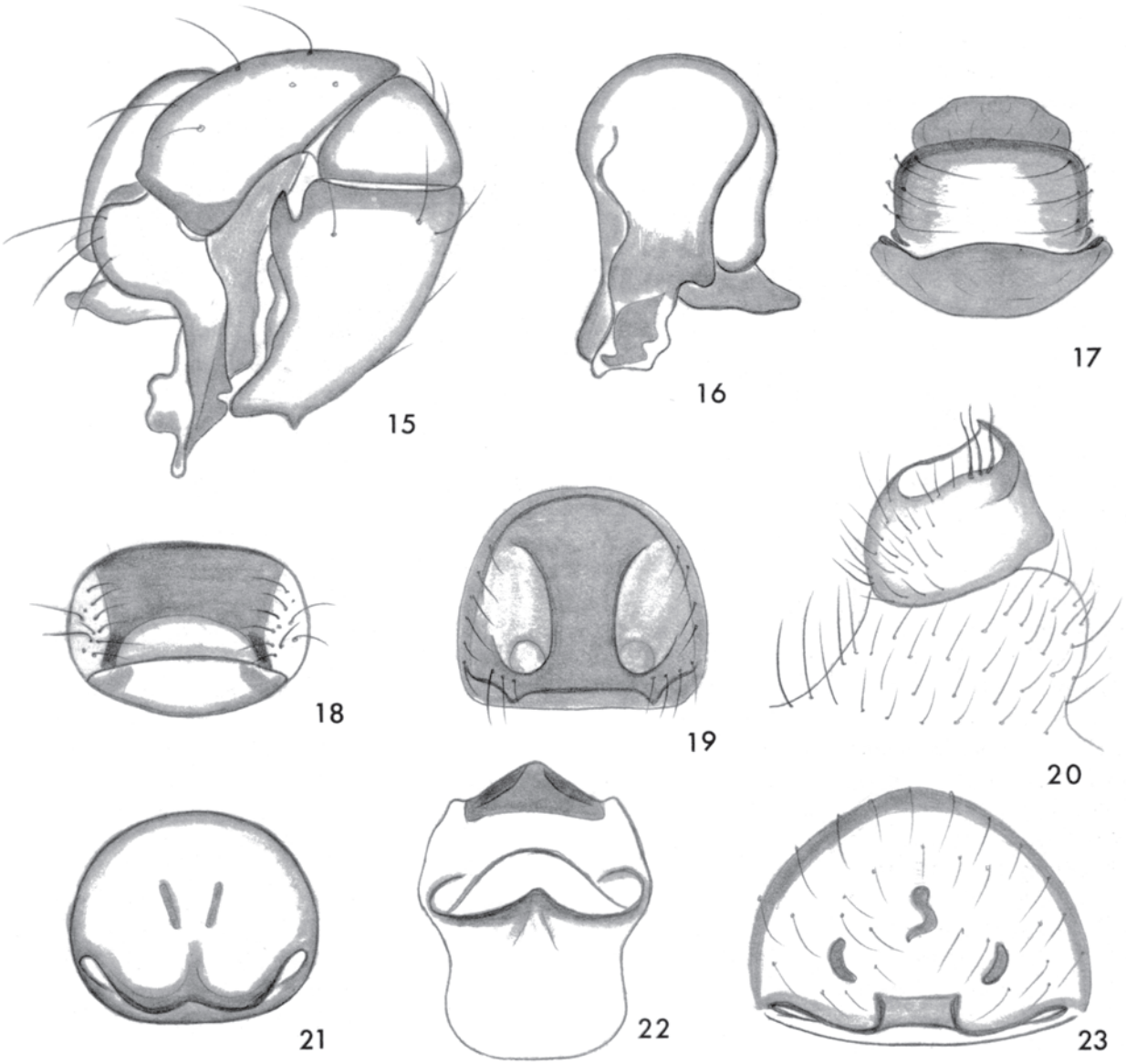
Female—Total length 3.2 mm. Carapace 1.3 mm long, 1.15 mm wide. Abdomen 1.75 mm long, 1.3 mm wide.

Base color of carapace and appendages dull yellow; carapace with dark maculation behind median groove; eyes ringed with black; patellae dusky brown and apices of tibiae with narrow brown rings; abdomen whitish, with few scattered, subintegumental bluish spots on dorsum.

Structure typical, like that of *tinaja.* Ocular tubercle of medium height; triads of eyes separated by less than width of one; ratio of eyes: ALE:AME:PLE:PME = 13:0:12:13. Anterior lateral eyes separated by two diameters (26/13). Posterior eye row moderately procurved; oval median eyes separated by long diameter, slightly separated from lateral eyes by third of narrow diameter. Abdomen elongate, as high as broad.

First leg: femur 6.5 mm, five times as long as carapace; legs fragmented.

Epigynum (Fig. 23) broad convex lobe truncated behind, with narrow transverse band defined by inter-



Figs. 15-17. *Modisimus gracilipes,* new species. 15. Left male palpus, retrolateral view. 16. Left male palpus, subdorsal view. 17. Epigynum, ventral view.
Fig. 18. *Modisimus beneficus,* new species, epigynum, ventral view.
Fig. 19. *Modisimus chickeringi,* new species, epigynum, ventral view.
Figs. 20-22. *Metagonia blanda,* new species, epigynum. 20. Lateral view. 21. Ventral view. 22. Posterior view.
Fig. 23. *Metagonia suzanne,* new species, epigynum, ventral view.

nal dark markings.

Type Data—Female holotype from Sumidero de El Jineo, 1 km NW Gómez Farías, Tamaulipas, México, 24 November 1971 (T. Raines, L. McNatt), from deep cave at 60 to 153 m.

Metagonia martha, new species

Diagnosis—Pale troglobite with rudimentary eyes, similar to *tinaja,* readily recognized by epigynum (Fig. 27).

Etymology—Named for Martha Helen McKenzie.

Female—Total length 2.4 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 1.6 mm long, 1.3 mm wide.

Cephalothorax whitish; legs dull yellow; abdomen gray.

Ocular tubercle convex, transverse ridge of medium development; eyes reduced to close-set, well separated triads, without pigment.

First leg: femur 4.2 mm, patella, 0.6 mm, tibia 4.4 mm, metatarsus 6.3 mm, tarsus 1.3 mm; total 16.8 mm. First leg 21 times, first femur 5.2 times as long as carapace. Tibia and patella of fourth leg 3.7 mm long.

Epigynum (Fig. 27) prominent, sclerotized brown lobe of quadrangular shape as seen in ventral view.

Type Data—Female holotype and six females from Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México, 26 December 1972 (J. Reddell, D. & M. McKenzie, S. Murphy).

Metagonia candela Gertsch

Metagonia candela Gertsch, 1971, p. 90.

Record—MEXICO: *Nuevo León:* Unnamed cave, 4 km W Bustamante, 30 September 1972 (P. Duncan).

Metagonia punctata Gertsch

Metagonia punctata Gertsch, 1971, p. 86.

Record—MEXICO: *San Luis Potosí:* Cueva de la Puente, 30 km ESE San Luis Potosí, 16 May 1972 (R. Ralph, W. Elliott, M. McEachern), two females.

Metagonia jarmila, new species

Diagnosis—Pale, essentially eyeless troglobite of *tinaja* group recognized by distinctive genitalia in both sexes: inner tarsal process of male palpus long blade; epigynum beak-like projection standing at nearly right angle on venter.

Etymology—Named for Mrs. Jarmila Peck.

Female—Total length 2.3 mm. Carapace 0.92 mm long, 0.75 mm wide. Abdomen 1.4 mm long, 1.1 mm wide.

Carapace white to pale yellow, with faint brownish bar at middle of pars thoracica; legs pale yellow, with only faint darker markings at juncture of segments; abdomen white.

Structure typical; clypeus 0.28 mm long; ocular tubercle low, less developed in some specimens; eyes obsolete or of moderate development, without pigment, eyes silvery spots; triads of eyes vestigial in some, in others faintly developed corneal projections; vestiges of triads separated by one and one-half length of one.

First leg: femur 5 mm, patella 0.4 mm, tibia 6.3 mm, metatarsus 11.3 mm, tarsus 1.4 mm; total 24.4 mm. First leg 26 times, first femur five times length of carapace.

Epigynum (Figs. 25-26) conspicuous, triangular, downwardly projecting process, grooved below, and with atriobursal orifices at base.

Male—Total length 2 mm. Carapace 0.8 mm long, 0.84 mm wide. Abdomen 1.2 mm long, 0.8 mm wide.

Coloration and structure like those of female. Eye tubercle of medium development but eyes mostly obsolete, reduced to faint corneal traces.

First leg: femur 7 mm, patella 0.37 mm, tibia 7.3 mm, metatarsus 13 mm, tarsus 1.7 mm; total 29.35 mm. First leg 38 times, first femur about 9 times as long as carapace.

Male palpus (Fig. 24) typical of *tinaja* group; tarsal process with three terminal spurs and inner process long, flat, hinged, blade-like spur.

Type Data—Male holotype and two females from Bucks Bypass Cave, Caves Branch, Belize (British Honduras), 122 m, 14 August 1972 (S. Peck).

Distribution—Caves of Belize.

Other Record—BELIZE: St. Herman's Cave, Caves Branch, 122 m, 23 July 1972 and 21 August 1972 (S. & J. Peck), six females.

FAMILY TELEMIDAE

Up to the present time the family Telemidae has been reported only from southern Europe and Africa. The family was based on a tiny eyeless spider, *Telema tenella* Simon, known only from caves in the Pyrenees of southern France, and a few other records are now known from Africa. Years ago it became plain to me that the spiders from the western United States assigned to the genus *Usophila* were representatives of the family and likely even of the genus *Telema.* The discovery of a species in Guatemala, based on a single mature female, represents a further extension of the range of this family of minute spiders, many of which are cavernicoles. The generic position must remain somewhat doubtful because of lack of a male.

Telema mayana, new species

Diagnosis—Essentially eyeless troglobite with six vestigial eyes barely discernible in transverse row, distinct from *Telema gracilis* (Keyserling) in Marx, 1897, p. 37, from Alabaster Cave, in El Dorado County, California, by lack of eyes and shorter legs.

Etymology—Named for the Mayas of Yucatán and Central America.

Female—Total length 1.3 mm. Carapace 0.5 mm long, 0.42 mm wide. Abdomen 0.4 mm long, 0.35 mm wide.

Cephalothorax and appendages yellow; carapace with faint radial shadings and narrow dusky marginal band; chelicerae, labium and endites faintly brown. Abdomen green above and on sides, paler below.

Structure typical of *Telema.* Carapace longer than

broad, convex, quite high, lacking cephalic sutures but with tiny linear median groove behind middle; pars cephalica highest behind eyes, with pair of tiny bristles beside median groove and one at each side of eye group; clypeus 0.1 mm high, sloping forward below transverse elevation of eye tubercle. Eyes six, nearly obsolete, four in transverse row; median eyes small, well separated from larger lateral eyes; all visible as trivial corneal elevations. Sternum 0.4 mm long and broad, set with few weak setae. Labium 0.16 mm long, 0.12 mm wide, rounded in front and emarginated behind into truncature of sternum. Endites twice as long as wide, rounded on outer side and moderately convergent around labium, but tips well separated. Chelicera with fairly long, curved fang and small row of curved hairs on each margin; promargin with sharp tooth and five small denticles; retromargin with five small denticles opposite the small ones above.

	I	II	III	IV
Femur	0.95	0.85	0.63	0.83
Patella	0.17	0.15	0.14	0.16
Tibia	0.90	0.75	0.52	0.65
Metatarsus	0.58	0.50	0.40	0.45
Tarsus	0.42	0.42	0.30	0.35
Total	3.02	2.67	1.99	2.44

Legs of medium length, very thin; leg formula 1342. First leg six times, first femur about twice as long as carapace. Legs with rows of small hairs; patellae with thin bristle above at apex and tibiae with similar one above near middle. Palp: femur 0.15 mm, patella 0.06 mm, tibia 0.15 mm, tarsus 0.22 mm; total 0.58 mm.

Abdomen suboval, elevated, slightly overhanging pedicel. Colulus large flat lobe pointed at apex. Pair of minute tracheal spiracles barely visible behind genital groove, one-third distance to spinnerets. Tiny zigzag belt present across front end of abdomen above lorum and pedicel.

Epigynum transverse, slightly curved lip just in front of genital groove; single median genital pouch visible through integument.

Type Data—Female holotype and immature male from Cueva Sepacuite n. 2, Finca Sepacuite, Senahu, Alta Verapaz, Guatemala, 26 August 1969 (S. & J. Peck).

FAMILY OCHYROCERATIDAE

This family of minute, lucifugous spiders is found only in tropical and subtropical regions. Most species live in deep ground detritus and a few have been reported from cave habitats, where they spin tiny tangled webs in wall crevices and under ground litter. An essentially blind species occurs on Jamaica and another is being described from the Hawaiian Islands. A species of *Theotima* from a cave in Tamaulipas, México, shows no trace of eyes and is classified as a troglobite.

Theotima sp.

Record—BELIZE: Bucks Bypass Cave, Caves Branch, 122 m, 14 August 1972 (S. Peck), two females.

Theotima pura, new species

Diagnosis—Minute, whitish troglobite distinct in having no trace of eyes.

Etymology—Specific name from Latin *purus*, pure.

Female—Total length 1 mm. Carapace 0.5 mm long, 0.35 mm wide. Abdomen 0.55 mm long, 0.4 mm wide.

Cephalothorax and appendages pale yellow; abdomen white.

Carapace longer than broad, of medium height, with scarcely any traces of cephalic sutures or median groove; pars cephalica little elevated, rounded in front; eyes obsolete. Sternum 0.31 mm long, 0.28 mm wide, rounded between posterior coxae, separating them by length. Labium with trivial emargination at apex, flanked by tiny setae. Chelicera with short curved fang; promargin with series of five small teeth; retromargin smooth.

	I	II	III	IV
Femur	0.60	0.56	0.46	0.64
Patella	0.15	0.15	0.13	0.15
Tibia	0.62	0.55	0.45	0.67
Metatarsus	0.43	0.39	0.36	0.46
Tarsus	0.14	0.27	0.25	0.36
Total	1.94	1.92	1.66	2.28

Leg formula 4123. First leg about four times, first femur 1.2 times as long as carapace. Legs thin, with sparse covering of pale hairs. Palpus: femur 0.1 mm, patella 0.04 mm, tibia 0.08 mm, tarsus 0.11 mm; total 0.33 mm; tarsus without apical claw.

Abdomen suboval, of medium height. Tracheal spiracle situated about half way between genital furrow and spinnerets. Colulus small rounded lobe set with fine hairs.

Type Data—Female holotype from Cueva de los Vampiros, 20 km NW El Limón, Tamaulipas, México, 27 May 1968 (J. Reddell).

Ochyrocera formosa, new species

Diagnosis—Relative of *Ochyrocera quinquevittata* Simon (1882) of St. Vincent, Lesser Antilles, readily distinguished by differences in color pattern and especially by details of male palpus with much longer tarsus and stouter, more angled embolus.

Etymology—Specific name from Latin *formosus,* beautiful.

Female—Total length 1.8 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 1.1 mm long, 0.9 mm wide.

Carapace pale green with three dark stripes, one on each side margin and middle one running from middle to posterior margin; clypeus with dusky smudging; eye tubercles black. Sternum purplish on sides, broken by small yellow spots opposite coxae and narrow central yellow band running to point before posterior margin. Legs purplish except for pale patellae and pale rings at ends of apical segments.

Structure typical of genus; carapace low, moderately convex, with faint indication of median groove; pars cephalica moderately elevated with conspicuous, rounded, declining clypeus 0.16 mm long, equal to about three diameters of anterior median eye. Eyes (Fig. 29) six, subequal in size; front row essentially straight; anterior median eyes slightly separated, little farther from lateral eyes. Sternum 0.39 mm long, 0.43 mm wide, widely truncated in front, narrowly behind to separate posterior coxae by length of one. Labium 0.15 mm long and wide, rounded in front and with small emargination at apex. Endites about twice as long as wide, convergent around labium and nearly touching at apices. Chelicera armed as follows: promargin with seven strong teeth and broad inner keel as long as tooth row; retromargin unarmed.

Legs very long, thin, mostly lost or fragmented; second femur 2 mm long, about three times as long as carapace.

Abdomen voluminous, suboval, higher than broad. Tracheal spiracle situated about half way between genital groove and spinnerets. Epigynum (Fig. 30) transverse plaque with small subintegumental receptacle on each margin above genital groove.

Male—Total length 1.7 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 1 mm long, 0.7 mm wide.

Coloration and general structure similar to those of female. Legs uniform dusky yellow to brownish, proportionately much longer than those of female. First leg: femur 4.2 mm, patella 0.3 mm, tibia 4.4 mm, metatarsus 1.9 mm, tarsus 1.15 mm; total 11.95 mm. First leg 17 times as long as carapace; first metatarsus with curve at base; metatarsus and tarsus with numerous false sutures.

Male palpus (Fig. 28) with following features: tibia 3.5 times as long as broad; tarsus prolonged forward into sharp spur and thus readily distinguished from all species but *quinquevittata* Simon by presence of stout straight spine on tarsus overhanging bulb, but this spine much shorter than tarsus; bulb elongate oval, with embolus strongly bent.

Type Data—Male holotype and male and three females from Gruta de Silvino, 34 km W Puerto Charrios, Izabal, Guatemala, 20-22 August 1969 (S. & J. Peck).

FAMILY SCYTODIDAE

Genus *Loxosceles* Heinecken and Lowe

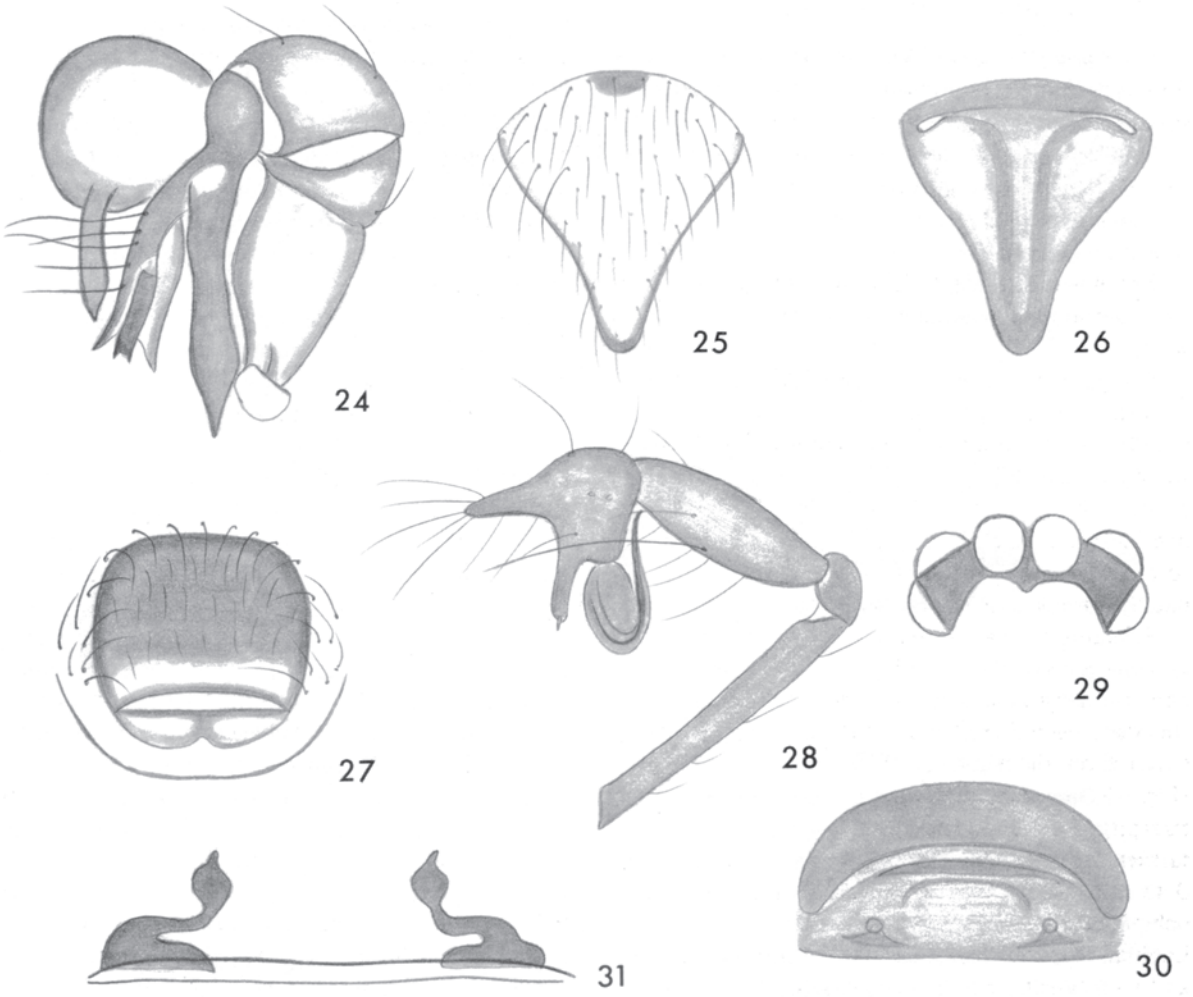
The genus *Loxosceles* has many species in México and most of these live in caves when they are available. Except for some loss of pigment, most of the cavernicoles differ little from those found outside and are classified as troglophiles. All the Mexican species belong to the *reclusa* group, a series of closely allied taxa found in North America, in limited number in Guatemala and Costa Rica of Central America and in the West Indies. The species are separated on the basis of color differences, the ranges being from whitish, yellow, dusky orange or even blackish, length and proportion of the legs, and especially by the features of the male and female genitalia. The epigyna of the females have provided very important characters in spite of variability in some species and often are more useful than the male palpi in sorting out the closely related species. In order to give an adequate nomenclature for the cave representatives, diagnoses of the several new species are presented here in anticipation of a future review of the entire fauna of continental North America.

The coloration and structure are similar in both sexes of each species but males have longer legs. The chelicerae, often the labium and endites, and the tibiae and tarsi of the palpi are dark mahogany brown. The eyes are always narrowly ringed with black. The systematic features are those of the *reclusa* group (Gertsch, 1958, p. 8) but the typical leg formula, 2413, shows some variation in both sexes as shown below.

Loxosceles valdosa, new species

Loxosceles bolivari Gertsch, 1958, p. 22 (Female, not male holotype). Reddell, 1971, p. 32.(Reddell and Mitchell, 1971, p. 147.

Diagnosis—Pale, long-legged troglophile with first leg of male longer than fourth; embolus of male palpus much longer than bulb; epigynal pouches close



Figs. 24-26. *Metagonia jarmila,* new species. 24. Left male palpus, retrolateral view. 25. Epigynum, subdorsal view. 26. Epigynum, subventral view.

Fig. 27.

Fig. 27. *Metagonia martha,* new species, epigynum, ventral view.

Figs. 28-30. *Ochyrocera formosa,* new species. 28. Left male palpus, retrolateral view. 29. Eyes of female. 30. Epigynum, ventral view.

Fig. 31. *Loxosceles luteola,* new species, epigynum, ventral view.

together on midline.

Etymology—Named for Cueva de Valdosa of the Sierra de El Abra.

Female from Cueva de Valdosa—Total length 9.6 mm. Carapace 3.8 mm long, 3.25 mm wide. Abdomen 5.8 mm long, 3 mm wide.

Cephalothorax and appendages yellowish to dull orange, with following markings: carapace with dusky orange Y-shaped marking and dentated marginal band around sides; eyes narrowly ringed with black; abdomen uniform gray.

Clypeus 0.4 mm long, sloping, equal to two diameters of anterior median eye; eyes of average size, subequal, all 0.2 mm in longest diameter; median eyes situated about radius in front of line along front edges of anterior lateral eyes, more than their diameter from lateral eyes (24/20).

	I	II	III	IV
Femur	6.75	7.50	6.20	6.60
Patella	1.25	1.30	1.20	1.20
Tibia	7.30	8.00	5.65	6.40
Metatarsus	6.10	8.25	6.60	7.35
Tarsus	1.50	1.75	1.50	1.60
Total	22.90	26.80	21.15	23.15

Leg formula 2413. First leg six times, first femur about 1.8 times as long as carapace. Palpus: femur 1.35 mm, patella, 0.35 mm, tibia 1 mm, tarsus 1.25 mm; total 3.95 mm.

Epigynum (Figs. 40-41) with oval pouches close

together at middle of genital furrow; each pouch with rounded angle on outer side and principal fingerlike receptacle but latter subjected to extreme variability by presence of adventitious lobes.

Male Holotype—Total length 7.9 mm. Carapace 3.4 mm long, 3.1 mm wide. Abdomen 4.5 mm long, 2.5 mm wide.

Coloration and structure essentially like those of female. Eyes more closely grouped; median eyes only diameter from anterior lateral eyes.

	I	II	III	IV
Femur	7.75	9.00	7.00	7.50
Patella	1.25	1.35	1.25	1.15
Tibia	9.90	10.65	6.70	7.50
Metatarsus	8.90	10.50	7.65	9.35
Tarsus	1.75	1.75	1.15	1.70
Total	29.55	33.25	23.75	27.20

Leg formula 1423. First leg 8.7 times, first femur 2.27 times as long as carapace.

Male palpus: femur 1.7 mm, patella, 0.6 mm, tibia 1.2 mm, tarsus 0.4 mm; total 3.9 mm. See Fig. 39; femur about twice as long as broad; embolus longer than bulb (0.54 mm/0.30 mm).

Type Data—Male holotype and six immature from Cueva de Valdosa, 11 km E Valles, San Luis Potosí, Mexico, 24 November 1967 (J. Reddell, S. Fowler).

Distribution—Caves of San Luis Potosí and Tamaulipas, México.

Other Records—*San Luis Potosí:* Cueva de Valdosa, 11 km E Valles, 19 February 1970 (J.A.L. Cooke), two males, five females, immature in webs of twilight zone; 25 November 1967 (M. Collins, T. Evans, M. Meredith), male, immature. Cueva de Los Sabinos, 13 km NNE Valles, 3 April 1942, female allotype of *bolivari* and immature. Cueva de Taninul n. 4, 12 km ESE Valles, 11 July 1969 (S. & J. Peck), two females, immature. Sótano (=Cueva) Escondido, 12 km NE Valles, 31 January 1969 (J. Reddell, W. Russell), two females, immature. Cueva de la Libertad, 25 km NW Valles, 8 April 1968 (T. Raines), two males, two females. Cuevacita del Sotanito, 9 km NE Valles, 1 June 1968 (J. Reddell), female. *Tamaulipas:* Cueva del Abra, 15 km SSW Mante, 25 November 1963 (J. Reddell), female; 7 December 1945 (C. Bolívar, F. Bonet), two females, immature. Cueva de San Rafael de los Castros, 12 km ESE Mante, 10 April 1966 (J. Fish, D. McKenzie), female. Grutas de Quintero, 13 km SW Mante, 28 November 1964 (J. Reddell), male, female. Sótano de Vasquez, 7 km SE Ocampo, 29 December 1972 (R. Jameson, P. Duncan), male, three females.

Loxosceles bolivari Gertsch

Loxosceles bolivari Gertsch, 1958, p. 22 (male holotype only).

Discussion—The name *bolivari* is herein restricted to a species from Nuevo León and the female allotype, along with much more material now available, now assigned to the new species *valdosa* described above.

Type Data—Male holotype from Cueva García (=Grutas de Villa de García), Nuevo León, México, 19 September 1942 (C. Bolívar).

Distribution—Caves of Nuevo León, México.

Other Record—MEXICO: *Nuevo León:* Cueva del Carrizal, 10 km SW Candela, 2 March 1963 (W. Russell), two females from within 90 m of entrance.

Loxosceles devia Gertsch and Mulaik

Loxosceles devia Gertsch and Mulaik, 1940, p. 316. Gertsch, 1958, p. 11.

Record—MEXICO: *Tamaulipas:* Cueva de los Cuarteles, 10 km SW Aldama, 23 December 1972 (J. Reddell, D. & M. McKenzie, S. Murphy), two males, four females.

Loxosceles misteca Gertsch

Loxosceles misteca Gertsch, 1958, p. 27.

Records—MEXICO: *Guerrero:* Grutas de Cacahuamilpa, 17 km NE Taxco, 4 May 1963 (W.J. Gertsch, W. Ivie), two males, 10 females, immature; 17 August 1966 (J. Reddell), female; 2 September 1966 (J. & W. Ivie), female, immature. Grutas de El Mogote, 12 km N Taxco, 25 August 1965 (J. Reddell, W. Bell), male, immature; 22 December 1966 (T. Raines), female. Pozo Melendez, 20 km S Taxco, 9 June 1966 (J. Fish), two females, immature. Cueva de Carlos Pacheco, near Grutas de Cacahuamilpa, 17 km NE Taxco, 27 June 1954 (R. deSaussure), immature from wall in total darkness. *México:* Grutas de la Estrella, 13 km SSE Ixtapan de la Sal, 17 August 1966 (J. Reddell, D. McKenzie), male, female, immature.

Loxosceles tehuana Gertsch

Loxosceles tehuana Gertsch, 1958, p. 26.

Record—MEXICO: *Chiapas:* Cueva de Tempisque, 13 km W Ocozocoautla, 17 August 1967 (J. Reddell, T.R. Evans), female.

Loxosceles deserta, new species

Loxosceles unicolor: Gertsch, 1958, p. 15.

Discussion—In 1958 I used the name *unicolor* Keyserling for a long-legged species widely distributed from Arizona, southern Utah and Nevada into adjacent California. After study of the presumed type of *unicolor,* in the collection of the United States National Museum, it is clear that the common western species is distinct so it is renamed above. The exact identity of *unicolor,* said to come from Punta de Aguas, a small community south of Albuquerque, New Mexico, but possibly with spurious locality data, remains obscure. Since 1958 the name *unicolor* has been widely and erroneously used for several species, and is part of medical literature because of its venomous bite. The species is well described in the paper above and there is no need for repetition of the features setting it aside from *arizonica,* its nearest relative. A new holotype and other data are given below.

Type Data—Male holotype from Twentynine Palms, California, May 1945 (J. H. Branch).

Distribution—Common species of southern Utah and Nevada, Arizona especially in western portion, and central and south California.

Loxosceles aurea, new species

Diagnosis—Pale yellow, largely unmarked troglophile related to *devia* Gertsch and Mulaik, recognized by following features: legs much longer, first one about seven times instead of five times length of carapace; epigynal pouches widely separated by three times basal width.

Etymology—Specific name from Latin *aureus,* golden.

Female—Total length 7.8 mm. Carapace 3.2 mm long, 2.85 mm wide. Abdomen 5 mm long, 2.5 mm wide.

Base color of entire spider golden yellow to orange except as follows: carapace with or without faint Y-shaped brownish marking on dorsum; eyes narrowly ringed with black; abdomen whitish with yellow cast.

Clypeus sloping, 0.37 mm long, equal to two diameters of anterior median eye; eyes subequal in size; median eyes lying just in front of line along edges of lateral eyes and separated from them by slightly more than diameter (21/16).

Leg formula 2413. Legs thin; first leg 7.3 times, first femur 1.97 times as long as carapace. Palpus: femur 1.2 mm, patella 0.35 mm, tibia 1 mm, tarsus 1.2 mm; total 3.75 mm.

	I	II	III	IV
Femur	6.35	7.20	5.70	6.70
Patella	1.10	1.20	1.10	1.20
Tibia	6.80	7.70	5.75	6.65
Metatarsus	6.30	7.65	6.25	7.60
Tarsus	1.50	1.60	1.25	1.60
Total	22.05	25.35	20.05	23.75

Epigynum (Fig. 36) similar to that of *devia;* basal pouch of seminal receptacle narrower, with long curved, tubular receptacle and small finger at base; seminal pouches widely separated by three times basal width of one.

Male—Total length 6.1 mm. Carapace 2.75 mm long, 2.5 mm wide. Abdomen 3.35 mm long, 1.7 mm wide.

	I	II	III	IV
Femur	5.50	6.15	5.20	5.90
Patella	1.00	1.10	0.90	1.00
Tibia	6.00	6.50	4.70	5.50
Metatarsus	5.70	6.50	5.70	7.20
Tarsus	1.50	1.35	1.25	1.50
Total	19.70	21.60	17.75	21.10

Leg formula 2413. First leg 7.1 times, first femur twice as long as carapace.

Male palpus: femur 1.3 mm, patella 0.5 mm, tibia 0.85 mm, tarsus 0.35 mm; total 3 mm. See Fig. 37 of *belli;* same proportions but embolus much longer than bulb (0.4 mm/0.22 mm).

Type Data—Female holotype from Cueva del Guano, 23 km S Gómez Palacio, Durango, México, 24 February 1966 (J. Reddell, W. Bell).

Distribution—Known only from above cave.

Other Records—MEXICO: *Durango:* Cueva del Guano, 24 February 1966 (J. Reddell, W. Bell), female, penultimate males, two immature; 16-17 June 1972 (J. Reddell, W. Elliott, E. Alexander, C. Kunath), two females from guano-covered breakdown. *Coahuila:* epigean station 75 km SW Cuatro Ciénegas de Carranza, 18 July 1965 (J. Reddell, J. Fish), male, immature.

Loxosceles belli, new species

Diagnosis—Dusky, short-legged species allied to *arizonica,* distinguished by following differences: legs of male and embolus of palpus proportionately longer; leg formula of female 4213 and first leg five times as long as carapace.

Etymology—Named for Mr. William Bell.

Female—Total length 7.7 mm. Carapace 3.2 mm long, 2.5 mm wide. Abdomen 4.5 mm long, 2.5 mm wide.

Base color of cephalothorax and appendages dull

yellow; carapace with dusky Y-shaped marking and faint duskiness along side margins; eyes narrowly ringed with black; chelicerae and tibia and tarsus of palpus reddish brown. Abdomen dirty gray.

Clypeus 0.4 mm high, equal to more than two diameters of anterior median eye; eyes subequal in size, about 0.17 mm in diameter; median eyes only slightly forward of line along front edges of anterior lateral eyes and separated from them by slightly more than diameter (20/17).

	I	II	III	IV
Femur	4.50	4.75	4.20	4.85
Patella	1.10	1.10	1.00	1.10
Tibia	4.50	4.90	3.70	4.50
Metatarsus	4.50	5.00	4.40	5.60
Tarsus	1.35	1.30	1.20	1.35
Total	15.95	17.05	14.50	17.40

Leg formula 4213. First leg five times, first femur 1.4 times as long as carapace. Palpus: femur 1.25 mm, patella 0.5 mm, tibia 0.8 mm, tarsus 1.2 mm; total 3.75 mm.

Epigynum (Fig. 38) with two large pouches subcontiguous at midline, each with single elongated, apically enlarged seminal receptacle arising from middle of pouch.

Male—Total length: 6.1 mm. Carapace 3.1 mm long, 2.7 mm wide. Abdomen 3 mm long, 1.5 mm wide.

	I	II	III	IV
Femur	6.00	6.50	5.50	6.00
Patella	1.25	1.25	1.15	1.15
Tibia	7.00	7.75	5.35	6.15
Metatarsus	6.70	7.85	6.50	7.70
Tarsus	1.50	1.60	1.25	1.50
Total	22.45	24.95	18.75	22.50

Leg formula 2413; first and fourth legs subequal. First leg 7.2 times, first femur 1.9 times as long as carapace.

Male palpus: femur 1.6 mm, patella 0.6 mm, tibia 1.1 mm, tarsus 0.45 mm; total 3.75 mm. See Fig. 37, proportions like those of *arizonica;* tibia twice as long as wide above and on side; embolus longer than bulb (0.23 mm/0.15 mm).

Type Data—Male holotype, female and immature from Cueva de las Animas, 56 km E Monclova, Coahuila, México, 21 February 1966 (W. Bell, J. Reddell).

Distribution—Caves of Coahuila, México.

Other Record—MEXICO: *Coahuila:* Cueva de los Lagos, 25 km NW Villa Acuña, 15 November 1964 (J. Reddell, B. Martin), female probably this species.

Loxosceles luteola, new species

Diagnosis—Pale yellow, largely unmarked troglophile related to *aureus,* distinguished by distinctive epigynum and shorter legs.

Etymology—Specific name from Latin *luteolus,* yellow.

Female—Total length 6.2 mm. Carapace 2.7 mm long, 2.3 mm wide. Abdomen 3.5 mm long, 1.7 mm wide.

Base color of cephalothorax and appendages yellow to orange; carapace with faint traces of Y-shaped marking; eyes narrowly ringed with black; abdomen uniform whitish.

Clypeus sloping, 0.25 mm long, equal to two diameters of median eyes; eyes subequal in size; middle eyes lying just in front of line along edges of anterior eyes and separated from them by slightly more than long diameter (16/13).

	I	II	III	IV
Femur	4.85	5.65	4.65	5.00
Patella	1.00	1.00	0.90	0.95
Tibia	5.40	6.00	4.25	4.95
Metatarsus	5.00	6.10	4.75	5.85
Tarsus	1.20	1.25	1.15	1.15
Total	17.45	20.00	15.70	17.90

Leg formula 2413. Legs thin; first leg 6.4 times, first femur 1.8 times as long as carapace. Palpus: femur 1 mm, patella 0.3 mm, tibia 0.75 mm, tarsus 1 mm; total 3.05 mm.

Epigynum (Fig. 31) with basal pouches separated by twice basal diameter of one, with single curved finger with rounded enlargement near end.

Type Data—Female holotype from Gruta Sur de San Bartolo, 11 km SSE Santa Catarina, Nuevo León, México, 3 December 1966 (T. Raines).

Loxosceles aranea, new species

Diagnosis—Pale troglophile with legs of medium length, distinguished by details of epigynum.

Etymology—Specific name from Latin *araneus,* spider, named for Sótano de Dos Arañas Grandes.

Female—Total length 7.5 mm. Carapace 3.5 mm long, 3 mm wide. Abdomen 4 mm long, 2.5 mm wide.

Base color of cephalothorax and abdomen yellow to orange; carapace with typical dusky orange Y-shaped marking at center and faint dustiness on side margins; chelicerae and tibiae and patella of palpus dark reddish brown; abdomen uniform whitish.

Clypeus 0.48 mm, equal to more than two diameters (48/17) of anterior lateral eye; eyes subequal in size, each about 0.17 mm; posterior edges of median

eyes nearly touching front edges of anterior lateral eyes and separated from each side eye by little more than diameter (19/17).

	I	II	III	IV
Femur	5.60	5.70	5.00	5.50
Patella	1.20	1.20	1.20	1.15
Tibia	6.00	6.35	4.85	5.30
Metatarsus	5.35	6.15	5.00	6.00
Tarsus	1.30	1.35	1.20	1.20
Total	19.45	20.75	17.25	20.05

Leg formula 2413. First leg 5.5 times, first femur 1.3 times as long as carapace. Palpus: femur 1.25 mm, patella 0.5 mm, tibia 0.85 mm, tarsus 1.1 mm; total 3.7 mm.

Epigynum (Fig. 35) with large rectangular pouches subcontiguous at middle, each with curved tubular receptacle enlarged at end.

Type Data—Female holotype and three immature from Sótano de Dos Arañas Grandes, 2 km E Río Blanco, Querétaro, México, 9 July 1967 (J. Reddell, J. Fish).

Loxosceles yucatana Chamberlin and Ivie

Loxosceles yucatana Chamberlin and Ivie, 1938, p. 126.

Records—BELIZE: Rio Frio Cave A, Augustine, 458 m, 20 August 1972 (S. Peck), male, five females, immature. GUATEMALA: Cueva Najohnaj Coholtunich, El Petén, 14 km SW Flores, 25 August 1972 (S. & J. Peck), eight subadult.

Loxosceles guatemala, new species

Diagnosis—Troglophile related to *yucatana,* readily distinguished by distinctive epigynum (Fig. 34).

Etymology—Named for Guatemala, used in apposition.

Female—Total length 9.8 mm. Carapace 4.2 mm long, 3.4 mm wide. Abdomen 5.6 mm long, 3.5 mm wide.

Base color of cephalothorax and appendages bright orange, with following markings: carapace with dusky brown Y-shaped marking and dusky bands along sides. Abdomen whitish, covered with dusky hairs.

Clypeus 0.5 mm long, equal to little more than two diameters of anterior median eye; eyes subequal, about 0.22 mm in diameter; median eyes situated just in front of line along front edges of anterior lateral eyes.

	I	II	III	IV
Femur	6.70	7.50	6.50	6.70
Patella	1.50	1.60	1.50	1.40
Tibia	7.40	7.85	6.00	6.75
Metatarsus	7.00	7.85	6.70	7.85
Tarsus	1.70	1.70	1.50	1.65
Total	24.30	26.50	22.20	24.35

Leg formula 2413. First leg 6.6 times, first femur 1.6 times as long as carapace. Palpus: femur 1.5 mm, patella 0.62 mm, tibia 1.1 mm, tarsus 1.5 mm; total 4.72 mm.

Epigynum (Fig. 34) with broad, narrow, separated pouches, each with principal erect, apically enlarged receptacle and two short outside fingers.

Type Data—Female holotype, three females and immature from Cueva Lanquin, Lanquin, Alta Verapaz, Guatemala, 28 August 1969 (S. & J. Peck).

Distribution—Caves of Guatemala.

Other Record—GUATEMALA: Cemetery Cave, Lanquin, 312 m (N. Sullivan), female, two immature.

Loxosceles tenango, new species

Diagnosis—Long-legged troglophile with following features: male palpus similar to that of *arizonica* with tibia twice as long as lateral width; pouches of epigynum large, suboval, subcontiguous at midline, with sinuous tubular receptacle enlarged at apex.

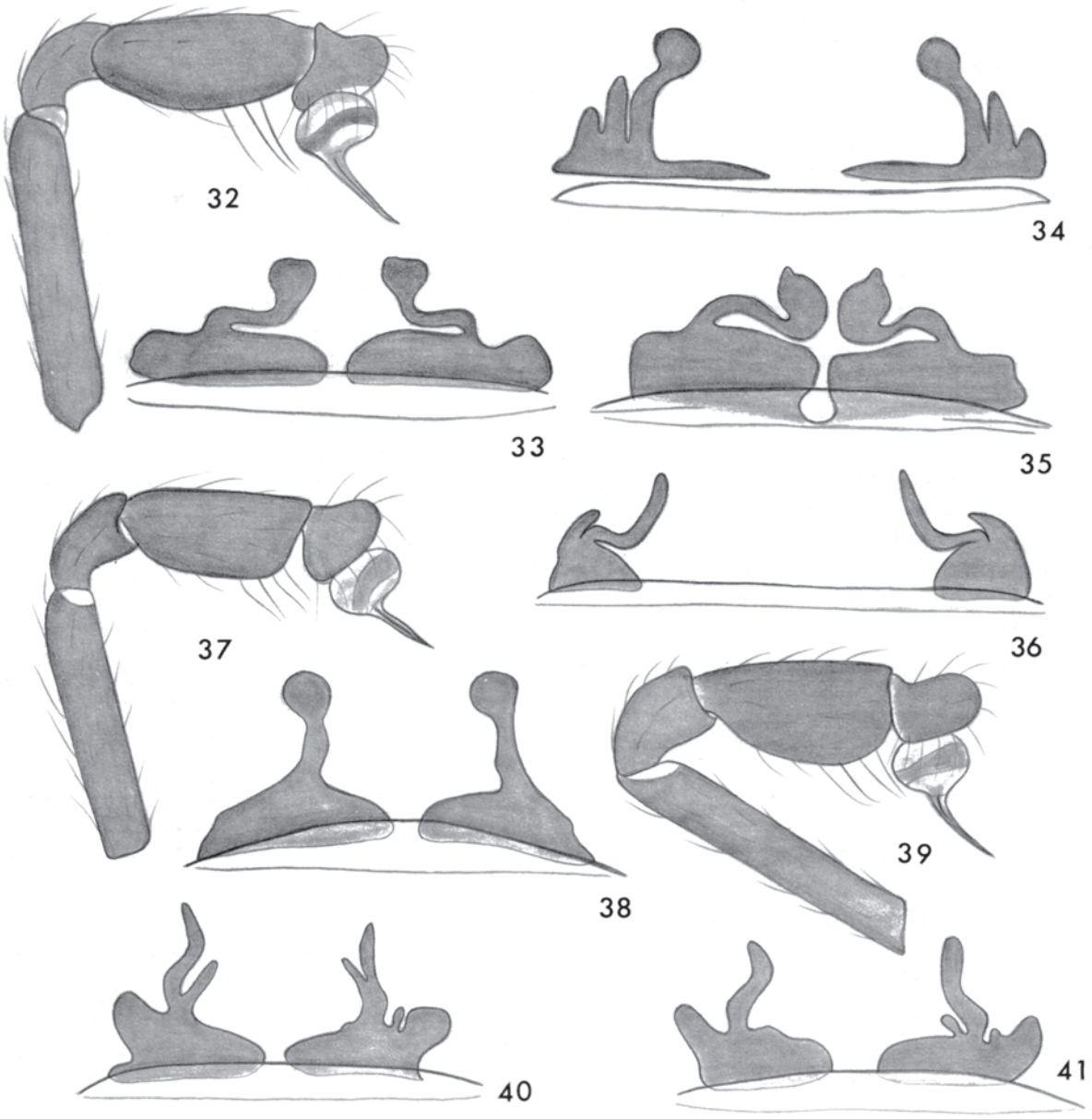
Etymology—Named for Cueva de El Tenango, used in apposition.

Female—Total length 8.35 mm. Carapace 3.35 mm long, 3.1 mm wide. Abdomen 5 mm long, 3 mm wide.

Cephalothorax and legs dusky orange; carapace with orange-brown Y-shaped marking and marginal dusky stripes on sides leaving paler spot on each side of median groove; eyes narrowly ringed with black. Abdomen uniform gray.

Clypeus 0.5 mm long, equal in length to three diameters of anterior lateral eye (50/18); eyes subequal in size, each about 0.18 mm; median eyes situated third of their diameter in front of line along front edges of anterior lateral eyes, more than diameter from lateral eyes (24/18).

	I	II	III	IV
Femur	5.70	6.35	5.50	5.75
Patella	1.20	1.20	1.15	1.15
Tibia	6.00	6.65	4.75	5.50
Metatarsus	5.50	6.25	5.15	6.00
Tarsus	1.10	1.40	1.15	1.35
Total	19.50	21.85	17.70	19.75



Figs. 32-33. *Loxosceles tenango,* new species. 32. Right male palpus, retrolateral view. 33. Epigynum, ventral view.
Fig. 34. *Loxosceles guatemala,* new species, epigynum, ventral view.
Fig. 35. *Loxosceles aranea,* new species, epigynum, ventral view.
Fig. 36. *Loxosceles aurea,* new species, epigynum, ventral view.
Figs. 37-38. *Loxosceles belli,* new species. 37. Right male palpus, retrolateral view. 38. Epigynum, ventral view.
Figs. 39-41. *Loxosceles valdosa,* new species. 39. Right male palpus, retrolateral view. 40. Epigynum, ventral view. 41. Another epigynum, ventral view.

Leg formula 2413. First leg 5.8 times, first femur 1.6 times as long as carapace. Palpus: femur 1.15 mm, patella 0.46 mm, tibia 0.8 mm, tarsus 1.1 mm; total 3.51 mm.

Epigynum (Fig. 33) with large suboval pouches subcontiguous at midline and on each side single curved tubular receptacle with apical enlargement.

Male—Total length 7 mm. Carapace 3 mm long, 2.7 mm wide. Abdomen 4 mm long, 2.3 mm wide.

	I	II	III	IV
Femur	6.30	7.00	5.60	5.80
Patella	1.15	1.15	1.10	1.00
Tibia	7.30	8.00	5.30	5.70
Metatarsus	6.50	7.60	5.70	6.80
Tarsus	1.35	1.40	1.20	1.35
Total	22.60	25.15	18.90	20.65

Leg formula 2143. First leg 7.53 times, first femur

2.1 times as long as carapace.

Male palpus: femur 1.4 mm, patella 0.5 mm, tibia 1 mm, tarsus 0.35 mm; total 3.25 mm. See Fig. 32; tibia twice as long as lateral width; embolus longer than bulb (0.42 mm/0.27 mm).

Type Data—Male holotype, male, six females, and immature from Cueva de El Tenango, 6 km S Chapulhuacán, Hidalgo, México, 18 August 1965 (J. Reddell, J. Fish, W. Bell).

FAMILY SYMPHYTOGNATHIDAE

Maymena mayana (Chamberlin and Ivie)

Maymena mayana: Gertsch, 1971, p. 92.

Records—MEXICO: *Oaxaca:* Cueva del Guayabo, 12 km NE Valle Nacional, 29 December 1972 (J. Reddell, D. & M. McKenzie, S. Murphy), male. Grutas de Monteflor, 6 km NE Valle Nacional, 28 December 1972 (J. Reddell, D. & M. McKenzie, S. Murphy), seven females. GUATEMALA: *Alta Verapaz:* Cueva Lanquin, Lanquin, 28 August 1969 (S. & J. Peck), male, four females; 4 June 1959 (W. L. Varnedoe), three females. *Izabal:* Cueva de la Coche, 2 km W Livingston, 21 August 1969 (S. & J. Peck), two males, four females, immature. *El Petén:* Cueva Jobitzinaj, 6 km S Flores, 22 January 1972 (D. McKenzie), female. BELIZE: Rio Frio Cave A, Augustine, 458 m, 20 August 1972 (S. Peck), two females.

Maymena chica Gertsch

Maymena chica Gertsch, 1971, p. 94.

Records—MEXICO: *San Luis Potosí:* Cueva de los Caballos, 30 km ESE San Luis Potosí, about 3000 m, 18 May 1972 (W. Elliott), immature female. Cueva de la Puente, 30 km ESE San Luis Potosí, about 3000 m, 16 May 1972 (W. Elliott, R. Ralph, M. McEachern), male, female, immature; same data 15 May 1972, male. Cueva de Cinquenta y Ocho, 30 km ESE San Luis Potosí, 3000 m, 18 May 1972 (W. Elliott, R. Ralph, P. Lynn), females. Sótano de la Tinaja, 11 km NE Valles, 16 October 1972 (V. Roth, B. Firstman), male, seven females, immature from near pool in small orbwebs.

Maymena delicata Gertsch

Maymena delicata Gertsch, 1971, p. 94.

Records—MEXICO: *Oaxaca:* Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, 26 December 1972 (J. Reddell, D. & M. McKenzie, S. Murphy), female. Grutas de San Sebastian, 20 km N Sola de Vega, 31 December 1972 (J. Reddell, D. & M. McKenzie, S. Murphy), female. Cueva de Llano Grande, 25 km N Sola de Vega, 31 December 1972 (J. Reddell, D. & M. McKenzie, S. Murphy), female.

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A NEW CAVE-ADAPTED PLANARIAN (TRICLADIDA, PALUDICOLA, PLANARIIDAE) FROM CHIAPAS, MEXICO[1]

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The purpose of this paper is to present the description of a new species of cavernicole planarian of the genus *Dugesia* occurring in caves of Chiapas, México.

ORDER TRICLADIDA

SUBORDER PALUDICOLA (=PROBURSALIA)

FAMILY PLANARIIDAE

Genus *Dugesia* Girard, 1850

Dugesia mckenziei, new species

Description—A small, rather slender, white, very small-eyed troglobite (appearance in life shown in Figs. 1, 2, and preserved in Figs. 3, 4). In life fully sexually mature specimens measure about 8 mm to 10 mm in length and 1 mm in width. The head is triangular with moderately developed and rather pointed auricles. The anterior end of the head is bluntly pointed (Fig. 2). Behind the head the body begins to widen slightly, reaching its greatest width at about mid-body, finally tapering to a bluntly pointed posterior end. The rather long pharynx is situated somewhat behind the middle of the body, the mouth at about the middle of the postpharyngeal region. The genital pore opens midway between the mouth and the posterior end. In living animals the copulatory apparatus and a pair of spermiducal vesicles are visible from the ventral side as opaque areas.

A pair of very small eyes is situated at the anterior level of the auricles; they are scarcely noticeable in living specimens. Distance between the eyes is slightly more than one-third the width of the head at the level of the eyes.

Although in gross aspect presenting a milky-white appearance, microscopic examination reveals that the species is a low pigmented form with pale yellowish-brown pigments (as seen in material preserved in isopropyl alcohol). Drop-shaped areas on the basal parts of the auricles are free of pigment as is the submarginal adhesive zone (Fig. 4).

The structure of the pharynx is typical of the family Planariidae, the muscle fibers of the internal zone forming two separate layers, an inner, thick, circular layer and an outer, thin, longitudinal one. The dorsal epidermis is thicker than the ventral. The anterior trunk of the intestine bears 13 to 15 lateral branches; each posterior trunk, 12 to 15 or more short

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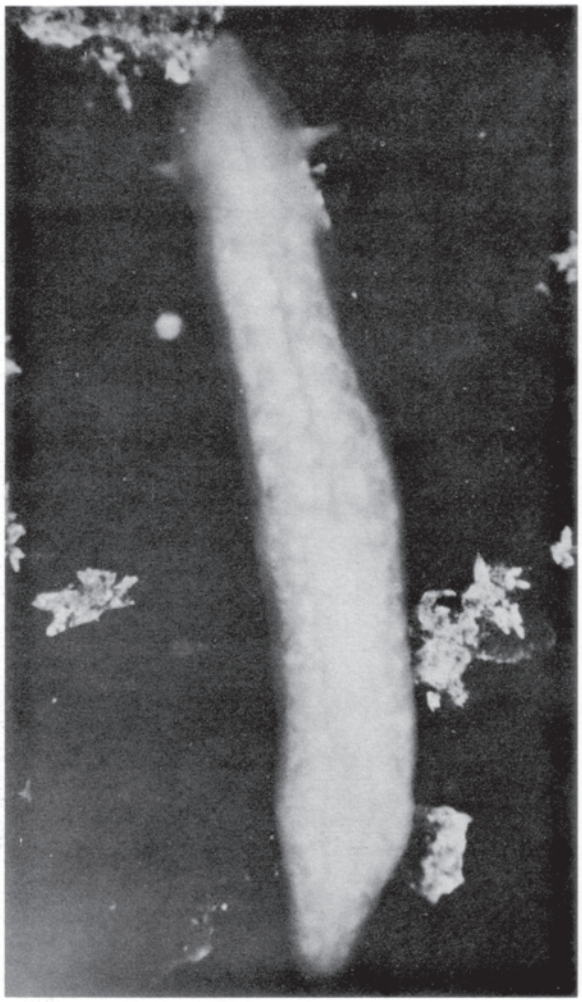

Fig. 1. *Dugesia mckenziei,* holotype in life, dorsal. Note size and arrangement of testes.

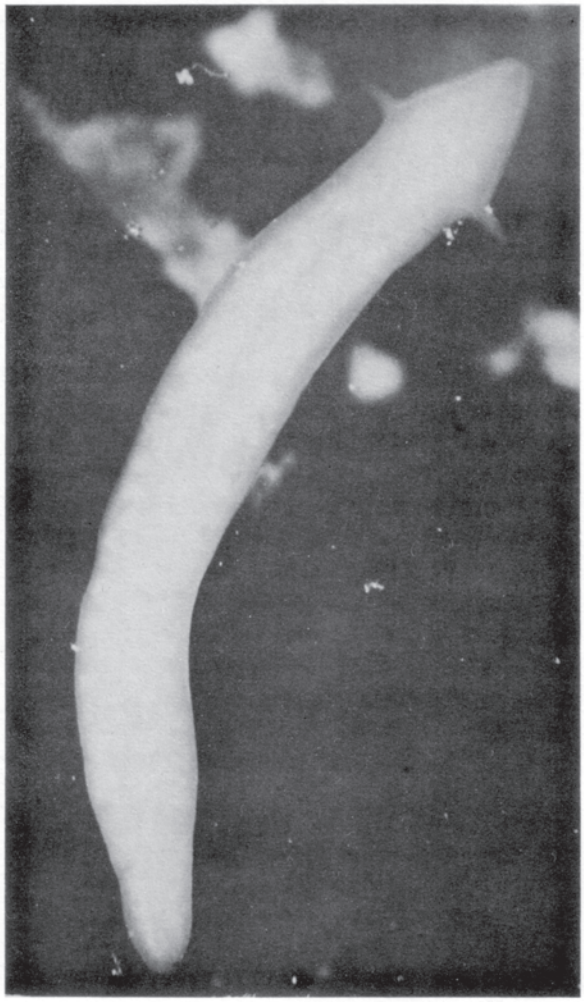

Fig. 2. *Dugesia mckenziei,* holotype in life, ventral. Note size and shape of auricles and shape of head.

lateral branches.

The minute eyes (Fig. 5) are embedded in the parenchyma slightly beneath the dorsal subepidermal muscles. The pigment cell layer is conspicuous but very small in size, and the photoreceptor cells are but slightly developed (Fig. 6). In one specimen measured (La Cueva de Los Llanos, Specimen Lot No. 1151a) the pigment cup was about 30 μ in diameter and about 12 μ in depth (depth of the body at the level of the eyes about 290 μ).

The ovaries are located, as is typical, at a level behind the second or third diverticulum of the anterior trunk of the intestine. The ovaries are large, their diameter being about one-half the depth of the body at their level. Numerous yolk glands located between the intestinal diverticulae occur throughout the body.

The testes occur in a band running the length of the body (Fig. 3) and are situated in the dorsal parenchyma (Fig. 7). No testes were found in the parenchyma between the two posterior intestinal trunks. There are apparently somewhat less than 40 testes on each side of the body.

The copulatory apparatus of *D. mckenziei* is shown by photomicrographs in Figs. 8, 9, and in semi-diagrammatic sagittal view in Fig. 10.

The genital pore leads posterodorsally into the terminal part of the bursal canal and anterodorsally into the male antrum. A common genital pore is lacking. The outer wall of most of the male antrum is clothed with a flattened, glandular, nucleate epithelium below which occurs two muscle layers, an outer one of circular fibers and an inner one of longitudinal fibers. The epithelial cells of the basal and posterior parts of the male antrum are taller and more glandular than elsewhere.

The penis consists of a bulb embedded in the parenchyma and a papilla projecting into the male

Fig. 3. *Dugesia mckenziei,* holotype, fixed in Bouin's fluid, dorsal. Note size and arrangement of testes.

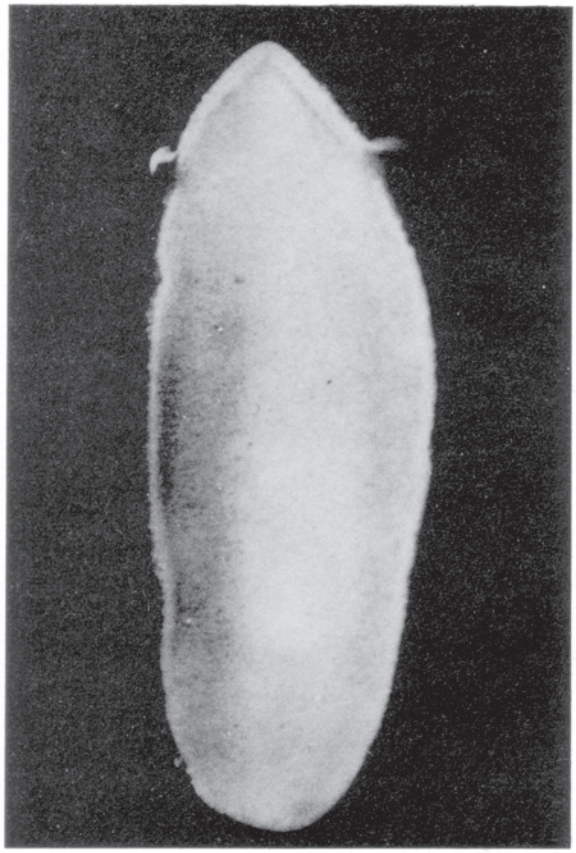

Fig. 4. *Dugesia mckenziei,* paratype, fixed in isopropyl alcohol, ventral. Note marginal adhesive zone.

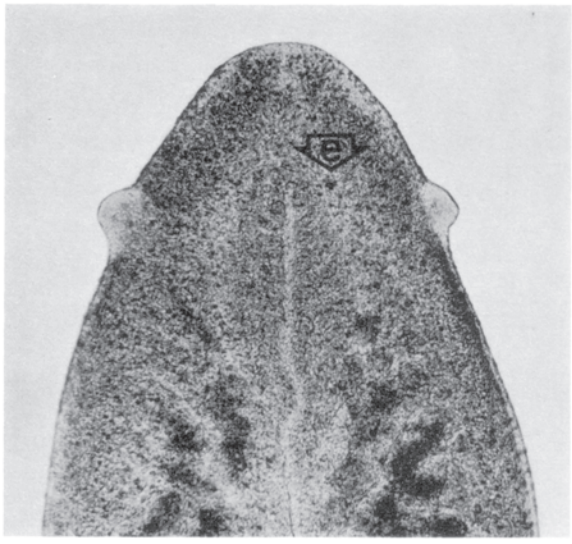

Fig. 5. Head of stained whole mount. Note minute eyes.

Fig. 6. Sagittal section showing eye.

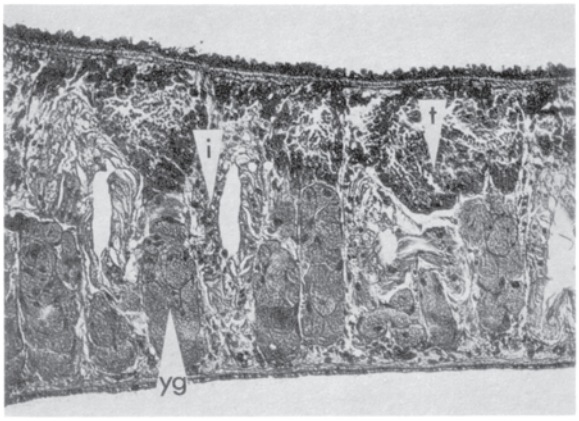

Fig. 7. Sagittal section showing dorsal position of testes.

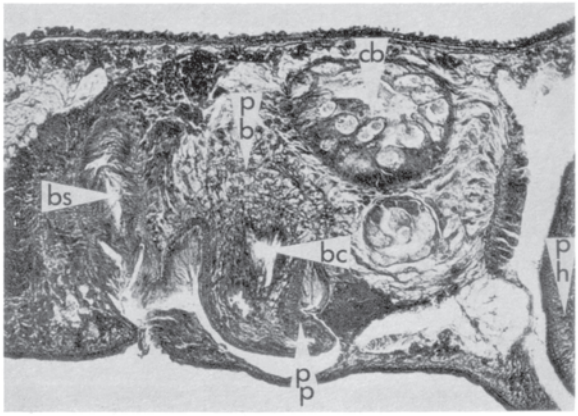

Fig. 8. Sagittal section showing parts of the copulatory apparatus.

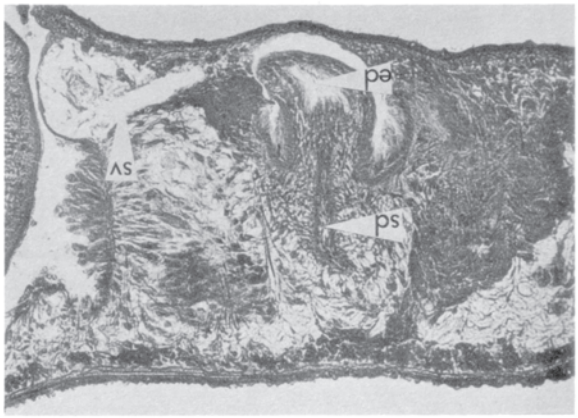

Fig. 9. Sagittal section showing parts of the copulatory apparatus.

antrum. The bulb is hemispherical in shape and is moderately muscular. It contains a moderately wide bulbar cavity or seminal vesicle. The bulbar cavity continues into the papilla as a wide ejaculatory duct and opens at the tip of the papilla. The penis lumen (bulbar cavity + ejaculatory duct) is lined with a tall, glandular epithelium tapering in thickness anteriorly. The sperm ducts form highly developed spermiducal vesicles on each side of the postpharyngeal region between the mouth and the anterior level of the penis bulb. Along the sides of the penis each vesicle narrows to a slender duct that proceeds posteriorly to the level of the genital pore, then ascends vertically, curves anteroventrally, and finally opens separately into the posterior part of the bulbar cavity. The penis bulb is pierced by a considerable number of ducts of the penis glands.

The penis papilla is symmetrical and is of a long, rather pointed, conical shape. It is moderately muscular. The outer wall is covered by an epithelium similar to that lining the male antrum. The nucleate epithelium is taller at the basal part of the papilla than in the distal portion. Below the epithelium there is a layer of circular muscle fibers followed by a layer of longitudinal ones.

The copulatory bursa, situated in the usual position, is a medium-sized sac with a wide lumen. It is lined with a tall, glandular epithelium. The bursal stalk runs posteriorly over the posterodorsal portion of the penis, and at a point just posterior to the level of the genital pore it curves ventrally and opens at the pore. The bursal stalk is lined with a tall, glandular, nucleate epithelium and is covered by a muscular coat of inner circular and outer longitudinal fibers. The two ovovitelline ducts converge at the level of the copulatory apparatus and open separately into the bursal canal at a point about mid-way between the bursa and the genital pore. At this point the bursal stalk is somewhat wider and the muscular coat thicker than in the more anterior part of the stalk. Many eosinophilous cement glands open into the terminal part of the genital antrum near the genital pore.

The egg capsule, or cocoon, of *D. mckenziei* is not known.

Remarks—Seven species of freshwater triclads are now known with certainty to occur in México. These are *Dimarcus villalobosi* Mitchell and Kawakatsu, 1972; *Dugesia dorotocephala* (Woodworth, 1897); *Dugesia typhlomexicana* Mitchell and Kawakatsu, 1973; *Dugesia barbarae* Mitchell and Kawakatsu, 1973; *Dugesia guatemalensis* Mitchell and Kawakatsu, 1973; *Dugesia mckenziei* Mitchell and Kawakatsu, n.sp.; and *Cura azteca* Benazzi and Giannini, 1971.

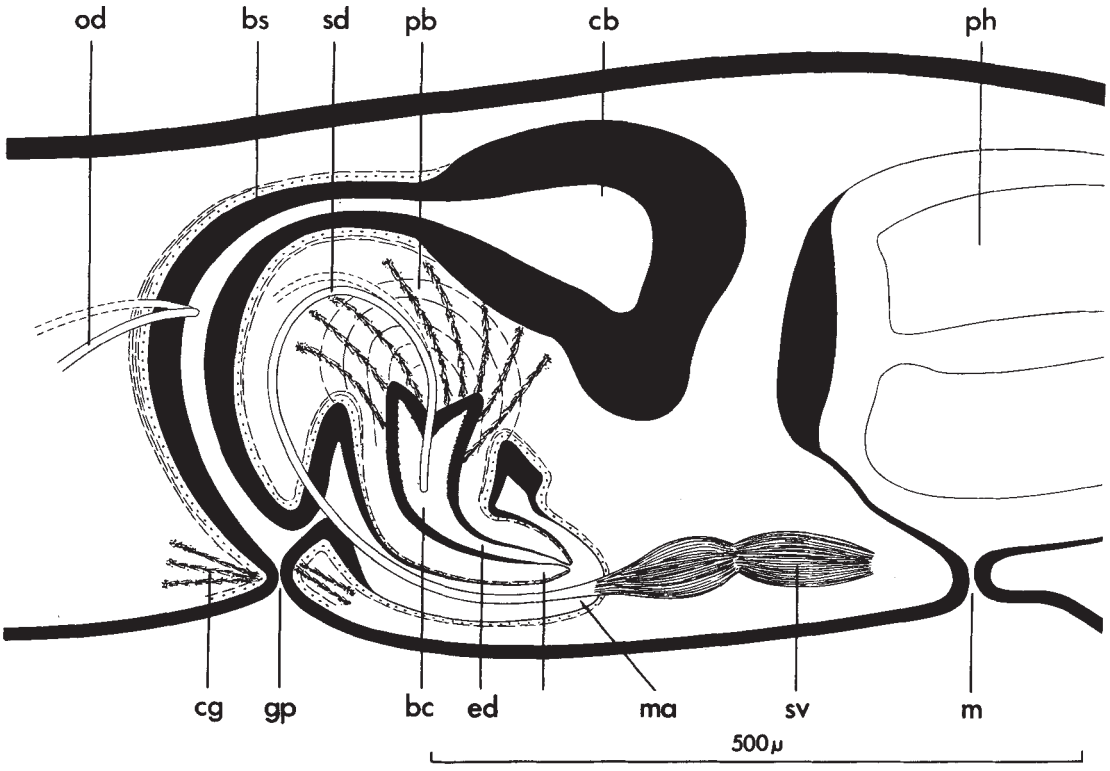

Fig. 10. Semi-diagrammatic sagittal view of copulatory apparatus.

Dimarcus villalobosi is a marine relict of unique morphology occurring in Las Grutas de Coconá, Teapa, Tabasco (cf. Mitchell and Kawakatsu, 1972). Of the remaining six species, *Dugesia dorotocephala* and *Cura azteca* are eyed, pigmented, epigean forms; while *Dugesia typhlomexicana, D. barbarae, D. guatemalensis,* and *D. mckenziei* are cavernicoles. *D. guatemalensis* is a small-eyed troglophile occurring in La Cueva de las Perlas in the Sierra de Guatemala of Tamaulipas. *D. typhlomexicana* and *D. barbarae* are eyeless troglobites occurring in La Cueva de la Mina and La Cueva de Capilla, respectively, caves also located in the Sierra de Guatemala. A detailed discussion of the affinities of the three latter *Dugesia* species may be found in Mitchell and Kawakatsu, 1973.

Dugesia mckenziei is easily separable from the dark, eyed epigean species. Its minute eyes separate it from *D. typhlomexicana* and *D. barbarae.* It bears the closest resemblance to *D. guatemalensis,* but the course of its sperm ducts and the wide ejaculatory duct separate it from the latter species.

We regard *Dugesia mckenziei* a troglobite. Even though it possesses eyes, they are minute, and the body is scarcely pigmented, appearing white in life. It is surely confined to a subterranean habitat. There seems, however, no doubt that it is a young troglobite. Further discussion of this species will await future publications of ours on the freshwater triclad fauna of México.

Differential Diagnosis—*Dugesia mckenziei* differs from the other members of the genus by the following combination of characteristics: Troglobitic species with slight, microscopic pigment and two minute eyes. Small, 8 to 10 mm in length in life. Auricles of moderate length. Testes moderate in number and dorsal. Penis bulb well-developed, moderately muscular, and with a single bulbar cavity. Sperm ducts opening separately into a bulbar cavity at the basal part of the penis lumen. Penis papilla symmetrical, conical, long, rather pointed, and with a wide ejaculatory duct. No common genital antrum. Copulatory bursa medium-sized. Two ovovitelline ducts entering the bursal stalk separately.

Collection Data—*Specimen Lot No. 1150.* Two sexually mature specimens from La Cueva de Los Llanos, 15 km ESE San Cristobal de las Casas, Chiapas, México. Taken from slow-moving stream. Altitude about 2,295 m. 5 February 1972. Coll. David McKenzie. *Specimen Lot No. 1151.* Two specimens from La Cueva de Los Llanos. One sexually mature, the other a prepharyngeal piece. 27 August 1972. Water temperature, 16.5°C (61.5°F). Coll. Robert W.

Mitchell, William H. Russell, Jerry W. Cooke. *Specimen Lot No. 1152.* One specimen from La Cueva de los Murciélagos, 15 km ESE San Cristobal de las Casas. This cave is within 100 m of La Cueva de Los Llanos and it is probable that the waters of the two caves are connected. 29 August 1972. Water temperature 24°C (75°F). (Differences between the water temperatures of these two caves possibly resulted from taking the measurements near the entrances during times of differing epigean temperatures.) Coll. Robert W. Mitchell.

Type Series—Holotype, a set of serial sagittal sections (No. 1151a, 3 slides) deposited in the Division of Worms, U.S. National Museum. Two paratypes also deposited in the U.S.N.M., one a set of sagittal sections (No. 1152a, 3 slides), the other a whole mount of a prepharyngeal piece with a pharynx (No. 1151b). The other paratypes are sets of sagittal sections (Nos. 1150a and b) and are retained in Kawakatsu's laboratory in Sapporo and in The Museum, Texas Tech University.

Type Locality—La Cueva de Los Llanos, 15 km ESE San Cristobal de las Casas, Chiapas, México.

Distribution—Known only from the type locality and a nearby cave, La Cueva de los Murciélagos.

Etymology—Named for the discoverer of the first specimens, Mr. David McKenzie, ardent student of physical and biological speleology.

Methods—Animals of Specimen Lot Nos. 1151 and 1152 were killed and fixed in Bouin's fluid at ambient temperature. Animals of Specimen Lot No. 1150 were killed and fixed in 70% isopropyl alcohol. All animals were subsequently stored in 70% ethyl alcohol. Serial sagittal sections were cut at 8 microns. Staining employed Delafield's hemotoxylin and eosin. Sectioning and staining were done in the laboratory of the junior author. Kawakatsu and Miyazaki (1972) have demonstrated that Bouin's fluid is a superior killing and fixing agent for triclad Turbellaria, especially for comparative taxonomic studies. Therefore, the animals killed and fixed in isopropyl alcohol were not used in construction of Fig. 10, the semi-diagrammatic sagittal view of the copulatory apparatus.

Abbreviations Used in Figures—bc, bulbar cavity; bs, bursal stalk; cb, copulatory bursa; cg, cement gland; e, eye; ed, ejaculatory duct; gp, genital pore; i, intestine; m, mouth; ma, male antrum; od, ovovitelline duct; pb, penis bulb; pc, pigment cell layer; ph, pharynx; pp, penis papilla; sd, sperm duct; sv, spermiducal vesicle; t, testis; vc, photoreceptor (visual) cells; yg, yolk glands.

Acknowledgments—We wish to thank Mr. David McKenzie for giving to us the first specimens of the planarian described in this paper and for providing the senior author with directions for locating La Cueva de Los Llanos. We also appreciate the assistance of Mr. William H. Russell and Mr. Jerry W. Cooke in the collection of additional specimens.

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A CHECKLIST OF THE CAVE FAUNA OF MEXICO. IV. ADDITIONAL RECORDS FROM THE SIERRA DE EL ABRA, TAMAULIPAS AND SAN LUIS POTOSI[1]

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INTRODUCTION

Since the publication by Reddell and Mitchell (1971) of the first report on the cave fauna of the Sierra de El Abra numerous new records have become available. These new records are largely the result of intensive exploration in caves along the virtually inacessible crest of the Sierra de El Abra. In addition, however, previously unstudied taxa (such as the Diptera) have now been identified. There have also been published several papers describing new taxa.

Although the previous checklist and this list now bring to about 265 the total species known from the caves of the Sierra de El Abra many species remain to be added to the list. The terrestrial isopods (under study by George A. Schultz), the very rich centipede fauna, the beetle fauna, and the mites are among groups only very poorly known. Besides these obvious exceptions continued intensive exploration will doubtless reveal many species of troglobite of the greatest systematic and zoogeographic interest.

The troglobite fauna of the Sierra de El Abra is much less well developed than that of the adjoining Sierra de Guatemala or nearby regions. Mitchell (1969) has discussed the striking differences between the faunas of lowland tropical regions and the higher mountain regions. It is not appropriate here to discuss his conclusions, but as the Sierra de El Abra becomes better known its terrestrial troglobite fauna has also become expanded to include a total of 12 species, as opposed to 9 species of aquatic troglobite. The following list includes all of the troglobites now known from the Sierra de El Abra.

Copepods
- *Diaptomus (Microdiaptomus) cokeri* Osorio Tafall

Ostracods
- *Sphaeromicola cirolanae* Rioja

Isopods
- *Speocirolana bolivari* (Rioja)
- *S. pelaezi* (Bolívar)
- *Spherarmadillo cavernicola* Mulaik
- *Brackenridgia bridgesi* (Van Name)
- *Cylindroniscus vallesensis* Schultz

Mysids
- *Spelaeomysis quinterensis* (Villalobos)

Shrimp
- *Troglocubanus* sp.

Scorpions
- *Typhlochactas elliotti* Mitchell

Pseudoscorpions
- *Aphrastochthonius parvus* Muchmore
- *A. russelli* Muchmore
- *Paravachonium bolivari* Beier

Schizomids
- *Agastoschizomus lucifer* Rowland

Opilionids
- *Hoplobunus boneti* (Goodnight and Goodnight)

Supported in part by a Grant in Aid of Research from the Society of Sigma Xi and by research funds from the International Center for Arid and Semi-Arid Land Studies (ICASALS), Texas Tech University.

Millipeds
Mexiterpes sabinus Causey
Undescribed trichopolydesmid
Thysanurans
Undescribed nicoletiid
Fish
Astyanax antrobius (Alvárez)
A. hubbsi (Alvárez)
A. jordani (Hubbs and Innes)

In the following list, with but few exceptions, only new records and significant new bibliographic citations are included. Where recent taxonomic studies (such as that of the spiders of the genus *Loxosceles)* have resulted in possible confusion over previous identifications or where specimens previously listed only by the generic name are now identified to the species level the records are repeated. The cave names used are those standardized in the files of the Association for Mexican Cave Studies. All of the caves in the Sierra de El Abra from which collections have been made are located on the accompanying map (Fig. 1). Troglobites are indicated by an asterisk preceding the taxa name.

Many people have made significant contributions to our continuing study of the cave fauna of the Sierra de El Abra. We wish to thank in particular N.B. Causey, W.J. Gertsch, T.H. Hubbell, R.W. Mitchell, and W.H. Russell for their interest and support of the study of the cave fauna of this region. We also wish to express our appreciation to the following individuals who have aided in collecting or who have contributed specimens: Miles Abernathy, Craig Bittinger, Steve Bittinger, Don Broussard, Mel Brownfield, Jerry Cooke, John A.L. Cooke, John Fish, Blake Harrison, Roy Jameson, Jimmy Jarl, Jan Lewis, Jim McIntyre, David McKenzie, R.W. Mitchell, Neal Morris, James Peck, Stewart Peck, Terry Raines, W.H. Russell, Jim Shepperd, Pierre Strinati, Ann Sturdivant, Jack White, and Suzanne Wiley.

We wish also to thank the following systematists for their identification of the indicated taxa: D.M. Anderson, beetles; T.C. Barr, Jr., beetles; T.E. Bowman, isopods; N.B. Causey, millipeds; K. Christiansen, collembolans; W.E. Duellman, frogs; R.C. Froeschner, hemipterans; R.J. Gagnè, flies; G.E. Gates, earthworms; W.J. Gertsch, amblypygids, spiders; R. Gonzalez R., diplurans; A.B. Gurney, roaches; L.H. Herman, beetles; J.L. Herring, hemipterans; H.H. Hobbs, Jr., ostracods; T.H. Hubbell, crickets; J.M. Kingsolver, beetles; R.W. Mitchell, fish, parrots; W.B. Muchmore, pseudoscorpions; V. Roth, spiders; C.W. Sabrosky, flies; G.A. Schultz, isopods; R.L. Smiley, mites; P.J. Spangler, beetles; T.J. Spilman, beetles; W.R. Suter, beetles; R.E. Warner, beetles; Pedro Wygodzinsky, thysanurans and diplurans.

PHYLUM ANNELIDA

CLASS CLITELLATA

Order Oligochaeta

Family Octochaetidae
Dichogaster sp. (det. G.E. Gates)
Records—*San Luis Potosí:* Cueva de los Monos; *Tamaulipas:* Cueva de la Florida and ?Cueva de El Pachón.
Comment—Material from Cueva de El Pachón was too poorly preserved to be positively placed in this genus.

PHYLUM ARTHROPODA

CLASS CRUSTACEA

Order Podocopa

Family Entocytheridae
Entocythere claytonhoffi Rioja
Comment—The record of this species from Cueva de San Nicolas, Tamaulipas, is in error and refers instead to Cueva de San Nicolas, San Luis Potosí, a cave in the Aquismón region.
**Sphaeromicola cirolanae* Rioja (det. H.H. Hobbs)
Records—*San Luis Potosí:* Cueva de la Curva, Sótano de Matapalma, Sótano de las Piedras, and Sótano de Yerbaniz; *Tamaulipas:* Cueva de El Pachón and Sótano de El Venadito.
Bibliography—Hobbs and Hobbs, 1973.

Order Isopoda

Family Cirolanidae
**Speocirolana bolivari* (Rioja)
Bibliography—Hobbs and Hobbs, 1973; Sbordoni and Argano, 1972.
**Speocirolana pelaezi* (Bolívar) (det. T.E. Bowman)
Records—*San Luis Potosí:* Sótano de Coatimundi, Sótano de Matapalma, and Sótano de Yerbaniz.
Bibliography—Hobbs and Hobbs, 1973; Sbordoni and Argano, 1972.
Family Trichoniscidae
**Cylindroniscus* sp. nr. *vallesensis* Schultz (det. G.A. Schultz)
Records—*San Luis Potosí:* Sótano de Yerbaniz.

Order Mysidacea

Family Lepidomysidae
**Spelaeomysis quinterensis* (Villalobos)
Bibliography—Bowman, 1973; Sbordoni and Argano, 1972.

Order Decapoda

Family Astacidae
Procambarus (Ortmannicus) toltecae Hobbs
Comment—This species does not occur in the Sierra de El Abra. The record of this species from Cueva de San Nicolas, Tamaulipas, refers instead to Cueva de San Nicolas, San Luis Potosí, a cave in the Aquismón region.

CLASS ARACHNIDA

Order Chelonethida

Family Chernetidae
Unidentified genus & species (det. W.B. Muchmore)
Records—*Tamaulipas:* Cueva de El Pachón.
Hesperochernes sp. (det. W.B. Muchmore)
Records—*San Luis Potosí:* Sótano del Tigre and Cueva de Valdosa; *Tamaulipas:* Cueva de El Pachón and Grutas de Quintero.
Comment—Specimens listed earlier as an unidentified genus and species of chernetid from Grutas de Quintero and Cueva de Valdosa have now been determined to belong to this genus.
? Semeiochernes sp. (det. W.B. Muchmore)
Records—*San Luis Potosí:* Cueva de los Monos and Cueva de Valdosa; *Tamaulipas:* Cueva Grande del Arroyo Seco, Cueva de la Florida, and Cueva de San Rafael de los Castros.
Comment—All previous records of this genus in Mexican caves should be considered questionable.
Family Chthoniidae
**Aphrastochthonius parvus* Muchmore
Records—*Tamaulipas:* Cueva de la Florida.
Bibliography—Muchmore, 1972a.
Comment—This species was previously listed as *Aphrastochthonius* sp.
**Aphrastochthonius russelli* Muchmore
Records—*San Luis Potosí:* Cueva Pinta.
Bibliography—Muchmore, 1972a.
Family Vachoniidae
**Paravachonium bolivari* Beier
Bibliography—Muchmore, 1972; 1973.

Order Amblypygida

Family Tarantulidae
Tarantula crassimanus (C.L. Koch) (det. W.J. Gertsch)
Records—*San Luis Potosí:* Cueva de Tantobal; *Tamaulipas:* Grutas de Quintero.
Tarantula fuscimana (C.L. Koch) (det. W.J. Gertsch)
Records—*San Luis Potosí:* Cueva Chica, Cueva de Taninul n. 1, Sótano de la Tinaja, and Sótano de Yerbaniz.
Comment—The record from Cueva de Taninul n. 1 was previously cited as *Tarantula* sp.

Order Araneae

Suborder Mygalomorphae

Family Theraphosidae
Aphonopelma sp. (det. V. Roth)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Comment—No adults were collected in this cave.
Schizopelma sp. (det. W.J. Gertsch)
Records—*San Luis Potosí:* Cueva Chica and Sótano de las Piedras; *Tamaulipas:* Cueva de los Pájaros.
Comment—These records were previously listed under *Aphonopelma* sp.

Suborder Araneomorphae

Family Argiopidae
Meta sp. (det. W.J. Gertsch)
Records—*Tamaulipas:* Cueva de San Rafael de los Castros.
Comment—Only immature specimens were collected.
Family Clubionidae
Corinna sp. (det. W.J. Gertsch)
Records—*Tamaulipas:* Cueva de San Rafael de los Castros.
Family Ctenidae
Ctenus sp. (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de la Cuesta, Sótano de la Estrella, and Cueva de los Monos; *Tamaulipas:* Sótano de Santa Elena.
Family Linyphiidae
Erigone monterreyensis Gertsch (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Family Nesticidae
Nesticus sp. (det. W.J. Gertsch)
Records—*Tamaulipas:* Cueva de El Pachón.
Comment—This record was previously listed under *Nesticus pallidus.*

Nesticus pallidus Emerton (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de las Piedras.
Family Pholcidae
Metagonia sp. (det. W.J. Gertsch)
Records—*San Luis Potosı:* Sótano de las Piedras; *Tamaulipas:* Sótano de Santa Elena.
Metagonia pasquinii Brignoli
Records—*San Luis Potosí:* Cueva de Los Sabinos.
Bibliography—Brignoli, 1972.
Comment—This species was previously cited as *Metagonia tinaja* Gertsch.
Metagonia tinaja Gertsch (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de Matapalma; *Tamaulipas:* Sótano de El Venadito.
Bibliography—Brignoli, 1972; Gertsch, 1973.
Modisimus sp. (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Modisimus boneti Gertsch (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de los Monos and Cueva de Taninul n. 1.
Bibliography—Gertsch, 1973.
Modisimus texanus Banks (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Bibliography—Gertsch, 1973.
Pholcophora elliotti Gertsch
Bibliography—Brignoli, 1972.
Physocyclus globosus (Taczanowski) (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Bibliography—Gertsch, 1973.
Family Scytodidae
Loxosceles sp. (det. W.J. Gertsch)
Records—*San Luis Potosí:* Cueva del León.
Loxosceles valdosa Gertsch (det. W.J. Gertsch)
Records—*San Luis Potosí:* Cueva de Los Sabinos, Cuevacita del Sotanito, Cueva de Taninul n. 1, and Cueva de Valdosa; *Tamaulipas:* Cueva del Abra, Cueva de San Rafael de los Castros, and Grutas de Quintero.
Bibliography—Gertsch, 1973.
Comment—The specimens from Cueva de Los Sabinos were previously listed under *Loxosceles bolivari* Gertsch and the remainder under *Loxosceles* sp.
Family Symphytognathidae
Maymena chica Gertsch (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de la Cuesta, Sótano de la Estrella, Joya de Higuerón, and Cueva de los Monos.
Family Theridiidae
Dipoena sp. (det. W.J. Gertsch)
Records—*San Luis Potosí:* Sótano de la Cuesta.
Comment—This is apparently a new species.

Order Opilionida

Family Cosmetidae
Cynorta jamesoni Goodnight and Goodnight
Records—*San Luis Potosí:* Sótano de la Cuesta and Sótano de la Estrella; *Tamaulipas:* Cueva de la Florida and Cueva de El Pachón.
Bibliography—Goodnight and Goodnight, 1973.
Family Phalangodidae
**Hoplobunus boneti* (Goodnight and Goodnight)
Records—*San Luis Potosí:* Sótano de Coatimundi, Cueva de los Monos, Sótano de la Pipa, and Cueva de Tanchipa.
Bibliography—Goodnight and Goodnight, 1973.

Order Ricinulei

Family Ricinoididae
Cryptocellus osorioi Bolívar
Bibliography—Sbordoni and Argano, 1972.
Cryptocellus pelaezi Coronado
Bibliography—Sbordoni and Argano, 1972.

Order Acarina

Family Cheyletidae
Cheyletus malaccensis Oud. (det. R.L. Smiley)
Records—*Tamaulipas:* Cueva de El Pachón.
Family Erythraeidae
Unidentified genus and species (det. W.R. Elliott)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Bibliography—Elliott and Strandtmann, 1971.
Family Myobiidae
Jamesonia arganoi Vomero
Records—*San Luis Potosí:* Cueva de Los Sabinos.
Bibliography—Vomero, 1972.
Comment—This mite was taken from *Desmodus rotundus murinus.*
Family Rhagidiidae
Rhagidia trisetatus Elliott and Strandtmann
Records—*San Luis Potosí:* Sótano de la Tinaja.
Bibliography—Elliott and Strandtmann, 1971.
Comment—This species was previously cited as *Rhagidia* sp.
Rhagidia weyerensis (Packard)
Bibliography—Elliott and Strandtmann, 1971.
Family Rosensteinidae
Nycteriglyphus sp. (det. R.L. Smiley)
Records—*San Luis Potosí:* Cueva de Los Sabinos.
Family Trombiculidae
Unidentified genus and species (det. W.R. Elliott)
Records—*Tamaulipas:* Sótano de Santa Elena.
Bibliography—Elliott and Strandtmann, 1971.
Microtrombicula boneti (Hoffmann)

Comment—This species was previously listed as *Eltonella (Coecicula) boneti.*

CLASS DIPLOPODA

Order Chordeumida

Family Trichopetalidae
**Mexiterpes* sp. (det. N.B. Causey)
Records—*San Luis Potosí:* Cueva de los Monos.

Order Julida

Family Julidae
Diploiulus latistriatus (Curtis) (det. N.B. Causey)
Records—*San Luis Potosí:* Cueva de las Cuatas.

Order Polydesmida

Family Rhachodesmidae
Strongylodesmus conspicuus Causey
Records—*San Luis Potosí:* Sótano del Tigre and Sótano de la Tinaja; *Tamaulipas:* Sótano de El Venadito.
Bibliography—Causey, 1973.
Family Stylodesmidae
Undescribed genus and species (det. N.B. Causey)
Records—*Tamaulipas:* Sótano de Santa Elena.
Family Trichopolydesmidae
*Undescribed genus and species (det. N.B. Causey)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Family Xystodesmidae
Rhysodesmus sp. (det. N.B. Causey)
Records—*San Luis Potosí:* Cueva Chica, Cueva de los Monos, and Cueva de Tantobal.

Order Spirostreptida

Family Spirostreptidae
Orthoporus sp. (det. N.B. Causey)
Records—*Tamaulipas:* Sótano de Santa Elena.

CLASS INSECTA

Order Thysanura

Family Nicoletiidae
*Unidentified genus & species (det. P. Wygodzinsky)
Records—*San Luis Potosí:* Sótano de la Cuesta and Sótano de Soyate; *Tamaulipas:* Sótano de Santa Elena.
Nicoletia sp. (det. P. Wygodzinsky)
Records—*San Luis Potosí:* Sótano de Matapalma and Sótano de Yerbaniz; *Tamaulipas:* Cueva de El Pachón.
**Texoreddellia texensis* (Ulrich)
Records—*Tamaulipas:* Grutas de Quintero.
Bibliography—Paclt, 1971; Wygodzinsky, 1973.
Comment—Thysanurans from this cave doubtlessly belong to the unidentified and probably undescribed troglobite genus listed above. This identification is certainly in error.

Order Diplura

Family Campodeidae
Unidentified genus & species (det. P. Wygodzinsky)
Records—*Tamaulipas:* Cueva de El Pachón and Sótano de Santa Elena.
Family Japygidae
Allojapyx allodontus (Silvestri) (det. R. Gonzalez)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Metajapyx sp. (det. R. Gonzalez)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Mixojapyx sp. (det. R. Gonzalez)
Records—*San Luis Potosí:* Sótano de Matapalma and Sótano de la Tinaja.

Order Collembola

Family Entomobryidae
**Pseudosinella strinatii* Christiansen (det. K. Christiansen)
Records—*San Luis Potosí:* Cueva Chica, Cueva de los Monos, Cueva Pinta, Cueva de Taninul n. 1, Sótano del Tigre, and Sótano de Yerbaniz; *Tamaulipas:* Cueva de la Florida, Cueva de El Pachón, and Cueva de San Rafael de los Castros.
Bibliography—Christiansen, 1973.
Family Hypogastruridae
Acherontiella sabina Bonet (det. K. Christiansen)
Records—*San Luis Potosí:* Ventana Jabalí and Cueva de los Monos; *Tamaulipas:* Cueva de San Rafael de los Castros.
Family Isotomidae
Proisotoma sp. (det. K. Christiansen)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Family Sminthuridae
Temeritas sp. (det. K. Christiansen)
Records—*San Luis Potosí:* Sótano de la Tinaja.

Order Blattaria

Family Blattellidae
Nesomylacris reddelli Fisk and Gurney
Records—*Tamaulipas:* Cueva de El Pachón.
Bibliography—Fisk and Gurney, 1972.
Family Blattidae
Periplaneta sp. (det. A.B. Gurney)
Records—*Tamaulipas:* Cueva Grande del Arroyo Seco.
Comment—A single nymph of this genus was collected.

Family Polyphagidae
Homoeogamia mexicana Burmeister (det. A.B. Gurney)
Records—*San Luis Potosí:* Cueva de los Monos.

Order Saltatoria

Family Gryllidae
Paracophus apterus Chopard (det. T.H. Hubbell)
Records—*San Luis Potosí:* Cueva Escondida, Sótano de Ferrocarril, Ventana Jabalí, Cueva de los Monos, Sótano de las Piedras, and Cueva de Valdosa; *Tamaulipas:* Cueva Grande del Arroyo Seco, Cueva de la Florida, Cueva de los Pájaros, Cueva de San Rafael de los Castros, and Sótano de Santa Elena.
Bibliography—Hubbell, 1972.
Paracophus placonotus Hubbell (det. T.H. Hubbell)
Records—*San Luis Potosí:* Cueva Chica and Cueva de Tantabal.
Bibliography—Hubbell, 1972.

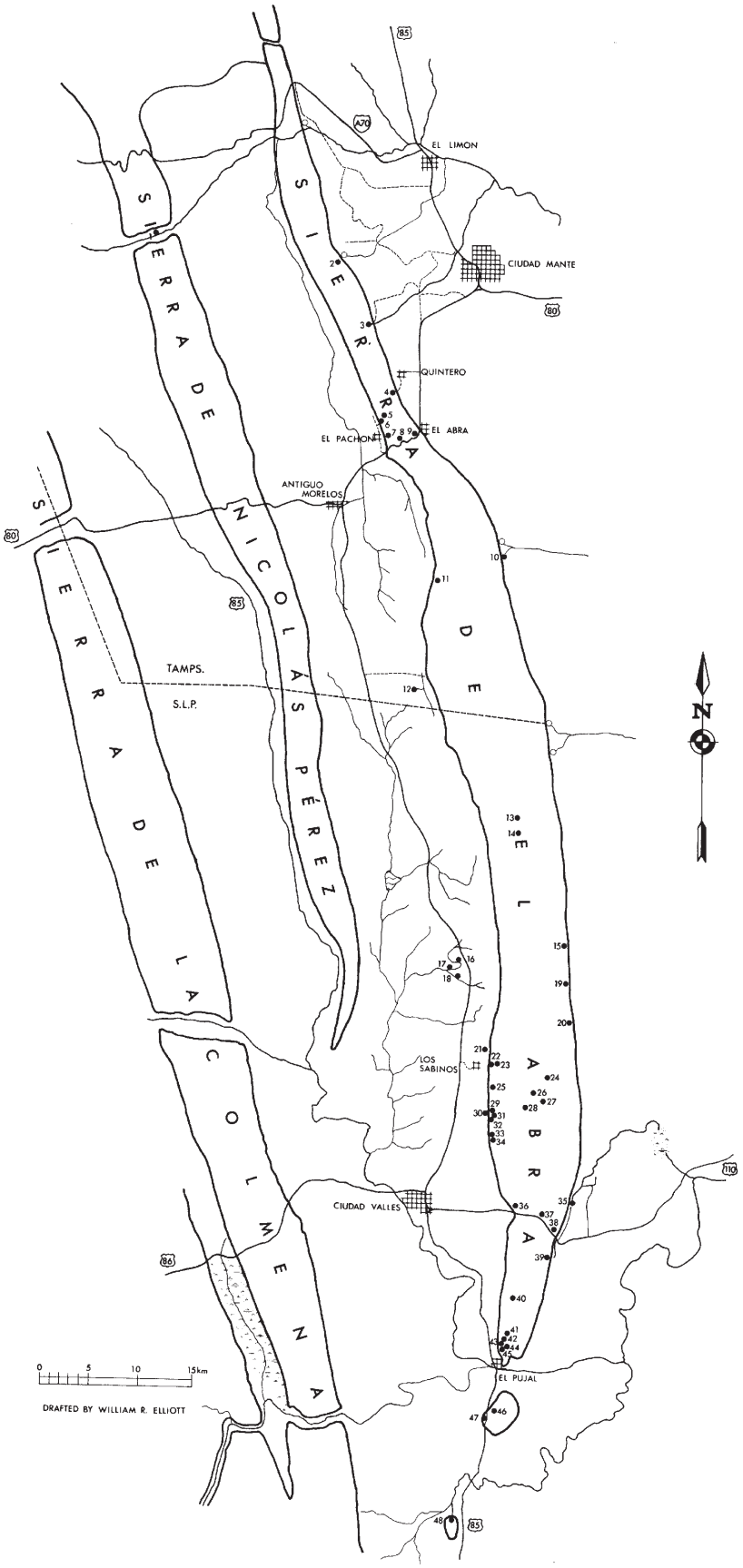
Order Hemiptera

Family Lygaeidae
Unidentified genus and species (det. J.L. Herring)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Family Naucoridae
Ambrysus melanopterus Stal (det. R.C. Froeschner)
Records—*San Luis Potosí:* Cueva Chica.
Family Reduviidae
Repipta sp. (det. R.C. Froeschner)
Records—*San Luis Potosí:* Joya de Higuerón.

Order Coleoptera

Family Alleculidae
Hymenorus sp. (det. T.J. Spilman)
Records—*San Luis Potosí:* Cueva de Tanchipa.
Comment—Two larvae of this genus were collected in this cave.
Lystronychus sp. (det. T.J. Spilman)
Records—*Tamaulipas:* Grutas de Quintero.
Family Carabidae
Masoreine spp. (det. T.C. Barr, Jr.)
Records—*Tamaulipas:* Cueva de la Florida.
Amara sp. (det. T.C. Barr, Jr.)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Clivina sp. (det. T.C. Barr, Jr.)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Colpodes sp. (det. T.C. Barr, Jr.)
Records—*San Luis Potosí:* Sótano de Yerbaniz; *Tamaulipas:* Sótano de El Venadito.
Pachyteles urrutiai Bolívar (det. T.C. Barr, Jr.)
Records—*San Luis Potosí:* Cueva de Taninul n. 1.
Schizogenius sp. (det. T.C. Barr, Jr.)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Tachys (s.str.) sp. (det. T.C. Barr, Jr.)
Records—*San Luis Potosí:* Sótano de Matapalma and Sótano de Yerbaniz; *Tamaulipas:* Sótano de El Venadito.
Tachys (s.lat.) sp. (det. T.C. Barr, Jr.)
Records—*San Luis Potosí:* Sótano de las Piedras and Sótano de Yerbaniz; *Tamaulipas:* Cueva de El Pachón.
Family Curculionidae
Dioptrophorus sp. (det. R.E. Warner)
Records—*Tamaulipas:* Cueva de la Florida.
Family Dryopidae
Pelonomus sp. (det. P.J. Spangler)
Records—*Tamaulipas:* Cueva de la Florida.
Family Histeridae
Epierus sp. (det. J.M. Kingsolver)
Records—*San Luis Potosí:* Cueva del Nacimiento del Río Choy and Sótano de Yerbaniz; *Tamaulipas:* Cueva de El Pachón.
Euspilotus sp. (det. J.M. Kingsolver)
Records—*San Luis Potosí:* Ventana Jabalí; *Tamaulipas:* Sótano de Santa Elena.
Family Leiodidae
Dissochaetus aztecus Szymczakowski
Records—*Tamaulipas:* Cueva de El Pachón.
Bibliography—Peck, 1973.
Ptomaphagus (Adelops) sp.
Records—*San Luis Potosí:* Sótano de las Piedras.
Bibliography—Walsh, 1972.
Ptomaphagus (Adelops) elabra Peck
Bibliography—Peck, 1973; 1973a.

Fig. 1. Map of Sierra de El Abra, San Luis Potosí and Tamaulipas, México, showing caves for which biological records are available. Key to caves: 1. Grutas de El Puente; 2. Cueva de San Rafael de los Castros; 3. Cueva del Nacimiento del Río Mante; 4. Grutas de Quintero; 5. Cueva de la Florida; 6. Cueva de los Pajaros; 7. Cueva de El Pachón; 8. Cueva del Abra; 9. Cueva de San Nicolás; 10. Cueva Grande del Arroyo Seco; 11. Sótano de Santa Elena; 12. Sótano de El Venadito; 13. Cueva de la Cuesta; 14. Cueva de Tanchipa; 15. Cueva de las Cuatas; 16. Sótano de Yerbaniz; 17. Sótano de Matapalma; 18. Sótano de Japonés; 19. Cueva de la Ceiba; 20. Ventana Jabalí; 21. Sótano del Tigre; 22. Sótano del Arroyo; 23. Cueva de los Sabinos; 24. Cueva de los Monos; 25. Sótano de la Tinaja; 26. Sótano Escondido; 27. Cueva Pinta; 28. Sótano de Soyate; 29. Sotanito de Montecillos; 30. Cuevacita del Sotanito; 31. Cueva del León; 32. Sótano de Pichijumo; 33. Sótano de las Piedras; 34. Sótano de Palma Seca; 35. Cueva del Nacimiento del Río Choy; 36. Cueva de la Curva; 37. Cueva de Valdosa; 38. Cueva de Taninul n. 4; 39. Cueva de Taninul n. 1; 40. Sótano del Toro; 41. Cueva Grande; 42. Sótano de Manuel; 43. Sótano de Fer-de-Lance; 44. Cueva de las Ranas; 45. Cueva Chica; 46. Cueva de El Nilo; 47. Cueva de Tantobal; 48. Cueva del Nacimiento del Río Coy.


EL LIMON
CIUDAD MANTE
QUINTERO
EL PACHON
EL ABRA
ANTIGUO MORELOS
TAMPS.
S.L.P.
LOS SABINOS
CIUDAD VALLES
EL PUJAL
SIERRA DE NICOLAS PEREZ
SIERRA DE LA COLMENA
SIERRA DE EL ABRA
N
0 5 10 15km
DRAFTED BY WILLIAM R. ELLIOTT

Family Limnichidae
Unidentified genus and species (det. P.J. Spangler)
Records—*San Luis Potosí:* Sótano de la Tinaja and Sótano de Yerbaniz.
Family Pselaphidae
Unidentified genus & species (det. D.M. Anderson)
Records—*Tamaulipas:* Grutas de Quintero.
Comment—A larva of this family was collected.
Family Scydmaenidae
"Connophron" sp. nr. *humile* Casey (det. W.R. Suter)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Comment—This is apparently a new species.
Family Staphylinidae
Belonuchus sp. nr. *moquinus* Casey (det. L.H. Herman)
Records—*San Luis Potosí:* Ventana Jabalí, Sótano de los Monos, Sótano de las Piedras; *Tamaulipas:* Cueva del Abra.
Biocrypta sp. (det. L.H. Herman)
Records—*Tamaulipas:* Sótano de El Venadito.
Diochus sp. (det. L.H. Herman)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Homaeotarsus sp. (det. L.H. Herman)
Records—*San Luis Potosí:* Cueva Chica, Sótano de Matapalma, and Sótano de Yerbaniz.
Megalinus sp. (det. L.H. Herman)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Orus (Nivorus) sp. (det. L.H. Herman)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Osorius sp. (det. L.H. Herman)
Records—*San Luis Potosí:* Sótano de la Tinaja.
Stilicolina condei Jarrige (det. L.H. Herman)
Records—*San Luis Potosí:* Sótano de Yerbaniz.
Tachyperus sp. (det. L.H. Herman)
Records—*Tamaulipas:* Sótano de El Venadito.
Family Tenebrionidae
Eleodes sp. (det. T.J. Spilman)
Records—*Tamaulipas:* Cueva del Abra.
Eleodes rugosa Perbosc. (det. T.J. Spilman)
Records—*Tamaulipas:* Grutas de Quintero.
Zophobas atratus (F.) (det. T.J. Spilman)
Records—*San Luis Potosí:* Cueva del Nacimiento del Río Choy.

Order Diptera

Family Milichiidae
Milichia sp. (det. C.W. Sabrosky)
Records—*San Luis Potosí:* Cueva Chica.
Comment—Only a single damaged female was available for study.
Family Psychodidae
Unidentified genus and species (det. R.J. Gagnè)
Records—*Tamaulipas:* Cueva de El Pachón.
Family Sciaridae
Bradysia sp. (det. R.J. Gagnè)
Records—*Tamaulipas:* Sótano de El Venadito.

PHYLUM CHORDATA

CLASS TELEOSTEI

Order Cypriniformes

Family Characidae
**Astyanax* sp. (det. R.W. Mitchell)
Records—*San Luis Potosí:* Cueva de la Curva, Las Cuatas (Este), Las Cuatas (Oeste), Sótano del Japonés, Sótano de Jos, Sótano del Mante, Sotanito de Montecillos, Sótano de Palma Seca, Sótano de las Piedras, Sótano de Soyate, Sótano del Toro, and Sótano de Yerbaniz; *Tamaulipas:* Sótano de El Venadito.

CLASS AMPHIBIA

Order Anura

Family Hylidae
Smilisca baudinii (Dumeril and Bibron) (det. W.E. Duellman)
Records—*San Luis Potosí:* Sotanito de Montecillos.
Family Ranidae
Rana pipiens (Schreber) (det. W.E. Duellman)
Records—*San Luis Potosí:* Sótano de Yerbaniz.

CLASS REPTILIA

Order Squamata

Family Crotalidae
Bothrops atrox asper (Garman) (det. R.O. Albert)
Records—*San Luis Potosí:* Sótano de las Piedras.

CLASS AVES

Order Psittaciformes

Family Psittacidae
Aratinga holochlora (Sclater) (det. R.W. Mitchell)
Records—*Tamaulipas:* Cueva de los Pájaros.
Comment—These parrots were observed roosting in pockets in the ceiling near the lower entrance.

Order Strigiformes

Family Tytonidae
Tyto alba (Scopoli)
Records—*San Luis Potosí:* Sótano de la Tinaja, Cueva de Taninul n. 1, and Sótano de Yerba-

niz; *Tamaulipas:* Cueva de San Rafael de los Castros.

CLASS MAMMALIA

Order Chiroptera

Family Phyllostomatidae

Artibeus jamaicensis yucatanicus Allen

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

Bibliography—Mollhagen, 1971.

Artibeus lituratus palmarum J.A. Allen & Chapman

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

Bibliography—Mollhagen, 1971.

Desmodus rotundus murinus Wagner

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

Bibliography—Mollhagen, 1971.

Micronycteris megalotis mexicana Miller

Records—*San Luis Potosí:* Cueva de El Nilo.

Bibliography—Mollhagen, 1971.

Family Mormoopidae

Mormoops megalophylla megalophylla Peters

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

Bibliography—Mollhagen, 1971.

Pteronotus davyi fulvus (Thomas)

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

Bibliography—Mollhagen, 1971.

Pteronotus parnellii (Gray)

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

Bibliography—Mollhagen, 1971.

Pteronotus personatus psilotis (Dobson)

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

Bibliography—Mollhagen, 1971.

Family Natalidae

Natalus stramineus saturatus Gray

Records—*San Luis Potosí:* Cueva del Nacimiento del Río Coy.

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A CHECKLIST OF THE CAVE FAUNA OF MEXICO. V. ADDITIONAL RECORDS FROM THE SIERRA DE GUATEMALA, TAMAULIPAS[1]

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INTRODUCTION

The Sierra de Guatemala is the best-known high altitude karst region in México. It is also the richest with 159 species (27 troglobites) recorded in the first checklist of the fauna of this area (Reddell and Mitchell, 1971). Since publication of that list several important taxonomic papers (Hubbell, 1972; Causey,1971; Mitchell and Kawakatsu, 1973; Muchmore, 1972) have been published. Several caves in the immediate vicinity of Gómez Farías have been discovered and studied since 1971. This has resulted in the addition of many new species for the Sierra de Guatemala, bringing the total known to about 230. Many new records for previously published species are also now available.

The Sierra de Guatemala contains one of the more remarkable troglobite assemblages in North America. At the present time 35 species of troglobite are known. This includes 7 aquatic and 28 terrestrial species. The significance of this fauna has been briefly discussed by Mitchell and Kawakatsu (1973). They also include maps and descriptions of three of the more significant caves in the area (Cueva de la Mina, Cueva de la Capilla, and Cueva de las Perlas). The following list includes all of the troglobites now known from the Sierra de Guatemala.

Supported in part by a Grant in Aid of Research from the Society of Sigma Xi and by research funds from the International Center for Arid and Semi-Arid Land Studies (ICASALS), Texas Tech University.

Flatworms
- *Dugesia barbarae* Mitchell and Kawakatsu
- *D. typhlomexicana* Mitchell and Kawakatsu

Ostracods
- *Sphaeromicola cirolanae* Rioja

Isopods
- *Speocirolana bolivari* (Rioja)
- *S. pelaezi* (Bolívar)
- *Spherarmadillo cavernicola* Mulaik
- *Brackenridgia bridgesi* (Van Name)

Mysids
- *Spelaeomysis quinterensis* (Villalobos)

Scorpions
- *Typhlochactas rhodesi* Mitchell

Pseudoscorpions
- *Aphrastochthonius major* Muchmore
- *Tyrannochthonius troglobius* Muchmore
- *Paravachonium superbum* Muchmore

Spiders
- *Euagrus cavernicola* Gertsch
- *Cicurina (Cicurusta) mina* Gertsch
- *Leptoneta capilla* Gertsch
- *Metagonia capilla* Gertsch
- *Theotima pura* Gertsch

Opilionids
- *Hoplobunus boneti* (Goodnight and Goodnight)
- *H. inops* Goodnight and Goodnight

Millipeds
- *Glomeroides promiscus* Causey
- *Strongylodesmus harrisoni* Causey
- *Unculabes* sp.
- *? Speodesmus* sp.

Sphaeriodesmus sp.
Mexicambala blanda Causey
M. inopis Causey
Collembola
Pseudosinella strinatii Christiansen
Oncopodura prietoi Bonet
Crickets
Paracophus caecus Hubbell
Beetles
Antroforceps bolivari Barr
Mexaphaenops intermedius Barr
Mexisphodrus profundus Barr
Ptomaphagus (Adelops) troglomexicanus Peck
Stenopholea reddelli Herman
Fish
Astyanax sp.

This supplementary checklist includes only those species for which new records or new important bibliographic citations are available or which have been the subject of recent taxonomic study. Previously published records are repeated only where there has been recent taxonomic study. An asterisk indicates that the species is an apparent troglobite. The cave names used follow those standardized by the Association for Mexican Cave Studies. All caves in which collections have been made are located on the accompanying map (Fig. 1).

We wish to express our appreciation here to Mr. John Hunter, Dr. Barbara Warburton, and Southmost College in Brownsville, Texas, for their continued interest in our studies and for permitting us to use the research facilities at the Southmost College Research Station at Rancho del Cielo.

It is also appropriate here to thank Nell B. Causey, W.J. Gertsch, T.H. Hubbell, R.W. Mitchell, and W.H. Russell for their continued support and assistance in our studies of the fauna of the Sierra de Guatemala.

We wish to express our appreciation to the following people for assisting us in collecting or in supplying us with specimens: Francis Abernethy, Don Broussard, Mel Brownfield, Jerry Cooke, Ronald Fieseler, John George, Russ Harmon, Jimmy Jarl, Masaharu Kawakatsu, Jim McIntyre, David McKenzie, R.W. Mitchell, Neal Morris, Stewart Peck, Terry Raines, W.H. Russell, Pierre Strinati, Ann Sturdivant, Virginia Tipton, and Suzanne Wiley.

We are also deeply grateful to the following systematists for providing us with identifications of the indicated taxa: D.M. Anderson, beetles; T.C. Barr, Jr., beetles; T.E. Bowman, isopods; G.W. Byers, flies; O.L. Cartwright, beetles; N.B. Causey, millipeds; K.C. Christiansen, collembolans; D.R. Davis, moths; W.E. Duellman, frogs; O.S. Flint, odonata; R.C. Froeschner, hemipterans; R.J. Gagnè, flies; G.E. Gates, earthworms; W.J. Gertsch, uropygids, amblypygids, spiders; C.J. and M.L. Goodnight, opilionids; T.F. Halstead, hemipterans; L.H. Herman, beetles; H.H. Hobbs, Jr., ostracods; J.R. Holsinger, amphipods; T.H. Hubbell, crickets; Leslie Hubricht, snails; J.M. Kingsolver, beetles; J.P. Kramer, homopterans; P.M. Marsh, hymenopterans; W.B. Muchmore, pseudoscorpions; S.B. Peck, beetles; R.L. Smiley, mites; Paul Spangler, beetles; T.J. Spilman, beetles; G.C. Steyskal, flies; W.R. Suter, beetles; Sigurd Szerlip, hemipterans; P.G. Thompson, snails; W.W. Wirth, flies.

PHYLUM PLATYHELMINTHES

CLASS TURBELLARIA

Order Tricladida

Family Planariidae
Dugesia sp.
Bibliography—Mitchell and Kawakatsu, 1973.
**Dugesia barbarae* Mitchell and Kawakatsu
Records—Cueva de la Capilla.
Bibliography—Mitchell and Kawakatsu, 1973.
Comment—This species was listed as *Dugesia* sp. II in the earlier listing.
Dugesia guatemalensis Mitchell and Kawakatsu
Records—Cueva de las Perlas.
Bibliography—Mitchell and Kawakatsu, 1973.
Comment—This species was listed as *Dugesia* sp. III in the earlier list.
**Dugesia typhlomexicana* Mitchell and Kawakatsu
Records—Cueva de la Mina.
Bibliography—Mitchell and Kawakatsu, 1973.
Comment—This species was listed as *Dugesia* sp. I in the earlier list.

PHYLUM ANNELIDA

CLASS CLITELLATA

Order Oligochaeta

Family Lumbricidae
Dendrobaena rubida (Savigny) (det. G.E. Gates)
Records—Harrison Sinkhole.
Bibliography—Gates, 1973.
Family Octochaetidae
Dichogaster sp. (det. G.E. Gates)
Records—?Cueva de Tres Manantiales.
Comment—Specimens from this cave were too poorly preserved for positive identification, but probably belong to this genus.

PHYLUM ARTHROPODA

CLASS CRUSTACEA

Order Podogona

Family Entocytheridae
**Sphaeromicola cirolanae* Rioja (det. H.H. Hobbs)
Records—Bee Cave and Sótano de El Molino.
Bibliography—Hobbs and Hobbs, 1973.
Comment.—This troglobitic ostracod was found associated with *Speocirolana pelaezi* (Bolívar).

Order Amphipoda

Family Hyallelidae
Hyalella azteca (Saussure) (det. J.R. Holsinger)
Records—Hoya de Nubas.
Comment—This wide-spread amphipod was collected from the spring entrance to this small cave.

Order Isopoda

Family Cirolanidae
**Speocirolana bolivari* (Rioja)
Bibliography—Hobbs and Hobbs, 1973.
**Speocirolana pelaezi* (Bolívar) (det. T.E. Bowman)
Records—Sótano de El Molino, Cueva de Tres Manantiales, and Sótano de Vasquez.
Bibliography—Hobbs and Hobbs, 1973.

Order Mysidacea

Family Lepidomysidae
**Spelaeomysis quinterensis* (Villalobos)
Bibliography—Bowman, 1973.
Comment—The generic name was misspelled in the previous list.

CLASS ARACHNIDA

Order Chelonethida

Family Chernetidae
Hesperochernes sp. (det. W.B. Muchmore)
Records—Cueva de la Mina.
Bibliography—Muchmore, 1972.
? Semeiochernes sp. (det. W.B. Muchmore)
Records—Crystal Cave.
Comment—Specimens from Crystal Cave are only tentatively placed in this genus.
Family Chthoniidae
**Aphrastochthonius major* Muchmore
Records—Cueva de la Capilla.
Bibliography—Muchmore, 1973.
Mundochthonius mexicanus Muchmore
Records—Crystal Cave.
Bibliography—Muchmore, 1973.
Comment—This species is also known from caves on Chipinque Mesa, Nuevo León.
Family Syarinidae
Pachychitra similis Muchmore
Records—Cueva de los Vampiros.
Bibliography—Muchmore, 1972.
Comment—In the previous list this species was cited as *Pachychitra* sp.
Family Vachoniidae
**Paravachonium superbum* Muchmore
Records—Sótano de Gómez Farías.
Bibliography—Muchmore, 1972.
Comment—In the previous list this species was recorded as *Paravachonium* sp.

Order Uropygida

Family Thelyphonidae
Mastigoproctus giganteus Lucas (det. W.J. Gertsch)
Records—Sumidero de El Jineo.

Order Schizomida

Family Schizomidae
Schizomus mexicanus Rowland
Records—Sumidero de El Jineo and Cueva del Nacimiento del Río Frío.
Bibliography—Rowland, 1973.

Order Amblypygida

Family Tarantulidae
Tarantula fuscimana (C.L. Koch) (det. W.J. Gertsch)
Records—Resumidero de los Mangos, Sótano de El Molino, and Sótano de Vasquez.

Order Araneae

Suborder Mygalomorphae

Family Theraphosidae
Schizopelma sp. (det. W.J. Gertsch)
Records—Harrison Sinkhole, Cueva de la Mina, and Wet Cave.
Comment—Specimens from Cueva de la Mina and Wet Cave were previously listed as *Aphonopelma* sp.

Suborder Araneomorphae

Family Agelenidae
Cicurina (Cicurusta) iviei Gertsch
Records—Harrison Sinkhole and ?Cueva de la Mina.

Bibliography—Brignoli, 1972.
Comment—Specimens from Cueva de la Mina are only tentatively identified as this species.
**Cicurina (Cicurusta) mina* Gertsch
Bibliography—Brignoli, 1972.
Family Argiopidae
Azilia vagepicta Simon (det. W.J. Gertsch)
Records—Sótano del Caballo Moro and Sótano de los Pinos.
Leucauge venusta (Walckenaer) (det. W.J. Gertsch)
Records—Sótano del Caballo Moro.
Family Clubionidae
Phrurotimpus sp. (det. W.J. Gertsch)
Records—Cueva de la Capilla.
Syrisca affinis (Banks) (det. W.J. Gertsch)
Records—Cueva del Nacimiento del Río Frío.
Family Ctenidae
Ctenus sp. (det. W.J. Gertsch)
Records—Cueva de la Capilla.
Comment—These specimens were immature.
Family Leptonetidae
**Leptoneta capilla* Gertsch (det. W.J. Gertsch)
Records—Cueva de la Mina.
Bibliography—Brignoli, 1972.
Comment—Specimens from Cueva de la Mina were listed as *Leptoneta* sp. in the previous list. Brignoli erected the genus *Neoleptoneta* for all of the Mexican species, but Gertsch does not consider this to be valid.
Leptoneta rainesi Gertsch (det. W.J. Gertsch)
Records—Wet Cave.
Bibliography—Brignoli, 1972.
Comment—This species was removed to the genus *Neoleptoneta* by Brignoli, but Gertsch does not consider this valid.
Family Linyphiidae
Linyphiinae gen. et sp. (det. W.J. Gertsch)
Records—Cueva de las Perlas.
Comment—Specimens from this cave were too immature for further identification.
Eperigone tlaxcalana Gertsch and Davis (det. W.J. Gertsch)
Records—Sótano de Vasquez.
Family Nesticidae
Gaucelmus augustinus Keyserling (det. W.J. Gertsch)
Records—Crystal Cave.
Nesticus pallidus Emerton (det. W.J. Gertsch)
Records—Cueva de Tres Manantiales and Sótano de Vasquez.
Bibliography—Brignoli, 1972.
Family Ochyroceratidae
**Theotima pura* Gertsch (det. W.J. Gertsch)
Records—Cueva de los Vampiros.
Bibliography—Gertsch, 1973.
Family Pholcidae
Metagonia sp. (det. W.J. Gertsch)
Records—Sótano de El Molino and Cueva de los Vampiros.
Comment—This genus is represented only by immature specimens in these caves.
Metagonia pura Gertsch
Bibliography—Brignoli, 1972.
Metagonia suzanne Gertsch (det. W.J. Gertsch)
Records—Sumidero de El Jineo.
Bibliography—Gertsch, 1973.
Modisimus sp. (det. W.J. Gertsch)
Records—Sumidero de El Jineo.
Comment—Only immature specimens of this genus were collected in this cave.
Modisimus mckenziei Gertsch (det. W.J. Gertsch)
Records—Bee Cave and Cueva de la Paloma.
Bibliography—Gertsch, 1973.
Family Salticidae
Lyssomanes sp. (det. W.J. Gertsch)
Records—Cueva de Tres Manantiales.
Family Scytodidae
Loxosceles valdosa Gertsch (det. W.J. Gertsch)
Records—Sótano de Vasquez.
Family Theridiidae
Anelosimus studiosus (Hentz) (det. W.J. Gertsch)
Records—Sótano del Caballo Moro.
Stemmops sp. (det. W.J. Gertsch)
Records—Sumidero de El Jineo.
Comment—Specimens from this cave were immature.
Family Uloboridae
Uloborus sp. (det. W.J. Gertsch)
Records—Cueva de la Capilla.
Family Zodariidae
Storena sp. (det. W.J. Gertsch)
Records—Sumidero de El Jineo.

Order Opilionida

Family Cosmetidae
Cynorta jamesoni Goodnight and Goodnight
Records—Cueva de la Mina, Grutas de El Puente, and Sótano de Vasquez.
Bibliography—Goodnight and Goodnight, 1973.
Family Phalangodidae
**Hoplobunus boneti* (Goodnight and Goodnight)
Records—Cueva del Remolino.
Bibliography—Goodnight and Goodnight, 1973.
**Hoplobunus inops* Goodnight and Goodnight
Records—Sumidero de El Jineo, Cueva de Tres Manantiales, and Sótano de Vasquez.
Bibliography—Goodnight and Goodnight, 1973.

Order Acarina

Family Rosensteinidae
Nycteriglyphus sp. (det. R.L. Smiley)
Records—Cueva de la Mina.

CLASS DIPLOPODA

Order Glomerida

Family Glomeridae
**Glomeroides promiscus* Causey (det. N.B. Causey)
Records—Sótano del Naranjo and Cueva de Tres Manantiales.

Order Chordeumida

Family Cleidogonidae
Cleidogona sp. (det. N.B. Causey)
Records—Cueva del Remolino.
Cleidogona crystallina Shear
Records—Cueva de la Capilla, Crystal Cave, Cueva Chica de la Perra, and Salamander Cave (=Cueva del Rancho del Cielo n. 3).
Bibliography—Shear, 1972.
Comment—All of the above records were previously listed as *Cleidogona* sp.
Cleidogona pecki Shear
Records—Cueva de la Mina.
Bibliography—Shear, 1972.
Comment—This record was previously cited as *Cleidogona* sp.

Order Polydesmida

Family Rhachodesmidae
Strongylodesmus conspicuus Causey
Records—Cueva del Rancho del Cielo n. 7 and Sótano de El Refugio.
Bibliography—Causey, 1973.
**Strongylodesmus harrisoni* Causey
Records—?"Sinkhole" at Rancho del Cielo, ?Sótano de Gómez Farías, Sumidero de El Jineo, ?Sótano de la Joya de Salas, Sótano del León, Resumidero de los Mangos, Sótano de El Molino, Cueva de las Perlas, ?Cueva del Remolino, ?Salamander Cave, Sótano de Tres Cerritos, Cueva de Tres Manantiales, and ?Wet Cave.
Bibliography—Causey, 1973.
Comment—Records indicated by a question mark are not known by adult males and so are only tentatively assigned to this species.
**Unculabes* sp. (det. N.B. Causey)
Records—Cueva de la Mina.
Bibliography—Causey, 1973.
Family Trichopolydesmidae
**? Speodesmus* sp. (det. N.B. Causey)
Records—Cueva del Remolino.
Comment—Trichopolydesmids from this cave are tentatively assigned to this genus, but may belong to an undescribed genus.
Family Xystodesmidae
Rhysodesmus sp. (det. N.B. Causey)
Records—Cueva del Remolino.

Order Spirobolida

Family Atopetholidae
Unidentified genus and species (det. N.B. Causey)
Records—Cueva del Remolino.

Order Spirostreptida

Family Cambalidae
**Mexicambala blanda* Causey (det. N.B. Causey)
Records—Bee Cave, Crystal Cave, Sótano de Gómez Farías, Harrison Sinkhole, Sumidero de El Jineo, Sótano del León, Sótano de El Molino, Cueva del Nacimiento del Río Frío, Cueva de la Paloma, Grutas de El Puente, Cueva del Remolino, Sótano de Tres Cerritos, Cueva de Tres Manantiales, and Sótano de Vasquez.
Bibliography—Causey, 1971; 1973.
Comment—Some of the above records were previously listed as *Mexicambala* sp.
**Mexicambala inopis* Causey (det. N.B. Causey)
Records—Cueva de la Capilla, Sótano de la Joya de Salas, Cueva de los Leones, and Cueva de la Mina.
Bibliography—Causey, 1971; 1973.
Comment—Some of the above records were previously cited as *Mexicambala* sp.

CLASS INSECTA

Order Collembola

Family Entomobryidae
Pseudosinella reddelli Christiansen
Records—Bee Cave, Cueva de la Capilla, Cueva del Infiernillo, Cueva de la Mina, Cueva del Remolino, and Cueva de Tres Manantiales.
Bibliography—Christiansen, 1973.
**Pseudosinella strinatii* Christiansen
Records—Crystal Cave and Cueva de la Paloma.
Bibliography—Christiansen, 1973.
Family Hypogastruridae
Acherontiella sabina Bonet (det. K.C. Christiansen)
Records—Crystal Cave and Cueva del Infiernillo.
Family Oncopoduridae

**Oncopodura prietoi* Bonet (det. K.C. Christiansen)
Records—Bee Cave.
Comment—This species was previously cited as *Oncopodura* sp.

Order Odonata

Family Libellulidae
Dythemis sp. prob. *multipunctata* Kirby (det. O.S. Flint)
Records—Sótano de El Molino.
Comment—This species doubtless washed into the cave.

Order Saltatoria

Family Gryllidae
Nemobius sp. (det. T.H. Hubbell)
Records—?Sótano del Caballo Moro.
Comment—Immature specimens from this cave are tentatively placed in this genus.
Paracophus apterus Chopard (det. T.H. Hubbell)
Records—"Cave" at Rancho del Cielo, Dry Cave, Sótano de Gómez Farías, Cueva del Nacimiento del Río Frío, Grutas de El Puente, Cueva del Rancho del Cielo n. 3, Cueva de Tres Manantiales, and Cueva de los Vampiros.
Bibliography—Hubbell, 1972.
Comment—This species is the common cricket in the caves of the Sierra de El Abra and the lower elevation caves of the Sierra de Guatemala.
**Paracophus caecus* Hubbell (det. T.H. Hubbell)
Records—"Cave" at Rancho del Cielo, Bee Cave, Cueva de la Capilla, Crystal Cave, Sótano de Gómez Farías, Harrison Sinkhole, Cueva del Infiernillo, Sótano de la Joya de Salas, Cueva de la Mina, Sótano de El Molino, Cueva del Nacimiento del Río Frío, Sótano de los Pinos, Cueva de Tres Manantiales, Cueva de los Vampiros, and Wet Cave.
Bibliography—Hubbell, 1972.
Comment—Many of the above records were previously listed as *Paracophus* sp.
Paracophus placonotus Hubbell (det. T.H. Hubbell)
Records—Cueva de Tres Manantiales.
Paracophus reddelli Hubbell (det. T.H. Hubbell)
Records—Bee Cave and Cueva del Nacimiento del Río Frío.
Bibliography—Hubbell, 1972.
Family Rhaphidophoridae
Exochodrilus caelestis Hubbell
Records—"Sinkhole" at Rancho del Cielo and Dry Cave.
Bibliography—Hubbell, 1972.
Comment—This species was previously listed as an undescribed genus and species of Rhaphidophoridae.
Exochodrilus forcipatus Hubbell
Records—Cueva de la Capilla, Cueva de la Mina, and 2,000 Meter Cave.
Bibliography—Hubbell, 1972.
Comment—This species was previously listed as an undescribed genus and species of Rhaphidophoridae.

Order Hemiptera

Family Belostomatidae
Abedus signoreti Mayr (det. R.C. Froeschner)
Records—Sótano de El Molino.
Family Enicocephalidae
Systelloderes sp. (det. R.C. Froeschner)
Records—Harrison Sinkhole.
Family Pyrrhocoridae
Dysdercus sp. (det. T.F. Halstead)
Records—Cueva del Nacimiento del Río Frío.
Family Tingidae
Ceratocombus sp. (det. R.C. Froeschner)
Records—Harrison Sinkhole.
Family Veliidae
Microvelia sp. (det Sigurd Szerlip)
Records—Sótano del León.

Order Homoptera

Family Cixiidae
Unidentified genus and species (det. J.P. Kramer)
Records—Cueva de la Mina.
Comment—Nymphs of this family are frequently found in this cave.

Order Coleoptera

Family Anthicidae
Anthicus sp. (det. T.J. Spilman)
Records—Salamander Cave.
Family Carabidae
Agonum (Platynus) sp. (det. T.C. Barr)
Records—Resumidero de los Mangos.
**Mexaphaenops intermedius* Barr
Records—Cueva de la Mina.
Bibliography—Vigna Taglianti, 1972.
Tachys (s.str.) sp. (det. T.C. Barr)
Records—Sumidero de El Jineo, Resumidero de los Mangos, Cueva de Tres Manantiales, and Sótano de Vasquez.
Family Dytiscidae
Hydroporus belfragei Sharp (det. Paul Spangler)

Records—Cueva de la Capilla.
Bibliography—Sbordoni and Argano, 1972.
Comment—This species was previously listed as an unidentified genus and species. It is an abundant troglophile in pools in this cave.

Family Euglenidae
Ariotus sp. (det. T.J. Spilman)
Records—Sótano de Vasquez.

Family Leiodidae
Aglyptinus sp. (det. J.M. Kingsolver)
Records—Harrison Sinkhole.
Dissochaetus aztecus Szymczakowski
Records—Cueva de la Mina.
Bibliography—Peck, 1973.
Ptomaphagus (Adelops) sp.
Records—Cueva de la Mina.
Bibliography—Peck, 1973a.
Comment—This is apparantly an undescribed species.
Ptomaphagus (Adelops) elabra Peck (det. S.B. Peck)
Records—Sótano del León, Cueva de la Paloma, and Grutas de El Puente.
Bibliography—Peck, 1973; 1973a; Sbordoni and Argano, 1972.
**Ptomaphagus (Adelops) troglomexicanus* Peck
Bibliography—Peck, 1973; 1973a; Sbordoni and Argano, 1972; Vigna Taglianti, 1972.

Family Oedemeridae
Unidentified genus & species (det. D.M. Anderson)
Records—Cueva de la Mina.
Comment—A larva of this family was collected in this cave.

Family Pselaphidae
Unidentified genus & species (det. T.C. Barr)
Records—Sumidero de El Jineo.

Family Scaphidiidae
Scaphisoma sp. (det. J.M. Kingsolver)
Records—Harrison Sinkhole.

Family Scarabaeidae
Aphodius sp. (det. O.L. Cartwright)
Records—Wet Cave.

Family Scydmaenidae
"Connophron" sp. nr. *proximum* Casey (det. W.R. Suter)
Records—Sótano del León.
Comment—This probable new species will certainly be located in a different genus once revisionary work in this family is completed.

Family Staphylinidae
Aleocharinae genus and species (det. L.H. Herman)
Records—Sótano de El Porvenir.
Anotylus sp. (det. L.H. Herman)
Records—Harrison Sinkhole.
Erchomus sp. (det. L.H. Herman)
Records—Sótano de El Molino.
Homaeotarsus sp. (det. L.H. Herman)
Records—Sótano del Caballo Moro, Sumidero de El Jineo, and Resumidero de los Mangos.
Philonthus sp. (det. L.H. Herman)
Records—Salamander Cave.
Stilicolina condei Jarrige (det. L.H. Herman)
Records—Harrison Sinkhole.

Family Tenebrionidae
Zopherus sp. nr. *nodulosus* Solier (det. T.J. Spilman)
Records—Sótano de los Pinos.

Order Lepidoptera

Family Tineidae
Episcardia sp. (det. D.R. Davis)
Records—Salamander Cave.
Comment—Only alcoholic material was available for study.

Order Diptera

Family Chironomidae
Unidentified genus and species (det. W.W. Wirth)
Records—Sótano del Caballo Moro.

Family Dolichopodidae
Chrysotus sp. (det. G.C. Steyskal)
Records—Salamander Cave

Family Drosophilidae
Drosophila sp. (det. W.W. Wirth)
Records—Cueva de las Perlas.
Comment—This species was present in enormous swarms on the ceiling of this cave.

Family Muscidae
Unidentified genus and species (det. R.J. Gagnè)
Records—?Sótano del León and ?Cueva de la Paloma.
Comment—Larvae from these caves are tentatively identified as belonging to this family.
Fannia canicularis (L.) (det. R.J. Gagnè)
Records—Salamander Cave.
Phaonia sp. (det. R.J. Gagnè)
Records—Crystal Cave and Salamander Cave.

Family Mycetophilidae
Mycetophila sp. (det. R.J. Gagnè)
Records—Cueva de las Perlas.

Family Phoridae
Unidentified genus and species (det. W.W. Wirth)
Records—Salamander Cave.
Conicera dauci Meigen (det. W.W. Wirth)
Records—Sumidero de El Jineo.
Dohrniphora sp. (det. W.W. Wirth)

Records—Crystal Cave.
Puliciphora sp. (det. W.W. Wirth)
Records—Sótano del León.
Family Psychodidae
Unidentified genus and species (det. R.J. Gagnè)
Records—Sótano del Caballo Moro.
Family Sciaridae
Bradysia sp. (det. R.J. Gagnè)
Records—Crystal Cave, Sótano del Caballo Moro, and Harrison Sinkhole.
Bradysia coprophila (Lintner) (det. R.J. Gagnè)
Records—Sótano del Caballo Moro.
Sciara sp. (det. R.J. Gagnè)
Records—Sótano del Caballo Moro.
Family Sphaeroceridae
Archiborborus sp. (det. G.C. Steyskal)
Records—Sótano de El Porvenir.
Comment—This apparently represents an undescribed species.
Leptocera sp. (det. G.C. Steyskal)
Records—Sótano del Caballo Moro, Sótano de El Porvenir, and Salamander Cave.
Family Tipulidae
Teucholabis sp. (det. G.W. Byers)
Records—Sótano del Caballo Moro and Cueva de la Mina.

Order Hymenoptera

Family Scelionidae
Unidentified genus and species (det. P.M. Marsh)
Records—Cueva de la Mina.

PHYLUM MOLLUSCA

CLASS GASTROPODA

Order Basommatophora

Family Physidae
Physa sp. (det. Leslie Hubricht)
Records—Sótano de la Joya de Salas.
Family Planorbidae
Helisoma trivolvis (Say) (det. Leslie Hubricht)
Records—Sótano de la Joya de Salas.

Order Mesogastropoda

Family Cyclophoridae
Aperostoma mexicanum palmeri (Bartsch and Morrison) (det. F.G. Thompson)
Records—Harrison Sinkhole.

Order Geophila

Family Spiraxidae
Euglandina sp. (det. F.G. Thompson)
Records—Cueva Chica de la Perra.
Spiraxis sp. (det. F.G. Thompson)
Records—Harrison Sinkhole.
Comment—An apparently undescribed species was collected in this cave, but the material is inadequate for description.
Streptostyla bartschi (Dall) (det. F.G. Thompson)
Records—Crystal Cave and Cueva de la Mina.
Comment—This is an abundant species in these caves.
Family Urocoptidae
Coelocentrum sp. (det. F.G. Thompson)
Records—Harrison Sinkhole and Sótano de El Porvenir.
Comment—This apparently undescribed species is represented only by juvenile or broken material.
Family Xanthonychidae
Xanthonyx sp. (det. F.G. Thompson)
Records—Cueva de la Capilla.
Comment—This is apparently an undescribed species.

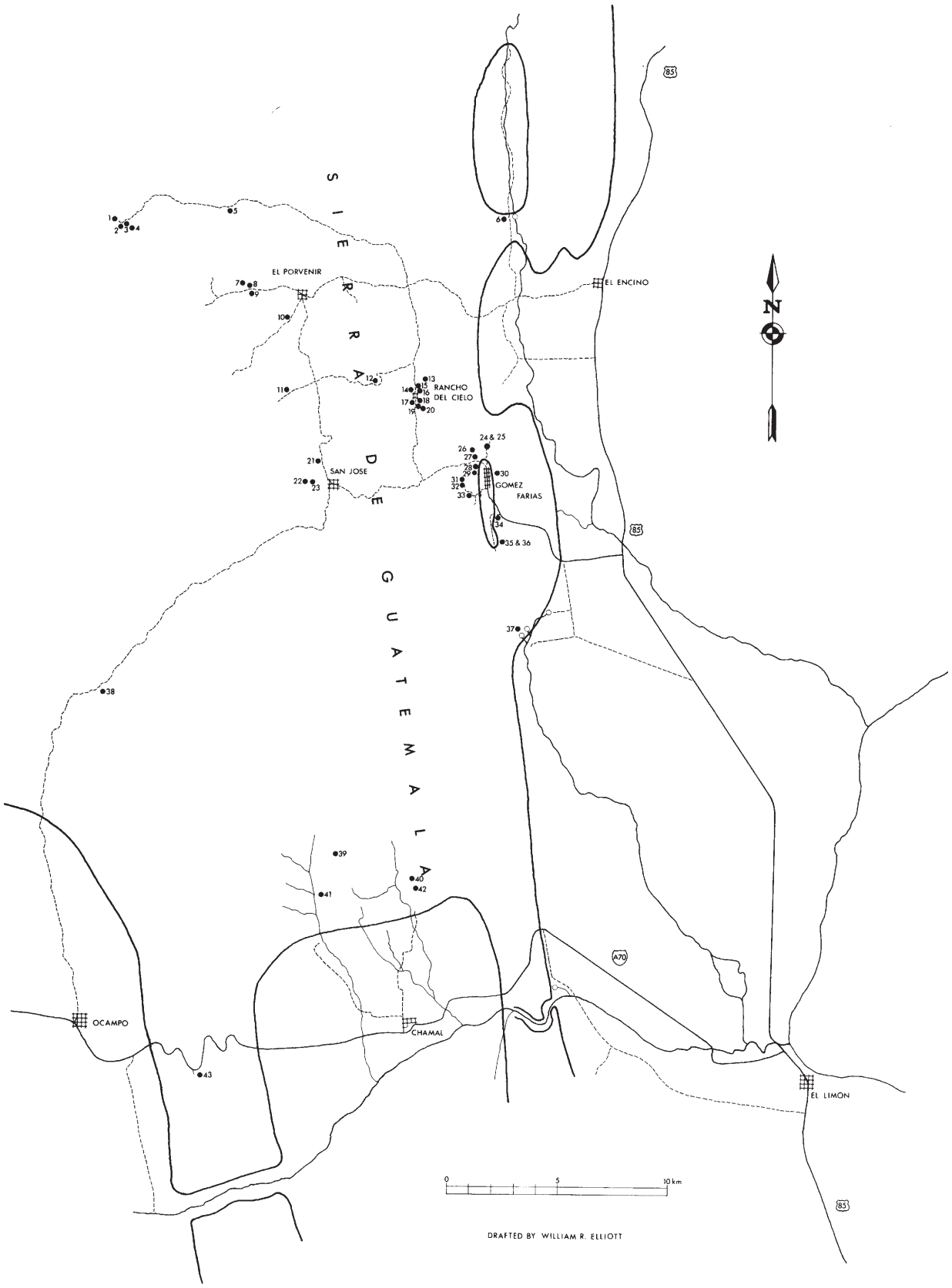
PHYLUM CHORDATA

CLASS TELEOSTEI

Order Cypriniformes

Family Characidae
**Astyanax* sp. (det. R.W. Mitchell)
Records—Sótano del Caballo Moro, Sótano Es-

Fig. 1. Map of Sierra de Guatemala, Tamaulipas, México, showing caves for which biological records are available. Key to caves: 1. Sótano de la Joya de Salas; 2. Cueva de los Leones; 3. Cueva de la Escuela; 4. Cueva de los Pinos; 5. 2000 Meter Cave; 6. Cueva del Río Sabinas; 7. Cueva Chica de la Perra; 8. Cueva de las Perlas; 9. Cueva de la Capilla; 10. Sótano de El Porvenir; 11. Agua Linda (cave); 12. Cueva de la Mina; 13. Sótano de Harrison; 14. Cueva del Rancho del Cielo n. 7; 15. Balanced Rock Cave; 16. Cueva del Rancho del Cielo n. 3; 17. Harrison Sinkhole; 18. Crystal Cave; 19. Wet Cave; 20. Dry Cave; 21. Casa Piedras (cave); 22. Cueva del Remolino; 23. Cueva del Infiernillo; 24. Sótano El Fin; 25. Sótano del Camino; 26. Sótano de El Triunfo; 27. Cueva del Plan; 28. Sumidero de El Jineo; 29. Sótano de El Molino; 30. Cueva de la Paloma; 31. Sótano del Naranjo; 32. Resumidero de los Mangos; 33. Sótano Escondido; 34. Sótano de Gómez Farías; 35. Cueva del León; 36. Sótano del León; 37. Cueva del Nacimiento del Río Frío; 38. Sótano de El Refugio; 39. Cueva de Tres Manantiales; 40. Cueva de los Vampiros; 41. Sótano del Caballo Moro; 42. Bee Cave; 43. Sótano de Vásquez.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condido, Sumidero de El Jineo, Sótano de El Molino, and Sótano de Vasquez.

CLASS AMPHIBIA

Order Anura

Family Leptodactylidae

Eleutherodactylus decoratus decoratus Taylor (det. W.E. Duellman)

Records—Small cave near El Refugio sawmill.

Syrrhophus longipes (Baird) (det. W.E. Duellman)

Records—Cueva de la Capilla.

CLASS AVES

Order Psittaciformes

Family Psittacidae

Ara militaris L.

Records—Sótano de El Refugio.

Comment—Several Military Macaws were observed flying in the entrance to this spectacular sótano; they apparently nest in the cave.

CLASS MAMMALIA

Order Chiroptera

Family Vespertilionidae

Myotis nigricans dalquesti Hall and Alvarez

Records—Grutas de El Puente.

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A CHECKLIST OF THE CAVE FAUNA OF MEXICO. VI. VALLE DE LOS FANTASMAS REGION, SAN LUIS POTOSI[1]

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This is the first report concerning the cave dwelling fauna of one of the highest altitude karst areas in México. The Valle de los Fantasmas Region lies in the western part of the Sierra Madre Oriental, specifically, in the Sierra de Alvárez which divides the Llanura de Río Verde from the Valle de San Luis Potosí. The region, as defined in this report, lies wholly within the Municipio de Zaragoza and is about 17 km wide and 28 km long (see map, Fig. 1). The largest village in the region is San Francisco, which may be reached by Highway 86 from Ciudad Valles, 227 km to the east, or San Luis Potosí, 38 km to the west. Elevations range from about 2600 m to 2900 m above sea level.

Floristically, the area may be characterized according to the scheme of Rzedowski (1965). Most of the region is "Encinar arbustivo" (oak scrub), a very open woodland with expanses of savannah and occasional clusters of *Opuntia* and *Agave*. About 15 km south of San Francisco the vegetation abruptly changes to juniper and, on the higher peaks nearby, pine. This is presumably related to the presence of volcanic soils (Rzedowski, 1965). The climate is temperate (the mean annual temperature is probably 15°-16°C) and semi-humid (an estimated 1000 mm of rainfall yearly).

Geologically, the area is complex and has not been adequately studied. The Cretaceous limestone has been intensely folded and ranges from massive to thin bedded from east to west. Metamorphosis is apparent, especially in the southern and western areas. Red Earth is common in many areas (good examples may be seen along Highway 86 between Valle de los Fantasmas and Puerto Altamira). Karst development is more advanced on the eastern side of the area. Massive karren, lapies, and karst pinnacles have developed near San Francisco and in the Valle de los Fantasmas immediately to the west. Presumably, the building-size karst pinnacles in the Valle de los Fantasmas are the source of the name Fantasmas (phantoms), as they appear rather ghostly in the frequent fogs encountered at these elevations. The development of sótanos is often controlled, especially in the western areas, by steeply dipping or vertical beds. Igneous activity has further complicated the geology, especially to the south in the vicinity of Cueva de la Puente. This system drains a 1 km diameter dolina which is actually a valley flanked by volcanic ridges and blocked at the south end by an igneous bridge (La Puente). The actual extent of the karst is not presently known, but uninvestigated karst terrain may be seen to the north from Puerto Altamira. The area south of Cueva de la Virgen has not been investigated.

The area was first visited by AMCS members in August 1966. John Fish, David McKenzie, James Reddell, and Richard M. Smith explored seven small pits ranging from 10 to 43 m deep. Cueva de Aguacate and Cueva de Carnicerías were also visited and a few collections made. Fish entered the impressive Sótano de San Francisco but was unable to reach the bottom because the rope was not long enough (Fish and Reddell, 1966). The area was again visited in November 1966 by Jonathan Davis, John Fish, Charlie Jennings, Charlie and Susie Loving, and Mac Mc-

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Laughlin (Fish, 1966). This time Fish reached the bottom of Sótano de San Francisco, but found only water and no place to get off. Biological collections were made from several unspecified pits in the immediate area, and from Sótano de Carlos. *Mexisphodrus* beetles and the first specimens of *Mexaphaenops fishi* Barr, a troglobite carabid beetle, were collected on this trip. As interest in the area grew, nine more expeditions involving forty persons were made to the region in the years 1969, 1971, and 1972. To date, fifty caves and pits have been reported. Forty-eight of these have been explored, eighteen have been mapped, and twenty-one have been studied biologically. Sixteen of the caves and pits have no names and at least seven (most in the immediate San Francisco area) have not been accurately located on a map. Brief descriptions of the caves that have been studied biologically and other important caves are given below. Maps and descriptions of many of these caves are given by Walsh (1972).

Sótano de Abernathy—This small pit (22 m drop) is located in the "Los Sótanos Unidos" area, about 2 km west of San Francisco. A hole 6 m above the floor leads into a parallel dome-pit, the bottom of which is 38 m below the surface. The pit was mapped in January 1969 by Miles Abernathy, William Elliott, and David Honea.

Cueva del Agua—Located about 14 km SSE of San Francisco in the Cañon de Chivos, this cave ends in a siphon and mud fill after 120 m. The cave was mapped in March 1969 by Jimmy Jarl and Brian Peterson, but no biological collections were made.

Sótano de las Arañas—This pit is located in the Los Sótanos Unidos area and is developed along strongly folded bedding planes. The beds dip 65° at the entrance and steepen to 90° farther down. The entrance is 3 m in diameter and drops 46 m to a talus slope, which ends at the 61 m level. Numerous Recent mammal bones were observed in the cave. The cave was mapped in November 1968 by Joe Cepeda and Russell Harmon.

Cueva de los Caballos—This cave is about 400 m NW of Sótano de las Arañas, near the bottom of a small valley. The 6 m high, 9 m wide entrance leads into a 13 m x 15 m room formed under vertically dipping beds. About 30 m of low passage leads from the east end of the room in the dark zone, where the air temperature was 17°C. The entrance room is sometimes used as a horse corral. The cave was mapped in January 1969 by Joe Cepeda and Russell Harmon.

Sótano de Carlos—This pit is about 2 km N of San Francisco on the other side of a pass. The 2 m diameter entrance is under a boulder and drops 88 m to a room 8 m wide and 23 m long. The total depth is 99 m. The cave was mapped in November 1968 by Russell Harmon and David Honea.

Cueva de Carnicerías—This cave was visited in 1966 and is located in the karst valley containing the village of San Francisco. The cave is a single room formed by collapse and is about 15 m in diameter and 9 m deep.

Cueva de Cinquenta y Ocho—This 105 m long cave lies 1 km W of the village of Cinquenta y Ocho near the top, and on the south side of an east-west valley. The cave is about 3 m wide and 5 m high for most of its length. The air temperature was 14.5°C at the end of the cave. The cave was mapped in May 1972 by William Elliott, Pam Lynn, and Ron Ralph.

Cueva de Entrada Chica—This cave is a 35 m deep vertical pit with a 0.5 m in diameter entrance. It is located in Valle de los Fantasmas and was visited in 1966.

Sumidero de Fantasmas—This large sink, located north of the highway in Valle de los Fantasmas, was visited in 1966. It is a vertical shaft 6 m wide, 10 m long, and 30 m deep. It receives the flood waters of a long flat draw. There is no horizontal extent and the floor is of deep mud.

Sótano de la Golondrina—This pit is about 500 m west of Highway 86 at the "Agua" sign, which is 800 m north of the cobblestone road leading to the Los Sótanos Unidos area. The 3 m diameter entrance drops 18 m to the top of a muddy talus slope. The room at the bottom of the slope is 15 m wide and 12 m high. The total depth is 38 m. A 10 m long side passage at the 18 m level contains many arthropods. The pit was mapped in November 1968 by Martha Burk, Sharon Cathey, William Elliott, and Jimmy Jarl.

Cueva de la Iglesia—This cave is located 1.6 km west of San Francisco in the Valle de los Fantasmas. The 15 m wide, 4 m high entrance slopes down to a single room which is 30 m wide, 40 m long and 14 m high. The total depth is 14 m. The cave was mapped in November 1968 by Keith Heuss, Jimmy Jarl, Jim McIntire, Brian Peterson, and Joe Sumbera, but no biological collections were made.

Cueva de la Laguna—This cave is located on the west side of a stock tank, about 5 km north of Highway 86 in the Valle de los Fantasmas. It may be reached by a dirt road. The 6 m wide, 2 to 3 m high entrance leads into a 12 m long, 5 to 6 m wide room, then under a natural bridge into a 9 m square room. The passage continues for 9 m to a crawlway which goes up to the left for 5 or 6 m. The cave was mapped in May 1972 by William Elliott and Mike

McEachern, and is about 34 m long. The air temperature was 17°C.

Cueva de las Moscas—This 12 m long cave was visited in 1968. It is located at the base of a cliff about 2 km south of San Francisco and about 150 m northwest of the dirt road to La Puente.

Sótano de Nopales—This pit lies about 1 km southwest of the village of Cinquenta y Ocho near the top of a ridge. The 14 m long, 4 m wide entrance drops 26 m to a 40 m long sloping room. The pit was mapped in November 1968 by Duane Faith and Jimmy Jarl.

Sótano de Ojo de Agua—This deep pit is located approximately 8 or 9 km ESE of San Francisco in the Sierra de los Arboles. A two hour hike over confusing, obscure trails is required to reach it. The 8 m diameter entrance drops 71 m to the top of a talus slope. Short drops of 2, 3, 2, and 5 m lead to the lowest level at 97 m. A 35 m long, muddy passage doubles back under the entrance at the 93 m level. The mud temperature in this passage was 13.5°C. The pit was mapped in November 1968 by William Elliott and Jimmy Jarl.

Sótano del Pájaro—This pit is located in the Los Sótanos Unidos area. It has two entrances, 2 m and 0.5 m in diameter, which connect at the 5 m level. The larger entrance drops 27 m into a 2 m wide, 10 m long fissure. At the south end of the fissure there is a 6 m drop to a ledge, then a 25 m drop to the main room of the cave. This room is about 9 m in diameter. A 20 m long, 5 m wide, 8 m high passage strikes northeast and ends abruptly. This passage is formed in 70° dipping beds. The lowest point is in the main room (61 m). The bottom of the final drop is littered with many bones *(Peromyscus,* weasel, skunk, deer, pig, goat, and horse). The pit was mapped in January 1969 by William Elliott and David Honea.

Cueva de la Puente—This large cave is located in the Dolina de la Puente about 17 km SSE of San Francisco. The cave is formed in metamorphosed limestone. It is not uncommon to see cobbles of serpentine, rhyolite, and limestone together on the cave floor, as well as red and yellow streaks in the cave walls. The cave has two entrances. The main arroyo entrance is 24 m wide and 8 m high and accepts most of the run-off from the volcanic ridges that flank the dolina. The 6 m diameter upper entrance is located 100 m inside the main entrance but does not appear to take any run-off. The 5 m high, 12 m wide passage continues until a 1 m high crawlway is encountered 240 m inside the main entrance. After 100 m the passage opens up to 12 m wide and 2 to 5 m high. This continues for 180 m, at which point a small stream enters from a fissure on the right. This high, narrow fissure has been explored for about 300 m to where it ends in a breakdown room. The main passage continues at the same width and with ceiling heights up to 15 m for 800 m to the Big Room, which is 60 m long, 24 m wide, and 25 to 30 m high. A large stream passage enters from the left. This may be followed over cascades and through small lakes for about 300 m upstream, and roughly southeast, to where the water spurts out of a small hole in the wall. At the Big Room the two streams merge and continue another 240 m to a siphon. The cave meanders from northeast to northwest and strikes north. The terminal siphon lies close to a large, sawdust filled dolina near a junction of the La Puente road, 0.5 km north of the Dolina de la Puente. Terraced sandbanks, large cobbles, and large logs attest to the violent flooding which the cave must undergo at times. As a result, most of the cave fauna is washed in. According to the local inhabitants, the cave has two resurgences, Cueva de la Virgen and Cueva de Salida del Agua de la Puente, which will be discussed below. The air temperature in the cave was 21° to 21.5°C, and the water temperature was 18°-19°C. The cave is considerably warmer than other caves in the region and this might be explained by the close proximity of volcanic rock. The cave was mapped in March 1969 by Logan McNatt, Brian Peterson, Joe Sumbera, Mike Walsh, and Gail Webster. About 2400 m of passage have been explored and 2066 m mapped, making this the largest cave in the Valle de los Fantasmas Region.

Sótano de Puerto de los Lobos—This impressive pit is located 2.7 km south of San Francisco on the southern slope of the Sierra de los Arboles. The full name is Sótano Hondo de la Sierra de los Arboles de Puerto de los Lobos. The 10 m diameter entrance is obscured by a thicket of oaks. It does not appear to take surface run-off. The entrance drops 179 m to the top of a steep talus slope. At the bottom of the slope is a 5.5 m drop to a mud slope which ends after 30 m at the low point, 198 m below the entrance. It is possible to rig the pit to obtain a 189 m free drop. At the top of the talus slope is an 8 m x 12 m, 15 m high room, the floor of which is covered with 15 cm of water. A small seep trickles out of the wall and the water flows out of the room and sinks in the talus. At the time of its discovery, the pit was the third deepest drop in México. It was mapped in September 1968 by William Elliott, Duane Faith, Jim McIntire, and Joe Sumbera.

Cueva de Salida del Agua de la Puente—This cave is located in the Cañon de Chivos, 14 km SSE of San Francisco, and about 2.6 km northeast of the terminal siphon in Cueva de la Puente. It is rumored to be

a wet weather resurgence for Cueva de la Puente. Large trees have been reported to wash out of the cave during heavy rains. The cave is a large passage which ends after 122 m in a mud and water siphon. The cave was mapped in March 1969 by Brian Peterson and Jimmy Jarl, but no biological collections were made.

"Cave at San Francisco"—This cave was visited in 1966 but it was not mapped and its exact location is unknown.

Sótano de San Francisco—This impressive pit is located in the village of San Francisco. The steep-sided arroyo leading to the cave carries a small, swift stream during the rainy season. The 3 x 4.5 m entrance drops 102 m to a 21 m long, 4.5 m wide pool full of human fecal matter. A 2 m drop is then encountered, and then a 12 m long pool after 7 m of dry ground. At the end of the second pool is an unentered pit, estimated to be between 170 and 245 m deep. This pit could lead to an extensive system. The cave was first entered by John Fish in August 1966 and again in November 1966 at which time he drew a sketch map (Fish, 1966). The pit was mapped to the top of the second drop in May 1972 by Mike McEachern and Ron Ralph. The water temperature was 14.5°-15°C.

Sótano de San Francisco n. 2—This pit is located 1 km south of San Francisco in a 12 m diameter dolina. The pit follows a vertical bedding plane down to a water filled passage, 43 m below the surface. This passage goes 7 m, turns left, goes another 11 m, and ends in a 5 m long, muddy room. The water temperature was 12°C. The cave was partially mapped in January 1969 by William Elliott and David Honea. The map was completed in May 1972 by William Elliott and Mike McEachern.

Cueva de Sierra Blanca—This cave is located 10.5 km south of San Francisco, about 1 km up a canyon from the La Puente road. The 10 m wide, 5 m high entrance leads into a 24 m long, 10 m wide room, then another room of the same dimensions. Two walking passages extend from the second room, one for 46 m to a breakdown choke, the other to a 3 m diameter room and then to a smaller entrance. The cave was visited in September 1968 but was not mapped nor investigated biologically.

Sótano de Super-Macho—This small, 14 m blind pit was visited in January 1969. It is located in the Los Sótanos Unidos area.

"Small cave at Valle de los Fantasmas"—This cave was visited in 1966, but its exact location is unknown.

"Sink at Valle de los Fantasmas"—This was visited in 1966, but its exact location is unknown.

"Sótano at Valle de los Fantasmas"—This pit was visited in 1966, but its exact location is unknown.

Cueva de la Virgen—This cave is located 2.5 km southeast of Cueva de la Puente. It is reported by the local people to flow during wet weather. Presumably, it is a resurgence for Cueva de la Puente. Past the 24 m high, 6 m wide entrance, the passage slopes upward for about 61 m to a water filled passage which retains the passage dimensions of 24 m in height and 12 m in width. The cave has not been mapped nor studied biologically. It was explored in November 1968 by Duane Faith, Jim McIntire, Bill Ramsel, and Joe Sumbera.

This report is not a complete summary of the taxa that have been collected in this region. Several new species await description, particularly among the millipedes, spiders, and crickets. Terrestrial isopods have been collected in Cueva de la Puente and Cueva de la Laguna and are being studied by Dr. George A. Schultz.

It is most interesting to note that of the 98 species listed in this report (93 of them invertebrates), only two may be considered troglobites (one millipede and one carabid beetle). This contrasts sharply with the nature of the cave fauna of the Sierra de Guatemala, which has a rather high number and percentage of cave-adapted forms (about 18% of the invertebrates) (Mitchell, 1969; Reddell and Mitchell, 1971; Reddell and Elliott, 1973a). The troglobite fauna of the Valle de los Fantasmas region (about 2% of the invertebrates) also contrasts strongly with that of the Sierra de El Abra (about 9% of the invertebrates) (Reddell and Mitchell, 1971a; Reddell and Elliott, 1973), a lowland, semi-tropical area where one would expect the lowest number and percentage of cave adapted species, according to Mitchell's hypothesis (1969). In addition, there are no aquatic troglobites in the Valle de los Fantasmas region, whereas aquatic species make up 50% and 27% of the invertebrate troglobites in the Sierra de El Abra and Sierra de Guatemala, respectively. Furthermore, the cave fauna of the Valle de los Fantasmas region appears to have few affinities with those of the other two regions, and perhaps has had a much different history of colonization. Although little is known of the relative ages of cave systems in these three areas, we find it tempting to speculate that climatic changes in such a high altitude area as Valle de los Fantasmas may have been much more drastic than in the two lower areas we are comparing, especially during the Pleistocene. Severe changes may have served not only to wipe out epigean forms but incipient cave forms as well.

The cave names given in the following checklist are those accepted as standard by the Association for

Mexican Cave Studies. Troglobites are indicated by an asterisk.

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PHYLUM ANNELIDA

CLASS CLITELLATA

Order Oligochaeta

Family Lumbricidae

Dendrobaena rubida (Savigny) (det. G.E. Gates)
Records—Cueva de la Puente.
Bibliography—Gates, 1973a.
Comment—This species is probably of European origin.

Octolasion tyrtaeum (Savigny) (det. G.E. Gates)
Records—Sótano de la Golondrina, Sótano de Nopales, and Sótano de Ojo de Agua.
Bibliography—Gates, 1971; 1973; 1973a.
Comment—This species is probably of European origin.

PHYLUM ARTHORPODA

CLASS ARACHNIDA

Order Scorpionida

Family Vejovidae

Vejovis sp. nr. *granulatus* Pocock (det. W.J. Gertsch)
Records—Sótano de Carlos.
Comment—This probably represents an undescribed species.

Order Chelonethida

Family Cheliferidae

Mexichelifer reddelli Muchmore
Records—Cueva de Carnicerías.
Bibliography—Muchmore, 1973.

Family Chernetidae

Undetermined genus and species
Records—Cueva de Cinquenta y Ocho.
Comment—A single protonymph was collected in the dark zone.

Order Araneae

Suborder Mygalomorphae

Family Barychelidae

Zygopelma sp. (det. W.J. Gertsch)
Records—Sótano de Puerto de los Lobos.
Comment—This apparently represents an undescribed species.

Family Theraphosidae

Schizopelma elliotti Gertsch
Records—Cueva de la Laguna.
Bibliography—Gertsch, 1973.

Suborder Araneomorphae

Family Agelenidae

Tegenaria selva Roth (det. W.J. Gertsch)
Records—Sótano de Abernathy, Sótano de las Arañas, Cueva de los Caballos, Sótano de la Golondrina, Cueva de la Laguna, Cueva de las Moscas, Sótano de Puerto de los Lobos, and Sótano de Ojo de Agua.
Bibliography—Gertsch, 1971.

Family Caponiidae

Orthonops lapanus Gertsch and Mulaik (det. W.J. Gertsch)
Records—Sótano at Valle de los Fantasmas.

Family Clubionidae

Phrurotimpus sp. (det. W.J. Gertsch)
Records—Cueva de la Puente.
Comment—This species is probably an accidental.

Family Linyphiidae
Eperigone sp. (det. W.J. Gertsch)
Records—Sótano de Puerto de los Lobos.
Family Nesticidae
Nesticus pallidus Emerton (det. W.J. Gertsch)
Records—Cueva de la Laguna, Sótano de la Golondrina, Cueva de la Puente, Sótano de San Francisco, and Sótano at Valle de los Fantasmas.
Bibliography—Gertsch, 1971.
Family Pholcidae
Coryssocnemis abernathyi Gertsch
Records—Sótano de Abernathy, Cueva de los Caballos, Sótano de la Golondrina, and Cueva de las Moscas.
Bibliography—Gertsch, 1971; 1973.
Metagonia punctata Gertsch (det. W.J. Gertsch)
Records—Cueva de Carnicerías, Cueva de Entrada Chica, Cueva de la Puente, and Sótano at Valle de los Fantasmas.
Bibliography—Gertsch, 1971; 1973.
Modisimus sp. (det. W.J. Gertsch)
Records—Sótano at Valle de los Fantasmas.
Psilochorus concinnus Gertsch (det. W.J. Gertsch)
Records—Cueva de Cinquenta y Ocho.
Bibliography—Gertsch, 1973.
Family Symphytognathidae
Maymena chica Gertsch (det. W.J. Gertsch)
Records—Cueva de los Caballos, Cueva de Cinquenta y Ocho, and Cueva de la Puente.
Bibliography—Gertsch, 1973.

Order Opilionida

Family Cosmetidae
Cynorta jamesoni Goodnight and Goodnight
Records—Sótano de Puerto de los Lobos.
Bibliography—Goodnight and Goodnight, 1973.
Family Phalangodidae
Karos parvus Goodnight and Goodnight
Records—Sótano de Puerto de los Lobos.
Bibliography—Goodnight and Goodnight, 1971.

CLASS DIPLOPODA

Order Chordeumida

Family Trichopetalidae
**Poterpes egeo* Causey
Records—Cueva de la Puente and ?Sótano de Puerto de los Lobos.
Bibliography—Causey, 1969; Reddell, 1971.
Comment—This troglobite is presently known only from these two caves.

Order Julida

Family Paraiulidae
Paraiulus sp. (det. N.B. Causey)
Records—Cueva de Carnicerías, Sumidero de Fantasmas, and Sótano de Puerto de los Lobos.
Comment—This is apparently an undescribed species.

Order Polydesmida

Family Rhachodesmidae
Strongylodesmus sp. (det. N.B. Causey)
Records—Sótano de Puerto de los Lobos.
Strongylodesmus potosianus (Chamberlin) (det. N. B. Causey)
Records—Sumidero de Fantasmas.
Bibliography—Causey, 1973.
Tiphallus frivolus Causey (det. N.B. Causey)
Records—Sótano de Nopales.
Bibliography—Causey, 1973.
Family Stylodesmidae
Bolivaresmus sp. (det. N.B. Causey)
Records—Cueva de la Puente.
Comment—This is apparently a new species.
Ceratesmus sp. (det. N.B. Causey)
Records—Cueva de Cinquenta y Ocho.
Comment—This is apparently a new species.
Family Xystodesmidae
Rhysodesmus sp. (det. N.B. Causey)
Records—Sumidero de Fantasmas.

CLASS INSECTA

Order Diplura

Family Campodeidae
Unidentified genus and species (det. W.R. Elliott)
Records—Cueva de los Caballos.
Comment—A single specimen was taken in the dark zone.

Order Collembola

Family Entomobryidae
Pseudosinella reddelli Christiansen (det. K. Christiansen)
Records—Cueva de Cinquenta y Ocho, Sótano de la Golondrina, Sótano de Ojo de Agua, and Cueva de la Puente.
Bibliography—Christiansen, 1973.

Order Ephemeroptera

Family Leptophlebiidae

Neochoroterpes mexicanus Allen (det. R.K. Allen)
Records—Cueva de la Puente.
Comment—Nymphs were taken in 19°C stagnant water.

Order Odonata

Family Coenagrionidae
Argia sp. (det. O.S. Flint)
Records—Cueva de la Puente and Sótano de San Francisco.
Comment—Nymphs were taken from water in both caves.
Family Cordulegasteridae
Cordulegaster diadema Selays (det. O.S. Flint)
Records—Cueva de la Puente.
Comment—One nymph was collected from 19°C stagnant water.

Order Dermaptera

Family Forficulidae
Ancistrogaster sp. cf. *toltecus* (Scudder) (det. A.B. Gurney and A. Brindle)
Records—Cueva de la Puente.
Comment—This is apparently a new species.
Ancistrogaster impennis Bormans (det. A.B. Gurney)
Records—Cueva de Carnicerías.

Order Hemiptera

Family Belostomatidae
Abedus immensus Menke (det. R.C. Froeschner)
Records—Cueva de la Laguna and Cueva de la Puente.
Comment—A male with eggs on its back was taken in a stagnant pool in Cueva de la Puente.
Family Dipsocoridae
Unidentified genus and species (det. S. Szerlip)
Records—Cueva de la Puente.
Family Gerridae
Gerris remigis Say (det. R.C. Froeschner)
Records—Sótano de San Francisco n. 2.
Comment—This common species was abundant in the 12°C water at the bottom of the cave.
Family Veliidae
Microvelia ? beameri McKinstry (det. S. Szerlip)
Records—Cueva de la Puente.
Rhagovelia varipes Champion (det. S. Szerlip)
Records—Cueva de la Puente.

Order Saltatoria

Family Rhaphidophoridae
Exochodrilus sp. (det. T.H. Hubbell)
Records—Sótano de Abernathy, Sótano de las Arañas, Sótano de Carlos, Cueva de Carnicerías, Cueva de Entrada Chica, Sumidero de Fantasmas, Sótano de la Golondrina, Sótano de Ojo de Agua, Cueva de las Moscas, Sótano del Pájaro, Sótano de Puerto de los Lobos, Sótano de Super-Macho, and Sótano at Valle de los Fantasmas.
Comment—This apparently represents an undescribed species. Crickets taken in Cueva de los Caballos, Cueva de Cinquenta y Ocho, and Cueva de la Laguna are probably this species.

Order Coleoptera

Family Cantharidae
Discodon sp. (det. T.J. Spilman)
Records—Cueva de la Puente
Family Carabidae
Agonum (Platynus) sp. (det. T.C. Barr)
Records—Sótano de la Golondrina and Cueva de la Puente.
Comment—This species may be a troglophile or trogloxene.
Amara sp. (det. T.C. Barr)
Records—Sótano de la Golondrina.
Comment—This is probably an accidental.
Bembidion sp. (det. T.C. Barr)
Records—Sótano de San Francisco n. 2.
Comment—This is probably an accidental.
Colpodes sp. (det. T.C. Barr)
Records—Sótano de Puerto de los Lobos.
**Mexaphaenops fishi* Barr (det. T.C. Barr)
Records—Small cave at Valle de los Fantasmas and Sótano de la Golondrina.
Bibliography—Barr, 1967; 1971.
Comment—This is an apparent troglobite.
? Mexisphodrus sp. (det. T.C. Barr)
Records—Sumidero de Fantasmas, Sótano de la Golondrina, Sótano del Pájaro, Cueva de la Puente, Sótano de Puerto de los Lobos, Sótano de San Francisco n. 2, and Sink at Valle de los Fantasmas.
Comment—This troglophilic species may actually belong in the genus *Colpodes.*
Family Chrysomelidae
Heikertingerella sp. (det. R.E. White)

Records—Sótano de San Francisco n. 2.
Comment—This accidental species was taken in the twilight zone of the entrance pit.

Family Elateridae
Aeolus sp. (det. T.J. Spilman)
Records—Sumidero de Fantasmas.

Family Elmidae
Cylloepus sp. (det. P.J. Spangler)
Records—Cueva de la Puente.

Family Lampyridae
Unidentified genus & species (det. D.M. Anderson)
Records—Sótano de Puerto de los Lobos.
Comment—Only larvae of this family were collected.

Family Ptilodactylidae
Ptilodactyla sp. (det. T.J. Spilman)
Records—Cueva de la Puente.

Family Scarabaeidae
Ancognatha manca LeConte (det. H.F. Howden)
Records—Cueva de la Puente.
Comment—This species is common in México and is accidental in the cave.
Aphodius sp. (det. H.F. Howden)
Records—Cueva de los Caballos.
Comment—A single specimen was collected in the entrance area, where it may have been feeding on dung.
Ataenius cognatus LeConte (det. O.L. Cartwright)
Records—Sumidero de Fantasmas.
Diplotaxis sp. (det. O.L. Cartwright)
Records—Sótano de Puerto de los Lobos.

Family Silphidae
Silpha cayennensis Sturm. (det. T.J. Spilman)
Records—Cueva de la Puente.

Family Staphylinidae
Aleocharinae genus et sp. (det. L.H. Herman)
Records—Cueva de la Puente.
Carpelimus sp. (det. L.H. Herman)
Records—Cueva de la Puente.
Deleaster trimaculata Fall (det. L.H. Herman)
Records—Cueva de la Puente.
Homaeotarsus sp. (det. L.H. Herman)
Records—Cueva de la Puente.
Neomedon sp. (det. L.H. Herman)
Records—Cueva de la Puente.
Staphylinus sp. (det. L.H. Herman)
Records—Cueva de la Puente.
Stilicolina condei Jarrige (det. L.H. Herman)
Records—Cueva de la Puente and Cave at San Francisco.
Comment—This troglophile species ranges north into Texas.

Family Tenebrionidae
Eleodes sp. (det. T.J. Spilman)
Records—Cueva de los Caballos and Cueva de Cinquenta y Ocho.
Comment—Specimens were collected at the dark edge of the twilight zone in Cueva de los Caballos and in the entrance of Cueva de Cinquenta y Ocho.
Eleodes sp. nr. *rotundicollis* Eschscholtz (det. T.J. Spilman)
Records—Cueva de Carnicerías.
Eleodes sp. nr. *solieri* Champion (det. T.J. Spilman)
Records—Sótano at Valle de los Fantasmas.
Eleodes sallei Champion (det. T.J. Spilman)
Records—Sótano de Abernathy, Cueva de Cinquenta y Ocho, Sótano de la Golondrina, Cueva de las Moscas, Sótano de Nopales, Sótano de Ojo de Agua, Sótano del Pájaro, Sótano de Puerto de los Lobos, and Sótano de Super-Macho.
Comment—This species is a trogloxene. One specimen was collected in the dark zone of Cueva de Cinquenta y Ocho.
Eleodes solieri Champion (det. T.J. Spilman)
Records—Sumidero de Fantasmas.

Order Trichoptera

Family Calamoceratidae
Phylloicus sp. (det. O.S. Flint)
Records—Cueva de la Puente.
Comment—Larvae and their leaf-constructed cases were collected in 19°C stagnant water.

Family Philopotamidae
Wormaldia sp. (det. O.S. Flint)
Records—Cueva de la Puente.
Comment—A single female was collected in the dark zone.

Family Psychomyiidae
Polycentrepus sp. (det. O.S. Flint)
Records—Cueva de la Puente.
Comment—One larva was collected in 19°C stagnant water.
Polycentrepus picana Ross (det. O.S. Flint)
Records—Cueva de la Puente.
Comment—One adult was collected in the dark zone.

Order Lepidoptera

Family Tineidae
Tinea sp. (det. D.R. Davis)
Records—Cueva de la Laguna.

Order Diptera

Family Calliphoridae

Calliphora vicina R.-D. (det. R.J. Gagnè)
Records—Sótano de San Francisco.
Comment—One adult was collected at the bottom of the entrance pit near a pool laden with human fecal matter.
Phaenicia sp. (det. R.J. Gagnè)
Records—Sótano de San Francisco.
Comment—A single larva was taken from a pool laden with fecal matter at the bottom of the entrance pit.
Family Cecidomyiidae
Lestodiplosis sp. (det. R.J. Gagnè)
Records—Cueva de la Puente.
Family Chironomidae
Unidentified genus and species (det. W.W. Wirth)
Records—Sótano de Ojo de Agua.
Family Dolichopodidae
Chrysotus sp. (det. G.C. Steyskal)
Records—Sótano de San Francisco n. 2.
Peloreopeodes cornutus Van Duzee (det. G.C. Steyskal)
Records—Cueva de la Puente.
Family Drosophilidae
Unidentified genus and species (det. W.W. Wirth)
Records—Sótano at Valle de los Fantasmas.
Drosophila sp. (det. W.W. Wirth)
Records—Sótano de San Francisco n. 2.
Family Empididae
Drapetis sp. (det. G.C. Steyskal)
Records—Sótano at Valle de los Fantasmas.
Family Mycetophilidae
Unidentified genus and species (det. R.J. Gagnè)
Records—Cueva de la Puente.
Rymosia sp. (det. R.J. Gagnè)
Records—Cueva de los Caballos and Cueva de Cinquenta y Ocho.
Family Scenopinidae
Pseudatrichia sp. nr. *melanderi* Kelsey (det. L.V. Knutson)
Records—Cueva de Cinquenta y Ocho.
Family Sciaridae
Bradysia sp. (det. R.J. Gagnè)
Records—Cueva de la Puente.
Family Sphaeroceridae
Leptocera sp. (det. G.C. Steyskal)
Records—Cueva de Cinquenta y Ocho and Sótano de San Francisco n. 2.
Family Tipulidae
Epiphragma (Epiphragma) sp. (det. G.W. Byers)
Records—Sótano de San Francisco.
Comment—This may be a new species.
Limonia (Dicranomyia) sp. (det. G.W. Byers)
Records—Sótano de la Golondrina.

Order Hymenoptera

Family Formicidae
Pheidole sp. (det. D.R. Smith)
Records—Sótano de San Francisco n. 2.
Comment—Accidental; the head and thorax of a worker were collected at the bottom of the entrance pit.
Tapinoma sp. (det. D.R. Smith)
Records—Sumidero de Fantasmas.
Family Ichneumonidae
Orthocentrus sp. (det. R.W. Carlson)
Records—Cueva de la Puente.
Comment—This is probably a parasite of fungus gnats (Mycetophilidae).

PHYLUM CHORDATA

CLASS AMPHIBIA

Order Urodela

Family Ambystomidae
Ambystoma tigrinum (Green) (det. R. Newcomer, W.R. Elliott)
Records—Sótano de Abernathy, Sótano de la Golondrina, and Sótano de Puerto de los Lobos.
Family Plethodontidae
Pseudoeurycea sp. (det. J.R. Reddell)
Records—Sótano de Abernathy, Sótano de la Golondrina, Sótano de Puerto de los Lobos, and Sótano de Ojo de Agua.
Bibliography—Walsh, 1972.
Comment—This species is frequently found on the walls of entrance pits.

Order Anura

Family Leptodactylidae
Syrrhophus longipes (Baird) (det. J.D. Lynch)
Records—Sótano de Puerto de los Lobos.
Comment—A single frog collected from Sótano de la Golondrina may be this species.

CLASS MAMMALIA

Order Chiroptera

Family Phyllostomatidae
Artibeus sp. (det. T.R. Mollhagen)
Records—Cueva de la Puente.
Comment—A colony of perhaps several hundred Leaf-nose bats roosts near the smaller, upper entrance. Other than one dead bat seen at the bottom of Sótano de Ojo de Agua, bats

have not been observed in any other cave in the Valle de los Fantasmas Region.

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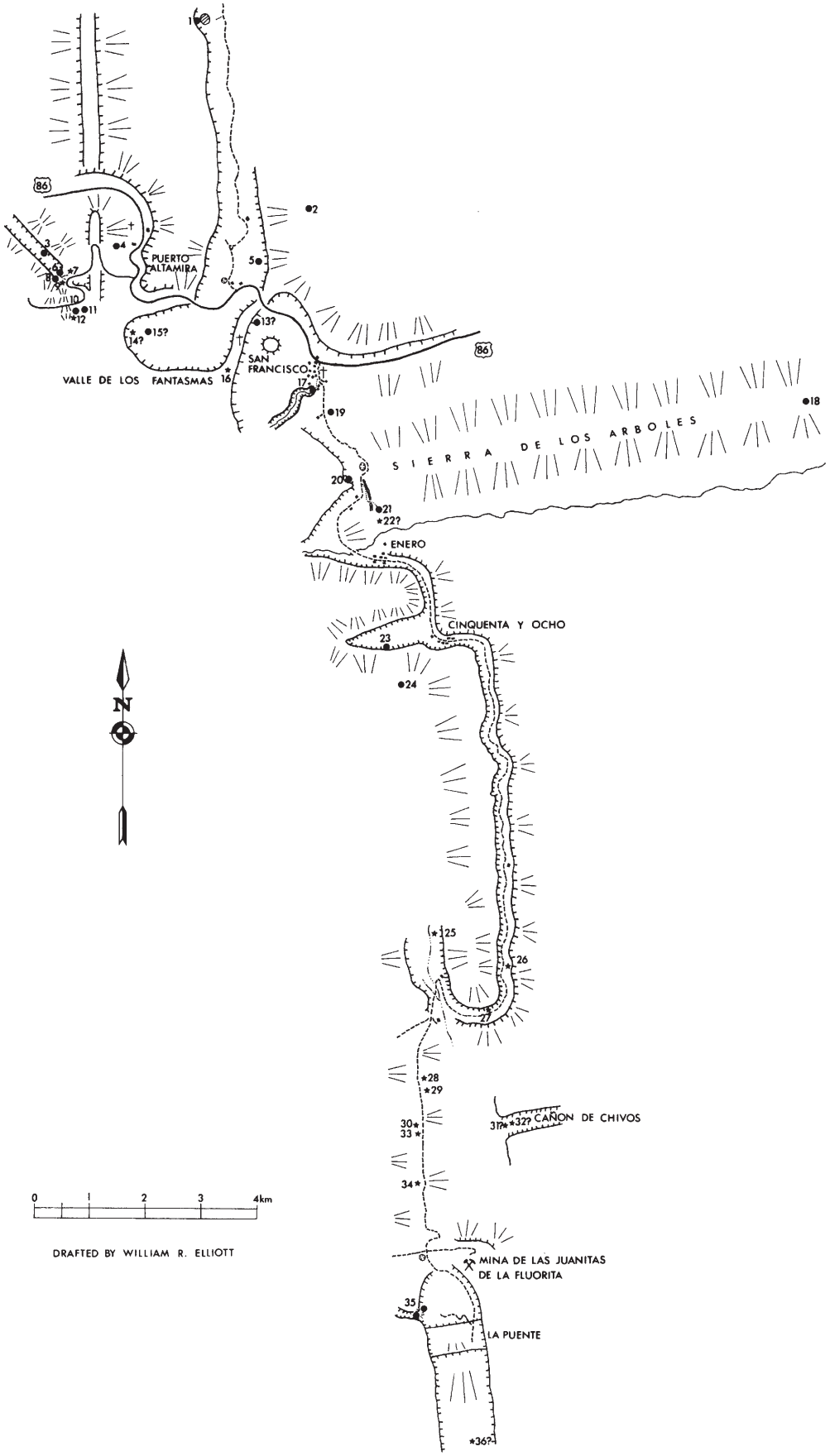
Fig. 1. Map of Valle de los Fantasmas Region, San Luis Potosí, México, showing known caves. Dots represent caves for which biological records are available, stars represent other caves, and question marks indicate caves for which locations are uncertain. Key to caves: 1. Cueva de la Laguna; 2. Sótano de Carlos; 3. Cueva de los Caballos; 4. Sótano de la Golondrina; 5. Sumidero de Fantasmas; 6. Sótano del Pájaro; 7. Unnamed 35 m pit; 8. Sótano de las Arañas; 9. Cueva Delgada; 10. Sótano de Abernathy; 11. Sótano de Super-Macho; 12. Unnamed, unentered pit; 13?. Cueva de Entrada Chica; 14?. Cueva de Aguacate; 15?. Cueva de Carnicerías; 16. Cueva de la Iglesia; 17. Sótano de San Francisco; 18. Sótano de Ojo de Agua; 19. Sótano de San Francisco n. 2; 20. Cueva de las Moscas; 21. Sótano de Puerto de los Lobos; 22?. Sótano de Enero; 23. Cueva de Cinquenta y Ocho; 24. Sótano de Nopales; 25. Cueva de Sierra Blanca; 26. Unnamed cave in sinkhole; 27. Unnamed 15 m pit; 28. Unnamed 10 m pit; 29. Unnamed large blind pit; 30. Unnamed small cave; 31?. Cueva de Salida de Agua de la Puente; 32?. Cueva del Agua; 33. Unnamed small pit; 34. Unnamed small cave; 35. Cueva de la Puente; 36?. Cueva de la Virgen.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PUERTO CALTAMIRA
VALLE DE LOS FANTASMAS
SAN FRANCISCO
SIERRA DE LOS ARBOLES
ENERO
CINQUENTA Y OCHO
CAÑON DE CHIVOS
MINA DE LAS JUANITAS
DE LA FLUORITA
LA PUENTE
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0 1 2 3 4km
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