FURTHER STUDIES ON THE CAVERNICOLE FAUNA OF MEXICO AND ADJACENT REGIONS

ASSOCIATION FOR MEXICAN CAVE STUDIES
BULLETIN 8

AND

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BULLETIN 28

EDITED BY
JAMES R. REDDELL

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Cover: *Paraphrynus chacmool* (Rowland) from Actún Ziz, Yucatán
Photograph by Robert W. Mitchell

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PREFACE

This is a joint publication of the Association for Mexican Cave Studies and the Texas Memorial Museum. Printing costs have been subsidized in part by the Dora Dieterich Bonham Fund of the Texas Memorial Museum.

The continuing study of the cavernicole and related endogean fauna of México and Central America has resulted in the accumulation of considerable additional material of interest. This volume includes studies on a portion of the new and little-studied taxa collected in recent years. Among the many taxa described in this volume are fifty new species and subspecies of troglobite from México. In addition, revisionary studies include additional cavernicole and endogean species from the United States, Central America, South America, and the West Indies.

The addition of 50 new taxa of troglobite to the fauna of México, Guatemala, and Belize brings the total of described troglobites in this region to 330. Reddell (1981, Bull. 27, Texas Mem. Mus., Univ. Texas at Austin) has summarized the fauna known from these three countries; some of the taxa described here are listed by generic name in that volume. It is apparent that, despite almost 20 years of intensive study, we are still far from achieving a deep understanding of the cavernicole fauna of this complex region.

Many of the newly described taxa were found in three extensive karst regions that have received intensive study in recent years. Peter Sprouse, Terri Treacy, Dale Pate, and other members of the Association for Mexican Cave Studies (AMCS) have conducted an extensive study of the Purificación region in the Sierra Madre Oriental about 35 kilometers northwest of Ciudad Victoria in Tamaulipas and adjacent Nuevo León. This project has included mapping and exploration of all caves visited and an intensive collecting effort. The Sistema Purificación is the longest cave in México with more than 40 kilometers of surveyed passage and a depth of almost 1,000 meters.

The Huautla de Jiménez region of northern Oaxaca has received much recent attention by Bill Stone, Bill Steele, and other members of the AMCS. This high elevation karst region is now known to contain the deepest explored caves in the Western Hemisphere. Sótano de San Agustín is more than 1,200 meters deep, while other caves in the area exceed 900 meters in depth. Although collecting has been incidental to the mapping and exploration of these difficult caves, several interesting troglobites have been found.

The Cuetzalan region of northern Puebla is among the more important karst regions in México, with numerous extensive stream caves having been mapped and many others remaining to be studied. Collections by Andrew Grubbs, David McKenzie, James Reddell, Steve Robertson, and others have resulted in the discovery of numerous troglobites and troglophiles of great interest.

Additional material has also accumulated from recent explorations in the caves of western México, the Xilitla and Aquismón regions of San Luis Potosí, the Acatlán region of Oaxaca, the San Pablo Zoquitlán region of Puebla, and Belize.

Many people have contributed to this volume and I wish first to thank the authors of the papers included herein for preparing manuscripts with very little advance notice. I am also grateful to Jerry Atkinson, William Elliott, Andrew Grubbs, Roy Jameson, David McKenzie, Logan McNatt, Steve Robertson, Peter Sprouse, Bill Steele, and Lisa Wilk for providing me with collections made during the course of their projects in México and Belize.

Dr. Robert W. Mitchell of Texas Tech University kindly provided me with the photograph on the cover.

I am especially grateful to Mark Longley, Terry Raines, and Jane Sullivan for their invaluable assistance in the preparation and publication of this volume.

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SPEOCIROLANA GUERRAI SP. NOV., CIROLANIDO TROGLOBIO ANOPTALMO DE LA CUEVA DE LA CHORRERA, LINARES, NUEVO LEON, MEXICO (CRUSTACEA: ISOPODA)

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RESUMEN

Se describe una especie nueva de cirolánido troglobio procedente de la Cueva de la Chorrera, Linares, Nuevo León, México, sobre la base de cuarenta y ocho (48) ejemplares que se caracterizan por presentar meropoditos de los pereiópodos I a III respectivamente con 1, 2, y 2 a 3 espinas en el ángulo apical interno, más una espina subapical a medial cada uno. Lacinia del maxilípedo con dos (2) ganchos acopladores curvos. Palpo del maxilípedo con dos (2) ganchos acopladores curvos. Palpo del maxilípedo con 2-7 espinas rígidas, barbadas, en el borde externo del segundo artejo, y 1-4 en el correspondiente al tercer artejo. Urópodos sexualmente dimórficos, con el exopodito redondeado en los machos y foliáceo en las hembras; en ambos sexos presenta modalmente 6-7 aguijones en el borde interno del endopodito y 1 en el exopodito. Telson redondeado. Anténula con 9-21 y antena con 23-51 artejos flagelares, respectivamente, en número proporcional a la longitud del cuerpo. Cara interna del propodito del pereiópodo VII con un espolón subdistal y 1 hacia la parte media.

El agua de la Cueva es quieta, clara y generalmente baja. El fondo es lodoso, con poca grava y las paredes rocosas, con playa sólo hacia la entrada de la cueva. Su alimento parece ser excremento de murciélagos, según se observó durante cuarenta (40) días de acutiverio.

Se considera su origen posiblemente precretácio y se dan alternativas.

La especie se dedica al Sr. Adán Guerra, quién auspició parte del trabajo de campo como administrador del entonces Aquarium Municipal Felipe de J. Benavides.

ABSTRACT

Speocirolana guerrai, sp. nov., is a blind troglobitic cirolanid isopod from Cueva de la Chorrera, Linares, Nuevo León, México. The type-series is composed of 48 specimens. It is characterized by having 1, 2, and 2-3 spines on the internal apical angle of meropodites in pereiopods I, II and III, plus a medial to subapical spine each. Lacinia of maxiliped with 2 (1-3) coupling hooks. Palp of maxilliped with 2-7 external, barbed, rigid spines on second segment, and 1-4 on third. Uropod sexually dimorphic, its exopodite distal end rounded and pilose in males, foliar in females; both sexes have 6-7 stout spines along the endopodite medial margin and 1 on the exopodite. Telson rounded. Flagellar articles of the antennula 9-21 and 23-51 on antenna, number in both proportional to body length. Pereiopod VII with 1 subdistal and 1 medial stout spines on the propodite internal face.

The water in the cave is transparent, lentic, and shallow, forming a beach towards the entrance; sides rocky, bottom muddy, with some gravel. Food of the isopods is bat excreta, confirmed during 40 days of captivity.

The origin is possibly Pre-Tertiary, but there are other alternatives.

The species is dedicated to Mr. Adán Guerra, former head of the Aquarium Municipal Felipe de J. Benavides, who financed field work.

La Sierra Madre Oriental, básicamente caliza, presenta numerosas cuevas y grutas, algunas con aguas permanentes. Una de tales cuevas, La Chorrera, situada sobre el kilómetro 27.3 de la Carretera Linares-Galeana, proporcionó ejemplares de un cirolánido troglobio, anoftalmo y depigmentado, durante una serie de colectas efectuadas por personal de la Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León (UANL), auspiciadas por el Aquarium Municipal de Monterrey Felipe de J. Benavides. El material se encuentra en la colección del autor, depositada en la primera institución mencionada, excepto los depositados en las siguientes instituciones: British Museum (BM), Universidad Nacional Autónoma de México (UNAM : Instituto de Biología), United States National Museum (USNM), y Tulane University (TU).

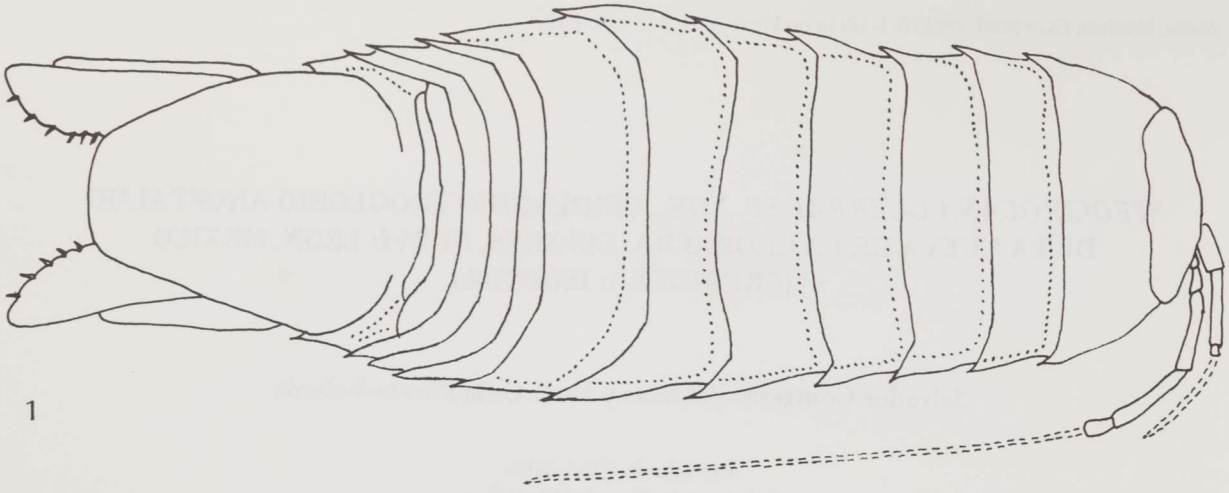


Fig. 1.—*Speocirolana guerrai* sp. nov., vista dorsal, semi-diagramático.

El material colectado representa una forma del Género *Speocirolana*, (Bolívar, 1950) Bowman 1964, considerando básicamente los primeros 3 pares de pereiópodos prensores y los 4 restantes ambulatorios. Se considera que además representa una especie indescrita, por las razones dadas en la discusión, para la cual se propone el nombre de:

Speocirolana guerrai sp. nov.

Holotipo.—1, UANL 53, hembra de 24.6 mm. de longitud, colectada en la Cueva la Chorrera, 27.3 km. al W de Linares, Nuevo León, el 19 de Marzo de 1971, por Héctor Medina Pedraza, de la Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León.

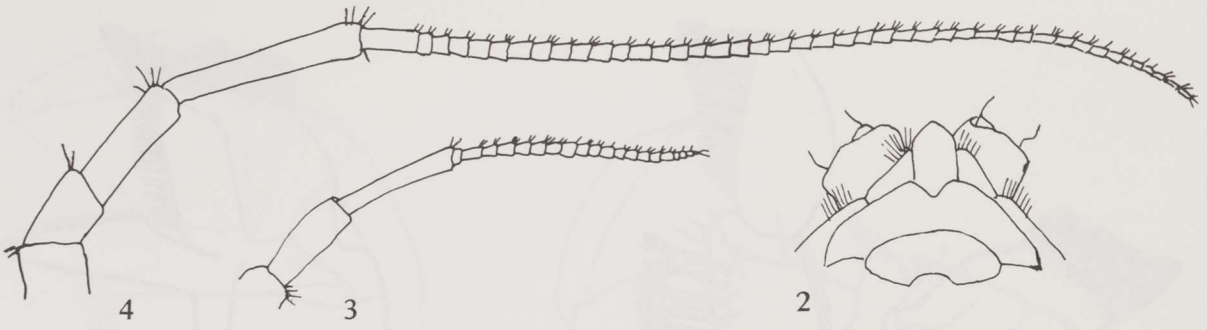
Paratipos.—3, UANL 54, (14.5-21.7 mm.; 3: 1 hembra, 1 macho adulto, 1 juvenil), colectados con el holotipo; 10, UANL 56 (14.9-24.0 mm.; 10: 3 machos, 7 hembras), misma localidad, colectados por Salvador Contreras-Balderas, Francisco J. Guzmán-Hernández, Oscar Pérez-Maciel, César Saldívar de León, Jesús A. Aguilar-Abrego, el 11 de Mayo de 1971; 34, UANL 57 (9-25.9 mm.; 34: 18 machos y 16 hembras), misma localidad, colectados por Salvador, Armando y Luis Contreras-Balderas y José María Torres-Ayala, el 13 de Junio de 1971. Un macho y una hembra de esta serie fueron enviados a otras colecciones bajo los números de catálogo siguientes: BM 1972:18:2, UNAM Número pendiente, TU Número pendiente, USNM 140471, UANL 64, (16.0-24.8 mm.; 6: 5 hembras, 1 macho) misma localidad, colectado por Arturo Jiménez, el 12 de Octubre de 1972.

Diagnosis.—Meropoditos de los pereiópodos I a III respectivamente con 1, 2, y 2 a 3 espinas en el ángulo apical interno, más una espina subapical a medial cada uno. Lacinia del maxilípedo con 2 ganchos acopladores curvos. Palpo del maxilípedo con 2-7 espinas rígidas, barbadas, en el borde externo del segundo artejo, y 1-4 en el correspondiente al tercer artejo. Urópodo modalmente con 6-7 aguijones en el borde interno del endopodito y 1 en el del exopodito. Télson redondeado. Anténula con 9-19 y antena con 33-51 artejos flagelares, respectivamente, en número proporcional a la longitud del cuerpo. Cara interna del propodito del pereiópodo VII con 1 espolón subdistal y 1 hacia la parte media. Sexualmente dimórfica, los exópodos del uropodito redondeados distalmente y pilosos en el macho, foliares y lisos en la hembra, excepto por un penacho distal.

Descripción.—Tallas observadas: 9.0-25.9 mm. longitud total. Los valores iniciales son del holotipo y los de paréntesis de los paratipos. Forma anoftalma y depigmentada, excepto: los superficies masticadoras las puntas de las uñas de los pereiópodos y del endopodito del urópodo, que son pardas. La relación de la longitud del cuerpo a su anchura máxima varía de 2.5 a 3.2; la cabeza es dos veces más ancha que larga, con el perfil anterior convexo, el posterior forma 3 lados con ángulos abiertos. El dorso del cuerpo presenta sétulas dispersas en la cutícula. El aspecto general se muestra en la Fig. 1.

No hay epímeros en el pereionito I, el II y III lo tienen pequeño y redondeado, del IV al VII se presentan con fuertes ángulos posterolaterales y aumento progresivo de tamaño. El pléon consiste de 5 segmentos visibles, del I al III aproximadamente iguales, angostos, semilunares y con extremos dirigidos hacia atrás; IV y V son más pequeños y rectos que los anteriores.

La lámina frontal es menos de 2 veces tan larga como ancha, terminada en una punta roma. El clípeo



Figs. 2-4.—*Speocirolana guerrai* sp. nov.: 2, lámina frontal, clípeo y labro; 3, anténula; 4, antena.

es ancho, fuertemente escotado en V anteriormente, con lóbulos laterales ligeramente afilados. El labro es ancho, redondeado anterior y lateralmente; el borde bucal es escotado, pubescente y pardo (Fig. 2).

La anténula es de tamaño menor que el pedúnculo de la antena; presenta 3 artejos pedunculares y 18 (9-21) flagelares (Fig. 3). Los artejos medios y terminales presentan grupos de setas uniformes en tamaño, con estethasa excepto en los últimos dos. La antena es larga, deprimida sobre el cuerpo alcanza un punto sobre el pereionito VII o el pleonito I, presenta 6 artejos pedunculares (el primero reducido) y 44 (23-51) artejos flagelares (Fig. 4), los últimos aproximadamente 2 veces tan largos como anchos. La Fig. 5 muestra la correlación entre talla y número de artejos flagelares de la anténula y de la antena.

Las mandíbulas son semejantes en el número de cúspides, pero los de la derecha son casi 2 veces más altos que los de la izquierda. El *acies* está provisto de 4 dientes, de los cuales el último es el mayor y el penúltimo es una proyección de su base, mientras los 2 anteriores se presentan poco separados. La *Lacinia mobilis* es aproximadamente rectangular, con 16 (10-25) espinas transparentes, largas, en el borde ganchudas y de tamaño uniforme. La parte molar es casi triangular, provista de una fila de 29 (21-37) dientes pequeños, ganchudos, triangulares. En la cara opuesta a la inserción de la *Lacinia mobilis* aparecen dos cóndilos romos subiguales. El palpo consiste de 3 artejos, el terminal es ovoide, con setas plumosas, graduadas y mayores en la parte distal, el segundo es el mayor, provisto de setas plumosas en su borde externo, en 3-4 filas irregulares, entre las cuales hay pubescencia que se extiende en todo el borde; el borde interno es pubescente en su mitad distal (Fig. 6).

La primera maxila tiene su lámina externa poco mayor que la interna, encorvada hacia adentro, con un adelgazamiento hacia la parte media; presenta 11 espinas (12 en 2) en su ápice truncado, colocadas en 2 filas, 7 anteriores (8 en 1), dispuestos en U invertida, y 4 posteriores (5 en 1), todas barbadas en su cara interna. La lámina interna es subigual a la externa, delgada, con el tercio distal ensanchado, truncado, provisto de 3 espinas fuertemente plumosas, más una seta grande y encorvada, implantada sobre la base de la segunda espina, y una seta menor terminal (Fig. 8).

La segunda maxila presenta 3 enditos, 1 corto e interno y 2 largos y externos. El endito interno presenta 19 (11-19) setas, la mayoría plumosas en casi toda su longitud, de varios tamaños mezclados; además se aprecian numerosas setas pequeñas que cubren la porción distal y alrededor de las setas mayores. Los enditos externos presentan 7 (5-7) y 13 (11-13) espinas, respectivamente (Fig. 9).

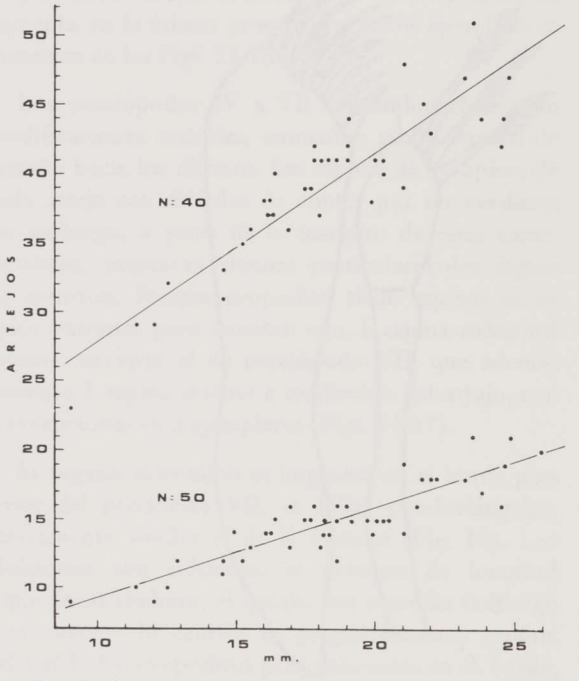
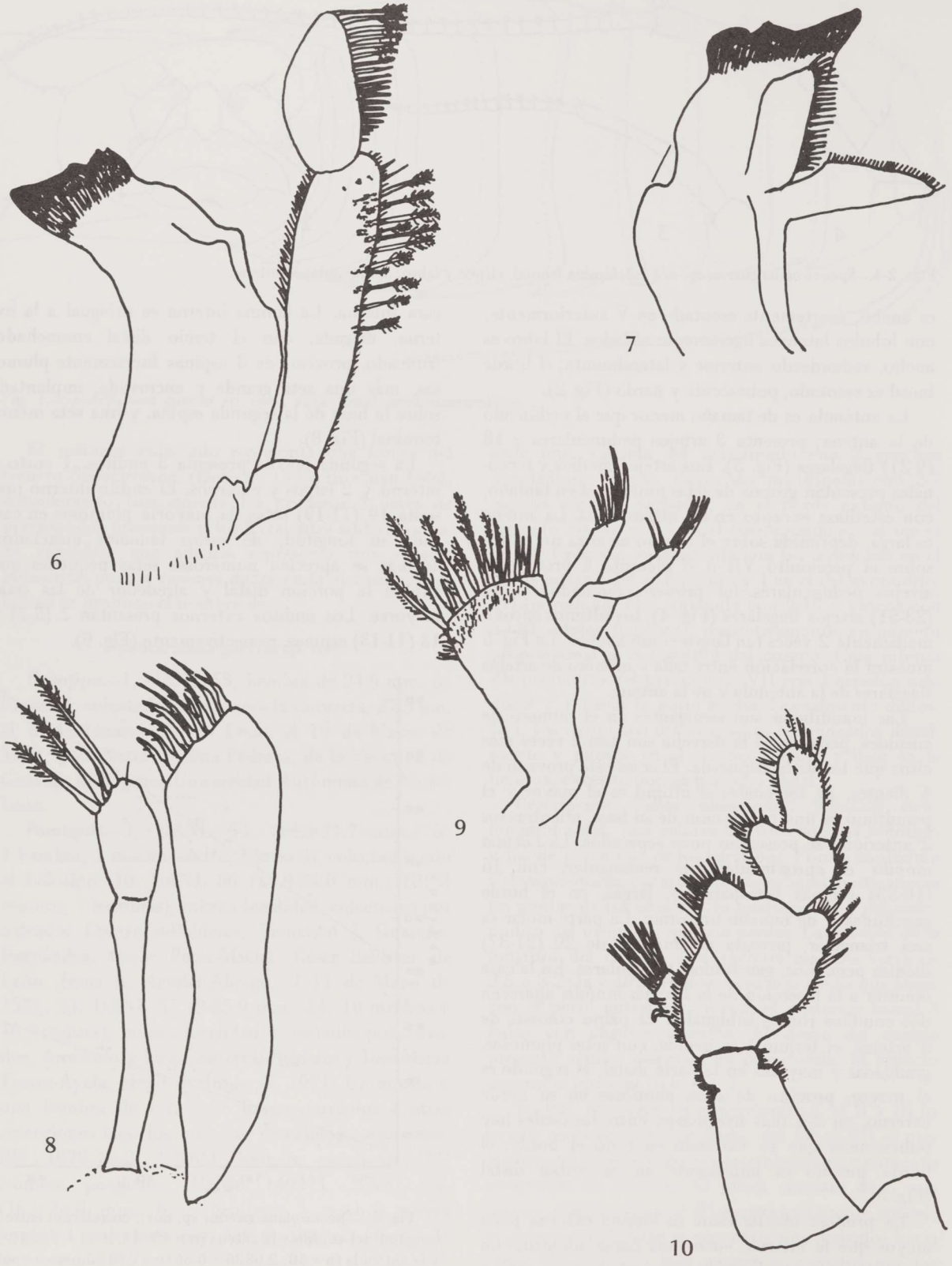
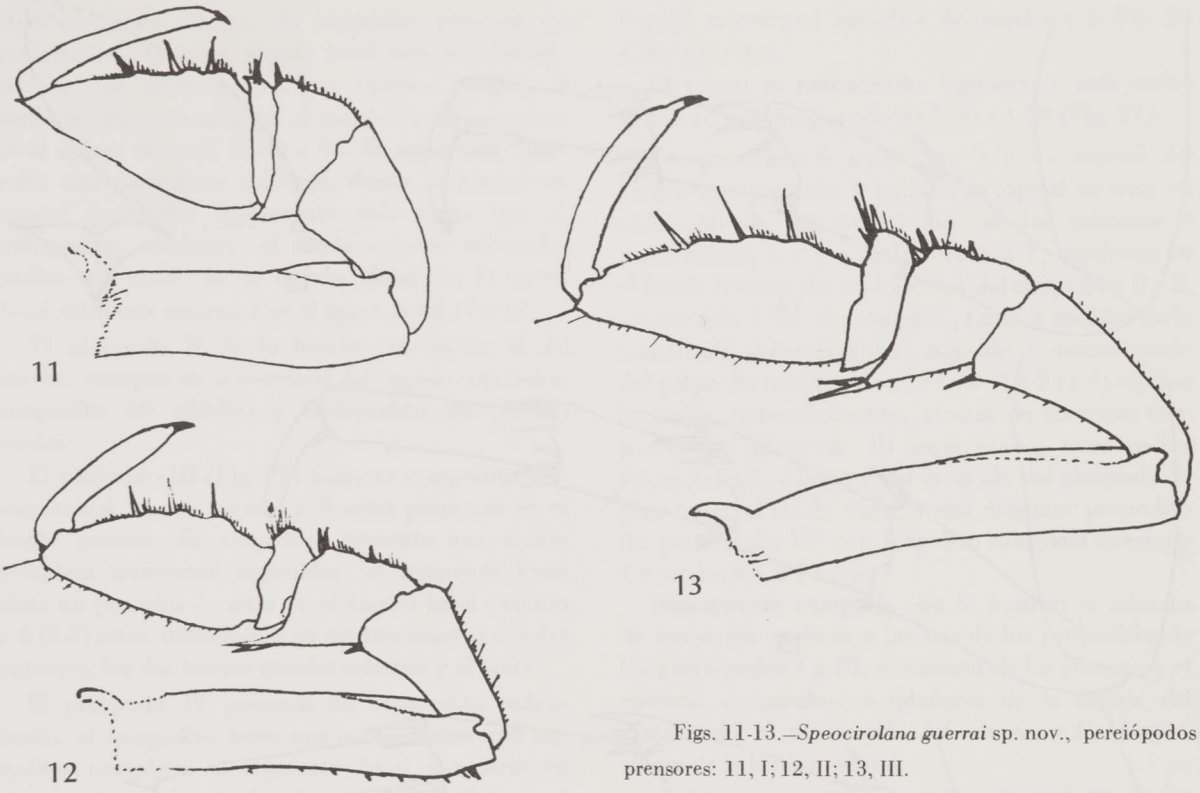


Fig. 5.—*Speocirolana guerrai* sp. nov.: correlación entre la longitud del cuerpo y la antena (n = 40: 14.4848 + 1.3513 x) y la anténula (n = 50: 2.6836 + 0.6616 x). El número de puntos en la gráfica es menor a n por las observaciones repetidas. Las líneas calculadas se obtuvieron en una calculadora Texas Instruments SR-51, alimentando los valores numéricos originales.



Figs. 6-10.—*Speocirolana guerrai* sp. nov.: 6, mandíbula y palpo; 7, acies, lacinia mobilis, y pars molaris; 8, maxilla I; 9, maxila II; 10, maxilípedo y palpo, base y ganchos acopladores.



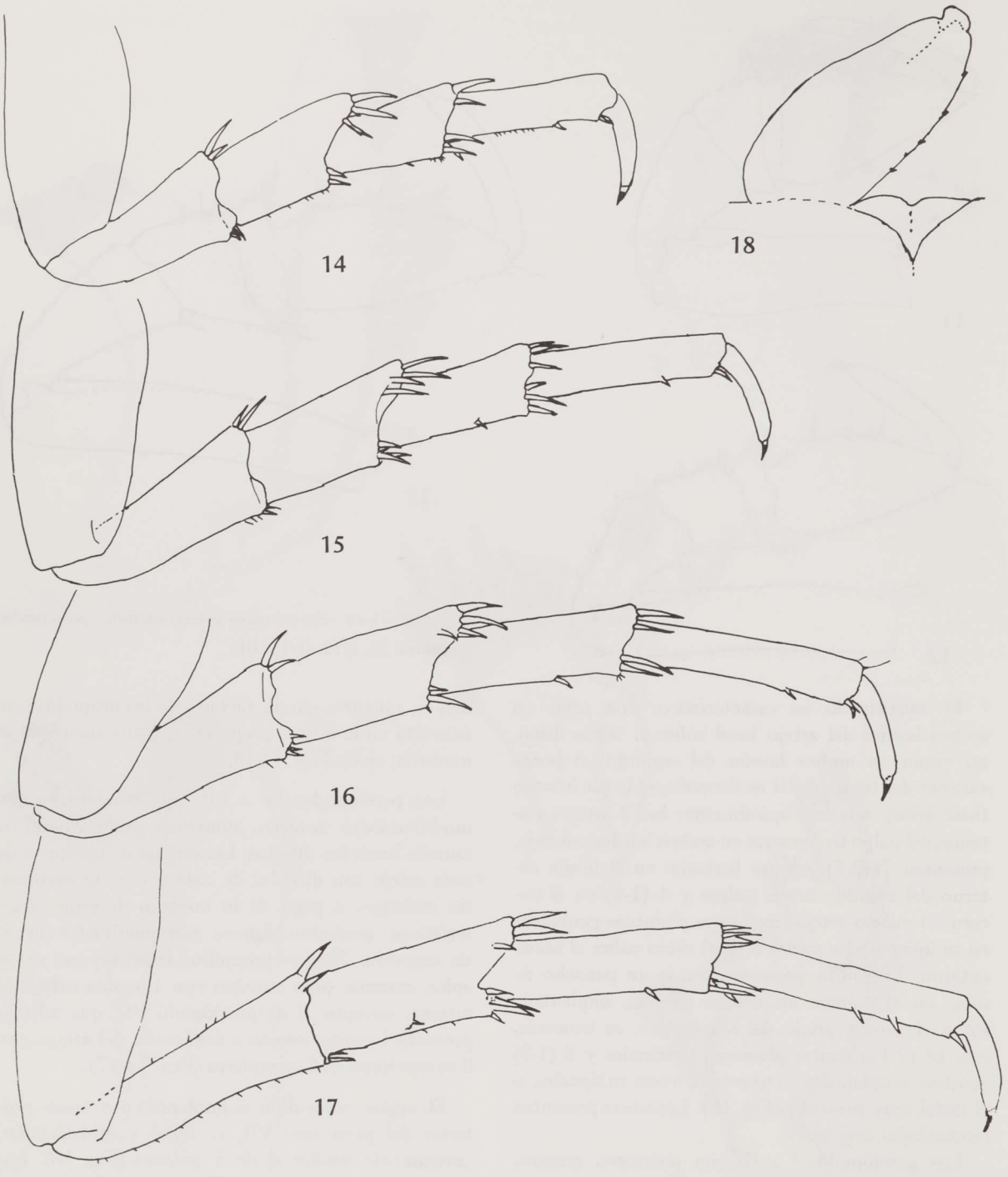
Figs. 11-13.—*Speocirolana guerrai* sp. nov., pereiópodos prensores: 11, I; 12, II; 13, III.

El maxilípedo es característico, con setas en ambos bordes del artejo basal sobre el tercio distal, así como en ambos bordes del segundo; el borde externo del tercer distal es desnudo, el borde interno tiene setas, mayores apicalmente; los 3 artejos restantes del palpo tienen setas en ambos bordes; además, presentan 7 (2-7) espinas barbadas en el borde externo del segundo artejo palpar y 4 (1-4) en el tercero; el cuarto artejo tiene setas plumosas graduadas en su ápice de las cuales 8 (2-8) están sobre el borde externo. El endito presenta además un penacho de setas en el márgen mesial. La Lacinia, implantada sobre el primer artejo del maxilípedo, es truncada, con 13 (9-14) cerdas plumosas terminales y 3 (1-3) ganchos acopladores, retrorsos, a veces subiguales, ó el distal muy pequeño (Fig. 10). Las coxas presentan crestas bajas diagonales.

Los pereiópodos I a III son prensores, gruesos, subqueliformes, replegados hacia delante y debajo del cuerpo. El borde interno de los propoditos presenta 3 espolones y setas finas en estos pereiópodos; los carpopoditos tienen 1, 3 y 3 espolones apicales internos, respectivamente; los meropoditos presentan 1, 2 y 2-3 espolones apicales internos, respectivamente del I al III, más 1 espolón algo menor, subapical a medial, mientras que en el ángulo apical externo tienen 1 espina roma, 2 y 2 espinas largas, en el mismo orden. El tamaño de estos pereiópodos es progresivamente mayor, mientras que la anchura de los propoditos no aumenta en la misma proporción. Estos apéndices se muestran en las Figs. 11-13.

Los pereiópodos IV a VII son ambulatorios, sin modificaciones notorias, aumentan gradualmente de tamaño hacia los últimos. Las espinas de los ápices de cada artejo son difíciles de contar por ser caedizas; sin embargo, a pesar de lo inseguro de estas características, presentan algunas particularidades dignas de mención. Ningún propodito tiene espinas en su ápice externo, pero cuentan con 1 espina subapical interna, excepto el de pereiópodo VII, que además presenta 1 espina interna a mediación del artejo, con 3 excepciones en 2 ejemplares (Figs. 14-17).

El órgano masculino se implanta en el borde posterior del pereiónito VII, es foliar y subtriángular, enteramente similar al de *S. bolivari* (Fig. 18). Los pleópodos son foliáceos, el primero de longitud triple de su anchura, el quinto vez y media tan largo como ancho. El cambio de proporciones es gradual del I al V; los exopoditos presentan setas en su borde, con disminución progresiva en su número, especialmente escasas en el V. La cantidad de dichas setas de los exopoditos es relativamente proporcional al tamaño del ejemplar. Sólo los endopoditos I y II tienen setas como es usual en el género, en número sin correlación con el tamaño del ejemplar.



Figs. 14-18.—*Speocirolana guerrai* sp. nov., pereiópodos ambulatorios: 14, IV; 15, V; 16, VI; 17, VII; 18, órgano masculino.

El pleópodo I (Fig. 19) se implanta sobre un sympodito subrectangular, más ancho que largo, con 6 espinas ganchudas fuertes en su borde interno más una seta plumosa. El exopodito tiene 1 espina sobre el borde externo, cerca de la base; presenta 58 (38-62) setas plumosas en los tres cuartos del borde distal externo, en el cuarto distal interno y en el ápice, donde son mayores. El endopodito es subigual, con un penacho de setas en el ángulo basal interno y 30 (18-30) setas en ambos bordes sobre el quinto distal y el ápice, mayores que las basales.

El pleópodo II del macho (Fig. 20) tiene un sympodito trapezoidal, más ancho en la base; presenta 7 espinas ganchudas y 3-7 setas plumosas en una hilera

sobre el borde interno. El exopodito presenta un penacho de setas en el ángulo basal externo; el borde externo con setas en sus tres cuartos distales, el borde interno con setas en el cuarto distal, así como en el ápice, en total de 46 a 66. El endopodito presenta una escotadura subbasal, donde se inserta un órgano copulador ligeramente más largo que el endopodito, arqueado; el borde externo del endopodito con setas, en su quinto distal, en la mitad distal del borde interno y en el ápice, total 17 a 32.

El pleópodo II de la hembra es similar al del macho, excepto en la presencia del órgano copulador, exopodito 66 (48-66) y endopodito 26 (17-26) cerdas.

El pleópodo III (Fig. 21) tiene un sympodito subtrapezoidal, con 6 espinas y 9 setas plumosas en el borde interno. El exopodito presenta una sutura completa transversal sigmoidea: el segmento basal tiene un penacho de setas en el ángulo basal externo y 4 (2-5) setas, distribuídas en sus tres cuartos distales externos, los dos tercios distales internos y el ápice.

El pleópodo IV presenta un sympodito redondeado; el exopodito tiene una sutura transversal sigmoidea completa; el segmento basal con setas en pincel sobre el ángulo basal externo y 3 (2-4) en el borde externo; el segmento distal tiene 47 (30-47) setas plumosas en casi todo el borde externo, los dos tercios distales internos y en el ápice, donde el borde presenta una escotadura ligera (Fig. 22).

El pleópodo V (Fig. 23) tiene un sympodito redondeado; el exopodito con una sutura transversal completa; sólo el segmento distal con setas, escasas, sobre los ápices internos y externos; el borde distal ligeramente escotado, desnudo, inclinado, resulta en un ápice interno más largo que el externo.

Una característica no mencionada anteriormente en el género es la presencia de 7 a 14 engrosamientos discoidales submarginales sobre ambas caras del borde interno, provistas de filamentos pequeños, en grupos, poco aparentes en el pleópodo I y más notorios en el V (Fig. 24).

El urópodo sobresale del telson, no así el ápice interno del sympodito, que es subigual, pero alcanza la mitad del endopodito. El exopodito del macho tiene el ápice y la sección transversal redondeados e iguala ó rebasa el extremo del endopodito; presenta 1 aguijón, a veces ausente, sobre el borde interno y tiene numerosas setas cortas que le dan aspecto piloso; en la hembra es foliar, subtriángular y más corto que el endopodito, con escasas setas pequeñas, excepto por un pequeño penacho distal; el endopodito tiene 7 (5-8) aguijones, usualmente 7, sobre el borde interno. Todos presentan setas apicales. La Fig. 25 muestra el apéndice del macho y la Fig. 26 el de la hembra.

El telson es redondeado, ligeramente más ancho que largo, con proporción de 1.06 a 1.13 (Fig. 27).

Comparación.—*S. guerrai* es la única especie del género que presenta 1 espolón subápical interno en cada uno de los meropoditos de los primeros 3 pereiópodos; 4 a 9, usualmente 6 a 7, aguijones en el borde interno del endopodito del urópodo y 0 a 2, usualmente 1 en el exopodito; *Lacinia mobilis* de la mandíbula subrectangular; segundo y tercer artejo del palpo del maxilípedo con 4 (2-7) y 2 (1-4) espinas barbadas, respectivamente, además de las setas; exopodito del pleópodo III segmentado; setas en los ápices externo é interno del exópodo del pleópodo V, pero no en el borde distal, y éste diagonal; propodito del pereiópodo VII con 1 aguijón subapical interno y 1 a mediación del artejo.

Básicamente comparte con *S. bolivari* el número de espolones en la cara interna de los propoditos de los pereiópodos I a III; el tamaño de las antenas, y el número de ganchos acopladores de la lacinia del maxilípedo, lo translúcido del cuerpo, y las proporciones de la lámina frontal.

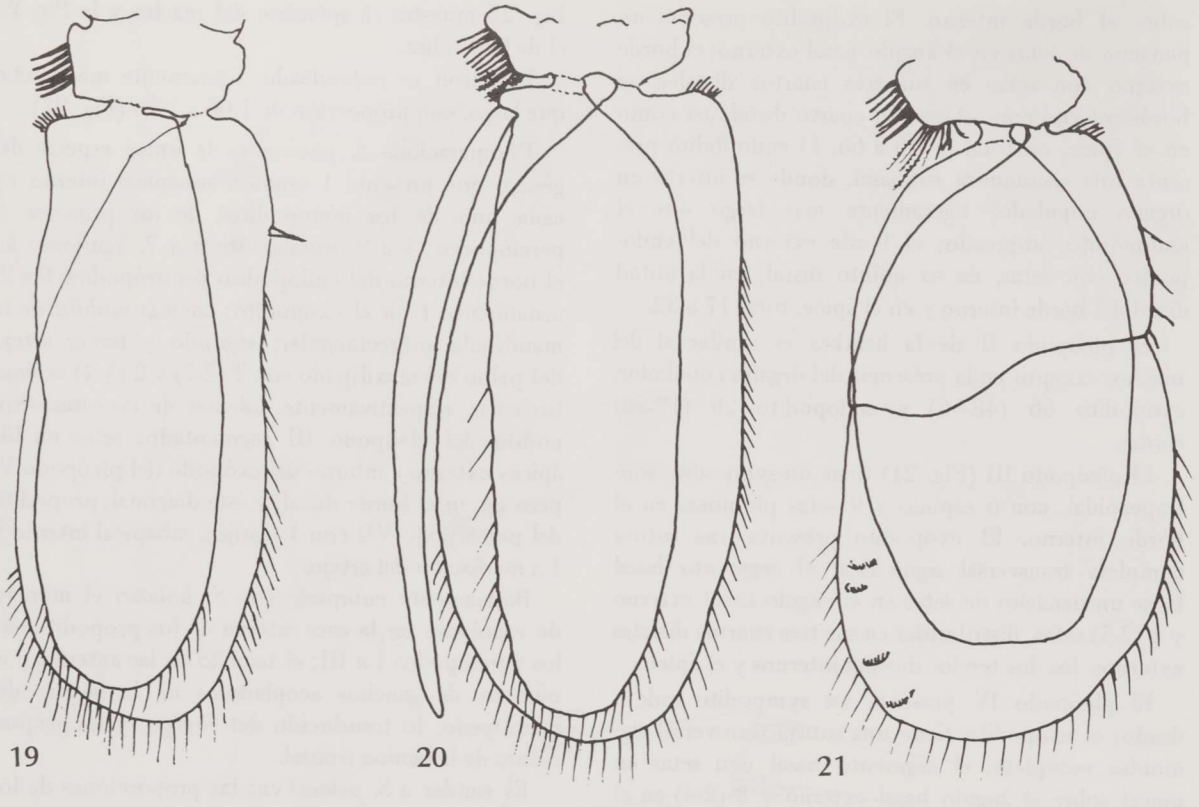
Es similar a *S. pelaezi* en: las proporciones de los artejos terminales de la antena; la forma de la cabeza, y el telson redondeado.

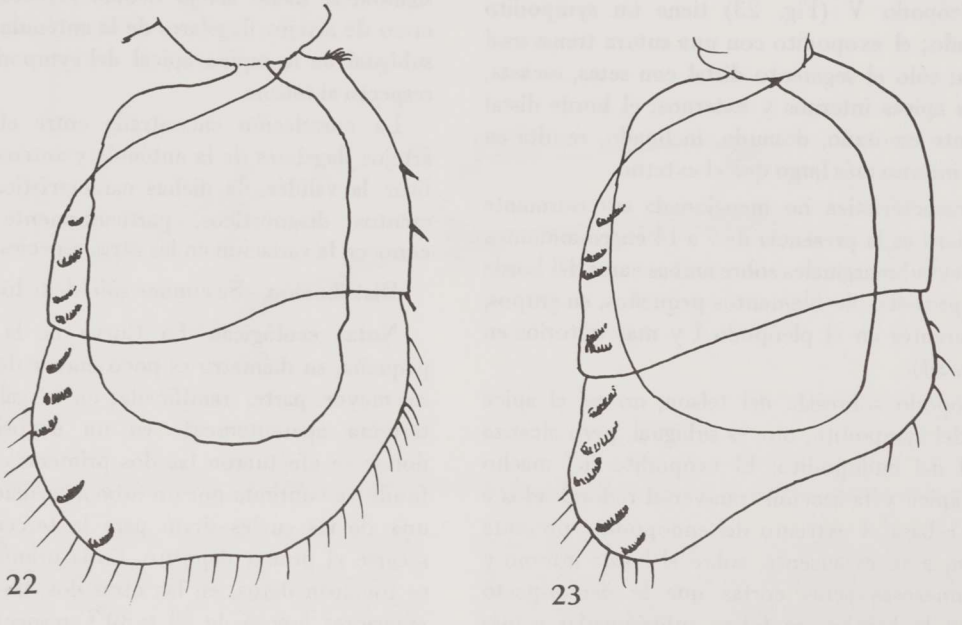
Se parece a *S. thermydronis* en: perfil del grupo de setas del artejo distal del palpo mandibular en curva sigmoidea, dicho artejo ovoide y recto; el bajo número de artejos flagelares de la anténula, y el tamaño subigual de la espina apical del sympodito uropodal respecto al telson.

La correlación encontrada entre el número de artejos flagelares de la anténula y antena lleva a rectificar la validéz de dichas características como elementos diagnósticos, particularmente cuando se conocen la variación en las otras especies.

Distribución.—Se conoce sólo de la localidad tipo.

Notas ecológicas.—La Cueva de la Chorrera es pequeña, su diámetro es poco mayor de 3 metros en su mayor parte, ramificada; en la galería inferior, termina aparentemente en un depósito de agua, donde se efectuaron las dos primeras colectas, en el fondo se continúa por un tubo a cavidades interiores, una de las cuales sirvió para la tercera colecta, al secarse el primer depósito. En la primero colecta no se tomaron datos, en las otras dos, las temperaturas exteriores fueron de 34 y 30°C respectivamente, las interiores aérea y acuática fueron 26.5 y 22°C, en ambas colectas. El agua es quieta, clara, baja en su mayor parte, excepto atrás del depósito posterior, que es más profundo. El fondo es lodoso, con algo de





Figs. 19-23.—*Speocirolana guerrai* sp. nov., pleópodos: 19, I; 20, II, masculino; 21, III; 22, IV; 23, V.

grava, como el piso de la cueva. Las paredes son rocosas. Como la galería es descendente, sólo forma playa hacia la boca de la cueva.

El fondo de los depósitos contiene deyecciones de murciélagos, los principales habitantes de la cueva son vampiros; durante las colectas se observaron frecuentemente isópodos comiendo de dichos excrementos, fué el alimento único que tomaron ejemplares en cautiverio, que sobrevivieron 40 días.

Los únicos organismos asociados reconocidos fueron hongos y protozoarios no identificados y un ostrácodo epizoario de las cochinillas, de la familia Entocytheridae, subfamilia *Sphaeromicolinae; Sphaeromicola cirolanae* Rioja, 1951, según informó Horton H. Hobbs (in Litt., 1972; ver, 1971).

Los estratos donde se localiza la cueva son calizos, llenos de grietas y huecos, por lo que es de esperarse que la ocurrencia de esta especie sea más amplia en la región.

Etimología.—El nombre trivial se deriva del apellido Guerra, por dedicarse la especie al Sr. Adán F. Guerra.

Orígen.—Para establecer una presunción sobre el orígen de *Speocirolana guerrai*, nov. sp., es necesario considerar todas las especies del género así como examinar la paleogeografía de la región y localidades tipo. Además de la ya mencionada, se conocen las siguientes especies en el género: *S. thermydronis* Cole y Minckley (1966) de Cuatro Ciénegas, Coahuila, *S. bolivari* (Rioja, 1953) de Grutas de Quinero, ca. de Mante, Tamaulipas, *S. pelaezi* (Bolívar, 1950) de Gruta Los Sabinos ca. Valles, San Luis Potosí. Tales son localidades tipo, pero las dos últimas especies se distribuyen ampliamente en la región (Reddell, 1971 y subsecuentes). La *"Conilera" stygia* Packard (1900) de pozos en Monterrey, Nuevo León, que no se ha vuelto a encontrar, probablemente fuera una forma de éste género, según Cole y Minckley (1966) y Bowman (com. pers.). *S. thermydronis* difiere de las demás especies en ser habitante de manantiales y por no tener setas en los endopoditos de los pleópodos I y II; las demás especies forman un grupo muy similar, al que probablemente pertenecía la especie de Packard, con orígen posiblemente simultáneo y ligeramente separado de *S. thermydronis*. La distribución se indica en la Fig. 28.

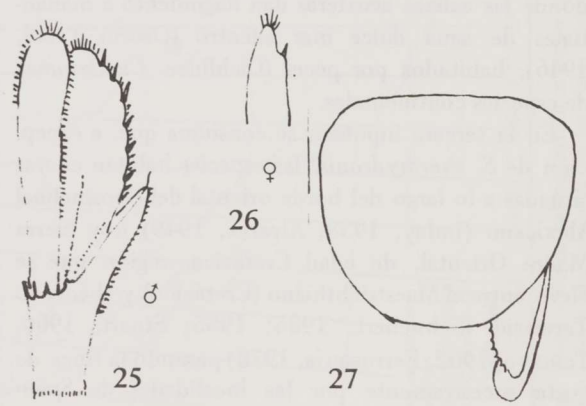
El orígen marino del género ha sido señalada por diferentes autores (Bolívar, 1950; Cole and Minckley, 1966; Rioja, 1953); pertenece a la familia marina Cirolanidae, que ha producido frecuentemente formas troglobias dulceacuícolas, tanto en las regiones periféricas del Golfo de México y en Cuba, como alrededor del Mar Mediterráneo (Bolívar, 1950).

Fig. 24.—*Speocirolana guerrai* sp. nov., engrosamientos discoidales submarginales, internos y filamentosos, presentes en los pleópodos III a V. No se logró precisar ni su estructura fina, ni sus posibles funciones. Foto F. Jiménez y G. Guajardo.

Varias hipótesis son posibles para explicar el orígen del grupo:

La primera hipótesis indicaría una posible migración del ancestro desde el mar a las tierras emergidas por vía subterranea, con posterior diferenciación en la zona cársica que hoy ocupan sus descendientes. Este tipo de orígen fué sugerido por Bowman (1964) para *Antrolana lira*, de Virginia (EE.UU.), excepto que lo condiciona a un intermediario epigeo. Esta explicación es insostenible al intentar aplicarla a la evolución de especies como las de *Speocirolana*, especialmente al notarse la coincidencia, difícilmente casual, de la distribución del género a lo largo de dos líneas de costa antiguas, improbables de resultar por migración, que además es de un ancestro hipotético.

La segunda indicaría que las especies de *Speocirolana* se encuentran en una serie de localidades que corresponden aproximadamente a lo que según Imlay (1943) y Buckhardt (1930) fué la costa del Jurásico Superior. Sin embargo, la región estuvo sumergida



Figs. 25-27.—*Speocirolana guerrai* sp. nov.: 25, urópodo, macho; 26, urópodo, extremo distal en la hembra; 27, telson, macho.

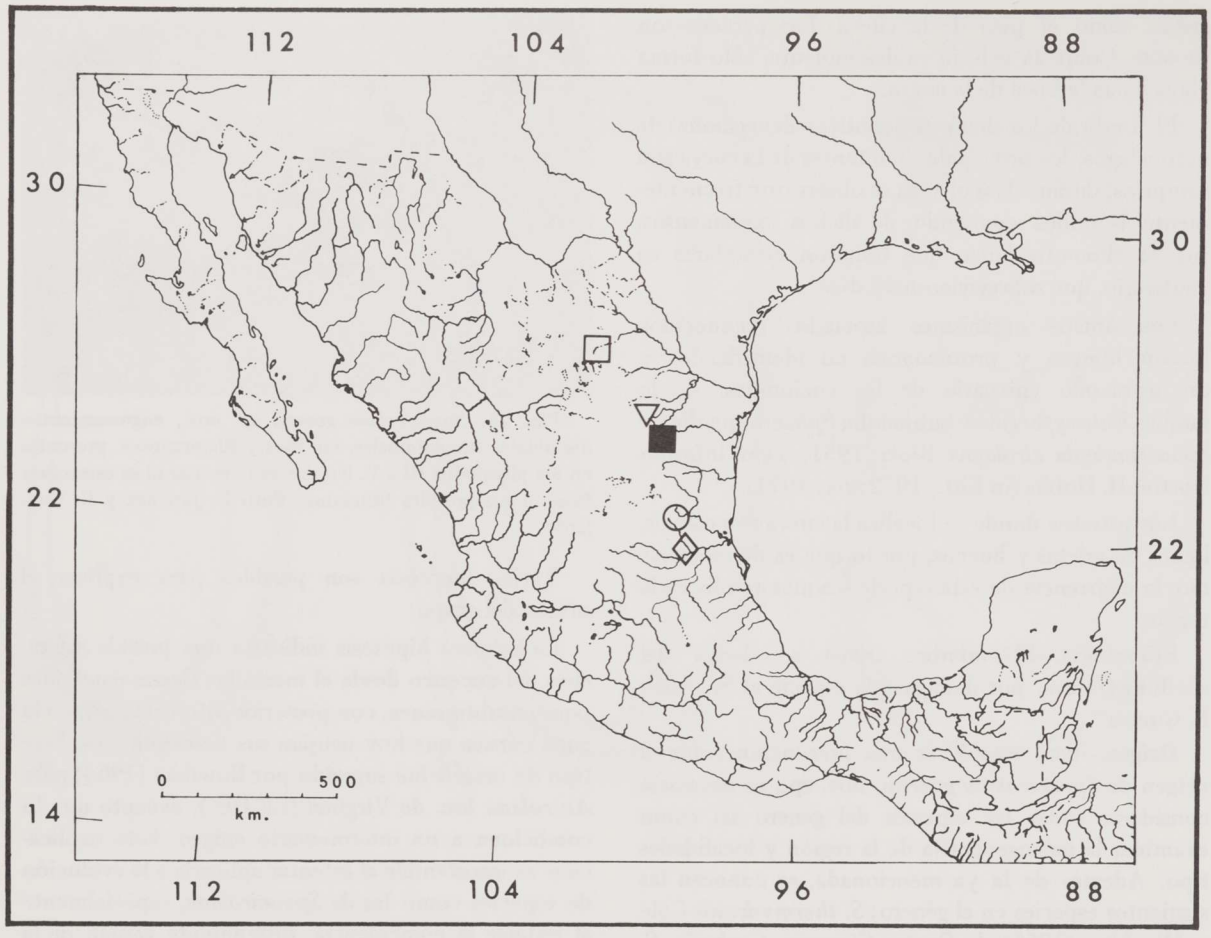


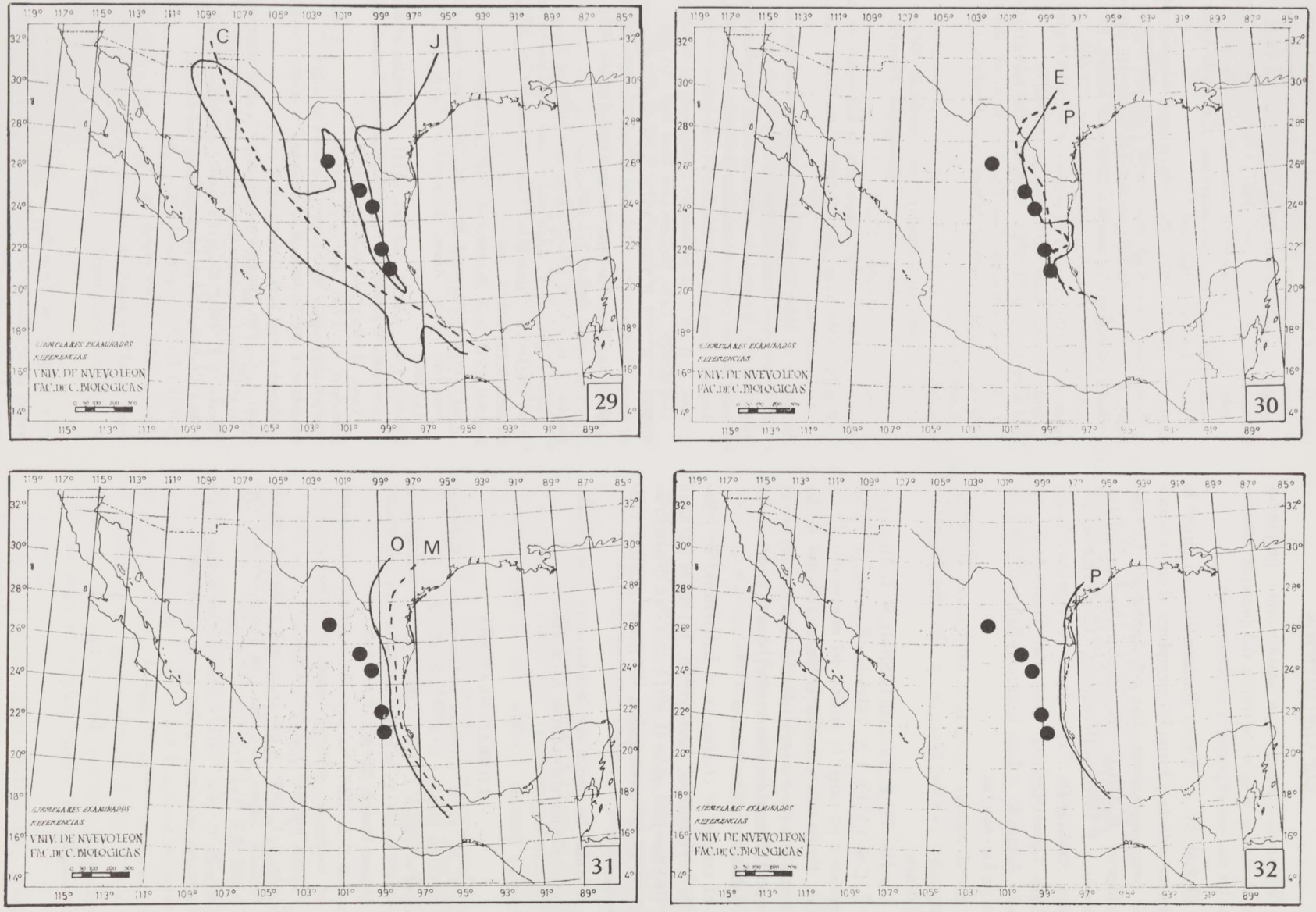
Fig. 28.—Mapa de México con la distribución de las especies de los isópodos cirolánidos del género *Speocirolana:* □ *S. thermydronis* Cole y Minckley. Cuatro Ciénegas, Coahuila; ▽ *"Conilera" stygia* Packard. Monterrey, Nuevo León; ■ *S. guerrai* sp. nov. Contreras y Purata; ○ *S. bolivari* (Rioja). ca. Quintero, Tamaulipas; ◇ *S. pelaezi* (Bolívar). ca. Valles, San Luis Potosí. Las últimas dos son frecuentemente simpátricas en una amplia zona intermedia.

durante la mayor parte del Cretácico, por lo cual el ancestro probablemente costero, no podría haber sobrevivido fácilmente, excepto si ocurriera lo que hoy sucede en la periferia de la Península de Yucatán, dónde las calizas acuíferas dan nacimiento a manantiales de agua dulce mar adentro (Osorio Tafall, 1946), habitados por peces (Cichlidae: *Cichlasoma)* de especies continentales.

En la tercera hipótesis se considera que, a excepción de *S. thermydronis,* las especies habitan cuevas situadas a lo largo del borde oriental del Geosinclinal Mexicano (Imlay, 1938; Alvarez, 1949) hoy Sierra Madre Oriental, de edad Cretácica, región que se elevó entre el Maestrichthiano (Cretácico) y el eoceno Terciario (Schuchert, 1935; 1955; Stuart, 1966; Tamayo, 1962; Ferrusquía, 1978) pasando la línea de costa sucesivamente por las localidades de *Speocirolana,* en un órden mal conocido, pero que hasta donde se aprecia no se refleja en el patrón de diferenciación observado en el género. Desde esas épocas, las transgresiones marinas escasamente han llegado cerca de una ó dos áreas del problema (Figs. 29-32).

De las tres hipótesis, parecen más factibles la segunda y la tercera; ambas coinciden en general con la opinión de Cole y Minckley (1966) quienes atribuyen al género un probable orígen pre-Terciario.

Por la situación zoogeográfica expuesta, se reafirma la suposición de que *"Conilera" stygia* Packard, debió representar una *Speocirolana,* según Cole y Minckley (1966) y Bowman (com. pers.), pues no sería razonable suponer la presencia intermedia de otro género, en medio de un grupo bastante uniforme, que además compartiera la característica principal de poseer los primeros tres pares de pereiópodos prensores y los cuatro restantes ambulatorios. Al no conocerse material tipo, ní encontrarse nuevos ejemplares, el estado de *"Conilera" stygia,* seguirá siendo una incógnita, y se puede quedar como *nomen dubium.*



Figs. 29-32.—Mapas paleogeográficos según diferentes fuentes (redibujados), con la costa actual y las áreas con Isópodos Cirolánidos del género *Speocirolana*, para mostrar el probable orígen pre-Terciario, en las viejas costas de las penínsulas de Coahuila (izquierda) y Tamaulipas (derecha) en Jurásico: 29, Jurásico y Cretácio; 30, Paleoceno y Eoceno; 31, Oligoceno y Mioceno; 32, Plio-pleistoceno.

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SPEOCIROLANA PUBENS AND *S. ENDECA*, NEW TROGLOBITIC ISOPOD CRUSTACEANS FROM MEXICO (FLABELLIFERA: CIROLANIDAE)

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ABSTRACT

Two new species of the cirolanid isopod genus *Speocirolana* are described from Mexican caves: *S. pubens* from Cueva de la Bonita, San Luis Potosí and Cueva del Ojo de Agua de Manantiales, Tamaulipas, and *S. endeca* from Sótano de las Calenturas and Cueva del Tecolote, Tamaulipas.

Of the 9 species of troglobitic cirolanid isopods described from México, 4 are members of the genus *Speocirolana* Bolívar (1950): *S. pelaezi* (Bolívar, 1950) and *S. bolivari* (Rioja, 1953) from the states of San Luis Potosí and Tamaulipas, *S. thermydronis* Cole and Minckley (1966) from central Coahuila, and *S. guerrai* Contreras-Balderas and Purata-Velarde, 1981, this bulletin) from Nuevo León. The 2 new species described herein are the 5th and 6th members of the genus.

Speocirolana pubens, new species
Figs. 1-4

Material examined.—MEXICO: *San Luis Potosí:* Cueva de la Bonita, San Nicolas de los Montes, *ca.* 13 km N of Agua Buena (the latter *ca.* 30 km W of Ciudad Valles), elevation *ca.* 800 m, 3 January 1977 (R. Mitchell, L. Faulkenberry), 2 males (13.8 and 14.3 mm), 4 females (17.3, 17.4, 19.6, and 19.7 mm). The 14.3 mm male is the holotype (USNM 181960); the other specimens are paratypes (USNM 181961). *Tamaulipas:* Cueva del Ojo de Agua de Manantiales, 14 km NNE of Ocampo, 3 September 1979 (W. R. Elliott), 1 female.

Description.—Body about 2.5X as long as wide; width increasing posteriorly to maximum at pereonite 7. Largest female 19.7 mm; largest male 14.3 mm. Head rounded anteriorly, with rudimentary rostral point in some specimens; frontal margin raised into slight ridge. Frontal lamina conical, projecting anteriorly and slightly ventrally in lateral view, pentagonal in ventral view.

Pereonite 1 the longest; pereonites 2-4 subequal, shorter than pereonites 5-7. Coxae with low carinae, increasingly longer and higher; rounded posteriorly, coxa 7 reaching posterior margin of pleonite 3 epimeron.

Pleonites subequal in length; epimera of pleonites 1-3 produced posteriorly. Telson linguiform, 7/8 as long as width at base, without marginal spines or setae.

Antenna 1 reaching nearly to posterior margin of pereonite 1; peduncle segment 3 about 1.4X length of segment 2; flagellum about 20-merous, distal 9 segments, except 8th from last, each with single esthete. Antenna 2 reaching posterior margin of pereonite 5; peduncle segment 5 about 1/3 longer than segment 4; flagellum about 24-merous.

Incisors of mandibles similar except cusps less deeply separated in left mandible; left lacinia with 19 spines; molars with about 25 spines; palp segment 2 nearly 2X length of segment 1, outer margin with row of pectinate setae, inner margin densely hirsute; segment 3 about 2/3 length of segment 1. Exopod of maxilla 1 with 12 spines; endopod with 3 circumplumose spines. Maxilla 2 with 5 and 10 setae on palp and exopod, respectively, endopod with 16 setae of varying lengths. Maxilliped with 2 retinacula.

Pereopod 1 with robust oval propus, greatest width about 0.6 length, palm with 4 stout spines;

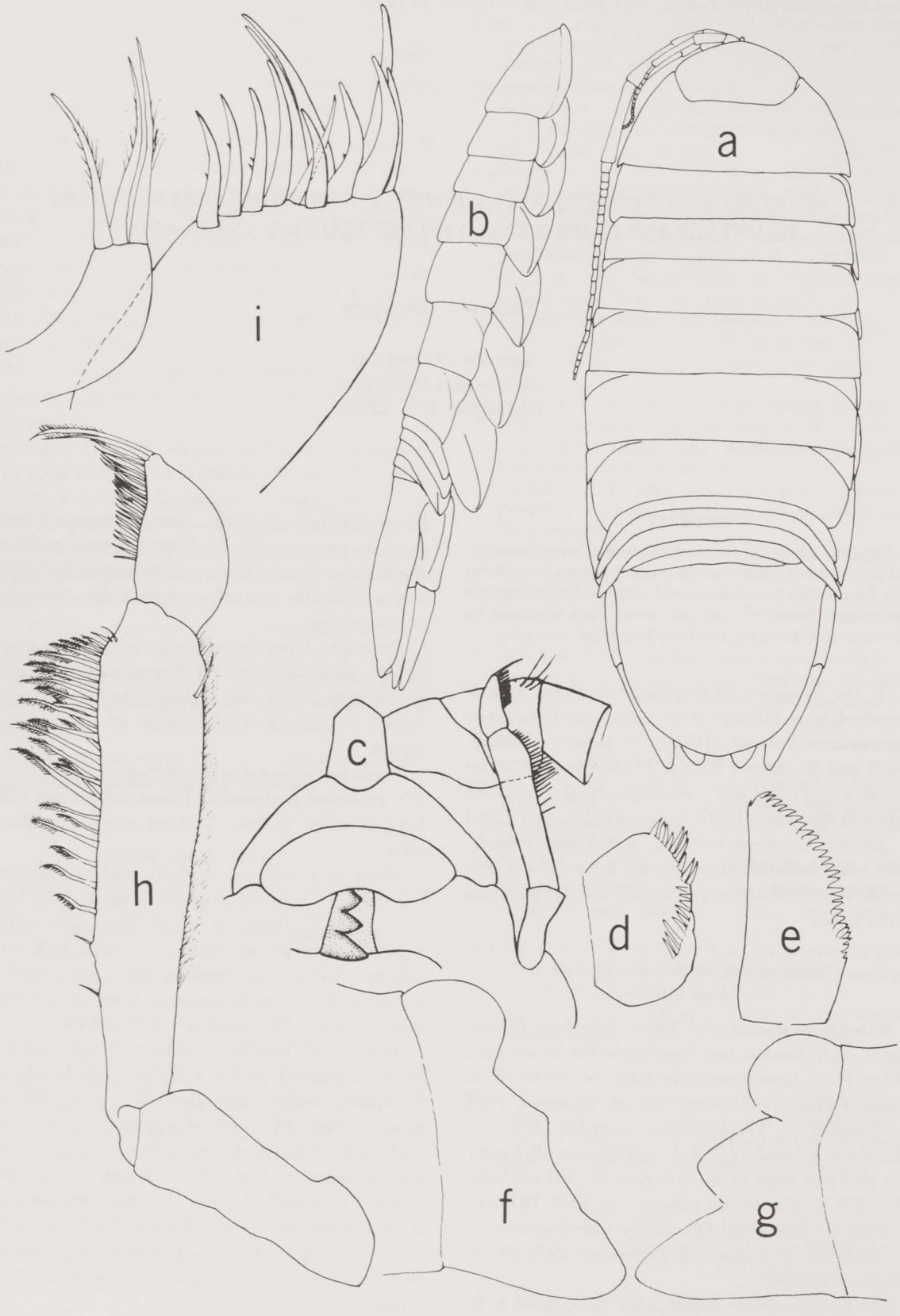

Fig. 1.—*Speocirolana pubens: a,* habitus, dorsal; *b,* habitus, lateral (head not shown); *c,* head, ventral; *d,* lacinia of left mandible; *e,* molar of right mandible; *f-g,* incisors of left and right mandibles; *h,* mandibular palp; *i,* maxilla 1.

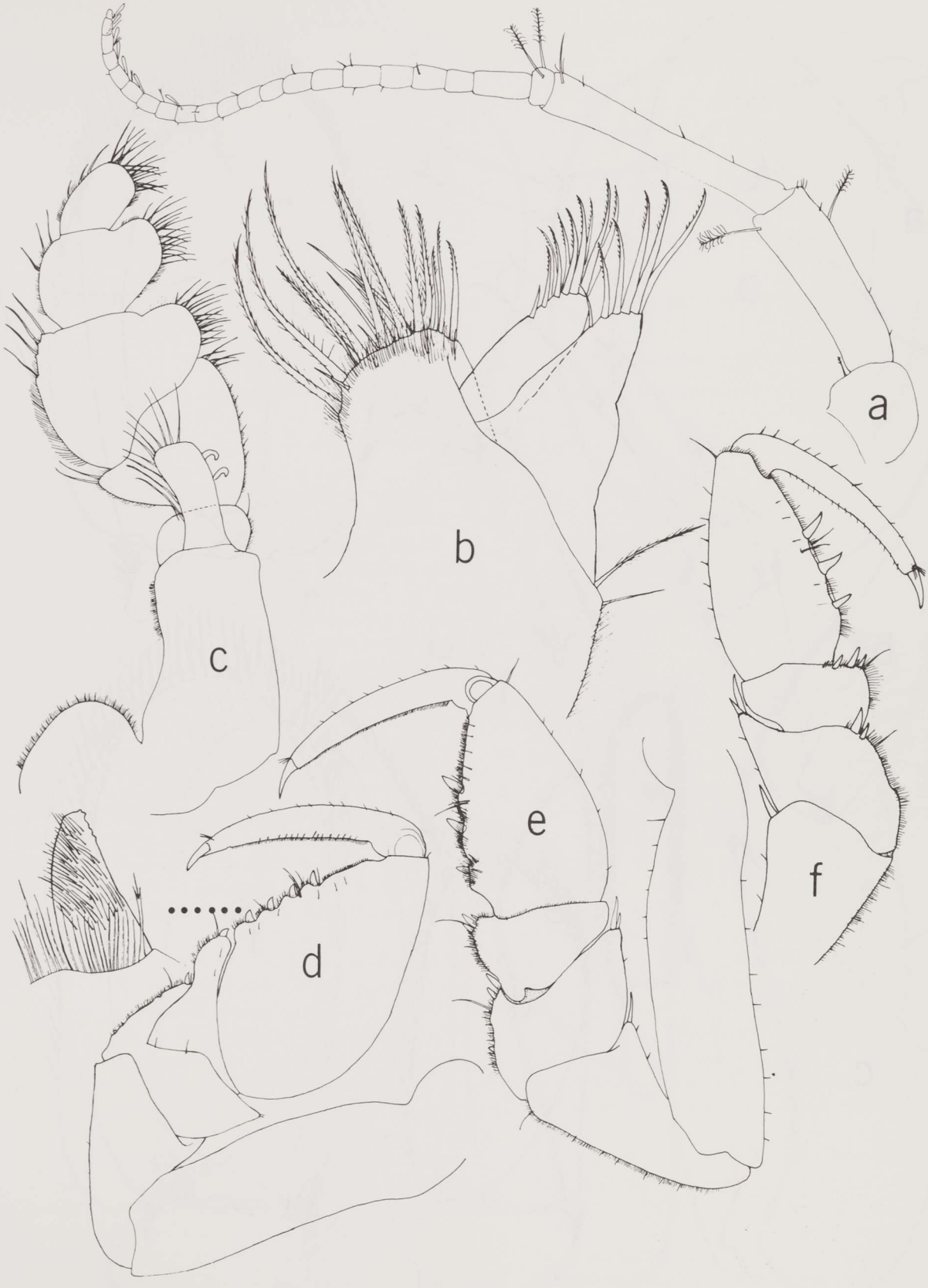

Fig. 2.—*Speocirolana pubens: a,* antenna 1; *b,* maxilla 2; *c,* maxilliped; *d,* pereopod 1; *e,* pereopod 2; *f,* pereopod 3.

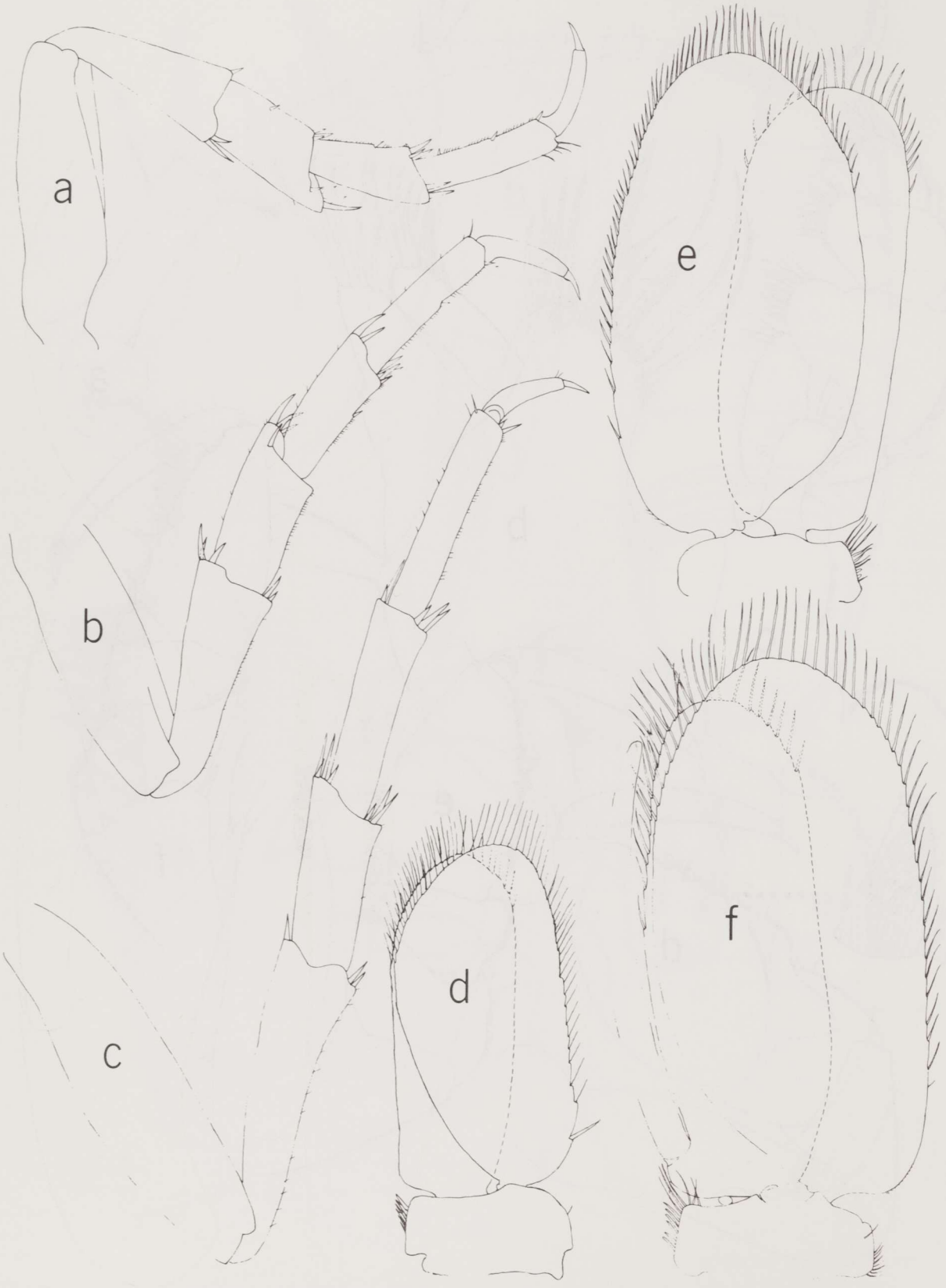

Fig. 3.—*Speocirolana pubens: a*, left pereopod 4; *b*, left pereopod 5; *c*, pereopod 7; *d*, pleopod 1; *e*, pleopod 2, female; *f*, pleopod 2, male.

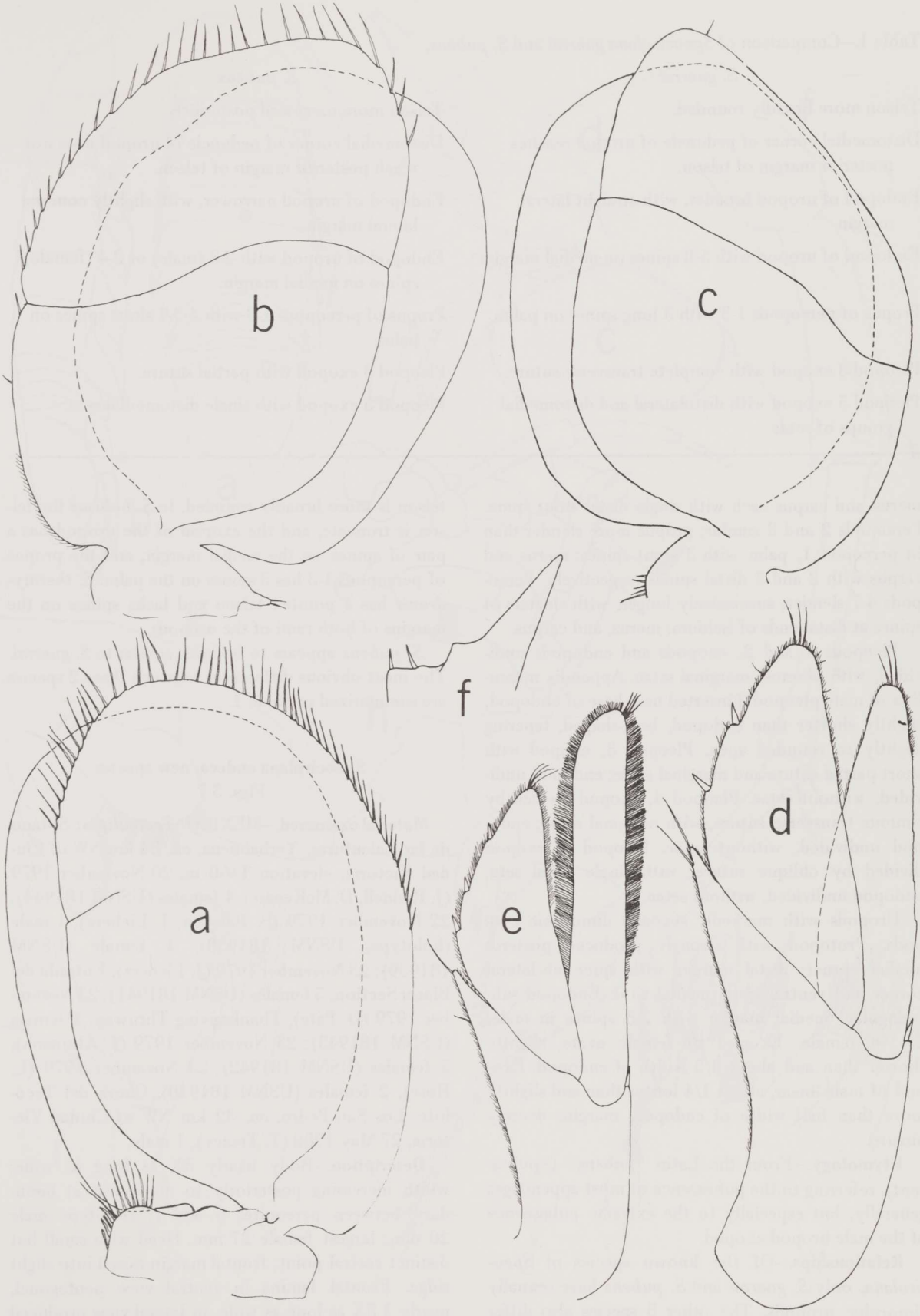

Fig. 4.—*Speocirolana pubens: a*, pleopod 3; *b*, pleopod 4; *c*, pleopod 5; *d*, female uropod; *e*, male uropod; *f*, distal margin of protopod of uropod, ventral.

Table 1.—Comparison of *Speocirolana guerrai* and *S. pubens*.

S. guerrai	*S. pubens*
Telson more broadly rounded.	Telson more narrowed posteriorly.
Distomedial corner of peduncle of uropod reaches posterior margin of telson.	Distomedial corner of peduncle of uropod does not reach posterior margin of telson.
Endopod of uropod broader, with straight lateral margin.	Endopod of uropod narrower, with slightly concave lateral margin.
Endopod of uropod with 5-8 spines on medial margin.	Endopod of uropod with 2-3 (male) or 2-4 (female) spines on medial margin.
Propus of pereopods 1-3 with 3 long spines on palm.	Propus of pereopods 1-3 with 4-3-4 short spines on palm.
Pleopod 3 exopod with complete transverse suture.	Pleopod 3 exopod with partial suture.
Pleopod 5 exopod with distolateral and distomedial groups of setae.	Pleopod 5 exopod with single distomedial seta.

merus and carpus each with single distal stout spine. Pereopods 2 and 3 similar; propus more slender than in pereopod 1, palm with 3 stout spines; merus and carpus with 2 and 3 distal spines respectively. Pereopods 4-7 slender, successively longer, with clusters of spines at distal ends of ischium, merus, and carpus.

Pleopods 1 and 2, exopods and endopods undivided, with plumose marginal setae. Appendix masculina of male pleopod 2 inserted near base of endopod, slightly shorter than endopod, bow-shaped, tapering slightly to rounded apex. Pleopod 3, exopod with short partial suture and marginal setae; endopod undivided, without setae. Pleopod 4, exopod divided by sinuous transverse suture, with marginal setae; endopod undivided, without setae. Pleopod 5, exopod divided by oblique suture, with single distal seta; endopod undivided, without setae.

Uropods with markedly sexually dimorphic exopods. Protopod with strongly produced posteromedial corner; distal margin with spine at lateral corner and ventral spine medial to it. Endopod subtriangular; medial margin with 2-3 spines in male, 2-4 in female. Exopod of female ovate, slightly shorter than and about 3/5 width of endopod. Exopod of male linear, about 1/4 longer than and slightly more than half width of endopod, margins densely hirsute.

Etymology.—From the Latin "pubens" (=pubescent), referring to the pubescence of most appendages generally, but especially to the extreme pubescence of the male uropod exopod.

Relationships.—Of the known species of *Speocirolana*, only *S. guerrai* and *S. pubens* have sexually dimorphic uropods. The other 3 species also differ in other respects from *S. pubens*. In *S. pelaezi* the telson is more broadly rounded. In *S. bolivari* the telson is truncate, and the exopod of the uropod has a pair of spines on the medial margin, and the propus of pereopods 1-3 has 3 spines on the palm. *S. thermydronis* has a pointed telson and lacks spines on the margins of both rami of the uropods.

S. pubens appears to be most similar to *S. guerrai*. The most obvious differences between these 2 species are summarized in Table 1.

Speocirolana endeca, new species
Figs. 5-7

Material examined.—MEXICO: *Tamaulipas:* Sótano de las Calenturas, Yerbabuena, *ca.* 34 km NW of Ciudad Victoria, elevation 1460 m, 20 November 1979 (J. Reddell, D. McKenzie), 4 females (USNM 181944); 22 November 1979 (S. Balsdon, J. Lieberz), 1 male (holotype, USNM 181938), 1 female (USNM 181939); 23 November 1979 (J. Lieberz), Entrada del Blazer Section, 5 females (USNM 181941); 23 November 1979 (D. Pate), Thanksgiving Thruway, 1 female (USNM 181943); 23 November 1979 (J. Atkinson), 5 females (USNM 181942); 23 November 1979 (L. Hose), 2 females (USNM 181940). Cueva del Tecolote, Los San Pedro, *ca.* 32 km NW of Ciudad Victoria, 27 May 1980 (T. Treacy), 1 male.

Description.—Body nearly 3X as long as wide; width increasing posteriorly to maximum at boundary between pereonites 6 and 7. Holotype male 20 mm; largest female 27 mm. Head with small but distinct rostral point; frontal margin raised into slight ridge. Frontal lamina in ventral view pentagonal, nearly 1.5X as long as wide, in lateral view produced into point directed anteriorly and slightly ventrally.

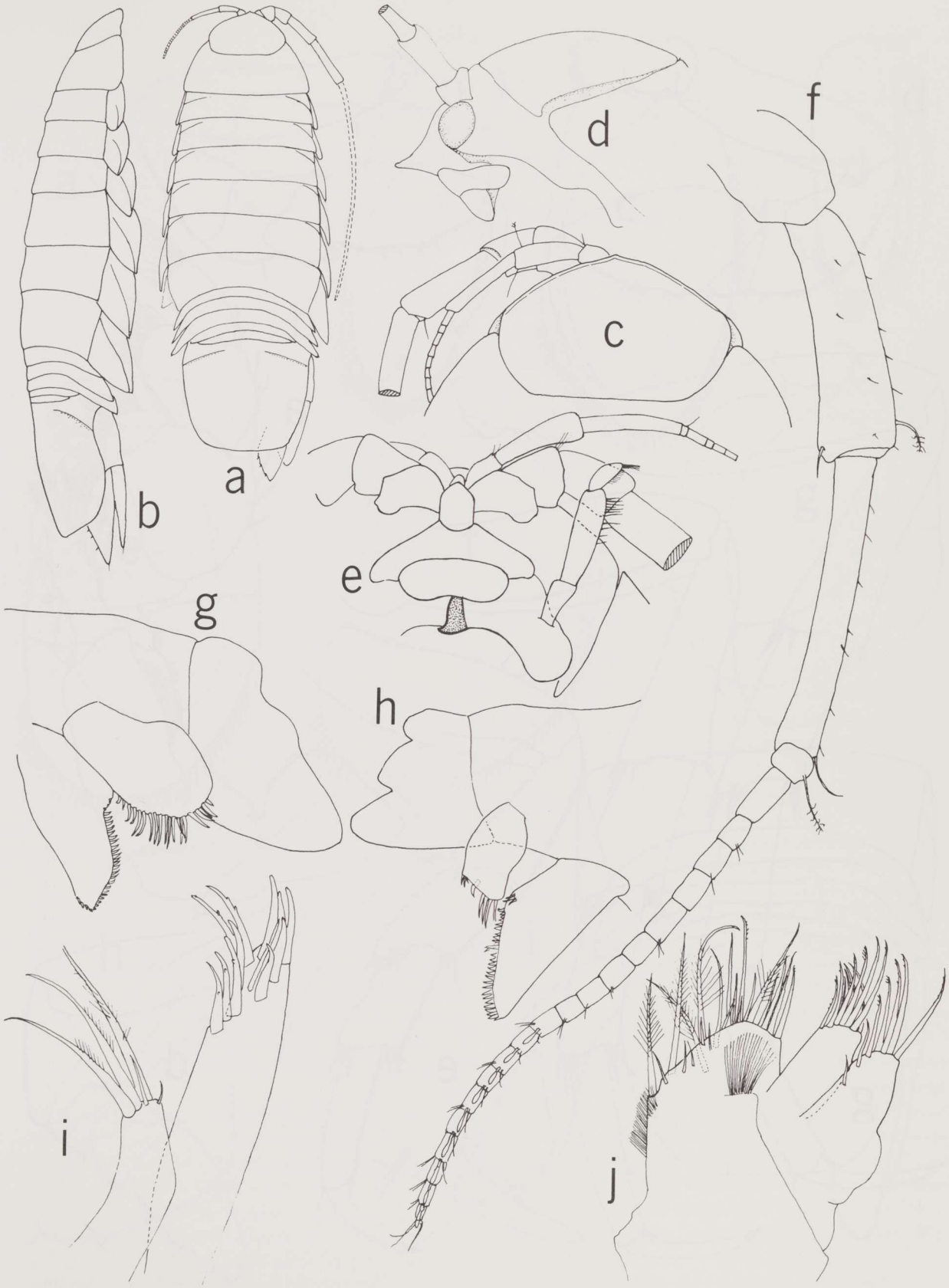

Fig. 5.—*Speocirolana endeca: a,* habitus, dorsal; *b,* habitus, lateral; *c,* head, dorsal; *d,* head, lateral; *e,* head, ventral; *f,* antenna 2; *g-h,* left and right mandibles; *i,* maxilla 1; *j,* maxilla 2.

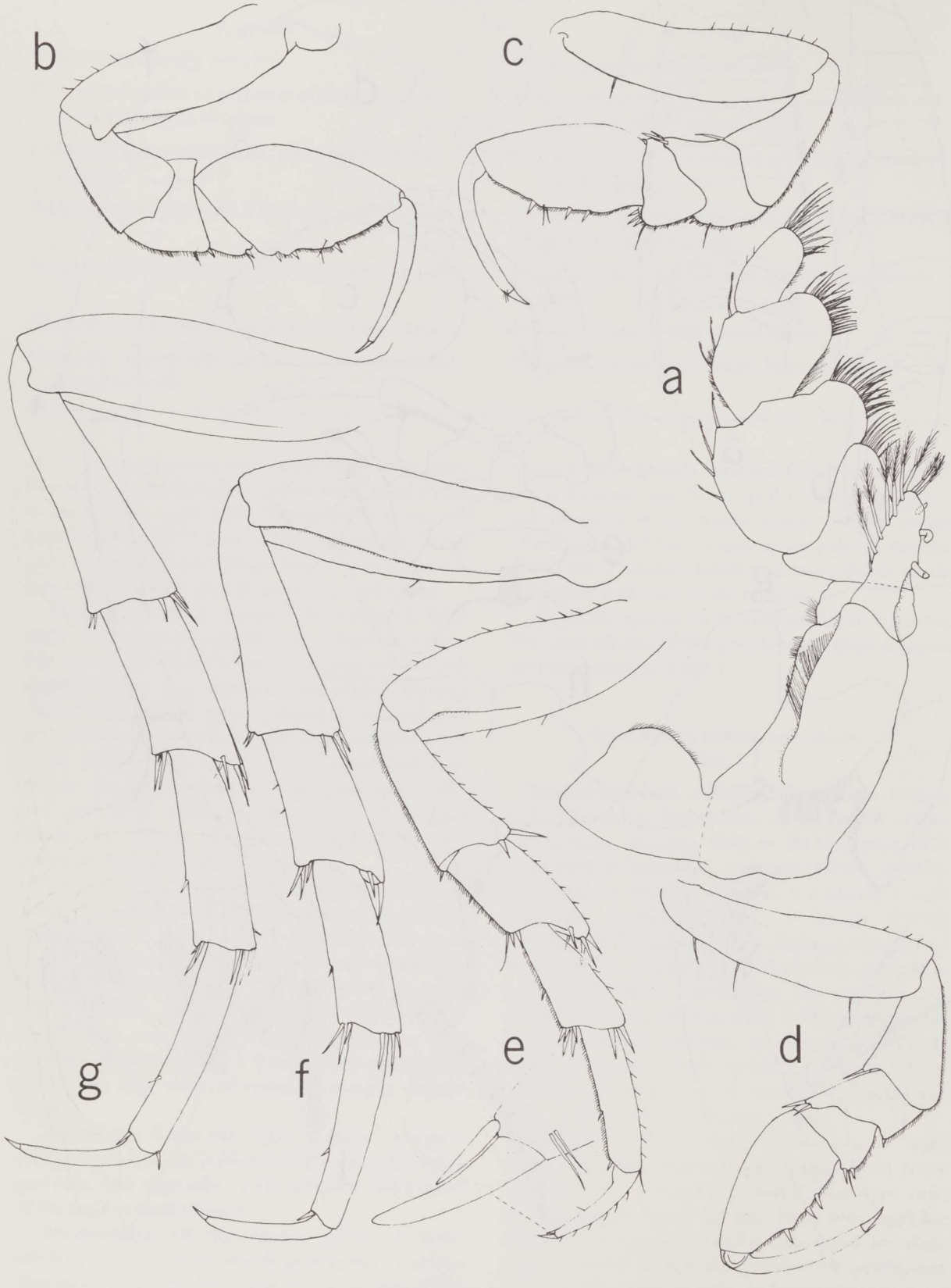

Fig. 6.—*Speocirolana endeca*: *a*, maxilliped; *b-f*, pereopods 1-5; *g*, pereopod 7.

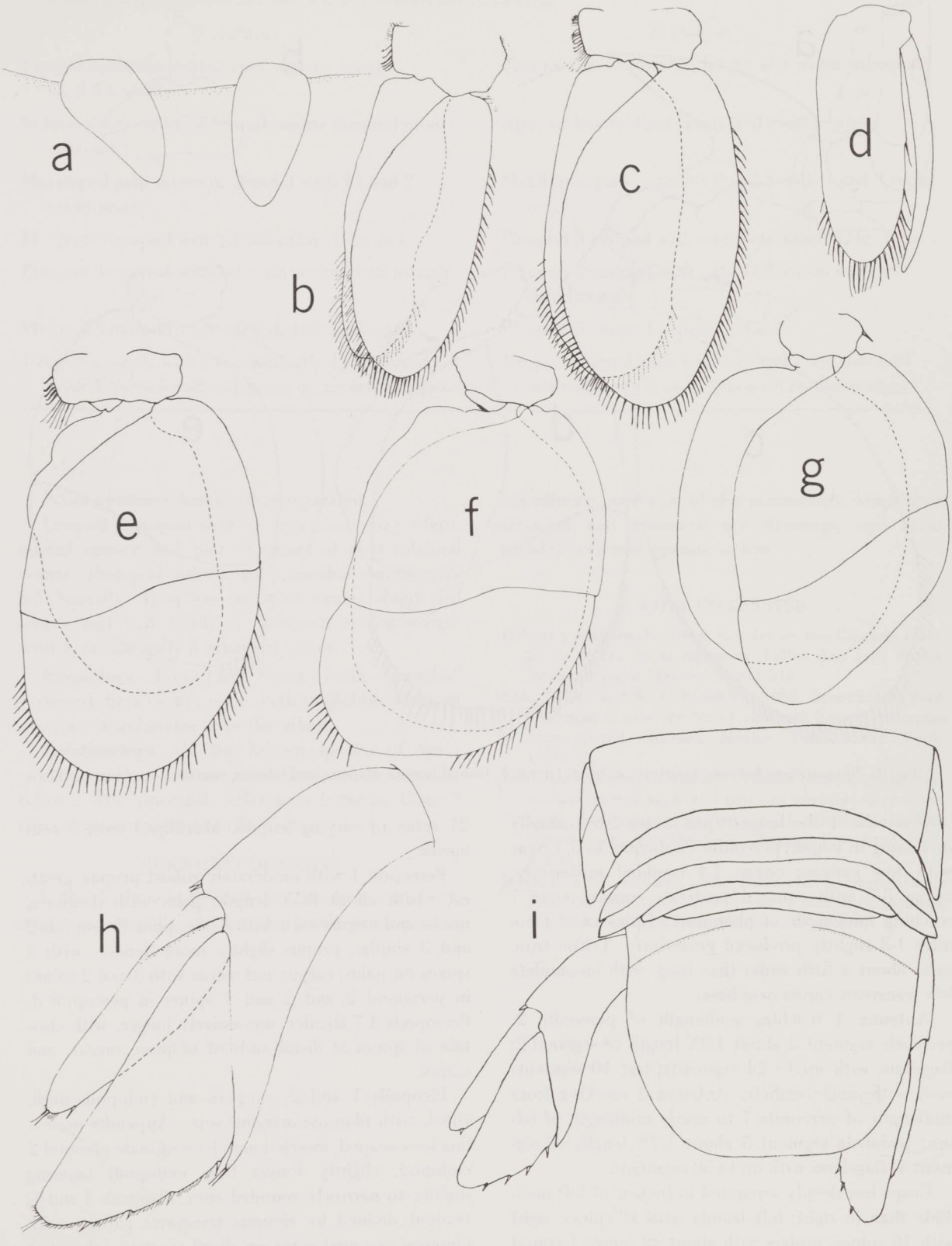

Fig. 7.—*Speocirolana endeca: a,* penes; *b,* pleopod 1; *c,* pleopod 2, female; *d,* pleopod 2 endopod, male; *e-g,* pleopods 3-5; *h,* uropod, ventral; *i,* pleonite 7, pleon, and telson, dorsal.

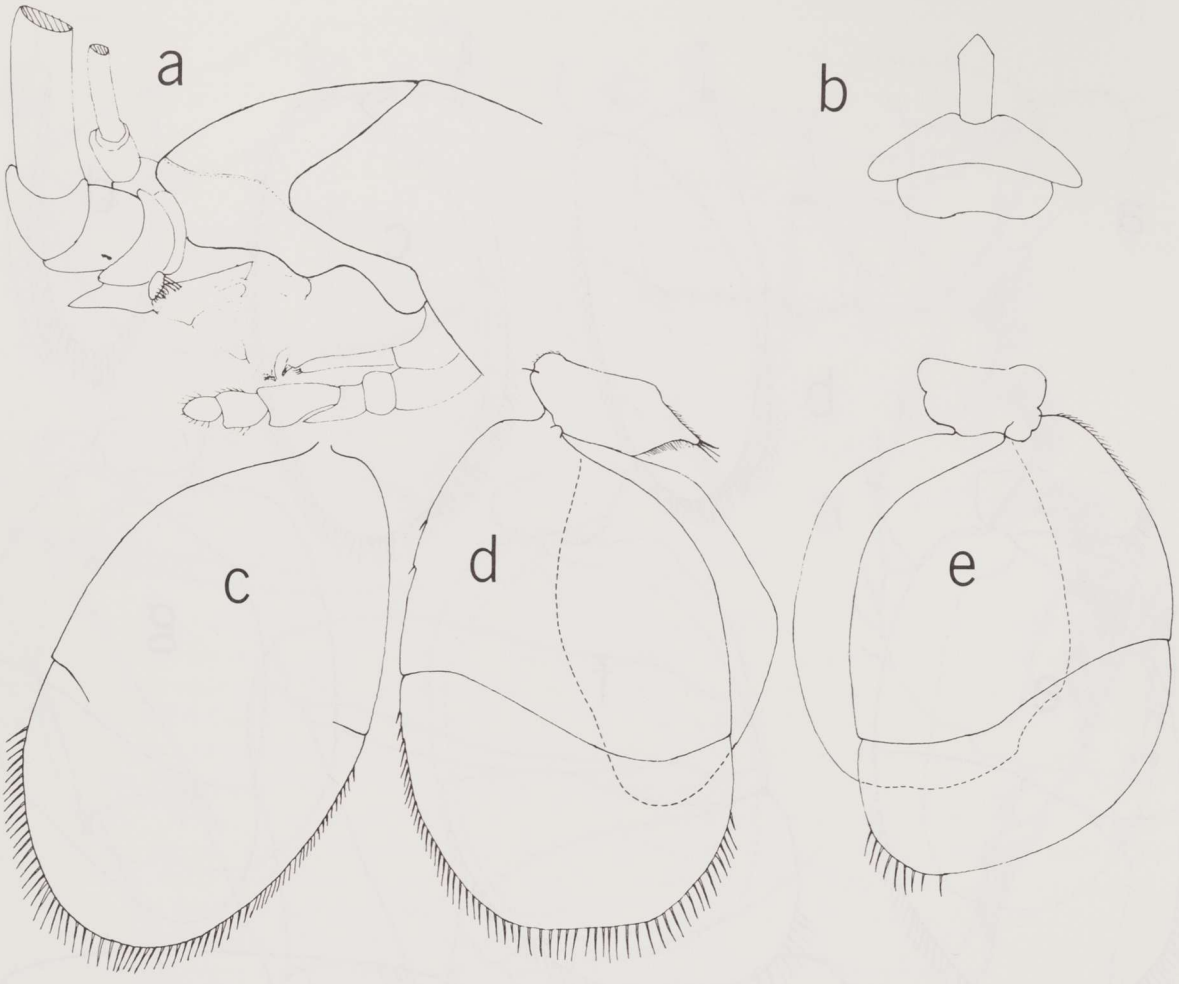

Fig. 8.—*Speocirolana bolivari*, topotype: *a*, head, lateral; *b*, frontal lamina, clypeus, and labrum, ventral; *c-e*, pleopods 3-5.

Pereonite 1 the longest; pereonites 2-6 gradually increasing in length; pereonite 7 subequal to 5. Coxae with low carinae; coxae 2-4 rounded posteriorly, coxae 5-7 with squared posterior corners, coxa 7 reaching midlength of pleonite 2. Epimera of pleonites 1-3 slightly produced posteriorly. Telson truncate, about a fifth wider than long, with incomplete low transverse carina near base.

Antenna 1 reaching midlength of pereonite 2; peduncle segment 3 about 1.3X length of segment 2; flagellum with up to 24 segments; last 10 segments each with single esthete. Antenna 2 reaching from midlength of pereonite 7 to nearly midlength of telson; peduncle segment 5 about 1.7X length of segment 4; flagellum with up to 50 segments.

Cusps less deeply separated in incisor of left mandible than in right; left lacinia with 19 spines, right with 16 spines; molars with about 30 spines. Exopod of maxilla 1 with 12 spines; endopod with 3 plumose spines and 2 small setae. Maxilla 2 with 5 and 10 setae on palp and exopod respectively; endopod with 21 setae of varying lengths. Maxilliped with 3 retinacula.

Pereopod 1 with moderately robust propus; greatest width about 0.5X length; palm with 3 spines, merus and carpus each with single spine. Pereopods 2 and 3 similar; propus slightly more slender, with 3 spines on palm; carpus and merus with 3 and 2 spines in pereopod 2 and 2 and 1 spines in pereopod 3. Pereopods 4-7 slender, successively longer, with clusters of spines at distal ends of ischium, merus, and carpus.

Pleopods 1 and 2, exopods and endopods undivided, with plumose marginal setae. Appendix masculina bow-shaped, inserted near base of male pleopod 2 endopod, slightly longer than endopod, tapering slightly to narrowly rounded apex. Pleopods 3 and 4, exopod divided by sinuous transverse suture, with plumose marginal setae on distal segment (absent at apex of pleopod 4); endopod undivided, without setae. Pleopod 5, exopod divided by oblique suture; endopod undivided, both without setae.

Table 2.–Comparison of *Speocirolana bolivari* and *S. endeca*.

S. bolivari	*S. endeca*
Frontal lamina in ventral view narrow, length ca. 2.5X width.	Frontal lamina broader, length and width subequal.
In lateral view apex of frontal lamina directed more anteriad.	Apex of frontal lamina directed more ventrad.
Maxilliped palp segments 2 and 3 with 11 and 7 outer setae.	Maxilliped palp segments 2 and 3 with 4 and 3 outer setae.
Pleopod 3 exopod with partial suture (Fig. 8c).	Pleopod 3 exopod with complete suture (Fig. 7e).
Pleopod 4 exopod with setae on entire distal margin.	Pleopod 4 exopod with setae lacking on most of distal margin.
Pleopod 5 exopod with a few distomedial setae.	Pleopod 5 exopod without setae.
Uropod exopod with 2 (occasionally 1), endopod with 5 (occasionally 4) spines on medial margins.	Uropod exopod with 1 (occasionally 2), endopod with 4 (rarely 3 or 5) spines on medial margins.

Penes pyriform, bases widely separated.

Uropod protopod with strongly produced posteromedial corner and pair of spines at posterolateral corner. Endopod subtriangular; medial margin with 3-5 (usually 4) spines. Exopod ovate, about 4/5 length and half width of endopod; medial margin with 1, occasionally 2 subapical spines.

Etymology.–From the Greek noun "endeka" (=eleven), because this is the 11th troglobitic Mexican species of Cirolanidae to be described.

Relationships.–Of the known species of *Speocirolana*, only *S. bolivari* and *S. endeca* have truncate telsons. The principal differences between these 2 species are summarized in Table 2.

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I thank James Reddell for sending me these interesting isopods and for the gentle pressure that expedited completion of this manuscript. Ann Cohen arranged and mounted my drawings, and Brian Kensley reviewed the manuscript.

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THREE NEW STENASELLID ISOPODS FROM MEXICO (CRUSTACEA: ASELLOTA)

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ABSTRACT

Descriptions and illustrations are given of *Mexistenasellus colei*, from Cueva del Infiernillo, Tamaulipas; *M. nulemex*, from a mine below Cueva de la Boca, Nuevo León; and *Etlastenasellus confinis*, from Cueva del Guayabo, Oaxaca. A key is given to Mexican Stenasellidae, based on the exopod of the 4th pleopod. It is suggested that the ancestors of Mexican Stenasellidae inhabited the marine embayment that covered most of central and eastern México at the end of the Cretaceous or beginning of the Tertiary.

Subterranean aquatic isopods of the family Stenasellidae were first discovered in the Old World in the late 19th century (Dolfuss, 1897). It was not until 1972, when about 25 Stenasellidae had been described from southern Europe and Africa (Magniez, 1974), that the first new-world stenasellid was described, *Mexistenasellus coahuila* Cole and Minckley, 1972. Since then, 4 more species of new-world stenasellids have been described: *Mexistenasellus parzefalli* Magniez, 1972 (male described by Magniez, 1973); *M. wilkensi* Magniez, 1972; *M. magniezi* Argano, 1974; and *Etlastenasellus mixtecus* Argano, 1977. These 5 new-world stenasellids are inhabitants of México; no stenasellids have been reported from other American countries, but a single specimen has been collected from a well in Texas (Glenn Longley, in litt., 13 September 1976).

The 3 new species of Stenasellidae described herein increase the new-world species to 8, all from México. Their known distribution is shown in Fig. 1.

Mexistenasellus Cole and Minckley, 1972

Mexistenasellus Cole and Minckley, 1972:314 [Type-species, by original designation and monotypy, *Mexistenasellus coahuila* Cole and Minckley, 1972.]

Mexistenasellus colei, new species
Figs. 2-4

Material examined.—MEXICO: *Tamaulipas:* Cueva del Infiernillo, near Conrado Castillo, *ca.* 75 km. (by road) SW of El Barretal, 8 May 1977 (Peter Sprouse), 2 female paratypes (USNM 172213) in deep pool about 500 m from cave entrance; 27 December 1977 (David McKenzie), 2 male paratypes (USNM 172212) in pool in righthand passage, T 14°, swimming on bark chips; April 1978 (Peter Sprouse), male holotype (USNM 172210) and 7 male and 6 female paratypes (USNM 172211) in Main Sump.

Description.—Blind, unpigmented in alcohol. Total length, excluding uropod, up to 11.5 mm. Body slender, length about 5X width. Head width about 1.4X length; rostrum short, obtuse. Coxae visible dorsally. Pleotelson about 0.2X longer than wide, lateral margins setose; caudomedial lobe low, bordered by 2 setae.

Antenna 1 reaching to about 8th flagellar segment of antenna 2, flagellum 12-16-merous, last 10 segments each with esthete. Antenna 2 reaching to about midlength of pereonite 6, flagellum 35-40-merous. Mandible with 4-cuspate incisors; lacina of left mandible 5-cuspate; spine-row with 12 spines in right, 6 spines in left mandible; right molar with 9 setae, ventralmost very short, left molar with 12 setae; 1st segment of palp with single long seta, 2nd segment with row of setae on distal 1/3, 3rd segment with long apical seta and 10 additional setae in right, 12 additional setae in left mandible. Maxilla 1, outer ramus with 12 dentate apical spines and a shorter subapical spine; inner ramus with 4 apical spines. Lobes of maxilla 2 (outer to inner) with 10, 9, and 14 setae. Maxilliped with sparsely armed endite, with 4 and 3 retinacula on right and left sides.

Fig. 1.—Distribution of Stenasellidae in México: 1, *Mexistenasellus coahuila;* 2, *M. nulemex;* 3, *M. colei;* 4, *M. parzefalli* and *M. wilkensi;* 5, *M. magniezi;* 6, *Etlastenasellus confinis;* 7, *E. mixtecus.*

Pereopod 1 similar in male and female; propus more than 2X as long as broad; palm slightly convex, proximal half armed with 6 robust spines; posterior margin of carpus with 5 spines with dentate apices; dactyl with slender spine paralleling claw for 0.6 of its length, subterminal robust spine, and several setae along posterior margin. Pereopods 2-4 slender; posterior margin of carpus spinose; pereopod 4 not sexually dimorphic. Pereopods 5-7 slender, successively longer; pereopod 7 much the longest.

Male pleopod 1 exopod oval, with 10 marginal setae. Male pleopod 2 protopod 1.5X longer than wide, with 4 distolateral setae; exopod with slightly diagonal suture between segments; distal segment slightly shorter than proximal segment, with single apical seta. Endopod distal segment oblong, broadening slightly distally; anterior surface with groove medial to midwidth, broadening proximally, overlapped near midlength by fold from either side, medial fold external; cannula projecting apically lateral to groove.

Female pleopod 2 pyriform, with long seta on lateral margin and shorter subapical seta. Pleopod 3 exopod oval, with transverse suture at midlength, 2 apical setae and a short seta on surface of proximal segment; endopod about 0.3 width of exopod, reaching proximal 1/4 of distal exopod segment. Pleopod 4 exopod distinctly shorter and about 0.4 width of endopod; proximal segment 1.4X length of distal segment. Pleopod 5 exopod narrow, linear; proximal segment subequal in length to endopod; distal segment 1/4 length of proximal segment.

Uropods slender, linear; exopod distinctly shorter than endopod; both rami with apical cluster of long setae.

Etymology.—Named for Dr. Gerald A. Cole, distinguished carcinologist and limnologist, and codiscoverer of the 1st *Mexistenasellus.*

Relationships.—The affinities of *M. colei* are not evident, but I have the impression that it is most similar to *M. coahuila.* Diagnostic features of *M. colei* are 4 spines on maxilla 1 inner ramus, 3 and 4 retinacula on maxillipeds, slender propus of pereopod 1, form of male pleopod 2, sparse setation of female pleopods 2 and 3, and slender exopods of pleopods 4 and 5.

Fig. 2.—*Mexistenasellus colei;* 10.7 mm female: *a*, habitus, dorsal; *b*, right antenna 1, dorsal; *c*, right antenna 2 peduncle, dorsal; *d*, right mandible; *e*, *f*, incisors of right and left mandibles; *g*, lacinia of left mandible; *h*, left mandibular palp; *i*, right maxilliped; *j*, endite of left maxilliped.

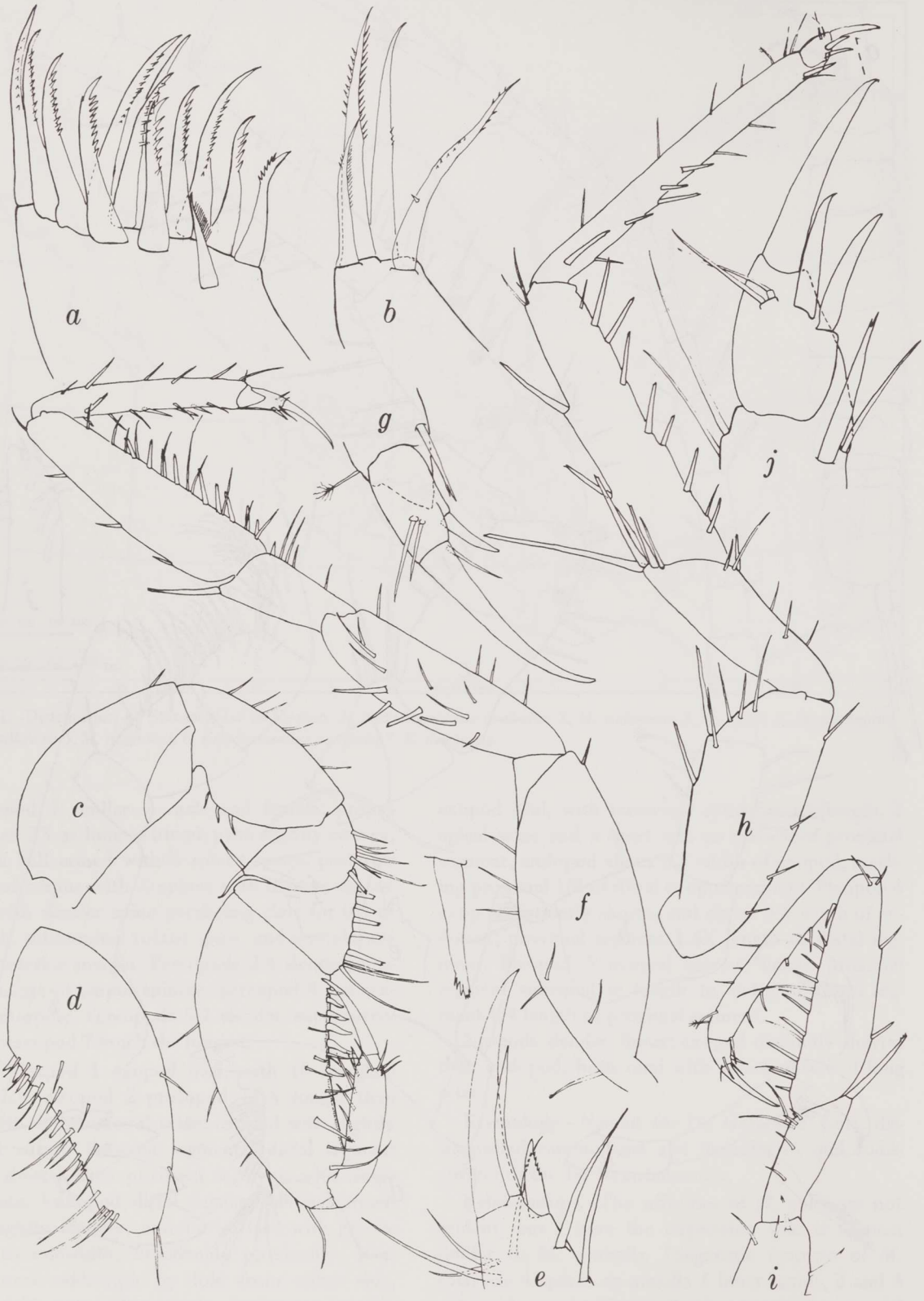

Fig. 3.—*Mexistenasellus colei*, *a-h*, female: *a*, maxilla 1, outer ramus; *b*, same, inner ramus; *c*, right pereopod 1, medial; *d*, propus of same, lateral; *e*, apex of dactyl of same, lateral; *f*, pereopod 2, lateral; *g*, dactyl of same, medial; *h*, pereopod 4; *i*, male pereopod 4.

Fig. 4.—*Mexistenasellus colei: a,* male pleopod 1; *b,* male pleopod 2, anterior; *c,* male pleopod 2, posterior; *d,* right female pleopod 2; *e,* female pleopod 3; *f,* female pleopod 4; *g,* female pleopod 5; *h,* female uropod, dorsal; *i,* uropod protopod, ventral.

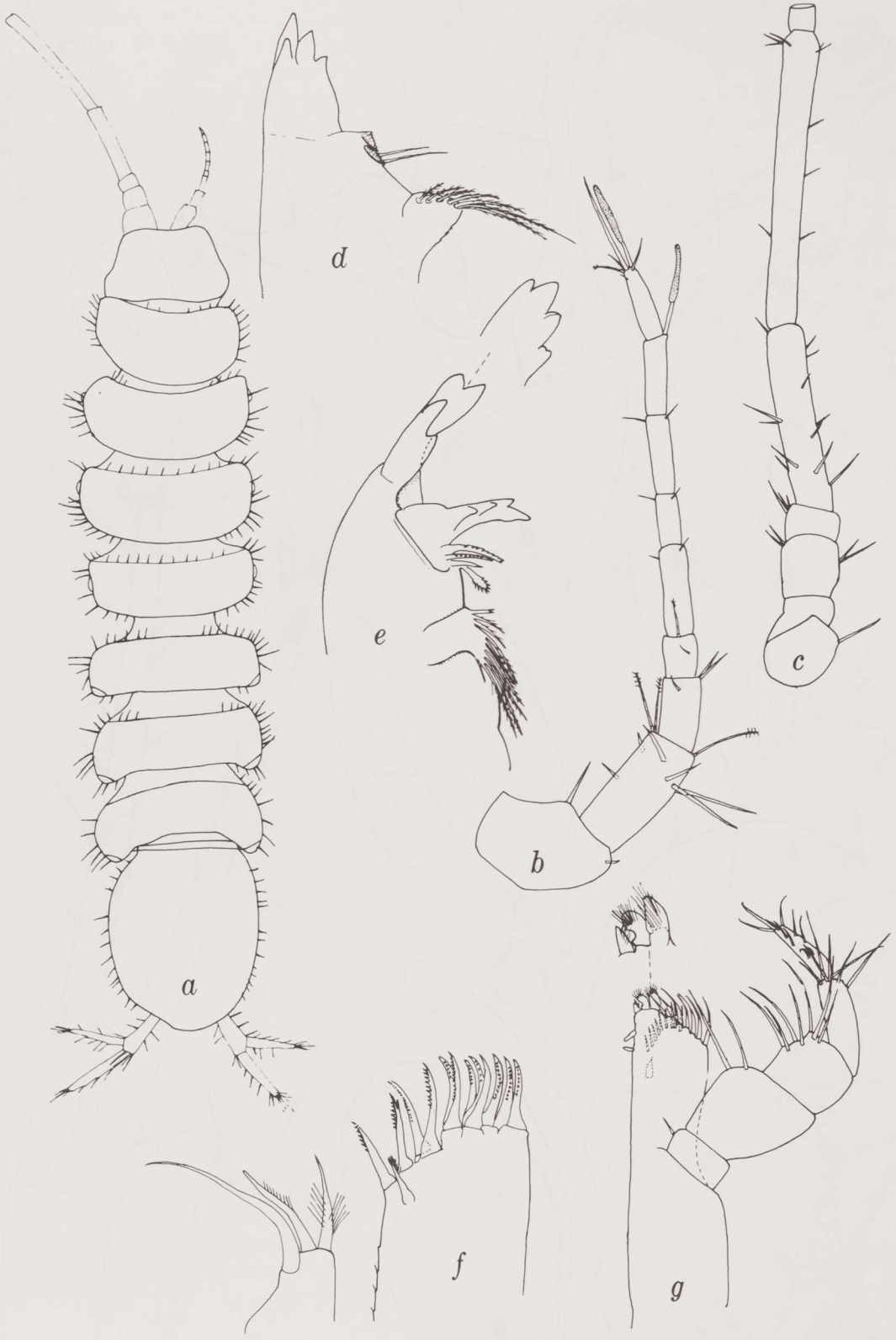

Fig. 5.—*Mexistenasellus nulemex*, female: *a*, habitus, dorsal; *b*, antenna 1; *c*, antenna 2, peduncle; *d*, right mandible; *e*, left mandible; *f*, maxilla 1; *g*, maxilliped.

Mexistenasellus nulemex, new species
Figs. 5-7

Material examined—MEXICO: *Nuevo León:* Mine below Cueva de la Boca, Santiago (20 mi. SE Monterrey), 22 June 1971 (Stewart Peck), male holotype (USNM 173663) and 8 female and 3 male paratypes (USNM 173664) on wood.

Description.—Blind, unpigmented in alcohol. Total length, excluding uropods, up to 5.9 mm (male holotype); largest female 5.3 mm. Body slender, length about 4.5X width. Head width about 1.7X length; rostrum not developed. Coxae visible dorsally. Pleotelson about 0.2X longer than wide; lateral margins slightly convex, setose; caudomedial lobe low.

Antenna 1 reaching beyond midlength of 5th peduncle segment of antenna 2; flagellum 6-merous, distal 2 segments each with esthete. Antenna 2 reaching just beyond posterior margin of pereonite 5; flagellum with up to about 45 segments. Mandibles with 4-cuspate incisors; lacinia of left mandible 4-cuspate; spine-row of left mandible with 4 serrate spines, that of right mandible with 2 triangular spines with 1 dentate margin and 2 slender naked spines; left molar with 11 setae, right molar with 7 setae. Maxilla 1, outer ramus with 12 dentate spines and shorter subterminal plumose spine; inner ramus with 3 apical spines. Maxilliped endite with 3 blunt fringed apical spines and 2 retinacula.

Male pereopod 1 propus robust, palm markedly convex, with 4 large conical spines proximally and 6 short stout conical spines distally; merus and carpus each with 3 slender spines on posterior margin. Female pereopod 1 propus more slender; palm nearly straight, armed with slender spines; dactyl flexor margin with about 5 obliquely directed spines. Pereopods 2-7 slender, moderately spinose, successively longer.

Male pleopod 1 exopod subrectangular, about twice as long as wide, with 3 apical setae. Male pleopod 2 protopod slightly wider than long, unarmed; exopod 2-merous, proximal segment with seta at distolateral corner, distal segment short, semicircular, with 3 setae on lateral margin; endopod with short proximal segment, distal segment about 3X as long as wide, distal third bent laterad at angle of about 35° and produced at distolateral corner into conical process, orifice located on anterior surface at about midlength of bent part of segment, from it emerges dense group of setae reaching beyond apex of segment. Female pleopod 2 triangular, with 2 apical setae and 1 at midlength of lateral margin. Pleopod 3 exopod suboblong, segments about equal in length, with setae on margins and on anterior surface of distal segment; endopod nearly half width of exopod, reaching about proximal 3rd of exopod distal segment. Pleopod 4 exopod about 2X as long as wide, with oblique suture, distal segment with setose medial margin; endopod about half width of exopod, reaching slightly beyond suture. Pleopod 5 exopod longer and slightly narrower than endopod, distal segment about 1/4 length proximal segment; endopod with partial suture near midlength. Uropod about 2/3 length of pleotelson; rami slender, linear; endopod about 5/6 length of protopod; exopod about 5/6 length of endopod.

Etymology.—A contraction of *Nuevo León, México.*

Relationships.—*M. nulemex* appears to be most similar to *M. parzefalli.* Maxilla 1 inner ramus has 3 apical spines in these 2 species and in *M. magniezi,* 4 in the other 3 species. The male pereopod 1 is similar in *M. nulemex* and *M. parzefalli;* the propus is more strongly developed and its palm more heavily armed with spines than in *M. coahuila* and *M. colei* (the male is unknown in *M. wilkensi* and *M. magniezi*). The male pleopod 2 distal orifice of *M. parzefalli* and *M. nulemex* has numerous emergent setae; these are not present in *M. coahuila* and *M. colei.*

M. nulemex is much smaller than *M. parzefalli* (5.9 mm vs. 14 mm). *M. nulemex* has a shorter distal exopod segment of male pleopod 2 with fewer marginal setae, a different shape of the distal endopod segment of male pleopod 2 and a subterminal position of the orifice.

M. magniezi is of comparable length (5.5 mm) to *M. nulemex,* but has twice as many spines in the mandibular spine rows, a transverse suture in pleopod 4 exopod, and a much shorter uropod protopod.

Etlastenasellus Argano, 1977

Etlastenasellus Argano, 1977:117 [Type-species, by original designation and monotypy, *Etlastenasellus mixtecus* Argano, 1977.]

Etlastenasellus confinis, new species
Figs. 8-10

Material examined.—MEXICO: *Oaxaca:* Cueva del Guayabo, 12 km N Valle Nacional, 29 Dec. 1972 (James Reddell, David McKenzie, Martha Helen McKenzie, Stuart Murphy), male holotype (USNM 173394) and 12 paratypes (USNM 173395) in small rimstone-lined drip pool about 800 m from cave entrance.

Description.—Blind, unpigmented in alcohol. Total length of largest specimen (holotype), exluding uropods, 3.7 mm. Body moderately slender, length about 4X width. Head width about 1.6X length; anterior

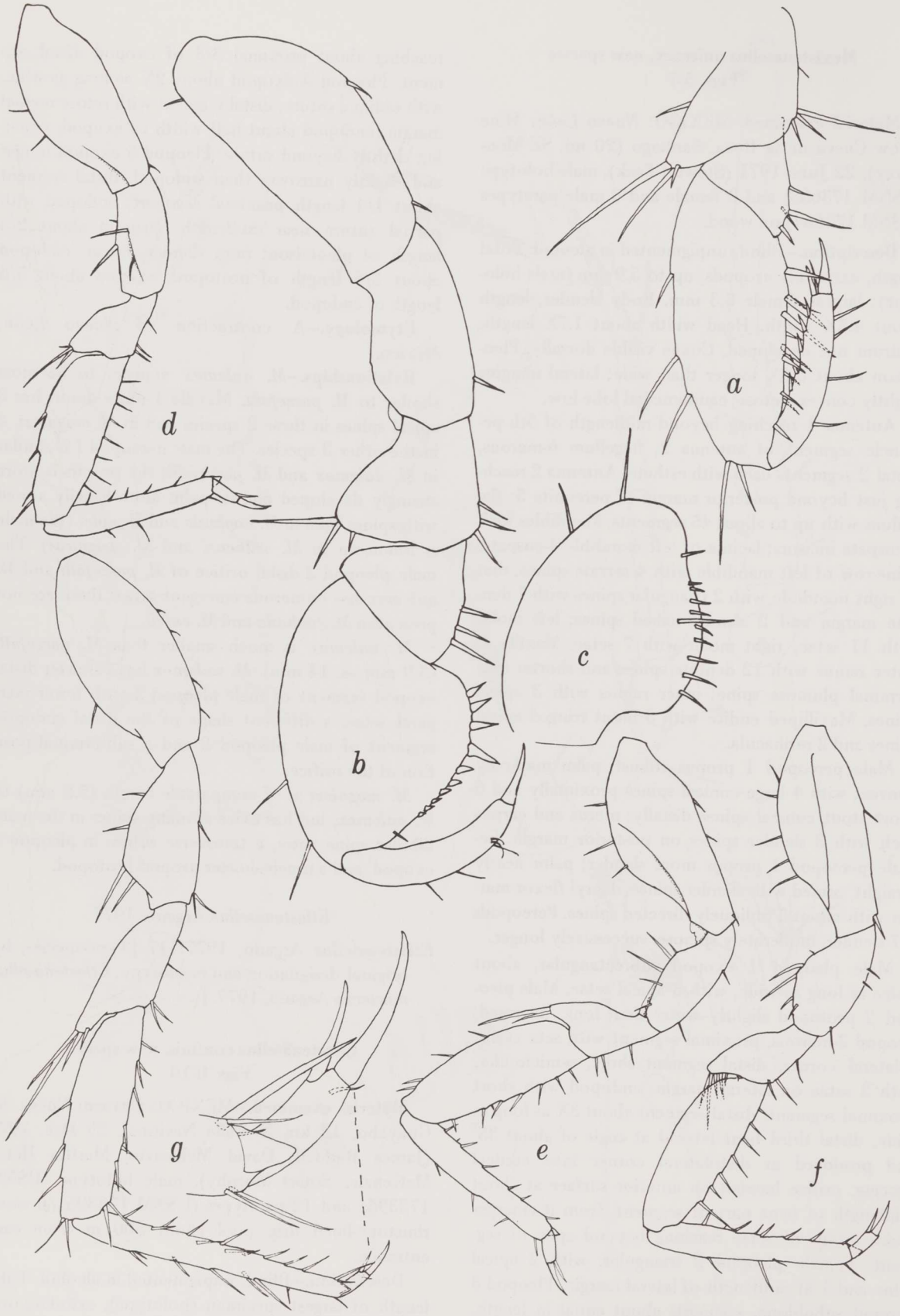

Fig. 6.—*Mexistenasellus nulemex: a,* female pereopod 1; *b,* male pereopod 1, medial; *c,* propus of same, lateral; *d,* male pereopod 2; *e,* male pereopod 3; *f,* male pereopod 4; *g,* male pereopod 7.

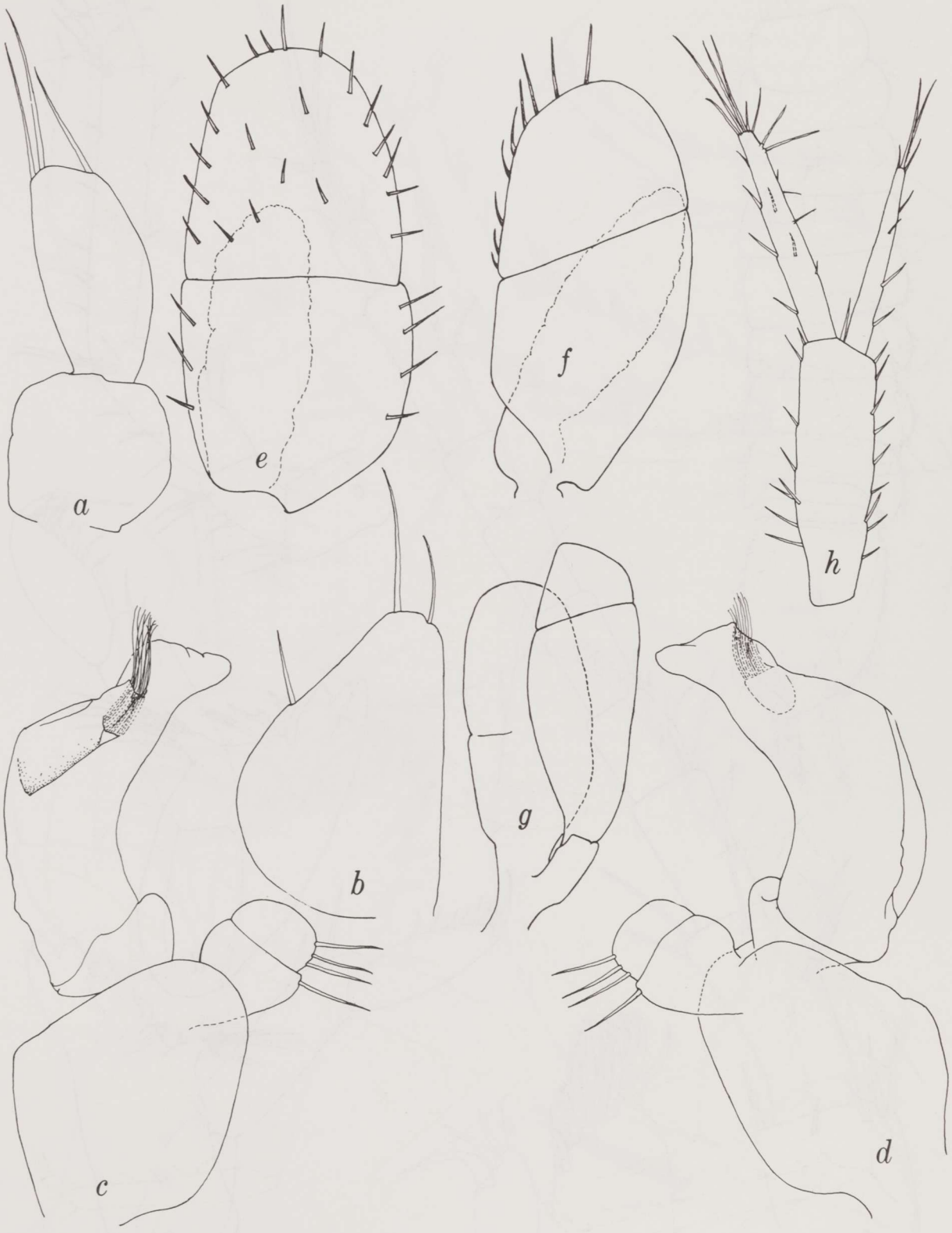

Fig. 7.—*Mexistenasellus nulemex: a*, male pleopod 1; *b*, female pleopod 2; *c*, male pleopod 2, anterior; *d*, same, posterior; *e*, male pleopod 3; *f*, male pleopod 4; *g*, male pleopod 5; *h*, female uropod.

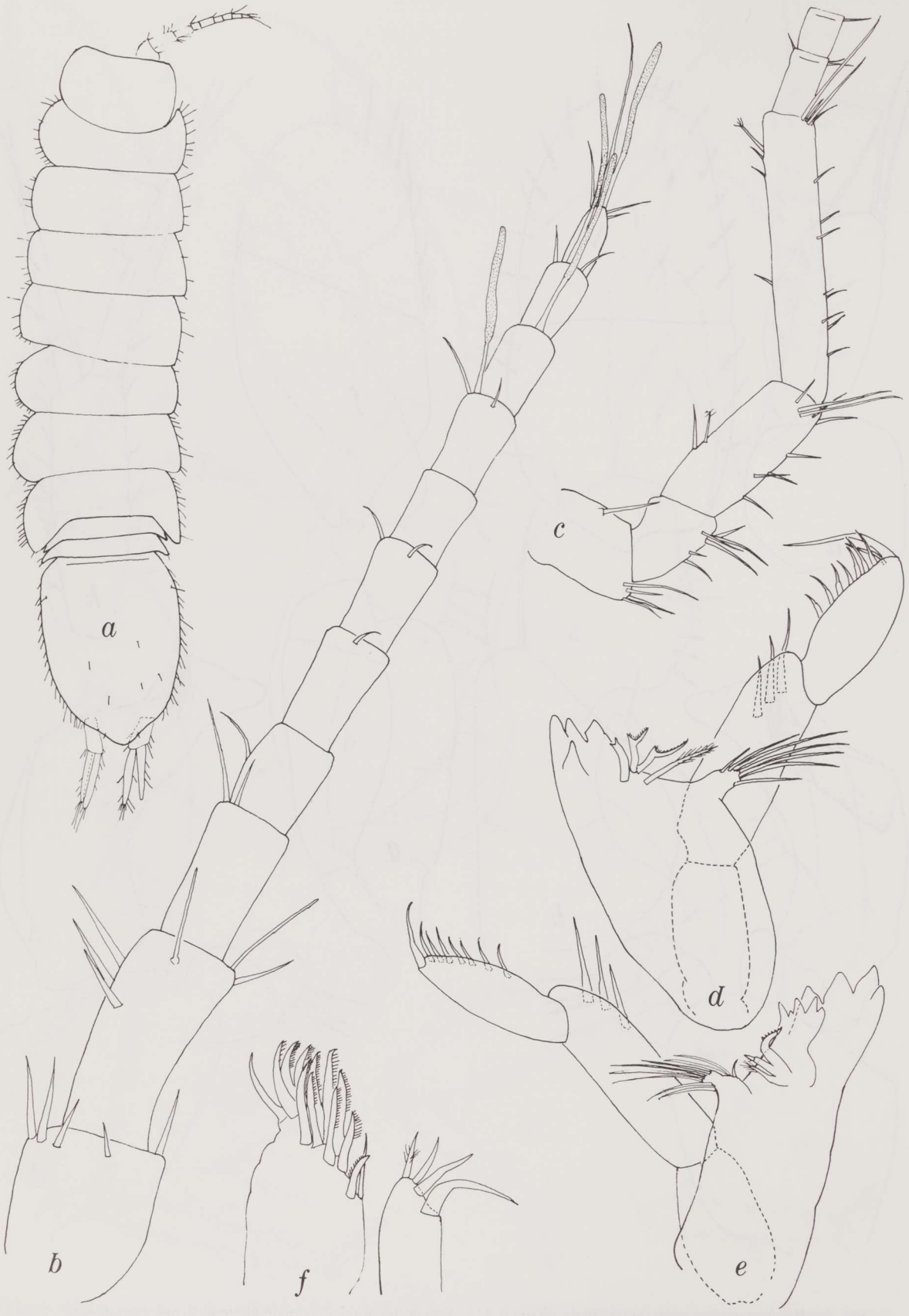

Fig. 8.—*Etlastenasellus confinis*, female: *a*, habitus, dorsal; *b*, left antenna 1, ventral; *c*, antenna 2 peduncle; *d*, right mandible; *e*, left mandible; *f*, maxilla 1.

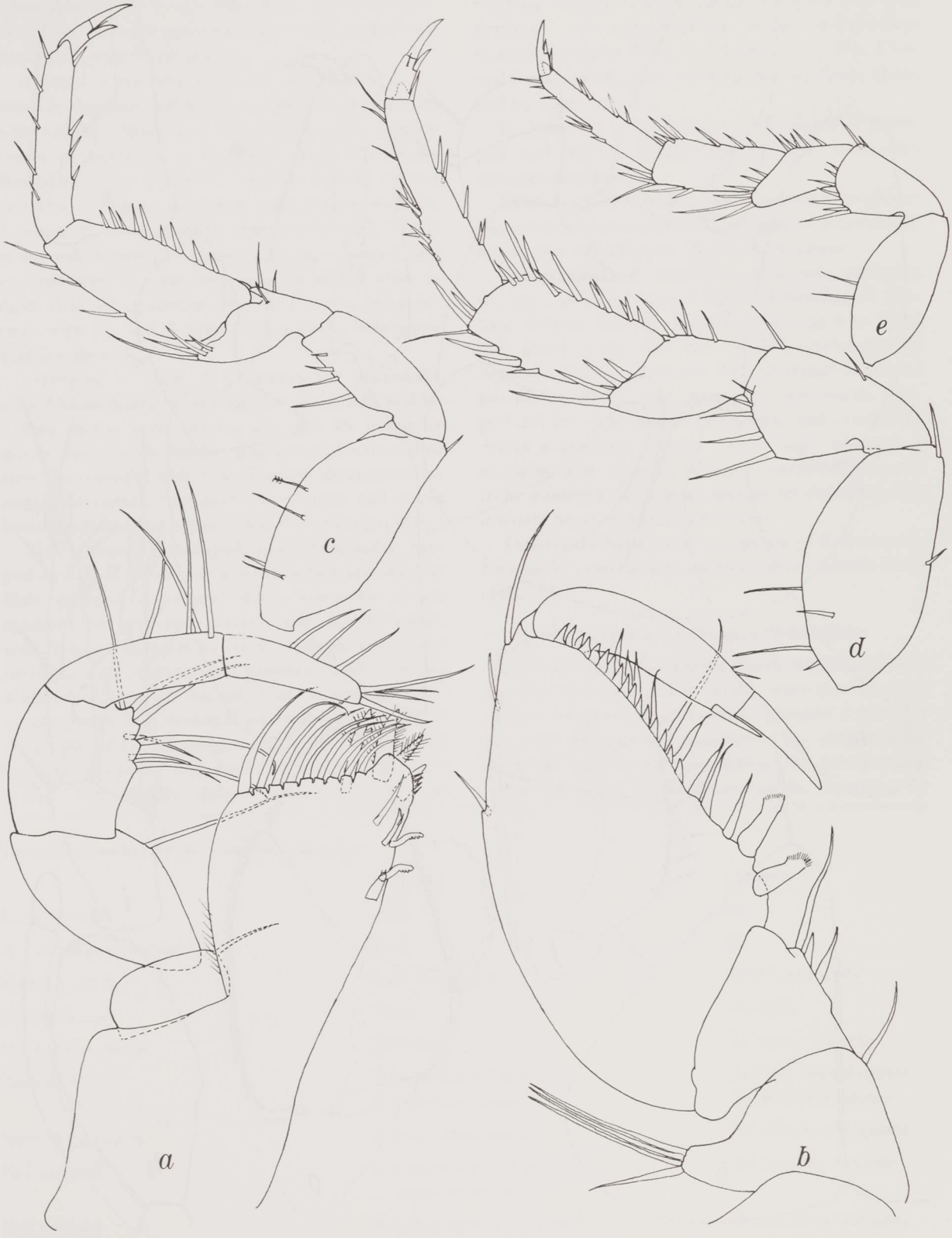

Fig. 9.—*Etlastenasellus confinis*, male: *a*, maxilliped; *b*, pereopod 1; *c*, pereopod 2; *d*, pereopod 5; *e*, pereopod 6.

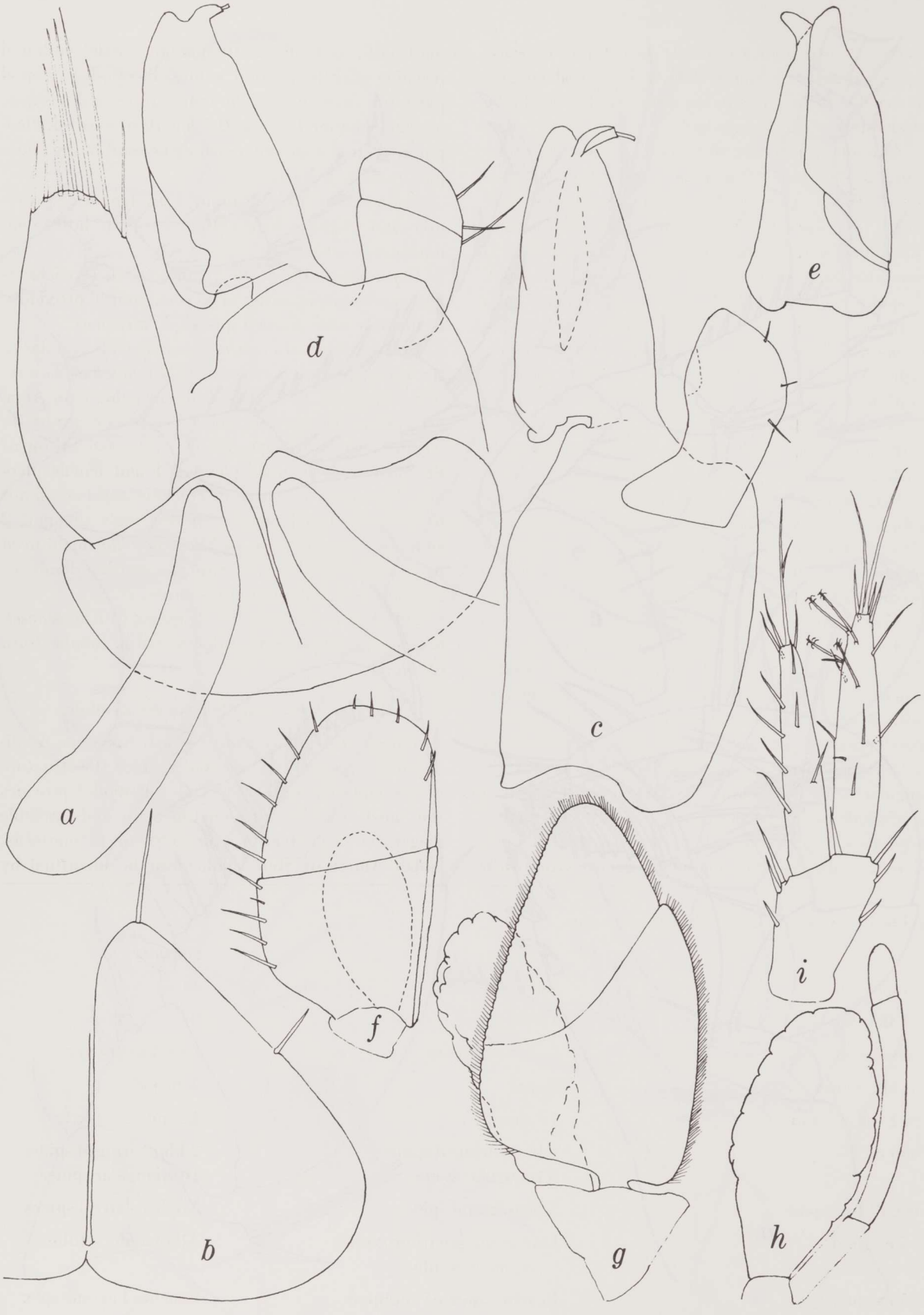

Fig. 10.–*Etlastenasellus confinis: a*, male penis and pleopod 1; *b*, female pleopod 1; *c*, male pleopod 2, anterior; *d*, male pleopod 2 endopod, medial; *e*, male pleopod 2, posterior; *f*, female pleopod 3; *g*, female pleopod 4; *h*, female pleopod 5; *i*, right female uropod, dorsal.

margin slightly concave. Coxae not visible dorsally. Telson about 1/3 longer than wide; lateral margins setose; dorsum with scattered setae; caudomedial lobe moderately well developed.

Antenna 1 reaching distal end of peduncle of antenna 2; flagellum 6-8-merous; distal 4 segments each with esthete. Antenna 2 reaching anterior or midlength of pereonite 5; flagellum about 25-merous. Mandibles with 4-cuspate incisors; lacinia of left mandible 5-cuspate; spine-row with 4 spines in right, 3 spines in left mandible; right molar with 7, left molar with 9 setae; 1st segment of palp unarmed, 2nd segment with 3 setae, 3rd segment with 9 setae in right, 8 in left mandible. Maxilla 1, outer and inner rami with 13 and 4 spines respectively. Maxilliped with 2 retinacula.

Pereopod 1, palm of propus armed proximally with 2 blunt spines having fringed apices, followed by 7 long spines with slender tips and 16 triangular spines; dactyl with slender spine inserted proximal to claw. Pereopod 2 with row of spines along posterior margin of carpus. Pereopod 5-6, ischium and merus broad, posterodistal margins armed with long spines.

Male pleopod 1 protopods fused proximally; exopod oval, 2 1/4X as long as wide, with 8 apical setae. Male pleopod 2 exopod short, transverse suture apparent on posterior surface only, lateral margin with 3 setae; endopod pyriform, with medial groove overlapped by anterior and posterior folds; cannula subterminal, curving laterad. Female pleopod 1 triangular, with long terminal seta and shorter seta at midlength of lateral margin; right and left pleopods separate except for very short fusion at base. Pleopod 3 oval, with slightly oblique transverse suture near midlength, and about 16 marginal setae; endopod reaching slightly beyond suture. Pleopod 4 exopod pyriform, with curved oblique suture and setulose margins; endopod fleshy, 0.7 length of exopod. Pleopod 5 exopod unarmed, reaching beyond fleshy endopod by distal segment.

Endopod of uropod about 1.6X length of protopod and slightly longer than exopod; both rami moderately setose.

Etymology.—From the Latin *confinis* (=neighboring, adjoining), referring to its geographical proximity to the only other known species, *E. mixtecus.*

Relationships.—*E. confinis* is sufficiently similar to the type- and only species of *Etlastenasellus, E. mixtecus* Argano (1977), that I am assigning it to Argano's genus despite the lack of close conformity to Argano's generic diagnosis. The proximal fusion of the protopods of male pleopod 1 and female pleopod 2 is less extensive in *E. confinis,* and I could not detect a proximal segment in the male pleopod 2 endopod. The diagnosis of *Etlastenasellus* might need to be modified when more species are described, but it would be premature to do so now.

Differences between the 2 species of *Etlastenasellus* can be conveniently summarized in tabular form (Table 1).

Key to Species of Mexican Stenasellidae

For identification of most North American Asellidae it is necessary to have males, since the structure of the endopod tip of the male pleopod 2 provides the most reliable and sometimes the only reliable diagnostic characters. Fortunately for taxonomists, North American Stenasellidae can be identified by

Table 1.—Comparison of *Etlastenasellus* spp.

	mixtecus	*confinis*
Length/width	ca. 5	ca. 4
A·1 flagellar segments	11 (9?)	8
Esthetes on A·1	Last 3 segments	Last 4 segments
Rt. Md incisor	Entire	4-cuspid
Mx·1 outer ramus	10 spines	12 spines + 1 seta
Palm of P·1	4 blunt fringed spines 4 triangular spines	2 blunt fringed spines 16 triangular spines
Male Pl·1 exopod	2 distolateral spines	No distolateral spines
Pl·4 exopod	Lateral margin of proximal segment setulose	All margins setulose
Pl·5 exopod	Reaches apex of endopod	Reaches beyond apex of endopod
Uropod	Rami > 2X protopod	Rami < 2X protopod

characters common to both sexes. One such character that might prove to be particularly useful is the exopod of the 4th pleopod. The key below can be used to separate North American Stenasellidae by this character alone.

1. Distal segment without marginal setae 2
   Distal segment with marginal setae 4
2. Exopod about 2X as long as wide, with strongly diagonal suture 3
   Exopod more than 4X as long as wide, with nearly transverse suture . . . . . *M. colei*
3. Apex truncate . . . . . *M. coahuila*
   Apex obtuse . . . . . *E. mixtecus*
4. Suture transverse . . . . . *M. magniezi*
   Suture diagonal, at least in medial half. 5
5. Proximal segment with marginal setae 6
   Proximal segment without marginal setae. 7
6. Distal segment quadrate, wider than long . . . . . *M. parzefalli*
   Distal segment triangular, longer than wide . . . . . *E. confinis*
7. Suture straight. . . . . *M. nulemex*
   Suture bent near midlength . . . . . *M. wilkensi*

Origin of Species of Mexican Stenasellidae

According to Magniez (1974), present day species of Stenasellidae evolved from blind marine ancestors from interstitial habitats. In contrast, species of Asellidae now living in subterranean habitats are believed to have been derived from epigean freshwater precursors which dispersed in surface waters. Since the ancestral stenasellids lived in interstitial habitats and present day species are active burrowers (although reasonably vagile), their distribution cannot be accounted for in the same way as that of asellids. In Africa the various species of stenasellids reached their present inland locations by migration upstream via phreatic routes. This seems improbable in México; it is more likely that the ancestral stenasellids, like the ancestors of the amphipod genus *Mexiweckelia* (Holsinger, 1973), were inhabitants of the shallow marine embayment that apparently covered most of central and eastern México and southern Texas at the end of the Cretaceous or beginning of the Tertiary. As the waters of the embayment regressed, local populations of stenasellids became isolated and evolved into the present day species.

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A NEW CRAYFISH (DECAPODA: CAMBARIDAE) FROM THE STATE OF PUEBLA, MEXICO, WITH NEW LOCALITY RECORDS FOR *PROCAMBARUS (VILLALOBOSUS) XOCHITLANAE* AND ENTOCYTHERID OSTRACOD SYMBIONTS

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ABSTRACT

Procambarus (Villalobosus) cuetzalanae, a probable troglophile or trogloxene, is described from Cueva de Tasalolpan in the Tecuantepec Basin, 5 km southwest of Cuetzalan, Puebla. It has its closest affinities with *P. (V.) riojai* (Villalobos, 1944) which frequents headwater streams of Río Necaxa and Río Cazones. A new locality is cited for *P. (V.) xochitlanae* Hobbs (1975) and new hosts and localities for the entocytherid ostracods *Entocythere mexicana* Rioja (1943) and *Uncinocythere dobbinae* (Rioja, 1943).

The crayfish described here, although found in subterranean habitats in all except one of the five known localities (all near Cuetzalan, Puebla), exhibits no obvious adaptations to a spelean existence; thus it is probable that when sufficient information concerning its ecological distribution becomes available it will be found to be either a troglophile or trogloxene. It is a member of the genus *Procambarus*, by far the largest of the American crayfish genera, and one that embraces more than half of the crayfish species occurring in México. Whereas in the United States most members of the genus appear, for the most part, to shun the mountains, representatives of the Mexican subgenus *Villalobosus*, to which this crayfish belongs, exhibit no such aversion to high elevation in the tropics.

Insofar as is known, the combined ranges of all of the members of the subgenus *Villalobosus* encompass four major drainage basins (Río Tuxpan, Cazones, Tecolutla, and Nautla) lying on the Atlantic versant of México within the states of Hidalgo, Puebla, and Veracruz. Of the 10 recognized species, including that described herein, only three have not been reported from the Río Tecolutla Basin, and only three of the seven frequenting the latter have been found in either the adjacent Río Cazones or Río Nautla watersheds. Thus on the basis of the present state of our knowledge of the ranges of these crayfishes, which to be sure is quite meager, the Río Tecolutla Basin appears to support the greatest diversity of this probably monophyletic stock, including the species described here and its closest relative, *Procambarus (V.) riojai* (Villalobos, 1944: 161). The composition of the subgenus together with summaries of the ranges of the previously described species may be found in Hobbs (1974, 1975); further details concerning most of these crayfishes are available in Villalobos (1955).

Procambarus (Villalobosus) cuetzalanae, new species
Fig. 1

Diagnosis.—Body pigmented, eyes well developed. Rostrum devoid of marginal spines, median carina absent. Cervical spine represented by small tubercle. Areola of specimens with carapace length greater than 19.9 mm, 5.5 to 8.6 (average 6.8) times as long as wide and constituting 34.1 to 36.9 (average 34.5) percent of carapace length (39.8 to 42.8, average 40.9, percent of postorbital carapace length). Suborbital angle subacute to broadly obtuse. Postorbital ridge terminating anteriorly with or without acute to subacute tubercle. Hepatic area tuberculate; branchiostegal spine, if present, spiniform or tuberculiform. Antennal scale approximately twice as long as wide, broadest distal to midlength. Ischium of only fourth

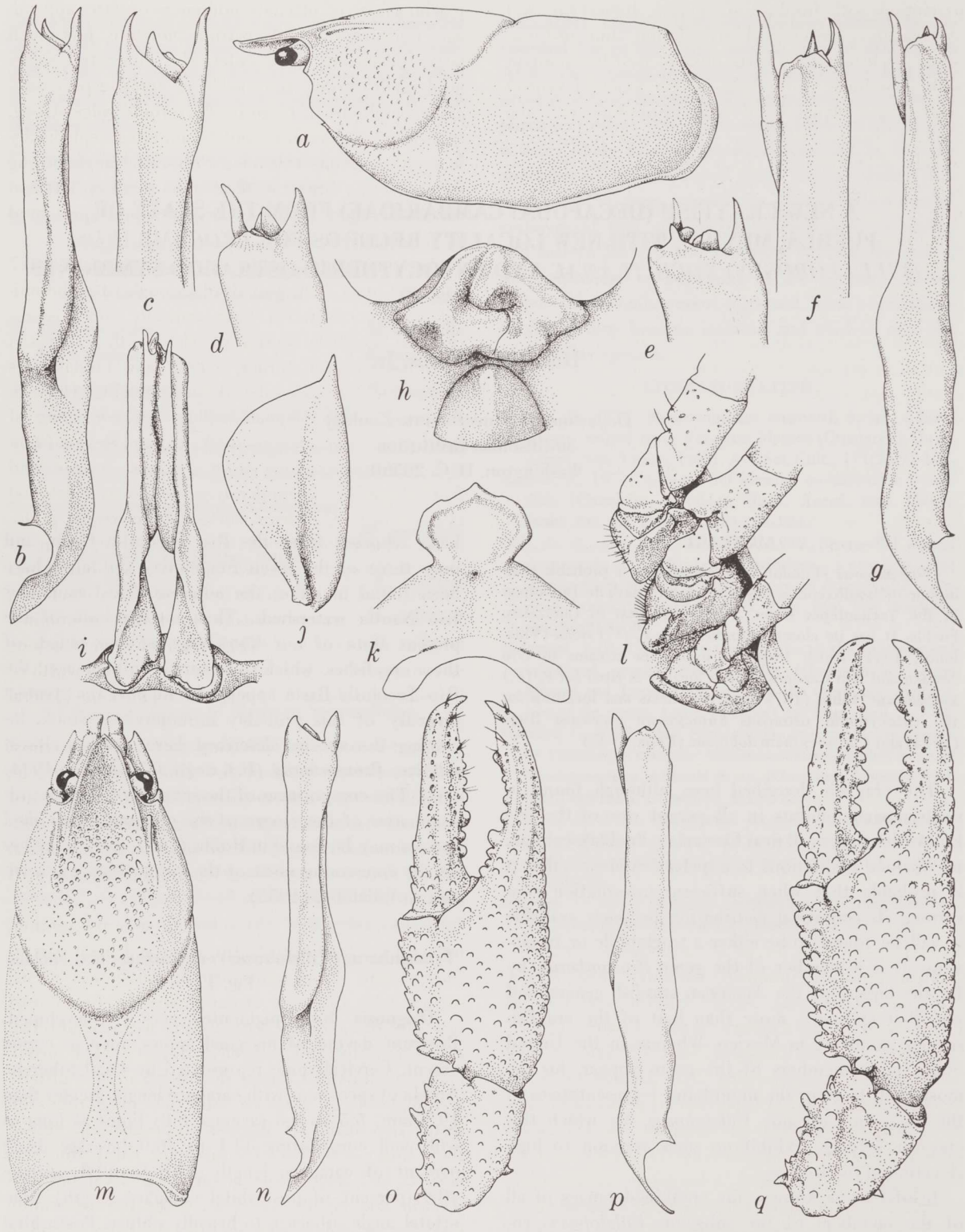

Fig. 1.—*Procambarus (Villalobosus) cuetzalanae*, new species (*a-d*, *f-q*, all from holotype except *h* and *o* from allotype and *n* and *p* from morphotype) and *P. (V.) riojai* (*e*): *a*, lateral view of carapace; *b*, *n*, mesial view of first pleopod; *c*, mesial view of distal part of first pleopod; *d*, cephalolateral view of same; *e*, cephalolateral view of distal part of first pleopod of paratypic male, form I; *f*, lateral view of distal part of first pleopod; *g*, *p*, lateral view of first pleopod; *h*, annulus ventralis and adjacent sternites; *i*, caudal view of first pleopods; *j*, antennal scale; *k*, epistome; *l*, basal podomeres of third through fifth pereiopods; *m*, dorsal view of carapace; *o*, *q*, dorsal view of distal podomeres of cheliped.

pereiopod with hook; hook simple, tumescent, and overreaching basioischial articulation, but not opposed by tubercle on basis; coxa of fourth pereiopod with prominent acute boss on caudomesial ventral angle. First pleopods of first form male reaching cephalic margin of coxae of second pereiopods, weakly asymmetrical, lacking shoulder on cephalic surface, subapical setae limited to 1 or 2 at cephalomesial base of cephalic process; mesial process, most prominent of terminal elements, corneous, slightly sinuous, and directed distally, its cornified texture contrasting sharply with adjacent calcified base; cephalic process, also partly corneous, acute, and directed distally with tip turned somewhat caudally; central projection arising from middle of shaft, appearing acute in mesial and lateral aspects, and directed distally but falling short of mesial and cephalic processes, its compound nature clearly evident in cephalolateral view; caudal element consisting of reduced caudal knob situated caudolaterally, low bladelike caudal process on lateral flank of central projection, and low rounded adventitious process at caudomesial base of central projection. Annulus ventralis about 1.7 times as long as wide, subsymmetrical in outline; ventral surface strongly sculptured: cephalic half with oblique trough slanting laterally from midcephalic margin and joining side of depression occupying median part of caudal half of annulus; sinus originating in trough, and, following sigmoid curve in depression, ending on caudal wall of annulus; cephalic wall convex, caudal wall concave; tongue broad and rounded. Postannular sclerite large and highly elevated, occupying concavity on caudal surface of annulus when extended forward. First pleopod present in female.

Holotypic male, Form I.—Cephalothorax (Fig. 1*a*, *m*) subovate, compressed, and with greatest width slightly more than height at caudodorsal margin of cervical groove. Abdomen narrower than thorax (12.1 and 13.9 mm). Areola 6.8 times as long as broad with 3 punctations across narrowest part. Cephalic section of carapace about 1.8 times as long as areola, latter comprising 35.3 percent of entire length of carapace (41.6 percent of postorbital carapace length). Surface of carapace conspicuously setose, deeply punctate dorsally (especially in anterior gastric region), and tuberculate to granulate laterally; hepatic and anteroventral branchiostegal areas with rather large tubercles. Rostrum broad basally with weakly convergent margins devoid of spines or tubercles; margins, somewhat thickened and elevated above concave surface, contracting rather decidedly at level of about midlength of penultimate podomere of antennular peduncle, and apex reaching base of ultimate podomere of latter appendage; dorsal surface of rostrum punctate, pits much larger posteriorly than anteriorly. Subrostral ridges moderately strong and visible in dorsal aspect only along basal part of rostrum. Postorbital ridge strong, grooved dorsolaterally, and terminating cephalically in small corneous tubercles. Suborbital angle strong and subacute. Branchiostegal spine small on left and almost obsolete on right. Cervical spine represented by very small tubercle.

Abdomen subequal in length to carapace (30.7 and 30.9 mm). Pleura of third through fifth abdominal segments rounded both ventrally and posteroventrally. Cephalic section of telson with 3 spines in each caudolateral corner, lateral and mesial ones immovable. Cephalic lobe of epistome (Fig. 1*k*) with 7 obtuse angles, cephalomedian one consisting of short projection; margins thickened and elevated ventrally; proximomedian area of lobe convex and flanked caudally by moderately deep fovea; epistomal zygoma arched. Ventral surface of proximal podomere of antennular peduncle with strong spine at about midlength. Antennal peduncle without spines although rounded tubercle present on ischium; flagellum reaching caudally to fourth abdominal tergum. Antennal scale (Fig. 1*j*) about twice as long as broad, widest distal to midlength, greatest width of lamellar area about 1.7 times that of thickened lateral part.

Third maxilliped extending to level of proximal end of distal podomere of antennular peduncle; ischium with distolateral extremity rounded and not produced; its lateral half bearing tufts of short plumose setae with only distomesial area naked; mesial half of podomere bearing 2 longitudinal rows of stiff setal tufts.

Right chela (Fig. 1*q*) subovate in cross section, moderately depressed. Entire palm and basal part of fingers with strong subsquamous tubercles; mesial surface with tubercles arranged linearly, mesialmost row consisting of 9. Both fingers with longitudinal ridges dorsally and ventrally, ridges flanked proximally by tubercles, latter decreasing in size distally and replaced by rows of setiferous punctations on distal two-thirds of fingers. Opposable margin of fixed finger with row of 9 tubercles, third from base largest, and large tubercle on lower level between seventh and eighth tubercles; single row of minute denticles extending between tubercles from second to eighth, at level of latter, and again just distal to ninth, denticles clustering, but distalmost 5 forming single row. Opposable margin of dactyl with tubercles and denticles arranged as on fixed finger; however, large one on lower level absent.

Carpus of cheliped longer than broad with oblique furrow dorsally; dorsal, mesial, and lateral surfaces tuberculate, latter sparsely so; mesial face with 1 tubercle distinctly larger than others; ventral surface with widely spaced punctations and with 2 marginal tubercles distally: acute one mesially and more swollen one on lateral articular condyle.

Merus with dorsal surface tuberculate, tubercles increasing in size distally; mesial and lateral surfaces irregular and with scattered setiferous punctations; ventral surface with mesial row of 12 spikelike tubercles and more irregular lateral one of 13, 4 present in oblique row joining mesial and lateral rows distally. Ischium with row of 4 (3 on left) tubercles ventromesially.

Hook (Fig. 1*l*) on ischium of fourth pereiopod only (rudiment in form of 2 tubercles present on third); hook strong, somewhat inflated, overreaching basioischial articulation, but not opposed by tubercle on basis. Coxa of fourth pereiopod with prominent, acute, laterally disposed boss caudomesially; that of fifth with compressed, less conspicuous caudomesial boss; coxa of third pereiopod with rudiment of boss consisting of low caudomesial ridge. Sternum between second, third, and fourth pereiopods shallow and heavily setose, but setae extending from ventrolateral margins directed ventrally and comparatively inconspicuous.

First pleopod (Fig. 1*b-d, f, g, i*) as described in "Diagnosis"; in addition, proximomesial lobes not overlapping mesially, but that of sinistral member situated distinctly proximal to that of dextral.

Uropod with mesial lobe of proximal podomere bearing acute spine; distomedian spine of mesial ramus premarginal.

Allotypic female.—Differing from holotype, except in secondary sexual characteristics, as follows: rostrum reaching midlength of ultimate podomere of antennular peduncle; postorbital ridge ending in small acute tubercle; branchiostegal spine represented by small tubercle; cephalic lobe of epistome with more distinct anterolateral prominences; palm of chela (Fig. 1*o*) with mesial row of 8 (7 on left) tubercles; opposable margin of fixed finger of right chela with row of 9 tubercles (fourth from base largest), left with 10 (fifth from base largest); dactyl of both chelae with row of 8 tubercles on opposable surface; ventral surface of merus of cheliped with mesial row of 11 tubercles and lateral one of 12; ischium with mesioventral row of 3 tubercles on right and 4 on left chelipeds.

Annulus ventralis (Fig. 1*h*) as described in "Diagnosis." Sternum immediately cephalic to annulus V-shaped in section and with scattered setiferous punctations but devoid of tubercles or projections. Postannular sclerite very prominent, subconical, slightly less than three-fourths as long and three-fifths as wide as annulus. First pleopod reaching slightly anterior to midlength of annulus when abdomen flexed. (See Table 1.)

Morphotypic male, Form II.—Differing from holotype in following respects: rostrum with corneous upturned tip; postorbital ridge truncate; branchiostegal spine small; cephalic lobe of epistome with cephalolateral areas more produced anteriorly; antenna reaching fifth abdominal tergum; opposable margin of fixed finger of left chela with row of 8 tubercles, fourth from base largest, one of distal 2 tubercles present in holotype lacking; ventral surface of merus of cheliped with mesial row of 12 tubercles, lateral one of 11, and oblique row of 3. Hook on ischium of third pereiopod even more reduced, and that on fourth distinctly smaller, not overreaching basioischial articulation; boss on coxa of fourth pereiopod only slightly reduced, those on third and fifth distinctly less clearly defined. (See Table 1.)

First pleopod (Fig. 1*n, p*) lacking corneous terminals but all represented; caudal element not clearly differentiated, and cephalic and mesial processes rather shorter and more robust.

Type-locality.—Cueva de Tasalolpan, 5 km southwest of Cuetzalan, Puebla, in the Río Tecuantepec (tributary to Río Tecolutla) watershed. A map of 1.4 kilometers of this cave, prepared by D. McKenzie from a survey conducted by A. Grubbs, D. McKenzie, J. Reddell, and C. Soileau, accompanies an article by Peter Sprouse (1979:62). According to Sprouse,

Table 1.—Measurements (mm) of *Procambarus (Villalobosus) cuetzalanae.*

	Holotype	Allotype	Morphotype
Carapace:			
Height	13.2	12.5	13.4
Width	13.9	12.6	13.5
Total length	30.9	28.4	30.3
Postorbital length	26.2	24.1	25.9
Areola:			
Width	1.6	1.4	1.5
Length	10.9	9.9	10.7
Rostrum:			
Width	5.2	5.0	5.2
Length	5.8	5.6	5.7
Chela:			
Length of mesial margin of palm	9.9	7.7	8.6
Width of palm	9.2	8.3	8.9
Length of lateral margin	26.1	21.7	23.1
Length of dactyl	14.6	11.1	12.6
Abdomen:			
Width	12.1	12.4	12.1
Length	30.7	30.5	30.5

most of the passages explored were dry, but an "active stream" leads to a "low air duct and a sump. The cave lies above and runs parallel to Sumidero de Atepolehuit [sic] and may drop into it. It is also not far from the main Sistema Cuetzalan."

Disposition of types.—The holotype, allotype, and morphotype are deposited in the National Museum of Natural History (Smithsonian Institution), nos. 177202, 177203, and 177204, respectively, as are the following paratypes: 5 male I, 7 male II, 3 females, 2 juvenile males, and 3 juvenile females. Of the remaining paratypes, 1 male I, 1 male II, and 1 female are in the Texas Memorial Museum, and similar series in the British Museum (Natural History) and Rijksmuseum van Natuurlijke Historie (Leiden, The Netherlands).

Size.—The largest specimen is a female having a carapace length of 39.6 (postorbital carapace length 34.5) mm. The largest and smallest first form males have corresponding lengths of 32.3 (27.4) and 24.4 (20.6) mm.

Range and specimens examined.—Known from five localities in the vicinity of Cuetzalan, Puebla: (1) Type-locality, 22 Dec. 1976 (J. R. Reddell, A. Grubbs, D. McKenzie, and C. Soileau), 4 male I, 8 male II, 5 females, 1 juvenile male. (2) Spring 6.1 km N of Cuetzalan, 19 Dec. 1976 (JRR, AG, DM, and CS), 1 male II. (3) Sumidero de Atepolihuit de San Andrés, N of Cuetzalan, 28 Dec. 1979 (J. Francisco, H. Galindo, and A. Manuel), 1 male I, 1 male II, 1 female); 2 Jan. 1980 (AG, J. Lieberz, and B. Richards), 1 male I, 1 male II. (4) Sima Zoquiapan, 1.1 km N of Cuetzalan, 2 Jan. 1980 (L. Wilk, J. Hooper, and M. Minton), 1 male I, 1 female, 1 juvenile male, 2 juvenile females. (5) Sumidero de Chichicasapan, 0.8 km S of Cuetzalan, Feb. 1980 (W. Liebman), 1 male II; Feb. 1980 (J. Jancewicz), 1 male I; Mar. 1980 (WL and W. Anderson), 1 male I, 1 juvenile female.

Variations.—Ignoring injuries and regenerated appendages, with few exceptions the specimens at hand are very uniform. The suborbital angle ranges from subacute to broadly obtuse; the epistome is rarely subrectangular, more frequently as illustrated (Fig. 1*k*), and most commonly bears anterolateral projections only slightly less prominent than the anteromedian one; the areola exhibits three or four punctations in the narrowest part, and in juveniles is distinctly broader than in most of the adults, scarcely five times as long as wide; and the arrangement and numbers of tubercles on the cheliped are as follows: opposable margin of fixed finger usually bearing 8 to 10, but occasional individuals with as few as 7 and one with 24; corresponding margin of dactyl in most specimens also with row of 8 to 10 but occasionally with as many as 21; mesial margin of palm of chela with mesialmost row of 7 to 9 tubercles and often with slightly more ventrolateral row of 6 to 10. The ventral surface of the merus of the cheliped supports a mesial row of 9 to 13 tubercles, a lateral one of 7 to 10, and an oblique row joining the other two of 2 to 4.

There are few differences in the secondary sexual features except as follows: The bosses on the coxae of the fourth and fifth pereiopods become progressively more conspicuous with increase in size of the animal, and, of course, the frequent enlargement and texture of the corneous parts make them more conspicuous in the first form male. The greatest variations noted in the first pleopod are in the relative lengths of the mesial and cephalic processes—in some individuals they extend about the same distance distally, but in some specimens the former reaches much beyond the latter. The caudal process may be slightly more or less conspicuous than that illustrated in Fig. 1*d*. The annulus ventralis appears more variable than it is, chiefly because of the broad arc through which it swings. If the caudal margin is pressed dorsally against the sternum, the annulus appears to be deeply cleft posteriorly. In swinging ventrally, the apparent posterolateral lobes seem to decrease in size.

Relationships.—This crayfish is more closely allied to *Procambarus (Villalobosus) riojai* than to any other species. The similarities are best seen in the structure of the first pleopod of the male, particularly in the disposition and appearance of the mesial and cephalic processes. The structure of the mesial process suggests a linking of the more generalized *P. (V.) riojai* with two of the more disparate, if not also advanced, members of the subgenus, *P. (V.) tlapacoyanensis* (Villalobos, 1947b:537) and *P. (V.) teziutlanensis* (Villalobos, 1947a:240). It may be distinguished from *P. (V.) riojai* in lacking a median carina on the rostrum, in possessing a much weaker, almost obsolete, boss on the coxa of the third pereiopod, in having a reduced, tuberculiform caudal element of the first pleopod of the first form male (cf. Fig. 1*d* and 1*e*), and in exhibiting a much more strongly sculptured annulus ventralis. It differs from the other two most conspicuously in possessing a proportionately smaller mesial process on the first pleopod of the male that is less sinuous than it is in *P. (V.) tlapacoyanensis* and decidedly less elongate than that in males of *P. (V.) teziutlanensis*. In contrast, the cephalic process is much better developed than in either of the latter two.

Ostracod associates.—In all of the subterranean localities listed above, this crayfish was infested with the entocytherid *Uncinocythere dobbinae* (Rioja, 1943), and those crayfish from Sumidero de Atepolihuit de San Andrés also carried representatives of *Entocythere mexicana* Rioja (1943). The ranges and previously recorded hosts of these ostracods are summarized by Hobbs (1971).

Procambarus (Villalobosus) xochitlanae Hobbs (1975)

Previously this crayfish has been reported to occur only in the type-locality, Cueva de los Camarones, three kilometers northwest of Xochitlán, Puebla. On 10 January 1980, a first form male of this crayfish was collected in Sumidero de Atepolihuit de Nauzontla, 32 kilometers north of Cuetzalan, Puebla, by A. Grubbs and J. Lieberz. The rostrum of this specimen is injured, therefore the carapace length cannot be recorded; the postorbital carapace length is 27.0 mm. This specimen was infested with the ostracod *Uncinocythere dobbinae.* A juvenile female (cl 14.1 mm, postorbital cl 11.5 mm) tentatively identified as a member of this species was obtained in Cueva de Guayateno no. 2, Cuetzalan, on 22 December 1979 by A. Villagómez.

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Assoc. Mexican Cave Stud. Bull., 8:45-50/Texas Mem. Mus. Bull., 28:45-50.

DESCRIPTION OF A NEW TROGLOBITIC CRAYFISH FROM MEXICO AND A LIST OF MEXICAN CRAYFISHES REPORTED SINCE THE PUBLICATION OF THE VILLALOBOS MONOGRAPH (1955) (DECAPODA, CAMBARIDAE)

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ABSTRACT

Procambarus (Scapulicambarus) xilitlae, the first troglobitic crayfish known to occur north of the Cordillera Volcánica Transversal in México, was collected in Hoya de las Guaguas, 10 kilometers south-southwest of Aquismón, San Luis Potosí. Its closest ally appears to be *P. (S.) strenthi* Hobbs (1977b), an epigean species that frequents the same watershed. The acquisition of a first form male is needed to confirm the tentative assignment of this crayfish to the subgenus *Scapulicambarus*.

The species described here from the Pánuco Basin is the fourth troglobitic crayfish to be reported from México and the first that has been recorded from north of the Cordillera Volcánica Transversal. The first of these troglobites, *Procambarus (Austrocambarus) rodriguezi* Hobbs (1943:198), was described from a lotic habitat in Cueva de Ojo de Agua Grande, near Córdoba, Veracruz, and the other two, *P. (A.) oaxacae oaxacae* Hobbs (1973:29) and *P. (A.) oaxacae reddelli* Hobbs (1973:33), were described from subterranean streams in the state of Oaxaca. The discovery of the new troglobite in subterranean waters of the Sierra Madre Oriental, where so much field work has been conducted in recent years, came as a distinct surprise to one of us (H.H.H.). Three of the local epigean species, *Procambarus (Ortmannicus) acutus cuevachicae* (Hobbs, 1941:1), *P. (O.) toltecae* Hobbs (1943:198), and *P. (O.) villalobosi* Hobbs (1969:41), have been found in spelean habitats in several localities from southern Tamaulipas to Puebla, but none of the three was encountered in the terminal siphon of the sótano from which members of the new crayfish were obtained. A fourth epigean species, *P. (Scapulicambarus) strenthi* Hobbs (1977b:412), which also occurs in the Río Pánuco basin, has not been reported from subterranean waters.

The new crayfish may be distinguished readily from the other Mexican troglobitic species by the absence of pigment from the eyes, the presence of hooks on the ischia of the third and fourth pereiopods of the male, and the absence of a preannular plate in the female.

Procambarus (Scapulicambarus) xilitlae, new species
Figure 1

Diagnosis.—Albinistic, eyes without pigment or faceted cornea. Rostrum with small marginal spines or tubercles; median carina absent. Carapace with cervical tubercle cephaloventral to row of minute tubercles flanking caudal margin of cervical groove. Areola 4.7 to 5.0 times as long as broad, constituting 36.5 to 37.6 percent of total length of carapace (46.1 to 46.6 percent of postorbital carapace length). Suborbital angle absent. Postorbital ridge with cephalic spine, lacking posterodorsal ones. Hepatic area with very few small tubercles. Antennal scale about 1.8 times as long as wide, broadest slightly distal to midlength. Ischia of third and fourth pereiopods of second form male with small hooks, neither approaching corresponding basioischial articulation nor opposed by tubercle on basis; caudomesial angle of coxa of fourth pereiopod with prominent boss triangular in mesial aspect, and coxa of fifth with much smaller one compressed in longitudinal plane of body. First pleopods of second form male

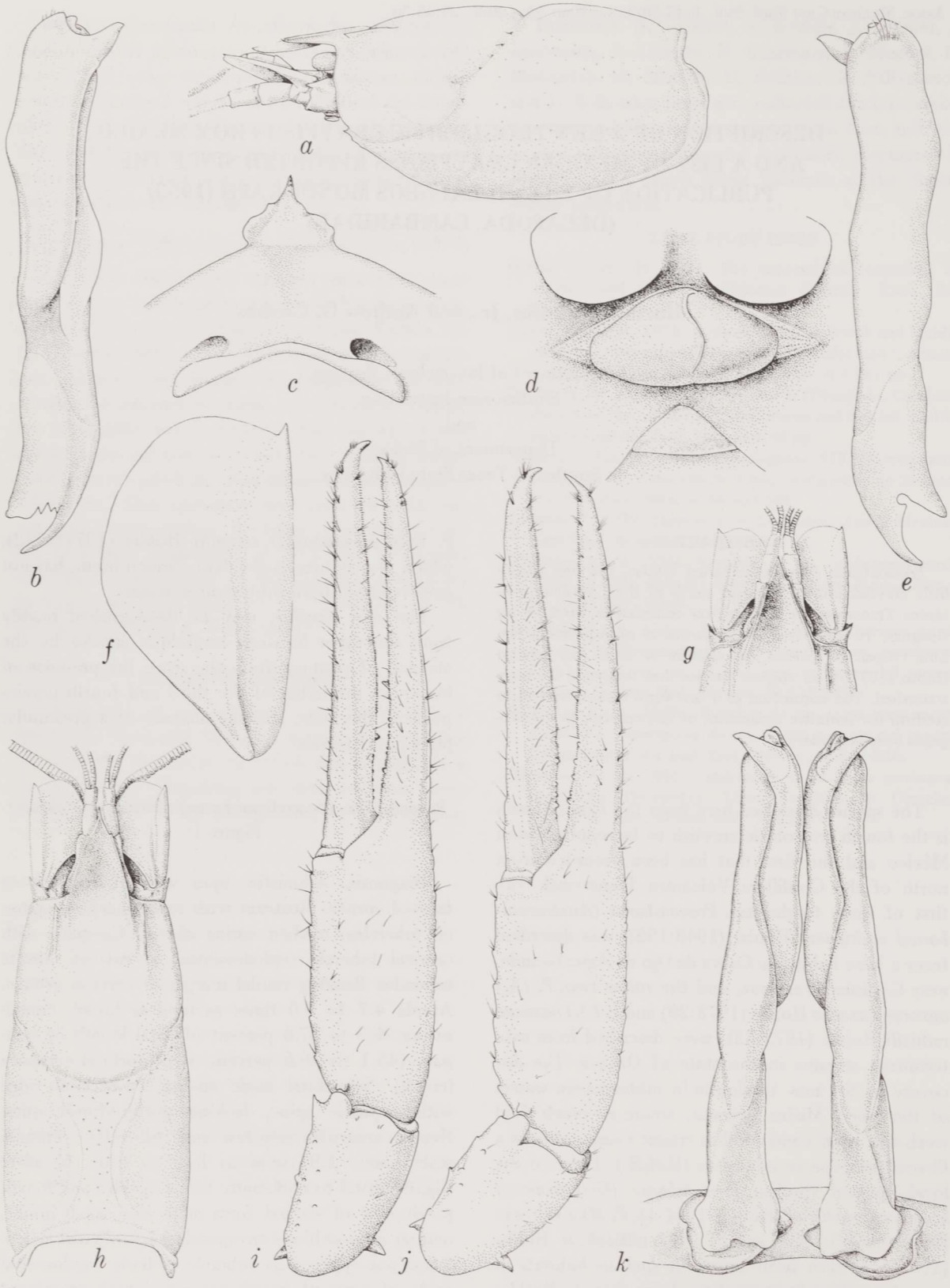

Fig. 1.—*Procambarus (Scapulicambarus) xilitlae*, new species. (All from holotype except *d*, *g*, *j*, from allotype.) *a*, lateral view of carapace; *b*, mesial view of first pleopod; *c*, epistome; *d*, annulus ventralis; *e*, lateral view of first pleopod; *f*, antennal scale; *g*, dorsal view of cephalic region; *h*, dorsal view of carapace; *i*, *j*, dorsal view of distal podomeres of cheliped; *k*, caudal view of first pleopods.

reaching coxae of third pereiopods, slightly asymmetrical (almost certainly distinctly so in first form male), provided with subapical setae, and bases of paired members widely separated; distal extremity bearing prominent conical mesial process, largest of terminal elements, directed caudolaterally and somewhat distally; cephalic process represented by subangular hood flanking cephalic surface of centrally located central projection, and caudal process consisting of swollen ridge on caudolateral extremity of shaft of appendage. Annulus ventralis hinged to sternum immediately anterior to it, not freely movable, suboval in outline, almost twice as wide as long, rather strongly arched ventrally, and bearing sigmoid sinus extending along most of median line of annulus; tongue and fossa not clearly defined. Sternum anterior to annulus weakly tuberculate or with caudally directed prominences flanking median line. Postannular sclerite triangular, its base about twice as broad as long and about 0.6 as wide and 0.5 as long as annulus. First pleopod in female small (rudimentary, probably regenerating, in allotype).

Holotypic male, Form II.—Cephalothorax (Fig. 1*a, h)* subovate, slightly compressed. Abdomen narrower than carapace (10.5 and 11.6 mm). Height and width of carapace subequal in region of caudodorsal margin of cervical groove. Areola distinctly elevated, 4.8 times as long as wide with 2 or 3 punctations across narrowest part. Cephalic section of carapace approximately 1.7 times as long as areola, length of latter 36.5 percent of entire length of carapace (46.1 percent of postorbital carapace length). Rostrum with rather strongly convergent margins, lateral carinae bearing pair of small spines delimiting base of acumen. Latter reaching distal extremity of penultimate podomere of antennule; dorsal surface concave, deepest immediately anterior to level of posterior margin of orbit; punctations sparse, few submarginal ones, including those on acumen, bearing rather long simple setae. Subrostral ridges weak and barely evident in dorsal aspect near base of rostrum. Postorbital ridges well developed but rather short, grooved dorsolaterally, and terminating anteriorly in small spine, more posterior spines or tubercles lacking. Caudodorsal margin of deep cervical groove with row of very small tubercles, each accompanied by 1 or 2 anteriorly directed setae. Suborbital angle obsolete. Branchiostegal spine small and accompanied by another small spine and/or produced angle immediately posteroventrally. Thoracic section of carapace conspicuously vaulted and branchiostegites moderately tuberculate dorsoventrally, less conspicuously so elsewhere, except ventrolaterally, below posterior section of cervical groove.

Abdomen clearly longer than carapace (32.8 and 27.4 mm). Pleura of third through fifth abdominal segments broadly rounded ventrally and lacking cephalo- or caudoventral angles. Cephalic section of telson with 2 pairs of spines in each caudolateral corner, mesial pair smaller than lateral pair, both fixed. Cephalic lobe of epistome (Fig. 1*c)* small with irregular cephalolateral margins and distinct acute cephalomedian projection bearing ventral row of 3 spines; main body with cephalomedian depression but lacking fovea; zygoma rather weak but broadly arched and flanked cephalolaterally by prominent paired pits. Ventral surface of proximal podomere of antennule with strong spine near midlength. Antenna with moderately large spine on basis, ischial spine represented by small, apically rounded tubercle; flagellum reaching beyond telson. Antennal scale (Fig. 1*f)* about 1.8 times as long as broad, widest slightly distal to midlength, and lamella little more than twice width of lateral thickened area.

Third maxilliped overreaching rostrum by length of dactyl; ischium with small acute tubercle distolaterally, mesial half with usual group of stiff setae and lateral half with distinctly fewer and smaller ones, most of which arranged in 2 longitudinal rows, 1 flanking lateral margin; exopod reaching distal end of merus.

Right chela (Fig. 1*i)* subovate in cross-section, depressed. Mesial surface of palm with single row of 5 very small tubercles, each accompanied by 1 or 2 setae, and lateral surface with depressed, irregularly dispersed tubercles; remainder of palm sparsely punctate with punctations bearing 1 or 2 setae. Both fingers with well defined submedian longitudinal ridges dorsally, flanked by setiferous punctations. Opposable margin of fixed finger with row of 6 small corneous teeth along proximal fourth and single larger, more ventrally placed one at end of proximal third of finger; single row of minute denticles extending from proximal end of finger to base of corneous tip. Lateral surface of fixed finger costate with row of setiferous punctations. Opposable margin of dactyl with row of 8 small tubercles, seventh from base largest, along slightly less than proximal third of finger, and minute denticles arranged as on fixed finger; mesial surface of dactyl with linear series of setiferous punctations.

Carpus of cheliped longer than broad with mesial, dorsomesial, and ventromesial surfaces bearing few small tubercles, dorsal distomesial angle with strong spine, and distoventral margin with small spine mesially. Shallow depression dorsally representing usual sulcus.

Merus of cheliped with small tubercles along dorsal ridge and 2 premarginal dorsal spines distally; mesial surface with few tubercles distally, but remainder and lateral surface rather smooth and polished. Ventral surface with mesial row of 14 small tubercles generally increasing in size toward distal end of podomere, distal 4 spiniform, and lateral row of 10, none so large as distal 2 in mesial row. Distolateral condyle with small spine ventrally. Ischium with mesioventral surface bearing setiferous punctations; sufflamen not produced but distinctly angular.

Hooks on ischia of third and fourth pereiopods and bosses on coxae of fourth and fifth as described in "Diagnosis." Sternum between third and fourth pereiopods rather shallow and with small inconspicuous setae. First pleopods (Fig. 1*b*, *e*, *k*) as described in "Diagnosis." Uropods with both lobes of basal podomere bearing spines; distomedian spine on mesial ramus far removed from distal margin of ramus.

Allotypic female.—Differing from holotype in following respects: rostral margins (Fig. 1*g*) very strongly convergent, lateral carinae more strongly elevated so that subrostral ridges evident in dorsal aspect to level of marginal spines; dorsal surface more strongly concave; cephalolateral margin of cephalic lobe of epistome with 2 or 3 spines and 2 on cephalomedian projection; ischial spine on antennal peduncle small and acute; opposable margin of fixed finger of chela (Fig. 1*j*) with row of 4 small corneous tubercles occupying little more than proximal 0.25 of length and larger, more ventrally placed one, at end of proximal 0.4 of finger; opposable margin of dactyl with row of 5 tubercles dispersed along slightly more than proximal 0.25 of margin; dorsal distomesial angle of carpus with subacute tubercle (tip broken); merus of cheliped with single premarginal dorsodistal spine; ventral surface with mesial row of 16 spines and lateral one of 9; ischium with 3 or 4 small tubercles on ventromesial surface. Annulus ventralis and accompanying sternal elements (Fig. 1*d*) as described in "Diagnosis." Dextral first pleopod small, left member either vestigial, or, more probably, regenerating.

Type-locality.—Hoya de las Guaguas, 10 kilometers south-southwest of Aquismón, and very near the town of Xilitla, San Luis Potosí, México. Hoya de las Guaguas is one of the large pits, or sótanos, of the Aquismón area and has been developed in lower Cretaceous limestone of the El Doctor formation (Raines, 1968). The cave (Stone, 1978) consists of two very large chambers in which colonies of green parakeets, *Aratinga holochlora* (Sclater), and white-collared swifts, *Streptoprocne zonaris* (Shaw), roost. The well lit entrance chamber is walled by a sheer drop of 150 to 200 meters. A steep 70 meter slope gives access to the second chamber, which is much darker and cave-like, and the bottom is about 430 meters below the surface. There is a dry stream bed that drains the chambers into a small passage at the bottom of the second room. This passage continues downward about 30 meters, where it reaches a sump that is very close to the level of the springs where the Río Pimienta resurges about 2 kilometers away. (This is the first cave in the area in which base level waters have been reached.) The water level of the sump has been observed to vary about 4 meters on different visits to the cave. The water is clear, and the bottom consists of smooth rock with a thin mantle of clay and silt. The crayfish and members of an apparently undescribed species of *Spelaeomysis* are the only organisms that have been observed to share the pool, and only a few individuals of either have been seen at a time. The crayfish were first noted by Steve Zeaman in January 1975 during the initial exploration of the sump passage. They were again observed in July 1977 by one of us (A.G.G.). In March 1980, three individuals were lured from the deep water by cheese bait and were captured.

Disposition of types.—The holotype, allotype, and paratypic female are deposited in the National Museum of Natural History (Smithsonian Institution), numbers 177140, 177141, and 177142, respectively.

Size.—See Table I.

Range and specimens examined.—This crayfish is known only from the type-locality, and the only specimens of which we are aware are the holotypic male, form II, allotypic female, and paratypic female,

Table 1.—Measurements (mm) of *Procambarus (Scapulicambarus) xilitlae.*

	Holotype	Allotype	Paratype ♀
Carapace			
Height	11.7	12.6	12.6
Width	11.6	12.1	12.1
Total length	27.4	28.1	28.7
Postorbital length	21.7	22.5	23.2
Areola			
Width	2.1	2.1	2.3
Length	10.0	10.4	10.8
Rostrum			
Width	4.2	4.6	4.5
Length	6.9	7.0	7.1
Chela			
Length of mesial margin of palm	6.4	6.4	6.4
Width of palm	3.4	4.0	4.0
Length of lateral margin	11.6	11.7	11.9
Length of dactyl	18.7	18.9	19.2
Abdomen			
Width	10.5	11.2	11.1
Length	32.8	33.4	33.9

all collected by R. Wolfe and one of us (A.G.G.) on 20 March 1980.

Relationships.—The availability of a first form male of this new crayfish would greatly strengthen our confidence in the inferences that we have made in assessing its relationship to other crayfishes. That it is a member of the genus *Procambarus* and distinct from all other known species are not questioned, but we are less certain as to which of the subgenera it should be assigned, *Ortmannicus* or *Scapulicambarus*. The single feature that serves consistently to permit a distinction between members of these closely allied subgenera is the presence of a well defined "shoulder" on the cephalic surface of the first pleopod of first form males of those assigned to *Scapulicambarus*. Whereas the shoulder in first form males belonging to the latter is always clearly distinct from the presumably homologous "hump" on the pleopods of certain members of *Ortmannicus*, the difference is frequently not so obvious in second form males (See Hobbs, 1977b:figs. 2*a* and *f*). The bulge on the pleopod of the second form male of *P. (S.) xilitlae* is only slightly less well developed than that in the second form male of *P. (S.) strenthi*, and because the two species demonstrate a number of similar features, and both occur in the Río Pánuco basin, we suggest that they have been derived from a comparatively recent ancestor that formerly inhabited much of the watershed. If we are correct in placing this crayfish in the subgenus *Scapulicambarus*, then *P. (S.) xilitlae* is the only member of the subgenus that is known to have become an obligate inhabitant of subterranean waters.

This crayfish may be distinguished from all other members of the subgenus by the non-faceted cornea, the absence of pigment from the entire body, the very slender setiferous chelae bearing few tubercles, and the vaulted areola. The terminal elements of the first pleopod are unique.

Etymology.—The name of this crayfish is derived from that of the town of Xilitla, located near the type-locality.

Species Reported to Occur in México Since the Publication of the Villalobos Monograph (1955)

Procambarus (Ortmannicus) gonopodocristatus Villalobos (1958:279): Veracruz.

Procambarus (Scapulicambarus) clarkii (Girard, 1852: 91), Hobbs (1962:273), Clark and Ralston (1976: 106): Baja California Norte, Chihuahua, Coahuila, Nuevo León, and Sonora.

Procambarus (Ortmannicus) villalobosi Hobbs (1969: 41): San Luis Potosí.

Procambarus (Austrocambarus) oaxacae oaxacae Hobbs (1973:29): Oaxaca.

Procambarus (Austrocambarus) oaxacae reddelli Hobbs (1973:33): Oaxaca.

Procambarus (Pennides) roberti Hobbs and Villalobos (1974:8): San Luis Potosí.

Procambarus (Villalobosus) xochitlanae Hobbs (1975: 16): Puebla.

Procambarus (Scapulicambarus) strenthi Hobbs 1977b:412): San Luis Potosí.

Procambarus (Austrocambarus) sbordonii Hobbs (1977a:201): Chiapas.

Cambarellus chihuahuae Hobbs (1980:194): Chihuahua.

Procambarus (Villalobosus) cuetzalanae Hobbs (1981: 00): Puebla.

Procambarus (Scapulicambarus) xilitlae Hobbs and Grubbs (herein): San Luis Potosí.

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Assoc. Mexican Cave Stud. Bull., 8:51-61/Texas Mem. Mus. Bull., 28:51-61.

STUDIES OF THE SCORPION SUBFAMILIES SUPERSTITIONINAE AND TYPHLOCHACTINAE, WITH DESCRIPTION OF A NEW GENUS (SCORPIONES, CHACTOIDEA)

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ABSTRACT

Alacran tartarus, a new genus and species of troglobitic scorpions from Oaxaca, México, is described. Cladistic analyses indicate that *Alacran* is the immediate sister group of *Typhlochactas* Mitchell, another genus of troglobitic and endogean scorpions from México. The tribe Typhlochactini Mitchell, new rank, is the higher taxon recognized to indicate the close phylogenetic relationship of the two primarily troglobitic genera. The Typhlochactini are the hypothesized sister group of *Superstitionia* Stahnke, an epigean monobasic genus from western North America. The tribe Superstitionini, new, is proposed in the sequenced classification of the subfamily Superstitioninae Stahnke. The usefulness of trichobothrial patterns in phylogeny reconstruction is considered in some detail.

RESUMEN

Alacran tartarus, nuevo género y nueva especie de escorpión troglobita de Oaxaca, México, se describe. Análisis cladísticos indican que *Alacran* es el grupo hermano inmediato de *Typhlochactas* Mitchell, otro género de escorpiones troglobitas y endógeos de México. La tribu Typhlochactini Mitchell, nuevo rango, es la categoría taxonómica superior que indica la proximidad filogenética de los dos géneros esencialmente troglobitas. Los Typhlochactini son el grupo hermano hipotético de *Superstitionia* Stahnke, un género épigeo y monotípico de Norte América occidental. La tribu Superstitionini, nueva, es propuesta dentro de la clasificación en sequencia de la subfamilia Superstitioninae Stahnke. La utilidad de planos tricobotriales en reconstrucciones filogenéticas es considerada en detalle.

INTRODUCTION

The caves on the Huautla Plateau, located on the Sierra Mazateca of northern Oaxaca, are among the deepest known caves in the world. The plateau's elevation (approximately 2000 m above sea level) and its subtropical latitude act in conjunction to trigger considerable precipitation in the area. The large amounts of rainfall are responsible, in large part, for the formation of the caves. In addition, such 'moist' caves are more suitable for life than are 'dry' caves. Therefore, the presence of troglobitic taxa, scorpions included, in the Huautla cave complex should not be unexpected. Indeed, a remarkable new genus of troglobitic scorpion has been collected from four caves of the Huautla complex. The surprising fact is the depth at which these scorpions exist: about 750-820 m (2,450-2,700 feet) below the cave entrance! This is one order of magnitude deeper than the previous depth record for troglobitic scorpions, *Typhlochactas elliotti* Mitchell from Sótano de Yerbaniz (-75 m), San Luis Potosí, México. Equally remarkable, and unexpected, is the rather large size these deep-dwelling scorpions attain: 60-70 mm in total length. *Typhlochactas* spp. are less than 20 mm long. Thus, insofar as cave ecosystems are concerned, the Huautla cave complex is rather perplexing if one considers the amounts of energy that must be translocated to great depths in order to support such large predatory arthropods.

Alacran, new genus

Type species.—*Alacran tartarus*, new species. Monobasic.

Etymology.—The generic epithet is a noun in apposition meaning scorpion in some Hispanic countries, especially in México. The gender is masculine.

Distribution.—Known only from four caves in the state of Oaxaca, México.

Description.—Relatively large troglobites, adults 60-70 mm in total length. Medium brown, completely eyeless (Fig. 1). Sternum longer than wide, anterior margin evenly convex rather than angular, with deep longitudinal furrow posteromedially (Fig. 2). Genital operculi subelliptical: on male completely separate, with well developed genital papillae; on female with complete median longitudinal membranous connection, no genital papillae. Pectines simple: three marginal lamellae and one large median lamella; no fulcra; on male with 5-6 teeth, on female with 5 teeth per comb. Stigmata small, circular. Hemispermatophore laminate, without a well developed capsule (Figs. 14-17). Ovariuterus without diverticula. Metasomal segments subquadrangular in cross-section: dorsolateral and ventrolateral carinae strong, granulose; without ventral submedian carinae; intercarinal spaces flat, smooth. Telson with very globose vesicle, aculeus short and moderately curved (Fig. 3). Venom glands simple, basal membrane and secretory epithelium without folds. Cheliceral fixed finger with two basalmost teeth not forming a distinct bicusp (Fig. 4). Cheliceral movable finger with ventral margin very strongly developed, smooth, bearing a well developed serrula, distal tooth moderate; dorsal margin with four subequal teeth plus one large distal tooth. Pedipalp femur with three trichobothria (Fig. 5). Pedipalp tibia with 26-27 trichobothria (Figs. 6-8). Pedipalp chela with 29 trichobothria (Figs. 9-11). Fixed finger of pedipalp chela with six distinct rows of denticles; basal row appears double due to presence of one inner accesory granule (Fig. 13). Movable finger of pedipalp chela with seven distinct rows of denticles; basal row appears double due to presence of one inner accesory granule (Fig. 12). Legs without tibial spurs and retrolateral pedal spurs; prolateral pedal spurs well developed; tarsi armed ventrally with two submedian, subparallel, and somewhat irregular rows of bristles.

Comparisons.—The genus *Alacran* shares a number of unique, and rather distinctive characters with *Typhlochactas* Mitchell, a genus known from three troglobitic and one litter inhabiting species from México. Some of the similarities between these two genera could be hypothesized to represent convergences resulting from adaptation to a troglobitic or endogean existence. If this were the case, however, then I would expect other scorpions with similar habits to exhibit the same morphological adaptations, which they do not. Among diplocentrids the three known troglobites (Francke, 1977, 1978), which show varying degrees of 'cave adaptedness,' still retain the most important diagnostic features of the family and of the genus *Diplocentrus* Peters. The only obvious convergent features between *Diplocentrus*, *Alacran* and *Typhlochactas* ascribable to troglobitic habits are trends towards eyelessness, loss of pigmentation, and appendage attenuation. Other troglophilic and troglobitic scorpions (e. g., some species of *Vaejovis* and *Uroctonus*, and an undescribed megacormine genus from México) reveal the same evolutionary trends with respect to cave adaptation, namely

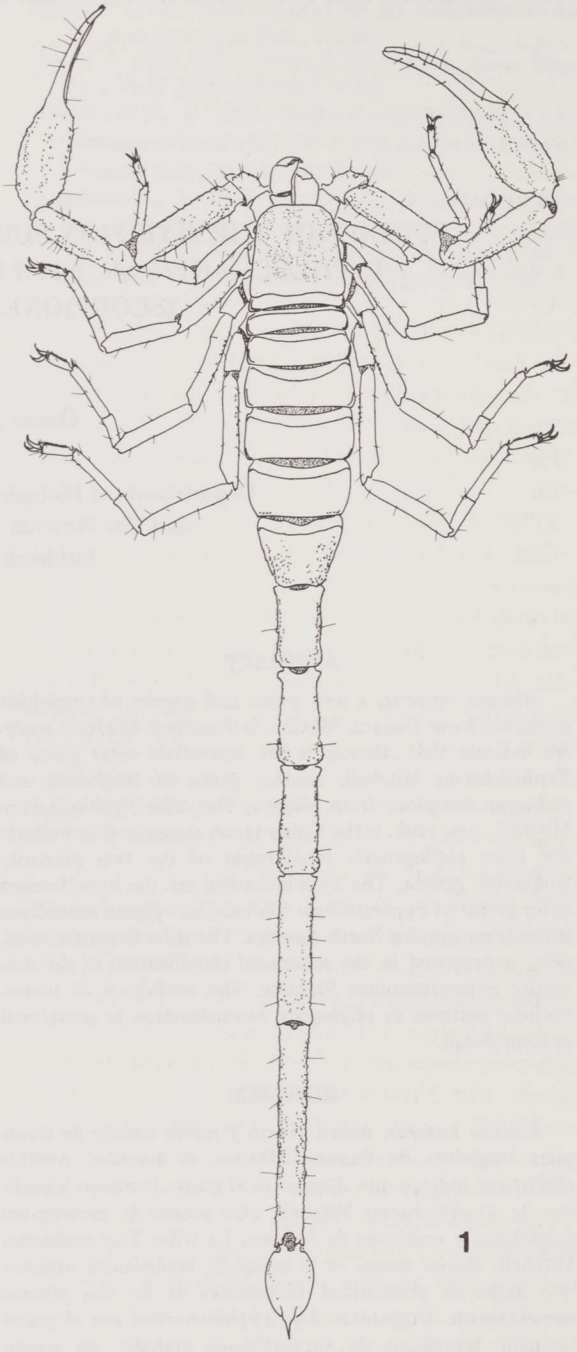


Fig. 1.—Holotype female of *Alacran tartarus*, new genus and species of troglobitic scorpion from Oaxaca, México (total length 62.60 mm).

loss of eyes and pigment, but retain the familial, subfamilial, and generic diagnostic characters. Therefore, I hypothesize that the characters shared by *Alacran* and *Typhlochactas* discussed below were derived from a common ancestor rather than acquired independently in response to the cave environment.

STERNUM—Subpentagonal, with sides slightly convergent anteriorly, and with anterior margin rounded rather than angular. Posteromedian depression present on distal one-third, fairly broad.

GENITAL OPERCULI—On females with complete median longitudinal membranous connection (or completely fused in *Typhlochactas sylvestris* Mitchell and Peck).

PECTINES—Simple, without fulcra, four to six teeth.

STIGMATA—Small, circular to oval.

CHELICERAE—Fixed finger with four teeth (only three in *T. sylvestris*, which lacks the subdistal tooth), and with basal and median teeth not forming a distinct bicusp. Among other Recent scorpions the absence of a bicusp is known only in *Chaerilus;* this genus differs considerably from *Alacran* and *Typhlochactas* in trichobothrial pattern and gnathobase morphology.

Movable finger with ventral edge very strongly developed (Fig. 4), unlike any other Recent scorpion, and with a well developed serrula.

PEDIPALP CHELAE FINGERS—Fixed finger with 5-6, movable finger with 6-7 distinct (broken and slightly offset) rows of denticles; apically each row flanked on inner aspect by a larger granule.

LEGS—Retrolateral pedal spurs absent: this is a diagnostic character of the Scorpionoidea, to which *Alacran* and *Typhlochactas* clearly do not belong based on hemispermatophores and female ovariuterus. Ventral aspect of tarsus with two somewhat irregular rows of setae; no mid-ventral row of spines or spicules.

The characteristics pertaining to the fixed finger of the chelicera, pedipalp chela fingers, and legs when taken together indicate a close phylogenetic relationship between *Alacran* and *Typhlochactas.* I hypothesize that the development of the movable finger of the chelicera, unique among Recent scorpions, is a synapomorphy between these two genera, rather than being a convergence due to troglobitic habits. Likewise, the absence of retrolateral pedal spurs in both *Alacran* and *Typhlochactas* is unique in the Chactoidea (Chactidae + Vaejovidae), the higher taxon in which the two genera presumably belong, and is thus also postulated to represent a synapomorphy between them.

Alacran differs from *Typhlochactas* as follows: the pedipalp tibia on *Alacran* has 26-27 trichobothria, of which 3 are located on the ventral aspect, whereas on *Typhlochactas* there are 19 trichobothria and only two of these are located on the ventral aspect; the pedipalp chela on *Alacran* has 29 trichobothria, with five on the ventral aspect of the palm and one medially on the external aspect of the palm, whereas *Typhlochactas* has 26 trichobothria, with four on the ventral aspect and none medially on the external aspect of the palm.

Alacran tartarus, new species

Type data.—Holotype female from Sótano de San Agustín (-720 m), San Agustín (5 km SE Huautla de Jiménez), Oaxaca, México, Spring 1979 (collected by members of the 1979 San Agustín Expedition of the Huautla Project). Deposited in the American Museum of Natural History, New York.

Etymology.—The specific epithet is a noun in apposition: *Tartarus* is the name given in Greek mythology to the deeper of the two divisions of the underworld.

Distribution.—Known only from four very deep caves in the vicinity of Huautla de Jiménez, Oaxaca, México.

Description.—The following description is based on the three known adult specimens (measurements in Table 1); parenthetical statements refer to sexual dimorphism noted on the single adult male available.

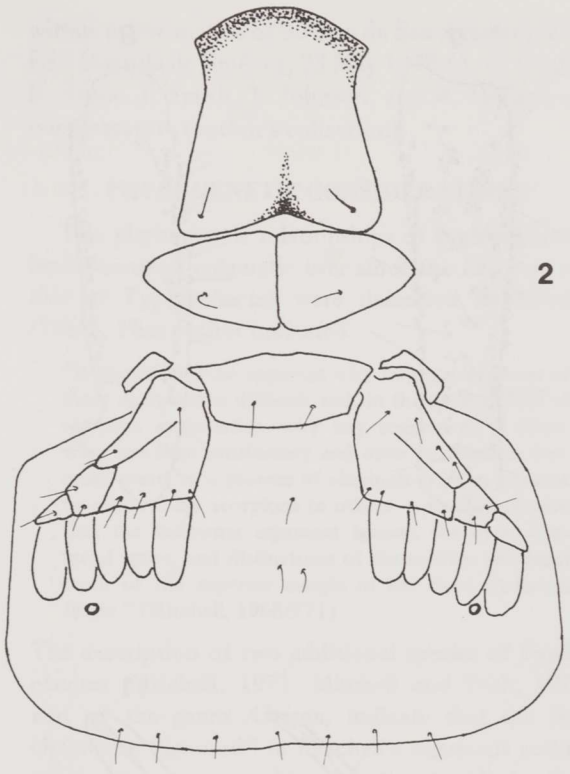
Prosoma. Carapace light brown, slightly wider than long; anterior margin straight; without distinct furrows or keels; median and lateral eyes absent; most areas covered with dense, minute granulation, on which are superimposed sparse to moderately dense small- and medium-sized granules (granules larger and more dense on male). Venter yellow brown, with very few scattered setae; gnathocoxae of legs I and II equal in length; gnathocoxae I moderately lobed anteriorly, with ectal sides slightly divergent anteriorly. Sternum as in Fig. 2.

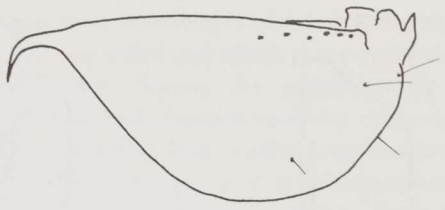
Mesosoma. Tergites light brown: 1-6 smooth (shagreened); 7 moderately granulose on sides, without distinct carinae. Sternopectinal area as in Fig. 2 (on male genital operculi without median longitudinal membranous connection, genital papillae well developed; pectines larger but with same overall configuration). Sternites shiny (on male, matte), lateral and posterior margins sparsely (moderately) granulose; last sternite without submedian carinae, lateral carinae represented by scattered granules. Stigmata very small, circular.

Metasoma. Segments subquadrangular in cross-section; angles represented by strongly developed dorsolateral and ventrolateral carinae, granulose, medium to dark brown; intercarinae smooth, light brown.

Table 1.—Measurements (in millimeters) of *Alacran tartarus*, new species, from deep caves of the Huautla Cave System, Oaxaca, México.

	Holotype female	Adult female	Adult male	Immature ?female
Total length	62.60	69.40	59.50	25.70
Carapace length	5.00	5.30	4.80	2.50
Anterior width	4.50	4.70	3.40	1.80
Median width	5.10	5.30	4.60	2.40
Posterior width	5.60	5.80	5.00	2.50
Mesosoma length	14.90	16.10	12.40	6.75
Metasoma length	42.70	48.00	42.30	16.45
Segment I: length	4.60	4.90	4.20	1.75
width	2.50	2.50	2.40	1.20
depth	2.20	2.30	2.10	1.00
Segment II: length	5.30	5.90	5.20	2.10
width	2.45	2.40	2.35	1.10
depth	1.90	2.10	2.00	0.95
Segment III: length	6.00	6.80	6.00	2.40
width	2.25	2.30	2.20	1.00
depth	1.90	2.00	1.90	0.90
Segment IV: length	8.20	9.40	8.30	3.20
width	1.85	2.00	1.80	0.85
depth	1.60	1.60	1.50	0.80
Segment V: length	12.40	14.40	12.50	4.70
width	1.60	1.60	1.50	0.80
depth	1.30	1.30	1.30	0.65
Telson length	6.20	6.60	6.10	2.30
Vesicle: length	5.20	5.70	5.30	1.95
width	2.85	2.90	2.90	1.00
depth	2.75	2.90	2.80	0.85
Aculeus: length	1.00	0.90	0.80	0.35
Pedipalp length	25.90	28.50	24.80	12.20
Femur: length	7.00	7.60	6.60	3.20
width	1.70	1.75	1.60	0.80
depth	0.90	0.90	0.80	0.40
Tibia: length	6.60	7.30	6.40	3.30
width	1.70	1.80	1.50	0.80
depth	1.60	1.60	1.50	0.80
Chela: length	12.30	13.60	11.80	5.70
width	2.90	3.10	2.90	1.05
depth	3.50	3.60	3.50	1.30
Movable finger length	7.60	7.90	7.40	3.55
Fixed finger length	6.30	6.60	6.10	3.00
Chelicera length	2.70	2.70	2.45	1.35
Chela: length	1.80	1.70	1.50	0.90
width	1.50	1.50	1.25	0.65
Movable finger length	1.50	1.60	1.60	0.80
Fixed finger length	0.90	1.00	0.95	0.45
Pectinal teeth count (L/R)	5/5	5/5	5/6	5/5





Figs. 2-4.—Holotype female of *Alacran tartarus:* 2, sternopectinal area, note small circular stigmata; 3, lateral aspect of telson; 4, dorsal aspect of left chelicera.

Lateral supramedian carinae on I weak, represented on each side by one row of medium-sized granules; on II and III vestigial, with 6-8 granules marking their position; on IV obsolete. All other metasomal carinae, i.e., dorsal submedian, lateral inframedian, and ventral submedian absent. Telson globose (Fig. 3), vesicle light brown; aculeus short and sharply curved, dark brown.

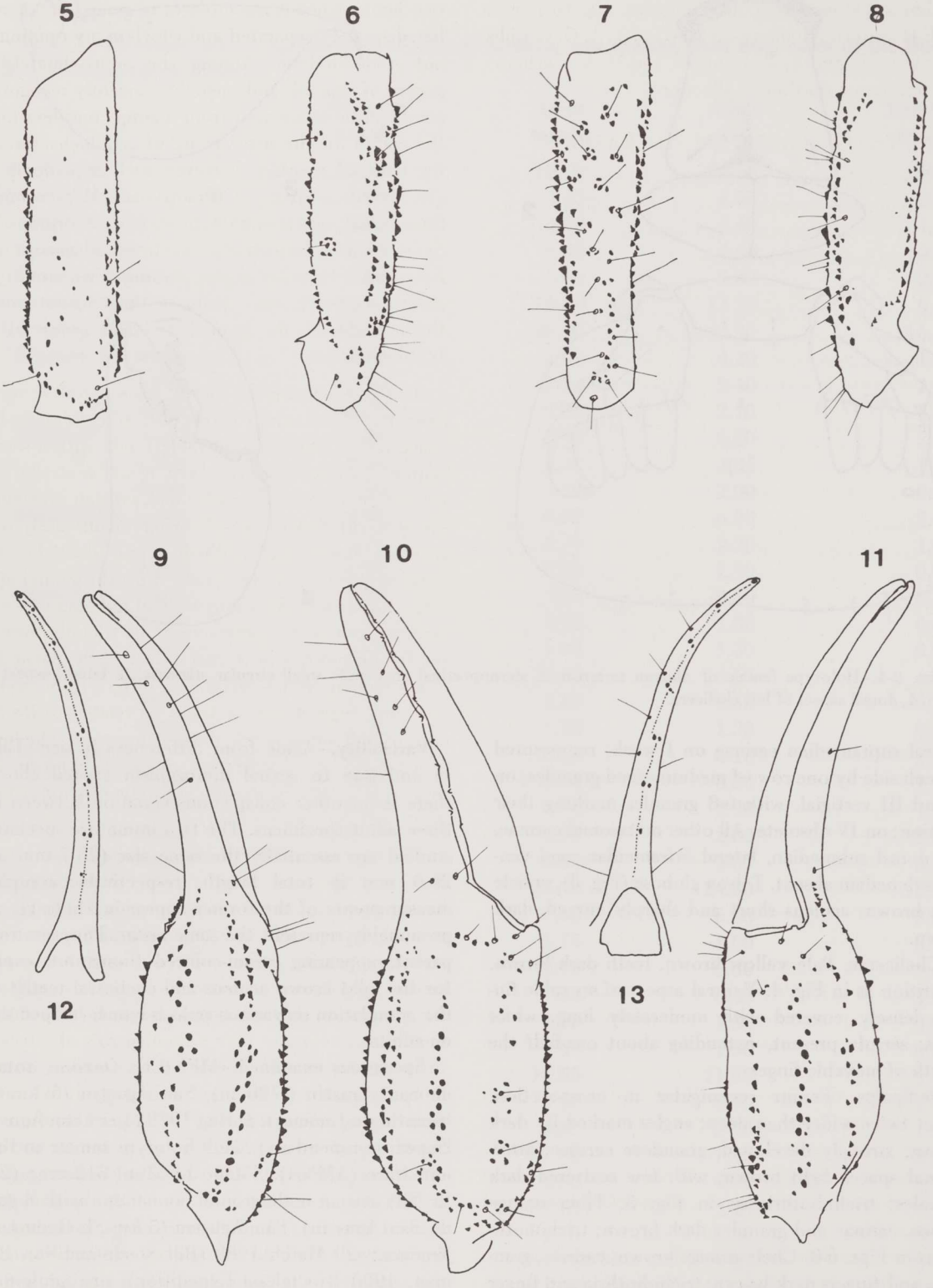
Chelicerae. Pale yellow brown, teeth dark brown. Dentition as in Fig. 4. Ventral aspect of movable finger densely covered with moderately long, white hairs; serrula present, extending about one-half the length of movable finger.

Pedipalps. Femur rectangular in cross-section, about twice wider than deep; angles marked by dark brown, strongly developed, granulose carinae; intercarinal spaces light brown, with few scattered dark granules; trichobothria as in Fig. 5. Tibia orange brown, carinae and granules dark brown; trichobothria as in Figs. 6-8. Chela orange brown; carinae, granules, and fingers dark brown; trichobothria and finger dentition as in Figs. 9-13.

Legs. Light yellow brown, sparsely setate. Femora dorsally with median longitudinal row of small granules. Tibial and retrolateral pedal spurs absent; prolateral pedal spurs well developed, dark brown.

Variability.—Aside from differences in size (Table 1) and due to sexual dimorphism (noted above), there is no other conspicuous variation between the three adult specimens. The two immature specimens studied are essentially the same size (25.7 mm and 26.0 mm in total length, respectively; complete measurements of the former appear in Table 1), and presumably represent the same instar. They are transparent, appearing cream-colored thoughout, except for the light brown aculeus and cheliceral teeth; and the granulation on various areas is less developed than on adults.

Specimens examined.—MEXICO: *Oaxaca:* Sótano de San Agustín (-720 m), San Agustín (5 km SE Huautla de Jiménez), Spring 1979 (1979 San Agustín Expedition members), adult holotype female and one immature (AMNH); Sótano Li Nita (-812 m; Sótano Li Nita has an underground connection with Sótano de San Agustín), San Agustín (5 km SE Huautla de Jiménez), 29 March 1980 (Bill Steele and Steve Zeman; 1980 Río Iglesia Expedition), one adult male (AMNH); Cueva del Escorpión (depth unknown), San Miguel Dolina (5 km SE Huautla de Jiménez), January 1978 (Roy Jameson and Patty Mothes), one adult female (author's collection); Sótano Agua de Carrizo (-760 m; underground passages have been explored to



Figs. 5-13.—Trichobothrial patterns and pedipalp finger dentition of *Alacran tartarus:* 5, dorsal aspect of femur; 6, dorsal aspect of tibia; 7, external aspect of tibia; 8, ventral aspect of tibia; 9, dorsal aspect of chela; 10, external aspect of chela; 11, ventral aspect of chela; 12, dentition of movable finger; 13, dentition of fixed finger.

within a few meters of Sótano de San Agustín), 5 km ESE Huautla de Jiménez, 23 May 1978 (A. G. Grubbs, B. Stone, J. Smith, T. Johnson, and M. McEachern), one immature (author's collection).

PHYLOGENETIC CONSIDERATIONS

The phylogenetic relationships of typhlochactines have remained enigmatic ever since the first two species of *Typhlochactas* were described by Mitchell (1968). That author indicated:

> "It should now be apparent why family placement of these scorpions is difficult and, in the present state of scorpion systematics, why any assignment is somewhat less than satisfactory and open to question. One must resort to a process of elimination in an attempt to relate these scorpions to others. I must emphasize that the following argument ignores the eyes, basitarsal spurs, and distinctness of the median and basal teeth of the superior margin of the fixed cheliceral finger." (Mitchell, 1968:771)

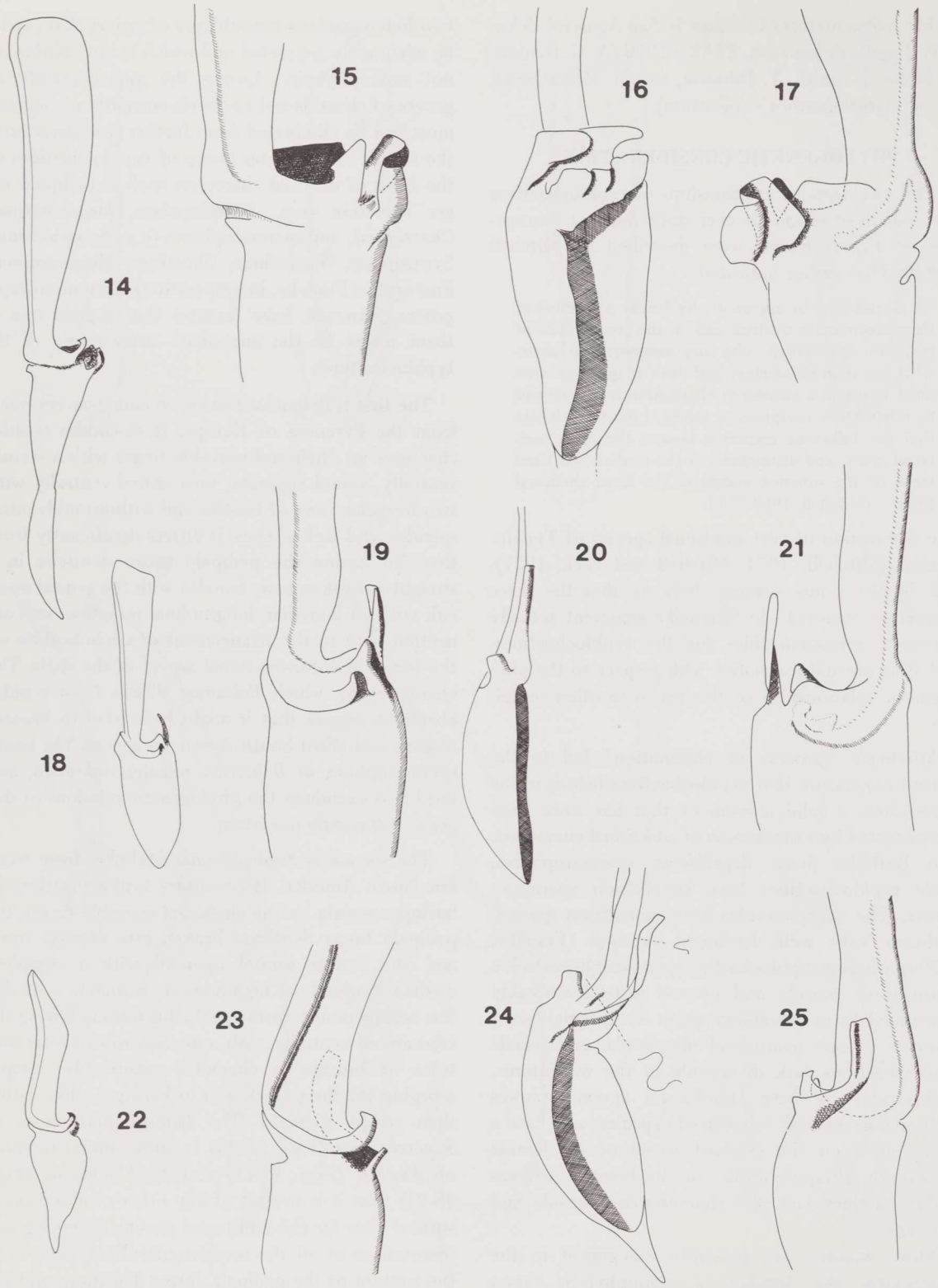
The description of two additional species of *Typhlochactas* (Mitchell, 1971; Mitchell and Peck, 1977), and of the genus *Alacran*, indicate that the three characters "ignored" in Mitchell's argument actually represent autapomorphies for the typhlochactines, and thus are uninformative with respect to the phylogenetic relationships of this taxon to other scorpions.

Mitchell's "process of elimination" led to the general conclusion that typhlochactines belong in the Chactoidea, a valid assessment that has since been corroborated by examination of additional characters. The Buthidae have flagelliform spermatophores, while typhlochactines have lamelliform spermatophores. The Scorpionoidea have lamelliform spermatophores with well developed capsules (Francke, 1979a), whereas typhlochactine spermatophores lack a conspicuous capsule and possess instead a weakly sclerotized to membranous sperm duct; female scorpionoids possess ovariuteral diverticula, and female typhlochactines lack diverticula in the ovariuterus. Bothriurids also have lamelliform spermatophores with well-developed, sclerotized capsules, and have a strong crest on the external aspect of the lamina (apparently autapomorphic for the family), whereas typhlochactines lack the characteristic capsule and laminar crest.

Three families are presently recognized in the Chactoidea: the Iuridae, a monophyletic taxon characterized by a prominent tooth on the ventral edge of the movable finger of the chelicera, and by complex (i.e., folded) venom glands in four of the five genera placed in this family (Francke and Soleglad, in press); and the Chactidae and Vaejovidae, two heterogeneous assemblages of genera that cannot be adequately separated and which in my opinion are not monophyletic. Among the approximately 30 genera of chactids and vaejovids currently recognized, most can be eliminated from further consideration in the search for the sister group of typhlochactines on the basis of assorted characters such as pedipalp finger dentition (e.g., Scorpiopsinae, Megacorminae, *Chactopsis*), and spermatophores (e.g., Scorpiopsinae, Syntropinae, Vaejovinae, Chactinae, Megacorminae, *Euscorpius;* Francke, in preparation). Two monotypic genera, however, have features that suggest one of them might be the immediate sister group of the typhlochactines.

The first is *Belisarius* Simon, an endogean scorpion from the Pyrenees of Europe. It resembles typhlochactines in: cheliceral movable finger with a serrula ventrally, round stigmata, tarsi armed ventrally with two irregular rows of bristles and without midventral spicules, and lack of eyes. It differs significantly from them in having the pedipalp finger denticles in a straight unbroken row, females with the genital operculi without a median longitudinal membranous connection, and in the arrangement of trichobothria on the femur and dorsoexternal aspect of the chela. The characters by which *Belisarius* differs from typhlochactines suggest that it might be related to *Broteochactas* and allied South American genera. The hemispermatophore of *Belisarius* remains unknown, and until it is examined the phylogenetic relations of this genus will remain uncertain.

The second is *Superstitionia* Stahnke, from western North America. It resembles typhlochactines in having a serrula on the cheliceral movable finger, the pedipalp finger dentition broken into discrete rows, and the female genital operculi with a complete median longitudinal membranous connection. It differs conspicuously from typhlochactines in having the tarsi armed ventrally with a median row of setaceous tufts or brushes (a character presumably autapomorphic for the genus), and in having slit-like rather than round stigmata. The hemispermatophore of *Superstitionia* (Figs. 22-25) is more similar to those of *Alacran* (Figs. 14-17) and *Typhlochactas* (Figs. 18-21) than it is to that of any other chactoid genus studied thus far (15 additional genera, including representatives of all the recognized subfamilies). Both the pattern of the pedipalp finger dentition, and the hemispermatophore, which are so similar between *Superstitionia* and typhlochactines are also unique among chactids and vaejovids, and are hereby hypothesized to represent synapomorphies between these taxa (Fig. 26).



Figs. 14-25.—Hemispermatophores of scorpions of the subfamily Superstitioninae: 14, 18 and 22, external aspect of hemispermatophore; all others, details of capsular region. Figs. 14-17: *Alacran tartarus:* 14, hemispermatophore (total length 6.5 mm); 15, external aspect; 16, dorsointernal aspect; 17, internal aspect. Figs. 18-21: *Typhlochactas elliotti* Mitchell: 18, hemispermatophore (total length 3.3 mm); 19, external aspect; 20, dorsal aspect; 21, internal aspect. Figs. 22-25: *Superstitionia donensis* Stahnke: 22, hemispermatophore (total length 2.9 mm); 23, external aspect; 24, dorsointernal aspect; 25, internal aspect.

Mitchell and Peck (1977) presented a "speculative reconstruction" of the evolutionary history of the four species of *Typhlochactas*, which corresponds to the relevant portion of the cladogram in Fig. 26. A cladistic analysis, using *Alacran* for sister group comparisons, makes it possible to identify the synapomorphies that corroborate the postulated relationships within *Typhlochactas*. The trichobothrial patterns of the fixed finger of the pedipalp chela of the five species under consideration appear in Figs. 27-31; each trichobothrium is designated according to Vachon's (1974) terminology (which correspond with the designations given by Mitchell and Peck, 1977). According to Vachon, trichobothria with the same designation are homologous; differences in their relative positions are due to "trichobothrial migration" and allometry. Differences in trichobothrial patterns due to allometry should be correlated with other features, and in the fixed finger of the pedipalp chela the dentition pattern is a suitable structure to test hypotheses of allometry. On the other hand, "trichobothrial migration" interpretations are untestable and should not be construed as scientific hypotheses. For example, in Figs. 28-31, compare the relative positions of the trichobothria on the external *(e)* series between *T. elliotti* and the other three species in the genus: by what mechanism(s) could *eb* "migrate" frrom the mid-region of the finger *(T. elliotti)* to the base of the finger (the other three

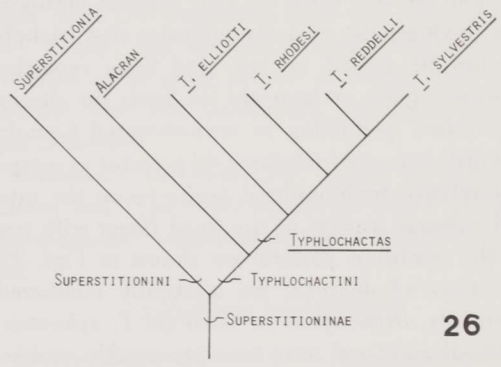
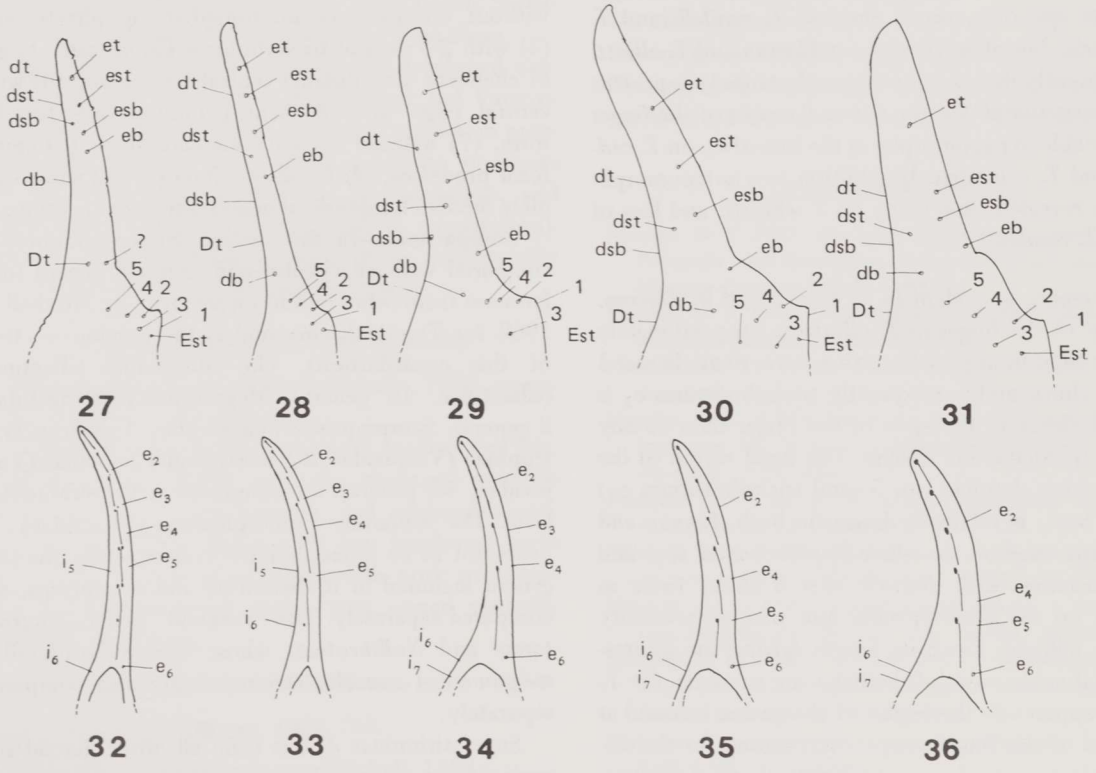


Fig. 26.—Cladogram expressing the hypothesized phylogenetic relations of members of the subfamily Superstitioninae.



Figs. 27-36.—Trichobothrial patterns of fixed finger of pedipalp in the Typhlochactini: 27-31: trichobothrial designations after Vachon (1974) and Mitchell and Peck (1977) (these authors consider trichobothria with the same designation to be homologous); 32-36: trichobothrial homologies hypothesized in this contribution. Figs. 37 and 32: *Alacran tartarus* Francke (fixed finger 6.30 mm long). Figs. 28 and 33: *Typhlochactas elliotti* Mitchell (fixed finger 2.30 mm long). Figs. 29 and 34: *T. rhodesi* Mitchell (fixed finger 2.40 mm long). Figs. 30 and 35: *T. reddelli* Mitchell (fixed finger 1.80 mm long). Figs. 31 and 36: *T. sylvestris* Mitchell and Peck (fixed finger 0.88 mm long).

species), or vice versa for that matter? Ontogenetic and phylogenetic evidence indicates that trichobothria can be gained or lost, and these evolutionary processes (gain or loss) are the basis for alternative hypotheses pertaining to trichobothrial homologies and differences in trichobothrial patterns in scorpions. The relative trichobothrial positions on the internal and external aspects of the fixed finger with respect to the dentition pattern are shown in Figs. 32-36. The rows of denticles are arbitrarily numbered sequentially from apical to basal (in *T. sylvestris* the subbasal and basal rows have presumably coalesced), and the trichobothria are designated as external (e) or internal (i) and with respect to their relative position to the denticle rows (e.g., e_3 designates an external trichobothrium at the level of the third row of denticles from the apex). In this case, homologous trichobothria are located on the same relative positions throughout, and differences in the patterns of the four *Typhlochactas* species can be hypothesized to represent gains or losses of trichobothria; the polarity of the transformation being determined in each case by out-group comparison with *Alacran*. On the inner aspect of the finger one synapomorphy is apparent: loss of i_5 on *T. rhodesi*, *T. reddelli* and *T. sylvestris*. The absence of i_7 on *Alacran* and *T. elliotti* is apparently due to convergence because i_7 is present in *Superstitionia*. On the external aspect of the finger the notable synapomorphy is the loss of e_3 on *T. reddelli* and *T. sylvestris*. In addition two autapomorphies are revealed: loss of e_6 on *T. elliotti*, and loss of e_5 on *T. rhodesi*.

Allometry is evident in *T. elliotti* and in *Alacran*. The tip of the finger in *T. elliotti* is proportionately shorter than in any of the other taxa: denticle row 1 is very short, and consequently trichobothrium e_2 is located closer to the apex of the finger than on any other typhlochactine species. The basal region of the finger, from denticle row 5 (and trichobothrium e_5) to the base, is relatively longer in both *Alacran* and *T. elliotti* than on the other *Typhlochactas* spp. and *Superstitionia*, with denticle row 6 about twice as long as on the other species, and with an accessory granule halfway down its length (giving the impression that seven rows of denticles are present). On *T. elliotti* apparently the region of elongation is found at the base of the finger proper, accounting for the distal displacement of trichobothrium i_6 to a position well on the finger; whereas on *Alacran* elongation presumably occurred in the region between trichobothria i_5 and i_6. These interpretations are supported by the relative positions of the trichobothrium designated *Dt* in Figs. 27 and 28.

CLASSIFICATION AND TAXONOMY

The phylogenetic information contained in the cladogram (Fig. 26) is also expressed by the following sequenced classification:

Subfamily Superstitioninae Stahnke, 1940
  Tribe Superstitionini, new tribe
    Superstitionia Stahnke, 1940
  Tribe Typhlochactini Mitchell, 1968, new rank
    Typhlochactas Mitchell, 1968
    Alacran Francke, new genus

The taxonomic changes resulting from this classification follow.

Subfamily SUPERSTITIONINAE Stahnke

Type genus.—*Superstitionia* Stahnke, 1940.

Included taxa.—Superstitionini, new tribe; and Typhlochactini, Mitchell, 1968, new rank.

Diagnosis.—Chactoid scorpions with: (1) pedipalp chela fingers with 5-7 distinct, broken rows of denticles and without numerous inner or outer supernumerary (=accessory) granules; (2) pedipalp femur with trichobothrium on dorsal face basal or subequal to trichobothrium on internal face; pedipalp tibia (3) without conspicuous anteromedian apophysis, and (4) with 2-3 ventral trichobothria; (5) movable finger of chelicera with distinct ventral serrula, and (6) with ventral edge smooth; hemispermatophores lamelliform, (7) without conspicuous capsule or (8) spiniform processes; (9) female genital operculi with complete median longitudinal membranous connection.

Comparisons.—In this section, Superstitioninae is compared with all chactid and vaejovid genera (differences from other families were given by Mitchell in 1968 for *Typhlochactas*, and in the previous section of this contribution). The subfamilies Chactinae (Chactidae, 10 genera), Megacorminae (Chactidae, 2 genera), Scorpiopsinae (Vaejovidae, 3 genera), Syntropinae (Vaejovidae, 2 genera), and Vaejovinae (Vaejovidae, 4-5 genera), are compared at the subfamilial level. The subfamily Euscorpioninae (Chactidae) appears not to be monophyletic: consequently the two genera included in it, *Belisarius* and *Euscorpius*, are compared separately. The "vaejovid" genera *Anuroctonus* and *Nullibroteas*, whose current subfamilial assignment I consider erroneous, are also compared separately.

Superstitioninae differs from all other chactid and vaejovid genera on character (1) above, as follows: Chactinae, Syntropinae, Vaejovinae, *Belisarius*, *Euscorpius*, *Anuroctonus*, and *Nullibroteas* all have a single, continuous row of median denticles on the pedipalp fingers; Megacorminae have a double row of median denticles flanked by inner and outer acces-

sory granules; and Scorpiopsinae have numerous imbricated rows of granules.

Character (2) above separates Superstitioninae from *Belisarius* and some Chactinae, which have the dorsal trichobothrium distal to the internal trichobothrium of the pedipalp femur.

Megacorminae, Scorpiopsinae, and *Euscorpius* differ from Superstitioninae by character (3) above; those taxa have a prominent anteromedian apophysis on the pedipalp tibia.

The following taxa have more than three ventral trichobothria on the pedipalp tibia (character 4 above), and can thus be easily differentiated from Superstitioninae by this character: Chactinae, Megacorminae, Scorpiopsinae, *Euscorpius*, *Anuroctonus*, and *Nullibroteas*. It is important to note that all the genera currently assigned to the family Chactidae, except *Belisarius* and Superstitioninae, have more than three ventral trichobothria on the pedipalp tibia.

The ventral edge of the movable finger of the chelicera (character 6) bears conspicuous denticles on the Megacorminae, Scorpiopsinae, some Chactinae (*Chactopsis* sp.), some Vaejovinae (*Uroctonus* spp., *Paruroctonus* spp.) and *Anuroctonus*, which enable Superstitioninae to be readily distinguished from them.

Hemispermatophores with a well developed capsule (character 7) occur in Syntropinae and Vaejovinae (Francke and Soleglad, in press; Francke, in preparation); and with conspicuous spiniform processes (character 8) in Megacorminae, Scorpiopsinae, and *Euscorpius* (Francke, 1979a), and in preparation). Both hemispermatophore types differ considerably from the type present in Superstitioninae.

Tribe **SUPERSTITIONINI**, new tribe

Type genus.—*Superstitionia* Stahnke, 1940, monobasic (western North America).

Diagnosis.—Superstitioninae with median and lateral eyes; small, slit-like stigmata; cheliceral movable finger ventral margin smooth and without a very strong edge, fixed finger with two basalmost teeth forming a distinct bicusp; legs with both prolateral and retrolateral pedal spurs; tarsi armed ventrally with setaceous tufts.

Tribe TYPHLOCHACTINI, new rank

Typhlochactinae Mitchell, 1968:753.

Type genus.—*Typhlochactas* Mitchell, 1968.

Included taxa.—*Typhlochactas* Mitchell and *Alacran* Francke (troglobites and litter inhabitants from México).

Diagnosis.—Superstitioninae without eyes; stigmata small, oval to circular; cheliceral movable finger ventral margin developed into very strong edge, fixed finger with two basalmost teeth not forming a distinct bicusp; legs without retrolateral pedal spurs, prolateral pedal spurs present or absent; tarsi armed ventrally with two submedian, somewhat irregular rows of bristles.

Remarks.—The characters useful in separating *Alacran* and *Typhlochactas* can be found under the "Comparisons" section after the description of *Alacran*.

ACKNOWLEDGMENTS

Special thanks are due to Mr. James R. Reddell for making it possible for me to study the remarkable troglobites described in this contribution, and to the members of the various expeditions to the Huautla caves for collecting them. Bill Steele was aware of my need to examine adult males and during the 1980 Río Iglesia Expedition succeeded in capturing the only one known, the hemispermatophore of which helped substantially my efforts to unravel the phylogenetic relationships of the group. Numerous collectors, curators, and institutions have made available valuable comparative material over the years in the form of gifts, exchanges, and loans, and I thank all of them for their generosity and cooperation. Mr. W. David Sissom made valuable suggestions on the manuscript. This research was partially supported by the Institute for Museum Research, Texas Tech University.

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SOME NEW SPECIES OF PSEUDOSCORPIONS FROM CAVES IN MEXICO (ARACHNIDA, PSEUDOSCORPIONIDA)

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ABSTRACT

Eleven new species are described: *Aphrastochthonius patei* from Tamaulipas; *Vachonium chukum*, *V. robustum*, and *V. loltun* from Yucatán; *Paravachonium delanoi* from Tamaulipas and *P. insolitum* from San Luis Potosí; *Typhloroncus troglobius* from Puebla, *T. diabolus* from Veracruz, and *T. attenuatus* from Tamaulipas; *Albiorix mirabilis* and *A. reddelli* from Oaxaca.

Continuing collection of pseudoscorpions from caves in México has resulted in a large bulk of undescribed material. Most of this belongs to the family Chernetidae and has not yet been studied seriously because of considerable taxonomic difficulties in that family. However, several forms belonging to other families can be described and placed with confidence.

All specimens are deposited in the Florida State Collection of Arthropods, Gainesville, Florida, unless otherwise noted.

FAMILY CHTHONIIDAE HANSEN

Genus *Aphrastochthonius* Chamberlin

Five species of this genus, 4 of them cavernicolous, have been known from México and Guatemala. For the characters of the genus and a key to species see Muchmore (1972b, 1976).

Aphrastochthonius alteriae Muchmore
Fig. 1

Previously, only females and nymphs have been reported for the *Aphrastochthonius* species of México and Guatemala. Now mention can be made of males of *A. alteriae* (Muchmore, 1977). Two males and a female were separated from rain forest litter at the ruins, Palenque, Chiapas, México, 24 January 1976, by C. H. Alteri; this is essentially the type-locality for the species. The males are very much like the females, but are slightly smaller and more slender. The genital opercula are very like those figured for *A. cubanus* by Dumitresco and Orghidan (1977:100) except that the 2 most posterior setae on either side of the genital aperture are bulbous at the base, as shown in Fig. 1. Such bulbous setae are unique to this species as far as is known—they do not occur in the male of *A. patei* (see below) and they were not figured by Chamberlin for the male of *A. tenax* (1962:309) and they have not been reported in any other pseudoscorpion. Possibly they perform some special sensory function.

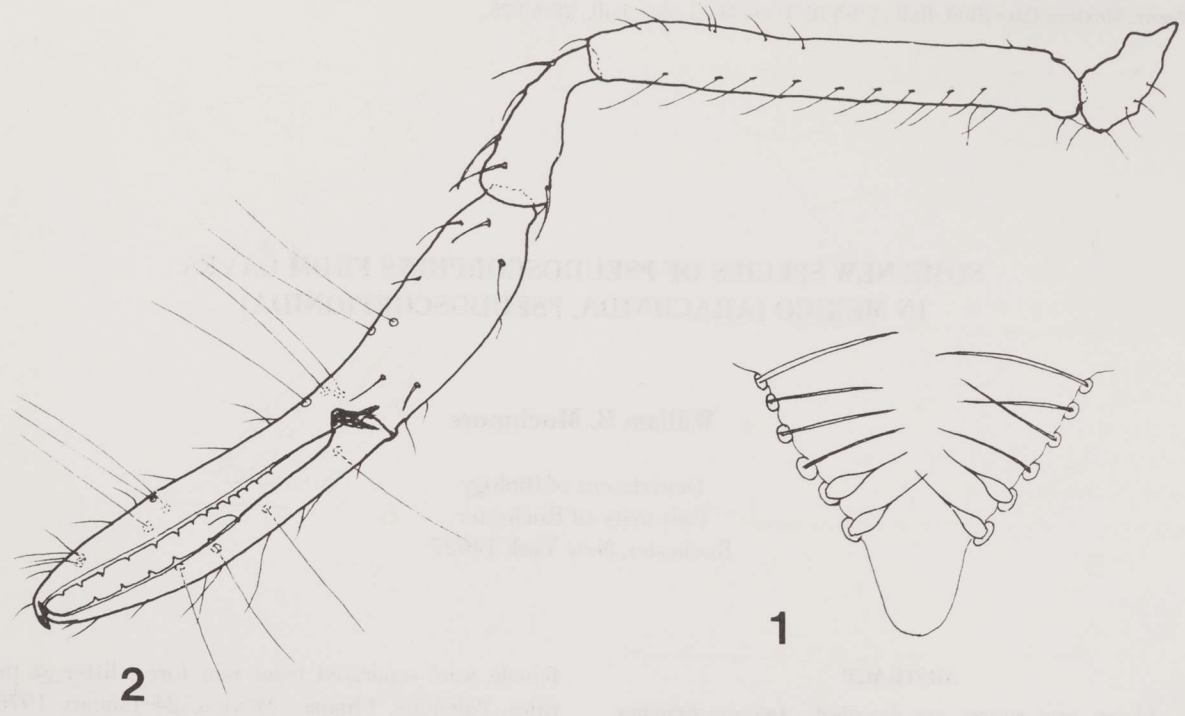
Measurements of the 2 males (mm).—Body length 0.85-0.86. Carapace length 0.27-0.28. Palpal femur 0.29-0.30 by 0.06; tibia 0.11 by 0.05-0.06; chela 0.385-0.39 by 0.065-0.07; hand 0.20 by 0.065-0.07; movable finger 0.20 long. Leg IV: entire femur 0.28 by 0.12-0.125.

Aphrastochthonius patei, new species
Fig. 2

Material.—Holotype male (WM 5278.01001) from la Cueva de Oyamel, SW El Barretal, Tamaulipas, México, 23 November 1977 (D. Pate).

Diagnosis.—A medium-sized species of the genus, with palpal femur 0.635 long; with 11 or 12 setae on hand of chelicera; and 4-6 microsetae on each side of carapace.

Description of male (female unknown).—With the characters of the genus (see Muchmore, 1972b:433).



Figs. 1-2.—*Aphrastochthonius* spp.: 1, *A. alteriae* Muchmore: central area of posterior genital operculum of male; 2, *A. patei*, new species, holotype male: dorsal view of right palp, chela twisted, showing medial surface.

Carapace about as long as broad; anterior margin with a few denticles at middle; no eyes; surface reticulated above, becoming scaly laterally; chaetotaxy 4-3-4-2-2=15 long, stout, setae dorsally, plus 4-6 microsetae on each side. Coxal area typical of the genus; chaetotaxy 1+m-2-1(8 or 9m):3m-3-1-CS:3-2-CS:2-5:2-5; palpal coxa with 8 or 9 microsetae (8 or 9m) on dorsolateral surface; each coxa I and II with 6 flat, parallel-rayed coxal spines. Intercoxal tubercle with 2 setae.

Abdomen typical; papillae on pleural membranes in irregular, longitudinal rows. Tergal chaetotaxy 4:3:3:5:6:6:6:6:6:2:T2T:0; sternal chaetotaxy 6:[4-4]:(3)6-6/11(3):(3)11(3):12:12:12:12:11:9:0:2.

Chelicera 0.78 as long as carapace; hand with 11 or 12 setae; flagellum of 8 pinnate setae; fixed finger with a row of 10 and movable finger with 12 marginal teeth; no spinneret evident.

Palp typical (Fig. 2). Surfaces, except chelal fingers, covered with tiny papillae. Trochanter 2.0, femur 7.95, tibia 2.4, and chela 6.5 times as long as broad; hand 2.8 times as long as deep; movable finger 1.37 times as long as hand. Femur 1.65 and chela 2.15 times as long as carapace. Placement of trichobothria typical. Movable chelal finger with 6 spaced, acute teeth; fixed finger with 16 similar teeth and a small, external denticle at base of terminal tooth. Sensory pit on movable finger well proximad of last tooth.

Legs typical, but rather slender for the genus; leg IV with entire femur 3.0 and tibia 5.9 times as long as deep.

Measurements (mm).—Body length 1.30. Carapace length 0.38. Chelicera 0.295 by 0.13. Palpal trochanter 0.16 by 0.08; femur 0.635 by 0.08; tibia 0.215 by 0.09; chela 0.815 by 0.125; hand 0.35 by 0.125; movable finger 0.48 long. Leg IV: entire femur 0.51 by 0.17; tibia 0.355 by 0.06; metatarsus 0.18 by 0.05; telotarsus 0.445 by 0.045.

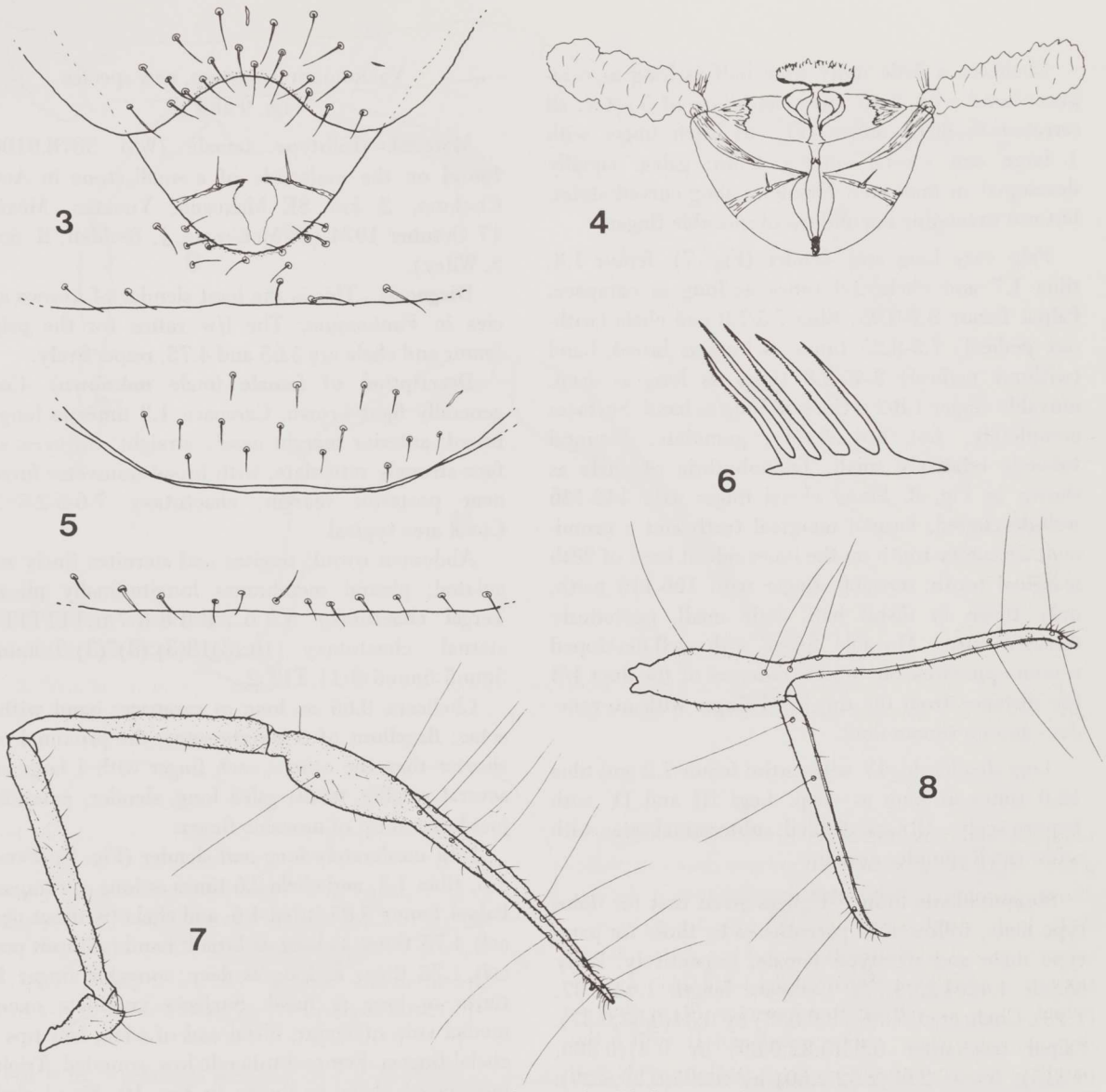
Etymology.—The species is named in honor of Dale Pate, who collected the specimen.

Remarks.—In the key to species of *Aphrastochthonius* (Muchmore, 1976:363), *A. patei* will run to couplet 4, where it separates by reason of the occurrence of 4-6 microsetae on each side of the carapace. In this species the posterior genital operculum of the male does not have the distinctive bulbous setae as seen in *A. alteriae* (see above).

FAMILY VACHONIIDAE CHAMBERLIN

Genus *Vachonium* Chamberlin

For the definition of the genus see Chamberlin (1947). Five species, all cavernicolous, have been known from México and Belize (Muchmore, 1977).



Figs. 3-8.—*Vachonium chukum*, new species: 3, genital opercula of holotype male; 4, internal genitalia of holotype male; 5, genital opercula of paratype female; 6, cheliceral flagellum; 7, dorsal view of left palp; 8, lateral view of right chela (Figs. 6-8 are of holotype male).

Vachonium chukum, new species
Figs. 3-8

Material.—Holotype male (WM 3879.01001) and single male and female paratypes found on the undersides of stones in the main room of Actún Chukum, 2 km SE Maxcanú, Yucatán, México, 29 November 1974 (J. Reddell, D. McKenzie, S. Wiley, R. W. Mitchell).

Diagnosis.—Similar in size to *Vachonium maya* Chamberlin, but with appendages more attenuate, palpal femur about 2.55 mm long, l/w ratio about 8.8 and chela about 3.95 mm long, l/w ratio about 8.0.

Description.—Males and female much alike except for genitalia. Generally light brown in color. Carapace about 1/3 longer than broad; anterior margin straight; no eyes; surface strongly reticulate, without a transverse furrow; chaetotaxy of holotype 5-6-4-2-4=21. Coxal area typical of the genus.

Abdomen elongate; tergites and sternites finely reticulated; pleural membranes longitudinally plicate. Tergal chaetotaxy of holotype 3:4:4:6:6:6:6:7:6:6: T1TT1T:2. Sternal chaetotaxy of holotype male 21:[1-1]:(3)12/6(3):(2)8(2):8:4mm4:4mm4:4mm4: 8:8:TT:2; sternal chaetotaxy of female paratype 15:(4)13(4):(2)6(2):8:-. Male genital opercula and internal genitalia as shown in Figs. 3 and 4; female genital opercula as in Fig. 5.

Chelicera a little more than half as long as carapace; hand with 8-10 setae; flagellum of 5 setae, all serrated in distal halves (Fig. 6); each finger with 1 large and several smaller teeth; galea, equally developed in male and female, a long curved stylet, but not extending beyond tip of movable finger.

Palp very long and slender (Fig. 7); femur 1.8, tibia 1.7 and chela 2.8 times as long as carapace. Palpal femur 8.7-8.95, tibia 7.5-7.8 and chela (without pedicel) 7.5-8.25 times as long as broad; hand (without pedicel) 2.45-2.8 times as long as deep; movable finger 1.8-2.0 times as long as hand. Surfaces completely, but not evenly, granulate. Femoral tubercle relatively small. Trichobothria of chela as shown in Fig. 8. Fixed chelal finger with 142-146 well-developed, cusped marginal teeth and a prominent accessory tooth on the inner side at level of 28th marginal tooth; movable finger with 106-116 teeth, only those in distal half with small, posteriorly directed cusps. Movable finger with well-developed venom apparatus, the nodus ramosus of the duct 1/3 the distance from the tip; fixed finger with no venedens and no venom duct.

Legs slender; leg IV with entire femur 7.2 and tibia 12.0 times as long as deep. Legs III and IV with femora scaly. All tarsi divided; subterminal setae with a few small spinules near tips.

Measurements (mm).—Figures given first for holotype male, followed in parentheses by those for paratype male and paratype female, respectively. Body length 4.42(4.23,4.77). Carapace length 1.44(1.37, 1.43). Chelicera 0.78(0.78,0.835) by 0.34(0.34,0.37). Palpal trochanter 0.85(0.82,0.89) by 0.41(0.385, 0.415); femur 2.63(2.52,2.60) by 0.295(0.29,0.29); tibia 2.41(2.34,2.45) by 0.32(0.30,0.325); chela (without pedicel) 3.97(3.88,4.03) by 0.495(0.47, 0.54); hand (without pedicel) 1.26(1.36,1.33) by 0.50(0.48,0.54); pedicel about 0.15 long; movable finger 2.58(2.48,2.55) long. Leg IV: entire femur 1.93(1.88,1.90) by 0.27(0.26,0.265); tibia 1.63(1.60, 1.70) by 0.13(0.13,0.15).

Etymology.—The species is named for the Actún Chukum where it is found; *chukum* is used as a noun in apposition.

Remarks.—These pseudoscorpions were taken at the same time and at the same general location in the cave where the holotype of the scorpion *Diplocentrus anophthalmus* Francke was found.

Here are recorded the first known males in the genus *Vachonium* Chamberlin. It is of interest to note that they differ little from the female except for the genital apparatus.

Vachonium robustum, new species
Figs. 9 and 10

Material.—Holotype female (WM 3878.01001) found on the underside of a small stone in Actún Chukum, 2 km SE Maxcanú, Yucatán, México, 17 October 1974 (D. McKenzie, J. Reddell, R. Solis, S. Wiley).

Diagnosis.—This is the least slender of known species in *Vachonium.* The l/w ratios for the palpal femur and chela are 5.65 and 4.75, respectively.

Description of female (male unknown).—Color generally light brown. Carapace 1.3 times as long as broad; anterior margin nearly straight; no eyes; surface strongly reticulate, with broad transverse furrow near posterior margin; chaetotaxy 7-6-5-2-5=25. Coxal area typical.

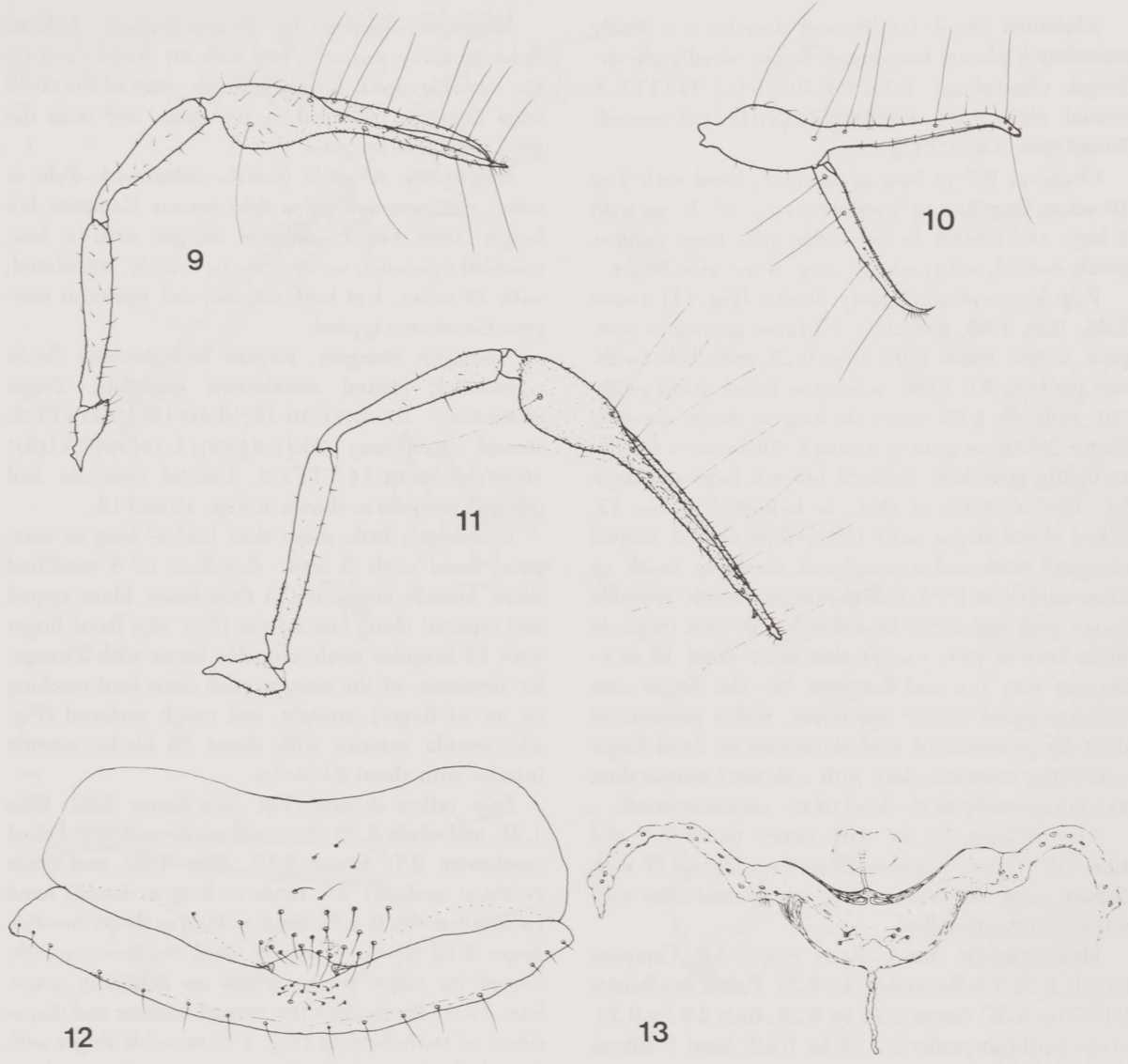
Abdomen ovoid; tergites and sternites finely reticulated; pleural membranes longitudinally plicate. Tergal chaetotaxy 6:5:6:7:8:8:8:8:7:6:T1TT1T:2; sternal chaetotaxy 16:(3)18(3):(3)7(3):9:5mm5: 5mm5:5mm5:9:11:T1T:2.

Chelicera 0.65 as long as carapace; hand with 8 setae; flagellum of 5 serrate setae, the proximal one shorter than the others; each finger with 1 large and several smaller teeth; galea long, slender, extending just beyond tip of movable finger.

Palp moderately long and slender (Fig. 9). Femur 1.5, tibia 1.3, and chela 2.6 times as long as carapace. Palpal femur 5.65, tibia 4.6, and chela (without pedicel) 4.75 times as long as broad; hand (without pedicel) 1.75 times as long as deep; movable finger 1.7 times as long as hand. Surfaces granulate except medial side of femur, distal end of tibia, and tips of chelal fingers. Femoral tubercle low, rounded. Trichobothria of chela as shown in Fig. 10. Fixed chelal finger with 119 well-developed, cusped marginal teeth and a prominent accessory tooth on the inner side at level of 27th marginal tooth; movable finger with 77 teeth, best developed in middle of row, becoming low and rounded proximally and obsolescent distally. Movable finger with well-developed venom apparatus, nodus ramosus of duct just proximad of trichobothrium *st;* fixed finger without a venedens, but with a small venom duct extending to a point just proximal to the accessory tooth.

Legs moderately slender; leg IV with femur 4.65 and tibia 7.85 times as long as deep. Legs III and IV with femora scaly. All tarsi divided; subterminal setae with few distal spinules.

Measurements (mm).—Body length 4.44. Carapace length 1.22. Chelicera 0.79 by 0.355. Palpal trochanter 0.78 by 0.34; femur 1.81 by 0.32; tibia 1.61 by 0.35; chela (without pedicel) 3.17 by 0.665; hand (without pedicel) 1.09 by 0.62; pedicel 0.185 long;



Figs. 9-10.—*Vachonium robustum*, new species, holotype female: 9, dorsal view of left palp; 10, lateral view of right chela.
Fig. 11.—*Vachonium loltun*, new species, holotype female: dorsal view of left palp.
Fig. 12-13.—*Paravachonium delanoi*, new species, holotype male: 12, genital opercula; 13, internal genitalia.

movable finger 1.87 long. Leg IV: entire femur 1.37 by 0.295; tibia 1.18 by 0.15.

Etymology.—The species is called *robustum* because of the relative robust structure among species of *Vachonium*.

Remarks.—This species was collected from the same cave as *V. chukum* (see above), but at a different time and in a different location in the cave. Because of the very considerable agreement in characters among the 3 specimens of *V. chukum*, it is unlikely that this is a variant of that species. It differs particularly in size, proportions and chaetotaxy and in the possession of a vestigial venom duct in the fixed chelal finger.

Vachonium loltun, new species
Fig. 11

Material.—Holotype female (WM 4564.0100) from underside of a small rock in Actún Loltún, 7 km SSW Oxkutzcab, Yucatán, México, 26 June 1975 (J. Reddell, A. Grubbs, D. McKenzie, S. Wiley).

Diagnosis.—Similar in size to *V. chukum* but with appendages, especially palpal chela much less attenuated—chela 3.66 mm long, l/w ratio 5.9; and with distinct venom duct in movable finger.

Description of female (male unknown).—Color generally light brown. Carapace about 1.25 times as long as broad; anterior margin slightly concave; no eyes; surface faintly reticulate, with no transverse furrow; chaetotaxy 7-6-3-2-4=22. Coxal area typical.

Abdomen ovoid; tergites and sternites very finely reticulated; pleural membranes longitudinally plicate. Tergal chaetotaxy 4:4:4:6:6:6:7:7:6:5:T1TT1T:2; sternal chaetotaxy 12:(3)20(3):(2)10(2):10:4mm4:5mm5:5mm4:8:8:TT:2.

Chelicera 0.7 as long as carapace; hand with 9 or 10 setae; flagellum of 5 serrate setae; each finger with 1 large and several smaller teeth; galea long, slender, gently curved, not reaching to tip of movable finger.

Palp long and moderately slender (Fig. 11); femur 1.85, tibia 1.65, and chela 3.0 times as long as carapace. Palpal femur 8.05, tibia 6.25, and chela (without pedicel) 5.9 times as long as broad; hand (without pedicel) 1.95 times as long as deep; movable finger 2.0 times as long as hand. All surfaces heavily to lightly granulate. Femoral tubercle large and angular. Trichobothria of chela as indicated in Fig. 11. Fixed chelal finger with 159 well-developed, cusped marginal teeth and a prominent accessory tooth on inner surface at level of 35th marginal tooth; movable finger with 103 teeth, best developed, with cusps, in distal half of row, except that most distal 10 or so become very low and flattened. Movable finger with well-developed venom apparatus, nodus ramosus of duct far proximal of trichobothrium *st;* fixed finger without a venedens, but with a distinct venom duct extending nearly to the level of the accessory tooth.

Legs slender; leg IV with entire femur 6.4 and tibia 10.5 times as long as deep. Legs III and IV with femora scaly. All tarsi divided; subterminal setae with a few spinules distally.

Measurements (mm).—Body length 4.0. Carapace length 1.23. Chelicera 0.86 by 0.37. Palpal trochanter 0.805 by 0.37; femur 2.26 by 0.28; tibia 2.0 by 0.32; chela (without pedicel) 3.66 by 0.62; hand (without pedicel) 1.17 by 0.60; pedicel 0.15 long; movable finger 2.33 long. Leg IV: entire femur 1.66 by 0.26; tibia 1.50 by 0.14.

Etymology.—This species is named for the Actún Loltún, where it is found; *loltun* is used as a noun in apposition.

Genus *Paravachonium* Beier

For a discussion of this genus see Muchmore (1972, 1973). Two species have been known, both from caves in Tamaulipas.

Paravachonium delanoi, new species
Figs. 12-19

Material.—Holotype male (WM 5278.02001) found in Cueva de Oyamel, SW of El Barretal, Tamaulipas, México, 23 November 1977 (J. Delano) and a paratype tritonymph from the same cave, 19 March 1978 (A. Grubbs).

Diagnosis.—Similar to *Paravachonium bolivari* Beier in many respects, but with no dental crest on the movable chelal finger, with the setae of the cheliceral flagellum rounded at the ends, and with the galea short and irregular.

Description of male (female unknown).—Pale in color, carapace and palps light brown. Carapace 1/3 longer than broad; anterior margin with a low, rounded epistome; no eyes; surface finely reticulated; with 21 setae, 4 at both anterior and posterior margins. Coxal area typical.

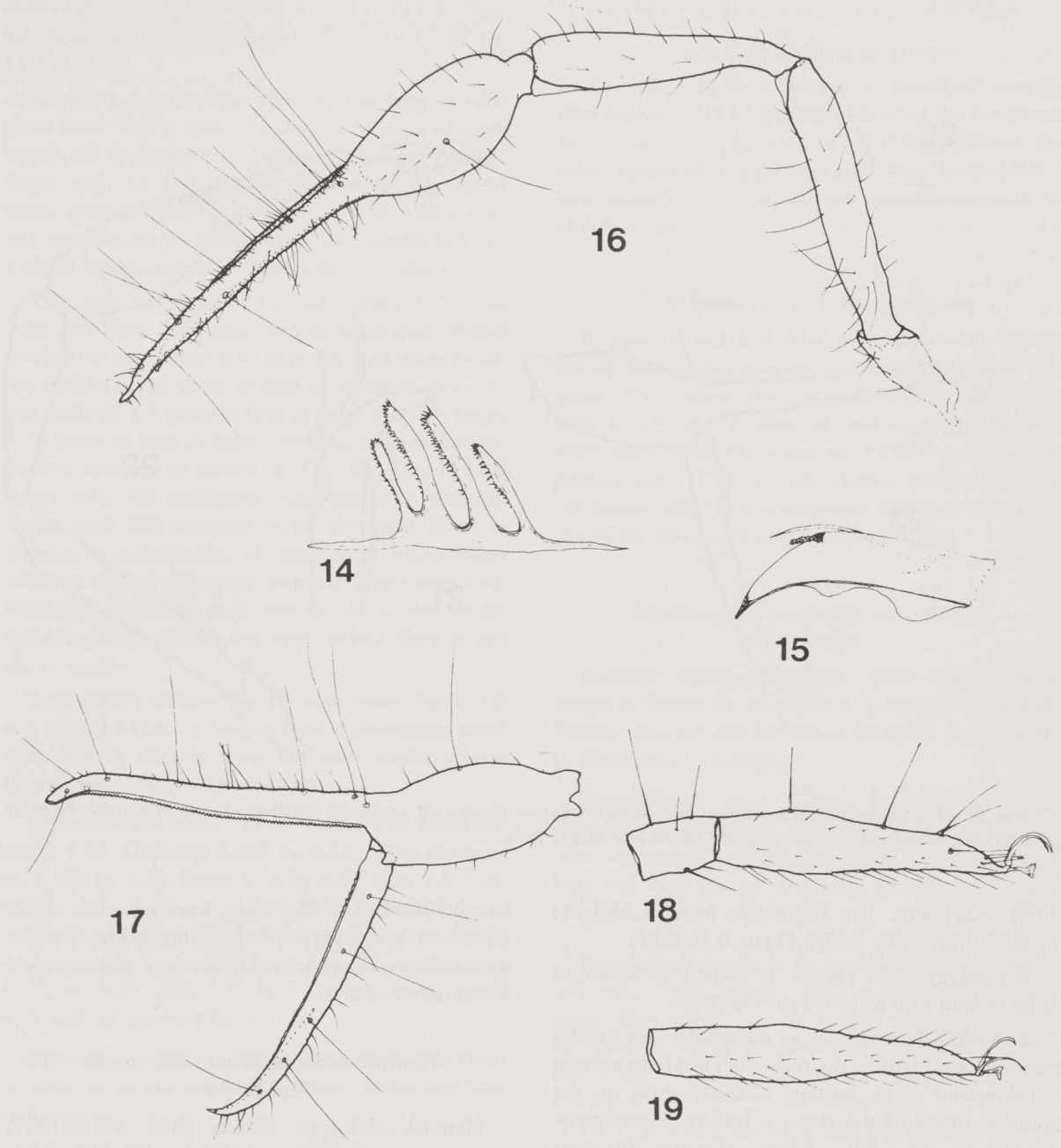
Abdomen elongate; tergites and sternites finely reticulated; pleural membranes granulate. Tergal chaetotaxy 6:9:8:11:10:10:10:10:10:8:T1T1TT:2; sternal chaetotaxy 25:[2-3]:(3)14/10(3):(5)11(3):16:17:18:16:14:14:TTTT:2. Genital opercula and internal genitalia as shown in Figs. 12 and 13.

Chelicera a little more than half as long as carapace; hand with 5 setae; flagellum of 4 modified setae, broadly connected at their bases, blunt tipped and serrated along one margin (Fig. 14); fixed finger with 10 irregular teeth; movable finger with 2 irregular elevations of the margin; galea short (not reaching to tip of finger), straight, and rough surfaced (Fig. 15); serrula exterior with about 28 blades; serrula interior with about 23 blades.

Palp rather slender (Fig. 16); femur 1.33, tibia 1.21, and chela 3.29 times as long as carapace. Palpal trochanter 2.7, femur 6.15, tibia 4.65, and chela (without pedicel) 5.0 times as long as broad; hand (without pedicel) 1.95 times as long as deep; movable finger 1.72 times as long as hand. Surfaces smooth, except for palpal fingers which are distinctly granulate. Fixed finger with the normal number and disposition of trichobothria (Fig. 17); movable finger with 5 trichobothria, evidently an extra one inserted between *st* and *sb* (Fig. 17). Fixed finger with 126 well-developed, cusped marginal teeth. Movable finger with 72 very low, flattened teeth, those toward base of finger *not* elongated to form a crest as in other known species of *Paravachonium.* Fixed finger without venom apparatus; movable finger with well-developed venedens and venom duct, nodus ramosus just distal to middle of finger.

Legs rather slender; leg IV with entire femur 5.7 and tibia 8.95 times as long as deep. Subterminal tarsal setae heavily dentate along one side; arolia shorter than claws, entire, margins ruffled.

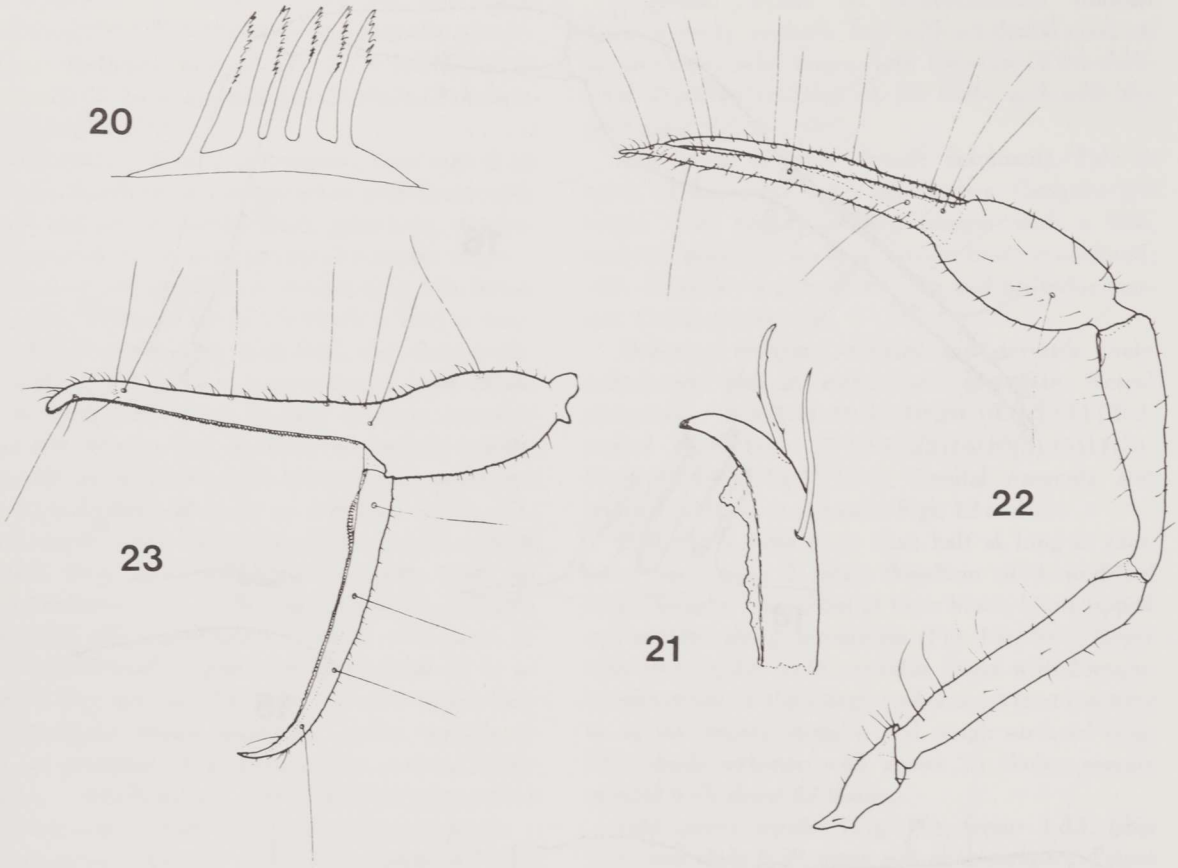
Tritonymph.—Much like the adult, but smaller and with less attenuated appendages. Carapace with a very low epistome; with 23 setae, 4 at anterior and 5 at posterior margins. Cheliceral hand with 5 setae, flagellum of 4 setae as in the adult; galea long, slender, curved, with a few tiny lateral spinules. Palpal chela



Figs. 14-19.—*Paravachonium delanoi*, new species, holotype male: 14, cheliceral flagellum; 15, tip of movable finger of chelicera; 16, dorsal view of right palp; 17, lateral view of left chela; 18, metatarsus and telotarsus of leg IV of paratype tritonymph; 19, (fused) tarsus of leg I of paratype tritonymph.

with marginal teeth as in adult, 102 on fixed finger and 59 on movable finger with none elongated. Trichobothria positioned more or less as in adult; *isb* missing on fixed finger; movable finger with 4 trichobothria, apparently the most basal adult one missing. Legs differ from those of adult in that the tarsi of legs III and IV are divided normally while those of legs I and II are not divided (Figs. 18 and 19).

Measurements (mm).—Figures for holotype male given first with those for tritonymph in parentheses. Body length 4.32(3.59). Carapace length 1.36(1.24). Chelicera 0.73(0.62) by 0.325(0.295). Palpal trochanter 0.84(0.695) by 0.31(0.26); femur 1.81(1.40) by 0.295(0.26); tibia 1.65(1.24) by 0.355(0.31); chela (without pedicel) 3.11(2.43) by 0.72(0.52); hand (without pedicel) 1.12(0.95) by 0.58(0.495); pedicel about 0.165(0.15) long; movable finger



Figs. 20-23.—*Paravachonium insolitum*, new species, holotype female: 20, cheliceral flagellum; 21, tip of movable finger of chelicera; 22, dorsal view of right palp; 23, lateral view of left chela.

1.93(1.525) long. Leg IV: entire femur 1.54(1.21) by 0.27(0.23); tibia 1.43(1.11) by 0.16(0.14).

Etymology.—The species is named in honor of John Delano who collected the holotype.

Remarks.—This species is remarkable for several reasons. Importantly, the male does not have a group of elongated teeth forming a dental crest on the movable finger of the chela, a feature characteristic of other known adults of *Paravachonium*. The crest is also lacking in the tritonymph, as in the deutonymph of *P. bolivari* (Muchmore, 1973:57). It should be noted that the adult of this species is represented by a male, while the other species are known only from females. Therefore, it may be that the dental crest is characteristic just of mature females.

Both the male and the tritonymph have an extra trichobothrium on the movable chelal finger, apparently inserted between *st* and *sb*. It remains to be seen how widespread this phenomenon is, in the species and in the genus.

On the chelicera the galea is of interest. In the tritonymph, it is long and slender and bears a few lateral spinules; in the male, however, it is short, thick and rough surfaced. It seems likely that the shriveled condition of the galea is a characteristic found only in males.

Paravachonium insolitum, new species
Figs. 20-23

Material.—Holotype female (WM 3411.01001) from Sótano de la Tinaja, 10.5 km NE Valles, San Luis Potosí, México, 7 June 1973 (J. Fish and S. Patrick).

Diagnosis.—Similar to *Paravachonium bolivari* Beier but larger, with 5 setae in the cheliceral flagellum and the galea with lateral spinules.

Description of female (male unknown).—Generally pale in color, carapace and palps light brown. Carapace 1/3 longer than broad; anterior margin straight; no eyes; surface reticulated; with 27 setae, 4 at both anterior and posterior margins. Coxal area typical.

Abdomen elongate; tergites and sternites finely reticulated; pleural membranes granulate. Tergal

chaetotaxy 6:8:9:10:9:9:9:9:9:7:T1T1T1T:2. Sternal chaetotaxy 8:(3)10(3):(3)13(3):18:18:17:16:16:11:1T1T1:2.

Chelicera a little more than half as long as carapace; hand with 5 setae; flagellum of 5 setae of equal length, all denticulate in distal halves (Fig. 20); fixed finger with 11 and movable finger with 9 irregular teeth; galea long, slender, slightly curved, with several tiny spinules on its surface (Fig. 21); serrula exterior with 30 blades; serrula interior with 27 blades.

Palp long and slender (Fig. 22); femur 1.39, tibia 1.26, and chela 2.37 times as long as carapace. Palpal trochanter 2.8, femur 6.0, tibia 4.4, and chela (without pedicel) 5.95 times as long as broad; hand (without pedicel) 1.9 times as long as deep; movable finger 1.75 times as long as hand. Surfaces smooth. Trichobothria normal, as shown in Fig. 23. Fixed chelal finger with 134 contiguous marginal teeth; movable finger with 100 marginal teeth, the basal 22 or so forming a conspicuous, elevated crest. Fixed finger without venom apparatus; movable finger with well-developed venedens and venom duct, the nodus ramosus about midway between trichobothria *st* and *sb*.

Legs rather slender; leg IV with entire femur 5.3 and tibia 8.7 times as long as deep. Subterminal tarsal setae heavily dentate along one side. Arolia shorter than claws, entire, margin smooth.

Measurements (mm).—Body length 3.93. Carapace length 1.25. Chelicera 0.665 by 0.31. Palpal trochanter 0.785 by 0.28; femur 1.74 by 0.29; tibia 1.575 by 0.355; chela (without pedicel) 2.96 by 0.585; hand (without pedicel) 1.035 by 0.55; pedicel about 0.155 long; movable finger 1.83 long. Leg IV: entire femur 1.375 by 0.26; tibia 1.31 by 0.15; metatarsus 0.235 by 0.125; telotarsus 0.80 by 0.10.

Etymology.—The specific name *insolitum* is given in reference to the unusual characters of the flagellum and galea.

Remarks.—This species is clearly closely related to the other species placed in *Paravachonium*. The possession of 5 setae in the cheliceral flagellum might seem sufficient justification for establishing a new genus; but, as was noted in respect to *P. superbum* (Muchmore, 1972a), the flagellum may be an unstable character in subterranean situations and so not taxonomically useful at the generic level.

The small spinules on the surface of the cheliceral galea are also seen in the tritonymph of *P. delanoi* (above). This may be a general characteristic of the genus not noticed previously because of poor conditions of preparation or observation.

FAMILY IDEORONCIDAE CHAMBERLIN

Genus *Typhloroncus* Muchmore

The genus *Typhloroncus* was described recently (Muchmore, 1979) on the basis of *T. coralensis* Muchmore from St. John, U. S. Virgin Islands. No other species is known from the West Indies, but 3 new cavernicolous species from México seem to be closely related.

Typhloroncus coralensis Muchmore

It must be noted that an error was made in the description of this species, the type-species of the genus. The figures given for the chaetotaxy of the 11th tergite and sternite are incorrect (Muchmore, 1979:318). Correctly, there are TT1TT on the tergal portion and 1TT1 on the sternal portion of the circumanal ring. This corresponds well with the situation in the Mexican forms described below.

Typhloroncus troglobius, new species

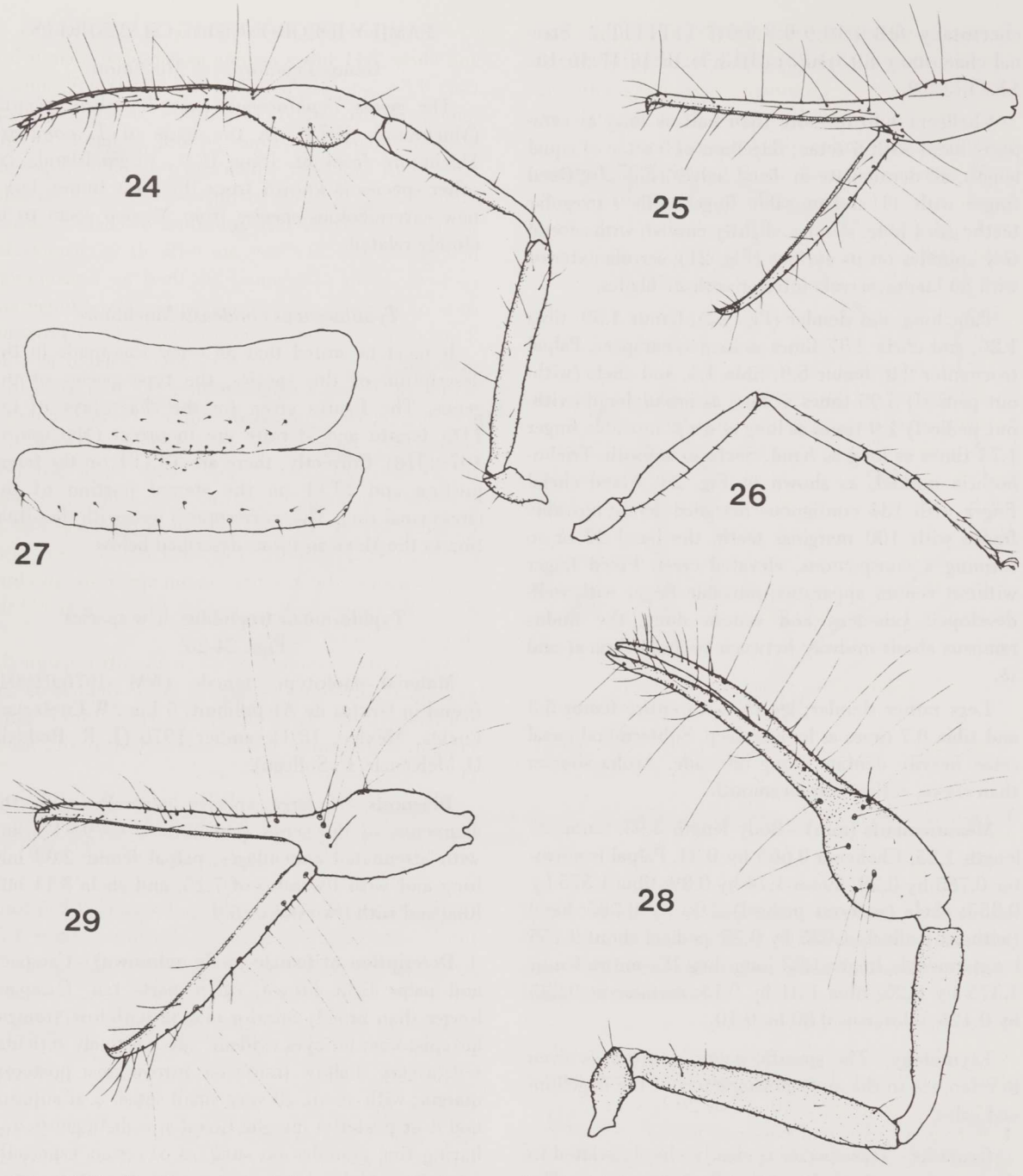
Figs. 24-26

Material.—Holotype female (WM 4676.01001) found in Grutas de Atepolihuit, 5 km SW Cuetzalan, Puebla, México, 18 December 1976 (J. R. Reddell, D. McKenzie, C. Soileau).

Diagnosis.—A large species generally with the characters of the genus (Muchmore, 1979:317) and with attenuated appendages; palpal femur 2.03 mm long and with l/w ratio of 7.25, and chela 3.11 mm long and with l/w ratio of 5.9.

Description of female (male unknown).—Carapace and palps light brown, other parts tan. Carapace longer than broad; anterior margin with low, triangular epistome; no eyes evident; surface finely reticulated; a very shallow transverse furrow near posterior margin; with about 20 very small setae, 5 at anterior and 4 at posterior margin. Coxal area distinguished in having fine granules on surfaces of coxae, especially medially. Abdominal tergites and sternites entire, surfaces finely reticulated; pleural membranes finely longitudinally striate, but with small irregularities anteriorly. Tergal chaetotaxy 2:2:3:4:5:5:5:6:6:6:T1TT1T:2; sternal chaetotaxy 12:(1)9(1):(1)8(1):9:11:12:10:8:10:TT:2.

Chelicera about half as long as carapace; hand with 5 setae, *es* long and straight; flagellum of 4 setae, the proximal one 2/3 as long as the others, all strongly dentate along one margin; each finger with 7 or 8 irregular teeth; galea long, slender, gently curved; serrula exterior with 33 blades.



Figs. 24-29.—*Typhloroncus troglobius*, new species, holotype female: 24, dorsal view of right palp; 25, lateral view of left chela; 26, leg IV. *Typhloroncus diabolus*, new species, holotype female: 27, genital opercula; 28, dorsal view of right palp; 29, lateral view of left chela.

Palp long and slender (Fig. 24); femur 1.68 and chela 2.57 times as long as carapace. Femur 7.25, tibia 6.1, and chela (without pedicel) 5.9 times as long as broad; hand 1.9 times as long as deep; movable finger 2.18 times as long as hand. Most surfaces, including bases of chelal fingers, covered with fine granules. Trichobothria of chela as shown in Figs. 24 and 25; much like those of *T. diabolus* except that there are only 4 on dorsum of hand; still, the 3 proximal ones on the dorsum are isolated and describe an obtuse triangle around the base of a distinct elevation of the surface. Fixed finger with an irregular marginal row of 94 contiguous teeth, most with cusps, but poorly developed basally; movable finger with 82 teeth, those in basal half becoming rounded and obsolescent. Both fingers with well-developed venom apparatus and long ducts, the nodus ramosus about 1/4 the distance from the distal end.

Legs slender (Fig. 26); leg IV with entire femur 5.8 and tibia 8.8 times as long as deep. Metatarsus and telotarsus with prominent setae along outer margins; subterminal tarsal setae finely denticulate near tips; arolia not divided, shorter than claws.

Measurements (mm).—Body length 3.85. Carapace length 1.21. Chelicera 0.635 long. Palpal trochanter 0.615 by 0.29; femur 2.035 by 0.28; tibia 1.77 by 0.29; chela (without pedicel) 3.11 by 0.525; hand (without pedicel) 0.985 by 0.52; pedicel 0.11 long; movable finger 2.15 long. Leg IV: entire femur 1.56 by 0.27; tibia 1.10 by 0.125; metatarsus 0.49 by 0.12; telotarsus 1.05 by 0.09.

Etymology.—The species is named *troglobius* in recognition of its subterranean habitat.

Remarks.—Though this and the following 2 species are strongly modified for cave life, they seem definitely congeneric with *T. coralensis* from the Virgin Islands. They correspond well in general features as well as in the lack of eyes, the undivided pedal arolia shorter than the claws, and the chaetotaxy and dorsal eminence of the palpal chela.

Typhloroncus diabolus, new species
Figs. 27-29

Material.—Holotype female (WM 3415.01001) found in Cueva del Diablo, 3 km SSW Ciudad Mendoza, Veracruz, México, 7 March 1973 (J. R. Reddell and S. Murphy).

Diagnosis.—A large species with the general characters of the genus (see Muchmore, 1979:317) and with moderately attenuated appendages; palpal femur 2.34 mm long and with l/w ratio of 4.5.

Description of female (male unknown).—Body and legs tan, carapace and palps light brown. Carapace longer than broad; anterior margin slightly produced but without a definite epistome; no eyes; surface strongly reticulated; a very faint transverse furrow near posterior margin; with about 20 very small setae, 4 at both anterior and posterior margins. Coxal area without unusual features. Abdomen elongate; tergites and sternites entire, surfaces finely reticulated; pleural membranes finely, longitudinally striated but with small irregularities anteriorly. Tergal chaetotaxy 3:4:6:6:7:8:6:6:8:7:T2TT1T:0; sternal chaetotaxy 20:(1)14(1):(1)11(1):13:13:13:11:10:10:T2T:2, genital opercula as shown in Fig. 27.

Chelicera about half as long as carapace; hand with 5 setae, *es* very long, straight; flagellum of 4 setae, regularly graduated in length and all strongly dentate along one margin; each finger with about 10 irregular teeth; galea long, slender, gently curved; serrula exterior with 33 blades.

Palp rather long and slender (Fig. 28); femur 1.51 and chela 2.41 times as long as carapace. Femur 5.7, tibia 4.55, and chela (without pedicel) 4.5 times as long as broad; hand 1.65 times as long as deep; movable finger 1.93 times as long as hand. All surfaces with granules, which are especially large and numerous on both chelal fingers and on medial sides of tibia and femur. Trichobothria of chela as shown in Figs. 28 and 29; these are difficult to characterize (as is usual for this group), but there are 5 prominent ones on dorsum of hand and base of fixed finger and 3 in a row on lateral side of hand; the 3 proximal ones on the dorsum are somewhat isolated and describe an obtuse triangle around the base of a low, but distinct elevation of the surface (as in *T. coralensis).* Fixed finger with an irregular marginal row of 90 contiguous teeth, most with cusps but best developed in middle of row; movable finger with irregular row of 75 teeth, those in proximal half of row becoming rounded, low, and obsolescent. Both fingers with well-developed venom apparatus and long ducts, the nodus ramosus in each finger about 1/4 the distance from the distal end.

Legs rather slender; leg IV with entire femur 5.2 and tibia 10.0 times as long as deep. Metatarsus and telotarsus each with prominent setae along outer margin; subterminal tarsal setae trifid at tip; arolia not divided, shorter than claws.

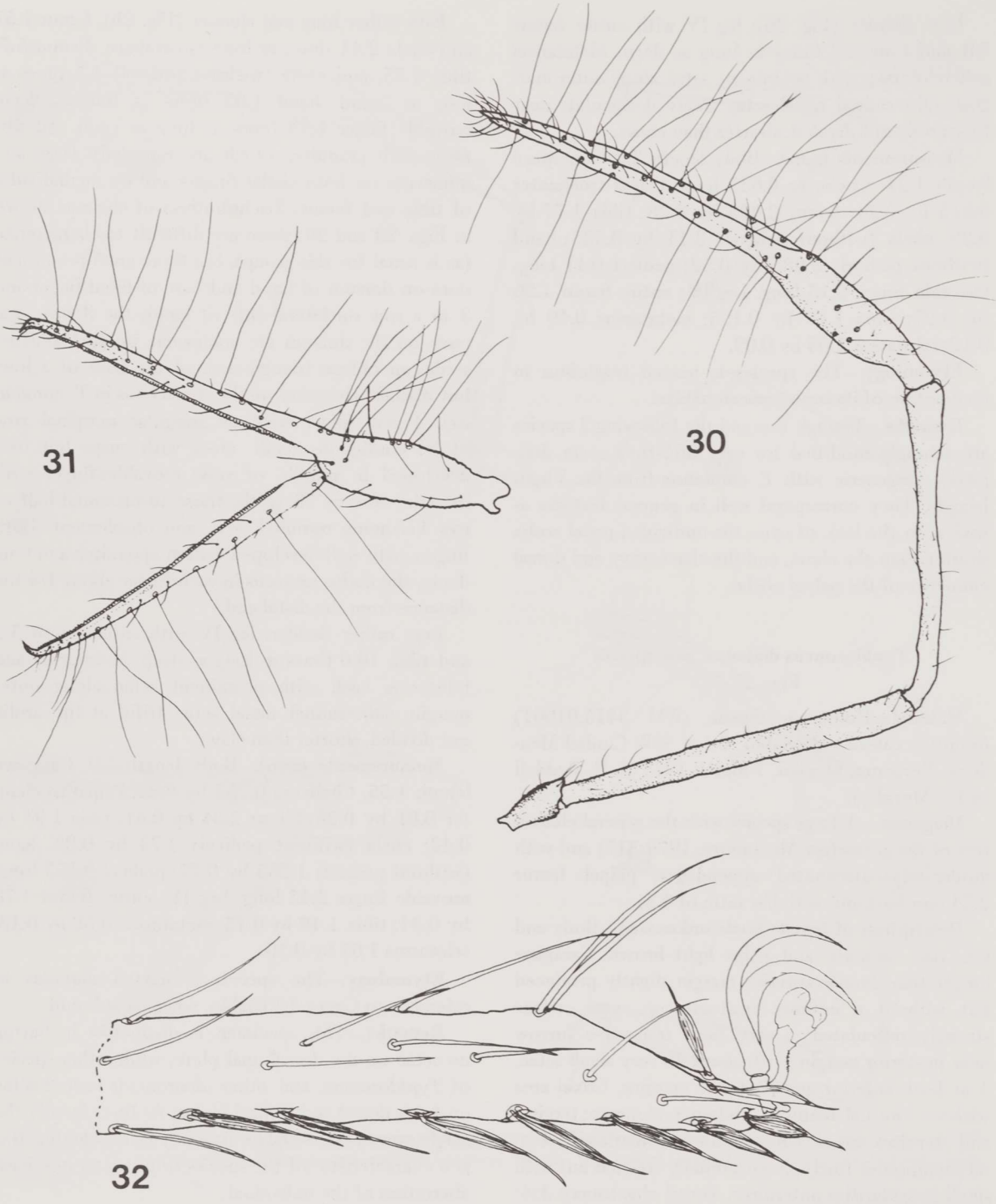
Measurements (mm).—Body length 5.9. Carapace length 1.55. Chelicera 0.755 by 0.33. Palpal trochanter 0.81 by 0.38; femur 2.34 by 0.41; tibia 1.91 by 0.42; chela (without pedicel) 3.73 by 0.83; hand (without pedicel) 1.265 by 0.77; pedicel 0.155 long; movable finger 2.45 long. Leg IV: entire femur 1.78 by 0.34; tibia 1.48 by 0.15; metatarsus 0.58 by 0.13; telotarsus 1.05 by 0.10.

Etymology.—The species is named *diabolus* in reference to Cueva del Diablo, where it is found.

Remarks.—This specimen is distinctive in having no setae on the dorsal anal plate, while other species of *Typhloroncus* and other ideoroncids have 2 setae on both dorsal and ventral plates. As there is only the single specimen available, it is not clear whether this is a characteristic of the species or just a teratological aberration of the individual.

Typhloroncus attenuatus, new species
Figs. 30-32

Material.—Holotype female (WM 5465.01001) found in Cueva del Brinco, near Conrado Castillo, about 40 km NW of Ciudad Victoria, Tamaulipas, México, in April 1978 (A. Grubbs, D. Pate, P. Sprouse, T. Treacy, S. Balsdon, R. Hemperly, P. Strickland).



Figs. 30-32.—*Typhloroncus attenuatus*, new species, holotype female: 30, dorsal view of right palp; 31, lateral view of left chela; 32, end of tarsus of leg IV, showing modified setae.

Diagnosis.—A large species generally with the characters of the genus (see Muchmore, 1979:317) and with very attenuate appendages; palpal femur 2.54 mm long and with l/w ratio of 9.6, and chela 3.22 mm long and with l/w ratio of 7.25; with highly modified setae on telotarsi of all legs.

Description of female (male unknown).—Most parts tan, but palps a little darker. Carapace longer than broad; anterior margin slightly concave at center; no eyes; surface strongly reticulated, almost scaly laterally; no transverse furrow evident; with only 11 setae, 4 at anterior margin and 1 at posterior (on right

side). Surfaces of coxae reticulate, becoming scaly medially on palp and legs I and II. Abdominal tergites and sternites entire, poorly sclerotized but finely reticulated anteriorly; pleural membranes finely longitudinally striate. Tergal chaetotaxy 2:2:2:3:3:4:4:4:4:5:T1T1T1T:2; sternal chaetotaxy 15:(1)6(1):(1)5(1):7:9:9:9:9:7:TT:2.

Chelicera about half as long as carapace; hand with 5 setae, *es* long, straight; flagellum of 4 setae, the proximal one shorter than the others, all strongly dentate along one margin; each finger with about 12 irregular teeth; galea long, slender, gently curved; serrula exterior with 30 blades.

Palp very long and slender (Fig. 30); femur 1.85 and chela 2.75 times as long as carapace. Femur 9.75; tibia 7.9, and chela (without pedicel) 8.5 times as long as broad; hand 3.0 times as long as deep; movable finger 1.85 times as long as hand. All surfaces with granules except distal halves of chelal fingers. Trichobothria of chela as shown in Figs. 30 and 31; much like those of *T. diabolus*, except that on dorsum of hand are only 4 which are relatively close together but still are arranged around base of a distinct elevation. Fixed finger with 149 contiguous marginal teeth, cusped only in distal third of row; movable finger with 133 teeth which are similar, but cusped only in distal quarter of row. Both fingers with well-developed venom apparatus; the ducts are large and conspicuous and long, with nodi ramosi 3/8 the distance from the distal end of each finger.

Legs very slender; leg IV with entire femur 8.2 and tibia 10.5 times as long as deep. Surfaces of femora scaly. Metatarsus of leg IV with a conspicuous tactile seta near proximal end. Each telotarsus with about 10 distal setae on the ventral half, and including the subterminal setae, broadened and depressed into the shape of long, pointed spoons; the depressions of all these setae face upwards; both inner and outer surfaces are finely, longitudinally striate (Fig. 32). Arolia not divided, shorter than claws.

Measurements (mm).—Body length 4.5. Carapace length 1.37. Chelicera 0.70 by 0.31. Palpal trochanter 0.68 by 0.27; femur 2.54 by 0.27; tibia 2.45 by 0.31; chela (without pedicel) 3.77 by 0.44; hand (without pedicel) 1.39 by 0.46; pedicel 0.22 long; movable finger 2.57 long. Leg IV: entire femur 2.01 by 0.245; tibia 1.47 by 0.14; metatarsus 0.59 by 0.135; telotarsus 1.48 by 0.095.

Etymology.—The species is called *attenuatus* in recognition of its strikingly attenuated appendages.

Remarks.—In addition to the attenuation of the appendages, this species is characterized by a reduction in the number of setae on the carapace and the tergites and sternites. Both of these features are connected with its strong adaptation to the cave environment.

Of further interest in this species is the unique modification of some of the distal ventral setae of the telotarsi of all legs into pointed, spoon-shaped structures. Though no evidence is available concerning their use, it seems likely that they perform some special sensory function.

Genus *Albiorix* Chamberlin

This genus was described by Chamberlin (1930) and several new Mexican forms were described by Hoff (1945). Most species are epigean, but one, *A. bolivari* Beier, is known from a cave in Guerrero.

Albiorix mirabilis, new species
Figs. 33-36

Material.—Holotype male (WM 4675.03001) from la Cueva de las Maravillas, 6 km S of Acatlán, Oaxaca, México, 29 December 1976 (J. R. Reddell, A. Grubbs, C. Soileau, D. McKenzie).

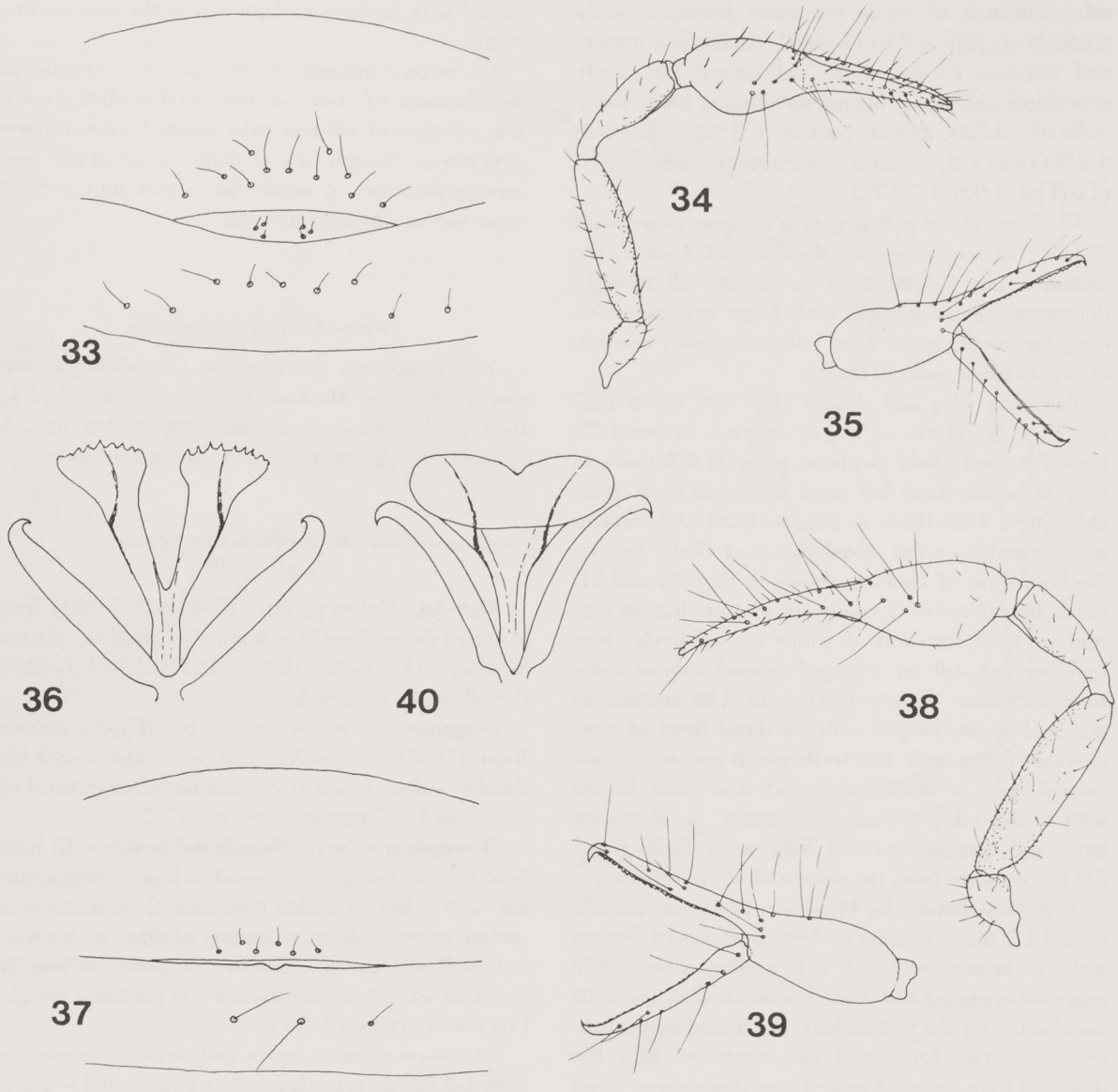
Diagnosis.—Generally similar to *Albiorix bolivari* Beier (1963) but smaller and with appendages less slender; palpal femur 0.73 mm long, l/w ratio 4.05 and chela 1.185 mm long, l/w ratio 3.7.

Description of male (female unknown).—All parts light brown. Carapace as broad as long; anterior margin with a low, rounded epistome; 2 corneate eyes; surface smooth above, reticulate at sides; with a wide but shallow transverse furrow near posterior margin; about 20 setae, 4 at anterior and 3 at posterior margin. Coxal area typical of the genus.

Abdomen ovoid; tergites and sternites entire; tergites 1-3 faintly reticulate, other tergites and sternites smooth; pleural membranes finely papillate anteriorly, but longitudinally striate posteriorly. Tergal chaetotaxy 4:4:5:8:8:8:9:8:9:9:T1T1T1T:2; sternal chaetotaxy 11:[3-3]:(1)9(1):(1)6(1):9:9:8:9:9:11:1TT1:2; genital opercula as in Fig. 33.

Chelicera nearly half as long as carapace; hand with 6 setae; flagellum of 4 subequal, serrate setae; no lamina exterior present; both movable and fixed fingers with 4 marginal teeth; galea long, slender, slightly curved; serrula exterior with 20 blades.

Palp slender (Fig. 34); femur 1.12, tibia 0.90, and chela 1.82 times as long as carapace. Palpal trochanter 2.35, femur 4.05, tibia 3.25 and chela (without pedicel) 3.7 times as long as broad; hand (without pedicel) 1.85 times as long as deep; movable finger 1.24 times as long as hand. Surfaces smooth except for distinct granules on medial side of femur



Figs. 33-40.—*Albiorix mirabilis,* new species, holotype male: 33, genital opercula; 34, dorsal view of left palp; 35, lateral view of right chela; 36, arolium and claws of pedal tarsus. *Albiorix reddelli,* new species, holotype female: 37, genital opercula; 38, dorsal view of right palp; 39, lateral view of left chela; 40, arolium and claws of pedal tarsus.

and a few on trochanter and tibia. Trichobothria of chela numerous, more or less as shown in Figs. 34 and 35; a slight depression in the dorsum of the hand occurs behind the proximal group of 3 trichobothria. Fixed chelal finger with 32 low, cusped marginal teeth; movable finger with 2 small, cusped denticles distally, followed proximally by 2 very low teeth and 19 or 20 barely detectable undulations of the margin. Venom apparatus well developed in both fingers, the nodi ramosi about 1/3 the distance from the distal end.

Legs about normal for the genus; leg IV with entire femur 2.5 and tibia 3.9 times as long as deep. Metatarsus of leg IV with a tactile seta near proximal end. Subterminal tarsal setae trifid at ends. Arolia longer than claws and clearly divided (bifurcate), the distal margins fringed (Fig. 36).

Measurements (mm).—Body length 2.17. Carapace length 0.65. Chelicera 0.29 by 0.13. Palpal trochanter 0.33 by 0.14; femur 0.73 by 0.18; tibia 0.585 by 0.18; chela (without pedicel) 1.185 by 0.32; hand (without pedicel) 0.54 by 0.29; pedicel about 0.065 long; movable finger 0.67 long. Leg IV: entire femur 0.58 by 0.23; tibia 0.41 by 0.105.

Etymology.—The species is called *mirabilis*, as one of the marvels to be found in la Cueva de las Maravillas.

Remarks.—This species has all the characters of the genus *Albiorix*, including the divided pedal arolia. It is interesting to note, however, that the distal margins of the arolia are fringed here, rather than smooth as in *A. bolivari* (unpublished observation). In addition, there is a slight depression in the dorsum of the palpal chela just proximal to the group of 3 trichobothria, a feature not noticed in other species of *Albiorix*.

Albiorix reddelli, new species
Figs. 37-40

Material.—Holotype female (WM 2957.01001) and paratype female from Grutas de Monteflor, 6 km N of Valle Nacional, Oaxaca, México, 28 December 1972 (J. R. Reddell).

Diagnosis.—Much like *Albiorix bolivari* Beier in size and morphology, but with palpal tibia shorter and stouter (l/w = 2.9-2.95) and with pedal arolia slightly indented but not distinctly divided.

Description of female (male unknown).—Pale in color, carapace and palps light brown. Carapace as broad as long; anterior margin with a low, rounded epistome; 2 corneate eyes; surface smooth above, becoming reticulate laterally, with no transverse furrow; with about 24 setae, 4 at both anterior and posterior margins. Coxal area typical for the genus.

Abdomen ovoid; tergites and sternites entire; anterior tergites finely reticulate, other tergites and sternites smooth; pleural membranes longitudinally, smoothly striate. Tergal chaetotaxy of holotype 2:4:5:6:9:10:9:9:10:8:T1T1T1T:2, paratype similar; sternal chaetotaxy 6:(2)3(2):(2)4(2):10:10:9:11:11:10:1T2T1:2, paratype similar; genital opercula as shown in Fig. 37.

Chelicera about half as long as carapace; hand with 6 setae; flagellum of 4 subequal, serrate setae; no lamina exterior present; movable finger with about 5 marginal teeth, fixed finger with 3 good-sized teeth and many, tiny denticles both distal and proximal to those; galea long, slender, curved; serrula exterior with about 20 blades.

Palp rather long and slender (Fig. 38). Palpal femur 1.31-1.34, tibia 0.85-0.88 and chela 2.11-2.15 as long as carapace. Trochanter 2.1-2.25, femur 4.05-4.1, tibia 2.9-2.95, and chela (without pedicel) 3.95-4.0 times as long as broad; hand (without pedicel 1.9-1.95 times as long as deep; movable finger about 1.2 times as long as hand. Palpal femur granulate medially, trochanter and tibia with few, small, scattered granules, other surfaces smooth. Trichobothria of chela numerous, more or less as shown in Figs. 38 and 39; on dorsum of hand is a group of 3 prominent trichobothria toward the middle and another prominent one set apart some distance distal to the group. Fixed chelal finger with 35 or 36 cusped, marginal teeth; movable finger with 2 small, cusped denticles distally, followed by about 25 low, rounded teeth. Venom apparatus well developed in both fingers, the nodi ramosi about 1/3 the distance from distal end.

Legs rather slender for the genus; leg IV with femur 2.95-3.0 and tibia 4.25-4.3 times as long as deep. Metatarsus of leg IV with a tactile seta near proximal end. Subterminal tarsal setae trifid at ends. Arolia longer than claws; not divided, but slightly indented at middle and distal margins smooth (Fig. 40).

Measurements (mm).—Body length 2.38-2.55. Carapace length 0.68-0.70. Chelicera 0.33-0.34 by 0.16-0.17. Palpal trochanter 0.38-0.385 by 0.17-0.185; femur 0.89-0.94 by 0.22-0.23; tibia 0.58-0.615 by 0.20-0.21; chela (without pedicel) 1.46-1.48 by 0.37; hand (without pedicel) 0.665 by 0.345-0.35; pedicel about 0.075 long; movable finger 0.79-0.815 long. Leg IV: entire femur 0.71-0.725 by 0.235-0.245; tibia 0.445-0.45 by 0.105.

Etymology.—The species is named for James R. Reddell who collected the specimens.

Remarks.—The nature of the arolia of the pedal tarsi in this species is interesting and may be of considerable taxonomic importance. As Chamberlin (1930) pointed out in his original description and as Hoff (1956) reaffirmed, the empodia (arolia) are clearly bifurcate (bifid or divided) in the genus *Albiorix*. In the present species, however, the arolia have the margins slightly indented but are definitely not divided into two parts. This poses the question whether this form actually belongs in *Albiorix* or should be placed in another genus. At the moment, there is no other genus into which it fits better, and it seems premature to erect a new genus before studying carefully the considerable amount of ideoroncid material available.

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THE TROGLOBITIC MYGALOMORPHS OF THE AMERICAS (ARACHNIDA, ARANEAE)

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ABSTRACT

The infraorder Mygalomorphae comprises mostly large sedentary spiders most numerous in tropical and subtropical regions. As compared with the more widespread and diverse araneomorphs, they have produced few obligate cavernicoles. The first one known was a small blind diplurid, now *Masteria caeca* (Simon), described in 1892 from a cave in the Philippine Islands. This was followed later by records of two additional eyeless troglobites, a barychelid from Cuba and a distinctive diplurid from West Australia. Within recent years a few mygalomorph troglobites have been discovered in eastern México. The aim of this paper is to make known additional troglobites from caves in México, Jamaica and Ecuador and to review and supplement the data on some of the known ones. The present number of world troglobitic mygalomorphs is now about a dozen belonging to four principal families. The following American taxa are now assigned to the family Dipluridae: from the island of Jamaica *Masteria pecki*, new species, from Falling Cave; and from México three species of *Euagrus: cavernicola* Gertsch from caves of La Sierra de Guatemala, Tamaulipas; *anops* Gertsch from Cueva de la Porra, San Luis Potosí; and *troglodyta*, new species from Cueva del Campamiento, Querétaro. The family Ctenizidae is represented by its first troglobite, *Spelocteniza ashmolei*, new genus and species from the cave at Los Tayos, Ecuador. The family Barychelidae is still represented only by *Troglothele coeca* Fage, based on immature specimens of an eyeless species from Gruta Bellamar in Cuba. The fourth family, Theraphosidae, is now represented by several large species assigned to the new genus *Spelopelma* from caves of eastern México: *stygium* (Gertsch), San Luis Potosí; *mitchelli*, new species from Entrada del Viento Alta, Tamaulipas; *elliotti* (Gertsch), from Cueva de la Laguna, San Luis Potosí; *reddelli* (Gertsch), from Oaxaca; *puebla*, new species from caves of Puebla; and *grieta*, new species from Cueva de la Grieta, Oaxaca. The species *Spelopelma nahuanum*, new species, based on a seemingly congeneric male taken on the surface at Zoquitlán, Puebla, has provided secondary sexual characters of that sex.

INTRODUCTION

The obligate cavernicoles have always been of singular interest because their deep commitment has led to presumed inalterable existence in a circumscribed cave environment. Typical results of such dedication are body depigmentation, appendage elongation, loss of eyes, and various changes in physiology that allow tolerable life in a monotonous environment. Most spider troglobites are derived from basically lucifugous taxa that live sedentary lives in the confines of webs or restricted soil enclaves. Numerous araneomorph spiders live in caves all over the world and many have become obligate cave dwellers. Cave existence is a prime factor in notable adaptive radiation of some spider groups which, having chosen or been compelled to occupy cave environments by climatic or other circumstances, are now essentially deprived of epigean populations. The result has been production of allopatric taxa in various stages of reproductive isolation that live progressively exclusive lives in separate enclaves. The genera *Nesticus* and *Leptoneta* in Appalachia and in similar centers in Europe and Japan offer graphic pictures of this fragmentation.

The mygalomorph spiders long have been considered poor prospects for evolution of obligate taxa in cave environments. Responsible for this at least in part is their lesser numbers as compared with the numerous, more widespread and derivative araneomorph spiders and their greater presence in tropical zones where conditions seem less favorable. Most

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mygalomorphs are nocturnal, sedentary spiders that live restricted lives in webs, retreats and burrows. They do not disperse far from their enclaves and seem to find suitable environments outside of caves. The first mygalomorph troglobite was a blind diplurid *(Accola caeca)* described by Eugene Simon in 1898 from Antipola Cave in the Philippines. This was followed in 1929 by an eyeless barychelid *(Troglothele coeca)* described by Louis Fage from Gruta Bellamar in Cuba. In 1969 came a third discovery, a distinct blind diplurid *(Troglodiplura lowryi)* by Barbara Main from Roaches Rest Cave in Western Australia. Recent years have been marked by description of several mygalomorph troglobites from caves of eastern México. The aim of this paper is to make known additional American troglobites from stations in México, Jamaica, and Ecuador, and to review and supplement the data on some recently described species. Brief characterizations of earlier described taxa not further mentioned since the time of their descriptions are included for general interest. The present number of world obligate mygalomorphs is about a dozen belonging to four principal families and it seems probable that an increasing number is likely to be discovered.

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The uncommon spider material herein considered has been assembled during excursions into various cave habitats in the Americas. To the following students of caves, and to those listed as collectors under the various taxa, I offer my gratitude for their cooperation and courtesies: Dr. Stewart B. Peck of Carleton University in Ottawa, Canada, for gifts of valuable material; Dr. Robert W. Mitchell of Texas Tech University in Lubbock, for his continued interest; Dr. N. P. Ashmole, who collected the first ctenizid troglobite in a cave at Morona-Santiago, Ecuador; Mr. James R. Reddell of the Texas Memorial Museum in Austin, for continued efforts to support this project; and to Dr. Norman I. Platnick of the American Museum of Natural History in New York, who provided items of literature and encouragement.

SYSTEMATIC SECTION

FAMILY DIPLURIDAE

The diplurids are mostly agile, sedentary funnel and sheet weavers that spread flat webs over the ground in the fashion of the agelenids. They use these webs both as retreats and spongy sheets to slow and entangle prey. One of their prime features is the long, flexible lateral spinnerets provided with many small spools capable of spinning out wide bands of silk. Some large diplurids spin sheets out from natural ground openings and a few are reported to dig their own.

Genus *Masteria* Koch

Masteria Koch, 1873, pp. 453, 457. Raven, 1977, p. 624.

Accola Simon, 1889, p. 191.

Raven has shown that the better known genus *Accola* is a junior synonym of *Masteria.* The masterias are among the smallest of the typical mygalomorphs and live under ground detritus and in caves in tropical regions. Simon's eyeless *caeca* came from a cave in the Philippine Islands, along with a species from a different cave which he named *cavicola.* A second eyeless species of *Masteria* from Jamaica in the West Indies is herein described for the first time.

Masteria caeca (Simon)

Accola caeca Simon, 1892b, p. 35. Bonnet, 1955, p. 141.

Diagnosis.—Briefly described, small whitish troglobite 8 mm long with following features: eyes completely absent; posterior pair of spinnerets very long as usual in genus; paired tarsal claws with single row of teeth.

Type data.—Female type from Antipola Cave, 5 or 6 kilometers north of Antipola, Morona Province, Philippine Islands, in Muséum d'Histoire Naturelle, Paris (not seen).

Distribution.—So far recorded only from above cave.

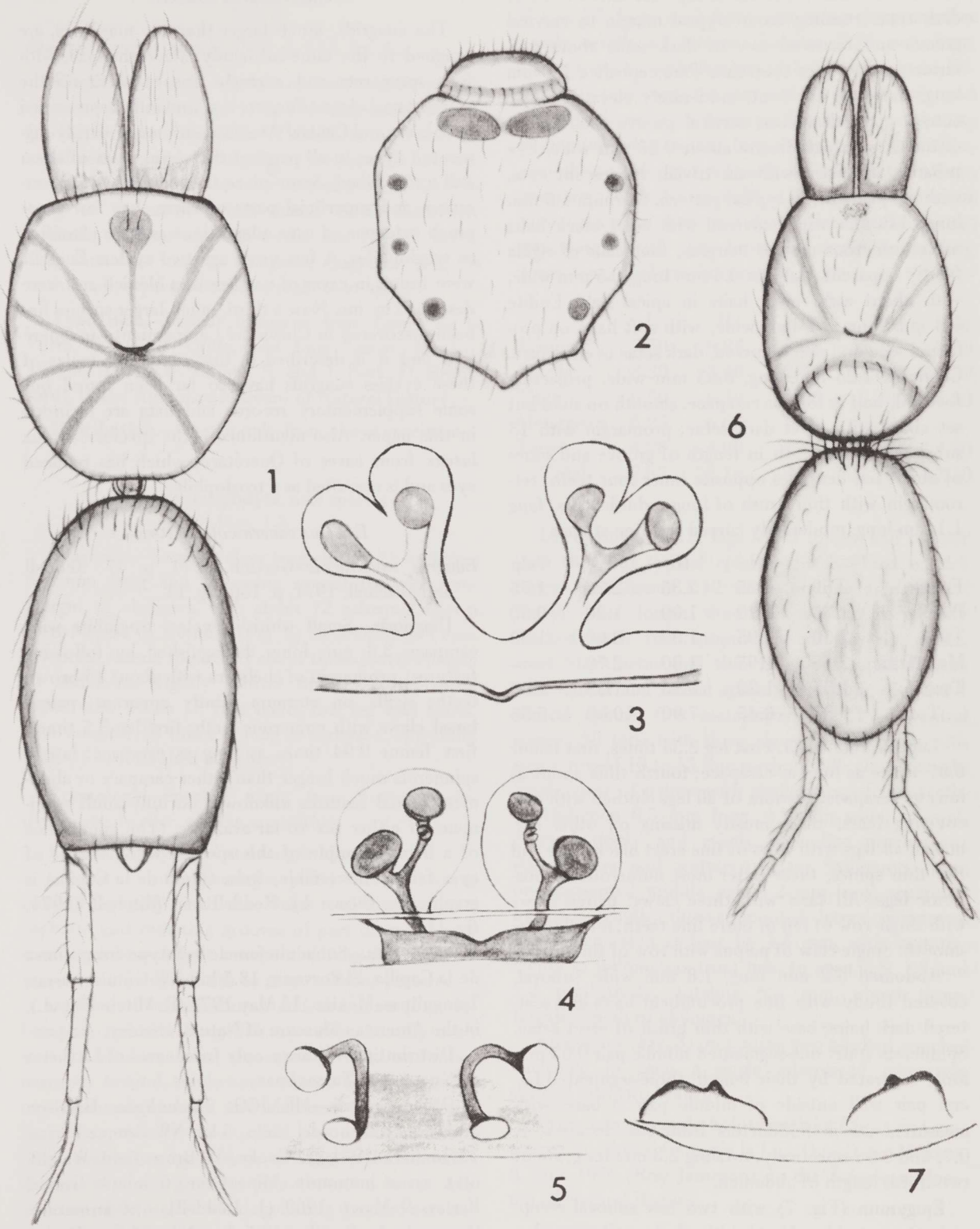
Masteria pecki, new species
Figs. 6-7

Diagnosis.—Pallid, essentially eyeless troglobite from Falling Cave, Jamaica, distinguished from epigean and cavernicole *Masteria lewisi* (Chickering) by lack of eyes and dark pigment and with much longer legs (first leg 2.54 times as long as carapace).

Etymology.—Named for Dr. Stewart B. Peck, Carleton University, Ottawa, Ontario, student of caves and cave faunas.

Female holotype.—Cephalothorax and appendages pale yellowish brown, with rather sparse clothing of dusky hairs and setae; fang and teeth of cheliceral margin brown. Abdomen gray to white, without darker pattern.

Outline of carapace and abdomen (Fig. 6). Carapace 2.75 mm long, 2.2 mm wide, elongate oval, rounded on sides, only moderately narrowed in



Figs. 1-3.—*Euagrus troglodyta,* new species, female: 1, cephalothorax and abdomen, dorsal view; 2, sternum and labium; 3, epigynum, dorsal view. Fig. 4.—*Euagrus luteus* Gertsch, epigynum, dorsal view. Fig. 5.—*Euagrus anops* Gertsch, epigynum, dorsal view. Figs. 6-7.—*Masteria pecki,* new species, female: 6, cephalothorax and abdomen, dorsal view; 7, epigynum, dorsal view.

front and behind, smooth except for three rows of dark setae running from clypeal margin to cervical groove and recurved row of dark setae above posterior part of pars thoracica. Pars cephalica 1.7 mm long, narrower in front, moderately elevated above convex pars thoracica; cervical groove shallow, indistinct, transverse fissure about 0.25 mm wide. Eye tubercle obsolete, with six trivial, evanescent eyes, without pigment, in typical pattern. Sternum 1.5 mm long, 1.3 mm wide, covered with erect black hairs more numerous around margins; four pairs of sigilla faintly apparent. Labium 0.4 mm long, 0.5 mm wide, with about eight erect hairs in apical half. Endite 0.8 mm long, 0.7 mm wide, with soft hairs on prolateral side and erect, curved, dark setae over surface. Chelicara 1.25 mm long, 0.65 mm wide, projecting forward, half as long as carapace, smooth on sides but set above with erect dark setae; promargin with 13 subequal brown teeth in length of groove and series of about ten denticles opposite inner four teeth; retromargin with thin brush of long reddish hairs; fang 1.1 mm long, moderately curved and fine at apex.

	I	II	III	IV	Palp
Femur	2.50	2.25	2.35	2.75	1.75
Patella	1.35	1.10	1.00	1.20	0.80
Tibia	2.50	1.95	1.80	2.60	1.50
Metatarsus	2.15	1.95	1.80	2.70	———
Tarsus	1.35	1.20	0.95	1.35	1.50
Total	9.85	8.45	7.90	10.60	5.55

Leg formula 4123. First leg 2.54 times, first femur 0.87 times as long as carapace; fourth tibia about as long as carapace. Femora of all legs clothed with soft covering hairs, these mostly missing on other segments; all legs with rows of fine erect black setae and few thin spines, these latter most numerous on posterior legs. All tarsi with three claws: paired claws with single row of ten or more fine teeth; middle claw smooth. Single claw of palpus with row of fine teeth.

Abdomen 3.2 mm long, 1.8 mm wide, suboval, covered thinly with fine procumbent hairs and scattered dark hairs; base with thin brush of erect setae. Spinnerets four: one-segmented middle pair 0.65 mm long, separated by their length; three-segmented lateral pair well outside of middle pair at base, with measurements in millimeters from base to apex, 1, 0.7, and 0.6 respectively, totaling 2.3 mm long, about two-thirds length of abdomen.

Epigynum (Fig. 7) with two low suboval receptacles separated by about width of one.

Type data.—Female holotype from Falling Cave, Douglas Castle, St. Ann Parish, Jamaica, December 20, 1972 (S. and J. Peck), in American Museum of Natural History.

Genus *Euagrus* Ausserer

The euagrids, much larger than the masterias, are assigned to the same subfamily, Macrothelinae, with four spinnerets and a single row of teeth on the paired tarsal claws. *Euagrus* is abundantly represented in México and Central America with many darkly pigmented types in all parts of that area, most of them still undescribed. Some place their sheet webs in entrances and superficial parts of caves, but few show much evidence of cave adaptations and are classified as troglophiles. A few years ago two eyeless *Euagrus* were found in caves of northeastern México and were described by me. Now a third, much larger species has been discovered in Cueva del Campamiento in Querétaro and it is described in this paper. No males of these eyeless euagrids have so far been found but some supplementary records and data are included in this paper. Also mentioned is the species *Euagrus luteus* from caves of Querétaro, which has reduced eyes and is classified as a troglophile.

Euagrus cavernicola Gertsch

Euagrus cavernicola Gertsch, 1971, p. 47; Reddell and Mitchell, 1971, p. 186, fig. 11.

Diagnosis.—Small whitish, eyeless troglobite with carapace 3.3 mm long, distinguished by following features: promargin of chelicera with about 15 brown teeth; sigilla on sternum faintly apparent; paired tarsal claws with numerous teeth; first leg 3.5 times, first femur 0.94 times as long as carapace; lateral spinnerets much longer than either carapace or abdomen; sexual features unknown: no fully adult specimens of either sex so far available. (The appearance of a living example of this species, with vestiges of eyes faintly discernible, from Cueva de la Capilla, is graphically shown by Reddell and Mitchell (1971, fig. 11).

Type data.—Subadult female holotype from Cueva de la Capilla, El Porvenir, 13.5 km NW Gómez Farías, Tamaulipas, México, 16 May 1971 (R. Mitchell et al.), in the American Museum of Natural History.

Distribution.—Known only from caves of La Sierra de Guatemala, Tamaulipas.

Other records.—MEXICO: *Tamaulipas:* Harrison Sinkhole, Rancho del Cielo, 5 km NW Gómez Farías, 12 January 1971 (J. Cooke, M. Brownfield, W. Elliott), seven immature. Mine Cave, 6 mi. N Gómez Farías, 9 March 1969 (J. Reddell), one immature. Cueva de la Capilla, 13.5 km NW Gómez Farías, 13 January 1971 (J. Reddell, J. Cooke, M. Brownfield), one immature. Cueva de la Perra (=Cueva de la Capilla), 28 January 1968, 7100 ft. (J. Reddell, R. Mitchell, F. Rose, J. George), 2 immature.

Euagrus anops Gertsch
Fig. 5

Euagrus anops Gertsch, 1973, p. 145, fig. 4.

Diagnosis.—Small, whitish eyeless troglobite with carapace 2.2 mm long, further distinguished by following features: promargin of chelicera with only six small teeth near base; sigilla of sternum inconspicuous; lateral spinnerets shorter than abdomen, about as long as carapace; paired tarsal claws essentially smooth, without obvious teeth; first leg 3.9 times, first femur as long as carapace; epigynum (Fig. 5) with small, separated tubules globose at apex.

Type data.—Female holotype from Cueva de la Porra, 5 km N Xilitla, San Luis Potosí, México, 19 July 1969 (W. Elliott, S. and J. Peck, D. Broussard), in the American Museum of Natural History.

Distribution.—Known only from above specimen.

Euagrus troglodyta, new species
Figs. 1-3

Diagnosis.—Large eyeless troglobite with carapace 6.7 mm long and following special features: promargin of chelicera with about 12 subequal brown teeth; sigilla of sternum (Fig. 2) all present and conspicuous; lateral spinnerets about three-fourths length of abdomen, slightly shorter than carapace; tarsal claws with 10 to 15 fine teeth; first leg 4.41 times, first femur 1.12 times as long as carapace; epigynum (Fig. 3) with bilobed pouches.

Etymology.—Specific name from Latin *troglodyta,* cave dweller, used in apposition.

Female holotype.—Total length 15 mm.

Carapace and appendages pallid orange brown, clothed sparsely with fine hairs and dark spines; cephalic and radiating grooves of pars thoracica reddish; chelicerae bright orange and fang dark reddish brown. Abdomen whitish to gray, without pattern.

Outline of cephalothorax and abdomen (Fig. 1). Carapace 6.7 mm long, 5.5 mm wide, broadly oval, well rounded on sides, truncated in front and more narrowly behind, thinly covered with fine inconspicuous procumbent hairs and scattered suberect setae, these concentrated on margins; pars cephalica 4 mm long, convex and elevated, as long as broad, with shallow cephalic grooves; pars thoracica lower, less convex, with well-marked radiating groove; cervical groove small transverse fissure 0.5 mm wide, situated back 4 mm from clypeal margin. Eye tubercle obsolete, without traces of eyes or vestiges. Sternum (Fig. 2) 3.23 mm long, 2.9 mm wide, sparsely set with erect setae; four pairs of sigilla present: small round second, third and fourth pairs opposite coxae I, II and III; large oval front pair lying close together nearly width of labium. Labium 0.75 mm long, 1.5 mm wide, with few dusky hairs along apex. Endite 2.25 mm long, 1.6 mm wide, with soft hairs and setae. Chelicera 4.35 mm long, 2 mm wide, projecting moderately downward, longer than pars cephalica, smooth on sides but set with suberect setae above; promargin with 12 on right, 11 on left chelicera of subequal brown teeth and 3 or 4 denticles in groove; retromargin with thin brush of dusky hairs; fang 4 mm long, moderately curved.

	I	II	III	IV	Palp
Femur	7.50	6.85	6.80	8.25	5.60
Patella	3.20	3.10	2.75	2.80	2.50
Tibia	6.50	6.50	6.75	8.30	5.00
Metatarsus	6.25	6.65	7.60	9.35	——
Tarsus	4.20	4.00	4.15	4.50	4.00
Total	27.65	27.10	28.05	33.20	17.10

Leg formula 4312; legs much longer and thinner than those of typical epigean species. First leg 4.1 times, first femur 1.12 times as long as carapace; fourth tibia longer than carapace. Legs sparsely clothed with fine subprocumbent covering hairs, erect black setae and thin black spines; all femora with dorsal and lateral spines; first tibia with 1-2-1 ventral spines; first metatarsus with 1-1-0 ventral spines. All tarsi with three claws: paired claws with single row of 10 to 15 fine teeth; middle claw smooth. Single claw of palpus with similar row of fine teeth.

Abdomen 8.5 mm long, 4.5 mm wide, suboval, covered thinly and evenly with fine procumbent dusky hairs and scattered setae. Spinnerets four: one-segmented middle pair 1.2 mm long, separated by their length; three-segmented lateral spinnerets widely separated at base by 1.5 mm, with measurements in millimeters from base to apex 2.5, 1.5 and 2.2 respectively, totaling 6.2 mm, about three-fourths length of abdomen.

Epigynum (Fig. 3) presenting two bilobed pouches enclosing in each a single sclerotized receptacle divided into two branches.

Type data.—Female holotype from Cueva de Campamiento, 2 km E Cerro de la Luz, Querétaro, México, 8 June 1976 (Roy Jameson), in the American Museum of Natural History.

Distribution.—Known only from caves in Querétaro and San Luis Potosí.

Other records.—MEXICO: *San Luis Potosí:* Sótano de La Silleta, La Silleta, 30 March 1980 (David Honea), 1 female.

Euagrus luteus Gertsch
Fig. 4

Euagrus luteus Gertsch, 1973, p. 145, fig. 3.

Diagnosis.—Golden brown troglophile with carapace 4 mm long, distinguished by following features: eye tubercle and eyes small, with posterior medians separated by more than two diameters; promargin of chelicera with 12 to 14 dark teeth; sigilla of sternum all distinct; paired claws with single row of 10 to 20 fine teeth in basal half; lateral spinnerets longer than abdomen; epigynum (Fig. 4) with pair of globose pouches, each enclosing single sclerotized receptacles divided into asymmetrical globose elements.

Type data.—Female holotype from iron mine at road, 2 km E Pinal de Amoles, Querétaro, México, 17 July 1969 (S. Peck), in American Museum of Natural History.

Distribution.—Caves of Querétaro.

Genus *Troglodiplura* Main

This genus was assigned by its author to the subfamily Diplurinae, which comprises diplurids with four spinnerets and paired tarsal claws bearing a double row of numerous teeth.

Troglodiplura lowryi Main

Troglodiplura lowryi Main, 1969, p. 9, fig. 1a-g.

Diagnosis.—Troglobite with carapace 10.5 mm long, with following special features: eyes completely absent; cervical groove short, straight transverse fissure; labium with rounded emargination at apex; three pairs of small sigilla well inside margins of sternum (labial pair probably hidden in labial groove); promargin of chelicera with row of nine large teeth; paired tarsal claws with double rows of numerous teeth.

Type data.—Holotype of uncertain sex based on several fragments from Roaches Rest Cave, 27 miles NW Madura, 29 August 1966 (D. C. and J. W. J. Lowry), in West Australia Museum (WAM 68-342).

Distribution.—Known only from the type fragment from above cave. The suggestion was made by the author that this distinctive species, showing no close relationship to the known diplurids of the region, might already be extinct because of grossly unfavorable conditions in the cave for this kind of spider. Some cave animals are notoriously rare, but the presence of living blind araneomorph spiders in the cave make it hopeful that living examples of the diplurid may eventually be discovered.

FAMILY CTENIZIDAE

The trapdoor spiders are subterranean specialists that live sedentary, circumscribed lives in burrows capped by silk covers. Most are stocky, short-legged introverts that remain in or near their burrows except during the mating season when some males of the colony attain maturity and leave their burrows in search of females. A few species have been reported as living in entrances and superficial outer areas of caves but until now none has been identified as a legitimate cavernicole. The discovery by Dr. N. P. Ashmole in a cave in Ecuador of a cave-adapted ctenizid with evanescent eyes is a notable event, seemingly the first troglobite for the family. Since only females and immature examples are so far known in a family where many of the prime generic characters are available only in the male sex, the eventual generic assignment remains somewhat uncertain. However, the derivative features of the female have prompted me to assign the taxon to a new genus in the limited group Cyrtauchenieae of Simon (1892a, p. 101). The few genera and species of ctenizids so far known from Ecuador and other parts of South America belong to different groups of Simon.

Spelocteniza, new genus

Diagnosis.—Carapace mostly smooth with few suberect setae; cervical groove short transverse fissure; eyes evanescent, present as whitish vestiges in two transverse rows of about equal width, with vestiges of anterior median eyes well separated from suboval lateral eyes, and posterior median eyes seemingly obsolete; sternum with four pairs of sigilla indistinctly evident in marginal position. Labium free, broader than long, with three black cuspules; endites with double row of seven spinules at base; chelicerae projecting forward, broadly rounded at apex where armed with trivial rastellum of few curved spines; promargin with row of eight subequal teeth. Legs slender, set sparsely with rows of setae and weak spines; scopular hairs absent from all segments; all paired tarsal claws long and thin, with double rows of fine teeth in basal third; unpaired claws shorter, without basal denticles. Posterior spinnerets three-segmented: basal segment small cap half as long as middle segment. Epigynum with sclerotized receptacles in two rounded pouches.

Genotype.—*Spelocteniza ashmolei*, new genus and species.

Etymology.—Generic name *Spelo* from Greek *spelaion*, cave, as prefix to generic name *Cteniza*

Latreille, this derived from Greek *kteis*, comb, in reference to the rastellum on the chelicera.

Speloctenizа ashmolei, new species
Figs. 8-9

Diagnosis.—Small troglobite with evanescent eyes sharing basic feature of Simon's Cyrtauchenieae with tarsal claws bearing double row of teeth; suggestive of *Pselligmus infaustus* of Brazil but differing widely in following basic features: eyes nearly obsolete; all legs without scopular hairs on apical segments; cervical groove thin transverse fissure.

Etymology.—Named for Dr. N. P. Ashmole.

Female holotype.—Total length 7.3 mm.

Cephalothorax and appendages quite uniform bright yellowish to orange, clothed sparsely with black setae; carapace with darker shadings outlining pars cephalica; straight cervical groove dusky; chelicerae slightly dusky brown; fang and teeth on groove black. Abdomen grayish without darker pattern.

Outline of cephalothorax and abdomen of female (Fig. 8). Carapace 2.7 mm long, 2.25 mm wide, its width at front 1.5 mm, clothed with few erect hairs along side margins and in ocular area. Pars cephalica subtriangular, longer than broad (17/15), truncated in front, broadly rounded on sides, narrowly truncated to 1 mm at posterior margin. Cervical groove trivial transverse fissure about 0.3 mm wide. Eye tubercle obsolete; eyes evanescent, present as pearly white oval vestiges barely raised above surface; only six eyes obviously present, with posterior medians not evident or possibly small and fused with posterior lateral eyes. Anterior eye row gently recurved; median eyes indistinct, separated from anterior lateral by their long diameter. Sternum 1.25 mm long, 1.1 mm wide, smooth, with thin covering of erect black setae; four pairs of sigilla faintly present: three posterior pairs small, round, marginal, and larger oval front pair in labial groove. Labium 0.3 mm long, 0.5 mm wide, with median and apical transverse rows of setae, about eight of apical row longer; rounded apex of labium with three spinules. Endite with even covering of erect setae, with usual brush of soft hairs along inner margin, and set at base with double row of seven spinules. Chelicera of average stoutness, projecting forward, 1 mm long, 0.75 mm wide at base, not fully third as long as carapace, fairly smooth above with few erect black setae along dorsum to apex where more numerous and at apex with rastellum of about six heavy, curved, socketed spines along inside half; fang about 1 mm long, heavy, moderately curved; promargin of groove with eight teeth and six denticles in groove opposite innermost teeth.

	I	II	III	IV	Palp
Femur	2.25	1.90	2.70	2.20	1.65
Patella	1.20	1.15	1.00	1.20	0.90
Tibia	1.60	1.50	1.20	2.00	1.10
Metatarsus	1.35	1.25	1.35	2.15	——
Tarsus	0.80	0.95	0.85	0.85	1.15
Total	7.20	6.75	6.10	8.40	4.80

Leg formula 4123. First leg 2.7 times, first femur 0.8 times as long as carapace. Legs slender (first and fourth femora about five times as long as wide) with little thickening of basal segments, all set sparsely with black hairs, erect setae and few weak spines. All legs without scopular hairs on tarsi and metatarsi. All paired tarsal claws long and thin, curved and set with double series of fine teeth: first and second legs with 10 teeth on proclaws and 7 teeth on retroclaws in basal half; third and fourth legs with teeth reduced to 4 to 6 in basal fourth; unpaired claws of all legs short, slightly curved, without basal denticles. Claw of pedipalp large, moderately curved, with two small teeth above base.

Abdomen suboval, sparsely set with short erect hairs. Spinnerets four: one-segmented middle pair small, thin, 0.23 mm long; three-segmented posterior pair with measurements in millimeters from base to apex 0.3, 0.22 and 0.11 respectively, totaling 0.63 mm.

Epigynum (Fig. 9) with two rounded pouches enclosing sclerotized branched receptacles.

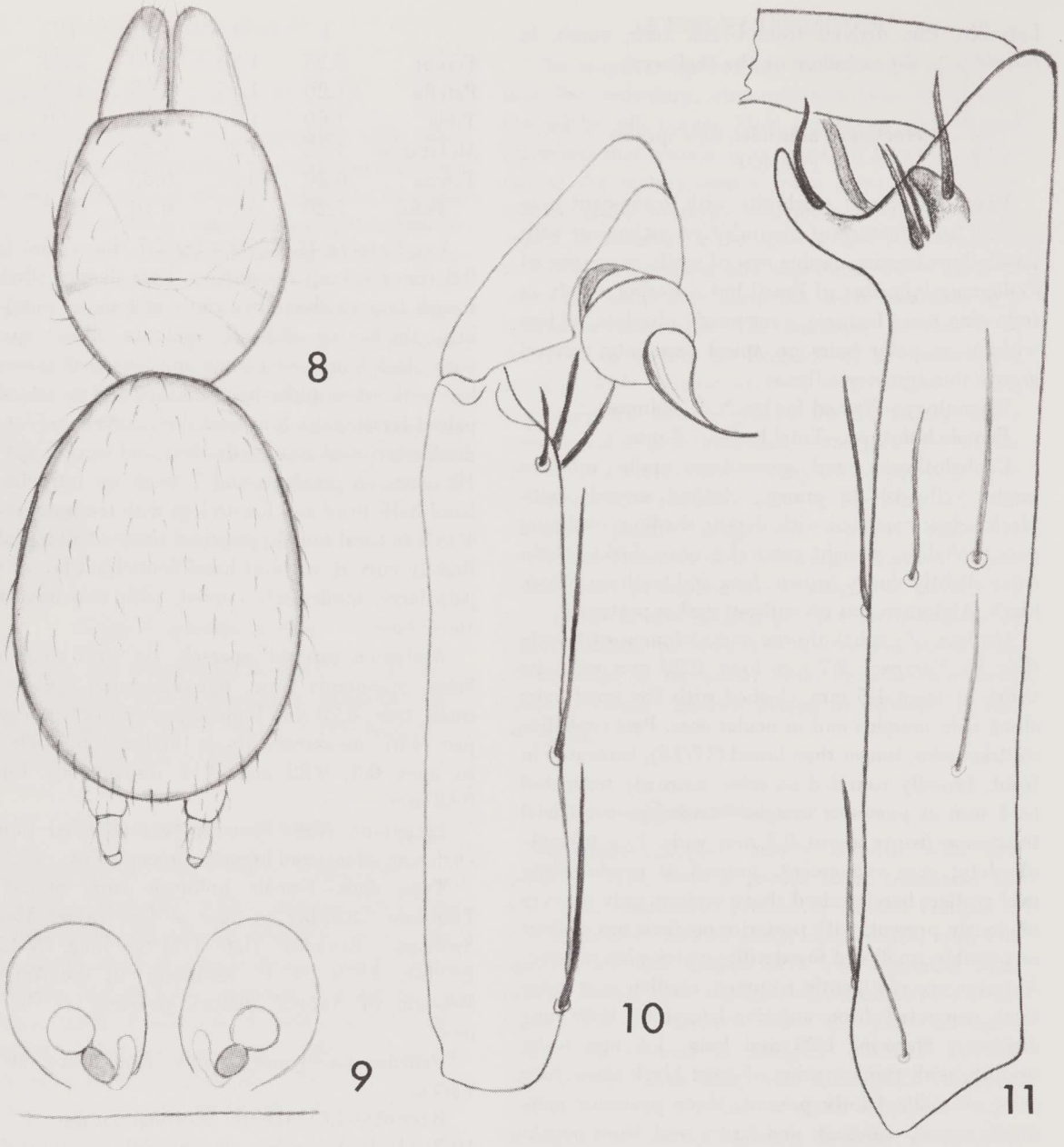
Type data.—Female holotype from Shovel Pot Trapdoor Chamber of cave at Los Tayos, Morona-Santiago, Ecuador (lat. 3°11′S, long. 78°12′W), 26 July 1976 (N. P. Ashmole), in the American Museum of Natural History courtesy of Dr. Ashmole.

Distribution.—Known only from cave at Los Tayos.

Records.—ECUADOR: Morona-Santiago, 27 July 1976 (N. P. Ashmole), one subadult female and two immature from Shovel Pot Trapdoor Chamber of cave, taken from trapdoor nests in vertical silk surface on wall; one immature from Main Shaft in northeast passage of chamber in trapdoor tube.

FAMILY BARYCHELIDAE

The barychelids resemble the trapdoor spiders in appearance but differ in having only two tarsal claws and prominent claw tufts. They also are sedentary types that burrow into the soil but the openings are never covered by a formal trapdoor; instead they lie open or are prolonged as thickened sheaths tied in vegetation. In 1929 Louis Fage described a remarkable eyeless barychelid from Gruta Bellamar in Cuba,



Figs. 8-9.—*Spelocteniza ashmolei,* new species, female: 8, cephalothorax and abdomen, dorsal view; epigynum, dorsal view.
Figs. 10-11.—*Spelopelma nahuanum,* new species, male: 10, palpus, retrolateral view; 11, tibia of right leg, prolateral view.

only the second mygalomorph troglobite known from the world at that time and the first blind member of the Barychelidae. The few cave barychelids from México and Guaemala show no signs of cave adaptation. Only a brief characterization of the Cuban species is given for general interest.

Genus *Troglothele* Fage

Louis Fage placed his genus *Troglothele* in the subfamily Leptopelmatinae of Simon (1892a, p. 125), which is represented by several genera from Central America and the West Indies. Mentioned as a special feature was the presence of a double row of teeth on the paired tarsal claws. The complete absence of a rastellum on the chelicera may be a consequence of the immature status of the specimens available to him since good development is sometimes a consequence of age. The status of his genus must remain uncertain until mature examples of both sexes become available.

Troglothele coeca Fage

Troglothele coeca Fage, 1929, p. 181. Bonnet, 1959, p. 4727.

Diagnosis.—Small whitish troglobite with carapace 3.5 mm long and following features: eyes completely

absent; cervical groove transverse; sternum with weak pair of sigilla on posterior margin; base of endites and apex of labium with many rows of spinules; paired tarsal claws with double row of teeth.

Type data.—Immature type and smaller immature from Gruta Bellamar, near Matanzas, Cuba (F. Silvestri collector), presumably in Museum d'Histoire Naturelle, Paris (not seen).

FAMILY THERAPHOSIDAE

The theraphosids are large spiders with features suggesting that they may be errant types capable of freedom of movement comparable to that of some araneomorphs. This is not the case inasmuch as most, in spite of adhesive tarsal pads favorable for running or climbing, are sedentary creatures committed to nocturnal lives in silken retreats in trees or openings in the soil. Most of our North American species dig their own burrows into the soil and stay in or very close to them during their long lives. Some theraphosids wander into caves during their foraging or station their burrows in entrances in a relationship similar to that of some troglophiles. Recently in eastern México it was noted that a few species seemed to have established an intimate association with cave environments and were living in and penetrating them to considerable distances; these are here claimed to be troglobites.

The conclusion that some of these theraphosids were cave adapted was based on such standard features as paler coloration, reduction and loss of eye tubercle and eyes, and absence from epigean collections. All but one of these cavernicoles lacked a formal patch of urticating hairs on the dorsum of the abdomen, possibly suggesting that this absence indicated little need in caves for this protective device found in all of our other theraphosids. So far only females and immature have been taken from cave stations, which range southward in allopatric pattern from Tamaulipas to Oaxaca and Puebla.

The systematics of North American members of the subfamily Theraphosinae is based largely on a few presence or absence characters involving longitudinal subdivision of the tarsal scopulae in both sexes and secondary sexual features of the palpi and front legs of males. There is much variation of these characters. Immature and subadult specimens differing often little in size and appearance from fully mature ones can be ascertained only by presence of formal genitalic structures. In young females there are sometimes present sclerotized precursors of the fully mature genitalic structure. Some of the above difficulties are chargeable to size growth during the perennial lives of both sexes, but especially of females. The immatures of both sexes look much alike and the mature male becomes apparent only after his final molt. From the first discovery of a juvenile *stygium* and later of mature females, placement to a genus proved difficult; most of the taxa were tentatively assigned to the Mexican genus *Schizopelma* in spite of various discrepancies. A decision now to award these cavernicoles their own generic name on the basis of various derivative characters has been enhanced by discovery of a seemingly congeneric male from an epigean station in Puebla, herein named *nahuanum*.

Spelopelma, new genus

Aphonopelma: Gertsch, 1971, pp. 47, 49, for *stygia*.
Schizopelma: Gertsch, 1973, pp. 142-144, for *stygia*, *reddelli* and *elliotti*.

Diagnosis.—Theraphosine genus largely conforming to group Ischnocoleae of Simon (1892a, p. 133), in which tarsal scopulae are divided by band of spines or setae. Carapace, low, widely truncated in front where margined by overhanging row of stiff setae; cervical groove deep transverse fissure; eye tubercle obsolete and eyes small or entirely obsolete; sternum with four pairs of sigilla lying close to sides; labium set with numerous cuspules in apical half; endites with large patch of cuspules on inner side at base. Legs relatively long, first legs averaging about four times that of carapace; tarsal scopulae usually divided by line or band of setae or spines; paired claws smooth. Male palpus with elongated segments; tibia more than four times as long as wide, armed at apex with prolateral and ventral spurs bearing black spines; palpal bulb bearing simple curved embolus. Abdomen suboval, clothed thinly with simple hairs and setae, with patch of urticating hairs present only in *elliotti*. Epigynum with two simple fingerlike receptacles.

Genotype.—*Spelopelma stygium* (Gertsch).

Etymology.—Generic name based on Greek *spelaion*, cave and *pelma*, sole of foot, in reference to adhesive tarsal pads.

The *stygium* group

In order to avoid excessive repetition of details in the individual descriptions, the common features of the *stygium* group are reviewed as follows: All are pallid spiders with base color of cephalothorax and appendages yellowish to orange brown and the abdomen grayish without contrasting pattern. The carapace is thinly clothed with soft procumbent hairs and set with stouter, suberect hairs and black setae. In all species the broad clypeus is provided with about 50

Key to Females of *Spelopelma*

1. Dorsum of abdomen with thick patch of urticating hairs covering two-thirds length; Cueva de la Laguna, San Luis Potosí . . . . . *S. elliotti* (Gertsch)
   Dorsum of abdomen without patch of urticating hairs 2
2. Receptacles of epigynum (Fig. 16) close together at base; middle spinnerets sometimes aborted; caves of Puebla . . . . . *S. puebla*, new species
   Receptacles of epigynum more widely separated 3
3. Scopulae of first and second tarsi mostly entire, with tuft of spines only at apex; first femur longer than carapace; epigynum (Fig. 15); caves of Oaxaca . . . . . *S. reddelli* (Gertsch)
   Scopulae of first and second tarsi with one or more rows of fine spines 4
4. Receptacles of epigynum (Fig. 13) moderately separated, directed strongly laterad; caves of San Luis Potosí . . . . . *S. stygium* (Gertsch)
   Receptacles of epigynum more widely separated 5
5. Receptacles of epigynum (Fig. 17) short and stout; Cueva de la Grieta, Oaxaca . . . . *S. grieta*, new species
   Receptacles of epigynum (Fig. 12) longer; Entrada del Viento Alta, Tamaulipas . . . *S. mitchelli*, new species

overhanging setae. The legs are similarly provided with black hairs and set with stout black spines. The chelicerae are bright reddish brown and the long fangs are brown or blackish. The sternum, labium and endites have no procumbent covering hairs and are evenly set with suberect black setae.

The several species have similar structure. The quite low carapace is broadly truncated in front, moderately rounded on the sides, narrowed and roundly truncated behind. The moderately convex, subtriangular pars cephalica is delimited behind by a small, deep, transverse cervical groove, and laterally by more or less distinct cephalic sutures; similar sutures radiate from the groove outward on the lower pars thoracica. The eye tubercle is mostly obsolete and the eyes reduced in size, with little or no pigment, evanescent with few traces or completely absent. The size and formulas of these eyes when present are given for each species. The sternum bears four pairs of sigilla: the second, third and fourth pairs are round in shape and located near the three posterior coxae; the first pair of larger, semilunar sigilla lie in the labial groove. The labium bears few or numerous small cuspules in the apical half. The endites are armed below at apex with a stout spur on the inner side, and on the inner side of the basal half with a large patch of cuspules. The prolateral face of the endite bears a thick band of reddish hairs, but the retrolateral face is mostly smooth, with few fine hairs, and lacks modified setae of any kind. The robust chelicerae project forward about half the length of the carapace, are evenly rounded and armed with a long curved fang. The promargin of the cheliceral groove bears a single row of about a dozen, subequal, black teeth and a small series of denticles in the groove opposite the innermost teeth; the retromargin is provided with a thick band of reddish hairs.

The leg formulas are 4132 or 4123. The long legs are relatively thinner than in epigean species, with the first leg averaging about four times and the first femur about as long as the carapace. The front leg spines are few, mostly in ventral position, and variable on the first and second pairs; they are more numerous and irregularly disposed on most segment surfaces of the third and fourth pairs of legs. The prolateral face of the first coxa is thinly covered with fine hairs and lacks enlarged or modified setae used by some authors for identifying genera. The tarsi and metatarsi of the first and second legs are heavily scopulate below and on the sides; the scopulae of the third and fourth pairs are thinner, cover only half the metatarsus of the third leg and are absent from the metatarsus of the fourth leg. In some species the front tarsi are entire or nearly so but in most all the tarsal scopulae are divided by a long row of setae or spines in single, double or multiple ranks; the variations are given in the specific descriptions. The tarsus of the female palpus is thickly scopulate below and on sides. All tarsal claws are smooth.

The elongate oval abdomen is covered thickly above and below with subprocumbent gray hairs and more or less thickly with suberect black hairs and setae. The dorsum in most species completely lacks scattered or formal patch of urticating hairs, present in most genera of North American theraphosids. Exceptions are *elliotti* and perhaps the male *nahuanum* from Zoquitlán, Puebla. The spinnerets typically are four in number, a three-segmented outer pair (posterior lateral spinnerets) and a one-segmented

middle pair (anterior median spinnerets), these reduced or aborted in the species *puebla*.

Spelopelma stygium (Gertsch)
Fig. 13

Aphonopelma stygia Gertsch, 1971, p. 49.
Schizopelma stygia: Gertsch, 1977, p. 142, figs. 1, 2a.

Diagnosis.—Pallid troglobite with evanescent eyes from caves of San Luis Potosí, with following features: first femur shorter than carapace; scopulae of first and second tarsi divided longitudinally mostly by double row of fine spines; epigynum (Fig. 13) with thick tubular receptacles close together at base and projecting laterad.

Female from Cueva de los Potrerillos.—Total length 22 mm.

Carapace 9.5 mm long, 8.3 mm wide. Clypeal margin with row of about 40 setae. Pars cephalica as long as wide; cervical groove 1.7 mm wide. Eye tubercle obsolete; ratio in millimeters of eight evanescent eyes, anterior lateral, anterior median, posterior lateral, posterior median, 0.30:0.13:0.18:0.15. Anterior eye row moderately procurved; 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), one diameter from lateral eyes. Sternum 4.5 mm long, 3.7 mm wide. Labium 1.5 mm long and broad, armed at tip with 16 small cuspules. Endite 3.8 mm long, 2 mm wide. Chelicera 4.5 mm long, 3 mm wide, about half as long as carapace; promargin with 15 subequal teeth.

	I	II	III	IV	Palp
Femur	9.15	8.15	8.00	10.50	7.00
Patella	5.20	4.75	4.10	4.50	4.10
Tibia	8.50	8.00	7.50	10.10	5.50
Metatarsus	7.50	7.15	9.70	12.50	——
Tarsus	5.10	4.90	5.15	6.40	4.60
Total	35.35	32.95	33.45	44.00	21.20

Leg formula 4132. First leg 3.7 times, first femur 0.96 times as long as carapace. Leg spines: first tibia with 1-1-2 ventral spines; first metatarsus with 0-1-1 ventral spines. First and second tarsi and metatarsi scopulate their length; tarsal scopulae of these legs divided by long, mostly double row of fine spines.

Abdomen 12 mm long, 6.5 mm wide. Spinnerets: middle spinneret 0.75 mm long; posterior spinnerets with segments from base to apex 1.6, 1.3, 2 respectively, totaling 4.9 mm.

Epigynum (Fig. 13) with broad basal atrium (bursa copulatrix) and two tubular, laterally directed receptacles 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 the American Museum of Natural History.

Distribution.—Known only from caves of San Luis Potosí.

Other Records.—MEXICO: *San Luis Potosí:* Cueva de los Potrerillos, same data as above (J. Reddell, J. Fish, W. Russell), female; 27 November 1972 (J. Reddell, T. Raines), female. Sótano del Pozo, 2 km W Ahuacatlán, 25 May 1974 (Charles Elliott), two females. Cueva de Las Rusias, Las Rusias, 4 August 1975 (D. McKenzie, S. Wiley, A. Grubbs), two immature specimens about 18 and 11 mm long respectively, probably this species. Cueva del Agua, 700 m E La Silleta, 27 March-1 April 1980 (D. Pate, P. Sprouse, T. Treacy), 2 immature females.

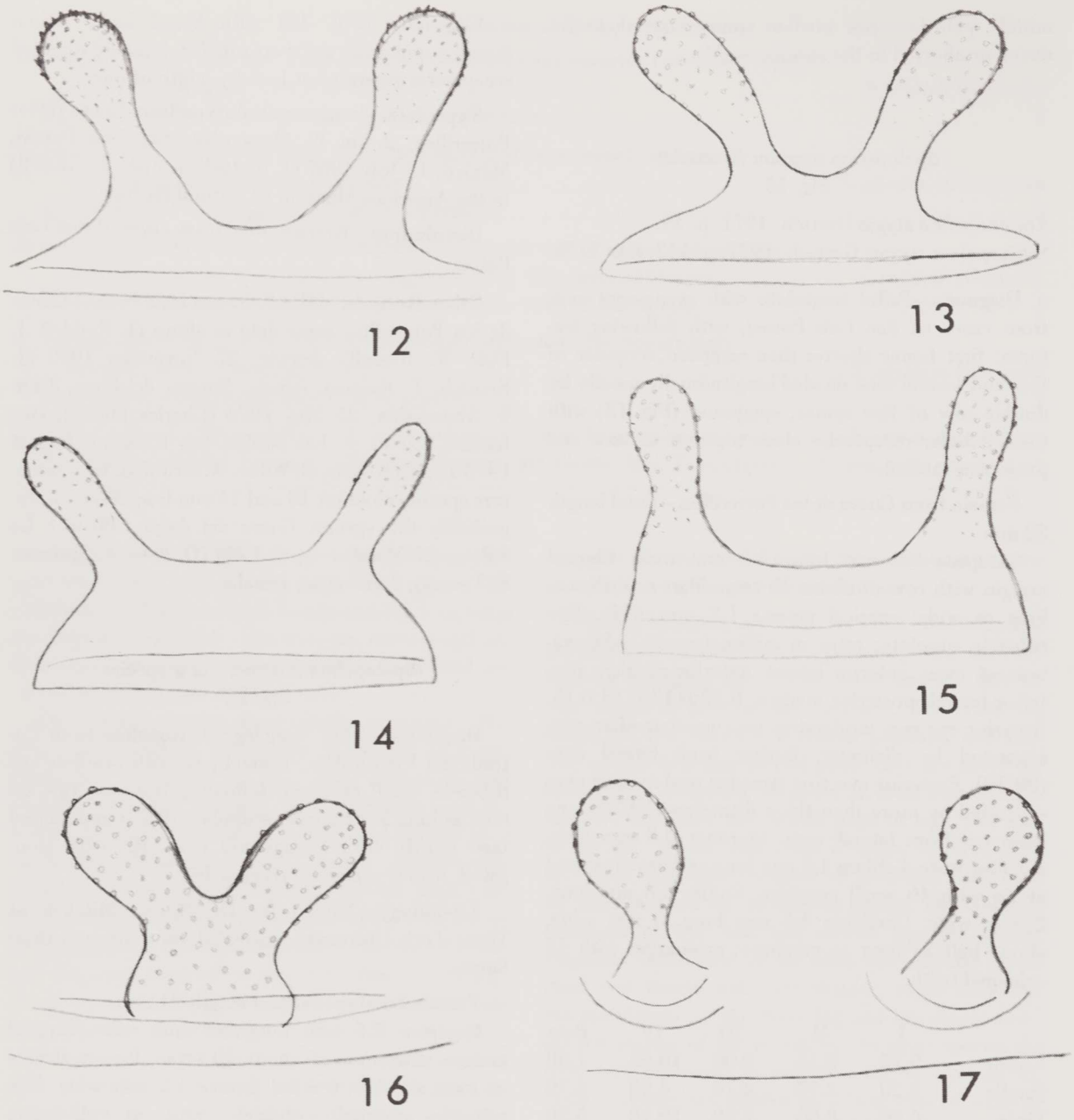
Spelopelma mitchelli, new species
Fig. 12

Diagnosis.—Pallid, long-legged troglobite from Entrada del Viento Alta, Tamaulipas, with obsolete eye tubercle, small eyes and following features: first femur as long as carapace; scopulae of first and second tarsi mostly entire; epigynum (Fig. 12) with elongated, widely separated receptacles.

Etymology.—Named for Dr. Robert Mitchell of Texas Tech University, specialist on caves and their faunas.

Female holotype.—Total length 21 mm.

Carapace 7.5 mm long, 6.7 mm wide. Clypeal margin with row of about 40 setae. Pars cephalica as long as wide; cervical groove 1.2 mm wide. Eye tubercle essentially obsolete; ratio in millimeters of eight evanescent eyes, anterior lateral, anterior median, posterior lateral, posterior median, 0.20: 0.10:0.13:0.11. Anterior eye row moderately procurved; median eyes on small elevation separated by two-thirds diameter, twice as far from lateral eyes. Posterior eye row straight; narrowly oval median eyes separated by twice their long diameter, one diameter from round lateral eyes. Sternum 3.7 mm long, 3.2 mm wide. Labium 1.2 mm long, 1.3 mm wide, armed at tip with 25 small cuspules. Endite 3.7 mm long, 2 mm wide, with cluster of small cuspules covering inner half of basal third. Chelicera 4 mm long, 2.3 mm wide, about twice as long as carapace; promargin with 10 subequal teeth.



Figs. 12-17.–Epigyna of *Spelopelma* spp., dorsal views: 12, *S. mitchelli*, new species; 13, *S. stygium* (Gertsch); 14, *S. elliotti* (Gertsch); 15, *S. reddelli* (Gertsch); 16, *S. puebla*, new species; 17, *S. grieta*, new species.

	I	II	III	IV	Palp
Femur	7.50	7.35	6.80	8.70	5.50
Patella	4.00	3.80	3.20	3.60	3.20
Tibia	6.70	6.00	5.70	8.00	4.50
Metatarsus	6.20	6.00	6.70	10.20	——
Tarsus	4.00	4.00	4.00	4.70	4.10
Total	28.40	27.15	26.40	35.20	17.30

Leg formula 4123. First leg 3.6 times, first femur as long as carapace. Leg spines: first tibia with 2-1-2 ventral spines; first metatarsus with 0-1-1 ventral spines. First and second tarsi and metatarsi scopulate their length; tarsal scopulae of first leg mostly entire, of second leg divided by thin row of few fine spines. Third tarsus and apical half of metatarsus scopulate; tarsal scopula divided by double or triple row of spines. Fourth tarsus and third of metatarsus scopulate; tarsal scopulae divided by broad band of fine spines covering most of venter.

Abdomen elongate oval, 10.5 mm long, 5.5 mm wide. Spinnerets: middle pair 0.75 mm long; posterior spinnerets with segments from base to apex, 1.7, 0.7 and 2.2, totaling 4.6 mm.

Epigynum (Fig. 12) with widely spaced, elongated receptacles.

Type data.—Female holotype from Entrada del Viento Alta, Tamaulipas, México, July 1978 (Peter Keys, Robert Anderson), in American Museum of Natural History.

Spelopelma elliotti (Gertsch)
Fig. 14

Schizopelma elliotti Gertsch, 1973, p. 144, fig. 2c.

Diagnosis.—Pallid troglobite similar to *stygium* with eye tubercle and eyes of medium development; seminal receptacles of epigynum (Fig. 14) widely separated at base, directed laterad; dorsum of abdomen with thick patch of silky hairs covering two-thirds length (these representing long, somewhat atypical, Type II urticating hairs).

Type data.—Female holotype and small female from Cueva de la Laguna, 5 km N Valle de los Fantasmas, San Luis Potosí, México, 3000 meters, 20 May 1972, in American Museum of Natural History.

Distribution.—Known only from above specimens.

Spelopelma reddelli (Gertsch)
Fig. 15

Schizopelma reddelli Gertsch, 1973, p. 143, fig. 2b.

Diagnosis.—Pallid, long-legged troglobite from caves of Oaxaca, with obsolete eye tubercle, small eyes, and following features: first femur longer than carapace; scopulae of first and second tarsi mostly entire, with group of spines only at apex; epigynum (Fig. 15).

Etymology.—Named for Mr. James Reddell, specialist in Mexican cave faunas.

Female from Cueva de la Culebra.—Total length 22 mm.

Carapace 11 mm long, 9.5 mm wide. Clypeal margin with row of about 40 setae. Pars cephalica 6.5 mm long, about as long as broad; cervical groove 1.5 mm wide. Eye tubercle obsolete, with eye group about one-fourth width of carapace. Eyes small, with brownish tubercles and blackish subintegumental patch at middle; ratio in millimeters of anterior lateral, anterior median, posterior lateral, posterior median, 0.22:0.12:0.23:0.20. Anterior eye row slightly procurved; median eyes separated by nearly two diameters, as far from oval lateral eyes. Posterior row straight; median eyes widely separated by about six diameters, nearly touching lateral eyes. Sternum 5.5 mm long, 4.5 mm wide. Labium 1.5 mm long, 2 mm wide, with six small cuspules near apex. Endite 4.5 mm long, 2.7 mm wide, with cluster of about 75 cuspules on inner side of basal half. Chelicera 3.5 mm long, 2.5 mm wide, less than third length of carapace; promargin with nine or ten black teeth.

	I	II	III	IV	Palp
Femur	12.99	11.75	11.25	——	8.75
Patella	5.60	5.50	5.00	——	4.50
Tibia	11.50	11.35	10.50	——	7.75
Metatarsus	11.50	11.20	12.50	——	——
Tarsus	7.00	7.00	7.00	——	7.00
Total	47.60	46.80	46.25	——	27.95

Leg formula probably 4123. First leg 4.3 times, first femur 1.1 times as long as carapace. Leg spines: first femur with 1-1 dorsal spines on prolateral side; first tibia with 1-1-0 prolateral and retrolateral and 1-1-2 ventral spines; first metatarsus with 2-1-1 ventral spines; second leg mostly as first; third leg as follows: femur with one dorsal near apex; tibia with 1-1-1 prolateral and retrolateral and 2-2-2 ventral spines; metatarsus with 1-1-1 prolateral, 1-1-0 retrolateral and 2-1-1-2 ventral spines. Fourth leg missing. First and second tarsi and metatarsi scopulate their full length; tarsi without trace of longitudinal division except for brush of spine at tip below tarsal pads. Third tarsus and apical half of metatarsus scopulate, and tarsus with band of fine spines from base to apex where enlarged to thicker brush.

Abdomen elongate oval, 11 mm long, 5.5 mm wide. Spinnerets: middle pair 0.8 mm long, three-segmented posterior pair from base to apex 2, 1.6, and 2, totaling 5.6 mm.

Epigynum (Fig. 15) with widely spaced, elongated receptacles.

Type data.—Female holotype found wandering over a clay bank deep in Cueva del Nacimiento del Río San Antonio, Oaxaca, México, 9 March 1973 (J. Reddell, S. Murphy, D. and M. McKenzie, M. Butterwick), in American Museum of Natural History.

Distribution.—Caves of Oaxaca.

Other records.—MEXICO: *Oaxaca:* Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, 11 December 1973 (J. Reddell, W. Elliott, R. Jameson), one female. Cueva de la Culebra, 11 km SW Acatlán, 30 December 1976 (collector unknown), female.

Spelopelma puebla, new species
Fig. 16

Diagnosis.—Pallid relative of *reddelli* from caves of Puebla with small evanescent eyes and following features: first femur as long as carapace; scopulae of first and second tarsi divided longitudinally by double row of small spines; epigynum (Fig. 16).

Etymology.—Specific name from Spanish *puebla*, a seed, town, people, used in apposition, named for the State of Puebla.

Female holotype from Cueva de Tasalolpan.—Total length 14 mm.

Carapace 7 mm long, 5.75 mm wide. Clypeal margin with about 50 setae. Pars cephalica about as long as width near front; cervical groove 1 mm wide. Eye tubercle low, mostly obsolete, with eye group equal to one-fourth width of carapace at that point. Eight whitish eyes present, evanescent, in ratio in millimeters of anterior lateral, anterior median, posterior lateral, posterior median, 0.21:0.11:0.15:0.10. Anterior eye row faintly procurved, essentially straight; median eyes separated by diameter, as far from lateral eyes. Posterior eye row recurved, with line along front edges of lateral eyes touching front of median; median eyes widely separated by four diameters, their radius from lateral eyes. Sternum 0.35 mm long, 0.27 mm wide. Labium 1 mm long, 1.3 mm wide, with eight tiny cuspules scattered across apex. Endite 2.8 mm long, 1.5 mm wide, with cluster of about 50 small cuspules on inner side of basal half. Chelicera 3 mm long, 1.75 mm wide, less than length of carapace; promargin with row of 12 black teeth.

	I	II	III	IV	Palp
Femur	7.00	6.00	6.15	7.80	5.00
Patella	4.00	3.60	3.00	3.20	3.00
Tibia	6.10	5.70	5.00	7.50	4.25
Metatarsus	5.35	5.25	6.70	9.50	——
Tarsus	3.70	3.70	3.80	5.00	3.30
Total	26.15	24.25	24.65	33.00	15.55

Leg formula 4132. First leg 3.75 times, first femur as long as carapace. Leg spines: first femur with weak subdorsal spine on prolateral side; left first tibia with 1-1-1 ventral spines and additional spine opposite single median spine; left first metatarsus with 1 submedian; right first metatarsus with 1 submedian and 1 subapical spine; second leg essentially as first; third leg with 2-2-2 ventral spines on tibiae and metatarsus; fourth legs with 2-2-2 ventral spines on tibiae and 2-2-1-2-2 on metatarsi. First and second tarsi and metatarsi scopulate their full length, with tarsal scopulae of these divided by double row of spines their length. Third tarsus and apical half of metatarsus scopulate, with tarsal scopulae of these with double or triple row of spines from base to apex; fourth tarsus thinly scopulate and few scopular hairs at apex of metatarsus and with four or more series of black spines covering ventral surface of tarsus.

Abdomen 7 mm long, shriveled, about 3 mm wide. Spinnerets: right middle spinneret 0.5 mm long but left one aborted, leaving inconspicuous vestige; three-segmented posterior pair from base 1.35, 0.85, and 1.65, totaling 3.85 mm.

Immature female from Cueva de la Barranca.—Total length 8.8 mm.

Carapace 3.5 mm long, 3.2 mm wide. Clypeal margin with row of about 20 bristles, with eight in middle enlarged. Pars cephalica about two-thirds length of carapace, with inconspicuous cephalic sutures; cervical groove 0.6 mm wide; pars thoracica with inconspicuous radiating grooves. Eye tubercle nearly obsolete, about third of frontal width. Eight small eyes evanescent as whitish spots in ratio in millimeters of anterior lateral, anterior median, posterior lateral, posterior median, 0.11:0.04:0.1:0.06. Anterior eye row moderately procurved; anterior median eyes separated by three diameters, about one diameter from lateral eyes. Posterior eye row essentially straight; median eyes separated by about four diameters, their radius from lateral eyes. Sternum 1.9 mm long, 1.6 mm wide; labial sigilla conspicuous but three lateral pairs not evident. Labium 0.5 mm long, 0.8 mm wide, with about 40 cuspules in apical third. Endite 1.5 mm long, 1 mm wide, with cluster of about 40 cuspules on inner side of basal third. Chelicera 2.4 mm long, 1 mm wide, two-thirds as long as carapace; promargin with 10 subequal black teeth.

	I	II	III	IV	Palp
Femur	3.75	3.70	3.50	4.70	3.00
Patella	2.75	1.75	1.70	2.00	1.50
Tibia	3.60	3.25	3.10	4.70	2.40
Metatarsus	3.10	2.30	3.60	5.30	——
Tarsus	2.30	2.35	2.35	3.10	2.20
Total	15.00	13.25	14.25	19.80	9.10

Leg formula 4132. First leg four times, first femur about 1.1 times as long as carapace. Leg spines: first tibia with 1 spine below at middle; first metatarsus with 1 median and 1 apical ventral spines. Third and fourth pairs of legs with stouter spines on all surfaces: third tibia and metatarsus with 2-2-2 ventral spines; fourth tibia with 2-2-2 ventral spines but fourth metatarsus with four irregularly spaced pairs. First, second and third legs with scopulae on tarsi and about half of metatarsi; fourth tarsi with thin covering below. Tarsal scopulae of first, second and third legs divided by double row of ten or more thin spines, and that of fourth tarsi with three rows of many thin spines covering ventral surfaces.

Abdomen 5.3 mm long, 3 mm wide. Spinnerets: middle pair aborted to small nodules tipped with few stiff setae; posterior pair with segments from base to apex 0.5, 0.4, and 0.6, totaling 1.5 mm.

Epigynum immature, small, but showing essential form of that of mature female (Fig. 16).

Type data.—Female holotype from Cueva de Tasalolpan, 5 km SW Cuetzalan, Puebla, México, 22 December 1976 (J. Reddell, A. Grubbs, C. Soileau, D. McKenzie), in American Museum of Natural History.

Distribution.—Caves of Puebla.

Other record.—MEXICO: *Puebla:* Cueva de la Barranca, 8 km SW Cuetzalan, 25 December 1973 (D. McKenzie), immature female.

Spelopelma grieta, new species
Fig. 17

Diagnosis.—Troglobitic species from Cueva de la Grieta, Oaxaca, distinguished as follows: eye tubercle and eyes obsolete; first femur shorter than carapace; scopulae of first and second tarsi divided longitudinally by row of small spines; epigynum (Fig. 17).

Etymology.—Specific name from Spanish *grieta*, crevice, crack, used in apposition, named for Cueva de la Grieta.

Female holotype.—Total length 19 mm.

Carapace 8 mm long, 6.5 mm wide. Clypeal margin with about 50 long setae. Pars cephalica 5 mm long, subtriangular, slightly longer than broad, with well-marked cephalic sutures; cervical groove 1.2 mm wide. Eye tubercle completely obsolete and eyes indicated only by subintegumental pale spots. Sternum 3.7 mm long, 3.2 mm wide. Labium 1.25 mm long and wide, with single cuspule at apex. Endite 3.5 mm long, 2 mm wide, with cluster of about 60 cuspules on inner side of basal half. Chelicera 4.5 mm long, 2 mm wide, more than half length of carapace; promargin with 12 to 18 black teeth, inner ones smaller.

	I	II	III	IV	Palp
Femur	7.70	7.50	7.00	8.50	5.80
Patella	4.40	4.00	3.00	3.70	3.35
Tibia	7.35	6.50	6.25	8.60	5.00
Metatarsus	6.15	6.50	7.00	10.40	——
Tarsus	4.70	4.50	4.50	6.00	4.35
Total	30.30	29.00	27.75	37.20	18.50

Leg formula 4123. First leg 3.8 times, first femur 0.97 times as long as carapace. Leg spines: first femur with single spine on prolateral side near apex; first tibia with 1-2-1 and first metatarsus with 1-1-2 ventral spines; second leg as first but with prolateral spine near apex and small spine at middle on retrolateral side; tibiae of third and fourth legs with 2-2-2 ventral spines and fourth metatarsus with spines in four ranks. First and second tarsi and metatarsi scopulate, with these tarsi divided by row of small spines doubled beyond middle; third tarsus and apical half of metatarsus lightly scopulate and this tarsus with double row of spines becoming four wide at apex; only tarsus of fourth leg scopulate and with four-ranked series of black spines covering ventral surface.

Abdomen elongate oval, 11 mm long, 5.5 mm wide. Spinnerets: middle pair 0.65 mm long; three-segmented posterior pair from base 1.5, 1, and 1.25, totaling 3.75 mm.

Epigynum (Fig. 17) small, with separated, subglobose receptacles.

Type data.—Female holotype from Cueva de la Grieta, Huautla, Oaxaca, México, 8 January 1975 (J. Jancewicz, D. Lowrey, S. Zeaman), in American Museum of Natural History.

Distribution.—Known only from above specimen.

Spelopelma nahuanum, new species
Figs. 10-11

Diagnosis.—Brownish, long-legged epigean species from Puebla with eyes on weakly developed eye tubercle and following special features: first femur as long as carapace; scopulae of first and second tarsi mostly entire; tibia of male palpus (Fig. 10) with two distinctive spurs at apex.

Etymology.—Named for the Nahuatl peoples of México.

Male holotype.—Total length 20 mm.

Carapace 10 mm long, 9 mm wide. Clypeal margin with about 50 setae. Pars cephalica as long as broad, with clypeal margin narrowed, about 4.5 mm wide. Eye tubercle low; eight eyes present in ratio of millimeters of anterior lateral, anterior median, posterior lateral, posterior median, 0.3:0.3:0.3:0.2. Anterior eye row moderately procurved; median eyes separated by radius and as far from equal lateral eyes. Posterior eye row moderately recurved; rounded median eyes separated by three diameters, about their radius from larger lateral eyes. Median ocular quadrangle twice as broad as long, narrowed in front (10/65). Sternum 4.5 mm long, 4 mm wide. Labium about 1.6 mm long and wide, armed at tip with about 26 small cuspules. Endite 4 mm long, 2 mm wide, with cluster of small cuspules scattered on inner basal third. Chelicera 4.2 mm long, 2.2 mm wide, about twice as long as carapace; promargin with 10 subequal black teeth.

	I	II	III	IV	Palp
Femur	10.50	10.00	9.60	12.00	7.00
Patella	5.00	5.00	4.00	4.70	3.70
Tibia	9.00	8.30	8.50	11.50	6.20
Metatarsus	9.50	8.70	11.25	15.75	——
Tarsus	6.70	6.50	6.70	8.25	3.00
Total	40.70	38.50	40.05	52.20	19.90

Leg formula 4132. First leg 4.7 times, first femur as long as carapace. Leg spines: first femur with 1-1 retrolateral spines in apical half; first tibia with 1-1 prolateral and 1-1-1 retrolateral and 2-2-2 ventral spines, and two close together as part of ventral and lateral spurs (Fig. 11); second leg like first but lacking spurs or extra spines; third and fourth legs with more numerous, stouter spines essentially in pattern of first legs, but with strong spination of metatarsi as follows: in three ranks in third but four-ranked on venter of fourth, 2-2-2-2. Palpal spines: tibia with two prolateral in apical third and 2-2-2 ventral pairs. All tarsi thickly scopulate their length; first, second and third metatarsi scopulate their full length but fourth metatarsus scopulate only about half. Scopulae of first and second tarsi mostly entire; those of third and fourth tarsi divided by row of small spines most numerous at apex.

Abdomen shrivelled, about 9 mm long, 5 mm wide, covered thinly with short procumbent dusky hairs and many scattered suberect black setae; apex of abdomen with small gray patch of urticating hairs. Spinnerets broken off.

Male palpus (Fig. 10) with following features: tibia more than four times as long as wide (62/13); tarsus flared at apex and there set with brushes of scopular hairs; bulb suboval, with thick curved embolus drawn to thin point.

Type data.—Male holotype from Zoquitlán, Puebla, México, 30 December 1978 (A. G. Grubbs), in American Museum of Natural History.

Distribution.—Known only from above specimen.

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THE SPIDER GENERA *PHOLCOPHORA* AND *ANOPSICUS* (ARANEAE, PHOLCIDAE) IN NORTH AMERICA, CENTRAL AMERICA AND THE WEST INDIES

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ABSTRACT

The sedentary pholcids of the genera *Pholcophora* and *Anopsicus* are lucifugous types that live under ground objects and detritus on the soil or inside ground openings and caves. A systematic review of the 74 taxa from continental and insular North America is presented with analyses of their features and relationships. With few somatic differences available, the specific characters are largely centered in the genitalia: the palpi of the males present excellent differences assuring quick identification; the epigyna of the female offer few usable details even when cleared. *Pholcophora* comprises 11 epigean species mostly from México, of which seven are described as new. The genotype, *Pholcophora americana* Banks, is a widespread species of the western United States. *Anopsicus* comprises 63 species of very small pholcids with quite stereotyped somatic features: 44 of them are described as new. Some females have a stridulatory apparatus of picks on the carapace and files on the front face of the abdomen. The generic name *Anopsicus* (based on the eyeless *pearsei* of Yucatán) has as junior synonyms *Pholcophorina* and *Ninetella.* Thirty-one of the taxa are cavernicoles and 11 of these are eyeless troglobites, six from México, four from Jamaica, and one from Cuba. Most of the species have six eyes in two triads, but a new four-eyed species from Jamaica has aborted the posterior lateral eyes.

INTRODUCTION

The pholcids of the genera *Pholcophora* and *Anopsicus* are small globose spiders, averaging under 2 mm in length, many with short legs by pholcid standards, that live reclusive lives under ground objects, in leaf and plant detritus, and in soil openings and caves. These sedentary aerial types spin web tangles in dark spaces and remain there in close contact with such webs as permanent residents, often in informal colonies. Most *Pholcophora* live close to the soil and there are few cave records. Many *Anopsicus* are epigean and others live in caves, mostly as troglophiles, but eleven of these have lost their eyes and are here claimed to be troglobites.

The taxa of *Pholcophora* are North American and live mostly south of the United States. An exception is the genotype, *americana*, which occurs in mesic foothills and mountains over much of the western United States. A new species from Curaçao, *levii* described herein, suggests that there may be a so far unrecorded fauna in South America. The numerous species of *Anopsicus*, now numbering 60, are widespread with many species in México, Central America and some of the West Indies. A South American fauna is so far known only by *Anopsicus (Pholcophorina) banksi* (Gertsch, 1939, p. 4) from the Galapagos Islands, but a species from Trinidad, *arima* described in this paper, suggests that others are likely to be found when more adequate collections become available.

The remarkable adaptive radiation of the genus *Anopsicus* has produced a large number of relatively local populations from what seems clearly to be a single phyletic line. Almost every taxon occurs within a single state or political subdivision, a single cave or epigean station. There are no wide ranging species. Of moderately wide distribution are a few as follows: *speophila* from caves of Campeche and Yucatán; the eyeless *pearsei* from caves of Yucatán and Quintana Roo; and the epigean *placens* from Tabasco and Chiapas. In terms of broad sympatry on the basis of the known material, it can be stated that seven species occur in Chiapas, seven in Oaxaca, three in Honduras,

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and three in the Canal Zone of Panama. The following cavernicoles are sympatric in the narrow sense: the eyeless *lucidus* lives in Cueva de Juan Sánchez, Oaxaca, with *soileauae;* the eyeless *clarus* lives in Portland Caves, Jamaica, with *pecki;* and the eyeless *cubanus* lives in Cueva Grande, Cuba, with *silvai.* Notable species clusters are the following: of seven species of Oaxaca four are blind troglobites from caves of a restricted area; and of eight cavernicoles from Jamaica, four are eyeless troglobites.

The aim of the present paper is to give a systematic review of the known species which in many ways must be preliminary, with the expectation that the number of taxa will be much increased as time goes by, even doubled, by more representative collecting of the wide area.

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SYSTEMATIC SECTION

Genus *Pholcophora* Banks

Pholcophora Banks, 1896, p. 57. Comstock, 1913, p. 329; 1940, p. 343. Bonnet, 1958, p. 3606. Gertsch, 1971, p. 76; 1977, p. 112 (part).

Diagnosis.—Genus of Subfamily Blechroscelinae (Petrunkevitch, 1939, p. 159): small spiders 1.5 to 3.5 mm long with subglobose abdomens. Carapace with longitudinal linear cervical groove. Eyes eight: lateral triads with subequal, subcontiguous, nocturnal eyes on black connate tubercles; diurnal anterior median eyes small; posterior eye row moderately recurved. Chelicerae of males with facial horns or spurs. Leg formula 4123; legs of medium length. Male palpus: femur without ventral spur at apex; tarsus with prominent retrolateral appendage and complicated bulb and embolic division attached on prolateral side. Epigynum small sclerotized cap on soft ring capable of moderate inflation during mating. Females without stridulatory device on carapace and base of abdomen.

Genotype.—*Pholcophora americana* Banks of western North America.

Description.—Carapace subround, of moderate convexity and elevation, lightly covered with procumbent dark hairs and few suberect ones on midline; triangular pars cephalica flanked by weak cephalic grooves; cervical groove distinct longitudinal linear depression, often part of Y-shaped dark figure on pale integument; clypeus wide, projecting downward where roundly narrowed in front, equal in height to lengths of one or more eye triads. Eyes eight in group occupying two-thirds or less width of pars cephalica; anterior eye row procurved; posterior eye row gently to moderately recurved; eye tubercles black and usually only distinctive contrast feature of paler carapace. Sternum sparsely set with erect black hairs. Chelicerae of females with simple inconspicuous pale tooth overhanging fang; those of males with additional facial horns or spurs of differing shapes, lengths and positions. Legs slender, with fourth legs slightly longer, of medium length in both sexes, all set with rows of inconspicuous dark hairs, without any of spine stature; femora moderately thickened, especially in males; tarsi long and sometimes flexible. Trichobothria few, one above near base of tibiae and metatarsi of some legs. Male palpi with following features: femora thin at base, with trivial rounded or conical spur bearing one or more setae, thicker at apex but lacking projection or formal spur; patellae and tibiae moderately to strongly incrassated, with moderate number of quite coarse overhanging setae set in conspicuous alveolae; tarsi short rings bearing long appendage on retrolateral side, this distinctive for each species; bulb attached to tarsal ring on prolateral side, basally thickened, bulbous, broadly produced to complicated apical embolic structure. Abdomen suboval, subglobose, as high or higher than long, precipitous behind, slightly overhanging carapace in front, covered with rather coarse black hairs. Epigynum small, convex, oval cap, sessile in resting position or moderately inflatable during mating; atribursal

orifice transverse groove low on posterior margin; pattern of sclerotized internal vesicles different for each species.

Discussion.—In previous papers (Gertsch, 1971, p. 76; 1977, p. 112) I used the generic name *Pholcophora* to include a series of epigean and cavernicole pholcids with both eight and six eyes. It now seems quite appropriate that the six-eyed representatives be given full generic recognition based on differences in eye number and pattern. I am now using the name *Anopsicus*, less appropriate because it was based on an eyeless species, to represent this large group of mostly eyed species. Expected morphological intergradation between the six- and eight-eyed groups has not materialized in any taxa. It seems likely that the loss of the anterior median eyes of *Anopsicus* was an ancient modification now clearly indicative of the validity of the separate generic lines. As now defined *Pholcophora* has only a few species but these are more variable in size and genitalic features than those of *Anopsicus*. Only two of the species have been taken in cave stations but it would be surprising if these small pholcids did not regularly enter caves when they are available. The species of *Pholcophora* are largely known from continental North America; the discovery of a species in Curaçao suggests that others may occur in South America. A key to the males is based largely on features of the palpi and chelicerae. The females can be best identified by study of the epigynal drawings.

Pholcophora americana Banks
Figs. 1-4, 7-9

Pholcophora americana Banks, 1896, p. 57; 1895, p. 419; 1910, p. 7. Petrunkevitch, 1911, p. 161; 1928, p. 110. Gertsch, 1935, p. 11. Roewer, 1942, p. 338. Bonnet, 1959, p. 3606. Gertsch, 1977, p. 112.

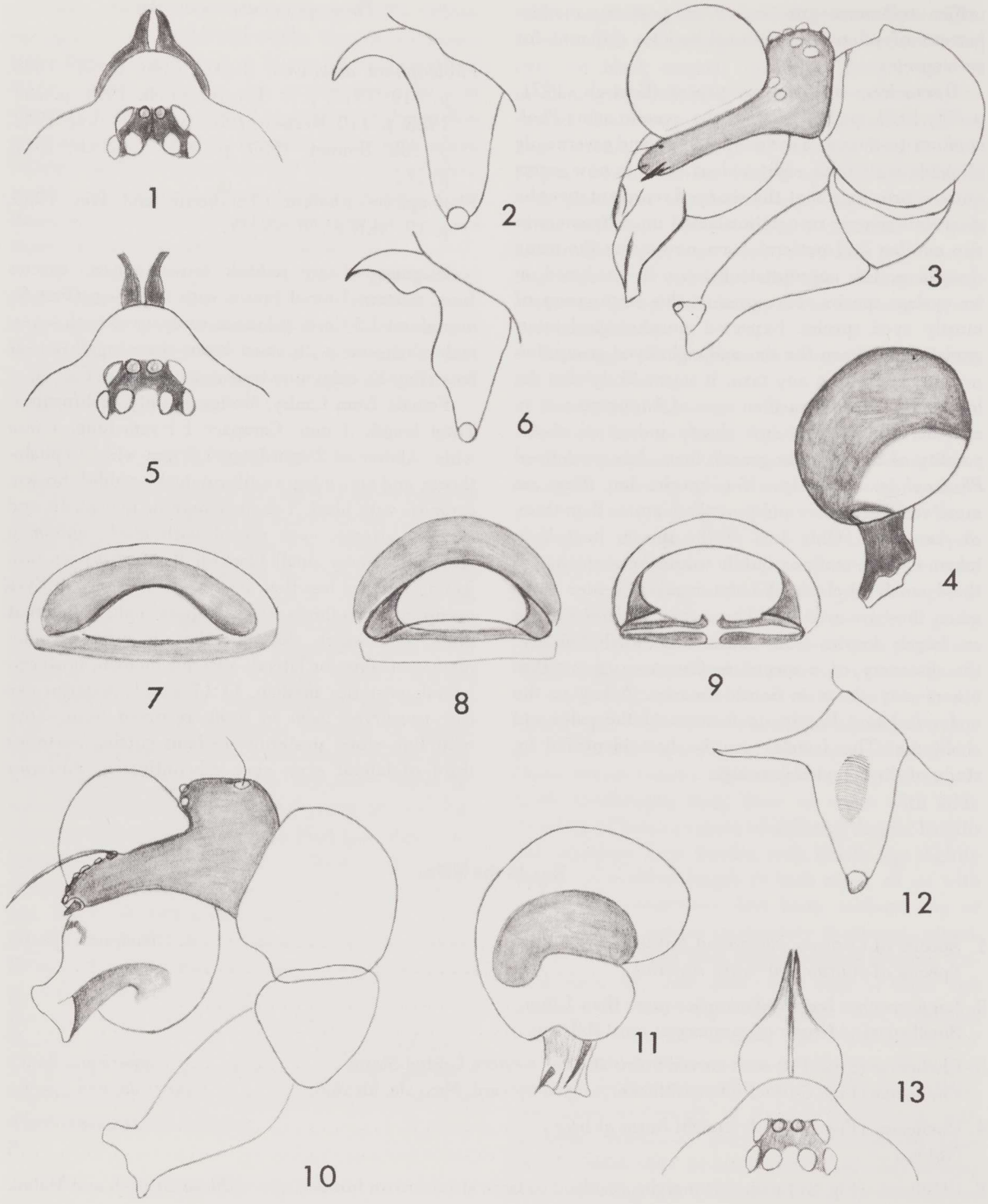
Pholcophora obscura Chamberlin and Ivie, 1935, p. 12. NEW SYNONYMY.

Diagnosis.—Large reddish brown epigean species from western United States with short legs (first femur about 1.5 times as long as carapace in both sexes; male chelicerae with short horns close together near base (Fig. 1); epigynum transverse opening (Fig. 7).

Female from Canby, Modoc County, California.—Total length 3 mm. Carapace 1.1 mm long, 1 mm wide. Abdomen 2 mm long, 1.3 mm wide. Cephalothorax and appendages uniform dusky reddish brown; carapace with black Y-shaped marking in cephalic and cervical sutures; eyes ringed with black; abdomen gray with many small blackish flecks. Clypeus projecting forward less than length of ocular triad. Eyes occupying two-thirds width of pars cephalica at that point; eyes eight, close together, in ratio in millimeters of anterior lateral, anterior median, posterior lateral, posterior median, 11:17:11:11. Anterior eye row procurved from in front, recurved from above with line along posterior medians cutting posterior third of lateral eyes; eyes subcontiguous. Posterior

Key to the Males

1. Species of Curaçao, Nederland Antilles; Figs. 11-13 . . . . . *levii*, new species
   Species of continental North America 2
2. Large species: length of carapace more than 1 mm 3
   Small species: length of carapace at most 0.8 mm 4
3. Chelicerae (Figs. 1-2) with curved horns at base; western United States . . . . . *americana* Banks
   Chelicerae (Figs. 5-6) with horns thicker, angled upward; Mexcala, México . . . . . *mexcala*, new species
4. Chelicerae (Fig. 16) with straight horns at base . . . . . *texana* Gertsch
   Not so 5
5. Chelicerae (Fig. 21) with side margins revolved to form stout brown horns . . . . . *diluta* Gertsch and Mulaik
   Not so 6
6. Chelicerae (Fig. 37) with small horns at base and triangular spurs at middle of face . . . . . *baja*, new species
   Chelicerae with only one set of horns or spurs 7
7. Chelicerae (Fig. 36) with spurs near apex of front face 8
   Chelicerae (Fig. 33) with long horns curved upward . . . . . *munda*, new species
8. Tarsal appendage (Fig. 34) subtruncate at apex . . . . . *hesperia*, new species
   Tarsal appendage (Fig. 40) narrowed at apex . . . . . *jalisco*, new species



Figs. 1-13.—Species of *Pholcophora:* Figs. 1-4: *P. americana* Banks, male: 1, eyes and cheliceral horns, dorsal view; 2, left chelicera, retrolateral view; 3, left palpus, retrolateral view; 4, bulb of palpus, prolateral view. Figs. 5-6: *P. mexcala,* male: 5, eyes and cheliceral horns, dorsal view; 6, left chelicera retrolateral view. Figs. 7-9: *P. americana* Banks, epigynum: 7 ventral view; 8, posterior view; 9, dorsal view. Figs. 10-11: *P. mexcala,* left male palpus: 10, retrolateral view; 11, bulb, prolateral view. Figs. 12-13: *P. levii,* male: 12, left chelicera, retrolateral view; 13, eyes and cheliceral horns, dorsal view.

eye row recurved; median eyes separated by radius, nearly touching lateral eyes. Median ocular quadrangle broader than long (26/17), narrowed in front (26/15). Sternum 3.5 mm long and wide. Chelicerae smooth, with few fine hairs.

	I	II	III	IV	Palp
Femur	1.60	1.30	1.47	1.90	0.24
Patella	0.37	0.35	0.35	0.37	0.10
Tibia	1.70	1.32	1.20	1.80	0.13
Metatarsus	1.93	1.56	1.55	1.85	——
Tarsus	0.55	0.52	0.50	0.56	0.30
Total	6.15	5.05	5.07	6.48	0.77

Leg formula 4132. First leg 5.6 times, first femur 1.45 times as long as carapace. Abdomen subglobose, higher than wide, precipitous behind. Epigynum (Figs. 7-9) transversely suboval with broad opening.

Male from N of O'Brien, Shasta Co., California.—Total length 2.75 mm. Carapace 1.1 mm long, 1 mm wide. Abdomen 1.5 mm long, 1.2 mm wide. Coloration and basic structure like those of female. Chelicerae (Figs. 1-2) with pair of short, stout horns close together at midline near base.

	I	II	III	IV	Palp
Femur	1.75	1.60	1.50	1.90	0.30
Patella	0.38	0.35	0.33	0.37	0.20
Tibia	1.72	1.45	1.25	1.77	0.30
Metatarsus	1.90	1.75	1.62	2.00	——
Tarsus	0.63	0.55	0.50	0.55	0.15
Total	6.38	5.70	5.20	6.59	0.95

Male palpus (Figs. 3-4) with stout segments: femur thin at base, set with rounded spur at base on retrolateral side; tibia inflated, nearly as broad as long; tarsus about half as wide as long, with tarsal appendage of medium length; bulb inflated, produced in apical half to stout process.

Type data.—Of *Pholcophora americana* Banks, female type from Fort Collins, Colorado, in MCZ; of *Pholcophora obscura* Chamberlin and Ivie, female holotype from Aspen Valley, Yosemite National Park, California, 11 August 1931 (W. Ivie), in AMNH.

Distribution.—Widespread from Colorado and New Mexico to Pacific States and adjacent Canada.

Selected records.—COLORADO: *Montrose County:* Black Canyon of the Gunnison, 29 July 1957 (H. and L. Levi), 6 immature from pinyon-pine-juniper station on north rim. NEW MEXICO: *Valencia County:* Mt. Taylor (C. C. Hoff), 3 females. UTAH: *Salt Lake County:* Saltair on Great Salt Lake, 26 July 1947 (W. Ivie), male, 2 females. MONTANA: *Flathead County:* Bigfork, 3100 ft, 23 August 1957 (H. and L. Levi), male, female in field under stones and logs. IDAHO: *Boise County:* Boise River above Arrowrock Dam, 11 June 1931 (W. Ivie), 3 females under rocks. NEVADA: *Washoe County:* Little Valley, Whitetail Forest Reserve, 17 July 1968 (A. Moreton), female from under rock. CALIFORNIA: Numerous specimens from twelve counties in foothills and forests of Sierran and Coast ranges. OREGON: *Klamath County:* Crater Lake National Park, 5 August 1951 (D. Lowrie), 3 males, 4 females from under bark of fallen trees. WASHINGTON: Cedar Lake, N Leadpoint, May 1962 (J. and W. Ivie), male. BRITISH COLUMBIA: Trail, 8 September 1963 (J. and W. Ivie), male. Above material in AMNH and MCZ.

Pholcophora mexcala, new species
Figs. 5-6, 10-11

Diagnosis.—Large epigean relative of *americana* with longer legs (first femur 2.4 times as long as carapace), distinctive horns (Figs. 5-6) on chelicerae and similar palpus (Figs. 10-11). Female unknown.

Etymology.—Specific name from Mexcala, type locality, used in apposition.

Male holotype.—Length 3.5 mm. Carapace 1.5 mm long, 1.4 mm wide. Abdomen 1.8 mm long, 1.6 mm wide. Cephalothorax and appendages bright orange brown; abdomen blackish with thin hastate pale marking above at base. Posterior eye row moderately recurved; median eyes separated by radius. Cheliceral horns (Figs. 5-6) thicker at base, apically thinner and angled upward. First leg: femur 3.56, patella, 0.65, tibia 4.3, metatarsus 5, tarsus 1, total length 14.50 mm; first leg 9.6 times, first femur 2.4 times as long as carapace. Male palpus (Figs. 10-11) with shorter, stouter tarsal appendage bearing larger apical spine.

Type data.—Male holotype from Mexcala, Guerrero, México, 2 July 1941 (L. I. Davis), in AMNH.

Pholcophora levii, new species
Figs. 12-13, 22-24

Diagnosis.—Epigean relative of *americana* from Curaçao with legs of medium length (first femur about 1.2 times as long as carapace), male chelicera with stridulatory file, cheliceral horns of male broad, close together on midline (Fig. 13), and epigynum broad, suboval, with narrow opening (Fig. 22).

Etymology.—Named for Dr. Herbert W. Levi of the Museum of Comparative Zoology.

Female.—Length 2.7 mm. Carapace 1.2 mm long, 1 mm wide. Abdomen 1.5 mm long, 1.2 mm wide. Cephalothorax and appendages bright yellowish to orange; carapace with dark cervical groove and dusky shadings on sides; eyes ringed with black; abdomen grayish with pale hastate mark running back from base and thickly covered with dusky flecks. Anterior eye row procurved; small median eyes contiguous,

nearly touching lateral eyes. Posterior eye row moderately procurved; median eyes separated by about two-thirds narrow diameter, touching lateral eyes. First leg: femur 1.5, patella 0.4, tibia 1.35, metatarsus 1.5, tarsus 0.33, total length 5.30 mm; first leg 4.4 times, first femur 1.2 times as long as carapace. Epigynum (Figs. 22-24) narrow transverse cap with narrow opening behind.

Male holotype.—Length 1.8 mm. Carapace 0.9 mm long, 0.78 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Coloration and structure like those of female. Chelicerae with prominent horns (Fig. 13) close together at midline set in upper third of face. Retrolateral face of chelicera with inconspicuous file of fine grooves and small pick on trochanter of palpus. First leg: femur 1.2, patella 0.32, tibia 1.05, metatarsus 1.11, tarsus 0.42, total length 4.11 mm; first leg 4.5 times, first femur 1.3 times as long as carapace. Male palpus (Figs. 10-11) stouter than that of *americana*, with shorter tarsal appendage.

Type data.—Male holotype and female from Piscadera Baai, Curaçao, Nederland Antilles, 20 December 1962 (H. W. Levi), in MCZ.

Distribution.—Known only from Curaçao.

Records.—NEDERLAND ANTILLES: *Curaçao:* S slope Veeris Berg, 20 December 1962, male, 27 females; 3 km N Savonet, 26 December 1962, male, 2 females, eggs from under stone; Grote Berg, 19 December 1962, 4 females (above H. W. Levi); SE of Airport, 20 December 1962 (H. W. Levi, B. de Jong), male, 7 females; Sint-Nicolaas, St. Martha Baai, 22 December 1962 (B. de Jong, H. W. Levi), female. Above material in MCZ.

Pholcophora texana Gertsch
Figs. 16-18, 25-27

Pholcophora texana Gertsch, 1935, p. 11; 1939, p. 1. Roewer, 1942, p. 338. Bonnet, 1958, p. 3606.

Diagnosis.—Pale epigean and cavernicole species with short legs (first femur about 1.2 times as long as carapace in both sexes), with epigynum (Fig. 25) rounded lobe behind, male chelicerae (Fig. 16) with straight horns at base and femur of palpus (Fig. 17) with patch of spinules.

Etymology.—Named for the state of Texas.

Female from El Tinieblo, Tamaulipas.—Length 1.7 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 1 mm long, 1 mm wide. Cephalothorax and appendages pale yellow; abdomen gray. Posterior eye row slightly recurved, with median eyes separated by diameters. First leg: femur 0.8, patella 0.24, tibia 0.72, metatarsus 0.83, tarsus 0.4, total length 2.99 mm; first leg 4.2 times, first femur 1.1 times as long as carapace. Epigynum (Figs. 25-27) procurved behind with transverse internal vesicles.

Male holotype.—Length 1.28 mm. Carapace 0.64 mm long, 0.53 mm wide. Abdomen 0.65 mm long, 0.5 mm wide. Chelicerae (Fig. 16) with long straight horns close together at base. First leg: femur 0.93, patella 0.21, tibia 0.93, metatarsus 0.98, tarsus 0.36, total length 3.41 mm; first leg 5.3 times, first femur 1.4 times as long as carapace. Male palpus (Figs. 17-18) typical: femur thin at base, with small basal spur, thicker at apex where set on inner side with close cluster of about 20 small spinules; tarsus with short appendage rounded apically (Fig. 17).

Type data.—Male holotype from one-half mile E Rio Grande City, Texas, 1 November 1934 (S. Mulaik), in AMNH.

Distribution.—Starr County, Texas, and adjacent states of eastern México.

Records.—TEXAS: *Starr County:* 0.5 mi. E Rio Grande City, 11 November 1934 (S. Mulaik), female. 5 mi. E Rio Grande City (S. Mulaik), female. MEXICO: *Tamaulipas:* Río Gualolejo, near Forlón, 16 April 1938 (L. I. Davis, B. Brown), female. San Fernando, 28 March 1937 (L. I. Davis), male, female. El Tinieblo, 23 February 1973 (W. Graham), 3 females, 1 immature. *San Luis Potosí:* 2 mi. E Santo Domingo, 6 June 1941 (A. M. and L. I. Davis), male, female. *Hidalgo:* 2 mi. SW Jacala, 18 August 1964 (J. and W. Ivie), female. *Nuevo León:* Grutas de San Bartolo, 10 mi. S Santa Catarina, February 1966 (W. Russell, D. McKenzie), female. Montemorelos, 23 May 1952 (W. J. Gertsch), female, immature.

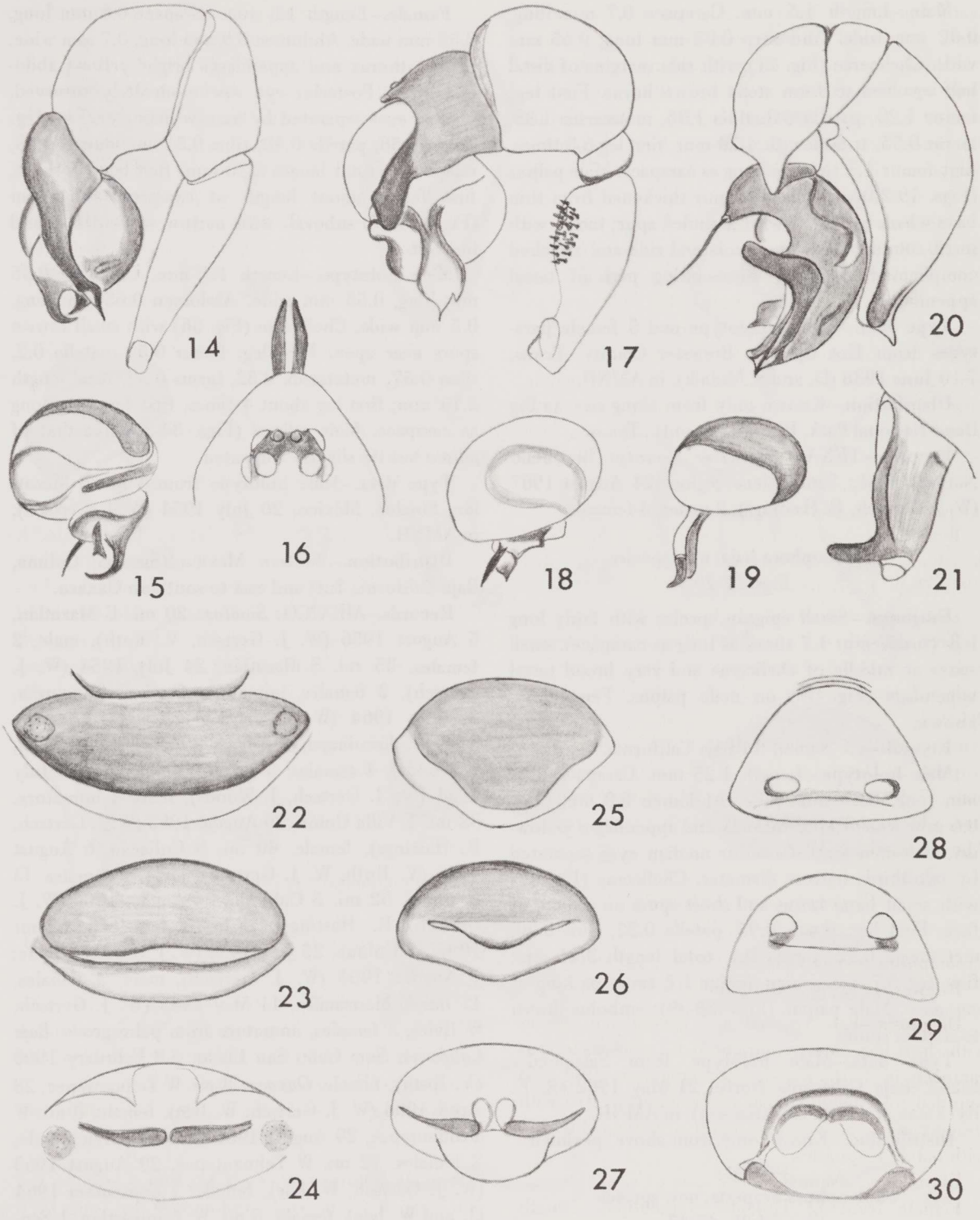
Pholcophora diluta Gertsch and Mulaik
Figs. 19-20, 28-30

Pholcophora diluta Gertsch and Mulaik, 1940, p. 320. Vogel, 1967, p. 112.

Diagnosis.—Small whitish epigean species with fairly long legs (first femur about 1.5 times as long as carapace), epigynum (Fig. 28) narrowed in front and male palpus (Fig. 20) very complicated.

Etymology.—Specific name from Latin *diluo*, dilute.

Female holotype.—Length 1.6 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 1 mm long, 0.75 mm wide. Whole spider whitish to pale yellow; eyes ringed with black. Posterior eye row moderately recurved, median eyes separated by diameter. Second leg: femur 1, patella 0.23, tibia 0.93, metatarsus 1.06, tarsus 0.15, total length 3.67 mm; second leg 5.3 times, second femur 1.4 times as long as carapace. Epigynum (Figs. 28-30) with cap narrowed in front.



Figs. 14-30.—Species of *Pholcophora:* Figs. 14-15: *P. levii,* male: 14, left palpus, retrolateral view; 15, bulb of palpus, retrolateral view. Figs. 16-18: *P. texana* Gertsch, male: 16, eyes and cheliceral horns, dorsal view; 17, left palpus, retrolateral view; 18, bulb and embolus, prolateral view. Figs. 19-21: *P. diluta* Gertsch and Mulaik, male: 19, bulb of palpus, prolateral view; 20, left palpus, retrolateral view; 21, left chelicera, retrolateral view. Figs. 22-24: *P. levii,* epigynum: 22, ventral view; 23, posterior view; 24, dorsal view. Figs. 25-27: *P. texana* Gertsch, epigynum: 25, ventral view; 26, posterior view; 27, dorsal view. Figs. 28-30: *P. diluta* Gertsch and Mulaik, epigynum: 28, ventral view; 29, posterior view; 30, dorsal view.

Male.—Length 1.5 mm. Carapace 0.7 mm long, 0.62 mm wide. Abdomen 0.85 mm long, 0.65 mm wide. Chelicerae (Fig. 21) with side margins of distal half revolved to form stout brown horns. First leg: femur 1.22, patella 0.3, tibia 1.36, metatarsus 1.33, tarsus 0.55, total length 4.70 mm; first leg 6.8 times, first femur 1.7 times as long as carapace. Male palpus (Figs. 19-20) specialized: femur thickened from thin base where provided with rounded spur; tarsus with small rounded spur on retrolateral side and attached complicated structure representing part of tarsal appendage.

Type data.—Female holotype and 5 female paratypes from Hot Springs, Brewster County, Texas, 7-10 June 1938 (D. and S. Mulaik), in AMNH.

Distribution.—Known only from along river in Big Bend National Park, Brewster County, Texas.

Records.—TEXAS: *Brewster County:* Big Bend National Park: Santa Elena region, 24 August 1967 (W. J. Gertsch, R. Hastings), 2 males, 4 females.

Pholcophora baja, new species
Figs. 27-29

Diagnosis.—Small epigean species with fairly long legs (first femur 1.7 times as long as carapace), small spurs at middle of chelicerae and very broad tarsal appendage (Fig. 37) on male palpus. Female unknown.

Etymology.—Named for Baja California.

Male holotype.—Length 1.25 mm. Carapace 0.57 mm long, 0.25 mm wide. Abdomen 0.8 mm long, 0.6 mm wide. Cephalothorax and appendages yellowish; abdomen gray. Posterior median eyes separated by two-thirds narrow diameter. Chelicerae (Fig. 37) with small basal horns and short spurs on middle of face. First leg: femur 0.95, patella 0.25, tibia 0.90, metatarsus 0.92, tarsus 0.4, total length 3.44 mm; first leg 5.7 times, first femur 1.7 times as long as carapace. Male palpus (Figs. 38-39): embolus drawn to slender spine.

Type data.—Male holotype from Salsipuedes Island, Baja California Norte, 21 May 1962 (R. E. Ryckman and C. P. Christianson), in AMNH.

Distribution.—Known only from above specimen.

Pholcophora hesperia, new species
Figs. 34-36, 45-47

Diagnosis.—Yellowish epigean species with short legs (first femur as long as carapace), distinctive epigynum (Fig. 45) and tarsal appendage of male palpus (Fig. 34).

Etymology.—Specific name from Latin *hesperius,* western.

Female.—Length 1.5 mm. Carapace 0.6 mm long, 0.52 mm wide. Abdomen 0.9 mm long, 0.7 mm wide. Cephalothorax and appendages bright yellow; abdomen gray. Posterior eye row moderately recurved, median eyes separated by narrow diameter. First leg: femur 0.58, patella 0.18, tibia 0.51, metatarsus 0.53, tarsus 0.3, total length 2.10 mm; first leg 3.5 times, first femur about length of carapace. Epigynum (Figs. 45-47) suboval, with narrow sclerotized band in front.

Male holotype.—Length 1.1 mm. Carapace 0.55 mm long, 0.53 mm wide. Abdomen 0.65 mm long, 0.5 mm wide. Chelicerae (Fig. 36) with small brown spurs near apex. First leg: femur 0.55, patella 0.2, tibia 0.57, metatarsus 0.52, tarsus 0.32, total length 2.16 mm; first leg about 4 times, first femur as long as carapace. Male palpus (Figs. 34-35) like that of *jalisco* but tip slightly truncated.

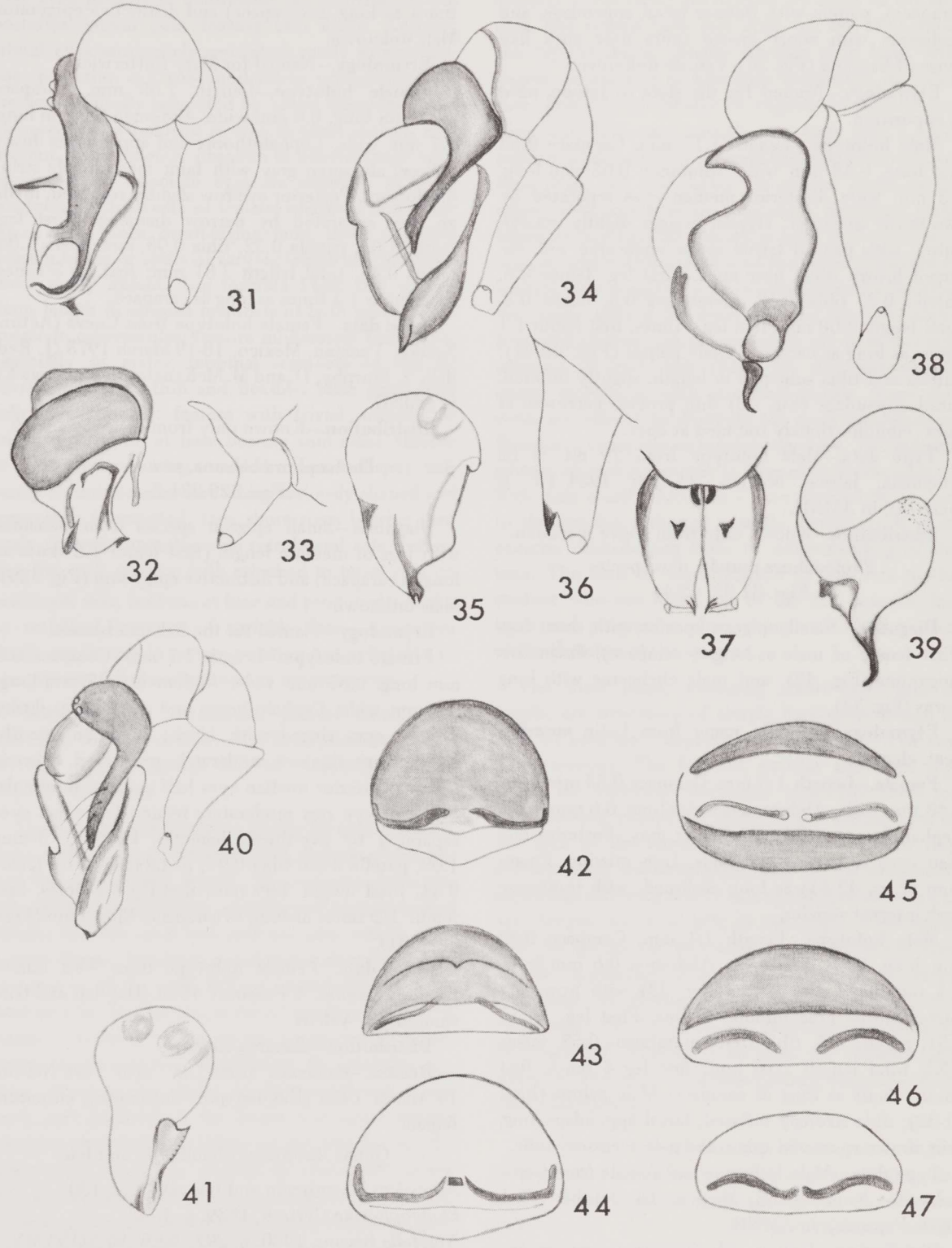
Type data.—Male holotype from 5 mi. S Mazatlán, Sinaloa, México, 20 July 1954 (W. J. Gertsch), in AMNH.

Distribution.—Western México (Sinaloa, Colima, Baja California Sur) and east to southern Oaxaca.

Records.—MEXICO: *Sinaloa:* 20 mi. E Mazatlán, 5 August 1956 (W. J. Gertsch, V. Roth), male, 2 females. 35 mi. S Mazatlán, 24 July 1954 (W. J. Gertsch), 2 females, immature. 5 mi. E Concordia, 26 July 1964 (W. J. Gertsch, J. Woods), female. 3 mi. E Escuinapa, 1 August 1964 (W. J. Gertsch, J. Woods), 4 females. 5 mi. E Villa Unión, 26 July 1964 (W. J. Gertsch, J. Woods), female, immature. 32 mi. E Villa Unión, 26 August 1965 (W. J. Gertsch, R. Hastings), female. 40 mi. S Culiacán, 6 August 1956 (V. Roth, W. J. Gertsch), male, 2 females. El Esquinal, 62 mi. S Culiacán, 24 August 1965 (W. J. Gertsch, R. Hastings), male, 6 females. *Colima:* 10 mi. S Colima, 25 July 1954 (W. J. Gertsch), male; 1 August 1954 (W. J. Gertsch), male, 3 females. 12 mi. E Manzanillo, 11 May 1963 (W. J. Gertsch, W. Ivie), 2 females, immature from palm grove. *Baja California Sur:* Cabo San Lucas, 5-8 February 1960 (V. Roth), female. *Oaxaca:* 3 mi. W Tehuantepec, 28 April 1963 (W. J. Gertsch, W. Ivie), female. 8 mi. W Tehuantepec, 29 August 1966 (J. and W. Ivie), male, 2 females. 12 mi. W Tehuantepec, 29 August 1963 (W. J. Gertsch, W. Ivie), female; 1 September 1964 (J. and W. Ivie), female. 5 mi. W Tequisistlán, 1 September 1964 (J. and W. Ivie), male, 7 females, immature.

Pholcophora jalisco, new species
Figs. 40-41

Diagnosis.—Small epigean species similar to *hesperia* with short legs (first femur 1.1 times as long as



Figs. 31-47.—Species of *Pholcophora:* Figs. 31-33: *P. munda,* male: 31, left palpus, retrolateral view; 32, bulb of palpus, prolateral view; 33, left chelicera, retrolateral view. Figs. 34-36: *P. hesperia,* male: 34, left palpus, retrolateral view. 35, bulb of palpus, prolateral view; 36, left chelicera, retrolateral view. Figs. 37-39: *P. baja,* male: 37, chelicerae, frontal view; 38, left palpus, retrolateral view; 39, bulb of palpus, prolateral view. Figs. 40-41: *P. jalisco,* left male palpus: 40, retrolateral view; 41, bulb of palpus, prolateral view. Figs. 42-44: *P. munda,* epigynum: 42, ventral view; 43, posterior view; 44, dorsal view. Figs. 45-47: *P. hesperia,* epigynum: 45, ventral view; 46, posterior view, 47, dorsal view.

carapace), palpus with thinner tarsal appendage, and chelicerae with short brown spurs near apex like those of *hesperia* (Fig. 36). Female unknown.

Etymology.—Named for the state of Jalisco, used in apposition.

Male holotype.—Length 1.17 mm. Carapace 0.53 mm long, 0.48 mm wide. Abdomen 0.65 mm long, 0.5 mm wide. Posterior median eyes separated by two-thirds diameter; clypeal margin slightly emarginated, with pair of trivial spurs; chelicerae with enlarged brown spurs near apex. First leg: femur 0.6, patella 0.2, tibia 0.48, metatarsus 0.5, tarsus 0.3, total length 2.08 mm; first leg 4 times, first femur 1.1 times as long as carapace. Male palpus (Figs. 40-41): patella and tibia subequal in length, slightly inflated; tarsal appendage (Fig. 40) thin process narrowed at apex; embolus thickly rounded at apex.

Type data.—Male holotype from 29 mi. N La Quemada, Jalisco, México, 24 July 1954 (W. J. Gertsch), in AMNH.

Distribution.—Known only from above specimen.

Pholcophora munda, new species
Figs. 31-33, 42-44

Diagnosis.—Small epigean species with short legs (first femur of male as long as carapace), distinctive epigynum (Fig. 42), and male chelicerae with long horns (Fig. 33).

Etymology.—Specific name from Latin *mundus*, neat, elegant.

Female.—Length 1.5 mm. Carapace 0.53 mm long, 0.48 mm wide. Abdomen 0.9 mm long, 0.6 mm wide. Cephalothorax yellow; abdomen gray. Posterior median eyes separated by radius. Legs missing. Epigynum (Figs. 42-44) as long as broad, with transverse dark internal vesicles.

Male holotype.—Length 1.1 mm. Carapace 0.53 mm long, 0.45 mm wide. Abdomen 0.6 mm long, 0.4 mm wide. Chelicerae (Fig. 33) with upwardly curved horns near middle of face. First leg: femur 0.51, patella 0.5, tibia 0.57, metatarsus 0.55, tarsus 0.32, total length 2.16 mm; first leg 4 times, first femur about as long as carapace. Male palpus (Figs. 31-32); tibia strongly inflated; tarsal appendage long, thin, drawn to curved spine, and pale accessory lobe.

Type data.—Male holotype and female from Cerro Colorado, Nuevo León, México, 16 October 1961 (O. de Ferrariis), in AMNH.

Distribution.—Known only from above specimens.

Pholcophora maria Gertsch

Pholcophora maria Gertsch, 1977, p. 112, figs. 33-35.

Diagnosis.—Small dusky species from Yucatán caves with legs of medium length (first femur 1.4 times as long as carapace) and distinctive epigynum. Male unknown.

Etymology.—Named for Mary Butterwick.

Female holotype.—Length 1.65 mm. Carapace 0.74 mm long, 0.6 mm wide. Abdomen 0.9 mm long, 0.7 mm wide. Cephalothorax and appendages dusky yellow; abdomen gray with faint median pale stripe on dorsum. Posterior eye row slightly recurved, median eyes separated by narrow diameter. First leg: femur 1.05, patella 0.32, tibia 0.93, metatarsus 1.08, tarsus 0.43, total length 3.81 mm; first leg 5 times, first femur 1.4 times as long as carapace.

Type data.—Female holotype from Cueva (Actún) Xpukil, Yucatán, México, 18-19 March 1973 (J. Reddell, S. Murphy, D. and M. McKenzie, M. Butterwick), in AMNH.

Distribution.—Known only from above specimen.

Pholcophora bahama, new species
Figs. 329-331

Diagnosis.—Small epigean species from Bahamas with legs of medium length (first femur 1.2 times as long as carapace) and distinctive epigynum (Fig. 329). Male unknown.

Etymology.—Named for the Bahama Islands.

Female holotype.—Length 1.7 mm. Carapace 0.8 mm long, 0.65 mm wide. Abdomen 0.95 mm long, 0.8 mm wide. Cephalothorax and appendages dusky yellow; eyes ringed with black; abdomen grayish. Eyes of anterior row moderately procurved, subcontiguous; anterior median eyes half as large as laterals. Posterior eye row moderately recurved; median eyes separated by two-thirds diameter. First leg: femur 1.09, patella 0.25, tibia 0.97, metatarsus 1.14, tarsus 0.44, total length 3.89 mm; first leg 4.3 times, first femur 1.2 times as long as carapace. Epigynum (Figs. 329-331).

Type data.—Female holotype from West Caicos Island, Bahamas, 4 February 1953 (Hayden and Giovannoli), in AMNH.

Distribution.—Bahama Islands.

Record.—*Bahamas:* Rum Cay, near Port Nelson, 16 March 1953 (Hayden and Giovannoli), immature female.

Genus *Anopsicus* Chamberlin and Ivie

Anopsicus Chamberlin and Ivie, 1938, p. 130.
Pholcophorina Gertsch, 1939, p. 1.
Ninetella Bryant, 1940, p. 297. NEW SYNONYMY.

Diagnosis.—Genus of Subfamily Bleochroscelinae sharing features of *Pholcophora*, distinguished as follows: Anterior median eyes never present; six eyes normally present arranged in two triads set close together, these eyes subequal and subcontiguous; only

four eyes present in *quatoculus* by abortion of the posterior lateral pair, leaving two diads. Anterior lateral eyes moderately separated, rarely subcontiguous; posterior eye row moderately procurved, with medians typically separated by about diameter. Eyes of cavernicoles reduced in size in some species, evanescent or completely obsolete in others; those with evanescent or obsolete eyes are regarded as being troglobites. Chelicerae of females unarmed except for trivial pale tooth overhanging fang; those of males bearing horns or spurs of varying length and position, these rarely absent. Leg formula 1432; legs of medium length in epigean members of both sexes, much longer in cavernicoles; femora moderately thickened, especially in males; terminal segments of legs of cavernicoles very thin and flexible. Male palpi with following features: femora with trivial rounded or angled projection at base bearing thin setae, thicker at apex where bearing rounded or pointed spur, this rarely absent; patellae and tibiae variously shaped and sometimes incrassated; tarsi short rings bearing variously formed appendages on retrolateral side distinctive for each species; bulb attached to tarsal ring on prolateral side, bulbous at base and produced apically to embolar structure of variable form. Epigynum small, sessile cap in resting position but inflatable to conspicuous lobular structures in many species.

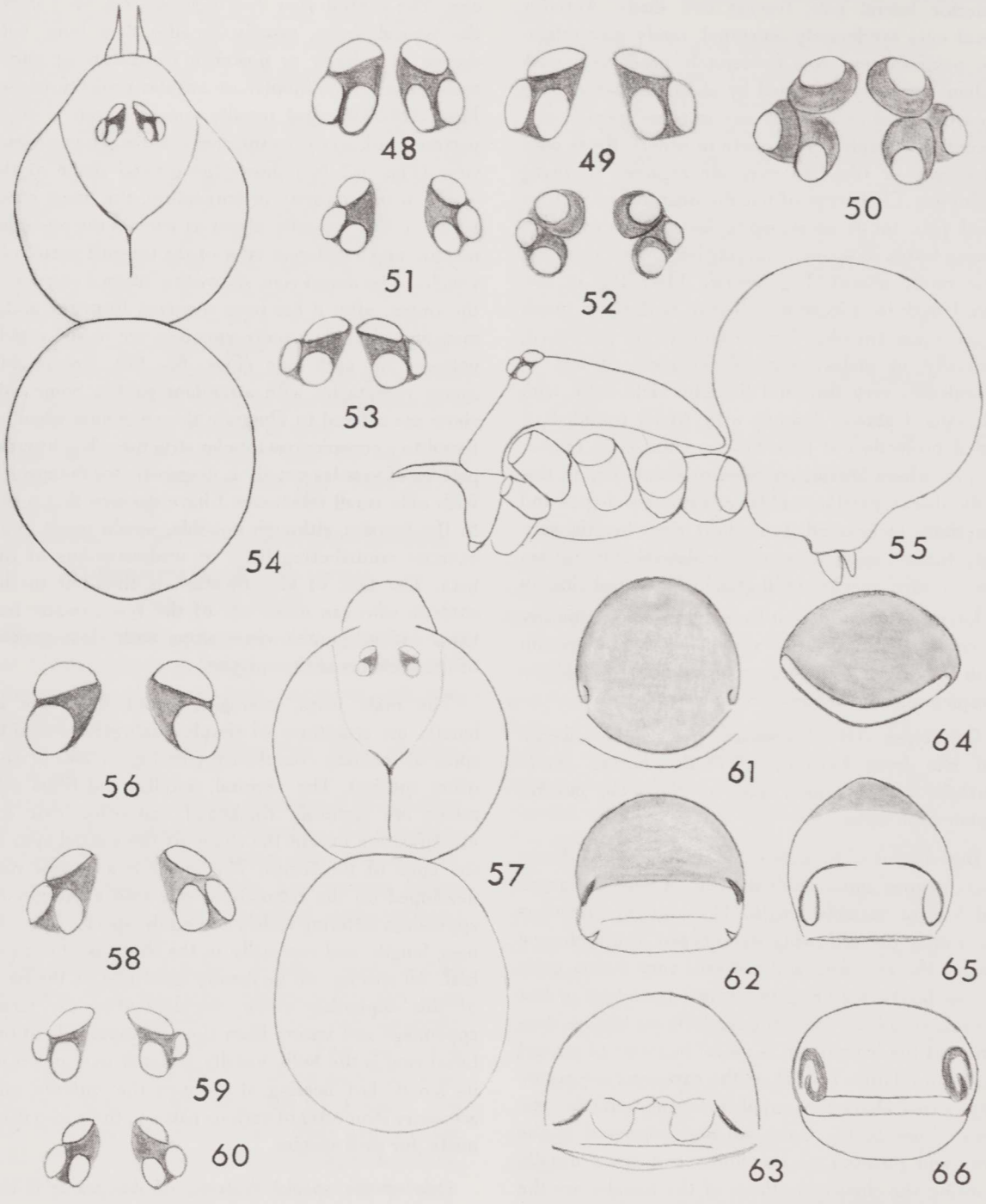
Genotypes.—Of *Anopsicus, pearsei* Chamberlin and Ivie from Yucatán; of *Pholcophorina, zeteki* Gertsch from Panama; and of *Ninetella, pulchra* Bryant from Cuba.

Description.—The habitus of the 60 taxa of *Anopsicus* features small pholcids with globose abdomens and legs of variable length. The somatic characters fall within the following stereotyped morphological design: the eye sizes and patterns vary within quite narrow limits, featuring occasional reduction or loss of some or all the eyes; the leg formula 1432 is standard and the leg pattern is useful in terms of general length in relation to that of the carapace; the secondary sexual characters supplement the genitalic features: those of the males are best expressed in the form and position of the horns and spurs usually adorning the chelicerae; those of the females are the stridulatory apparatus, present in about half of the taxa and offering features in the shapes and positions of both picks and files; finally, the genitalia of both sexes are of the haplogyne type and offer the best characters for identification of species.

A systematic analysis of *Anopsicus* resolves itself into a study of the genitalia of both sexes. The female epigyna, seen as tiny caps about 0.25 mm in width lying close to the abdomen, differ little among the species. Three views are offered for most of the species. The ventral view (see Figs. 61, 64, etc.) shows the typical shape, usually broader than long, with degree of anterior or posterior truncature or curvature, presence of lobular or angular projections (see Figs. 318-319), and usually on each side a small pattern marking of the internal vesicles. The posterior view (Figs. 62, 65) shows the general shape of the organ, with concavity or truncature, the linear atriobursal orifice typically about as wide as the posterior margin, and a different view of the internal pattern of vesicles. The dorsal view shows the internal vesicles of the organ, after it has been removed from the abdomen and cleared; usually apparent are paired vesicle patterns on each side (Figs. 63, 66), presumably sperm receptacles with attendant guides. Some side views are offered to illustrate the epigynum when inflated to a conspicuous lobular structure. The internal pattern of vesicles usually is diagnostic for the species. With only small reluctance I have decided that a key to the females, although possible, would result in an exercise contributing little to understanding of the taxa. The task of identification is thus left to the student who can make use of the few somatic features and geographic clues along with close perusal of the sketches of the epigyna.

The male palpi, averaging about 0.03 mm in length, are structures of simple haplogyne design in spite of seeming complexity (see Figs. 78-95 or any other species). The femoral, patellar and tibial segments are variously thickened and offer little for identification except the shape of the ventral spur at the apex of the femur. The tarsus is a narrow ring developed on the retrolateral side into a prominent appendage differing widely among the species in thickness, length, and especially in the shape of the apical half. All species can be readily identified on the basis of this appendage alone. Supplementing the tarsal appendage and arising from the prolateral side of the tarsal ring is the bulb, usually globular over much of its length but bearing at its apex the embolus and accessory structures of various pattern, these also diagnostic for each species.

One of the special features of *Anopsicus* is the presence in females of a stridulatory apparatus consisting of a sclerotized projection (pick) on each posterior corner of the truncated pars thoracica of the carapace and a complementary pair of rasping foveae (files) just above the pedicel of the abdomen. This structure, first noticed in *gruta* (Gertsch, 1971, p. 78, Fig. 137) is herein being more fully analyzed for the many species of the genus. The picks are variable in development, most often are rounded transparent



Figs. 48-66.—Species of *Anopsicus:* Figs. 48-49: *A. zeteki* (Gertsch), eyes: 48, eyes of male; 49, eyes of female. Fig. 50: *A. facetus,* eyes of female. Fig. 51: *A. reddelli,* eyes of female. Fig. 52: *A. soileauae,* eyes of female. Fig. 53: *A. concinnus,* eyes of female. Figs. 54-55: *A. zeteki* (Gertsch), male, carapace and abdomen: 54, dorsal view; 55, retrolateral view. Figs. 56-57: *A. quatoculus:* 56, eyes of female; 57, carapace and abdomen of female. Fig. 58: *A. zimmermani,* eyes of female. Fig. 59: *A. pecki,* eyes of female. Fig. 60: *A. chiapa,* eyes of female. Figs. 61-63: *A. speophila* (Chamberlin and Ivie), epigynum; 61, ventral view; 62, posterior view; 63, dorsal view. Figs. 64-66: *A. pearsei* Chamberlin and Ivie, epigynum: 64, ventral view, 65, posterior view; 66, dorsal view.

lobes (pleurital extensions of the carapace) as shown for *bispinosus* (Fig. 67), or lobes further provided with small rounded picks as in *mitchelli* (Fig. 69) and others. In other species the picks are more formal pigmented angles or spurs as in *davisi* (Fig. 68) and *gruta* (Fig. 71) in which the relationship of the picks and files are graphically shown. The files are similarly variable in development: in *bispinosus* (Fig. 73) and some other species they are conspicuous, roughened or ridged, brownish invaginations of quite large size; in most other species they are smaller, more widely separated foveae margined by a few short hairs. I presume that this apparatus is present in all females but in many of small size they may be undetectable under conventional magnification or possibly even aborted. Finally can be mentioned two species, *alteriae* and *ceiba* (Figs. 75, 76, 265), in which the picks have migrated to a median position opposite the cervical groove and in consequence the files are now positioned high up on the front of the abdomen overhanging the carapace. The relationships of the picks and files are graphically shown for *ceiba* (Fig. 265).

The typical stridulatory apparatus is a sound producing organ activated by rubbing the picks and files together probably during some phase of the sexual biology of the taxa. The device of *Anopsicus* is analogous to those of many other groups of spiders as shown by Bishop (1925) in his article on "Singing Spiders." In spiders the elements are placed on various body surfaces. Known to me in the Pholcidae are the following examples: the female of *Physocyclus globosus* has a sharp crest at the center of the carapace behind the cervical groove which presumably is rubbed against a large invaginated fovea at the middle of the abdomen just above the pedicel; all males of the genus *Physocyclus* have a file of fine ridges on the outer surface of the chelicera which is activated by a sharp spur at the base of the femur of the male palpus; in some *Psilochorus*, notably *diablo* and *tellezi*, a tubular process on the sternum between the posterior coxae (the pick) presumably is rubbed against an area of transverse striae (the file) on the frontal aspect of the epigynum. In the following descriptions of *Anopsicus* mention will be made only of those instances where the stridulatory elements are of notable development.

Since one of the prime identification aids for the species of *Anopsicus* is geography, I have made use of this by dividing the large fauna into the following distribution areas: 1, the Mexican fauna (p. 107); 2, the Central American fauna (p. 126); and 3, the West Indian fauna (p. 134).

The Mexican Fauna

México is rich in *Anopsicus* with 36 species now known and many others likely to be found in little explored areas. Of these, three males and nine females so far are unpaired. Twenty of the species came from caves and 16 from epigean habitats. Among them is *pearsei*, the first eyeless member of the family and designated as genotype by Chamberlin and Ivie. Four additional eyeless troglobites are described in this paper from Mexican caves, thus enlarging the total from México to six. None of the *Anopsicus* taxa from this large area occurs outside of México, and most (as previously noted) are restricted to narrow zones, either as cavernicoles or epigean types. Most of the cave species of this and other areas of this report are considered to be troglophiles, which presumes their occurrence outside of caves in suitable ecological habitats. At present and likely as a result of incomplete collecting, no cavernicole is known from a surface station and, vice versa, no epigean taxon is known from a cave habitat. A key to the males offered below is based on the features of the palpi and chelicerae.

Key to the Males

1. Species of the Yucatán Peninsula and Chiapas. 2
   Species of other parts of México. 11
2. Eyes present. 3
   Eyes absent: troglobite from caves of Yucatán and Quintana Roo; tarsal appendage (Fig. 170) . . . . . *pearsei* Chamberlin and Ivie
3. Tarsal appendage narrowed at apex. 4
   Tarsal appendage broad at apex 6
4. Femoral spur of palpus (Fig. 169) nearly obsolete; cheliceral horns with small spur below tip (Fig. 169); caves of Campeche and Yucatán. . . . . *speophila* (Chamberlin and Ivie)
   Femoral spur well developed 5

5. Tip of tarsal appendage (Fig. 164) with narrow spur; Cueva Halmensura, Campeche. . . . . *reddelli*, new species
Tip of tarsal appendage (Fig. 214) thicker, revolved inward; Palenque region of Chiapas . . . . . *alteriae*, new species

6. Chelicerae (Fig. 213) with pair of horns and spurs; caves of Chiapas . . . . . *bispinosus* (Gertsch)
Chelicerae with single pair of horns. 7

7. Tarsal appendage (Fig. 26) with small emargination at apex; Grutas de Zapaluta, Chiapas . . . . . *evansi* (Gertsch)
Not so. 8

8. Apex of tarsal apophysis (Fig. 200) with thin spines; Palenque region, Chiapas . . . . . *palenque* (Gertsch)
Not so. 9

9. Tarsal appendage spatulate 10
Tarsal appendage (Fig. 204) bluntly truncated; epigean species of Chiapas . . . . . *debora* (Gertsch)

10. Femoral spur large (Fig. 208); epigean species of Chiapas . . . . . *jeanae* (Gertsch)
Femoral spur small (Fig. 173); Cueva Loltún, Yucatán . . . . . *wileyae*, new species

11. Eyes absent 12
Eyes present. 15

12. Chelicerae (Fig. 124) without horns or spurs; Cueva de la Finca, Oaxaca . . . . . *vinnulus*, new species
Chelicerae with horns. 13

13. Tarsal appendage (Fig. 119) narrowed at tip to thin spine; Sótano de San Agustín, Oaxaca. . . . . *niveus*, new species
Tarsal appendage spatuliform. 14

14. Tip of tarsal appendage (Fig. 128) rounded; Gruta de Juxtlahuaca, Guerrero . . . . . *gruta* (Gertsch)
Tip of tarsal appendage (Fig. 116) with acute point; Cueva de Juan Sánchez, Oaxaca . . . . . *lucidus*, new species

15. Chelicerae (Fig. 133) without horns or spurs; Cueva de los Riscos, Durango . . . . . *exiguus* (Gertsch)
Chelicerae with horns or spurs 16

16. Tarsal appendage at apex acute or rounded spur 17
Tarsal appendage broad at apex, sometimes spatulate 20

17. Tip of tarsal appendage (Fig. 87) with trivial emargination; epigean species of Puebla . . . . . *puebla*, new species
Not so. 18

18. Tip of tarsal appendage sharp blade. 19
Tip of tarsal appendage (Fig. 158) blunt blade; epigean species of coastal Nayarit . . . . . *malkini*, new species

19. See tarsal appendage (Fig. 161); species of Colima . . . . . *boneti*, new species
See tarsal appendage (Fig. 125); species of southern Oaxaca . . . . . *tehuana*, new species

20. Tarsal appendage (Fig. 90) broadly bilobed at apex; Cueva Desapareciendo, Oaxaca. . . . . *grubbsi*, new species
Not so. 21

21. Tarsal appendage (Fig. 93) subtruncate at apex, with lateral series of fine teeth; caves of Puebla . . . . . *mckenziei*, new species
Not so. 22

22. Tarsal appendage (Fig. 101) spatulate; caves of Veracruz. . . . . *troglodyta* (Gertsch)
Not so. 23

23. Tarsal appendage relatively short, subtruncate or angled at apex. 24
Tarsal appendage (Fig. 98) long, with acute angle at apex; epigean species of Veracruz . . . . . *iviei*, new species

24. Tarsal appendage (Fig. 84) short, broadly pointed at apex; epigean species of San Luis Potosí . . . . . *covadonga*, new species
Not so 25

25. Tarsal appendage (Fig. 81) short, broad at base, truncated at apex; Cueva de la Virgen de Guadalupe, Tamaulipas . . . . . *mitchelli* (Gertsch)
Tarsal appendage (Fig. 78) longer, acute at apex; Cueva de los Cuarteles, Tamaulipas . . . . . *bolivari* (Gertsch)

Anopsicus placens (O. P.-Cambridge)
Fig. 180

Spermophora placens O. Pickard-Cambridge, 1896, p. 222. F. Pickard-Cambridge, 1902, p. 370. Roewer, 1942, p. 349. Bonnet, 1958, p. 3606.
Pholcophora placens: Gertsch, 1977, p. 114.

Diagnosis.—Epigean species with fairly long legs (first femur 3.3 times as long as carapace) and distinctive epigynum (Fig. 180). Male unknown.

Etymology.—Specific name from Latin *placeo*, agreeable.

Female.—Length 2.3 mm. Carapace 0.8 mm long, 0.77 mm wide. Abdomen 1.5 mm long, 1.1 mm wide. Cephalothorax and appendages dusky yellowish brown; abdomen gray. Eye triads: anterior lateral eyes separated by nearly diameter; posterior median eyes separated by full diameter. First leg: femur 2.7, patella 0.3, tibia 3, metatarsus 3.5, tarsus 0.85, total length 10.35 mm; first leg about 13 times, first femur 3.3 times as long as carapace. Stridulatory apparatus: picks on pars thoracica not detected; small foveal files present above base of abdomen. Epigynum (Fig. 180).

Type data.—Female type from Teapa, Tabasco, México, in British Musum (Natural History), examined; (type measures 1.8 mm and in same vial cluster of eggs, each about 0.15 mm in diameter).

Distribution.—Mexican states of Tabasco and Chiapas.

Records.—MEXICO: *Tabasco:* Teapa, 16 July 1947 (C. and M. Goodnight), 3 females. *Chiapas:* Pichuacalco, 18 July 1947 (C. and M. Goodnight), female.

Anopsicus speophila (Chamberlin and Ivie)
Figs. 61-63, 167-169

Spermophora speophila Chamberlin and Ivie, 1938, p. 130. Bonnet, 1958, p. 4115.
Pholcophora speophila: Gertsch, 1976, p. 76; 1977, p. 114.

Diagnosis.—Pale cavernicole with legs of medium length (first femur about twice as long as carapace), distinctive epigynum (Fig. 61) and tarsal appendage (Fig. 167) of male palpus.

Etymology.—Specific name from Latin *speophila*, living in caves.

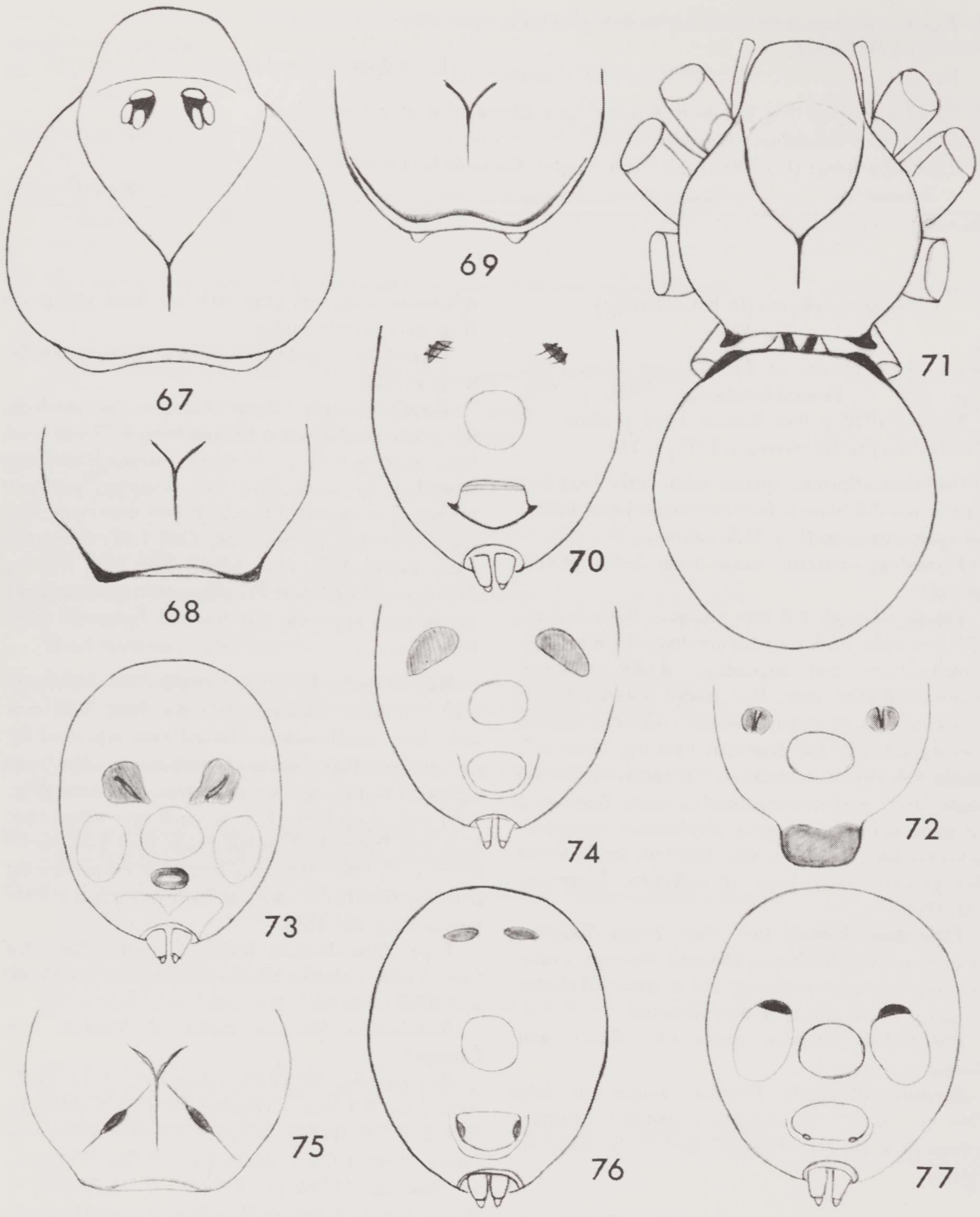
Female.—Length 1.7 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 1.0 mm long, 0.75 mm wide. Eyes small on well spaced triads; anterior lateral eyes separated by more than full diameter; posterior median eyes separated by about two diameters. First leg: femur 1.5, patella 0.23, tibia 1.45, metatarsus 1.62, tarsus 0.55, total length 5.35 mm; first leg 7.65 times, first femur 2.1 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 61-63).

Male.—Length 1.5 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.8 mm long, 0.75 mm wide. Eyes small: anterior lateral eyes separated by one and one-half diameters; posterior median eyes separated behind by two diameters. Chelicerae (Fig. 169) with sharp horns bearing small spur below tips. First leg: femur 1.45, patella 0.26, tibia 1.55, metatarsus 1.75, tarsus 0.6, total length 5.61 mm; first leg 8 times, first femur twice as long as carapace. Male palpus (Figs. 167-168).

Type data.—Female holotype from Chac Mol Cave, Tohil, Yucatán, México, 27 June (A. S. Pearse), in AMNH.

Distribution.—Mexican states of Yucatán and Campeche.

New records.—MEXICO: *Yucatán:* Grutas de Tzab-Nah, 2 km S Tecoh, 1 October 1974 (J. Reddell, D. McKenzie, S. Wiley), 2 males, females, immature. Cueva (Actún) Chen, Santa Rita, 3 km W Kiuick, 13 November 1974 (J. Reddell, D. McKenzie, S. Wiley), female. Cueva de Aguacate, 2 km S Maxcanú, 17 October 1974 (J. Reddell, S. Wiley, D. McKenzie, R. Solis), 2 females. Cueva (Actún) Kiuick, Kiuick, 13 November 1974 (J. Reddell, D. McKenzie, S. Wiley), female, immature. Cueva (Actún) Sabacá, 6 km S Tekax, 4 December 1974 (J. Reddell et al.), 2 females. *Campeche:* Grutas de San Antonio, 10 km NE Bolonchenticul, 23-24 November 1974 (J. Reddell, D. McKenzie, S. Wiley), 2 females, immature.



Figs. 67-77.—Species of *Anopsicus:* Fig. 67: *A. bispinosus* (Gertsch), carapace of female showing lobular picks. Fig. 68: *A. davisi* (Gertsch), pars thoracica of female showing angular files. Figs. 69-70: *A. mitchelli* (Gertsch), female: 69, dorsal view of pars thoracica showing picks; 70, abdomen showing small files. Figs. 71-72: *A. gruta* (Gertsch), female: 71, carapace and abdomen showing positions of picks and files; 72, portion of abdomen showing files. Fig. 73: *A. bispinosus* (Gertsch), female abdomen showing large files. Fig. 74: *A. boneti,* female abdomen showing files. Figs. 75-76: *A. alteriae,* female: 75, pars thoracica showing picks; 76, abdomen showing files. Fig. 77: *A. quatoculus,* abdomen of female showing files.

Anopsicus pearsei Chamberlin and Ivie
Figs. 64-66, 170-172

Anopsicus pearsei Chamberlin and Ivie, 1938, p. 130. Bonnet, 1955, p. 330.
Pholcophora pearsei: Gertsch, 1971, p. 48.

Diagnosis.—Essentially eyeless troglobite with legs of medium length (first femur about 3.6 times as long as carapace), distinctive epigynum (Fig. 64) and short, rounded tarsal appendage (Fig. 170) of male palpus.

Etymology.—Named for Dr. A. S. Pearse.

Female.—Length 1.5 mm. Carapace 0.73 mm long, 0.7 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Cephalothorax and appendages dusky yellow; abdomen gray. Eyes essentially obsolete, visible as widely spaced corneal vestiges. First leg: femur 2.6, patella 0.3, tibia 2.7, metatarsus 3.25, tarsus 0.9, total length 9.75 mm; first leg about 13 times, first femur 3.6 times as long as carapace. Stridulatory apparatus: picks on pars thoracica not detected; inconspicuous files present at base of abdomen. Epigynum (Figs. 64-66).

Male from Cueva Escondida.—Length 1.5 mm. Carapace 0.75 mm long, 0.7 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Chelicerae (Fig. 172) with thin, sharp horns set near base of face. Legs thin, first femur thickened in basal half; first leg: femur 2.3, patella 0.28, tibia 2.2, metatarsus 3.1, tarsus 0.8, total length 6.68 mm; first leg 11.4 times, first femur 3 times as long as carapace. Male palpus (Figs. 170-171).

Type data.—Female holotype from Oxolodt Cave, Kaua, Yucatán, México, 18 June (A. S. Pearse), in AMNH.

Distribution.—Mexican states of Yucatán and Quintana Roo.

New records.—MEXICO: *Yucatán:* Cueva (Actún) Kaua, 1 km W Kaua, 20 November 1974 (J. Reddell, D. McKenzie, S. Wiley), female; same, 20-21 October 1964, 7 females; same, 9-10 October 1974, 2 females, immature; 9 November 1974 (J. Reddell), male, female. Cueva Escondida, 3.5 km S Kaua, 21 July 1975 (J. Reddell, A. Grubbs, S. Wiley), male, 2 females. *Quintana Roo:* Cenote de Santo Domingo, 5 km NE Kilometer 50, 29 July 1975 (J. Reddell, D. McKenzie, A. Grubbs), female. Cenote de Las Ruinas, 29 July 1975 (J. Reddell, A. Grubbs, D. McKenzie, S. Wiley), female, immature.

Anopsicus palenque (Gertsch)
Figs. 200-203, 332-333

Pholcophora palenque Gertsch, 1977, p. 116.

Diagnosis.—Epigean species with eye triads close together, legs of medium length, and tarsal appendage (Fig. 200) of male palpus bent and enlarged at apex.

Etymology.—Named for Ruinas de Palenque.

Female.—Length 1.6 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 0.85 mm long, 0.75 mm wide. Cephalothorax and appendages dusky yellow; abdomen bluish, with faint pale linear marking above. Eye triads: anterior lateral eyes separated by about diameter; posterior median eyes separated by long diameter. First leg: femur 1.9, patella 0.26, tibia 2.1, metatarsus 2.45, tarsus 0.63, total length 7.34 mm; first leg 9.2 times, first femur 2.4 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 332-333).

Male holotype.—Length 1.25 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 0.65 mm long, 0.55 mm wide. Chelicerae (Figs. 202-203) with sharp spurs high up on face. First leg: femur 1.92, patella 0.27, tibia 2.1, metatarsus 2.5, tarsus 0.8, total length 7.59 mm; first leg 10.8 times, first femur 2.74 times as long as carapace. Male palpus (Figs. 200-201).

Type data.—Male holotype from 0.8 km N Ruinas de Palenque, Chiapas, México, 25 December 1973 (J. Reddell, R. W. Mitchell), in AMNH.

Distribution.—Known only from Palenque region, where it is sympatric with new species *alteriae.*

Anopsicus jeanae (Gertsch)
Figs. 208-210, 278

Pholcophora jeanae Gertsch, 1977, p. 116.

Diagnosis.—Epigean species with fairly long legs (first femur about 2.7 times as long as carapace), distinctive epigynum (Fig. 278) and tarsal appendage (Fig. 208) of male palpus.

Etymology.—Named for the late Jean Ivie.

Female.—Length 2.2 mm. Carapace 0.8 mm long, 0.77 mm wide. Abdomen 1.3 mm long, 1.1 mm wide. Cephalothorax and appendages dusky yellow; abdomen gray with bluish markings on dorsum. Eye triads: anterior lateral eyes separated by about full diameter; posterior median eyes separated by 1.3 diameters. First leg: femur 2.2, patella 0.3, tibia 2.3, metatarsus 2.75, tarsus 0.65, total length 8.20 mm; first leg 10 times, first femur 2.75 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 278).

Male holotype.—Length 1.75 mm. Carapace 0.85 mm long, 0.8 mm wide. Abdomen 0.9 mm long, 0.7 mm wide. Chelicerae (Fig. 210) with long, curved horns just below clypeal margin. First leg: femur 2.3, patella 0.3, tibia 2.45, metatarsus 3.3, tarsus 0.8, total length 9.50 mm; first leg 10.7 times, first femur 2.7 times as long as carapace. Male palpus (Figs. 208-209).

Type data.—Male holotype from La Venta, Villahermosa, Tabasco, México, 13 August 1965 (Jean and Wilton Ivie), in AMNH.

Distribution.—Known only from above material.

Anopsicus debora (Gertsch)
Figs. 204-207, 279

Pholcophora debora Gertsch, 1977, p. 117.

Diagnosis.—Epigean species with short legs (first femur about 1.8 times as long as carapace), distinctive epigynum (Fig. 279) and tarsal appendage (Fig. 204) of male palpus.

Etymology.—Named for Ms. Debora Denson.

Female.—Length 1.8 mm. Carapace 0.77 mm long, 0.7 mm wide. Abdomen 1 mm long, 0.73 mm wide. Cephalothorax and appendages dusky yellow to brown; abdomen bluish. Eye triads: anterior lateral eyes separated by little more than long diameter; posterior median eyes separated by one and one-half diameters. First leg: femur 1.35, patella 0.25, tibia 1.33, metatarsus 1.55, tarsus 0.55, total length 5.03 mm; first leg 6.5 times, first femur 1.76 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 279).

Male holotype.—Length 1 mm. Carapace 0.63 mm long, 0.6 mm wide. Abdomen 0.4 mm long, 0.35 mm wide. Chelicerae (Figs. 206-207) with sharp spurs at about middle of outer face. First femur 1.2 mm long, 1.9 times as long as carapace. Male palpus (Figs. 204-205).

Type data.—Male holotype and 4 females from Finca El Real, Ocosingo Valley, Chiapas, México, 1-7 July 1950 (C. and M. Goodnight), in AMNH.

Distribution.—Mexican state of Chiapas.

Records.—MEXICO: *Chiapas:* Monte Libano, 20 km E El Real, 4-5 July 1950 (C. and M. Goodnight, L. J. Stannard), 2 females. 5 mi. NE Chiapa, 22 August 1966 (J. and W. Ivie), 3 females.

Anopsicus bispinosus (Gertsch)
Figs. 67, 73, 211-213, 273-274

Pholcophora bispinosa Gertsch, 1971, p. 79. Brignoli, 1973, p. 221.

Diagnosis.—Large cavernicole (females to 3.5 mm long) with legs of medium length (first femur of male 2.7 times as long as carapace), distinctive epigynum (Fig. 273) and tarsal appendage (Fig. 211) of male palpus.

Etymology.—Specific name from Latin *bispinosus*, with two spines.

Female.—Length 2.9 mm. Carapace 1.2 mm long, 1.1 mm wide. Abdomen 1.9 mm long, 1.6 mm wide. Cephalothorax and appendages dusky orange; abdomen whitish. Eye triads: anterior lateral eyes separated by diameter; posterior median eyes separated by one and one-half diameters. First leg: femur 2.75, patella 0.45, tibia 2.85, metatarsus 2.8, tarsus 1, total length 9.85 mm; first leg 8 times, first femur 2.3 times as long as carapace. Stridulatory apparatus (Figs. 67, 73): pars thoracica with pale transverse, laterally rounded lobes serving as picks; files on abdomen above pedicel conspicuous dark, grooved foveae. Epigynum (Figs. 273-274).

Male holotype.—Length 2.1 mm. Carapace 1 mm long, 0.9 mm wide. Abdomen 1.3 mm long, 1 mm wide. Chelicerae (Fig. 213) with sharp, outwardly directed principal horns just below clypeal edge and below in apical half small sharp spurs. First leg: femur 2.7, patella 0.4, tibia 2.7, metatarsus 2.9, tarsus 0.8, total length 9.50 mm; first leg 9.5 times, first femur 2.7 times as long as carapace. Male palpus (Figs. 211-213).

Type data.—Male holotype from Cueva de Arcotete, 6 km S San Cristóbal, Chiapas, México, 15 August 1969 (S. and J. Peck), in AMNH.

Distribution.—Caves of Chiapas.

New records.—MEXICO: *Chiapas:* Cueva de Rancho Nuevo, 1 April 1971 (R. Argano), male, 6 females, immature (Brignoli, 1973, p. 221). Gruta de San Cristóbal, 5 mi. S San Cristóbal de las Casas (V. and B. Roth), male, 8 females, immature.

Anopsicus modicus, new species
Figs. 182-184

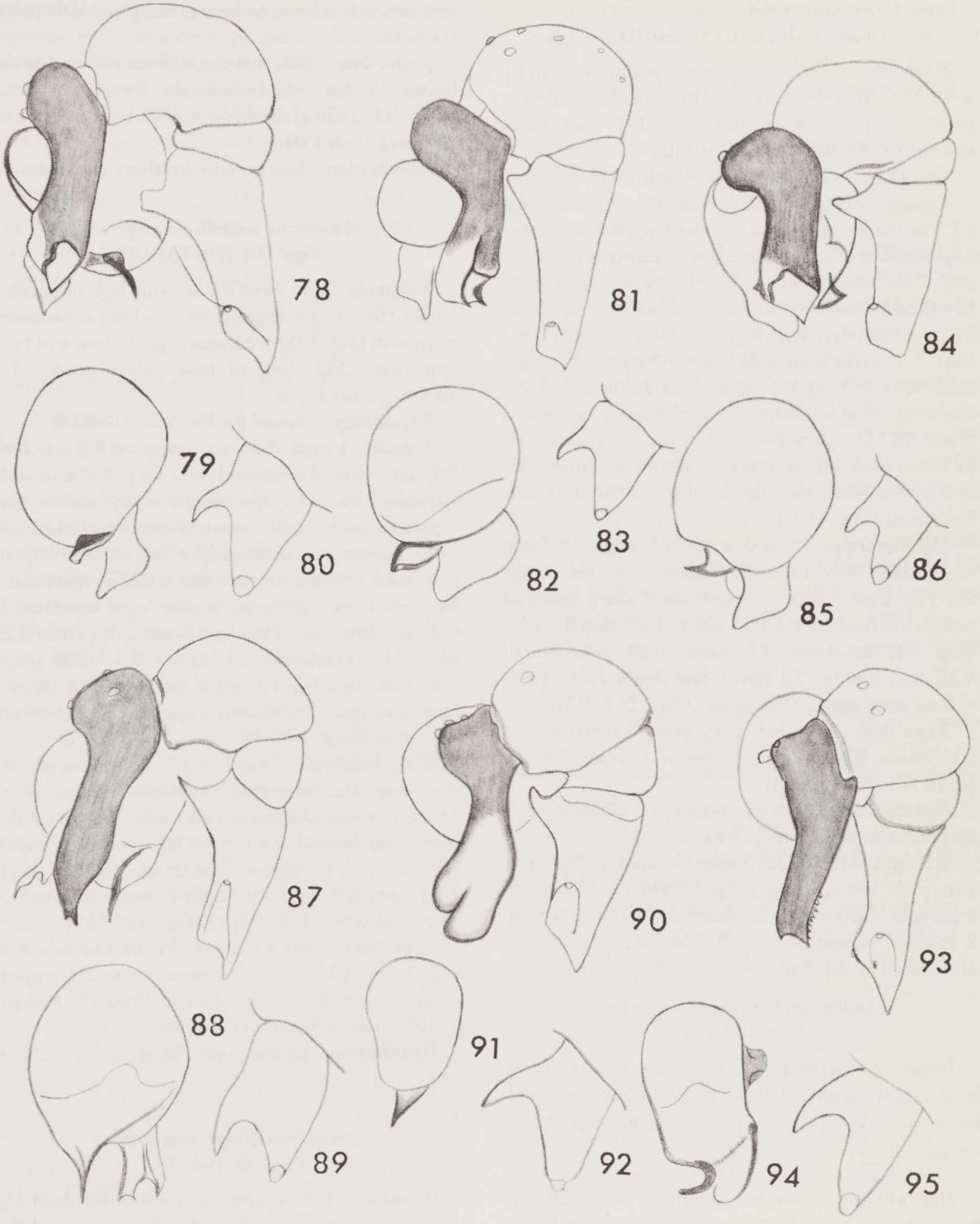
Diagnosis.—Epigean species with short legs (first femur 1.7 times as long as carapace) and distinctive epigynum (Fig. 182). Male unknown.

Etymology.—Specific name from Latin *modicus*, moderate.

Female holotype.—Length 1.5 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 0.9 mm long, 0.75 mm wide. Cephalothorax and appendages dusky yellow; carapace with Y-shaped linear marking and dusky shadings on clypeus and pars cephalica; abdomen gray. Eyes small on well spaced triads: anterior lateral eyes separated by little more than diameter; posterior median eyes separated by nearly two diameters. First leg: femur 1.2, patella 0.22, tibia 1.1, metatarsus 1.4, tarsus 0.5, total length 4.42 mm; first leg 6.3 times, first femur 1.7 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 182-184).

Type data.—Female holotype from Aquiles Serdán, Campeche, México, 28 September 1974 (J. Reddell), in AMNH.

Distribution.—Known only from female holotype.



Figs. 78-95.—Species of *Anopsicus:* Figs. 78-80: *A. bolivari* (Gertsch), male: 78, left palpus, retrolateral view; 79, bulb of palpus, prolateral view; 80, left chelicera, retrolateral view. Figs. 81-83: *A. mitchelli* (Gertsch), male: 81, left palpus, retrolateral view; 82, bulb of palpus, prolateral view; 83, left chelicera, retrolateral view. Figs. 84-86: *A. covadonga,* male: 84, left palpus, retrolateral view; 85, bulb of palpus, prolateral view; 86, left chelicera, retrolateral view. Figs. 87-89: *A. puebla,* male: 87, left palpus, retrolateral view; 88, bulb of palpus, prolateral view; 89, left chelicera, retrolateral view. Figs. 90-92: *A. grubbsi,* male: 90, left palpus, retrolateral view; 91, bulb of palpus, prolateral view; 92, left chelicera, retrolateral view. Figs. 93-95: *A. mckenziei,* male: 93, left palpus, retrolateral view; 94, bulb of palpus, prolateral view; 95, left chelicera, retrolateral view.

Anopsicus alteriae, new species
Figs. 75-76, 191-193, 214-215

Diagnosis.—Yellowish epigean species with quite short legs (first femur nearly twice as long as carapace), distinctive epigynum (Fig. 191) and tarsal appendage (Fig. 214) of male palpus.

Etymology.—Named for Ms. Charlotte H. Alteri.

Female.—Length 1.6 mm. Carapace 0.8 mm long, 0.72 mm wide. Abdomen 0.8 mm long, 0.6 mm wide. Cephalothorax and appendages yellowish; abdomen gray. Eye triads: anterior lateral eyes separated by two-thirds diameter; posterior median eyes separated by long diameter. First leg: femur 1.32, patella 0.21, tibia 1.4, metatarsus 1.55, tarsus 0.65, total length 5.12 mm; first leg 8.4 times, first femur about 1.7 times as long as carapace. Stridulatory apparatus (Figs. 75-76): pars thoracica with elevated brown picks on each side of cervical groove; abdomen with oval brown files close together high on front of face. Epigynum (Figs. 191-193).

Male holotype.—Length 1.3 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.65 mm long, 0.6 mm wide. Chelicerae with short sharp horns at middle of front. First leg: femur 1.35, patella 0.24, tibia 1.4, metatarsus 1.6, tarsus 0.53, total length 5.12 mm; first leg 7.1 times, first femur about twice as long as carapace. Male palpus (Figs. 214-215).

Type data.—Male holotype, male, 2 females from La Cañada Woods, near Palenque, Chiapas, México (C. H. Alteri), in AMNH.

Distribution.—Palenque region of Chiapas; presumably sympatric with *palenque.*

Records.—MEXICO: *Chiapas:* Ruinas de Palenque, Group IV left of gate, 3 April 1974 (C. H. Alteri), 3 females. Palenque, 2-24 March 1975 (C. H. Alteri), 2 females, immature. 1 km N Palenque, 25 July 1973 (J. Reddell et al.), female misidentified as *palenque.*

Anopsicus wileyae, new species
Figs. 173-175

Diagnosis.—Cavernicole with legs of medium length (first femur 2.5 times as long as carapace) and tarsal appendage (Fig. 173) of male palpus spatulate. Female unknown.

Etymology.—Named for Ms. Suzanne Wiley.

Male holotype.—Length 1.3 mm. Carapace 0.6 mm long, 0.5 mm wide. Abdomen 0.6 mm long, 9.5 mm wide. Cephalothorax and appendages yellowish; abdomen grayish. Eye triads moderately spaced: anterior lateral eyes separated by full diameter; posterior median eyes separated by diameter. Chelicerae (Fig. 175) with sharp horns set near base of face. First leg: femur 1.5, patella 0.25, tibia 1.5, metatarsus 1.7, tarsus 0.7, total length 5.65 mm; first leg 9 times, first femur 2.5 times as long as carapace. Male palpus (Figs. 173-174).

Type data.—Male holotype from Cueva (Actún) Loltún, 7 km SW Oxkutzcab, Yucatán, México, 25-26 July 1976 (J. Reddell, A. Grubbs, D. McKenzie, S. Wiley), in AMNH.

Distribution.—Known only by above specimen.

Anopsicus reddelli, new species
Figs. 164-166, 185-187

Diagnosis.—Pale cavernicole with legs of medium length (first femur about 3 times as long as carapace), epigynum (Fig. 185) with nasute projection and tarsal appendage (Fig. 164) of male palpus produced at apex to pointed spur.

Etymology.—Named for Mr. James Reddell.

Female.—Length 1.6 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 1 mm long, 0.7 mm wide. Cephalothorax and appendages dusky yellow; pars cephalica shaded with brown; abdomen whitish. Eyes small, posterior medians smaller than anterior laterals; eye triads well spaced: anterior lateral eyes separated by 2 diameters; posterior median eyes separated by full two diameters. First leg: femur 2.4, patella 0.25, tibia 2.0, metatarsus 2.3, tarsus 0.5, total length 7.45 mm; first leg 9.3 times, first femur 3 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 185-187).

Male holotype.—Length 1.15 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 0.8 mm long, 0.6 mm wide. Chelicerae (Fig. 166) with long thin horns near base of front. First leg: femur 2.2, patella 0.3, tibia 2.2, metatarsus 2.5, tarsus 0.7, total length 4.90 mm; first leg 6 times, first femur 2.7 times as long as carapace. Male palpus (Figs. 164-165).

Type data.—Male holotype, female and immature from Cueva (Actún) Halmensura, 5 km E Cumpich, Campeche, México, 31 October 1974 (J. Reddell, D. McKenzie, S. Wiley), in AMNH.

Distribution.—Known only from Cueva Halmensura.

Anopsicus chiapa, new species
Figs. 60, 194-196

Diagnosis.—Yellow epigean species with short legs (first femur 1.5 times as long as carapace) and distinctive epigynum (Fig. 194). Male unknown.

Etymology.—Specific name from Chiapa, the type locality, used in apposition.

Female holotype.—Length 1.12 mm. Carapace 0.6 mm long, 0.57 mm wide. Abdomen 0.7 mm long, 0.5 mm wide. Cephalothorax and appendages bright yellow; abdomen gray. Eyes (Fig. 60) on low triads:

anterior lateral eyes separated by diameter; posterior median eyes separated by nearly two diameters. First leg: femur 0.9, patella 0.22, tibia 0.9, metatarsus 1.0, tarsus 0.4, total length 3.42 mm; first leg 5.7 times, first femur 1.5 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 194-196).

Type data.—Female holotype from hillside 5 mi. NE Chiapa, Chiapas, México, 26 August 1966 (Jean and Wilton Ivie), in AMNH.

Distribution.—Known only by above specimen.

Anopsicus evansi (Gertsch)
Figs. 188-190, 216-218

Pholcophora evansi Gertsch, 1971, p. 80.

Diagnosis.—Cavernicole with legs of medium length (first femur of female 2.8 times as long as carapace), distinctive epigynum (Fig. 188) and tarsal appendage (Fig. 216) of male palpus elongated with small apical emargination.

Etymology.—Named for Mr. T. R. Evans.

Female.—Total length 2 mm. Carapace 1 mm long, 0.95 mm wide. Abdomen 1.2 mm long, 1 mm wide. Cephalothorax and appendages dusky orange; abdomen whitish. Triads of eyes well spaced: anterior lateral eyes separated by one and one-half diameters; posterior median eyes separated by two diameters. First leg: femur 2.8, patella 0.35, tibia 3.0, metatarsus 3.3, tarsus 0.75, total length 10.20 mm; first leg 10 times, first femur 2.8 times as long as carapace. Stridulatory apparatus: pars thoracica with trivial rounded picks; abdomen with narrow files above pedicel. Epigynum (Figs. 188-190).

Male holotype.—Length 1.8 mm. Carapace 1 mm long, 0.9 mm wide. Abdomen 0.9 mm long, 0.7 mm wide. Eye triads closer together. Chelicerae (Fig. 218) with sharp horns projecting outward from about middle of face. First leg: femur 2.35, patella 0.35, tibia 2.4, metatarsus 2.75, tarsus 0.7, total length 8.55 mm; first leg 8.5 times, first femur 2.3 times as long as carapace. Male palpus (Figs. 216-218).

Type data.—Male holotype from Grutas de Zapaluta, 6.5 km SE Zapaluta, Chiapas, México, 20 August 1967 (J. Reddell, J. Fish, T. R. Evans), in AMNH.

Distribution.—Known only from above cave.

Anopsicus mitchelli (Gertsch)
Figs. 81-83, 96, 104-106

Pholcophora mitchelli Gertsch, 1971, p. 77.

Diagnosis.—Cavernicole with long legs (first femur 2.7 times as long as carapace), distinctive epigynum (Fig. 104), and tarsal appendage of male palpus (Fig. 81).

Etymology.—Named for Dr. Robert Mitchell of Texas Tech University.

Female holotype.—Length 2.3 mm. Carapace 0.9 mm long, 0.8 mm wide. Abdomen 1.4 mm long, 1.1 mm wide. Cephalothorax and appendages dull yellow; abdomen whitish. Eye triads well separated: anterior lateral eyes separated by slightly more than diameter; posterior median eyes separated by two diameters. First leg: femur 2.4, patella 0.35, tibia 2.7, metatarsus 2.7, tarsus 0.7, total length 8.85 mm; first leg 9.8 times, first femur 2.7 times as long as carapace. Epigynum (Figs. 104-106). Stridulatory apparatus (Figs. 96-97): picks on pars thoracica rounded lobes; abdominal files low on abdomen.

Male.—Length 1.5 mm. Carapace 0.75 mm long, 0.7 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Chelicerae (Fig. 82) with short horns set near middle of face. Legs mostly missing. Male palpus (Figs. 81-82); tarsal appendage shorter than that of *bolivari*, truncated apically.

Type data.—Female holotype, females and male from Cueva de la Virgen de Guadalupe, 58 km SW Soto de la Marina, Tamaulipas, México, 31 October 1970 (W. Russell, G. and J. Ediger), in AMNH.

Distribution.—Known only from Cueva de la Virgen de Guadalupe.

Anopsicus bolivari (Gertsch)
Figs. 78-79, 109

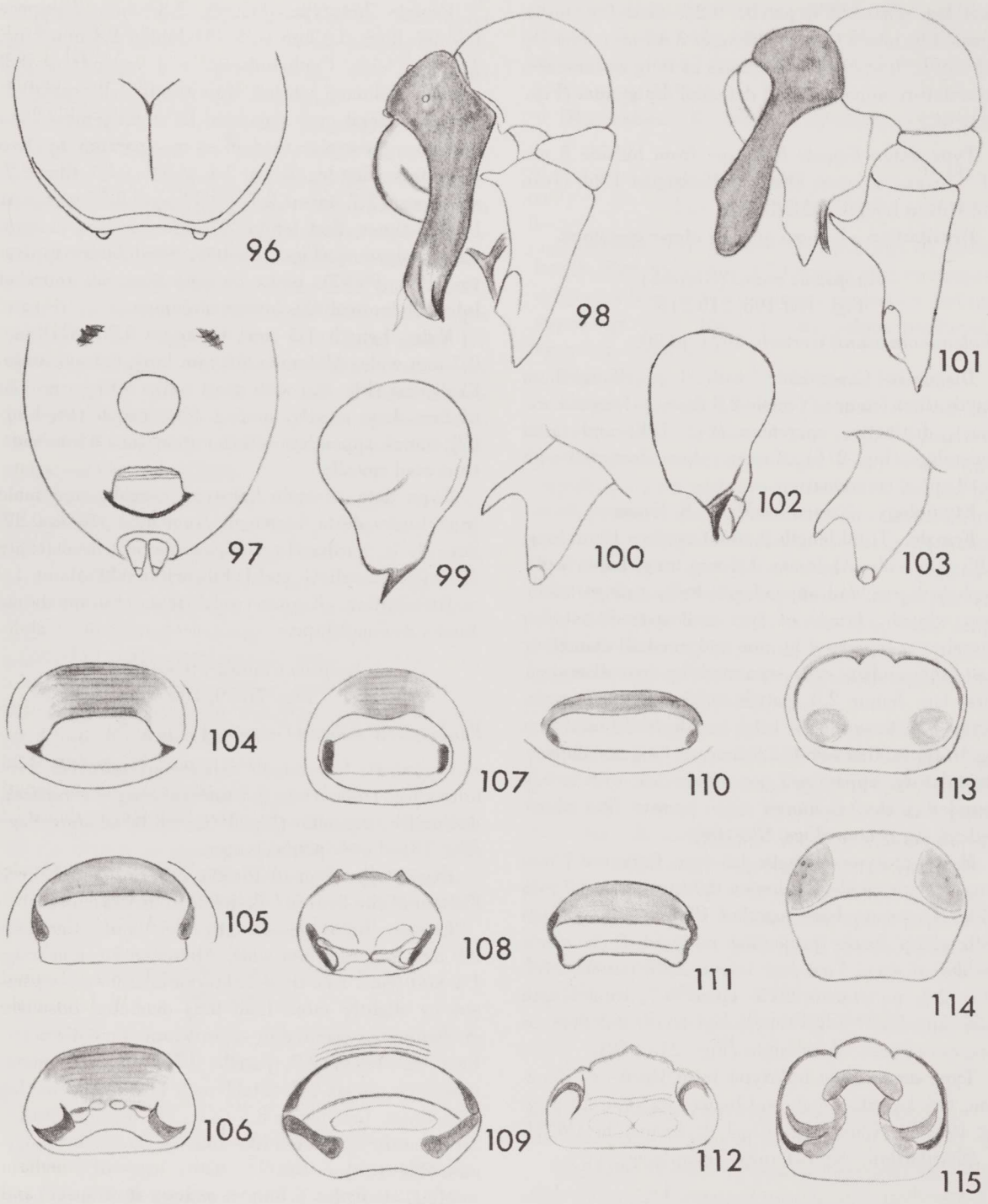
Pholcophora bolivari Gertsch, 1971, p. 79.

Diagnosis.—Cavernicole relative of *mitchelli* with longer legs (first femur 3.5 times as long as carapace), distinctive epigynum (Fig. 109) and tarsal appendage (Fig. 78) of male palpus longer.

Etymology.—Named for the late Dr. C. Bolívar y Pieltain of the Instituto Politécnico in México City.

Female holotype.—Length 2.4 mm. Carapace 0.9 mm long, 0.9 mm wide. Abdomen 1.5 mm long, 1.1 mm wide. Eye triads: anterior lateral eyes separated by slightly more than long diameter; posterior median eyes separated by slightly more than diameter. First leg: femur 3.2, patella 0.35, tibia 3.5, metatarsus 3.6, tarsus 0.7, total length 11.35 mm; first leg 12.6 times, first femur 3.5 times as long as carapace. Stridulatory apparatus like that of *mitchelli*. Epigynum (Fig. 109).

Male.—Length 2 mm. Carapace 0.9 mm long, 0.8 mm wide. Abdomen 1.1 mm long, 0.9 mm wide. Eye triads closer together: anterior lateral eyes separated by nearly diameter. Chelicerae (Fig. 80) with short horns set near middle of face. First leg: femur 3.3, patella 0.13, tibia 3.7, metatarsus 4.0, tarsus 1.0, total length 12.30 mm; first leg 13.6 times, first femur 3.6 times as long as carapace. Male palpus



Figs. 96-115.—Species of *Anopsicus:* Figs. 96-97: *A. mitchelli* (Gertsch), female: 96, pars thoracica showing picks; 97, abdomen showing files. Figs. 98-100: *A. iviei,* male: 98, left palpus, retrolateral view; 99, bulb of palpus, prolateral view; 100, left chelicera, retrolateral view. Figs. 101-103: *A. troglodyta* (Gertsch), male: 101, left palpus, retrolateral view; 102, bulb of palpus, prolateral view; 103, left chelicera, retrolateral view. Figs. 104-106: *A. mitchelli* (Gertsch), epigynum: 104, ventral view; 105, posterior view; 106, dorsal view. Figs. 107-108: *A. elliotti* (Gertsch), epigynum: 107, ventral view; 108, dorsal view. Fig. 109: *A. bolivari* (Gertsch), epigynum, dorsal view. Figs. 110-112: *A. ocote,* epigynum: 110, ventral view; 111, posterior view; 112, dorsal view. Figs. 113-115: *A. iviei,* epigynum: 113, ventral view; 114, posterior view; 115, dorsal view.

(Figs. 78-79); anterior femoral spur truncate; tarsal appendage bluntly pointed.

Type data.—Female holotype from Cueva de los Cuarteles, 10 km S Aldama, Tamaulipas, México, 6 December 1945 (C. Bolívar, F. Bonet, J. Alvarez), in AMNH.

Distribution.—Known only from Cueva de los Cuarteles.

New records.—MEXICO: *Tamaulipas:* Cueva de los Cuarteles, 11 January 1977 (J. Reddell, A. Grubbs), 3 males, 4 females; 23 December 1972 (J. Reddell, D. and M. McKenzie, S. Murphy), male, 2 females, immature.

Anopsicus elliotti (Gertsch)
Fig. 109

Pholcophora elliotti Gertsch, 1971, p. 79.

Diagnosis.—Cavernicole relative of *mitchelli* with shorter legs (first femur 1.6 times as long as carapace) and distinctive epigynum (Fig. 109). Male unknown.

Etymology.—Named for Dr. William Elliott.

Female holotype.—Length 2 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 1.3 mm long, 0.8 mm wide. Anterior lateral eyes separated by two-thirds diameter; posterior median eyes separated by slightly more than long diameter. First leg: femur 1.1, patella 0.21, tibia 1.2, metatarsus 1.1, tarsus 0.45, total length 4.06 mm; first leg 5.8 times, first femur 1.6 times as long as carapace. Stridulatory apparatus like that of *mitchelli.* Epigynum (Fig. 109).

Type data.—Female holotype from Sótano de las Piedras, NE Ciudad Valles, San Luis Potosí, México, 15 July 1969 (S. Peck, W. Elliott).

Distribution.—Caves of San Luis Potosí.

Other records.—MEXICO: *San Luis Potosí:* Cueva de Taninul n. 1, June 1967 (R. Mitchell), female; 17 March 1967 (R. Mitchell), 2 females.

Anopsicus potrero, new species
Figs. 197-199

Pholcophorina placens: Gertsch, 1939, p. 3.

Diagnosis.—Epigean relative of *mitchelli* with long legs (first femur 2.2 times as long as carapace) and distinctive epigynum (Fig. 197). Male unknown.

Etymology.—Named for Potrero, the type locality, used in apposition.

Female holotype.—Length 1.8 mm. Carapace 0.8 mm long, 0.8 mm wide. Abdomen 1 mm long, 0.8 mm wide. Anterior lateral eyes separated by diameter; posterior median eyes separated by slightly more than long diameter. First leg: femur 1.75, patella 0.32, tibia 1.9, metatarsus 2.17, tarsus 0.65, total length 6.79 mm; first leg 8.4 times, first femur 2.2 times as long as carapace. Stridulatory apparatus like that of *mitchelli.* Epigynum (Figs. 197-199).

Type data.—Female holotype from Potrero, México, 24 June 1936 (L. Irby Davis), in AMNH. Location of type locality uncertain, probably in Veracruz.

Distribution.—Known only from type specimen.

Anopsicus covadonga, new species
Figs. 84-86, 134-135

Diagnosis.—Epigean relative of *mitchelli* with legs of medium length (first femur about 1.9 times as long as carapace, distinctive epigynum (Fig. 134) and shorter tarsal appendage of male palpus (Fig. 84).

Etymology.—Named for type locality, Covadonga, used in apposition.

Female.—Length 2 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 1.2 mm long, 0.8 mm wide. Eye triads close together: anterior lateral eyes separated by about radius; posterior median eyes separated by full diameter. First leg: femur 1.5, patella 0.27, tibia 1.63, metatarsus 1.74, tarsus 0.6, total length 5.74 mm; first leg 7.2 times, first femur about 1.9 times as long as carapace. Stridulatory apparatus: small rounded picks on carapace; position of abdominal files not detected. Epigynum (Figs. 134-135).

Male holotype.—Length 1.5 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.8 mm long, 0.75 mm wide. Chelicerae (Fig. 86) with short stout horns at middle of face. First leg: femur 1.3, patella 0.23, tibia 1.38, metatarsus 1.43, tarsus 0.43, total length 4.77 mm; first leg 6.7 times, first femur about 1.9 times as long as carapace.

Type data.—Male holotype, 7 males and 6 females from Covadonga, SW Valles, San Luis Potosí, México, 16 August 1964 (J. and W. Ivie), in AMNH.

Distribution.—San Luis Potosí, México.

Record.—MEXICO: *San Luis Potosí:* Taninul, near Valles, 16 August 1964 (J. and W. Ivie), male, 4 females.

Anopsicus ocote, new species
Figs. 110-112

Diagnosis.—Cavernicole with legs of medium length (first femur 2.4 times as long as carapace) and distinctive broad epigynum (Fig. 110). Male unknown.

Etymology.—Named for cave locality, *ocote,* pine tree of México, used in apposition.

Female holotype.—Length 1.5 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 0.8 mm long, 0.65 mm wide. Eye triads close together: anterior

lateral eyes separated by about radius; posterior median eyes separated by diameter. First leg: femur 1.73, patella 0.3, tibia 1.76, metatarsus 1.8, tarsus 0.38, total length 6.07 mm; first leg 8.7 times, first femur 2.4 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 110-112).

Type data.—Female holotype from Cueva El Ocote, 15 mi. NE Jacala, Hidalgo, México, 18 August 1964 (J. and W. Ivie), in AMNH.

Distribution.—Known only from type specimen.

Anopsicus troglodyta (Gertsch)
Figs. 101-103, 334

Pholcophora troglodyta Gertsch, 1971, p. 77, figs. 92-94.

Diagnosis.—Cavernicole with long legs (first femur about 3 times as long as carapace), epigynum rounded behind and tarsal appendage of male palpus (Fig. 101) spatulate.

Etymology.—Specific name from Latin *troglodyta*, cave dweller.

Female.—Length 2.3 mm. Carapace 0.9 mm long, 0.8 mm wide. Abdomen 1.25 mm long, 1.1 mm wide. Cephalothorax and appendages dull yellow; abdomen whitish. Eye triads: anterior lateral eyes separated by slightly more than long diameter; posterior median eyes separated by one and one-half diameters. First leg: femur 2.5, patella 0.25, tibia 3.0, metatarsus 3.3, tarsus 0.8, total length 9.85 mm; first leg about 11 times, first femur 2.8 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 334) broadly rounded behind.

Male holotype.—Total length 1.6 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.9 mm long, 0.7 mm wide. Eyes smaller with space between triads wider. First leg: femur 2.3, patella 0.25, tibia 2.4, metatarsus, 3.2, tarsus 0.8, total length 8.95 mm; first leg 12.6 times, first femur about 3 times as long as carapace. Chelicerae (Fig. 103) with small horns at about middle of face. Male palpus (Figs. 101-102).

Type data.—Male holotype from Grutas de Atoyac, 2 km E Atoyac, Veracruz, México, 6 August 1969 (S. and J. Peck), in AMNH.

Distribution.—Known only from Grutas de Atoyac.

New record.—MEXICO: *Veracruz:* Grutas de Atoyac, 6 January 1977 (J. Reddell), female.

Anopsicus iviei, new species
Figs. 98-100, 113-115

Diagnosis.—Epigean species with legs of medium length (first femur about twice as long as carapace), distinctive epigynum (Fig. 113) and tarsal appendage of male palpus (Fig. 98) angled at tip.

Etymology.—Named for the late Wilton Ivie.

Female.—Length 1.6 mm. Carapace 0.75 mm long, 0.75 mm wide. Abdomen 0.9 mm long, 0.65 mm wide. Cephalothorax and legs dull yellowish brown; abdomen gray. Eye triads: anterior lateral eyes separated by diameter; posterior median eyes separated by more than long diameters. First leg: femur 1.52, patella 0.29, tibia 1.68, metatarsus 1.93, tarsus 0.53, total length 5.95 mm; first leg 8 times, first femur twice as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 113-115).

Male holotype.—Length 1.8 mm. Carapace 0.83 mm long, 0.8 mm wide. Abdomen 1 mm long, 0.8 mm wide. Chelicerae (Fig. 100) with sharp horns at middle of front. First leg: femur 1.7, patella 0.3, tibia 1.75, metatarsus 2.0, tarsus 0.6, total length 6.35 mm; first leg 7.7 times, first femur twice as long as carapace. Male palpus (Figs. 98-99).

Type data.—Male holotype, numerous males and females from Peñuela, Veracruz, México, 26 April 1963 (W. J. Gertsch, W. Ivie), in AMNH.

Distribution.—Mexican state of Veracruz.

Records.—MEXICO: *Veracruz:* 2 mi. E Córdoba, 6 August 1968 (J. and W. Ivie), female. Atoyac, 20 April 1944 (J. Alvarez, C. Tellez), juvenile probably this species.

Anopsicus puebla, new species
Figs. 87-89

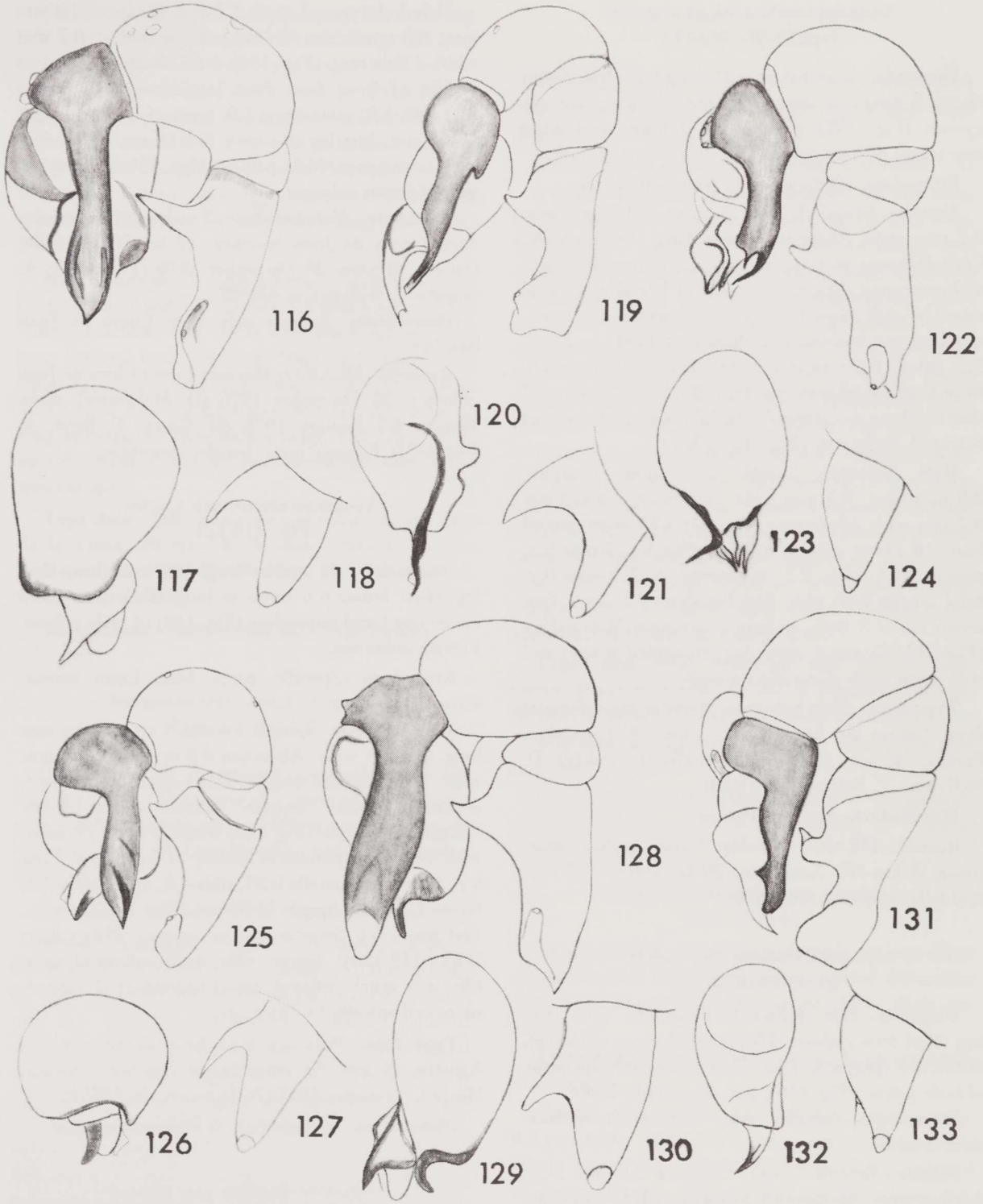
Diagnosis.—Epigean species with long legs (first femur 3 times as long as carapace) and tarsal appendage of male palpus (Fig. 87) narrowed apically to emarginate tip. Female unknown.

Etymology.—Named for Mexican state of Puebla, used in apposition.

Male holotype.—Length 1.7 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 1 mm long, 0.75 mm wide. Cephalothorax and appendages orange brown; abdomen bluish-gray with faint pale hastate marking and pattern of dark spots. Eye triads: anterior lateral eyes separated by diameter; posterior median eyes separated by about one and one-half diameters. Chelicerae (Fig. 89) with short horns near middle of face. First leg: femur 2.0, patella 0.25, tibia 2.2, metatarsus 2.4, tarsus 0.75, total length 7.60 mm; first leg 11 times, first femur about 3 times as long as carapace. Male palpus (Figs. 87-88).

Type data.—Male holotype from Hueytamalez, Puebla, México, 30 December 1945 (J. Alvarez), in AMNH.

Distribution.—Known only from type specimen.



Figs. 116-133.—Species of *Anopsicus:* Figs. 116-118: *A. lucidus*, male: 116, left palpus, retrolateral view; 117, bulb of palpus, prolateral view; 118, left chelicera, retrolateral view. Figs. 119-121: *A. niveus*, male: 119, left palpus, retrolateral view; 120, bulb of palpus, prolateral view; 121, left chelicera, retrolateral view. Figs. 122-124: *A. vinnulus*, male: 122, left male palpus, retrolateral view; 123, bulb of palpus, prolateral view; 124, left chelicera, retrolateral view. Figs. 125-127: *A. tehuanus*, male: 125, left palpus, retrolateral view; 126, bulb of palpus, prolateral view; 127, left chelicera, retrolateral view. Figs. 128-130: *A. gruta* (Gertsch), male: 128, left palpus, retrolateral view; 129, bulb of palpus, prolateral view; 130, left chelicera, retrolateral view. Figs. 131-133: *A. exiguus* (Gertsch), male: 131, left palpus, retrolateral view; 132, bulb of palpus, prolateral view; 133, left chelicera, retrolateral view.

Anopsicus mckenziei, new species
Figs. 93-95, 137-138

Diagnosis.—Cavernicole with long legs (first femur about 3 times as long as carapace), distinctive epigynum (Fig. 137) with rounded horns and tarsal appendage of male palpus (Fig. 93) serrate at apex.

Etymology.—Named for Mr. David McKenzie.

Female.—Length 1.7 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 1 mm long, 0.8 mm wide. Cephalothorax and appendages pale yellowish brown; abdomen gray. Eye triads: anterior lateral eyes separated by full diameter; posterior median eyes separated by one and one-half diameters. First leg: femur 2.2, patella 0.25, tibia 2.5, metatarsus 2.7, tarsus 0.9, total length 8.55 mm; first leg 8 times, first femur 2.7 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 137-138).

Male holotype.—Length 1.75 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 1 mm long, 0.7 mm wide. Chelicerae (Fig. 95) with short curved horns at about middle of face. First leg: femur 2.3, patella 0.25, tibia 2.7, metatarsus 3.25, tarsus 0.9, total length 9.40 mm; first leg about 12 times, first femur about 3 times as long as carapace. Male palpus (Figs. 93-94); tarsal appendage truncated at apex and with small teeth along inner margin.

Type data.—Male holotype, 2 males and 4 females from Grutas de Atepolihuit, 5 km SW Cuetzalan, Puebla, México, 18 December 1976 (J. Reddell, D. McKenzie, C. Soileau), in AMNH.

Distribution.—Caves of Puebla.

Record.—MEXICO: *Puebla:* Cueva de los Camerones, 3 km NW Xochitlán, 29 December 1975 (J. Reddell), 3 females, immature.

Anopsicus lucidus, new species
Figs. 116-118, 271-272

Diagnosis.—Pale yellowish troglobite with long legs (first femur about 5.5 times as long as carapace), distinctive epigynum (Fig. 271) and tarsal appendage of male palpus (Fig. 116), flat, shaped like blade.

Etymology.—Specific name from Latin *lucidus,* clear, bright.

Female.—Length 2 mm. Carapace 0.9 mm long, 0.8 mm wide. Abdomen 1.5 mm long, 1.25 mm wide. Cephalothorax and appendages dull yellowish; chelicerae light brown; abdomen dusky gray. Eyes evanescent, essentially obsolete, without pigment. First leg: femur 5.0, patella 0.4, tibia 5.75, metatarsus 8.0, tarsus 1.5, total length 20.65 mm; first leg 22.9 times, first femur 5.5 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 271-272).

Male holotype.—Length 1.7 mm. Carapace 0.8 mm long, 0.8 mm wide. Abdomen 1.1 mm long, 0.7 mm wide. Chelicerae (Fig. 118) with sharp horns near middle of front face. First leg: femur 4.6, patella 0.3, tibia 5.0, metatarsus 7.0, tarsus 1.5, total length 18.40 mm; first leg 23 times, first femur 5.7 times as long as carapace. Male palpus (Figs. 116-117); apical spur of femur enlarged.

Type data.—Male holotype, 2 males and 11 females from Cueva de Juan Sánchez, 12 km NW Acatlán, Oaxaca, México, 26 December 1976 (J. Reddell, A. Grubbs, C. Soileau), in AMNH.

Distribution.—Known only from Cueva de Juan Sánchez.

Records.—MEXICO: *Oaxaca:* Cueva Chica de Juan Sánchez, 26 December 1976 (D. McKenzie), male, female; 6-7 January 1976 (M. Casey, T. Byrd, A. Grubbs, D. Barnes), male, female, immature.

Anopsicus niveus, new species
Figs. 119-121

Diagnosis.—Pale eyeless troglobite with long thin legs (first femur 6.6 times as long as carapace) and distinctive tarsal appendage (Fig. 119) of male palpus. Female unknown.

Etymology.—Specific name from Latin *niveus,* snowy, whitish.

Male holotype.—Length 1.4 mm. Carapace 0.6 mm long, 0.5 mm wide. Abdomen 0.8 mm long, 0.6 mm wide. Whole spider whitish. Pars cephalica flattened, declining forward, smooth, without traces of eye vestiges. Chelicerae (Fig. 121) without horns or spurs, with two tiny spinules at middle of front face. First leg: femur 4.0, patella 0.25, tibia 4.0, metatarsus 5.5, tarsus 1.2, total length 14.95 mm; first leg 25 times, first femur 6.6 times as long as carapace. Male palpus (Figs. 119-120): femur with stout subapical spur; tibia not much inflated; tarsal appendage elongated, narrowed apically to thin spine.

Type data.—Male holotype from Sótano de San Agustín, 5 km SE Huautla de Jiménez, Oaxaca, México, 1 January 1977 (R. Jameson), in AMNH.

Distribution.—Known only from type specimen.

Anopsicus vinnulus, new species
Figs. 122-124, 275-276

Diagnosis.—Yellowish troglobite with long legs (first femur 5 times as long as carapace), epigynum (Fig. 275) lobed behind, and tarsal appendage (Fig. 122) with thin spurs at apex.

Etymology.—Specific name from Latin *vinnulus,* charming, pleasant.

Female.—Length 2.1 mm. Carapace 0.8 mm long, 0.8 mm wide. Abdomen 1.5 mm long, 1.2 mm wide. Cephalothorax and appendages dull yellow; chelicerae light brown; abdomen gray. Eyes evanescent, without pigment, essentially obsolete. First leg: femur 4.2, patella 0.3, tibia 4.5, metatarsus 6.2, tarsus 1.2, total length 16.40 mm; first leg 20 times, first femur 5 times as long as carapace. Stridulatory apparatus like that of *mitchelli.* Epigynum (Figs. 275-278).

Male holotype.—Length 2.4 mm. Carapace 0.9 mm long, 0.8 mm wide. Abdomen 1.5 mm long, 1.4 mm wide. Chelicerae (Fig. 124) with stout curved horns near base of face. First leg: femur 4.5, patella 0.3, tibia 5.2, metatarsus 7.0, tarsus 1.4, total length 18.40 mm; first leg 20 times, first femur 5 times as long as carapace. Male palpus (Figs. 122-123): femoral spur short, rounded; tarsal appendage with curved spine at apex.

Type data.—Male holotype and female from Cueva de la Finca, 10 mi. SW Acatlán, Oaxaca, México, 3 December 1976 (J. Reddell, D. McKenzie, A. Grubbs), in AMNH.

Distribution.—Known only from type locality.

Anopsicus soileauae, new species
Figs. 52, 150-151

Diagnosis.—Pale cavernicole, probable troglobite with long legs (first femur 3.7 times as long as carapace) and epigynum (Fig. 150) triangular lobe; inhabiting Cueva de Juan Sánchez with blind *lucidus.* Male unknown.

Etymology.—Named for Ms. Carmen Soileau.

Female holotype.—Length 1.5 mm. Carapace 0.6 mm long, 0.6 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Whole spider whitish to pale yellow, with eye tubercles conspicuously black. Triads of eyes (Fig. 52) moderately separated: anterior lateral eyes separated by diameter; posterior median eyes separated by about one and one-half diameters. First leg: femur 2.2, patella 0.2, tibia 2.3, metatarsus 3.0, tarsus 0.7, total length 8.4 mm; first leg 14 times, first femur 3.7 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 150-151): subtriangular lobe with internal pair of dark vesicles.

Type data.—Female holotype and female from Cueva de Juan Sánchez, 12 km NW Acatlán, Oaxaca, México, 26 December 1976 (J. Reddell, A. Grubbs, C. Soileau), in AMNH.

Distribution.—Known only from type locality.

Anopsicus grubbsi, new species
Figs. 90-92, 136

Diagnosis.—Cavernicole with small eyes, quadrangular epigynum (Fig. 136), and tarsal appendage (Fig. 90) of male palpus spatulate.

Etymology.—Named for Mr. Andrew Grubbs.

Female.—Length 1.4 mm. Carapace 0.7 mm long, 0.7 mm wide. Abdomen 0.75 mm long, 0.6 mm wide. Eyes on well separated triads: anterior lateral eyes separated by slightly more than long diameter; smaller posterior median eyes separated by three diameters. Fourth leg: femur 2.0, patella 0.25, tibia 2.0, metatarsus 2.0, tarsus 0.7, total length 6.95 mm; fourth leg about 10 times, fourth femur about 3 times as long as carapace. Stridulatory apparatus like that of *mitchelli.* Epigynum (Fig. 136).

Male holotype.—Length 1.8 mm. Carapace 0.67 mm long, 0.6 mm wide. Abdomen 0.75 mm long, 0.6 mm wide. Eye triads: anterior lateral eyes separated by full diameter; posterior median eyes separated by one and one-half diameters. Chelicerae (Fig. 92) with stout horns set just below clypeal margin on face. Male palpus (Figs. 90-91): tarsal appendage spatulate, divided at apex.

Type data.—Male holotype and female from Cueva Desapareciendo, 2 km S Acatlán, Oaxaca, México, 5 January 1976 (A. Grubbs), in AMNH.

Distribution.—Known only from Cueva Desapareciendo.

Record.—MEXICO: *Oaxaca:* Cueva Desapareciendo, 26 December 1976 (J. Reddell, A. Grubbs, C. Soileau), female.

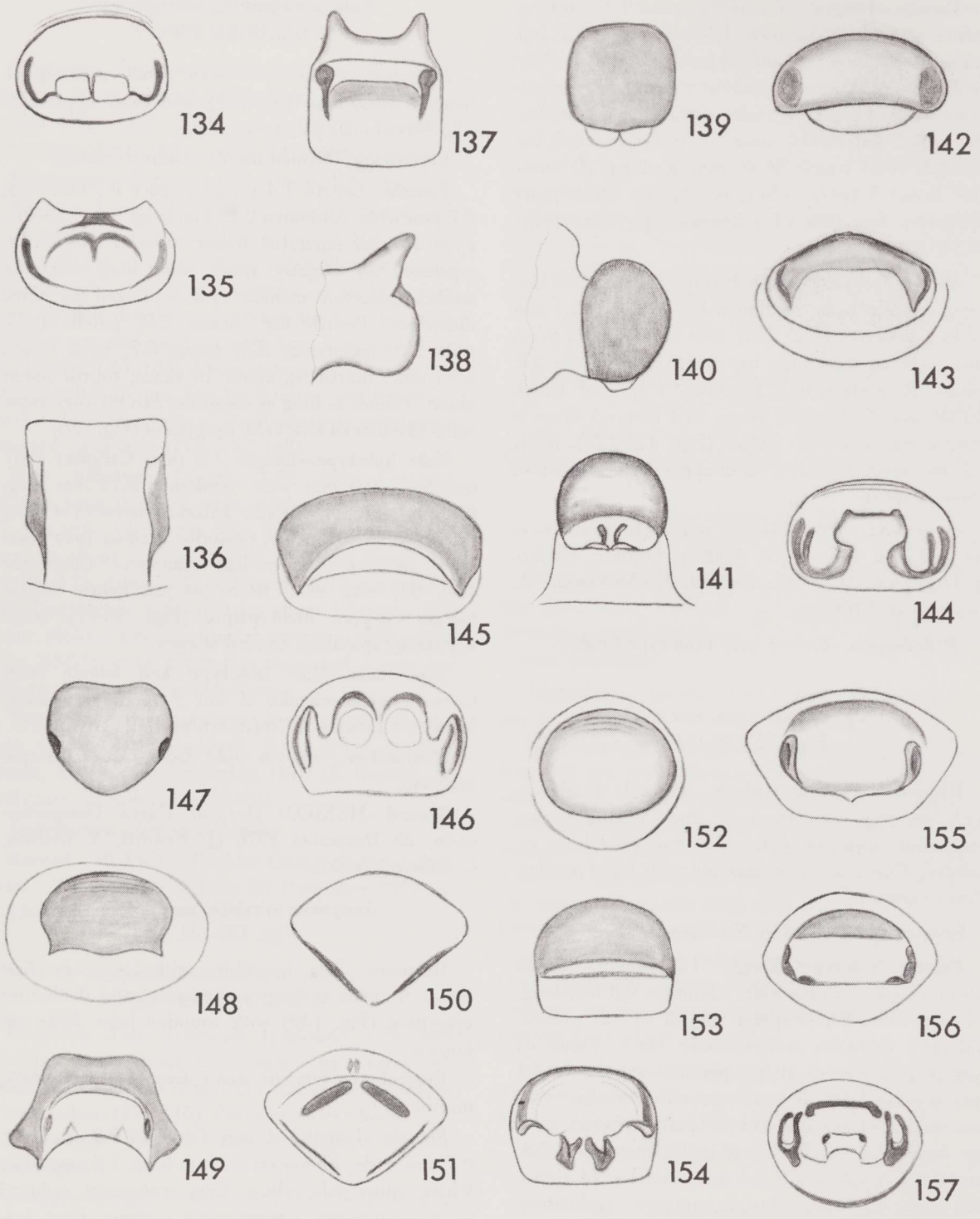
Anopsicus mirabilis, new species
Figs. 139-141

Diagnosis.—Pale troglobite with long legs (first femur 5 times as long as carapace) and distinctive epigynum (Fig. 139) with rounded lobe. Male unknown.

Etymology.—Specific name from Latin *mirabilis,* marvelous.

Female.—Length 2.1 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 1.5 mm long, 1.2 mm wide. Whole spider pale yellow. Eyes evanescent, reduced to inconspicuous, unpigmented vestiges. First leg: femur 4.2, patella 0.35, tibia 4.7, metatarsus 6.2, tarsus 1.3, total length 16.75 mm. First leg 21 times, first femur 5 times as long as carapace. Stridulatory apparatus like that of *mitchelli.* Epigynum (Figs. 139-141).

Type data.—Female holotype and 6 females from Cueva de las Maravillas, 6 km S Acatlán, Oaxaca,



Figs. 134-157.—Species of *Anopsicus:* Figs. 134-135: *A. covadonga,* epigynum: 134, ventral view; 135, dorsal view. Fig. 136: *A. grubbsi,* epigynum, posterior view. Figs. 137-138: *A. mckenziei,* epigynum: 137, posterior view; 138, prolateral view. Figs. 139-141: *A. mirabilis,* epigynum: 139, ventral view; 140, prolateral view; 141, posterior view. Figs. 142-144: *A. gruta* (Gertsch), epigynum: 142, ventral view; 143, posterior view; 144, dorsal view. Figs. 145-146: *A. tehuanus,* epigynum: 145, ventral view; 146, dorsal view. Figs. 147-149: *A. troglodyta* (Gertsch), epigynum: 147, ventral view; 148, posterior view; 149, dorsal view. Figs. 150-151: *A. soileauae,* epigynum: 150, ventral view; 151, dorsal view. Figs. 152-154: *A. boneti,* epigynum: 152, ventral view; 153, posterior view; 154, dorsal view. Figs. 155-157: *A. davisi* (Gertsch), epigynum: 155, ventral view; 156, posterior view; 157, dorsal view.

México, 29 December 1976 (J. Reddell, A. Grubbs, C. Soileau, D. McKenzie), in AMNH.

Distribution.—Known only from Cueva de las Maravillas.

Anopsicus tehuanus, new species
Figs. 125-127, 145-146

Diagnosis.—Epigean species with short legs (first femur about twice as long as carapace), distinctive epigynum (Fig. 145) and tarsal appendage (Fig. 125) blade drawn to sharp point.

Etymology.—Specific name based on Tehuantepec, type locality.

Female.—Length 2 mm. Carapace 0.85 mm long, 0.8 mm wide. Abdomen 1.2 mm long, 1 mm wide. Cephalothorax and appendages dusky orange; abdomen gray. Eye triads: anterior lateral eyes separated by radius; posterior median eyes separated by diameter. First leg: femur 1.55, patella 0.28, tibia 1.66, metatarsus 1.6, tarsus 0.53, total length 5.62 mm; first leg 6.6 times, first femur 1.8 times as long as carapace. Stridulatory apparatus: picks on pars thoracica small sclerotized angles; small, grooved files halfway up base of abdomen. Epigynum (Figs. 145-146).

Male holotype.—Length 1.5 mm. Carapace 0.65 mm long, 0.62 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Chelicerae (Fig. 127) sharp, curved horns near middle of face. First leg: femur 1.35, patella 0.25, tibia 1.45, metatarsus 1.4, tarsus 0.5, total length 4.95 mm; first leg 7.6 times, first femur twice as long as carapace. Male palpus (Figs. 125-126).

Type data.—Male holotype and female from 8 mi. W Tehuantepec, Oaxaca, México, 29 August 1966 (J. and W. Ivie), in AMNH.

Distribution.—Known only from above material.

Anopsicus gruta (Gertsch)
Figs. 71-72, 128-130, 142-144

Pholcophora gruta Gertsch, 1971, p. 78.

Diagnosis.—Pale troglobite with long legs (first femur of female 4 times as long as carapace), distinctive epigynum (Fig. 142), and tarsal appendage (Fig. 128) of male palpus apically rounded.

Etymology.—Specific name from Spanish *gruta,* cave, grotto.

Female holotype.—Length 2 mm. Carapace 1 mm long, 0.8 mm wide. Abdomen 1.1 mm long, 0.9 mm wide. Cephalothorax and appendages pale yellow; abdomen whitish. Eyes evanescent, essentially obsolete, visible as pale corneal vestiges. First leg: femur 4.0, patella 0.35, tibia 4.2, metatarsus 5.3, tarsus 1.2, total length 15.05 mm; first leg 15 times, first femur 4 times as long as carapace. Stridulatory apparatus (Figs. 71-72): pars thoracica with conspicuous, curved picks; pair of grooved files at base of abdomen. Epigynum (Figs. 142-144).

Male.—Length 1.9 mm. Carapace 0.95 mm long, 0.85 mm wide. Abdomen 1 mm long, 0.8 mm wide. Chelicerae (Fig. 130) with sharp horns at middle of frontal face. Legs mostly lost. Male palpus (Figs. 128-129); tarsal appendage long blade rounded at apex.

Type data.—Female holotype and female from Grutas de Juxtlahuaca, 6.5 km N Colotlipa, Guerrero, México, 16 January 1941 (C. Bolívar, F. Bonet), in AMNH.

Distribution.—Known only from Grutas de Juxtlahuaca.

Record.—MEXICO: *Guerrero:* Grutas de Juxtlahuaca, 15 August 1966 (J. Fish, J. Reddell), male.

Anopsicus davisi (Gertsch)
Figs. 68, 155-157

Pholcophorina davisi Gertsch, 1939, p. 4.

Diagnosis.—Epigean species with rather short legs (first femur about twice as long as carapace) and distinctive epigynum (Fig. 155). Male unknown.

Etymology.—Named for the late L. Irby Davis of Harlingen, Texas.

Female holotype.—Length 1.7 mm. Carapace 0.8 mm long, 0.72 mm wide. Abdomen 0.9 mm long, 0.8 mm wide. Eye triads moderately separated: anterior lateral eyes separated by two-thirds diameter; posterior median eyes separated by diameter. First leg: femur 1.5, patella 0.3, tibia 1.6, metatarsus 1.6, tarsus 0.6, total length 5.50 mm; first leg about 7 times, first femur nearly twice as long as carapace. Stridulatory apparatus (Fig. 68): pars thoracica with conspicuous angled picks on each posterior corner; small files at middle of abdominal face. Epigynum (Figs. 155-157).

Type data.—Female holotype from 62 mi. N Acapulco, Guerrero, México, 18 June 1936 (A. M. and L. I. Davis), in AMNH.

Distribution.—Known only from above specimen.

Anopsicus beatus, new species
Figs. 179-180

Diagnosis.—Epigean relative of *davisi* with short legs (first femur 1.8 times as long as carapace), eye triads close together, and distinctive epigynum (Fig. 179). Male unknown.

Etymology.—Specific name from Latin *beatus,* happy, blessed.

Female holotype.—Total length 1.2 mm. Carapace 0.6 mm long, 0.55 mm wide. Abdomen 0.7 mm long, 0.7 mm wide. Cephalothorax and appendages dull yellow; abdomen gray with bluish spotting. Eye triads close together: anterior lateral eyes subcontiguous; posterior median eyes separated by radius. First leg: femur 0.9, patella 0.2, tibia 0.92, metatarsus 0.94, tarsus 0.4, total length 3.36 mm; first leg 5.5 times, first femur 1.8 times as long as carapace. Stridulatory apparatus: picks on pars thoracica conspicuous spurs; abdominal files inconspicuous. Epigynum (Figs. 179-180).

Type data.—Female holotype and two females from Icacos, Guerrero, México, 15 October 1941 (C. Bolívar, R. Mercado), in AMNH.

Distribution.—Mexican state of Guerrero.

Records.—MEXICO: *Guerrero:* Acapulco, 17 June 1936 (L. I. Davis), 3 immatures probably this species. Pie de la Cuesta, 8 mi. W Acapulco, 29 June 1941 (L. I. Davis), female.

Anopsicus exiguus (Gertsch)
Figs. 131-133, 225

Pholcophora exigua Gertsch, 1971, p. 80.

Diagnosis.—Tiny white cavernicole, probable troglobite, with long legs (first femur more than 4 times as long as carapace), with rounded epigynum (Fig. 225), and distinctive tarsal appendage (Fig. 136) of male palpus.

Etymology.—Specific name from Latin *exiguus*, small.

Female.—Length 1.5 mm. Carapace 0.65 mm long, 0.7 mm wide. Abdomen 1 mm long, 0.7 mm wide. Whole spider whitish; black eye tubercles conspicuous. Eye triads low, moderately apart: anterior lateral eyes separated by radius; posterior median eyes separated by diameter. First leg: femur 2.5, patella 0.25, tibia 2.5, metatarsus 3.0, tarsus 0.7, total length 8.95 mm; first leg about 14 times, first femur 3.8 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 225) broadly rounded behind, with distinctive internal pattern.

Male holotype.—Length 1.2 mm. Carapace 0.5 mm long, 0.5 mm wide. Abdomen 0.7 mm long, 0.63 mm wide. Chelicerae (Fig. 133) without horns or spurs. First leg: femur 2.6, patella 0.25, tibia 3.2, metatarsus 3.5, tarsus 0.7, total length 10.25 mm; first leg 20 times, first femur 5 times as long as carapace. Male palpus (Figs. 131-132): sharp femoral spur near base of segment; tarsal appendage with pointed extension near apex.

Type data.—Male holotype and three females from Cueva de los Riscos, Sierra de la India, 6.5 km S Mapimí, Durango, México, August 1964 (W. Russell), in AMNH.

Distribution.—Known only from Cueva de los Riscos.

Anopsicus malkini, new species
Figs. 158-160, 176-178

Diagnosis.—Epigean species with short legs (first femur about twice as long as carapace), distinctive epigynum (Fig. 176) and tarsal appendage of male palpus.

Etymology.—Named for Mr. Borys Malkin.

Female.—Length 1.75 mm. Carapace 0.77 mm long, 0.7 mm wide. Abdomen 1 mm long, 0.9 mm wide. Cephalothorax and appendages dusky yellow; abdomen gray. Triads of eyes: anterior lateral eyes separated by two-thirds diameter; posterior median eyes separated by long diameter. First leg: femur 1.5, patella 0.28, tibia 1.65, metatarsus 1.7, tarsus 0.6, total length 5.73 mm; first leg 7.4 times, first femur about twice as long as carapace. Stridulatory apparatus: pars thoracica with curved pick on each corner; files inconspicuous foveae at base of abdomen. Epigynum (Figs. 176-178).

Male holotype.—Length 1.8 mm. Carapace 0.8 mm long, 0.75 mm wide. Abdomen 1 mm long, 0.9 mm wide. Eye triads closer together: anterior lateral eyes separated by one-third diameter; posterior median eyes separated behind by diameter. Chelicerae (Fig. 160) with sharp horns at middle of face. First leg: femur 1.5, patella 0.3, tibia 1.2, metatarsus 1.9, tarsus 0.5, total length 5.40 mm; first leg 6.7 times, first femur about twice as long as carapace. Male palpus (Figs. 158-159).

Type data.—Male holotype, male and 6 females from 7 mi. E San Blas, Nayarit, México, 27 June 1964 (W. J. Gertsch, J. Woods), in AMNH.

Distribution.—Coastal area of Nayarit.

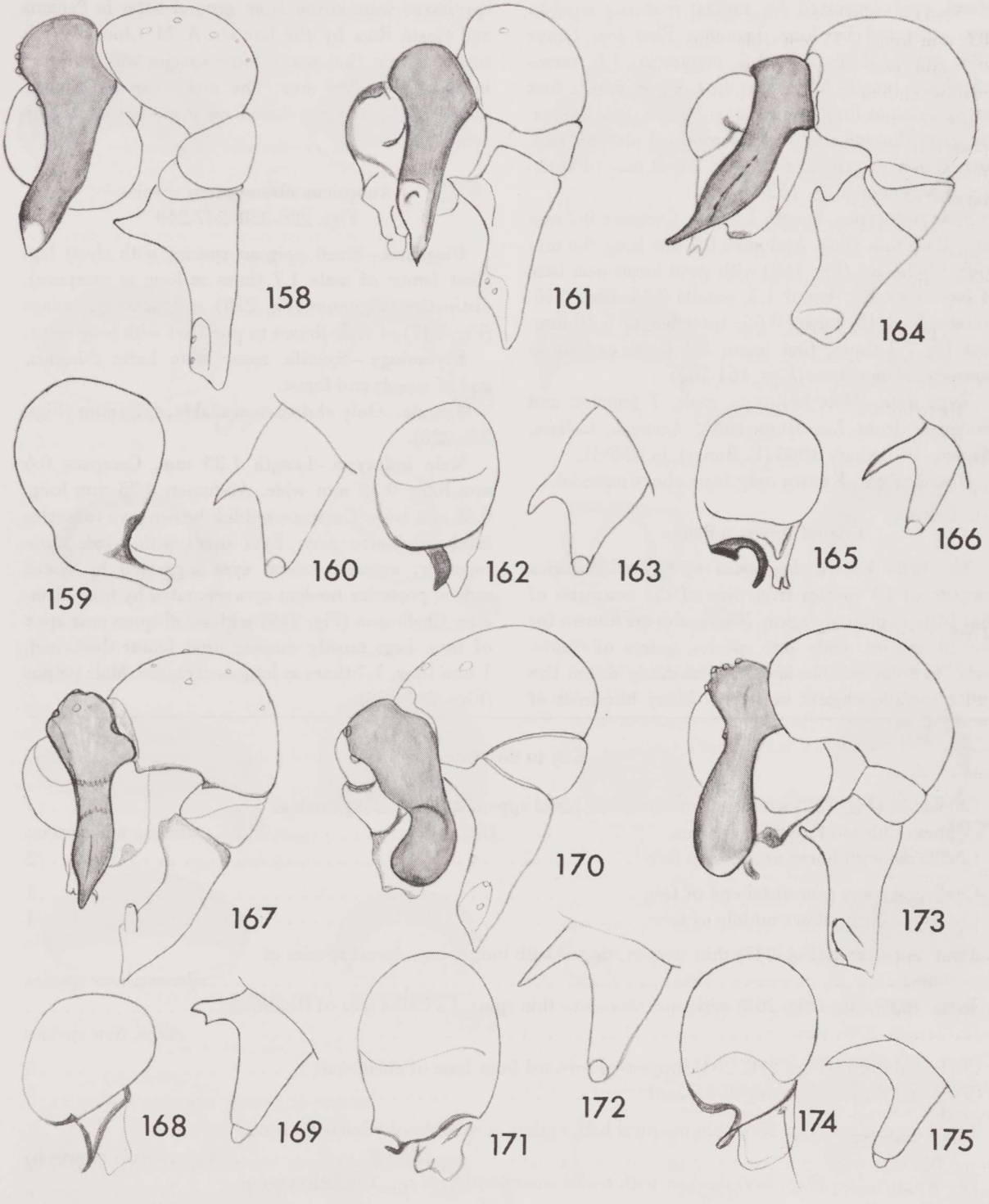
Record.—MEXICO: *Nayarit:* San Blas, 1947 (C. and M. Goodnight, B. Malkin), female.

Anopsicus boneti, new species
Figs. 74, 152-154, 161-163

Diagnosis.—Epigean species with legs of medium length (first femur 2.1 times as long as carapace), distinctive epigynum (Fig. 152) and tarsal appendage (Fig. 161) of male palpus.

Etymology.—Named for the late Dr. Federico Bonet of Mexico City.

Female.—Length 1.6 mm. Carapace 0.65 mm long, 0.6 mm wide. Abdomen 1 mm long, 0.9 mm wide. Cephalothorax and appendages dusky yellow; abdomen grayish. Eyes small in close set triads: anterior



Figs. 158-175.—Species of *Anopsicus:* Figs. 158-160: *A. malkini,* male: 158, left palpus, retrolateral view; 159, bulb of palpus, prolateral view; 160, left chelicera, retrolateral view. Figs. 161-163: *A. boneti,* male: 161, left palpus, retrolateral view; 162, bulb of palpus, prolateral view; 163, left chelicera, retrolateral view. Figs. 164-166: *A. reddelli,* male: 164, left palpus, retrolateral view; 165, bulb of palpus, prolateral view; 166, left chelicera, retrolateral view. Figs. 167-169: *A. speophila* (Chamberlin and Ivie), male: 167, left palpus, retrolateral view; 168, bulb of palpus, prolateral view; 169, left chelicera, retrolateral view. Figs. 170-172: *A. pearsei* (Chamberlin and Ivie), male: 170, left palpus, retrolateral view; 171, bulb of palpus, prolateral view; 172, left chelicera, retrolateral view. Figs. 173-175: *A. wileyae,* male: 173, left palpus, retrolateral view; 174, bulb of palpus, prolateral view; 175, left chelicera, retrolateral view.

lateral eyes separated by radius; posterior median eyes separated by long diameter. First leg: femur 1.35, patella 0.25, tibia 1.5, metatarsus 1.6, tarsus 0.5, total length 5.20 mm; first leg 8 times, first femur twice as long as carapace. Stridulatory apparatus: pars thoracica with small rounded pick on each corner; pair of grayish files (Fig. 74) at base of abdomen. Epigynum (Figs. 152-154).

Male holotype.—Length 1.4 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.7 mm long, 0.6 mm wide. Chelicerae (Fig. 163) with stout horns near base of face. First leg: femur 1.5, patella 0.25, tibia 1.35, metatarsus 1.45, tarsus 0.55, total length 5.10 mm; first leg 7.3 times, first femur 2.1 times as long as carapace. Male palpus (Figs. 161-162).

Type data.—Male holotype, male, 7 females, and immature from Las Humedades, Armería, Colima, México, 19 January 1945 (F. Bonet), in AMNH.

Distribution.—Known only from above material.

Central America Fauna

The little known *Anopsicus* of Central America consists of 13 species from five of the countries of that little exploited region. Nine males are known for the 13 species. Only one species, *quieta* of Guatemala, is a cavernicole and the remaining dozen live under surface objects or debris. Many hundreds of specimens were sifted from ground litter in Panama and Costa Rica by the late Dr. A. M. Chickering. It seems certain that many more species will be found in this diversified area. The males can be quickly identified by the key based on the palpi and chelicerae.

Anopsicus silvanus, new species
Figs. 226-228, 247-249

Diagnosis.—Small epigean species with short legs (first femur of male 1.7 times as long as carapace), distinctive epigynum (Fig. 226), and tarsal appendage (Fig. 247) of male drawn to point set with long spine.

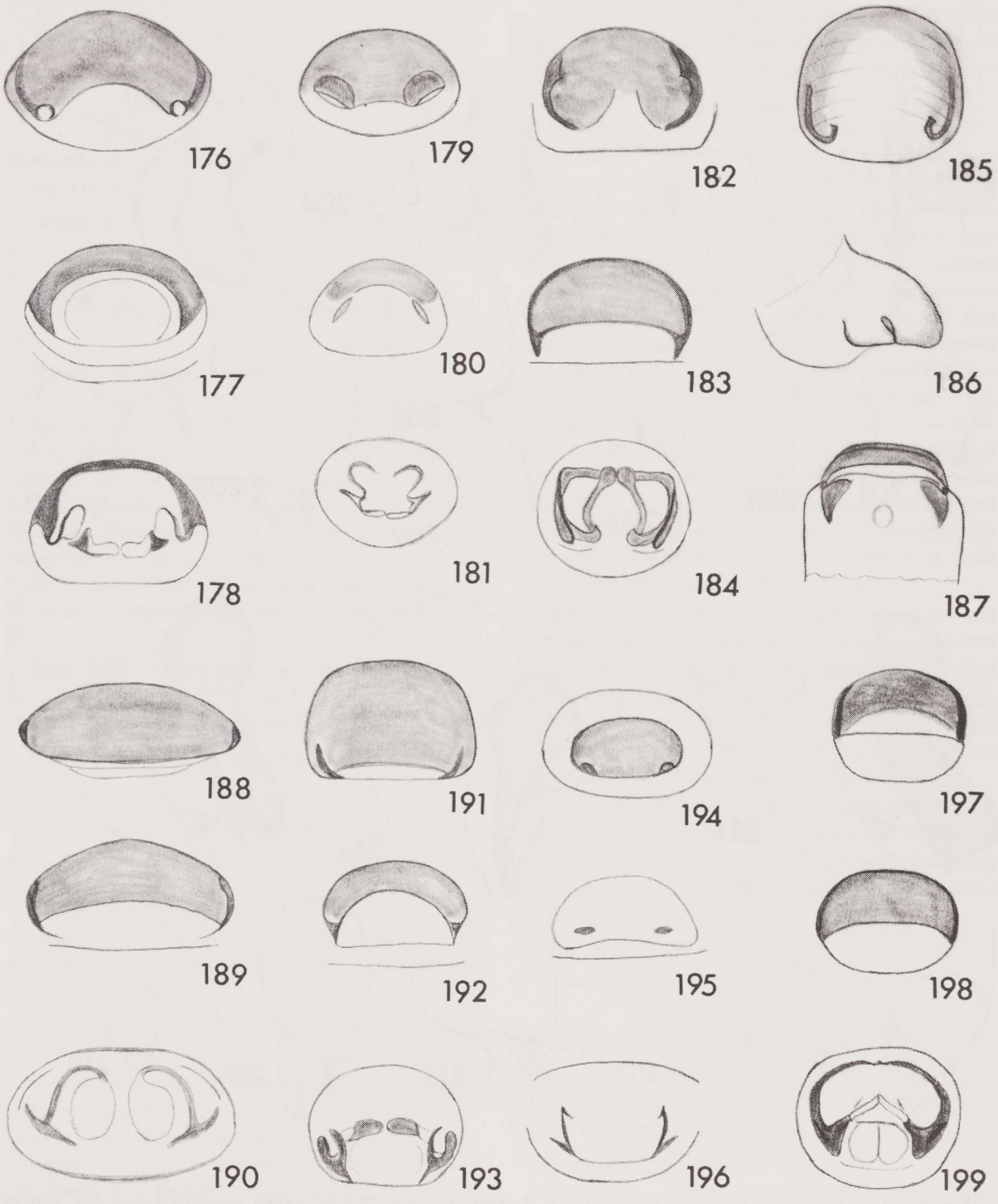
Etymology.—Specific name from Latin *Silvanus*, god of woods and forest.

Female.—Only abdomen available; epigynum (Figs. 226-228).

Male holotype.—Length 1.35 mm. Carapace 0.6 mm long, 0.55 mm wide. Abdomen 0.75 mm long, 0.56 mm wide. Carapace reddish brown; eye tubercles black; abdomen gray. Eyes small with triads close together: anterior lateral eyes separated by about radius; posterior median eyes separated by long diameter. Chelicerae (Fig. 249) with small spurs near apex of face. Legs mostly missing; first femur thickened, 1 mm long, 1.7 times as long as carapace. Male palpus (Figs. 247-249).

Key to the Males

1. Chelicerae (Fig. 252) without horns or spurs; tarsal appendage (Fig. 250) thick at apex; Chiriqui Province, Panama . . . . . *chiriqui*, new species
   Chelicerae with horns or spurs on face 2
2. Cheliceral spurs near distal end of face 3
   Cheliceral horns above middle of face 4
3. Tarsal appendage (Fig. 247) thin at apex, tipped with long spines; forest species of Belize . . . . . *silvanus*, new species
   Tarsal appendage (Fig. 262) with apex drawn to thin spine; La Ceiba area of Honduras . . . . . *ceiba*, new species
4. Cheliceral horns (Figs. 258, 261) projecting forward from base of chelicerae 5
   Cheliceral horns projecting downward 6
5. Tarsal appendage (Fig. 256) thin in apical half, ending in small hook; Canal Zone of Panama . . . . . *zeteki* (Gertsch)
   Tarsal appendage (Fig. 259) thicker, with trivial emargination at tip; Turrialba region of Costa Rica . . . . . *turrialba*, new species
6. Tarsal appendage thick at apex 7
   Tarsal appendage (Fig. 326) drawn to thin spine; Panama Canal Zone . . . . . *panama*, new species
7. Tarsal appendage (Fig. 253) spatulate; Panama Canal Zone . . . . . *chickeringi*, new species
   Tarsal appendage broadly truncated at apex 8
8. Tarsal appendage (Fig. 266) truncated; Honduras . . . . . *joyoa*, new species
   Tarsal appendage (Fig. 244) bent at apex; Costa Rica . . . . . *facetus*, new species



Figs. 176-199.—Epigyna of *Anopsicus:* Figs. 176-178: *A. malkini:* 176, ventral view; 177, posterior view; 178, dorsal view. Figs. 179-181: *A. beatus:* 179, ventral view; 180, posterior view; 181, dorsal view. Figs. 182-184: *A. modicus:* 182, ventral view; 183, posterior view; 184, dorsal view. Figs. 185-187: *A. reddelli:* 185, ventral view; 186, posterior view; 187, dorsal view. Figs. 188-190: *A. evansi* (Gertsch): 188, ventral view; 189, posterior view; 190, dorsal view. Figs. 191-193: *A. alteriae:* 191, ventral view; 192, posterior view; 193, dorsal view. Figs. 194-196: *A. chiapa:* 194, ventral view; 195, posterior view; 196, dorsal view. Figs. 197-199: *A. potrero:* 197, ventral view; 198, posterior view; 199, dorsal view.

Figs. 200-218.—Species of *Anopsicus:* Figs. 200-203: *A. palenque,* male: 200, left palpus, retrolateral view; 201, bulb of palpus, prolateral view; 202, left chelicera, frontal view; 203, left chelicera, retrolateral view. Figs. 204-207: *A. debora* (Gertsch), male: 204, left palpus, retrolateral view; 205, bulb of palpus, prolateral view; 206, left chelicera, frontal view; 207, left chelicera, retrolateral view. Figs. 208-210: *A. jeanae* (Gertsch), male: 208, left palpus, retrolateral view; 209, bulb of palpus, prolateral view; 210, left chelicera, retrolateral view. Figs. 211-213: *A. bispinosus* (Gertsch): 211, left palpus, retrolateral view; 212, bulb of palpus, prolateral view; 213, left chelicera, retrolateral view. Figs. 214-215: *A. alteriae,* male: 214, left palpus, retrolateral view; 215, bulb of palpus, prolateral view. Figs. 216-218: *A. evansi* (Gertsch), male: 216, left palpus, retrolateral view; 217, bulb of palpus, prolateral view; 218, left chelicera, retrolateral view.

Type data.—Male holotype and female abdomen from Columbia Forest, Toledo District, Belize, July 1974, in AMNH.

Distribution.—Known only from above material.

Anopsicus quietus (Gertsch)
Fig. 277

Pholcophora quieta Gertsch, 1973, p. 148; 1977, pp. 112, 115.

Diagnosis.—Dusky cavernicole of Guatemala with legs of medium length (first femur 2.2 times as long as carapace) and distinctive epigynum (Fig. 277).

Etymology.—Specific name from Latin *quietus*, quiet.

Female holotype.—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; abdomen greenish. Eye triads well separated: anterior lateral eyes separated by one and one-half diameters; posterior median eyes separated by two diameters. First leg: femur 1.7, patella 0.3, tibia 1.8, metatarsus 2.1, tarsus 1, total length 6.9 mm; first leg 8 times, first femur 2.2 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 277).

Type data.—Female holotype from Gruta de Silvino, Izabal, 34 km W Puerto Charrios, Guatemala, 20-22 August 1969 (S. and J. Peck), in AMNH.

Distribution.—Known only from Gruta de Silvino.

Anopsicus hanakash (Brignoli)

Pholcophora hanakash Brignoli, 1974, p. 221.

Diagnosis.—Epigean species of Guatemala with short legs (first femur about 1.9 times as long as carapace) and epigynum similar to those of *placens* and *jeanae* of Chiapas.

Etymology.—Named for Hanakash, forest God of Lacandon Indians.

Female holotype.—Length 1.85 mm. Carapace 0.85 mm long, 0.76 mm wide. Abdomen 1 mm long. Carapace yellowish; abdomen grayish with blue spots. Anterior lateral eyes separated by 1.5 diameters. First leg: femur 1.5, patella 0.22, tibia 1.55, metatarsus 1.8, tarsus, 0.62, total length 5.69 mm; first leg 8 times, first femur about 1.9 times as long as carapace.

Type data.—Female holotype from Río Usumacinta, near Yaxchilán, Guatemala, 12 March 1971 (A. Zullini), in Accademia Nazionale dei Lincei, Rome (not seen).

Anopsicus ceiba, new species
Figs. 262-265, 269-270

Diagnosis.—Brown epigean species from Honduras with short legs (first femur about twice as long as carapace), distinctive epigynum (Fig. 269) and tarsal appendage (Fig. 262) of male palpus.

Etymology.—Specific name from Spanish *ceiba*, silk-cotton tree, used in apposition.

Female.—Length 1.7 mm. Carapace 0.8 mm long, 0.73 mm wide. Abdomen 0.9 mm long, 1.75 mm wide. Cephalothorax and appendages dusky orange brown; carapace with prominent brown Y-shaped marking on pars cephalica flanked by conspicuous brown stridulatory picks; abdomen grayish. Eye triads close together: anterior lateral eyes separated by three-fourths diameter; posterior median eyes separated by long diameter. First leg: femur 1.45, patella 0.27, tibia 1.67, metatarsus 1.83, tarsus 0.63, total length 5.85 mm; first leg 7.3 times, first femur 1.8 times as long as carapace. Stridulatory apparatus (Fig. 265): pars thoracica with conspicuous elevated picks on each side of cervical groove; abdomen with oval brown foveal files close together high on front face. Epigynum (Figs. 269-270).

Male holotype.—Length 1.4 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.7 mm long, 0.6 mm wide. Chelicerae (Fig. 264) with thin spurs near apex overhanging fang. First leg: femur 1.5, patella 0.27, tibia 1.5, metatarsus 1.64, tarsus 0.5, total length 5.41 mm; first leg 7.7 times, first femur 2.1 times as long as carapace. Male palpus (Figs. 262-263).

Type data.—Male holotype and female from 14 km S La Ceiba, Departamento Atlantida, Honduras, 22 March 1979 (W. L. Brown, Jr.) from under rotten wood in steep forest slope at 130 meters, deposited in MCZ.

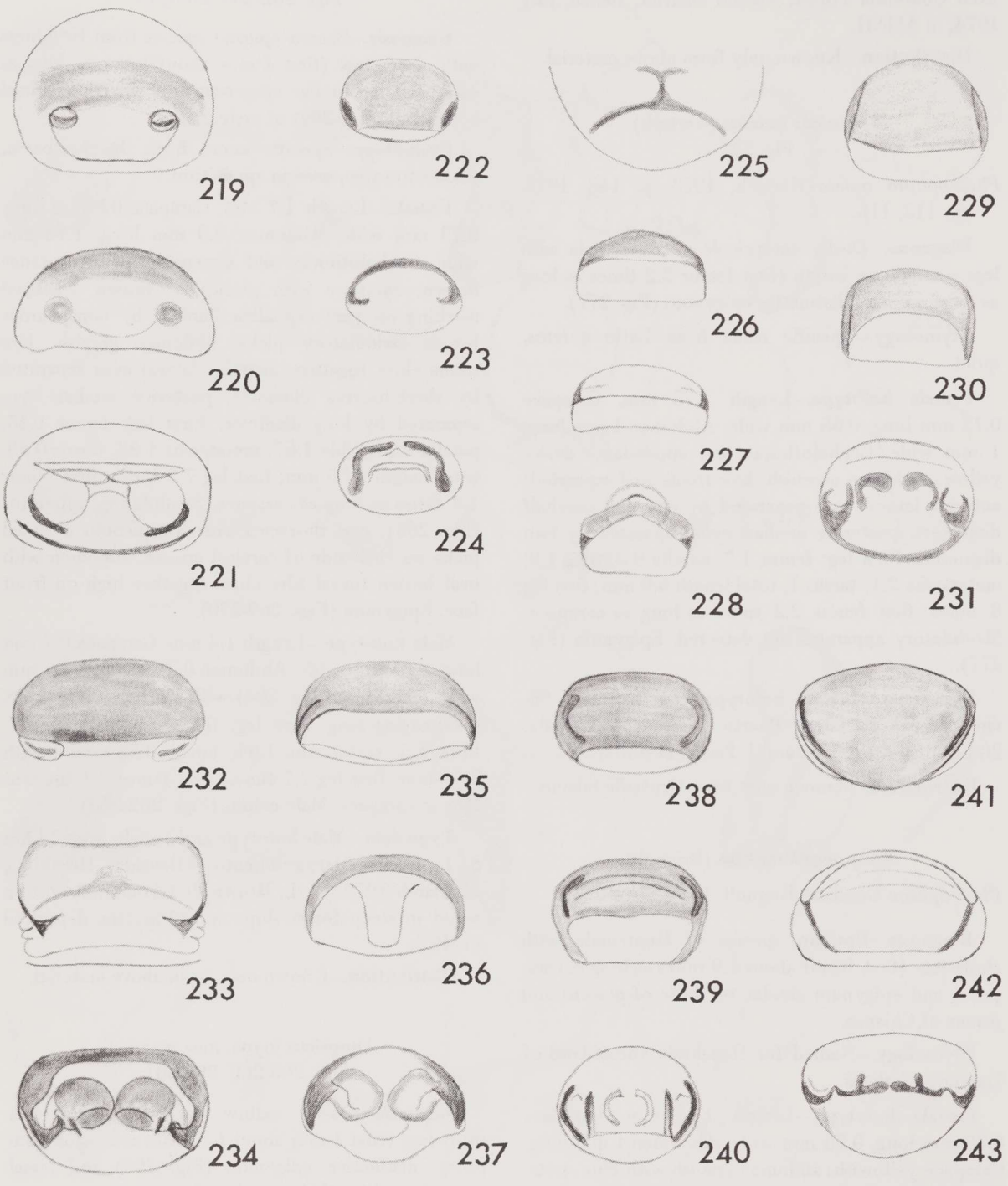
Distribution.—Known only from above material.

Anopsicus joyoa, new species
Figs. 266-268, 299-301

Diagnosis.—Dusky yellow epigean species with short legs (first femur about 1.8 times as long as carapace), distinctive epigynum (Fig. 299) and tarsal appendage (Fig. 266) of male palpus.

Etymology.—Specific name from Lake Joyoa, type locality, used in apposition.

Female.—Length 1.8 mm. Carapace 0.8 mm long, 0.75 mm wide. Abdomen 1 mm long, 0.85 mm wide. Cephalothorax and legs dusky yellow; abdomen grayish with greenish tinge. Eye triads close together: anterior lateral eyes separated by short diameter;



Figs. 219-243.—Epigyna of *Anopsicus:* Figs. 219-221: *A. facetus:* 219, ventral view; 220, posterior view; 221, dorsal view. Figs. 222-224: *A. turrialba:* 222, ventral view; 223, posterior view; 224, dorsal view. Fig. 225: *A. exiguus* (Gertsch), epigynum, ventral view. Figs. 226-228: *A. silvanus:* 226, ventral view; 227, posterior view; 228, dorsal view. Figs. 229-231: *A. concinnus:* 229, ventral view; 230, posterior view; 231, dorsal view. Figs. 232-234: *A. definitus:* 232, ventral view; 233, posterior view; 234, dorsal view. Figs. 235-237: *A. chiriqui:* 235, ventral view; 236, posterior view; 237, dorsal view. Figs. 238-240: *A. chickeringi:* 239, ventral view; 239, posterior view; 240, dorsal view. Figs. 241-243: *A. zeteki* (Gertsch): 241, ventral view; 242, posterior view; 243, dorsal view.

posterior lateral eyes separated by more than long diameter. First leg: femur 1.45, patella 0.3, tibia 1.55, metatarsus 1.8, tarsus 0.65, total length 5.65 mm; first leg 7 times, first femur 1.8 times as long as carapace. Stridulatory apparatus: pars thoracica with small lobular picks near side corners; abdomen with large oval foveal files on each side just above pedicel. Epigynum (Figs. 299-301).

Male holotype.—Length 1.8 mm. Carapace 0.83 mm long, 0.78 mm wide. Abdomen 1 mm long, 0.7 mm wide. Chelicerae (Fig. 268) with small sharp horns set at middle of face. First leg: femur 1.52, patella 0.27, tibia 1.6, metatarsus 1.9, tarsus 0.7, total length 5.99 mm; first leg 7.2 times, first femur 1.7 times as long as carapace. Male palpus (Figs. 266-267).

Type data.—Male holotype and female from E side island, Lake Joyoa, Departamento Cortes, Honduras (W. L. Brown, Jr.) from forest leaf litter of hill, 700 meters, deposited in MCZ.

Distribution.—Known only from above material.

Anopsicus definitus, new species
Figs. 232-234

Diagnosis.—Yellowish epigean species withe legs of medium length (first femur 2.7 times as long as carapace) and distinctive epigynum (Fig. 232). Male unknown.

Etymology.—Specific name from Latin *definitus*, definite, distinct.

Female holotype.—Length 1.7 mm. Carapace 0.9 mm long, 0.9 mm wide. Abdomen 0.9 mm long, 0.75 mm wide. Cephalothorax and appendages bright yellow; carapace with faint Y-shaped figure; abdomen dark greenish gray. Eye triads well separated: anterior lateral eyes separated by little more than long diameter; posterior median eyes separated by slightly more. First leg: femur 2.45, patella 1.35, tibia 2.75, metatarsus 3.3, tarsus missing; first femur 2.7 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 232-234).

Type data.—Female holotype from Lancetilla, Honduras, 14 July 1929 (A. M. Chickering), in MCZ.

Distribution.—Known only from above specimen.

Anopsicus concinnus, new species
Figs. 53, 229-231

Diagnosis.—Dark epigean species of Costa Rica with legs of medium length (first femur 1.8 times as long as carapace), lateral eyes subcontiguous, and distinctive epigynum (Fig. 229). Male unknown.

Etymology.—Specific name from Latin *concinnus*, pleasing.

Female holotype.—Length 1.2 mm. Carapace 0.6 mm long, 0.5 mm wide. Abdomen 0.65 mm long, 0.55 mm wide. Cephalothorax and appendages dark yellowish brown; carapace with dark Y-shaped figure; abdomen dark gray. Eyes (Fig. 53) small, triads close together: anterior lateral eyes nearly touching; posterior median eyes separated by diameter. First leg: femur 1.1, patella 0.21, tibia 1.2, metatarsus 1.12, tarsus 0.4, total length 4.03 mm; first leg 6.7 times, first femur 1.8 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 229-231).

Type data.—Female holotype and broken female from Puntarenas Reserve near Cabuya, Costa Rica, 9 July 1976 (C. and M. Goodnight), in AMNH.

Distribution.—Known only from above material.

Anopsicus facetus, new species
Figs. 50, 219-221, 244-246

Diagnosis.—Dark epigean species of Costa Rica with large eyes (Fig. 50), short legs (first femur about twice as long as carapace), distinctive epigynum (Fig. 219) and tarsal appendage (Fig. 244) of male palpus strongly bent at apex.

Etymology.—Specific name from Latin *facetus*, elegant.

Female.—Length 1.7 mm. Carapace 0.7 mm long, 0.7 mm wide. Abdomen 1.2 mm long, 1 mm wide. Cephalothorax and appendages dark reddish brown; abdomen dusky, paler below. Eyes (Fig. 50) large on prominent tubercles of moderately spaced triads: anterior lateral eyes separated by nearly full diameter; posterior median eyes separated by full diameter. Femora of all legs thickened; first leg: femur 1.25, patella 0.2, tibia 1.35, metatarsus 1.6, tarsus 0.6, total length 5.00 mm; first leg 7 times, first femur 1.8 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 219-221).

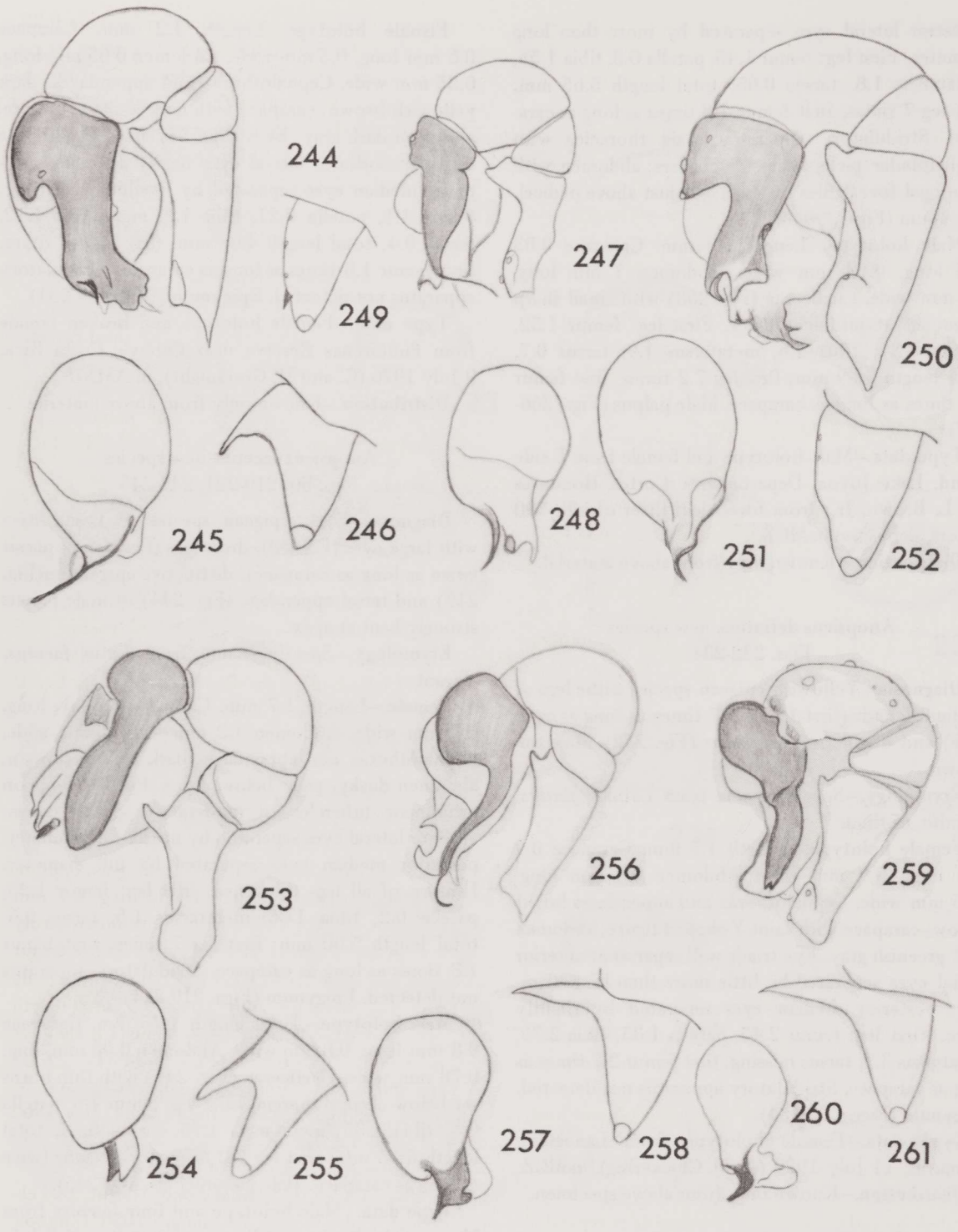
Male holotype.—Total length 1.75 mm. Carapace 0.8 mm long, 0.8 mm wide. Abdomen 0.96 mm long, 0.78 mm wide. Chelicerae (Fig. 246) with thin horns set below clypeal margin. First leg: femur 1.6, patella 0.3, tibia 1.35, metatarsus 1.75, tarsus 0.75, total length 5.75 mm; first leg 7.2 times, first femur twice as long as carapace. Male palpus (Figs. 244-245).

Type data.—Male holotype and four females from Monteverde, Puntarenas Reserve, Costa Rica, 1-9 July 1976 (M. and C. Goodnight), in AMNH.

Distribution.—Known only from above material.

Anopsicus turrialba, new species
Figs. 222-224, 259-261

Diagnosis.—Dusky brown epigean species of Costa Rica with short legs (first femur nearly twice as long



Figs. 244-261.—Species of *Anopsicus:* Figs. 244-246: *A. facetus,* male: 244, left palpus, retrolateral view; 245, bulb of palpus, prolateral view; 246, left chelicera, retrolateral view. Figs. 247-249: *A. silvanus,* male: 247, left palpus, retrolateral view; 248, bulb of palpus, prolateral view; 249, left chelicera, retrolateral view. Figs. 250-252: *A. chiriqui,* male: 250, left palpus, retrolateral view; 251, bulb of palpus, prolateral view; 252, left chelicera, retrolateral view; Figs. 253-255: *A. chickeringi,* male: 253, left palpus, retrolateral view; 254, bulb of palpus, prolateral view; 255, left chelicera, retrolateral view. Figs. 256-258: *A. zeteki* (Gertsch), male: 256, left palpus, retrolateral view; 257, bulb of palpus, prolateral view; 258, left chelicera, retrolateral view. Figs. 259-261: *A. turrialba,* male: 259, left palpus, retrolateral view; 260, bulb of palpus, prolateral view; 261, left chelicera, retrolateral view.

as carapace), distinctive epigynum (Fig. 222) and tarsal appendage (Fig. 259) of male palpus.

Etymology.—Specific name for Turrialba, type locality, used in apposition.

Female.—Length 1.35 mm. Carapace 0.62 mm long, 0.56 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Cephalothorax and appendages dusky yellowish brown; abdomen grayish. Eyes small on moderately spaced triads: anterior lateral eyes separated by little less than diameter; posterior median eyes separated by long diameter. Femora of all legs moderately thickened; first leg: femur 1.0, patella 0.22, tibia 1.07, metatarsus 1.2, tarsus 0.45, total length 3.94 mm; first leg 6.3 times, first femur 1.7 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 222-224).

Male holotype.—Length 1.1 mm. Carapace 0.62 mm long, 0.6 mm wide. Abdomen 0.8 mm long, 0.6 mm wide. Eye triads little closer together. Chelicerae (Fig. 261) with straight horns at base, projecting forward like those of *zeteki*. Second femora of legs more strongly thickened than others; first leg: femur 1.2, patella 0.25, tibia 1.2, metatarsus 1.35, tarsus 0.5, total length 4.50 mm; first leg 7 times, first femur about twice as long as carapace. Male palpus (Figs. 259-261).

Type data.—Male holotype, numerous males and females from Turrialba, Costa Rica, 25 July-15 August 1965 (A. M. Chickering), in MCZ.

Distribution.—Known only from above material.

Anopsicus chiriqui, new species
Figs. 235-237, 250-252

Diagnosis.—Dull orange epigean species of temperate Panama with legs of medium length (first femur about twice as long as carapace), male chelicerae without horns (Fig. 252), distinctive epigynum (Fig. 235) and tarsal appendage (Fig. 250) of male palpus.

Etymology.—Named for Chiriqui Province of Panama, used in apposition.

Female.—Length 1.6 mm. Carapace 0.7 mm long, 0.7 mm wide. Abdomen 1.1 mm long, 0.8 mm wide. Cephalothorax and appendages dull orange; abdomen gray. Eye triads close together: anterior lateral eyes separated by radius; posterior median eyes separated by full diameter. First leg: femur 1.5, patella 0.25, tibia 1.6 metatarsus 1.75, tarsus 0.5, total length 5.60 mm; first leg 8 times, first femur 2.1 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 235-237).

Male holotype.—Length 1.7 mm. Carapace 0.75 mm long, 0.75 mm wide. Abdomen 0.95 mm long, 0.75 mm wide. Chelicerae (Fig. 252) without horns or spurs on face. First leg: femur 1.7, patella 0.25, tibia 1.45, metatarsus 2.0, tarsus 0.7, total length 6.10 mm; first leg 8 times, first femur 2.2 times as long as carapace. Male palpus (Figs. 250-251).

Type data.—Male holotype, numerous males and females from El Volcán, Chiriqui, Panama, 12 August 1950 (A. M. Chickering), in MCZ.

Distribution.—Known only from above material.

Anopsicus chickeringi, new species
Figs. 238-240, 253-255

Diagnosis.—Pale epigean species of tropical Panama with legs of medium length (first femur 1.8 times as long as carapace), distinctive epigynum (Fig. 238) and tarsal appendage (Fig. 253) of male palpus.

Etymology.—Named for the late Dr. A. M. Chickering.

Female.—Length 1.9 mm. Carapace 0.75 mm long, 0.75 mm wide. Abdomen 1.1 mm long, 1 mm wide. Cephalothorax and appendages yellowish; carapace with dark Y-shaped linear marking outlining pars cephalica and cervical groove; abdomen grayish. Eye triads: anterior lateral eyes separated by radius; posterior median eyes separated by long diameter. Femora of legs moderately thickened; first leg: femur 1.4, patella 0.25, tibia 1.5, metatarsus 1.5, tarsus 0.5, total length 5.15 mm; first leg 6.8 times, first femur 1.8 times as long as carapace. Stridulatory apparatus: pars thoracica with small lateral picks; base of abdomen with small greenish files. Epigynum (Figs. 238-240).

Male holotype.—Length 1.9 mm. Carapace 0.9 mm long, 0.7 mm wide. Abdomen 1 mm long, 0.7 mm wide. Chelicerae (Fig. 255) with short downwardly directed horns set near base of face. Third femur much thicker than others; first leg: femur 1.6, patella 0.3, tibia 1.5, metatarsus 1.7, tarsus 0.5, total length 5.6 mm; first leg 6.2 times, first femur 1.8 times as long as carapace. Male palpus (Figs. 253-254).

Type data.—Male holotype, many males and females from Balboa, Canal Zone, Panama, May 1964 (A. M. Chickering), in MCZ.

Distribution.—Canal Zone of Panama.

Records.—PANAMA: *Canal Zone:* Gatun, 15 February 1958; Pedro Miguel, 23 January 1958; Gamboa, 7 January 1958 (all A. M. Chickering), many males, females, immature, in MCZ.

Anopsicus panama, new species
Figs. 326-328, 335-337

Diagnosis.—Dusky yellow epigean species with short legs (first femur of female 1.2 times as long as

carapace), distinctive epigynum (Figs. 335-337) wider than that of *zeteki*, and tarsal appendage (Fig. 326) of male palpus drawn to thin point.

Etymology.—Named for Panama, used in apposition.

Female.—Length 1.3 mm. Carapace 0.63 mm long, 0.5 mm wide. Abdomen 0.6 mm long, 0.5 mm wide. Cephalothorax and appendages dusky yellow; abdomen grayish. Eye triads close together: anterior lateral eyes separated by radius; posterior median eyes separated by diameter. First leg: femur 0.97, patella 0.23, tibia 0.97, metatarsus 1.1, tarsus 0.42, total length 2.69 mm; first leg about 4.3 times, first femur 1.2 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 335-337).

Male holotype.—Length 1.1 mm. Carapace 0.55 mm long, 0.5 mm wide. Abdomen 0.5 mm long, 0.45 mm wide. Chelicerae (Fig. 328) with curved horns projecting downward from near base of face. First leg: femur 1.1, patella 0.2, tibia 1.1, metatarsus 1.2, tarsus 0.4, total length 4.00 mm; first leg about 3.3 times, first femur twice as long as carapace. Male palpus (Figs. 326-327).

Type data.—Male holotype from Gatun, Panama Canal Zone, 30 January 1958 (A. M. Chickering), in MCZ.

Distribution.—Panama Canal Zone.

Record.—PANAMA: *Canal Zone:* Ft. Sherman, 16 August 1939 (A. M. Chickering), female in MCZ; arbitrarily assigned to above male.

Anopsicus zeteki (Gertsch)
Figs. 48-49, 54-55, 241-243, 256-258

Pholcophorina zeteki Gertsch, 1939, p. 1.

Diagnosis.—Yellowish epigean species from tropical Panama with legs of medium length (first femur about 1.7 times as long as carapace), distinctive epigynum (Fig. 241), male chelicerae (Fig. 258) with slender, straight horns and tarsal appendage (Fig. 256) strongly curved and ending in thin hook.

Etymology.—Named for the late James Zetek.

Female.—Length 1.7 mm. Carapace 0.62 mm long, 0.5 mm wide. Abdomen 1.1 mm long, 1.8 mm wide. Cephalothorax and appendages yellowish; abdomen bluish gray. Eyes (Figs. 48-49) and triads moderately spaced: anterior median eyes separated by five-eighths diameter; posterior median eyes separated by long diameter. First leg: femur 1.06, patella 0.2, tibia 1.08, metatarsus 1.2, tarsus 0.44, total length 3.98 mm; first leg 6.4 times, first femur 1.7 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 241-243).

Male.—Length 1.3 mm. Carapace 0.6 mm long, 0.55 mm wide. Abdomen 0.7 mm long, 0.5 mm wide. Chelicerae (Fig. 258) with straight, slender horns projecting outward from near base of face. First leg: femur 1.0, patella 0.21, tibia 1.1, metatarsus 1.2, tarsus 0.42, total length 3.93 mm; first leg about 6.6 times, first femur about 1.7 times as long as carapace. Male palpus (Figs. 256-257).

Type data.—Male holotype from Barro Colorado Island, Canal Zone, Panama, 10 February 1936 (W. J. Gertsch), in AMNH.

Distribution.—Panama Canal Zone.

Records.—PANAMA: *Canal Zone:* Barro Colorado Island, 4 July 1943, males and females; November 1952 (J. Zetek), male, females; January to July from 1934 to 1958 (A. M. Chickering), males, females (MCZ); January 1960 (W. J. Brown), male, females from leaf litter (MCZ). Summit, Experimental Gardens, Forest Preserve (A. M. Chickering), males and females (MCZ).

The West Indian Fauna

The *Anopsicus* fauna of the West Indies is in many ways the most interesting of those of the three areas in spite of the limited species representation, which certainly can be enlarged by adequate collecting. Ten species come from the island of Jamaica and some of them are especially notable; eight are cavernicoles and four of these are eyeless troglobites, represented only by females, from caves in four parishes; and *quatoculus* is a large four-eyed species which has aborted the posterior lateral eyes. The three species of Cuba are also of special interest as follows: *cubanus* is an eyeless troglobite from Cueva Grande in Las Villas Province; and living in the same cave and nearby Cueva de Colón is the large yellowish *silvai*, probably the largest species of the genus; a third whitish species, *pulcher*, was taken years ago on the surface near Soledad. Finally, I have included in this group *arima*, a typical *Anopsicus* represented by females from Trinidad (not keyed below).

The presence of a somewhat larger series of somatic characters and limited number of species make possible preparation of a key to both sexes.

Anopsicus quatoculus, new species
Figs. 56-57, 77, 281-283, 311-313

Diagnosis.—Large cavernicole with legs of medium length (first femur about twice as long as carapace, only four eyes (Figs. 56-57), posterior lateral eyes missing, distinctive epigynum (Fig. 311) and tarsal appendage (Fig. 281) of male palpus.

Key to the Males and Females

1. Species of Cuba. 2
   Species of Jamaica. 4

2. Eyes absent; tarsal appendage (Fig. 323) deeply notched and chelicerae (Fig. 325) without horns; troglobite from Cueva Grande . . . . . *.cubanus*, new species
   Eyes present. 3

3. Large yellowish species with distinctive epigynum (Fig. 338); caves of Las Villas Province. . . . . *.silvai*, new species
   Small whitish species from Soledad; bulb of male palpus (Fig. 293) with prominent lobe; epigynum (Fig. 309) with small auricular lobes. . . . . *pulcher* (Bryant)

4. Four eyes present; tarsal appendage (Fig. 281); epigynum (Fig. 311); caves of St. Ann, St. Catherine and Trelawny Parishes . . . . . *.quatoculus*, new species
   Six eyes or none present. 5

5. Males 6
   Females. 9

6. Tarsal appendage (Fig. 296) thick at apex; caves of Trelawny Parish . . . . . *.zimmermani*, new species
   Tarsal appendage much thinner at apex 7

7. Bulb of palpus (Fig. 291) with prominent lobe; chelicerae (Fig. 292) with small spurs in apical half of face; Portland Caves . . . . . *pecki*, new species
   Not so. 8

8. Tarsal appendage (Fig. 284) with two apical spurs; St. Andrew and St. Catherine Parishes . . . . . *lewisi*, new species
   Tarsal appendage (Fig. 287) pointed blade; Cousins Cove Cave, Hanover Parish . . . . . *nortoni*, new species

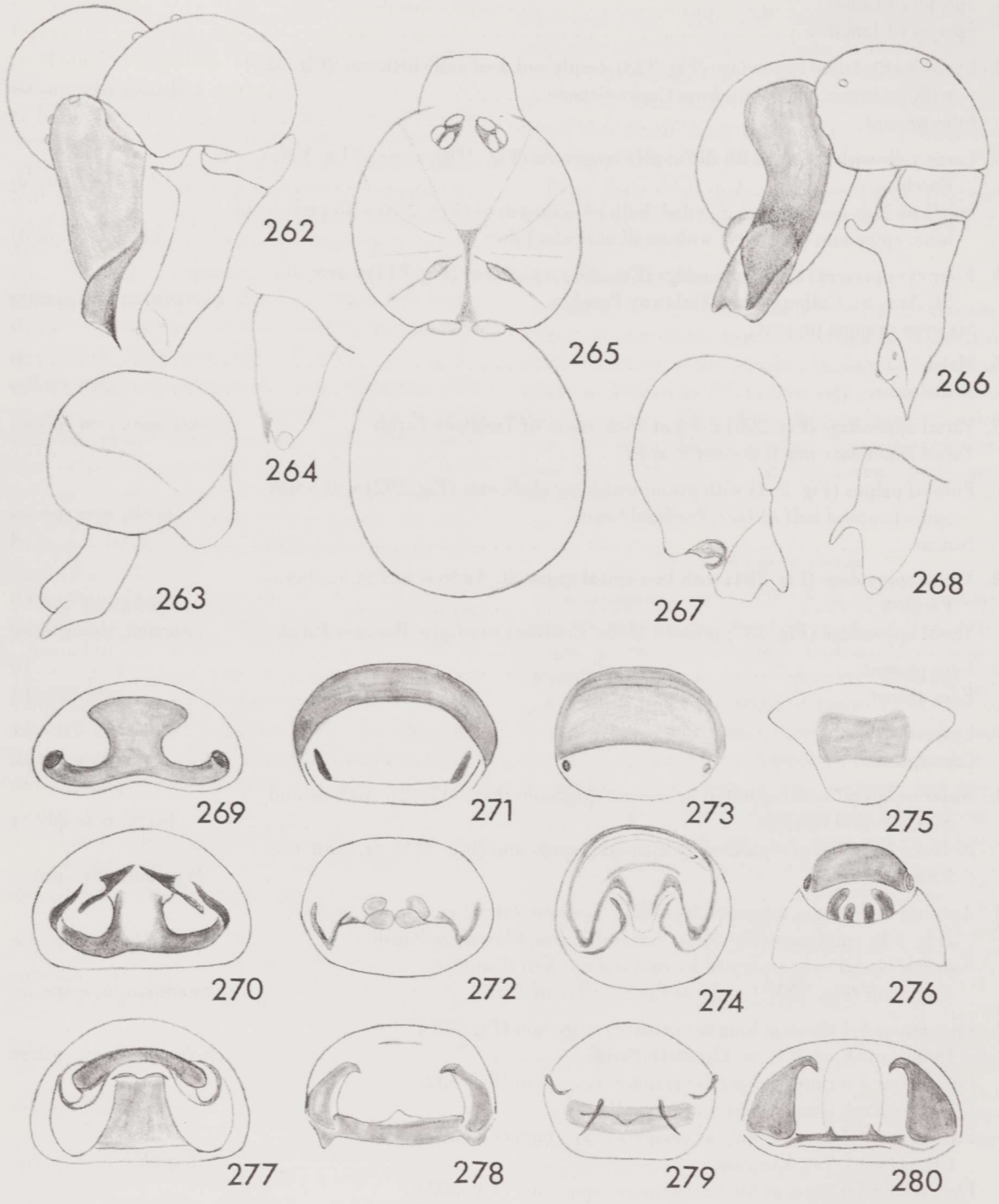
9. Eyes present. 10
   Eyes absent 13

10. Epigean species. 11
    Cave species 12

11. Anterior lateral eyes separated by radius; epigynum (Fig. 317); St. Andrew and St. Catherine Parishes . . . . . *lewisi*, new species
    Anterior lateral eyes separated by diameter; epigynum (Fig. 314); St. Catherine Parish . . . . . *bryantae*, new species

12. Anterior lateral eyes separated by radius; posterior lateral eyes much smaller; (Fig. 59); epigynum (Fig. 308); Portland Caves, Clarendon Parish . . . . . *pecki*, new species
    Anterior lateral eyes separated by one and one-half diameters; epigynum (Fig. 320); Carambie Cave, Trelawny Parish . . . . . *.zimmermani*, new species

13. First femur 6.4 times as long as carapace; epigynum (Fig. 306); Duanwarie Cave # 1, St. Elizabeth Parish . . . . . *nebulosus*, new species
    First femur 3.6 times as long as carapace; epigynum (Fig. 302); Worthy Park Cave # 2, St. Catherine Parish. . . . . *jarmila*, new species
    First femur 4.7 times as long as carapace; epigynum (Fig. 305); Cricket Cave, St. Ann Parish. . . . . *limpidus*, new species
    First femur 5.6 times as long as carapace; epigynum (Fig. 303); Jackson Bay Cave, Clarendon Parish . . . . . *clarus*, new species



Figs. 262-280.—Species of *Anopsicus:* Figs. 262-264: *A. ceiba,* male: 262, left palpus, retrolateral view; 263, bulb of palpus, prolateral view; 264, left chelicera, retrolateral view. Fig. 265: *A. ceiba,* female, showing stridulatory apparatus. Figs. 266-268: *A. joyoa,* male: 266, left palpus, retrolateral view; 267, bulb of palpus, prolateral view; 268, left chelicera, retrolateral view. Figs. 269-270: *A. ceiba,* epigynum: 269, ventral view; 270, dorsal view. Figs. 271-272: *A. lucidus,* epigynum: 271, ventral view; 272, dorsal view. Figs. 273-274: *A. bispinosus* (Gertsch), epigynum: 273, ventral view; 274, dorsal view. Figs. 275-276: *A. vinnulus,* epigynum: 275, ventral view; 276, dorsal view. Fig. 277: *A. quietus* (Gertsch), epigynum, dorsal view. Fig. 278: *A. jeanae* (Gertsch), epigynum, dorsal view. Fig. 279: *A. debora* (Gertsch), epigynum, dorsal view. Fig. 280: *A. placens* (O. P.-Cambridge), epigynum, dorsal view.

Etymology.—Specific name from Latin *quattuor*, four, and *oculus*, eyes, used in apposition.

Female.—Length 2.95 mm. Carapace 1.15 mm long, 1 mm wide. Abdomen 1.6 mm long, 1.25 mm wide. Cephalothorax and appendages yellowish brown; carapace with dusky shadings and thin Y-shaped black marking outlining pars cephalica; abdomen grayish. Eyes four, posterior laterals missing, on separated diads: anterior lateral eyes separated by long diameter; posterior median eyes separated by about two diameters. First leg: femur 2.4, patella 0.3, tibia 2.7, metatarsus 2.8, tarsus 0.7, total length 8.90 mm; first leg 7.5 times, first femur 2.1 times as long as carapace. Stridulatory apparatus: pars thoracica with transparent lobular picks; abdomen (Fig. 77) with brown files, set with few upright hairs, on each side of pedicel. Epigynum (Figs. 311-313).

Male holotype.—Length 2.3 mm. Carapace 1.1 mm long, 1 mm wide. Abdomen 1.3 mm long, 1 mm wide. Chelicerae (Fig. 283) with sharp horns at middle of face. Femora of all legs moderately thickened; first leg: femur 2.6, patella 0.3, tibia 2.7, metatarsus 3.2, tarsus 1.0, total length 9.80 mm; first leg 9 times, first femur 2.3 times as long as carapace. Male palpus (Figs. 281-282).

Type data.—Male holotype and 3 females from Thatchfield Light Hole, St. Ann Parish, Jamaica, 28 March 1973 (R. Norton, R. Zimmerman), in AMNH.

Distribution.—Caves of St. Ann, St. Catherine, and Trelawny Parishes, Jamaica.

Records.—JAMAICA: *St. Ann Parish:* Chesterfield Cave, 27 March 1973 (R. Norton, R. Zimmerman), male, 2 females. Norwood Rat Bat Hole, near Aenon Town, 2 September 1974 (S. Peck), male, 8 females, immature. *St. Catherine Parish:* Swansea Cave, Worthy Park Estate, 4 November 1973 (R. Norton), 2 females. *Trelawny Parish:* Drip Cave, 1.5 mi. SSE Stewart Town, 2 April 1968 (S. Peck, A. Fiske), 4 females, 6 immature; 28 July 1973 (R. Norton, R. Zimmerman), 2 females; 25 August 1974 (S. Peck), male, female, immature. Windsor Great Cave, 10 mi. S Falmouth, 5 April 1968 (S. Peck, A. Fiske), 2 juvenile; 26 August 1974 (S. Peck), 4 females. Harties Cave, Spring Garden, 4 April 1974 (S. Peck), female, immature.

Anopsicus nebulosus, new species
Figs. 306-307

Diagnosis.—Pale yellow, essentially eyeless troglobite with long legs (first femur 6.4 times as long as carapace) and distinctive epigynum (Fig. 306). Male unknown.

Etymology.—Specific name from Latin *nebulosus*, misty, nebulous.

Female holotype.—Length 1.4 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.7 mm long, 0.6 mm wide. Cephalothorax and appendages pale yellow; abdomen gray. Abdomen bluntly conical in shape. Pars cephalica with trivial vestiges of eyes. First leg: femur 4.5, patella 0.25, tibia 5.0, metatarsus 6.0, tarsus 1.4, total length 17.15 mm; first leg 24.5 times, first femur 6.4 times as long as carapace. Stridulatory apparatus: pars thoracica with rounded, slightly roughened picks; abdomen with narrow files on each side of pedicel. Epigynum (Figs. 306-307).

Type data.—Female holotype from Duanwarie Cave #1, St. Elizabeth Parish, Jamaica, 29 October (R. Norton), in AMNH.

Distribution.—Known only from Duanwarie Cave #1.

Anopsicus jarmila, new species
Fig. 302

Diagnosis.—Pale, essentially eyeless troglobite with long legs (first femur 3.6 times as long as carapace) and distinctive epigynum (Fig. 302). Male unknown.

Etymology.—Named for Mrs. Jarmila Peck.

Female holotype.—Length 1.6 mm. Carapace 0.68 mm long, 0.64 mm wide. Abdomen 1.1 mm long, 0.8 mm wide. Cephalothorax and appendages pale yellow; abdomen grayish. Pars cephalica with trivial vestiges of eyes. First leg: femur 2.5, patella 0.24, tibia 2.6, metatarsus 3.4, tarsus 0.7, total length 9.44 mm; first leg 14 times, first femur 3.6 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 302).

Type data.—Female holotype, 3 females and 8 juveniles from Worthy Park Cave #2, St. Catherine Parish, Jamaica, 26 December 1972 (S. and J. Peck), in AMNH.

Distribution.—Known only from Worthy Park Cave #2.

Anopsicus limpidus, new species
Fig. 305

Diagnosis.—Pale yellowish troglobite with rudimentary eyes, long legs (first femur 4.7 times as long as carapace) and distinctive epigynum (Fig. 305). Male unknown.

Etymology.—Specific name from Latin *limpidus*, clear, limpid.

Female holotype.—Length 1.75 mm. Carapace 1.8 mm long, 0.8 mm wide. Abdomen 1.1 mm long,

Figs. 281-298.—Species of *Anopsicus:* Figs. 281-283: *A. quatoculus,* male: 281, left palpus, retrolateral view; 282, bulb of palpus, prolateral view; 283, left chelicera, retrolateral view. Figs. 284-286: *A. lewisi,* male: 284, left palpus, retrolateral view; 285, bulb of palpus, prolateral view; 286, left chelicera, retrolateral view. Figs. 287-289: *A. nortoni,* male: 287, left palpus, retrolateral view; 288, bulb of palpus, prolateral view; 289, left chelicera, retrolateral view. Figs. 290-292: *A. pecki,* male: 290, left palpus, retrolateral view; 291, bulb of palpus, prolateral view; 292, left chelicera, retrolateral view. Figs. 293-295: *A. pulcher* (Bryant), male: 293, left palpus, retrolateral view; 294, bulb of palpus, prolateral view; 295, left chelicera, retrolateral view. Figs. 296-298: *A. zimmermani,* male: 296, left palpus, retrolateral view; 297, bulb of palpus, prolateral view; 298, left chelicera, retrolateral view.

1 mm wide. Cephalothorax and appendages dull yellow; abdomen gray to white. Eyes rudimentary, small, pearly white on widely separated triads. First leg: femur 3.5, patella 0.25, tibia 3.5, metatarsus 4.5, tarsus 0.75, total length 12.50 mm; first leg 15.5 times, first femur 4.7 times as long as carapace. Stridulatory apparatus: pars thoracica with small round picks; abdomen without evident files. Epigynum (Fig. 305).

Type data.—Female holotype, 2 females, and 2 immature from Cricket Cave, Douglas Castle, St. Ann Parish, Jamaica, 20 December 1972 (S. and J. Peck), in AMNH.

Distribution.—Known only from Cricket Cave.

Anopsicus clarus, new species
Figs. 303-304

Diagnosis.—Pale eyeless troglobite with long legs (first femur 5.6 times as long as carapace) and distinctive epigynum (Fig. 303). Male unknown.

Etymology.—Specific name from Latin *clarus*, clear.

Female holotype.—Length 1.9 mm. Carapace 0.8 mm long, 0.7 mm wide. Abdomen 1.2 mm long, 1 mm wide. Cephalothorax and appendages dull yellow; abdomen gray. Pars cephalica without trace of eyes. First leg: femur 4.5, patella 0.35, tibia 5.0, metatarsus 6.25, tarsus 1.2, total length 17.30 mm; first leg 21.6 times, first femur 5.6 times as long as carapace. Stridulatory apparatus: pars thoracica with rounded pick on each side; abdomen with suboval foveal files on each side of pedicel. Epigynum (Figs. 303-304).

Type data.—Female holotype and 2 females from Jackson Bay Cave, Jackson Bay, Clarendon Parish, Jamaica, 2 August 1974 (S. Peck), in AMNH.

Distribution.—Caves of Clarendon Parish, Jamaica.

Record.—JAMAICA: *Clarendon Parish:* Portland Caves, Portland Ridge, 15 May 1974 (S. Peck), female.

Anopsicus nortoni, new species
Figs. 287-289

Diagnosis.—Cavernicole with short legs (first femur 2.2 times as long as carapace) and distinctive tarsal appendage (Fig. 287) of male palpus. Female unknown.

Etymology.—Named for Mr. R. Norton.

Male holotype.—Length 1.5 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Cephalothorax and appendages dull yellowish brown; abdomen bluish gray. Eyes subequal on well spaced triads: anterior lateral eyes separated by long diameter; posterior median eyes separated by one and one-half diameters. Chelicerae (Fig. 289) with thin curved horns at middle of face. All femora moderately thickened; first leg: femur 1.56, patella 0.24, tibia 1.65, metatarsus 1.75, tarsus 0.65, total length 5.85 mm; first leg 8.3 times, first femur 2.2 times as long as carapace. Male palpus (Figs. 287-288).

Type data.—Male holotype from Cousins Cove Cave, Cousins Cove, Hanover Parish, Jamaica, 28 October 1973 (R. Norton), in AMNH.

Distribution.—Known only from Cousins Cove Cave.

Anopsicus zimmermani, new species
Figs. 58, 296-298, 320-322

Diagnosis.—Yellowish brown cavernicole with short legs (first femur about twice as long as carapace), distinctive epigynum (Fig. 320) and tarsal appendage (Fig. 296) of male palpus.

Etymology.—Named for Mr. R. Zimmerman.

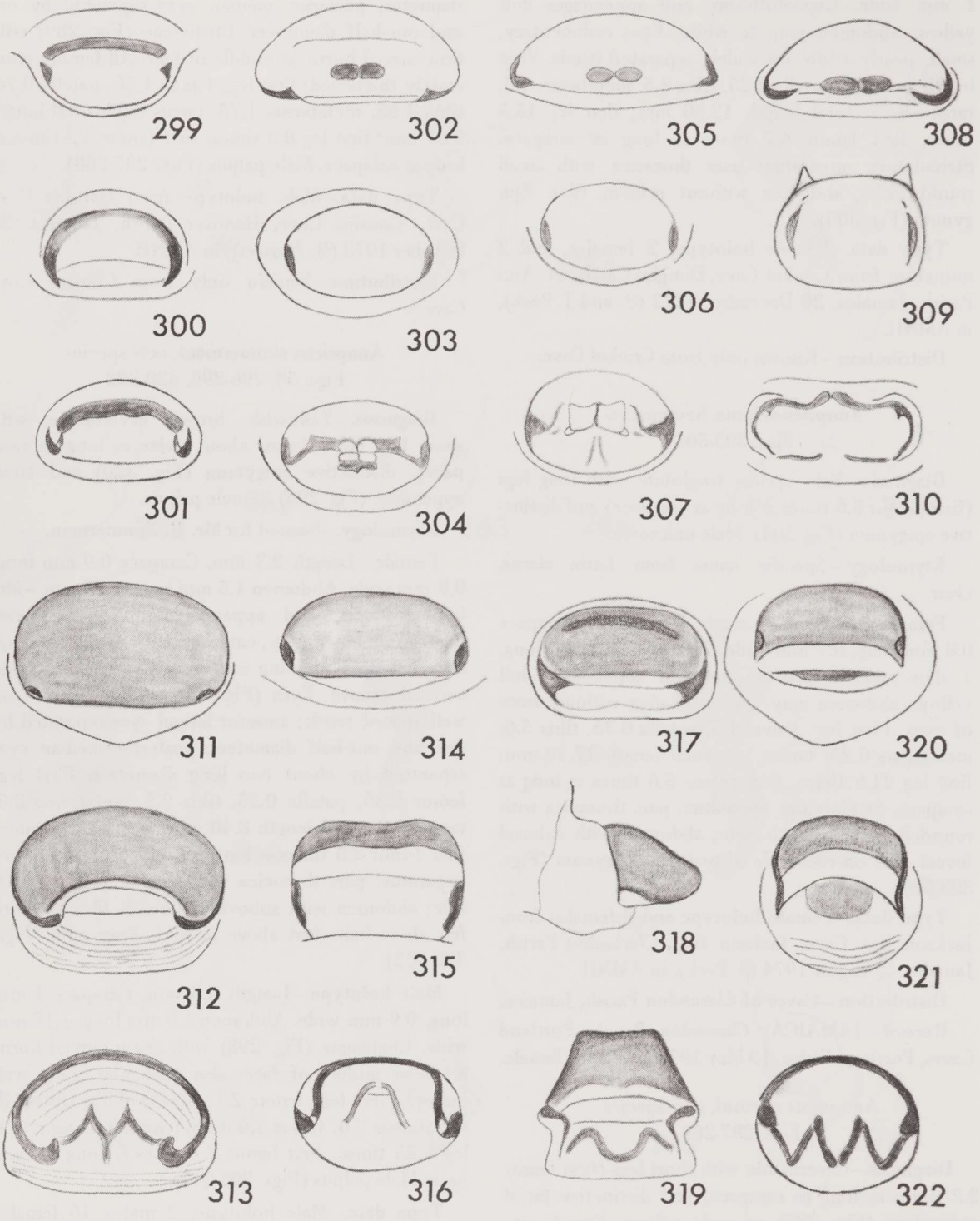
Female.—Length 2.3 mm. Carapace 0.9 mm long, 0.8 mm wide. Abdomen 1.5 mm long, 1.25 mm wide. Cephalothorax and appendages dusky yellowish brown; abdomen gray; carapace with dusky shadings and Y-shaped marking outlining pars cephalica and cervical groove. Eyes (Fig. 58) subequal in size on well spaced triads; anterior lateral eyes separated by one and one-half diameters; posterior median eyes separated by about two long diameters. First leg: femur 2.25, patella 0.25, tibia 2.5, metatarsus 2.5, tarsus 0.9, total length 8.40 mm; first leg 9.3 times, first femur 2.5 times as long as carapace. Stridulatory apparatus: pars thoracica with lobular pick on each side; abdomen with suboval yellowish files set with few short hairs just above pedicel. Epigynum (Figs. 320-322).

Male holotype.—Length 2.3 mm. Carapace 1 mm long, 0.9 mm wide. Abdomen 1.3 mm long, 1.15 mm wide. Chelicerae (Fig. 298) with sharp curved horns set near middle of face, also triangular spurs well below. First leg: femur 2.1, patella 0.35, tibia 2.8, metatarsus 3.0, tarsus 1.0, total length 9.25 mm; first leg 9.25 times, first femur 2.1 times as long as carapace. Male palpus (Figs. 296-297).

Type data.—Male holotype, 2 males, 16 females and immature from Carambie Cave, Spring Garden, Trelawny Parish, Jamaica, 4 November 1974 (S. Peck), in AMNH.

Distribution.—Caves of Trelawny Parish, Jamaica.

Record.—JAMAICA: *Trelawny Parish:* Printed Circuit Cave, 30 March 1973 (R. Norton, R. Zimmerman), female.



Figs. 299-322.–Epigyna of *Anopsicus:* Figs. 299-301: *A. joyoa:* 299, ventral view; 300, posterior view; 301, dorsal view. Fig. 302: *A. jarmila,* ventral view. Figs. 303-304: *A. clarus:* 303, ventral view; 304, dorsal view. Fig. 305: *A. limpidus,* ventral view. Figs. 306-307: *A. nebulosus:* 306, ventral view; 307, dorsal view. Fig. 308: *A. pecki,* dorsal view. Fig. 309: *A. pulcher* (Bryant), subdorsal view. Fig. 310: *A. arima,* ventral view. Figs. 311-313: *A. quatoculus:* 311, ventral view; 312, posterior view; 313, dorsal view. Figs. 314-316: *A. bryantae:* 314, ventral view; 315, posterior view; 316, dorsal view. Figs. 314-316: *A. bryantae:* 314, ventral view; 315, posterior view; 316, dorsal view. Figs. 317-319: *A. lewisi:* 317, ventral view; 318, posterior view; 319, dorsal view. Figs. 320-322: *A. zimmermani:* 320, ventral view; 321, posterior view; 322, dorsal view.

Anopsicus pecki, new species
Figs. 290-292, 308

Diagnosis.—Pale yellow cavernicole, probable troglobite, with long thin legs (first femur 3.3 times as long as carapace), distinctive epigynum (Fig. 308) and tarsal appendage (Fig. 290) of male palpus.

Etymology.—Named for Dr. Stewart Peck of Carleton University, Ottawa, Canada.

Female.—Length 1.3 mm. Carapace 0.62 mm long, 0.6 mm wide. Abdomen 0.7 mm long, 0.7 mm wide. Whole spider pale yellow with conspicuous black eye tubercles. Eyes small, dissimilar, posterior lateral pair small; eye triads close together: anterior lateral eyes separated by radius; posterior median eyes separated by nearly diameter. First leg: femur 2.1, patella 0.22, tibia 2.25, metatarsus 2.69, tarsus 0.65, total length 7.91 mm; first leg 12.7 times, first femur 3.3 times as long as carapace. Stridulatory apparatus: pars thoracica with inconspicuous rounded picks; abdomen without obvious traces of files. Epigynum (Fig. 308).

Male holotype.—Length 1.25 mm. Carapace 0.55 mm long, 0.53 mm wide. Abdomen 0.7 mm long, 0.6 mm wide. Chelicerae (Fig. 292) short spur in distal half of face. Fourth leg: femur 2.1, patella 0.24, tibia 2.0, metatarsus 2.55, tarsus 0.5, total length 7.39 mm; fourth leg 13.4 times, fourth femur 3.7 times as long as carapace. Male palpus (Figs. 290-291).

Type data.—Male holotype, male and 2 females from Portland Caves, Portland Ridge, Clarendon Parish, Jamaica, 22 December 1972 (S. and J. Peck) and 15 August 1974 (S. Peck), male, female, immature, in AMNH.

Distribution.—Known only from Portland Caves; sympatric with eyeless troglobite *clarus* from same cave.

Anopsicus lewisi, new species
Figs. 284-286, 317-319

Diagnosis.—Epigean species with short legs (first femur about twice as long as carapace), distinctive epigynum (Fig. 317) and tarsal appendage (Fig. 284) of male palpus.

Etymology.—Named for Dr. Bernard Lewis, Director of the Institute of Jamaica.

Female.—Length 1.7 mm. Carapace 0.73 mm long, 0.65 mm wide. Abdomen 1 mm long, 0.7 mm wide. Cephalothorax and appendages dusky orange brown; abdomen gray with bluish patches. Eyes subequal in size on closely set triads: anterior lateral eyes separated by radius; posterior median eyes separated by diameter. First leg: femur 1.17, patella 0.22, tibia 1.3, metatarsus 1.3, tarsus 0.35, total length 4.34 mm; first leg 5.9 times, first femur 1.6 times as long as carapace. Stridulatory apparatus: pars thoracica with transparent lobular picks on each side; abdomen with foveal files above pedicel. Epigynum (Figs. 317-319).

Male holotype.—Length 1.5 mm. Carapace 0.7 mm long, 0.65 mm wide. Abdomen 0.85 mm long, 0.6 mm wide. Chelicerae (Fig. 286) with short sharp horns pointing toward apices. All femora moderately thickened; first leg: femur 1.4, patella 0.24, tibia 1.45, metatarsus 1.5, tarsus 0.55, total length 5.14 mm; first leg 7.3 times, first femur twice as long as carapace. Male palpus (Figs. 284-285).

Type data.—Male holotype, male, 5 females and immature from 2 mi. W junction Red Hills Road to Spanishtown, St. Catherine Parish, Jamaica, November 1957 (A. M. Chickering), in MCZ.

Distribution.—St. Andrew and St. Catherine Parishes of Jamaica.

Records.—JAMAICA: *St. Catherine Parish:* 1 mi. W Spanishtown, 21 October 1957 (A. M. Chickering), male, female. *St. Andrew Parish:* Ferry, 9-10 mi. W Red Hills Road, 27 September 1957 (A. M. Chickering), 2 females; Cooper's Hill, 11 October 1960 (P. F. Bellinger), 1 immature; Red Hills Road, 28 October 1957 (A. M. Chickering), 2 males, 2 females, 7 immature; Hermitage Reservoir, 26 November 1927 (A. M. Chickering), female; Constant Springs, 28 May 1956 (C. C. Hoff), female. All above material in MCZ.

Anopsicus bryantae, new species
Figs. 314-316

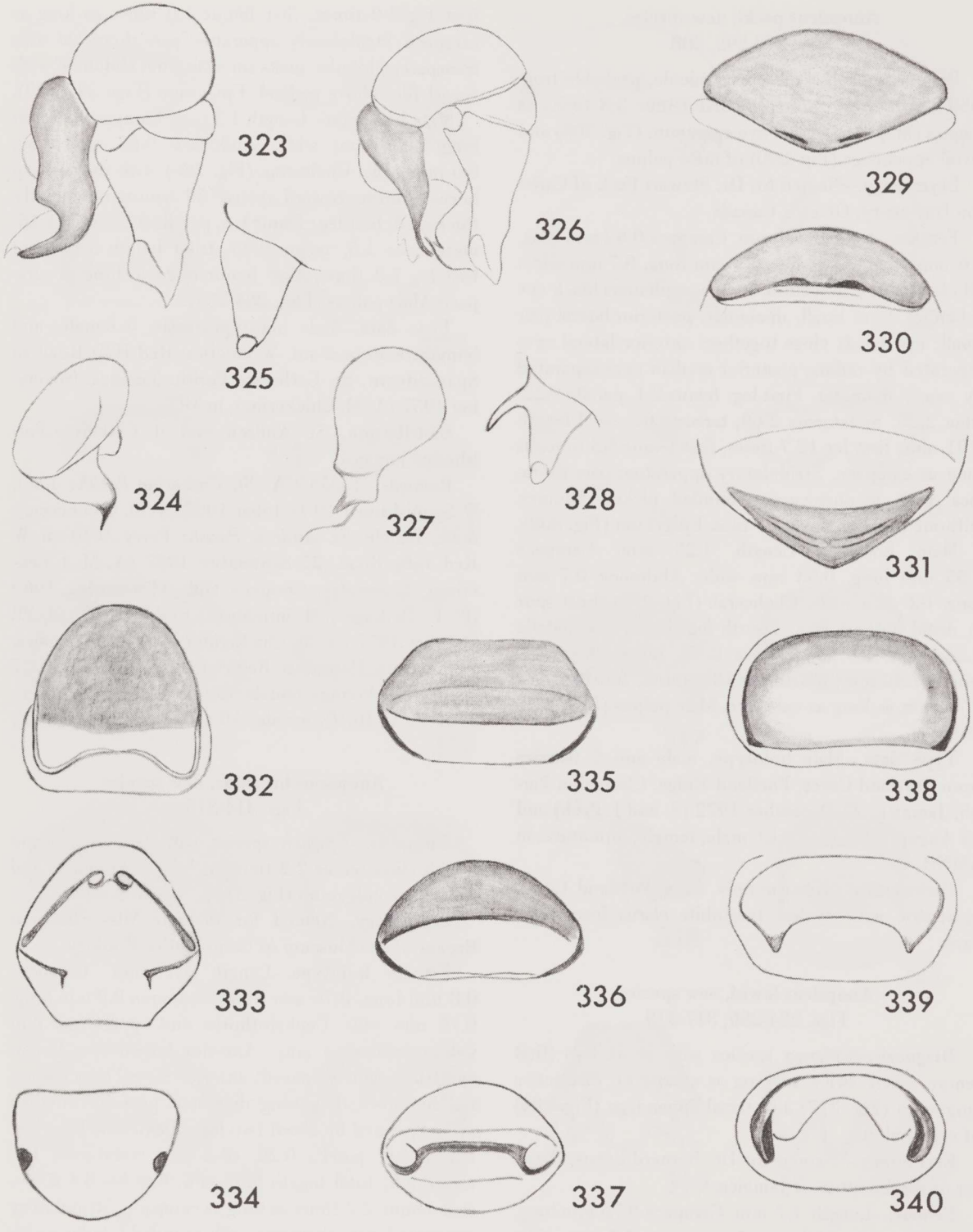
Diagnosis.—Epigean species with legs of medium length (first femur 2.2 times as long as carapace) and distinctive epigynum (Fig. 314). Male unknown.

Etymology.—Named for the late Miss Elizabeth Bryant of the Museum of Comparative Zoology.

Female holotype.—Length 1.7 mm. Carapace 0.8 mm long, 0.76 mm wide. Abdomen 0.9 mm long, 0.75 mm wide. Cephalothorax and appendages dull yellow; abdomen gray. Anterior lateral eyes larger; eye triads widely spaced: anterior lateral eyes separated by more than long diameter; posterior median eyes separated by about two long diameters. First leg: femur 1.8, patella 0.28, tibia 1.9, metatarsus 1.9, tarsus 0.6, total length 6.48 mm; first leg 8.1 times, first femur 2.2 times as long as carapace. Stridulatory apparatus: pars thoracica with rounded lobular picks; foveal files present above pedicel. Epigynum (Figs. 314-316).

Type data.—Female holotype from Tuanaboa Vale, St. Catherine Parish, Jamaica, 4 December 1957 (A. M. Chickering), in MCZ.

Distribution.—Known only from above specimen.



Figs. 323-340.—Species of *Anopsicus* and *Pholcophora:* Figs. 323-325: *Anopsicus cubanus,* male: 323, left palpus, retrolateral view; 324, bulb of palpus, prolateral view; 325, left chelicera, retrolateral view. Figs. 326-328: *A. panama,* male: 326, left palpus, retrolateral view; 327, bulb of palpus, prolateral view; 328, left chelicera, retrolateral view. Figs. 329-331: *Pholcophora bahama,* epigynum: 329, ventral view; 330, posterior view; 331, dorsal view. Figs. 332-333: *A. palenque,* epigynum: 332, ventral view; 333, dorsal view. Fig. 334: *A. troglodyta,* epigynum, ventral view. Figs. 335-337: *A. panama,* epigynum: 335, ventral view; 336, posterior view; 337, dorsal view. Figs. 338-340: *A. silvai,* epigynum: 338, ventral view; 339, posterior view; 340, dorsal view.

Anopsicus silvai, new species
Figs. 338-340

Diagnosis.—Large yellowish cavernicole with long legs (first femur 2.5 times as long as carapace) and distinctive epigynum (Fig. 338). Male unknown.

Etymology.—Named for Dr. Gilberto Silva T. of Havana, Cuba.

Female holotype.—Length 4 mm. Carapace 1.5 mm long, 1.3 mm wide. Abdomen 2.5 mm long, 2.2 mm wide. Cephalothorax and appendages bright yellow to orange; abdomen grayish. Eyes subequal in size on well separated triads: anterior lateral eyes separated by diameter; posterior eye row moderately procurved, median eyes separated by about two diameters. First leg: femur 3.7, patella 0.5, tibia 4.2, metatarsus 5.0, tarsus 1.0, total length 14.40 mm; first leg 9.6 times, first femur 2.5 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Figs. 338-340).

Type data.—Female holotype from Cueva Grande, Punta Caguanes, Yaguajay, Las Villas Provincia, Cuba (Gilberto Silva), in AMNH.

Distribution.—Caves of Las Villas Provincia, Cuba.

Record.—CUBA: *Las Villas Provincia:* Cueva de Colón, Punta Caguanes, Yaguajay (Gilberto Silva), female in AMNH.

Anopsicus cubanus, new species
Figs. 323-325

Diagnosis.—Eyeless troglobite with long legs (fourth femur 5 times as long as carapace) and distinctive tarsal appendage (Fig. 323) of male palpus deeply notched at apex. Female unknown.

Etymology.—Named for the island of Cuba.

Male holotype.—Length 1.1 mm. Carapace 0.65 mm long, 0.65 mm wide. Abdomen 0.55 mm long, 0.5 mm wide. Cephalothorax and appendages yellowish; abdomen grayish. Pars cephalica of poorly preserved specimen without trace of eyes or eye tubercles. Chelicerae (Fig. 325) without trace of horns or spurs. Femora of legs thin; fourth leg: femur 3.4, patella 0.3, tibia 3.25, metatarsus 4.0, tarsus 0.7, total length 11.65 mm; fourth leg about 18 times, fourth femur about 5 times as long as carapace. Male palpus (Figs. 323-324).

Type data.—Male holotype from Cueva Grande, Punta Caguanes, Yaguajay, Las Villas Provincia, Cuba (Gilberto Silva), in AMNH.

Distribution.—Known only from Cueva Grande, where *cubanus* occurs with the much larger *silvai.*

Anopsicus pulcher (Bryant)
Figs. 293-295, 309

Ninetella pulchra Bryant, 1940, p. 297. Mello-Leitão, 1946, p. 76.

Diagnosis.—Pale yellow epigean species with short legs (first femur 1.25 times as long as carapace), distinctive epigynum (Fig. 309) and tarsal appendage (Fig. 293) of male palpus.

Etymology.—Specific name from Latin *pulcher,* beautiful.

Female allotype.—Length 1.5 mm. Carapace 0.7 mm long, 0.6 mm wide. Abdomen 0.8 mm long, 0.7 mm wide. Cephalothorax and appendages pale yellow; abdomen gray. Eyes small, subequal in size on two compact triads: anterior lateral eyes separated by about two-thirds diameter; posterior median eyes separated by diameter. First leg: femur 0.9, patella 0.2, tibia 0.9, metatarsus 0.9, tarsus 0.45, total length 3.35 mm; first leg 4.8 times, first femur 1.3 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 309).

Male holotype.—Length 1.4 mm. Carapace 0.65 mm long, 0.65 mm wide. Abdomen 0.6 mm long, 0.5 mm wide. Chelicerae (Fig. 295) with slender, forwardly projecting horns about middle of face. First leg: femur 1.0, patella 0.2, tibia 1.2, metatarsus 1.05, tarsus 0.5, total length 3.95 mm; first leg 6 times, first femur 1.2 times as long as carapace. Male palpus (Figs. 293-294).

Type data.—Male holotype, female allotype and 2 male paratypes from Viches pasture, Soledad, Cuba, 3 July 1932 (Bates and Fairchild), in MCZ.

Distribution.—Known only from above material.

Discussion.—Miss Bryant assigned her *pulchra* to the new genus *Ninetella* of the subfamily Ninetidinae in the belief that two tiny eyes were present as stated in her quotation (1940, p. 298) that "a pair of easily overlooked minute eyes close to posterior row of eyes; these minute eyes may be the a.m.e. moved back." Such eyes are not visible in her available material, so it is clear that the presumed presence was occasioned by mediocre ocular equipment available to her. The anterior median eyes were anciently lost objects in *Anopsicus* and would in any case not reappear in such an extraneous position.

Anopsicus arima, new species
Fig. 310

Diagnosis.—Small yellow epigean species with fairly long legs (first femur 1.8 times as long as carapace) and distinctive epigynum (Fig. 310). Male unknown.

Etymology.—Specific name from type locality, Arima Valley, used in apposition.

Female.—Length 1.5 mm. Carapace 0.8 mm long, 0.6 mm wide. Abdomen 0.9 mm long, 0.7 mm wide. Cephalothorax and appendages bright yellow; eye tubercles black; abdomen whitish. Eyes large, on close set triads: anterior lateral eyes separated by diameter; posterior median eyes separated by narrow diameter. First leg: femur 1.45, patella 0.2, tibia 1.4, metatarsus 1.65, tarsus 0.65, total length 5.35 mm; first leg 6.6 times, first femur 1.8 times as long as carapace. Stridulatory apparatus not detected. Epigynum (Fig. 310).

Type data.—Female holotype and 2 females from Arima Valley, Trinidad, 800-1200 ft., 10-22 February 1964 (P. Wygodzinsky, J. Rozen), in AMNH.

Distribution.—Trinidad.

Record.—TRINIDAD: Simla, 20 April 1964 (A. M. Chickering), 2 females, 2 immature, in MCZ.

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MILLIPEDS (DIPLOPODA) FROM CAVES IN MEXICO AND CENTRAL AMERICA. IV. NEW SPECIES AND RECORDS OF GLOMERIDAE, CLEIDOGONIDAE, TRICHOPETALIDAE, FUHRMANNODESMIDAE AND SPHAERIODESMIDAE[1]

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ABSTRACT

A fourth report on millipeds collected in Mexican and Central American caves gives records of previously described species in the families Glomeridae, Cleidogonidae, Trichopetalidae, Fuhrmannodesmidae and the subfamily Bonetesminae of the Sphaeriodesmidae. Described as new are *Glomeroides patei, G. grubbsi* (Glomeridae); *Cleidogona eulalia, C. treacyae, C. yerbabuena, C. chiapas, C. jamesoni* (Cleidogonidae); *Mexiterpes calenturas, M. nogal* (Trichopetalidae); *Tylogoneus oyamel, Caramba enbecausius, Salvadoria beliza, S. mexicana* (Fuhrmannodesmidae); and *Bonetesmus soileauae* (Bonetesminae, Sphaeriodesmidae). A new genus, *Sumidero,* is described in the Fuhrmannodesmidae with two new species, *S. sumidero* and *S. sprousei; Speodesmus pecki* Shear is transferred to the new genus as well. *Caramba delnegro* Shear is transferred to *Tylogoneus.*

This fourth report in my series on Mexican and Central American cave millipeds describes new species, and gives new records for known species, of the families listed in the title. The collections upon which the work is based were made by members of the Association for Mexican Cave Studies, by members of the expeditions to México of the Accademia Nazionale dei Lincei and the Università di Roma, and by Dr. Stewart B. Peck and his associates. Future papers in this series based on the specimens now on hand will cover the families Pyrgodesmidae (=Stylodesmidae), Rhachodesmidae, Xystodesmidae, Cambalidae, Spirostreptidae, Typhlobolellidae, and others. Surface collections are being included only if they shed light on the relationships or the biogeography of troglobitic and troglophilic forms.

[1]Part I: Acc. Naz. Lincei, Prob. Att. Sci. Cult., 171(2): 239-305, 1974. Part II: Assoc. Mexican Cave Stud. Bull., 5:43-45, 1973. Part III: Acc. Naz. Lincei, Prob. Att. Sci. Cult., 171(3):235-266, 1977.

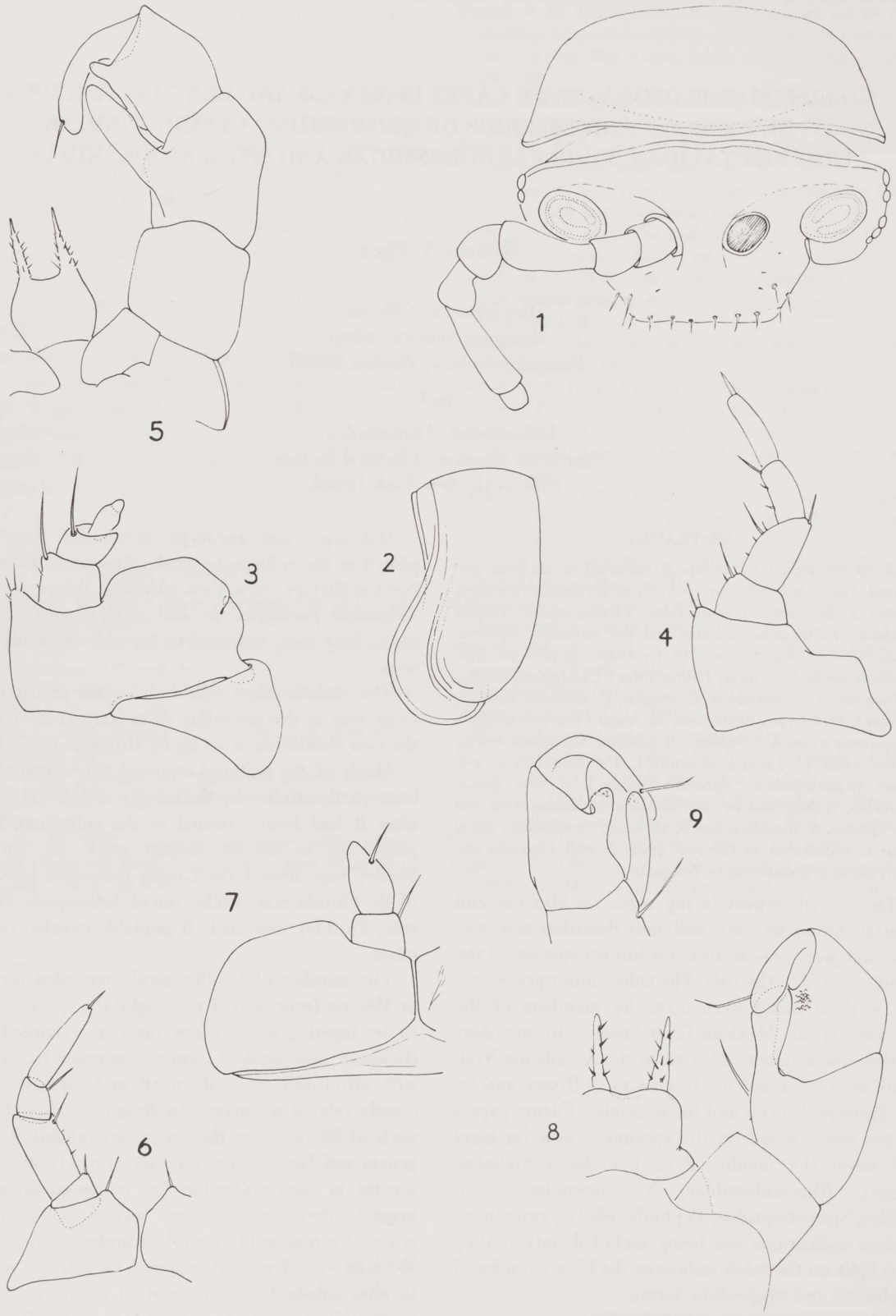
Holotype and paratype specimens have been placed in the collections of the American Museum of Natural History, New York (AMNH). Where available, additional paratypes, as well as all identified specimens, have been returned to the collectors' organizations.

The classification followed in this report differs from that in the preceding three parts; here I follow the new classification set up by Hoffman (1979).

Much of the material reported below had already been partly studied by the late Dr. Nell Bevel Causey; after it had been returned to the collectors, it was passed on to me for further work. Dr. Rowland Shelley has curated the Causey collection (now part of the Florida State Collection of Arthropods, Gainesville, Florida), and made it available to other taxonomists.

The number of families newly recorded for caves in México (represented by troglobitic species) seems to be tapering off; no new ones are recorded here. However, undescribed genera continue to turn up with affinities both to the north and south, often not closely related to surface-dwelling forms found in the parts of México near the caves they inhabit. In many genera and families, the number of newly discovered species in each collection has remained high. This suggests that there is some way to go before we arrive at a reasonably complete understanding of the Mexican cave fauna. However, I have found nothing to alter substantially the content of my earlier biogeographic essay on the subject (Shear, 1974).

I hope that at some future time I will be able to synthesize the accumulated data on Mexican and Central American cave millipeds and arrive at some



Figs. 1-9.—Anatomy of *Glomeroides* spp.: Figs. 1-5.—*G. patei*, n. sp.: 1, head of male, anterior view; 2, second segment of male, lateral view; 3, leg 17 of male, anterior view; 4, leg 18 of male, anterior view; 5, telopod, anterior view. Figs. 6-9—*G. grubbsi*, n. sp.: 6, leg 18 of male, anterior view; 7, leg 17 of male, anterior view; 8, telopod, anterior view; 9, terminal segments of telopod, posterior view.

coherent conclusions concerning their distributional and evolutionary history, but for the present, the geological and paleoclimatological framework is too sketchy, and, like myself, the other taxonomists working on material from Mexican caves must practice essentially alpha taxonomy.

SUBCLASS PENTAZONIA

SUPERORDER ONISCOMORPHA

ORDER GLOMERIDA

Family Glomeridae Leach

Glomeroides Chamberlin

This genus is well represented in México by both cave and epigean species. The epigean species are highly variable in size and color pattern; nearly all of them are undescribed. The distribution of the genus extends from México to Panamá; one isolated species occurs in the San Francisco Bay area. The glomerids as a whole seem to be a Laurasian group; aside from the occurrence of *Eupeyerimhoffia* and *Trachysphaera* in North Africa, the order is unknown in Africa, South America and Australia. The sister-group of the Glomerida, the Order Sphaerotheriida, is found in South Africa, India, southeast Asia and Australia.

Troglobitic species of *Glomeroides* have been described by Causey (1964, 1973) and Shear (1974). Aside from some variation in size, they are quite similar to one another, an observation which leads me to think that the troglobites might be descended from one ancestral stock, since their troglobitic adaptations are not pronounced enough to suggest such strong convergence.

Glomeroides caecus Causey

Glomeroides caecus Causey, 1964, Proc. Louisiana Acad. Sci., 27:65, figs. 1-5.

New record.—*San Luis Potosí:* Cueva de los Ladrones, 500 m SW La Silleta, 29 March 1980 (P. Sprouse), male, female (Association for Mexican Cave Studies, AMCS).

Glomeroides patei, new species
Figs. 1-5

Diagnosis.—Larger than *G. promiscus* Causey, and differing from *G. caecus* Causey and *G. grubbsi* Shear (below) in having ocelli. *Glomeroides pellucidus* Shear has 5 telopodite segments in leg 18 of the male; the present species has 4.

Types.—Male holotype and female paratypes (AMNH) from Sótano de las Calenturas, Yerbabuena, Tamaulipas, México, collected 19 September 1979 by D. Pate and colleagues.

Etymology.—The species epithet honors Mr. Dale Pate.

Description of male holotype.—Length, 6.3 mm, width, 2.9 mm. Head as usual in the genus, 0.84 mm long, 1.5 mm wide. Proportions of antennae as illustrated in Fig. 1. Antennal segment 3, 0.32 mm long. Five ocelli in two groups, dorsal group of 2, ventral group of 3; unpigmented. Collum (Fig. 1) without obvious striae, anteriolateral angle acute. Second segment (Fig. 2) as usual, striae weak. Leg 17 (Fig. 3) with 3 telopodite segments; leg 18 (Fig. 4) with 4. Telopods (Fig. 5) much as usual in the genus, but last segment somewhat longer, more compressed than usual, processes of penultimate and antepenultimate segments more distinct. Last tergite not emarginate. Cuticle soft, body lacking pigment, but preserved specimens turn brown.

Description of female paratype.—Length, 7.8 mm, width, 3.6 mm. Head 1.05 mm long, 1.40 mm wide. Antennal segment 3, 0.42 mm long. Nonsexual characters in agreement with those of male.

Records.—*Tamaulipas:* Cueva del Brinco, April 1978 (A. Grubbs, D. Pate, P. Sprouse, T. Treacy, S. Balsdon, R. Hemperly, P. Strickland), juveniles; Sistema Purificación, World Beyond, 26 November 1979 (P. Sprouse), males, females; same date and locality (J. Lieberz), males, females; Sistema Purificación, upstream World Beyond, 26 November 1979 (T. Treacy, P. Sprouse, J. Lieberz), males, females; Cueva de los Cuarteles, 10 km SW Aldama, 1 January 1976 (J. Reddell, A. Grubbs), male, females (all AMCS).

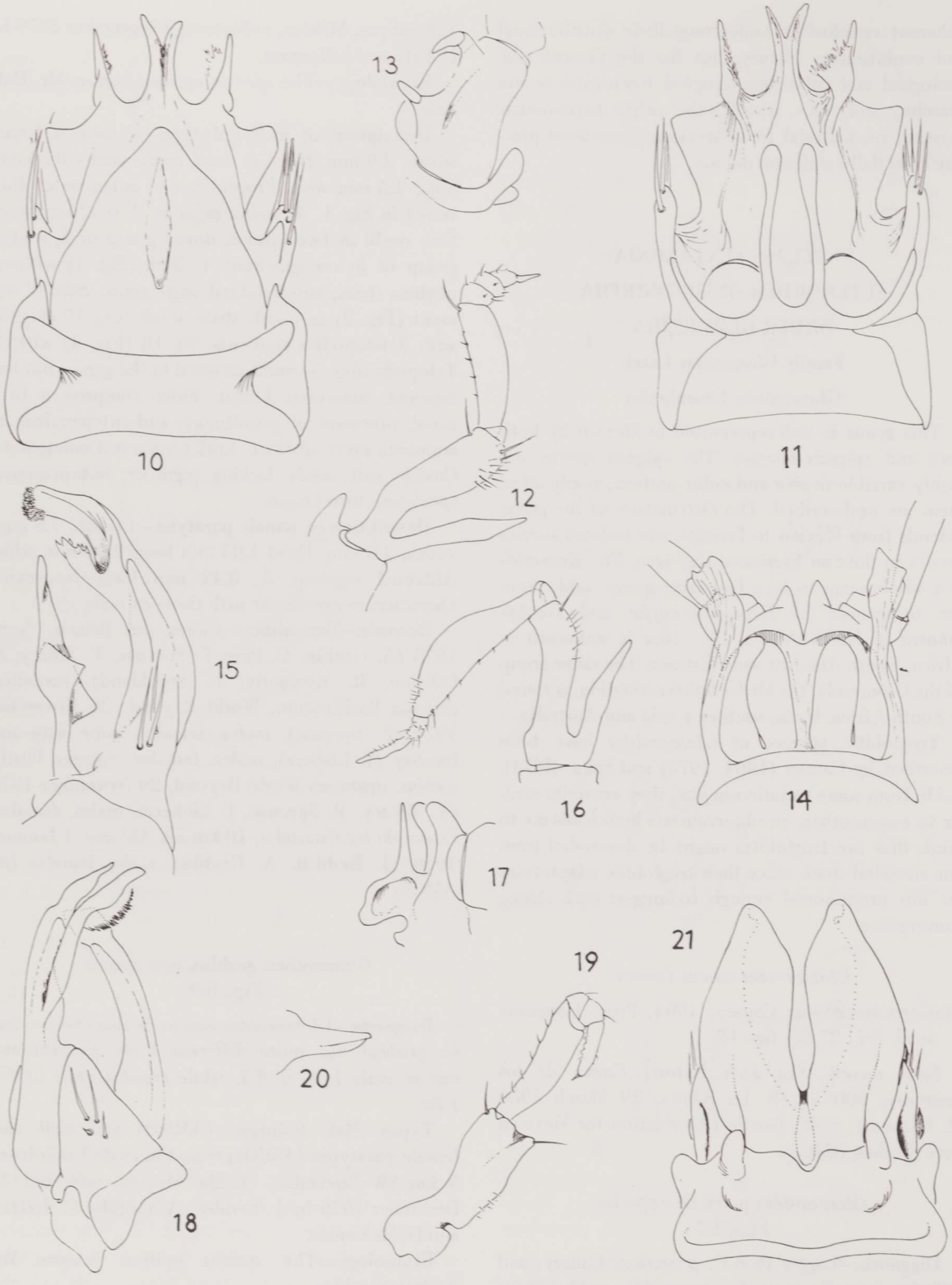
Glomeroides grubbsi, new species
Figs. 6-9

Diagnosis.—*Glomeroides caecus* is also eyeless, but *G. grubbsi* has quite different body proportions; *caecus* male L/W is 2.5, while *grubbsi* male L/W = 1.86.

Types.—Male holotype (AMNH) and male and female paratypes (AMNH) from Cueva de Tasalolpan, 5 km SW Cuetzalan, Puebla, México, collected 22 December 1976 by J. Reddell, A. Grubbs, C. Soileau and D. McKenzie.

Etymology.—The species epithet honors Mr. Andrew Grubbs.

Description of male holotype.—Length, 6.15 mm, width, 3.3 mm. Head 0.9 mm long, 1.65 mm wide. Antennal segment 3, 0.35 mm long. Ocelli entirely absent, but on a few specimens oblique lighting suggests the remnants of 2-3 cuticular lenses. Nonsexual



Figs. 10-21.—Anatomy of *Cleidogona* spp.: Figs. 10-14.—*C. eulalia*, n. sp.: 10, anterior gonopods, anterior view; 11, anterior gonopods, posterior view; 12, left posterior gonopod, anterior view; 13, left coxa 7 of male, posterior view; 14, cyphopods, posterior view. Figs. 15-17.—*C. treacyae*, n. sp.: 15, left anterior gonopod, lateral view; 16, left posterior gonopod, anterior view; 17, process of sternum 12, viewed from animal's left side. Figs. 18-20.—*C. yerbabuena*, n. sp.: 18, right anterior gonopod, lateral view; 19, left posterior gonopod, anterior view; 20, process of sternum 12, viewed from animal's right side. Fig. 21.—Anterior gonopods of *C. chiapas*, n. sp., anterior view.

characters typical for the genus. Leg 17 (Fig. 7), with two telopodite segments, leg 18 (Fig. 6) with 4. Telopods (Figs. 8-9) with process of antepenultimate segment broadly flattened towards tip, process of penultimate segment with small cuticular nodules. Cuticle soft, unpigmented.

Description of female paratype.—Length, 6.15 mm, width 3.75 mm. Head 1.05 mm long, 1.57 mm wide. Antennal segment 3, 0.34 mm long. Nonsexual characters as in male.

Records.—*Puebla:* Sumidero de Cohuatichan, 2 km S Cuetzalan, 17 December 1976 (J. Reddell, D. McKenzie), males, females; Sumidero de Atepolihuit de San Andres, 2 January 1980 (A. Grubbs, J. Lieberz, B. Richards), males, females (all AMCS).

SUBCLASS HELMINTHOMORPHA
SUPERORDER COELOCHAETA
ORDER CHORDEUMATIDA

Family Cleidogonidae Cook

Cleidogona Cook

For further data on this genus in México, see Shear, 1972, 1974, 1977. The Mexican fauna is extraordinarily rich in both epigean and troglobitic species.

Cleidogona totonaca Shear

Cleidogona totonaca Shear, 1972, Bull. Mus. Comp. Zool., 144:218, Figs. 257-259.

New record.—*Tamaulipas:* Sótano de las Calenturas, Yerbabuena, 19 November 1979 (D. Pate et al.), males, females (AMCS).

Notes.—This species is at best troglophilic and has pigmentation typical of epigean *Cleidogona.* It was described from Sótano del Gobernador, near Pinal de Amoles, Querétaro.

Cleidogona crucis (Chamberlin)

Cavota crucis Chamberlin, 1942, Bull. Univ. Utah, 7(2):8, Figs. 3-7.

Cleidogona crucis, Shear, 1972, Bull. Mus. Comp. Zool., 144:209, Figs. 193-196; 1974, Acc. Naz. Lincei, Prob. Att. Sci. Cult., 171(2):254.

New record.—*Veracruz:* Cueva de Corral de Piedra, 3 km S Corral de Piedra, 5 January 1977 (J. Reddell), males, females (AMCS).

Notes.—This species was previously known from Cueva de Atoyac and Cueva del Ojo de Agua Grande, near Córdoba, Veracruz. It is a troglobite.

Cleidogona pecki Shear

Cleidogona pecki Shear, 1972, Bull. Mus. Comp. Zool., 144:213, figs. 221-225.

New record.—*Tamaulipas:* Cave C-5, 13 km NW Gómez Farías, May 1974 (W. Russell, A. Grubbs), males (AMCS).

Notes.—This large troglobitic species was described from Cueva de la Mina, 6 km NW Gómez Farías, Tamaulipas.

Cleidogona baroqua Shear

Cleidogona baroqua Shear, 1972, Bull. Mus. Comp. Zool., 144:209, figs. 197-200.

New record.—*Oaxaca:* Sótano Li Nita, Huautla de Jiménez, April-May 1980 (S. Zeman), female (AMCS).

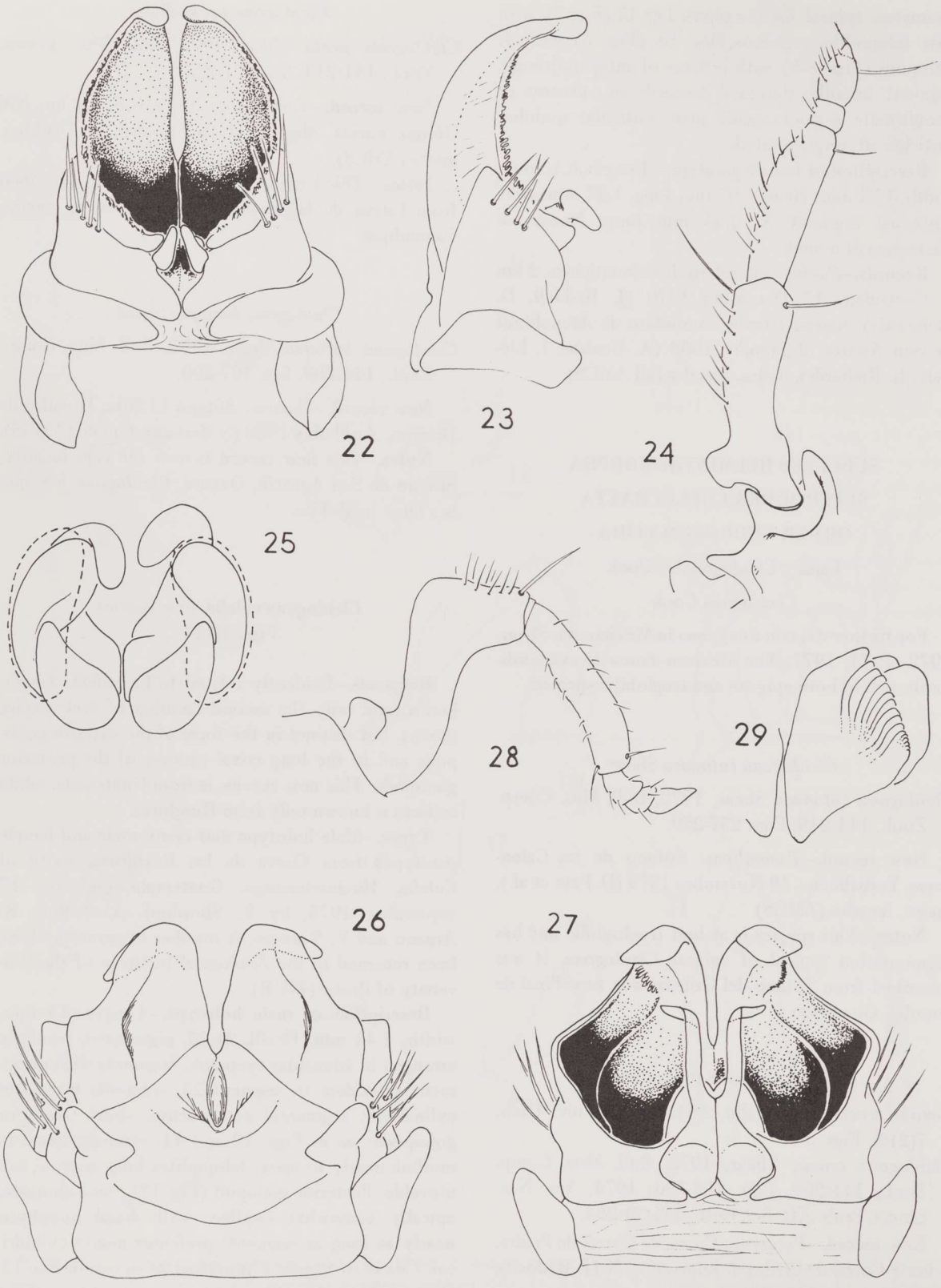
Notes.—This new record is near the type-locality, Sótano de San Agustín, Oaxaca. *Cleidogona baroqua* is a large troglobite.

Cleidogona eulalia, new species
Figs. 10-14

Diagnosis.—Evidently related to *C. ceibana* Chamberlin (and only the second member of that species group), but distinct in the form of the anterior gonopods and in the long coxal process of the posterior gonopods. This new species is from Guatemala, while *ceibana* is known only from Honduras.

Types.—Male holotype and many male and female paratypes from Cueva de los Resadores, south of Eulalia, Huehuetenango, Guatemala, collected 17 September 1975, by V. Sbordoni, A. Zullini, R. Argano and V. Vomero. A number of paratypes have been returned to the Zoological Institute of the University of Rome (ZIUR).

Description of male holotype.—Length, 15 mm, width, 1.44 mm. Ocelli, 24-25, pigmented, regularly arranged in triangular eyepatch. Segments with prominent shoulders to segment 25, segments thereafter cylindrical; segmental setae acute, short. Anterior gonopods: as in Figs. 10 and 11; strongly fused in midline nearly to apex, telopodites long, narrow, not movable. Posterior gonopod (Fig. 12): coxa elongate, apically somewhat swollen, with basal apophysis nearly as long as segment; prefemur nearly cylindrical. Coxae of legpair 7 modified as shown in Fig. 13. Coxae of legpairs 10 and 11 typical for genus. Sternum 12 little modified. Pigmentation typical, pale tan with light purplish brown mottling, darker anteriorly.



Figs. 22.29.—Anatomy of *Cleidogona* spp.: Figs. 22-25.—*C. chiapas,* n. sp.: 22, anterior gonopods, posterior view; 23, right anterior gonopod, lateral view; 24, right posterior gonopod, anterior view; 25, cyphopods, ventral view. Figs. 26-29.—*C. jamesoni,* n. sp.: 26, anterior gonopods, anterior view; 27, anterior gonopods, anterior view; 28, right posterior gonopod, anterior view; 29, right cyphopods, posterior view.

Description of female paratype.—Length, 17.5 mm, width, 1.65 mm. Ocelli, 24, regularly arranged, pigmented. Nonsexual characters as in male. Cyphopods (Fig. 14) with postgenital plate broadly divided, long transparent lamellae, apically broadened, extend ventrally on each side.

Records.—Known only from the type-locality.

Notes.—Although many specimens, especially young ones, have reduced pigmentation, this species is at most troglophilic. It occurs in the Cueva de los Resadores in great numbers.

Cleidogona treacyae, new species
Figs. 15-17

Diagnosis.—This new species seems closest to *C. bacillipus* (Chamberlin and Mulaik) of Texas and northern México, but *treacyae* has posterior gonopod prefemora that are markedly longer, and the anterior gonopod telopodites are much larger and of a different form. In addition, *treacyae* has a lateral process on the anterior gonopod colpocoxite that is not present in *bacillipus.* Both species are in the large Maculata species group.

Type.—Male holotype (AMNH) from Cueva de los Viet Cong, Xilitla Plateau, San Luis Potosí, México, collected 1 April 1980 by T. Treacy.

Etymology.—The species epithet honors Ms. Terri Treacy.

Description of male holotype.—Length, 22 mm, width, 2.72 mm. Ocelli 25, well pigmented, arranged in triangular eyepatch. All segments nearly cylindrical, but low shoulders on segments 3-7; segmental setae small, acute. Anterior gonopods (Fig. 15) in lateral view only slightly curved, colpocoxite with densely setose tip, lamellate lateral process; telopodites large, complex, movable. Posterior gonopod (Fig. 16) with coxal apophysis about 2/3 length of coxa. Coxae 10 and 11 as usual for genus; sternum 12 as in Fig. 17.

Female.—Unknown.

Records.—Known only from the type-locality.

Cleidogona yerbabuena, new species
Figs. 18-20

Diagnosis.—This species resembles *C. mayapec* Shear, described from Río Blanco, Querétaro, but is nearly half again as large, and the posterior gonopods are of a different form.

Types.—Male holotype (AMNH) from Sótano de las Calenturas, Yerbabuena, Tamaulipas, México, collected 19 November 1979 by D. Pate et al.

Etymology.—The species epithet is a noun in apposition, the name of the type-locality.

Description of male holotype.—Length, 16 mm, width, 1.83 mm. Ocelli, 27, well formed and pigmented, regularly arranged in triangular eyepatch. Segments generally cylindrical, but with small, rounded, smooth shoulders. Segmental setae small, acute. Anterior gonopods (Fig. 18) with colpocoxites apically cleft, no lateral processes; telopodites smoothly arched, nearly as large as colpocoxites. Posterior gonopods (Fig. 19): coxae with small, obtuse basal process separated from distal part of segment by distinct notch, distomesal corner of coxa drawn out, prefemora rather clavate. Coxae 10 and 11 as usual. Process of sternum 12 shown in Fig. 20. Coloration typical of epigean species.

Female.—Not collected.

Records.—*Tamaulipas:* Pozo de Lagartijo, 0.5 mi. SW fire tower, Rancho Nuevo, 1 November 1979 (P. Sprouse), male; Cueva del Esquélito, Conrado Castillo, October 1979 (P. Sprouse), males; Cueva de las Bandanas, Purificación Area, 17 April 1980 (D. Pate), males; Cueva del Tecolote, Los San Pedro, 26 April 1980 (D. Honea et al.), males. (All AMCS).

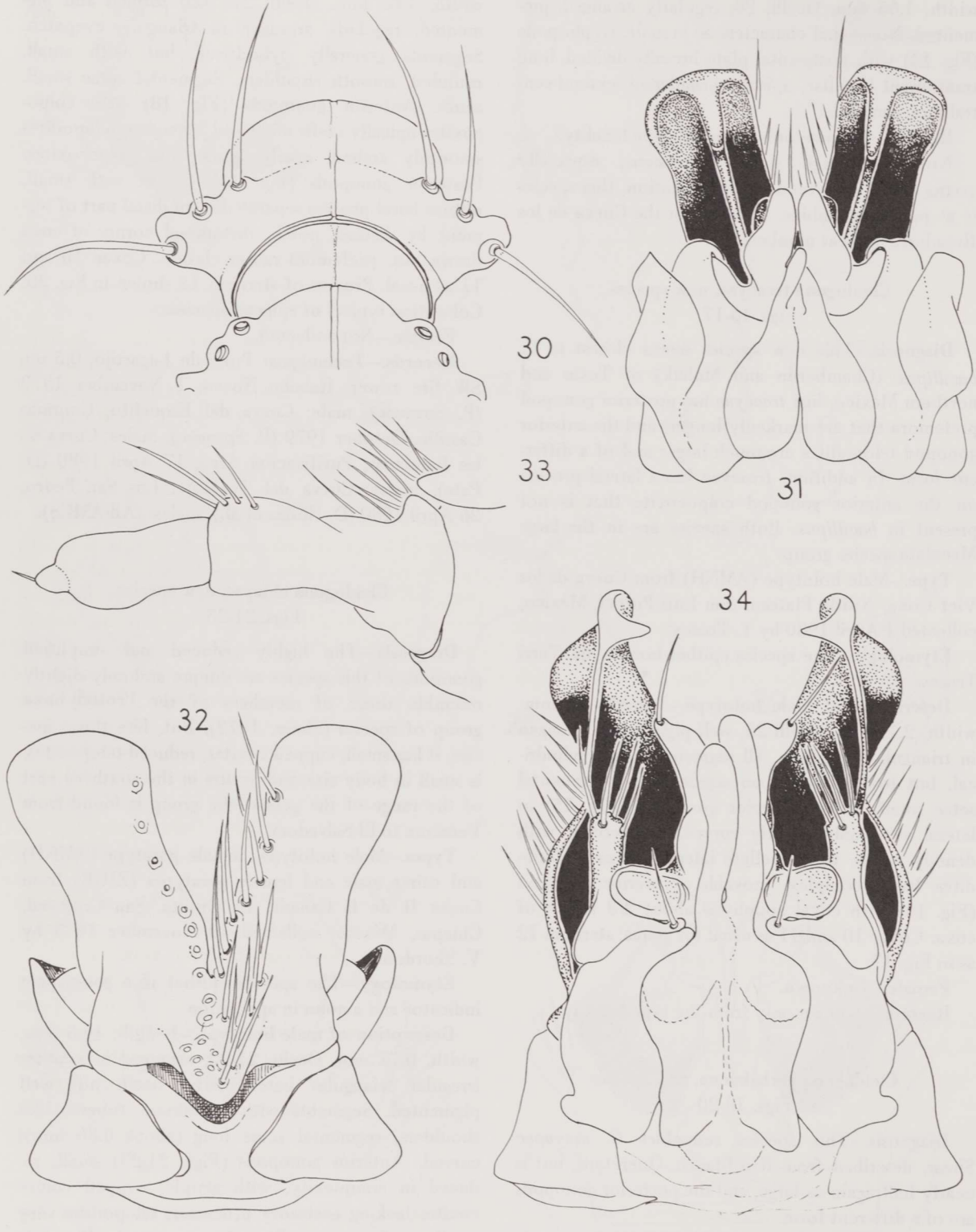
Cleidogona chiapas, new species
Figs. 21-25

Diagnosis.—The highly reduced and simplified gonopods of this species are unique and only slightly resemble those of members of the Protodybasia group of species (Shear, 1972). But, like those species, it has small, cupped coxites, reduced telopodites, is small in body size and occurs in the southern part of the range of the genus (the group is found from Veracruz to El Salvador).

Types.—Male holotype, female paratype (AMNH) and other male and female paratypes (ZIUR) from Cueva II de la Canada, La Quinta, San Cristóbal, Chiapas, México, collected 10 November 1975 by V. Sbordoni.

Etymology.—The species epithet is a geographic indicator and a noun in apposition.

Description of male holotype.—Length, 10.5 mm, width, 0.78 mm. Ocelli, 21-22, arranged in a rather irregular triangular patch, outer ocelli not well pigmented. Segments with prominent tubercle-like shoulders, segmental setae long (about 0.36 mm), curved. Anterior gonopods (Figs. 21-23) small, reduced in complexity, with simple, cupped colpocoxites lacking accessory processes; telopodites very small, rudimentary. Posterior gonopod (Fig. 24) likewise small, coxa and prefemur both cylindrical, coxa with blunt basal process. Coxae 10 and 11 and sternum 12 as usual. Coloration typical of epigean species.



Figs. 30-34.—Anatomy of *Mexiterpes* spp.: Figs. 30-33.—*M. calenturas*, n. sp.: 30, midbody segment of male, posteriodorsal view; 31, anterior gonopods, posterior view; 32, anterior gonopods, anterior view, setation omitted from left side; 33, left posterior gonopod, anterior view. Fig. 34.—Anterior gonopods of *M. nogal*, n. sp., posterior view.

Description of female paratype.—Length, 11.2 mm, width, 0.84 mm. Ocelli, 20 in well-formed patch. Nonsexual characters as in male. Cyphopods as in Fig. 25.

Records.—Known only from the type-locality.

Cleidogona jamesoni, new species
Figs. 26-29

Diagnosis.—This species resembles the foregoing and *C. atoyaca* Chamberlin, but has long, thin anterior gonopod telopodites that distinguish it from both.

Types.—Male holotype (AMNH) and male and female paratypes (AMCS) from Cueva del Volcancillo, 5 km SE Las Vigas, Veracruz, México, collected 8 January 1974 by J. Reddell, R. Jameson.

Etymology.—The species epithet honors Mr. Roy Jameson.

Description of male holotype.—Length, about 10 mm, width, 1.58 mm. Ocelli, 17 in triangular patch, well pigmented. Segmental shoulders poorly developed on segments 1-7, following segments cylindrical. Segmental setae moderately long, straight, acute. Anterior gonopods (Figs. 26-27) with cupped, decurved, short colpocoxites lacking accessory processes; telopodites long, acute, curved, basally fused, evidently movable. Posterior gonopod (Fig. 28) with coxa sharply bent dorsally and bearing blunt basal process; prefemur nearly cylindrical. Coxae 10 and 11 and sternum 12 as usual. Ground color ivory-white, mottled with light tan on anterior few segments and head. Young specimens somewhat darker.

Description of female paratype.—Length, 12-13 mm, width 1.2 mm. Ocelli, 21 in triangular patch. Nonsexual characters as in male. Cyphopods as in Fig. 29.

Records.—Known only from type-locality.

Family Trichopetalidae Verhoeff

Mexiterpes Causey

All the known species of this genus are evidently troglobites, though there is some variation in their degree of adaptation to the cave habitat, some species having pigment and ocelli.

Mexiterpes fishi (Causey)

Poterpes fishi Causey, 1969, Proc. Louisiana Acad. Sci., 32:47, figs. 6, 11-16.

New record.—*Querétaro:* Cueva de Campamiento (=Sumidero del Llano Conejo), 2 km E of Cerro de la Luz, 15 May 1977 (Roy Jameson), male (AMCS).

Notes.—This locality is not far from the type-locality, Cueva de la Luz, 20 mi. W of Aquismón, San Luis Potosí.

Mexiterpes metallicus Shear

Mexiterpes metallicus Shear, 1972, Bull. Mus. Comp. Zool., 144:281, figs. 532-538; 1974, Acc. Naz. Lincei, Prob. Att. Sci. Cult., 171(2):256.

New record.—*Querétaro:* Cueva del Rincón, Lagunita, El Doctor Platform, 21 November 1977 (Roy Jameson), males (AMCS).

Mexiterpes calenturas, new species
Figs. 30-33

Diagnosis.—The broad, setose colpocoxites of the anterior gonopods of this species are unlike any others.

Types.—Male holotype and female paratype (AMNH) from Sótano de las Calenturas, Entrada del Blazer Section, Yerbabuena, Tamaulipas, México, collected 22 November 1979 by J. Reddell and P. Sprouse.

Etymology.—The species epithet is a noun in apposition referring to the type-locality.

Description of male holotype.—Length, 8 mm, width, 0.9 mm. Ocelli absent. Segments (Fig. 30) typical, with shoulders strongly produced around bases of segmental setae, dorsum nearly flat; segmental setae 0.77 mm long, curved, acute, usually with secretion at the base. Pregonopodal legs more crassate than others, but without conspicuous modifications. Anterior gonopods (Figs. 31-32) with coxites basally fused, large, broad, densely setose along inner margin; telopodites and telopodite processes as shown. Posterior gonopods (Fig. 33) two-segmented, second segment with small terminal nipple representing vestigial third segment; claw absent. Pigment entirely lacking, cuticle somewhat leathery.

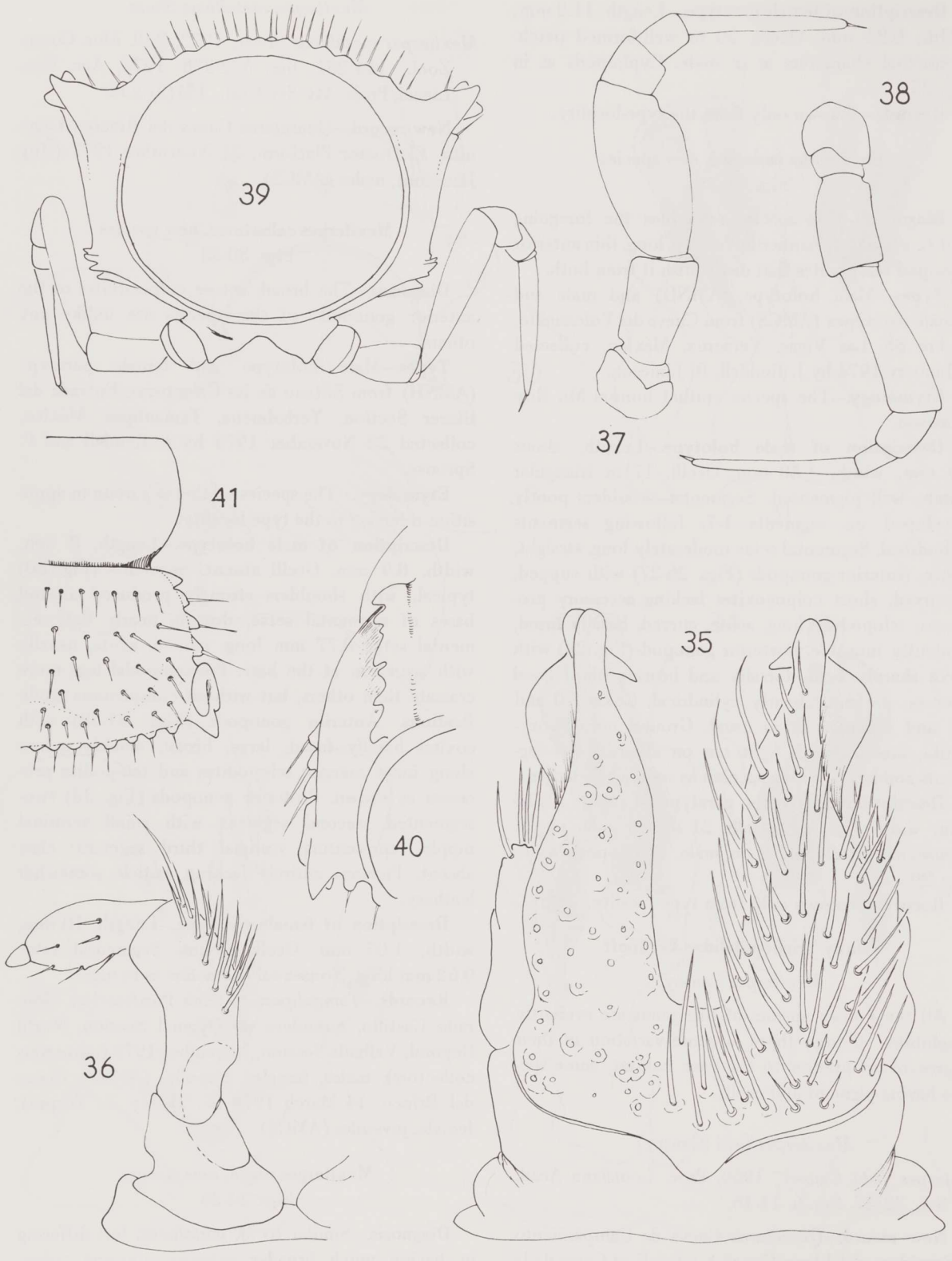
Description of female paratype.—Length, 10 mm, width, 1.05 mm. Ocelli absent. Segmental setae 0.62 mm long. Nonsexual characters as in male.

Records.—*Tamaulipas:* Sistema Purificación, Conrado Castillo, Sumidero de Oyamel Section, World Beyond, Valhalla Section, November 1979 (numerous collectors), males, females, juveniles (AMCS); Cueva del Brinco, 14 March 1979 (T. Treacy, L. Turpin), female, juveniles (AMCS).

Mexiterpes nogal, new species
Figs. 34-38

Diagnosis.—Similar to *M. metallicus,* but differing in having much broader anterior gonopod colpocoxites, and large, lobed telopodites rather than the narrow, dorsally curved ones of *metallicus.*

Types.—Male holotype and male and female paratypes (AMNH) from Sótano de Nogal, Querétaro,



Figs. 35-41.—Anatomy of *Mexiterpes nogal* and *Sumidero sumidero,* n. spp.: Figs. 35-38.—*M. nogal,* n. sp.: 35, anterior gonopods, anterior view, setation omitted from left side; 36, left posterior gonopod, anterior view; 37, left leg 3 of male, anterior view; 38, left leg 15 of male, anterior view. Figs. 39-41.—*S. sumidero,* n. sp.: 39, midbody segment, posterior view; 40, right side of midbody segment, view slightly posterior of ventral; 41, right side of midbody segment, dorsal view.

México, collected 18-19 March 1976 by A. Grubbs, R. Jameson and A. Cochrane.

Etymology.—The species epithet is a noun in apposition referring to the type-locality.

Description of male holotype.—Specimen fragmented, but length estimated at 12-13 mm, width, 1.57 mm. Ocelli 8, irregular in shape, poorly pigmented. Segments of typical form, segmental seta 0.75 mm long. Prefemur of leg 3 (Fig. 37) greatly enlarged, those of legs 4 and 5 only slightly so. Anterior gonopods (Figs. 34-35) large, complex; colpocoxites basally fused as usual, densely setose over entire surface, with broad subapical flange, bent over and acute at tips. Telopodites lobe-like, irregular; process from coxa on each side extends nearly to midline and bears single apical seta. Median telopodite process hooked. Posterior gonopods (Fig. 36) with three segments, but division between coxa and prefemur is indistinct in most specimens.

Description of female paratype.—Specimen fragmented, length estimated at 14 mm, width, 1.34 mm. Ocelli as in male. Segmental seta 0.72 mm long. Nonsexual characters as in male. Cyphopods essentially as in *M. metallicus.*

Records.—Known only from the type-locality.

SUBORDER MEROCHAETA

ORDER POLYDESMIDA

Superfamily Trichopolydesmoidea Verhoeff

Family Fuhrmannodesmidae Brolemann

According to Hoffman's magisterial *Classification of the Diplopoda* (1979), the Mexican forms so far described as trichopolydesmids belong here. The checkered history of family assignments in the small polydesmids is recounted in that book, and will not be delved into here. However, it now seems clear to me that the species I described (Shear, 1974) as *Speodesmus pecki* is not a member of that genus and not a member of the Polydesmidae, since it lacks the fimbriate pad near the seminal canal opening characteristically found in that family. With the discovery of a related new species, described below, I transfer *pecki* to the new genus *Sumidero,* in the Fuhrmannodesmidae.

Sumidero, new genus

Diagnosis.—A genus of fuhrmannodesmids with simple gonopods consisting of essentially a single piece with three terminal branches, the middle one being the solenomerite. Like *Tylogoneus* species, those of *Sumidero* have 19 segments, but *Tylogoneus* gonopods are strongly 3-branched from the base. *Caramba* consists of 18-segmented species with groups of setae on all gonopod branches; there are only two apical divisions, the solenomerite being lateral and having a flange-like branch.

Type-species.—*Sumidero sumidero* Shear.

Range.—Caves in Tamaulipas, San Luis Potosí, and Puebla, México.

Sumidero sumidero, new species

Figs. 39-43

Diagnosis.—Differs from *S. pecki* (Shear) in having the solenomerite blade-like rather than tubular, being larger, and in having much more pronounced segmental paranota, as well as "accessory paranota" present on the sides of each segment.

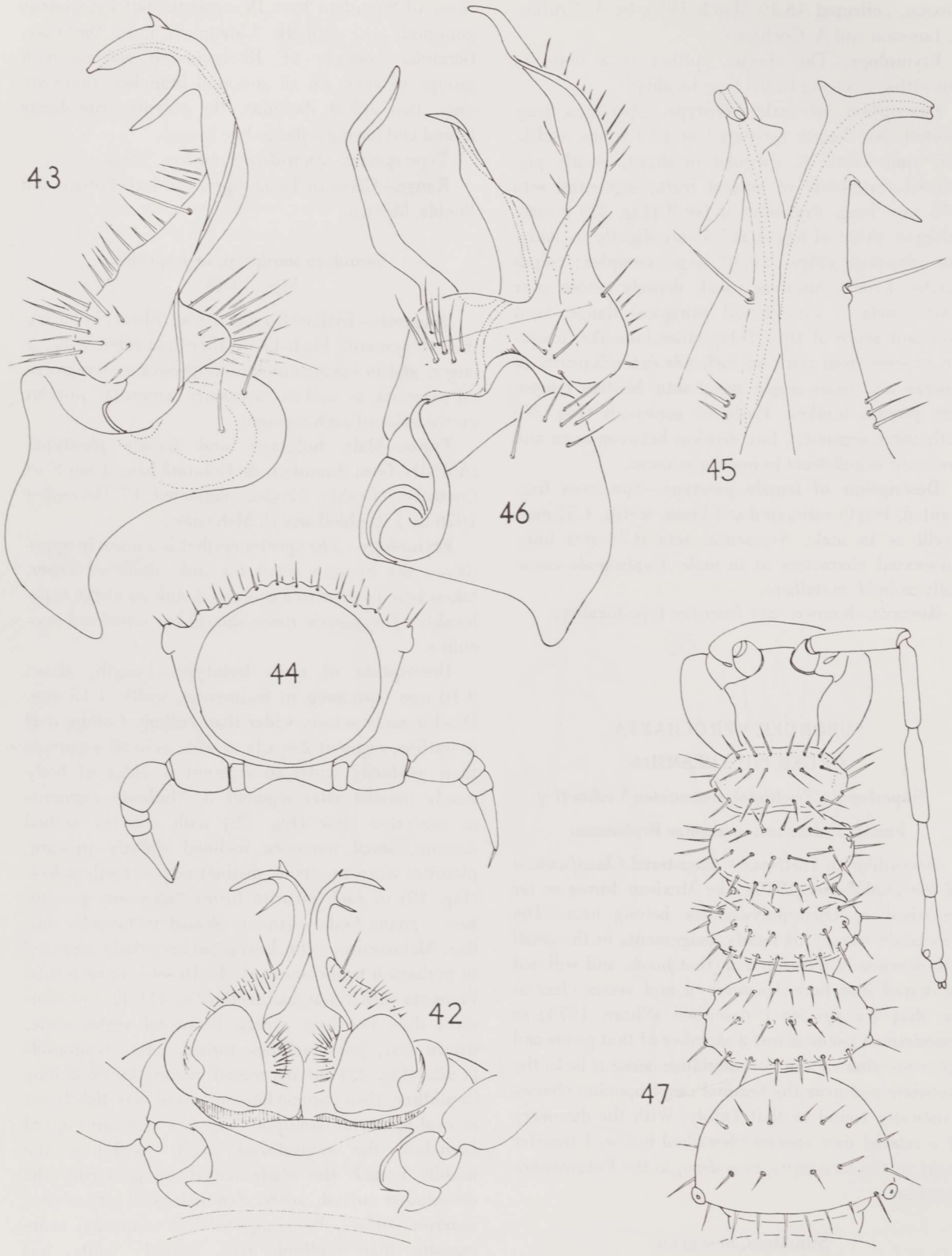
Types.—Male holotype and female paratypes (AMNH) from Sumidero de Cohuatichan, 2 km S of Cuetzalan, Puebla, México, collected 17 December 1976 by J. Reddell and D. McKenzie.

Etymology.—The species epithet is a noun in apposition, the Spanish word for sink, drain or sewer, taken here to refer to a geological sink, as at the type-locality. The generic name should be considered masculine.

Description of male holotype.—Length, about 9-10 mm (specimen in fragments), width, 1.15 mm. Head densely setose, wider than collum. Collum oval in outline, segment 2 nearly as wide as head, segments then gradually wider to segment 5; sides of body nearly parallel after segment 5. Midbody segments in posterior view (Fig. 39) with scarcely arched dorsum, small paranota inclined slightly upward; pleurites almost vertical, distinct row of teeth at base (Fig. 40) of each pleurite forms "accessory paranotum," giving body segments almost rectangular outline. Metazonites with short setae irregularly arranged in perhaps 6 transverse rows, 12-16 setae in each row. Paranota with 4 marginal teeth (Fig. 41); the anteriormost does not bear a seta. Paranotal angles acute, drawn out; pore-swellings torical, large. Gonopods *in situ* (Fig. 42) curving mesad, acropodites touching in midline, then curving laterad; coxae very tightly set in oval aperture. Gonopod (Fig. 43) with three apical branches, the ventralmost small, tooth-like, the middle branch the blade-shaped solenomerite, the dorsalmost curved, acute. Seminal canal passes over anterior surface. Pregonopodal legs somewhat more crassate than midbody legs. Entirely white, but cuticle hard, brittle.

Description of female paratype.—Length, 8.5 mm, width, 1.15 mm. Nonsexual characters as in male.

Records.—Known only from the type-locality.



Figs. 42-47.—Anatomy of *Sumidero* spp., *Tylogoneus oyamel*, n. sp., and *Caramba enbecausius*, n. sp.: Figs. 42-43.—*S. sumidero*, n. sp.: 42, gonopods *in situ*, posterioventral view; 43, right gonopod, mesal view. Figs. 44-45.—*S. sprousei*, n. sp.: 44, midbody segment, posterior view; 45, gonopod tips, view slightly lateral of posterior. Fig. 46.—Right gonopod of *T. oyamel*, n. sp., mesal view, but telopodite twisted somewhat laterally in preparation of slide. Fig. 47.—Anterior part of body of *Caramba enbecausius*, n. sp., dorsal view. Setation omitted from antenna.

Sumidero pecki (Shear) NEW COMBINATION

Sumidero pecki Shear, 1974, Acc. Naz. Lincei, Prob. Att. Sci. Cult., 171(2):273, figs. 55-58.

This species was described from a male found in Cueva del Pachón, near Ciudad Mante in Tamaulipas. It seems to have a more highly developed suite of troglobitic adaptations than *S. sumidero*, including much reduced paranota and entirely absent "accessory paranota." The similarity of the gonopods unites the two species.

Sumidero sprousei, new species
Figs. 44-45

Diagnosis.—A small species of *Sumidero* resembling *pecki* in some of its somatic characters, but with gonopods much closer to the type found in *S. sumidero.*

Types.—Male holotype and male and female paratypes (AMNH) from Sótano de La Silleta, La Silleta, San Luis Potosí, México, collected 30 March 1980, by Peter Sprouse.

Etymology.—The species epithet honors Mr. Peter Sprouse.

Description of male holotype.—Length, 5.7 mm, width, 0.51 mm. Head setose, wider than collum, collum basically oval, but with definite paranotal corners posteriorly. Body moniliform, especially in anterior half, posterior segments more compressed. Midbody segment (Fig. 44) with dorsum strongly arched, paranota much reduced, pore-swellings torical. Reduced paranota with 3 marginal teeth anterior to pore; segments with 5 rows of short setae, about 12 in each row. Gonopods very much like those of *S. sumidero*, but solenomerite proportionally shorter, narrower, ventralmost branch more triangular (Fig. 45); distalmost major seta without small setae distal to it. Pregonopodal legs and some other anterior legs markedly more crassate than in female. Unpigmented, cuticle thin, brittle.

Description of female paratype.—Length, 6.9 mm, width, 0.55 mm. Nonsexual characters as in male.

Records.—Known only from the type-locality.

Tylogoneus Causey

This genus, with its characteristic 3-branched gonopods, small size and much reduced paranota, has been known previously from two species found in caves in San Luis Potosí and Tamaulipas (Causey, 1973). After examining more specimens, I think my species *Caramba delnegro* Shear (Shear, 1977) must be transferred to this genus; the gonopods seem much closer to *Tylogoneus rainesi* Causey than to the two species of *Caramba.* However, the two genera are definitely closely related to each other, and more distantly to *Sumidero* species.

Tylogoneus delnegro (Shear) NEW COMBINATION

Caramba delnegro Shear, 1977, Acc. Naz. Lincei, Prob. Att. Sci. Cult., 171(3):248, figs. 24-28.

This species was described from males and females found in Cueva del Negro, near Bochil, Chiapas.

Tylogoneus oyamel, new species
Fig. 46

Diagnosis.—Differs from *T. rainesi* and *T. minus* Causey in the acute, rather than blunt, prefemoral branch; *T. delnegro* has a small branch near the tip of the solenomerite not present in *T. oyamel.*

Types.—Male holotype and female paratypes (AMNH) from Sumidero de Oyamel, Sistema Purificación, Conrado Castillo, Tamaulipas, México, collected 13 March 1979 by D. Pate and L. Wilk.

Etymology.—The species epithet, a noun in apposition, refers to the type-locality.

Description of male holotype.—19 segments. Length, 13.5 mm, width at segment 5, 0.85 mm. Segment structure and setation typical of genus (see Causey, 1973). Gonopods (Fig. 46) typically 3-branched; in mesal view prefemoral branch bears short setae nearly to tip, is sinuously curved; solenomerite branch nearly straight, acute; outer accessory branch near solenomerite base spatulate near its tip. Body lacking pigment, cuticle rather soft. Legs not modified.

Description of female paratype.—Length, 15 mm, width, 0.88 mm. All nonsexual characters as in male.

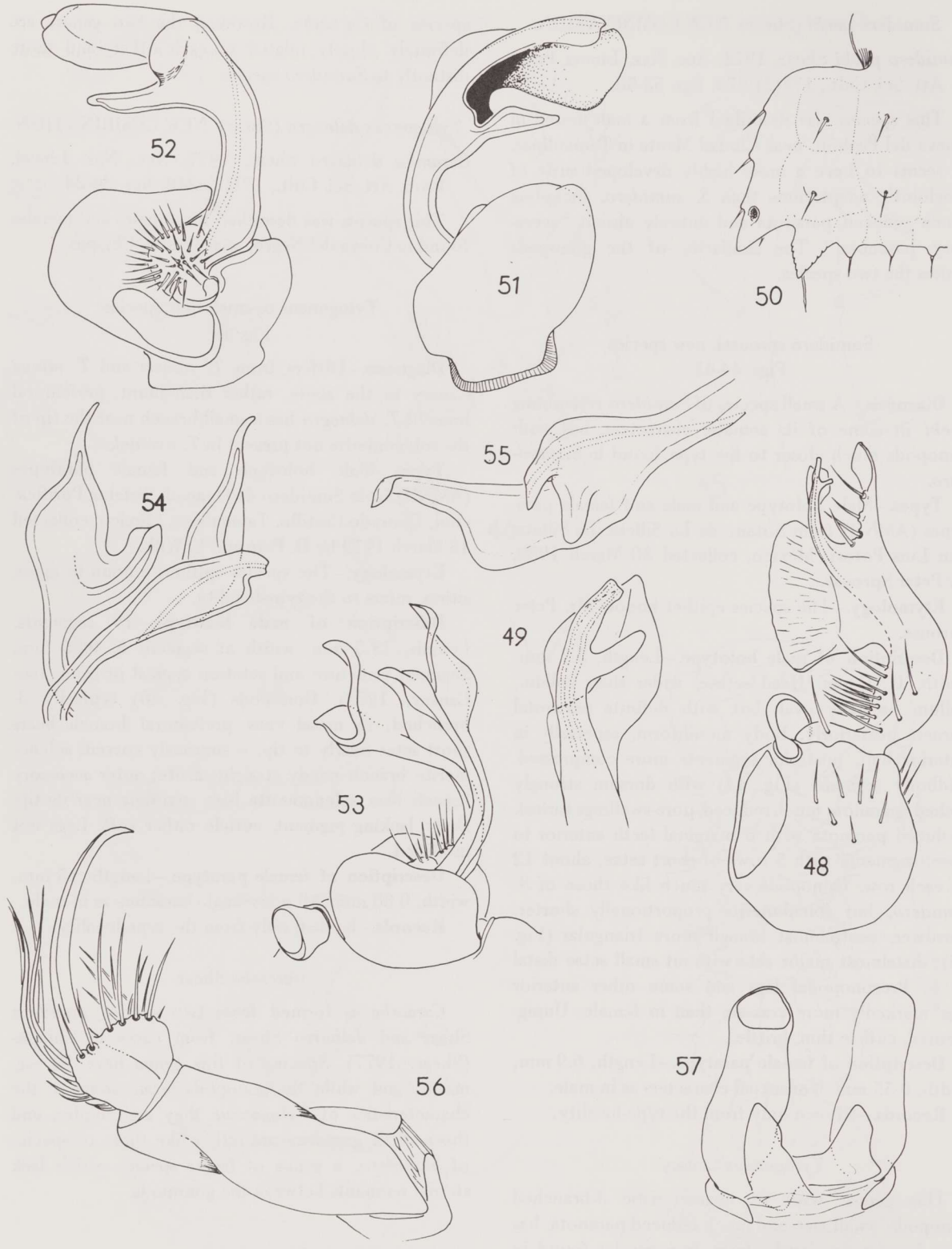
Records.—Known only from the type-locality.

Caramba Shear

Caramba is formed from two species, *grandeza* Shear and *delburro* Shear, from caves in Chiapas (Shear, 1977). Species of this genus have 18 segments, and while the gonopods retain some of the characteristics of *Tylogoneus* they are simpler, and those of *C. grandeza* are rather like those of species of *Sumidero*, a genus of larger species which lack sternal remnants between the gonopods.

Caramba enbecausius, new species
Figs. 47-49

Diagnosis.—Most similar to *C. delburro*, but the flange subtending the solenomerite of the gonopod is much larger and more flaring in the present species,



Figs. 48-57.—Anatomy of *Caramba enbecausius,* n. sp., *Salvadoria* spp., and *Bonetesmus soileauae,* n. sp.: Figs. 48-49.—*C. enbecausius,* n. sp.: 48, left gonopod, view slightly mesal of posterior; 49, solenomerite tip of same. Figs. 50-52.—*Salvadoria beliza,* n. sp.: 50, left paranotum of midbody segment, dorsal view; 51, right gonopod, lateral view; 52, the same, mesal view. Figs. 53-55.—*S. mexicana,* n. sp.: 53, gonopods *in situ,* viewed from animal's left side; 54, gonopod tips viewed from right side; 55, gonopod tip, posterior view. Figs. 56-57.—*B. soileauae,* n. sp.: 56, right gonopod, lateral view; 57, gonopod coxae and sternite, view slightly lateral of posterior.

and while *enbecausius* is the larger species, the segmental setae of *delburro* are much longer (compare the figure in Shear, 1977, with the present Fig. 47).

Types.—Male holotype and male and female paratypes (AMNH) from Cueva de Las Maravillas, 6 mi. S of Acatlán, Oaxaca, México, collected 29 December 1976 by J. Reddell, A. Grubbs, C. Soileau and D. McKenzie.

Etymology.—The species epithet is an arbitrary combination of letters.

Description of male holotype.—18 segments. Length, 6.7 mm, width at segment 5, 0.72 mm. Body appearing moniliform, paranota reduced to very low torical swellings (Fig. 47), pores on some posterior segments are small, not rimmed. Segmental setae about 0.11 mm long, densely scattered on anterior segments, then forming about 3 transverse rows. Gonopods (Figs. 48-49) closely resembling those of *C. delburro*, but flange arising from solenomerite base much larger, more flaring; when gonopods are in place the flat mesal surfaces of these flanges are closely appressed. Legs not modified. Entirely without pigment.

Description of female paratype.—Length, 7.0 mm, width 0.77 mm. Nonsexual characters as in male.

Records.—*Veracruz:* Cueva Macinga, Tlilapan, 9 January 1977 (J. Reddell, A. Grubbs, C. Soileau, D. McKenzie), males, females. *Puebla:* Horizontal Cave, Zoquitlán, January 1978 (P. Strickland, J. Hooper), male (all AMCS).

Salvadoria Kraus

Kraus (1954) described 5 species in this genus, all from El Salvador. The following two species, one from México and one from Belize, are the first records of this genus north of El Salvador. *Salvadoria mexicana* is the first probable troglobite in the genus. Characteristic of this section of the Fuhrmannodesmidae are gonopods with long, thin shafts, which cross in the midline, and expanded tips.

Salvadoria beliza, new species
Figs. 50-52

Diagnosis.—A typical species of *Salvadoria*, differing from those described in Kraus (1954) in the two large teeth at the lateroposterior angle of each metazonite (Fig. 50), and in the form of the gonopods.

Type.—Male holotype (AMNH) from Caves Branch, Cayo District, Belize, collected July-August, 1976, by L. McNatt.

Etymology.—The species epithet is a noun in apposition and refers to the species' country of origin.

Description of male holotype.—20 segments. Length, 13 mm, width at segment 6, 1.32 mm. Body of typical form (see Kraus, 1954), but midbody paranota (Fig. 50) with serrate edges, pores opening nearly flat on dorsal surface of large lateral tooth. Of three teeth on posterior margin of segment, lateralmost is much larger, with minutely serrate edge. Gonopods (Figs. 51-52) typical, coxae globose, closely appressed; telopodites crossing so that enlarged apices lie over opposite coxa. Apices expanded, bulky, with proximal shelf subtending lateral, bladelike solenomerite; mesal process very broad, spatulate. Color pale brown fading to ivory-white.

Female.—Unknown.

Records.—Known only from the type-locality.

Notes.—While not a troglobitic species, *S. beliza* occurs in a karst area and serves to link the following species with the Salvadorian ones described by Kraus (1954).

Salvadoria mexicana, new species
Figs. 53-55

Diagnosis.—A 19-segmented species of *Salvadoria*, unusually small and evidently troglobitic.

Type.—Male holotype (AMNH) from Sótano de Cancuc, Chiapas, México, collected 12 March 1977 by C. Soileau.

Etymology.—The species epithet is an adjective referring to the species' country of origin.

Description of male holotype.—19 segments. Length, about 4 mm (specimen in fragments), width at segment 6, 0.74 mm. Body form as usual, but paranota somewhat suppressed. Collum oval, narrower than head, with 2 rows of sparse, rather clavate setae; midbody segments with 3 marginal setae, 6-8 setae in 3 transverse rows. Legs unmodified. Gonopods (Figs. 53-55) crossing over as in other species; solenomerite lateral, basal dorsal branch suppressed, in form of low shelf (Fig. 55), mesal branch broad, twisted at tip. Entirely unpigmented cuticle thin and leathery.

Female.—Unknown.

Records.—Known only from the type-locality.

Superfamily Sphaeriodesmoidea

Family Sphaeriodesmidae Peters

Subfamily Bonetesminae Hoffman

Bonetesmus Chamberlin

In 1974, I placed this genus, following tradition, in the Oniscodesmidae. Hoffman (1979) has established that it really belongs in its own subfamily of the Sphaeriodesmidae. The genus now consists of three species (including the new one below) from southern

México; all are known only from caves and are probable troglobites.

Bonetesmus verus Chamberlin

Bonetesmus verus Chamberlin, 1942, Bull. Univ. Utah, 7(2):11, figs. 18-20; Shear, 1974, Acc. Naz. Lincei, Prob. Att. Sci. Cult., 171(2):257, figs. 20-28.

Bonetesmus novenus Causey, 1971, Assoc. Mexican Cave Stud. Bull., 4:30.

New records.—*Veracruz:* Cueva de Sala Seca, 4 January 1977 (J. Reddell, A. Grubbs, C. Soileau, D. McKenzie), males, females; Cueva de Corral de Piedra, 3 km SE Corral de Piedra, 5 January 1977 (collectors as preceding), males, females (all AMCS).

Bonetesmus soileauae, new species
Figs. 55-56

Diagnosis.—The gonopod acropodite (Fig. 56) is acute and curved; in *B. verus*, it is spatulate and broadened at the tip, and in *B. ojo* Shear, the acropodite is shorter, much heavier, and deeply divided apically.

Types.—Male holotype and female paratypes (AMNH) from Cueva de Las Maravillas, 6 km S of Acatlán, Oaxaca, México, collected 29 December 1976 by J. Reddell, C. Soileau, A. Grubbs, and D. McKenzie.

Etymology.—The species epithet honors Ms. Carmen Soileau.

Description of male holotype.—19 segments. Length, about 12 mm (specimen fragmentary), width, 2.02 mm. Body form and vestiture typical, as described for *B. verus* and *B. ojo* (Shear, 1974, 1977). Gonopods (Figs. 55, 56) with very large and prominent transverse sternum (Fig. 55) enfolding bases of coxae, incomplete on dorsal side. Coxae elongate, very sparsely setose, prefemur globular, mesally depressed, densely setose, posterior group of setae particularly large and prominent, sinuously curved; acropodite twice as long or longer than prefemur, acute, evenly curved, sickle-shaped (Fig. 56) seminal canal not detected. Legs not modified. Color opaque bone-white, cuticle heavy. Coloration obscured by usual adherent coat of orange silt.

Description of female paratype.—Length, 11.7 mm, width, 1.7 mm. Nonsexual characters as in male.

Records.—*Oaxaca:* Cueva de la Finca, 10 km S Acatlán, 31 December 1976 (J. Reddell, A. Grubbs, D. McKenzie), males, females (AMCS).

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THE CAVERNICOLOUS ANCHOMENINE BEETLES OF MEXICO (COLEOPTERA: CARABIDAE: AGONINI)

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ABSTRACT

Anchomenines are the largest and most conspicuous carabid beetles in Mexican caves. Most of them are assigned to *Mexisphodrus* Barr and *Rhadine* LeConte, two genera near *Platynus* Bon. Illustrated keys for determination of species and subspecies of these two genera are given. *Mexisphodrus* includes: *veraecrucis* Barr (Veracruz), *zoquitlan* n. sp. (Puebla), *urquijoi* Hendr. & Bol. (Oaxaca), *cuetzalan* n. sp. (Puebla), *profundus* Barr (Tamaulipas), *cancuc* n. sp. (Chiapas), *gertschi gertschi* Hendr. & Bol. (Hidalgo), *g. ahuacatlan* n. ssp. (San Luis Potosí), *g. sprousei* n. ssp. (San Luis Potosí), *g. camposantos* n. ssp. (Querétaro, Hidalgo), *purgatus* n. sp. (Tamaulipas, Nuevo León), *spiritus* n. sp. (San Luis Potosí), *boneti boneti* (Bol. & Hendr.), n. comb. (Nuevo León), *b. nortoni* n. ssp. (Nuevo León), *b. monterreyensis* n. ssp. (Nuevo León), *b. palmitensis* n. ssp. (Nuevo León), *valverdensis* n. sp. (Texas, U.S.A.). *Rhadine* includes: *euprepes* (Bates) (Chihuahua, Durango, Oaxaca), *hendrichsi* n. sp. (San Luis Potosí), *reddelli* n. sp. (Tamaulipas), *perlevis* Csy. (Chihuahua), *rotgeri* Bol. & Hendr. (Coahuila, Durango), *medellini* Bol. & Hendr. (San Luis Potosí), *araizai* (Bol.) (Nuevo León, Coahuila), *bolivari* n. sp. (Coahuila), *leptodes* (Bates) (Durango), *chipinque* n. sp. (Nuevo León), *elliotti* n. sp. (Nuevo León); the latter two species are the first troglobitic species of *Rhadine* known from México. *R. boneti* Bol. & Hendr. is transferred to *Mexisphodrus* and *R. pelaezi* Bol. & Hendr. to *Platynus*. *Agonum jonesi* Barr is a junior synonym of *R. larvalis* LeConte. *Miquihuana rhadiniformis*, n. gen. and sp. (Tamaulipas) is a troglobitic representative of the *Sphodrus* group, subtribe Sphodrina, with styloid right paramere; it is a wholly new element in the Nearctic cave carabid fauna.

Carabid beetles encountered in caves of México include trechines *(Mexaphaenops, Paratrechus, Mexitrechus, Chiapadytes)*, ozaenines *(Pachyteles)*, scaritines *(Antroforceps, Clivina, Ardistomis)*, bembidiines *(Tachys, Bembidion)*, anillines *(Mexanillus)*, lebiines *(Xenodromius* and other accidentals), harpalines *(Selenophorus* and other accidentals), and numerous anchomenines. The anchomenines are more widely prevalent, in many caves more abundant, and certainly larger and more conspicuous than representatives of any other carabid group, including the trechines. They are thus terrestrial predators of major ecological significance in cave communities of México.

The vast majority of Mexican anchomenines, including species described in various genera, were lumped by Whitehead (1973) into *Platynus* s. lat. The practice of Putzeys and Chaudoir of putting almost every subtropical and tropical anchomenine in the New World into *Colpodes* M'Leay had already been criticized by Casey (1920), who selected *Anchomenus* as the appropriate repository for most of these species, at the same time naming additional genera and subgenera. Recent studies on anchomenines of México and Central America have been almost entirely limited to cavernicolous species and montane relics. Whitehead's paper (1973) contains a very useful key to described species of epigean anchomenines from the region. Ball and Nègre (1972) reviewed the Nearctic *Calathus*, including several Mexican species.

Almost certainly Whitehead's concept of *Platynus* in the wide sense must sooner or later give way to a phylogenetically structured system involving a number of genus-group names, species groups, and so forth. Because such a classificatory scheme does not yet exist, the relationship of many cave-associated species to winged epigean species has not been established. The objective of the present study is less ambitious: what I have tried to do is describe the habitually cavernicolous anchomenines of México and

to suggest their relationships to each other. These fall into two major groups, which I treat as genera: 1) *Rhadine*, with narrow, blunt, prosternal process and non-lobate 4th tarsal segments; and 2) *Mexisphodrus*, with sharply truncate, triangular prosternal process and asymmetrically lobed 4th tarsal segments. In both groups the parameres of the male genitalia are conchoidal. The pattern of the female stylus is illustrated in Figs. 45 and 46.

Platynus (Hemiplatynus) umbripennis Casey has not been separately considered here; it is a habitual troglophile in caves of northern Guerrero, southwestern Morelos, and the southwestern part of the state of México (see Barr, Bolívar, and Hendrichs, 1968). *Platynus pelaezi* (Bolívar and Hendrichs) (1964:12) is suggested as a new combination for *Rhadine pelaezi*, a species described and known only from Grutas de García, near Monterrey, Nuevo León; it has neither the characteristic flat disc nor narrow, reflexed margin of the elytra in *Rhadine*, and it has rather large hind wing rudiments, which are absent in *Rhadine*.

The present paper limits discussion to anchomenine species regarded as troglobites or troglophiles. The many apparently accidental, full-winged species from Mexican caves have not been considered, although some of them possess a triangular, sharply truncate prosternum base and are probably taxonomically close to *Mexisphodrus* spp. *Mexisphodrus tlamayaensis* Barr (1966) is one such species with functional wings and large eyes; the tip of the aedeagus in this and several other apparently related species is produced as a narrow spout for some distance beyond the apical orifice, contrasting with the short, blunt aedeagal apex in the cave *Mexisphodrus*. It is probably not too closely related to the cave species (Barr, 1970; Whitehead, 1973). Whether *Mexisphodrus* is ultimately retained as a genus or assigned subgeneric standing will depend on the lumping or splitting proclivities of a future reviser. The group as constituted here—at least for the cave species—is in my judgment a monophyletic taxon deserving a genus-group name; the rank is necessarily subjective. *Speocolpodes* (Barr, 1973), a monobasic Guatemalan genus established for the remarkable troglobite *S. franiai*, may be absorbed into *Mexisphodrus* when morphologically and geographically intermediate species have been discovered, but at present such synonymy appears a little premature. *Speleodesmoides* (Mateu, 1978), a monobasic cave genus from Venezuela, is also phylogenetically close to *Mexisphodrus*, judging from the description.

Elsewhere (Barr, 1974) I have given my rationale for retaining *Rhadine* as a full genus. Lumping such a distinctive and highly monophyletic assemblage (with an estimated 70 species) with *Platynus* s. lat. seems to me counterproductive in any attempt to understand the phylogenetic complexities of the anchomenines.

All of the anchomenine genera previously mentioned belong to the Agonina (Agoni of Lindroth, 1956); both parameres of the male genitalia are conchoidal. Whether the similarity in habitus between these Nearctic cavernicoles and the Palearctic sphodrines is convergent or reflects close relationship has not been convincingly determined. Similarity between the true sphodrines (Sphodrina) and *Mexisphodrus* led me (Barr, 1965) to suspect that the latter might be primitive sphodrines, but I am now inclined to regard the form of the parameres as a very conservative character and thus view the convergence hypothesis as more likely. Similarly Uéno (1952) described the genus *Jujiroa* (Shikoku, Japan) as a sphodrid, but later (Uéno, 1955a) transferred it to the "true anchomenids" because both parameres are conchoidal. Evidently there is considerable convergence between these two lines of Agonina from México and Japan, respectively, and both are superficially convergent with the Sphodrina except for the nature of the parameres. Uéno (1955b) also described several species of *Trephionus* Bates (transferred to *Synuchus* Gyllenhal by Lindroth, 1956) from Japanese caves; these, too, have a habitus which recalls that of the sphodrines, but they belong to yet a third subtribe, the Synuchina (Synuchi of Lindroth, 1956). In all three subtribes it seems that adaptation to a subterranean existence leads to convergence of habitus.

More recently Habu (1978) revised the Japanese anchomenines, making use of the structure of the female genitalia (styli or hemisternites). In Habu's subtribe Platynina (=Agonina) the basal stylomere bears several subapical setae; the apical stylomere bears a pair of subapical setae on the inner side and usually three spines on the outer side. In his subtribe Sphodrina (=Sphodrina + Pristosiina excluding *Dolichus*) and Dolichina (=Synuchina plus *Dolichus*) the basal stylomere is glabrous, and the spines of the apical stylomere are reduced; in the Sphodrina the subapical pair of small setae is present, but it is absent in the Dolichina.

The recent discovery of the new Mexican genus *Miquihuana*, described in this paper, introduces a new element into the North American troglobitic fauna, because *Miquihuana* is a member of the Sphodrina, with compressed and truncate prosternal process and no longitudinal sulcus on the anterior tibia; the right paramere of the aedeagus is elongate, slender, arcuate,

and distinctly styloid, and the female stylus has a glabrous basal stylomere and only two spines on the apical stylomere. The genus is at present monobasic; its single species, *M. rhadiniformis*, is known from a cave in northwestern Tamaulipas, in the Sierra Madre Oriental. Jeannel (1937) divided the sphodrines into the *Calathus* group, the *Sphodrus* group, and the *Laemosthenes* group; *Miquihuana* in this scheme is a member of the *Sphodrus* group, heretofore not represented in the North American fauna. Except for the Holarctic genus *Calathus*, whose origins were traced by Lindroth (1956) and Ball and Nègre (1972) to the Old World, all known genera of Sphodrina are Palaearctic (see Lindroth, 1956; Jeannel, 1937, 1942). This suggests that *Miquihuana* is a remarkable relic of an Old World stock which is now apparently extinct in epigean habitats in North America. *Miquihuana* is also the only fully troglobitic sphodrine known at present. *Sphodropsis ghilianii* Schaum is a facultative cavernicole in the eastern Alps of southern Europe, and a number of species of other European sphodrine genera (notably *Antisphodrus* Schaufuss and *Ceuthosphodrus* Jeannel) are more or less cavernicolous (Jeannel, 1937). The single known species of *Miquihuana* very closely resembles an elongate, troglobitic species of *Rhadine*, and the argument for convergence of habitus among cavernicolous anchomenines becomes accordingly stronger.

The bulk of the available material used in this study was collected by Mr. James R. Reddell and his colleagues in the Association for Mexican Cave Studies. Significant additional collections were also made by Stewart B. and James H. Peck and R. M. Norton.

This paper is dedicated to my late colleagues Dr. Cándido Bolívar y Pieltain and Ing. Jorgé Hendrichs, whose deaths ended an era of pioneer discovery and description of the carabid fauna of Mexican caves. Dr. Bolívar's career spanned many decades and included studies of cave fauna of Europe, the United States (with René Jeannel in 1928), and in his adopted country México. The close and generous cooperation which Dr. Bolívar and Sr. Hendrichs offered me in the 1960's and 1970's led to the description of several new species of *Mexaphaenops*, the first four *Mexisphodrus* species to be discovered in Mexican caves, the first troglobitic North American scaritine (*Antroforceps bolivari* Barr), and clarification of the taxonomic status of *Platynus (Hemiplatynus) umbripennis* Casey. The assistance, counsel, and stimulating correspondence of these friends will be sorely missed. I know of no better way to honor their contributions and their memory than to continue the study of the Mexican cave carabid fauna which held their high interest in the last years of their productive lives.

Mexisphodrus Barr

Barr, 1965:65; type-species, *Mexisphodrus veraecrucis* Barr, by original designation.

Description.—Form more or less elongate, moderately to strongly convex, appendages elongate and slender; integuments dark piceous to reddish piceous. Prosternum sharply truncate and triangular at base; metepisternum with anterior margin half as long as outer margin; metathoracic wings vestigial (micropterous). Eyes rather small to very small, flat to convex, their diameter less than scape length, rudimentary in several species. Protibia longitudinally sulcate; tarsi with 4th segment asymmetrically bilobed; all tarsi strongly carinate both internally and externally; tarsi not strigose, typically glabrous above with strong isodiametric microsculpture. Elytra with 1-3 discal punctures, 1 or two punctures near apex of 7th stria; umbilicate series normally of 16-20 punctures; scutellar puncture and short scutellar stria usually present. Aedeagus typically anchomenine, basal bulb rather long and not appreciably larger in diameter than median lobe, basal orifice elongate and narrow; apex not narrowed nor produced, usually very briefly attenuate and acuminate, apical orifice subterminal, guarded by hood-like median flap and two lateral flaps, dorsal surface of median lobe in apical half with very strong isodiametric microsculpture; parameres sub-equal in length, conchoid, right paramere about half as wide as left. Female stylus with fringe of setae at inner, apical edge of basal stylomere; apical stylomere with two small subapical setae at inner side, spines of outer side rudimentary (Fig. 46).

Discussion.—It should be reiterated that *Mexisphodrus* is not a "true" sphodrine (Sphodri of Lindroth, 1956). The resemblances to the Sphodrina may be purely convergent, or they may result from an ancient common ancestry. Eleven species are recognized at the present time. The *veraecrucis* group includes four large, slender troglobites from caves in Puebla, western Veracruz, and northern Oaxaca. The *profundus* group, with transverse elytral microsculpture (like *Speocolpodes franiai*), includes one neartroglobite from Tamaulipas and a troglophile from Chiapas. The *gertschi* group includes two species with apparently functional eyes, dark piceous integuments, and deeply excavated elytral discs with prominent posthumeral ridges; one species occupies caves near the common border of San Luis Potosí, Hidalgo, and Querétaro, and the other is found in caves of the upper Purificación basin in western Tamaulipas. The

Key to Species and Subspecies of *Mexisphodrus*

1.* Eyes small but apparently functional, subconvex to convex with numerous facets visible and distinct 6
Eyes rudimentary, irregular or very small, individual facets present but more or less vestigial 2

2(1). Elytral microsculpture isodiametric; eye rudiments smaller, 1/4 to 1/2 as long as scape 3
Elytral microsculpture transverse; eye rudiments very flat, sunken beneath cuticle, 2/3 as long as scape; Tamaulipas (Gómez Farías and Encino areas) . . . . . *profundus* Barr

3(2). Elytral apex finely produced at apex of 3rd interval (Fig. 1) 4
Elytral apex finely produced at apex of 1st interval (Fig. 2) 5

4(3). Frontal grooves strongly wrinkled; pronotum hind angles acute; Veracruz (Tequila and Soledad Atzompa region) . . . . . *veraecrucis* Barr
Frontal grooves less wrinkled, more or less bifoveate, with anterior and posterior impressions; pronotum hind angles right; southern Puebla (Zoquitlán region) . . . . . *zoquitlan* n. sp.

5(3). Two pairs of supraorbital setae present; eye very small, its diameter scarcely 1/4 length of scape; northern Oaxaca (vicinity of Huautla de Jiménez and San Miguel) . . . . . *urquijoi* Hendrichs and Bolívar
One pair of supraorbital setae present; diameter of eye rudiment nearly half length of scape; northern Puebla (Cuetzalan region) . . . . . *cuetzalan* n. sp.

6(1). Elytral microsculpture transverse, body slender and subdepressed; eyes small and subconvex or flat and rectangular 7
Elytral microsculpture isodiametric, body (at least elytra) robust and convex 8

7(6). Eyes flat, almost rectangular; pronotum with prominent anterior angles and two pairs of marginal setae; elytra with 3 pairs of discal punctures; Tamaulipas . . . . . *profundus* Barr
Eyes small, round, subconvex; pronotum with subdued anterior angles and only one pair (anterior) of marginal setae; elytra with only two discal punctures; Chiapas . . . . . *cancuc* n. sp.

8(6). Elytra with conspicuous discal excavation from base to apical half or beyond, with posthumeral ridges or carinae 9
Elytra without basal excavation, disc simply convex to very convex 13

9(8). Dull-shining; sides of pronotum shallowly sinuate or convergent (Figs. 12-15); posthumeral ridge very prominent but rounded on top, not carinate; common corner of Hidalgo, San Luis Potosí, Querétaro 10
Polished-shining; sides of pronotum deeply sinuate before hind angles (Fig. 16); sharp discal carina behind humerus; upper Río Purificación basin, Tamaulipas, Nuevo León . . . . . *purgatus* n. sp.

10(9). Frontal grooves short and rather shallow; pronotum sides less rounded, anterior angles more prominent (Figs. 12, 15) 11
Frontal grooves deeper; pronotum sides more rounded, anterior angles less prominent (Figs. 13, 14) 12

11(10). Length 14.4-17.0 mm; pronotum about 0.87 as long as wide; posthumeral ridges prominent; Cueva de El Ocote, Hidalgo . . . . . *gertschi gertschi* Hendrichs and Bolívar
Length 11.0-13.4 mm; pronotum 0.8 as long as wide; posthumeral ridges subdued; eastern Querétaro, western Hidalgo . . . . . *gertschi camposantos* n. subsp.

**M. profundus*, with visibly reduced eyes, is keyed out under both choices in this couplet.

12(10). Pronotum sides strongly rounded; elytral sides not sinuate in basal third; strial impression and lateral explanation moderate; vicinity of La Silleta (8 km NW Xilitla), Querétaro . . . . . *gertschi sprousei* n. subsp.

Pronotum sides less rounded; elytral sides shallowly but distinctly sinuate in basal third, striae rather deeply impressed and disc more strongly explanate laterally in apical third; Ahuacatlán vicinity, eastern San Luis Potosí. . . . . *.gertschi ahuacatlan* n. subsp.

13(8). Elytra very convex, pronotum almost barrel-shaped (Figs. 18-22), very shallowly sinuate at sides 14

Elytra moderately convex, pronotum strongly cordiform, deeply sinuate at sides (Fig. 17); western San Luis Potosí . . . . . *.spiritus* n. sp.

14(13). Head with only one pair of supraorbital punctures; Nuevo León, México 15

Head with two pairs of supraorbital punctures; Val Verde Co., Texas . . . . . *.valverdensis* n. sp.

15(14). Elytra with rather deeply impressed striae, intervals subconvex 16

Elytral striae very fine and regular, intervals flat 17

16(15). Head with distinct neck constriction (Fig. 19); pronotum with one pair of marginal setae; elytra with 2 pairs of discal setae; vicinity of Monterrey, Nuevo León . . . . . *boneti monterreyensis* n. subsp.

Head without sharp neck constriction (Fig. 21); pronotum usually without marginal setae; elytra with 0 or 1 pair of discal punctures; vicinity of Bustamante, Nuevo León . . . . . *boneti palmitensis* n. subsp.

17(16). Head and pronotum shining, microsculpture obsolete; pronotum widest near middle, no marginal setae; Cueva de la Boca, near Santiago, Nuevo León . . . . . *boneti boneti* Bolívar and Hendrichs

Head and pronotum dull-shining, microsculpture evident; pronotum widest before middle, one pair (anterior) of marginal setae present (cave area about 35 km west of Montemorelos, Nuevo León). . . . . *.boneti nortoni* n. subsp.

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spiritus group includes a single species from caves of semi-arid western San Luis Potosí. The *boneti* group includes two species with barrel-shaped pronotum and very convex elytra; they occur in Nuevo León, México, and Val Verde County, Texas.

All of the species treated here are known only from caves, but without intensive collecting at the surface in the same region, it is not possible to say whether they also occur in non-cave microhabitats. In the caves they are found walking about on walls and floor. Known distributions of even the apparent troglophilic species (large eyes) are quite local, suggesting that they may be just as restricted geographically as are the troglobitic species. Geographic distribution of the genus is shown in Fig. 47; known species are decidedly eastern, limited to upland areas in the Sierra Madre Oriental, the Sistema Montañoso Oaxaqueño-Poblano, and so forth.

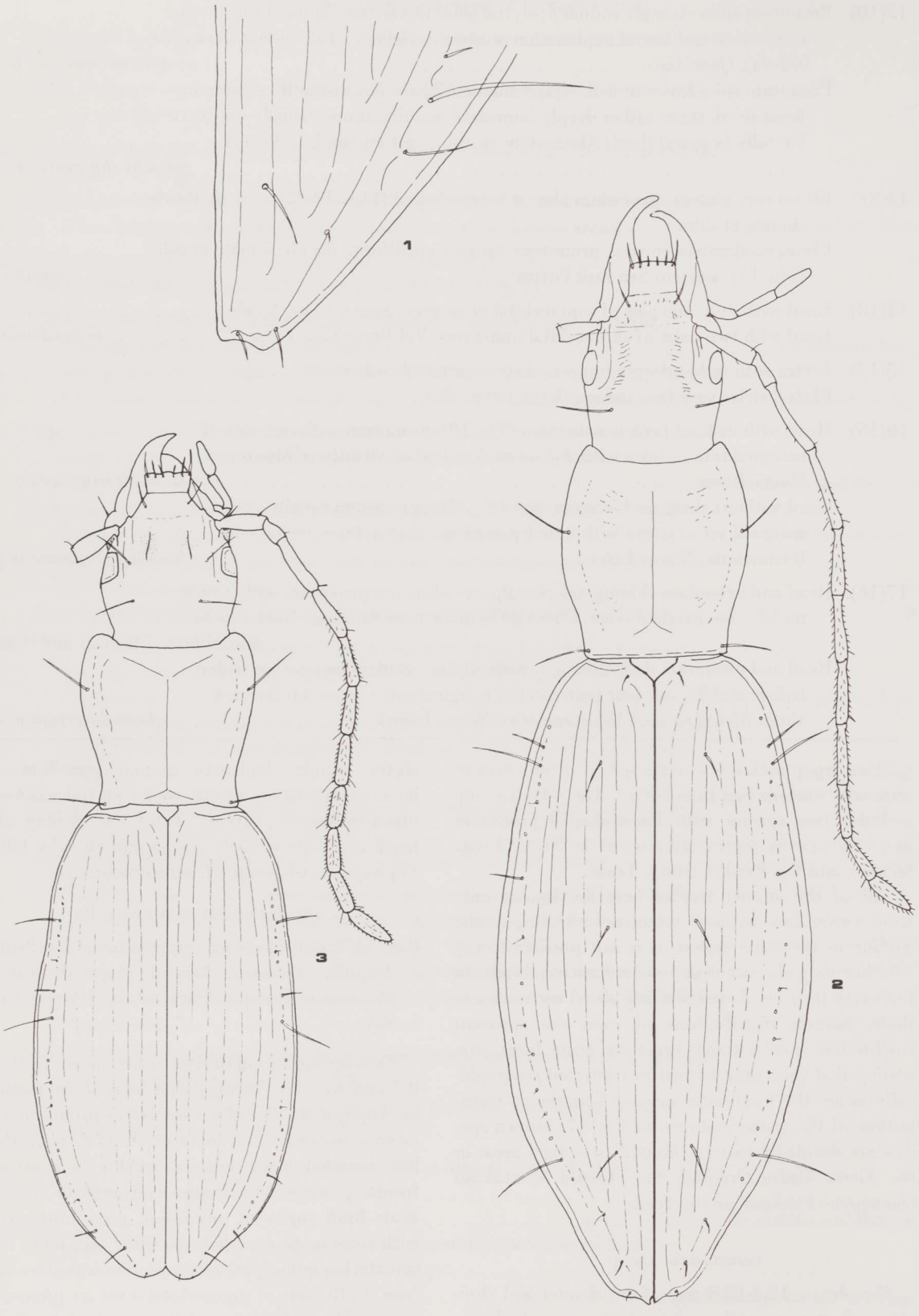
veraecrucis group

Size large, 12.4-18.8 mm; form slender and elongate, all species with rudimentary eyes which are flattened, 1/4 to 1/2 as long as scape, nevertheless with rudiments of numerous vestigial facets visible; elytra weakly deplanate around scutellum, posthumeral elevations rather weak; elytral microsculpture isodiametric, surface of disc dull shining; all 4th tarsal segments strongly and asymmetrically bilobed. Type-species of group: *M. veraecrucis* Barr.

Mexisphodrus veraecrucis Barr

Barr, 1965:66; type-locality, Sótano del Profesor, Tequila, Veracruz, México; type deposited in Museum of Comparative Zoology, Harvard University.

Description.—Length 16.9-18.8, mean 17.9 ± SD 0.7 mm (n = 6). Distinguished from *M. cuetzalan* and *M. urquijoi* by elytral apexes finely produced at 3rd interval instead of 1st interval; from *M. zoquitlan* by less rounded head, much wrinkled and excavated frontal grooves, less pronounced anterior angles and acute hind angles of pronotum, pronotum narrower with sides more rounded anteriorly and more deeply sinuate behind, elytra more slender and more ventricose. Both pairs of supraorbital setae are present (one pair in *M. cuetzalan*), and the eye diameter is about one-third the length of the scape (1/4 as long in *M. urquijoi*).



Figs. 1-3.—*Mexisphodrus* spp.: 1, *M. zoquitlan,* n. sp., elytral apex; 2, *M. cuetzalan,* n. sp.; 3, *M. profundus* Barr (Sótano de la Joya de Salas).

Discussion.—This species is known from 8 specimens in four caves near Tequila and Soledad Atzompa, south of Orizaba in western Veracruz: Sótano del Profesor and Sótano de los Sphodrini, near Tequila; and Sótano de Teanacan and Sótano Itamo, near Soledad Atzompa. The two localities are in contiguous karst, separated by a distance of only 10 km.

Mexisphodrus zoquitlan, new species
Figs. 1, 5

Description.—Closely similar to *M. veraecrucis,* differing in slightly smaller size, more rounded head, slightly lobed labrum margin, more or less bifoveate and less wrinkled frontal grooves, broader pronotum with sides less rounded and only feebly sinuate before base, anterior angles conspicuously produced, hind angles about right, elytra less slender and less ventricose. Length 13.8-18.5, mean 16.1 ± SD 1.6 mm (n = 6). Head 1.5 times longer than wide, eye 1/3 scape length. Pronotum nearly as long as wide, sides weakly arcuate and very shallowly sinuate before base; base 1/4 wider than apex and 0.8 maximum pronotum width; anterior angles prominent, blunt, and produced; hind angles about right, sharp. Elytra nearly 1.9 times longer than wide; 3 discal punctures present; umbilicate series with supernumerary punctures about as in *M. veraecrucis;* apex slightly produced at apex of 3rd interval. Aedeagus of holotype 3.12 mm long, typical for the group with basal bulb slender, basal orifice long and narrow, apical orifice subterminal.

Type-series.—Holotype male (American Museum of Natural History), allotype female, and one paratype male, Sótano of the Log-Filled Sink, 10 km E of San Pablo Zoquitlán, Puebla, México, January 1977, P. Strickland, P. Forsythe, F. Poer, and J. Rodemaker.

Measurements (mm).—Holotype, total length 16.0, head 3.15 long X 2.08 wide, pronotum 3.02 long X 3.08 wide, elytra 8.55 long X 4.59 wide, antenna 9.18 long, aedeagus 3.12 long.

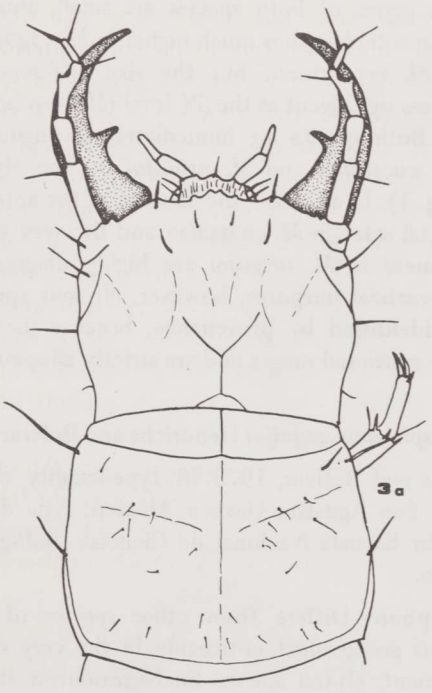
Discussion.—Described on 6 specimens from two caves near San Pablo Zoquitlán, Puebla: 2 males and 1 female, Sótano of the Log-Filled Sink (type-locality), and 3 females, Sótano de Coyomeapan (=Second River Cave), 12 km ESE San Pablo Zoquitlán (P. Strickland, leg.). The second male from Sótano of the Log-Filled Sink and all females from Sótano de Coyomeapan have been designated paratypes.

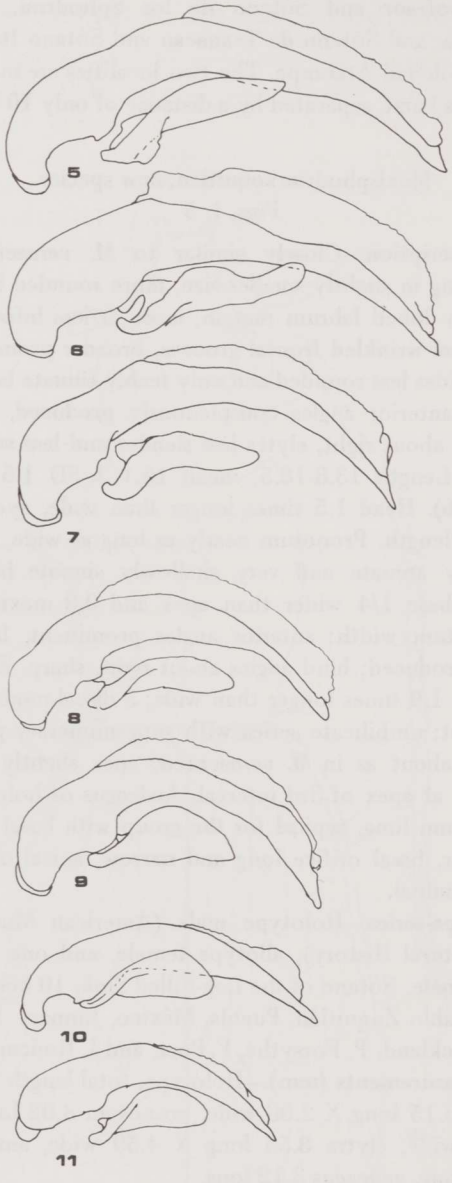
Mexisphodrus veraecrucis and *M. zoquitlan* are more closely similar than any other pairs of species in the *veraecrucis* group, and they are geographically closer to each other than the members of any other pair. The series of both species are small, and the variance in total length is much higher in *M. zoquitlan* than in *M. veraecrucis,* but the size difference is nevertheless significant at the 5% level (*M. zoquitlan* is smaller). Both species are immediately distinguished from *M. cuetzalan* and *M. urquijoi* by the elytral apex (Fig. 1). In addition, the absence of the anterior supraorbital setae in *M. cuetzalan* and the very small eye rudiment in *M. urquijoi* are highly diagnostic. For all practical purposes, however, all four species may be identified by provenance, because they all have very restricted ranges and are strictly allopatric.

Mexisphodrus urquijoi Hendrichs and Bolívar

Hendrichs and Bolívar, 1973:38; type-locality, Sótano de San Agustín, Oaxaca, México; type deposited in Escuela Nacional de Ciencias Biológicas, México.

Description.—Differs from other species of the *veraecrucis* group most noticeably in the very small eye rudiment; elytral apexes finely produced at the tips at the apex of the sutural stria (Fig. 1); two pairs of supraorbital setae; pronotum sides not sinuate before base, base distinctly wider than apex. Length 14.0-17.4, mean 15.3 (n = 4). Head 1.5 times longer than wide, a little rounded, neck about 0.8 greatest width; frontal grooves broad, rather shallow, with vague anterior and posterior depressions, separated from antennal ridge by 2 or 3 fine striae, one of which joins antennal groove behind anterior supraorbitals; eye very small, about 1/4 as long as scape, oblique and suboval, very flat, with vestiges of ommatidia, cuticle above eye with ommatidial vestiges covering an area about three times size of pale areolar rudiment; antenna less than 0.6 body length. Pronotum almost as wide as long (L/W about 1.02), widest in apical 0.4, base 0.9 times greatest width but apex only 0.7 times base width, sides weakly rounded apically then convergent behind anterior marginals; front angles prominent and produced, hind angles quite obtuse, finely produced, base oblique at sides behind hind angles; marginal gutter wide, disc with secondary inner crease, antebasal foveae with irregular elevated area in middle of depression. Elytra 1.9 times longer than wide, humeri strongly but not completely rounded, apexes finely produced along suture; disc depressed around scutellum, deplanate area in disc center extending through apical half; striae regular and moderately deep, intervals subconvex; microsculpture finely isodiametric, medium-shining; 3 discal punctures, anterior on 3rd stria, medial and posterior on 3rd interval; apex of 7th stria with 2 punctures; umbilicates 6(7) + 2 + 8(9),





Figs. 3a-11.—*Mexisphodrus* spp.: 3a, *M. profundus*, larva, head and prothorax, Cueva de la Mina; 4, *M. cancuc*, n. sp.; 5-11.—Aedeagi, left lateral view: 5, *M. zoquitlan*, n. sp.; 6, *M. cuetzalan*, n. sp.; 7, *M. gertschi sprousei*, n. subsp.; 8, *M. purgatus*, n. sp.; 9, *M. spiritus*, n. sp.; 10, *M. boneti palmitensis*, n. subsp.; 11, *M. valverdensis*, n. sp.

in three vaguely defined groups. Aedeagus 2.64 (holotype) to 2.92 mm long; feebly arcuate, widest in the middle, basal bulb not sharply set off from median lobe (Hendrichs and Bolívar, 1973:fig. 2).

Discussion.—Six specimens of this species are known, from caves in the vicinity of Huautla de Jiménez, northern Oaxaca: Sótano de San Agustín (type-locality); Cueva del Escorpión, San Miguel Dolina, San Miguel, 5 km SE Huautla de Jiménez; Sótano del Río Iglesia, 5 km SE Huautla de Jiménez; La Grieta, 2 km E San Andrés (5 km E Huautla de Jiménez); Sótano Li Nita, 5 km SE Huautla de Jiménez; and Cueva Bonita del Presidente, 1 km N Huautla de Jiménez. Most of these caves are part of a huge, integrated system (Stone, 1981; Steele, 1981).

In having the elytral apexes produced along the suture (instead of the 3rd interval) *M. urquijoi* resembles *M. cuetzalan*, from which it is readily distinguished by the much smaller eye rudiment and presence of both pairs of supraorbitals. The holotype is described as an old, partially damaged specimen. The five additional specimens show that both pairs of pronotal marginal setae are present and that the eyes are not entirely without rudiments of facets. The difference in size between *M. veraecrucis* and *M. urquijoi* is less than supposed by Hendrichs and Bolívar (1973), but *M. urquijoi* is probably smaller, although the small series available do not permit a statistically significant comparison.

Mexisphodrus cuetzalan, new species
Figs. 2, 6, 46

Description.—A large, elongate species differing from other species of the *veraecrucis* group in having only one pair of supraorbital setae; elytra finely produced at apex of first interval along sutural stria, as in *M. urquijoi.* Length 12.4-18.1, mean 15.0 ± SD 1.6 mm (n = 20). Dark piceous, microsculpture of head isodiametric, of pronotum disc finely transverse, of elytral disc isodiametric, dull shining. Head almost twice as long as wide; eye small, its diameter about 0.45 scape length, pale, individual ommatidia discernible; anterior margin of labrum truncate; dorsum of head strongly wrinkled between strong antennal ridge and shallow, short, frontal groove; only one pair of supraorbital setae (the posterior pair) present; antenna attaining apical fourth of elytra when laid back, pubescence beginning (as usual) near base of segment IV. Pronotum about 1.07 longer than wide, base width slightly more than apex width and 3/4 greatest width, which occurs before middle; anterior angles very prominent and produced; sides shallowly sinuate before base; hind angles large and slightly obtuse; disc subconvex, broadly deplanate internal to wide, well-defined gutter; two pairs of marginal setae. Elytra elongate-oval, somewhat ventricose, 1.9 times longer than wide, disc convex but slightly deplanate around scutellum, without posthumeral carina; humeri strongly but not completely rounded, margin slightly sinuate behind humerus and before apex, apexes minutely produced for width of first interval; longitudinal striae regular and moderately impressed, intervals subconvex, scutellar stria well developed, scutellar puncture setiferous; umbilicate series of 16 punctures in groups of 6 + 2 (widely spaced) + 8; 3 discal punctures, anterior on 3rd stria, middle and posterior punctures on 2nd stria. Aedeagus 2.89 mm long in holotype, basal bulb well defined but longer than wide, basal orifice elongate-oval; both parameres conchoid, right paramere conspicuously smaller than left.

Type-series.—Holotype male (American Museum of Natural History) and allotype female, Sumidero de Atepolihuit de San Andrés, Cuetzalan, Puebla, México, 2 January 1980, A. Grubbs, J. Lieberz, and B. Richards; paratype male, same cave, 28 December 1979, Hector Galindo and Adolfo Manuel.

Measurements (mm).—Holotype, total length 17.1, head 4.37 long X 2.22 wide, pronotum 3.12 long X 2.93 wide, elytra 9.58 long X 5.02 wide, aedeagus 2.89 long.

Discussion.—This species is described on 33 specimens collected from 11 caves in the vicinity of Cuetzalan and Xochitlán, northern Puebla: Sima de Coahuatichan, 2 km S Cuetzalan; Cueva Xochitl, 3 km S Xochitlán; Cueva Murciélago de Xocoyolo and Cueva de Xocoyolo, both 6 km S Cuetzalan; Simas de Octimaxal Sur No. 1 and No. 2, 3 km SSW Cuetzalan; Cueva de Tasalolpan, 5 km SW Cuetzalan; Grutas de Olivares, 8 km SW Cuetzalan; Grutas de Jonotla, 7 km SW Cuetzalan; Sumidero Atichayan (Sur), 2 km S Cuetzalan; Cueva de Guayateno No. 1, 7 km SW Cuetzalan; and Sima de Atepolihuit de San Andrés (type-locality).

The absence of the anterior supraorbital seta immediately distinguishes *M. cuetzalan* from other species of *Mexisphodrus.* The larger size and feeble basal depression of the elytra relate it to other species of the *veraecrucis* group, and the feebly produced elytral apex along the first interval is a character shared with *M. urquijoi.* This is the northernmost species of the group, the other three species being clustered around the common corner of Veracruz, Puebla, and Oaxaca.

profundus group

Form slender, elongate, somewhat depressed, length 10.4-14.4 mm; elytra polished shining, discal microsculpture finely and densely transverse; disc not conspicuously depressed around scutellum; 4th segments of middle and hind tarsi less conspicuously bilobed than on front tarsus. Type-species: *M. profundus* Barr.

This group includes two species, *M. profundus*, with small, flat eyes, from caves in the Sierra de Guatemala region of Tamaulipas, and *M. cancuc*, from a cave in Chiapas. These two species are perhaps closer to *Speocolpodes franiai* Barr, from a cave in Guatemala, than are the other species of *Mexisphodrus*, notably in degree of tarsal lobation and transverse elytral microsculpture.

Mexisphodrus profundus Barr
Fig. 3

Barr, 1966:113; type-locality, Sótano de la Joya de Salas, Tamaulipas; type deposited in Museum of Comparative Zoology, Harvard University.

Platynus profundus: Whitehead, 1973:207.

Description.—Length 10.5-14.4, mean 12.7 ± SD 0.9 mm (n = 20). Pale rufotestaceous to pale castaneous; form slender and elongate, polished shining, elytral microsculpture transverse. Eyes very flat, subnormal and subrectangular and/or sunken beneath cuticle (type-locality), but with numerous facets (vestigial in type-locality specimens); eye about 2/3 as long as scape, somewhat irregular in size, shape, and degree of rudimentation. Pronotum strongly cordiform, subparallel in some specimens, anterior angles strongly produced, sides weakly to moderately rounded, distinctly sinuate before sharp, about right hind angles; two pairs of marginal setae. Elytra rather depressed, striae moderately deep, intervals a little subconvex, no discal punctures, apexes rounded, umbilicate series about 16-18 (6 + 2-3 + 8-9) punctures, two closely spaced punctures at apex of 7th stria.

Discussion.—The type-locality cave is entered via a deep pit 25 km west of Encino, Tamaulipas. However, the species has subsequently been shown to occur in considerable abundance in caves of the Gómez Farías region, Tamaulipas, in La Cueva de la Mina, La Cueva Chica de la Perra, Crystal Cave, La Cueva de la Capilla, and Harrison's Sinkhole (Rancho del Cielo). Over 40 specimens from the latter caves have been examined. They differ from topotypic material primarily in less rudimentary eyes which, though still rather small and quite flat, are not sunken beneath the cuticle as they are in specimens from Sótano de la Joya de Salas. Ultimately the Gómez Farías populations should probably be designated a geographic race (subspecies); however, at present there is insufficient material from Joya de Salas to make a critical comparison.

Many of the specimens of *M. profundus* have been taken rather close to cave entrances or in the bottom of entrance shafts in wet areas (cf. Barr, 1966:114). Some specimens, notably those from La Cueva de la Mina, are heavily infested with laboulbeniaceous ascomycetes. In *M. profundus* the 4th segments of the middle and hind tarsi are a bit less strongly bilobed than in species of the *veraecrucis* group, but more so than in the following, presumably related species.

Mexisphodrus cancuc, new species
Fig. 4

Description.—Resembling *M. profundus* in body size, depressed and polished elytra with transverse microsculpture, cordiform pronotum, and moderately bilobed 4th tarsal segments, differing most conspicuously in small, round, convex, presumably functional eyes, subdued anterior angles, only one pair (anterior) of marginal setae on the pronotum, and presence of two elytral discal punctures instead of none. Length of unique female holotype 10.44 mm. Form elongate, slender, depressed; integuments shining, microsculpture (including elytral disc) generally transverse, glabrous; color dark reddish-testaceous. Head 1.4 times longer than wide, neck 0.8 times width measured across eyes; labrum not emarginate; frontal grooves short and broad anteriorly, represented by an irregular fovea each side medial to eye; antennal ridge weak, antennal groove curving around posterodorsal angle of eye; eye subconvex, its diameter half scape length; two pairs of supraorbital setae. Pronotum elongate cordiform, 1.1 times longer than wide, disc subconvex and broadly explanate at sides; anterior angles rounded; sides feebly arcuate apically, clearly though shallowly sinuate in basal fifth; hind angles sharp, about right; anterior marginal punctures present (setae broken?), no posterior marginal punctures present; apex seven-eighths as wide as base, which is seven eighths as wide as greatest width measured across anterior marginals. Elytra more than twice as long as wide, humeri completely rounded, greatest width behind middle, sides shallowly sinuate before apexes and finely and individually rounded at tips; disc weakly subconvex, scarcely depressed at base; striae moderately deep and regular, intervals feebly subconvex; scutellar puncture and short scutellar stria present; two discal punctures on 2nd stria behind middle, two closely

spaced punctures at apex of 7th stria; umbilicate series 6 + 2 + 8. Appendages long and very slender (right mesotibia is twisted and entire right metathoracic leg is missing in holotype); 4th segment of protarsus strongly and asymmetrically bilobed, of meso- and metatarsi less strongly bilobed; antenna 0.6 times body length, segment II half as long as segment I and 0.4 as long as III; segments III and IV subequal in length. Male unknown.

Type-series.—Holotype, a unique female (American Museum of Natural History), Sótano de Cancuc, Cancuc, 11 km NE Tenejapa, Chiapas, México, 12 March 1977, C. Soileau.

Measurements (mm).—Holotype, total length 10.44, head 2.08 long X 1.47 wide, pronotum 1.93 long X 1.74 wide, elytra 6.09 long X 2.94 wide, antenna 6.27 long, eye 0.31.

Discussion.—This species most closely resembles *M. profundus*, but it is more slender, the humeri more effaced and anterior pronotal angles not at all produced; the eyes, though about the same size as those of *M. profundus*, are more rounded and subconvex. In both species the middle and hind tarsi have the 4th segment less conspicuously bilobed than in the *veraecrucis* group, and the elytra are polished shining as a result of finely transverse discal microsculpture.

gertschi group

Size moderate to large (11.0-17.3 mm); form rather robust and convex, both species with convex, apparently functional eyes; elytra deeply excavated in basal half to two-thirds, with prominent posthumeral ridge or carina; elytral microsculpture isodiametric, dull-shining in one species and polished in the other; all 4th tarsal segments asymmetrically bilobed, though a little less strongly than in species of the *veraecrucis* group.

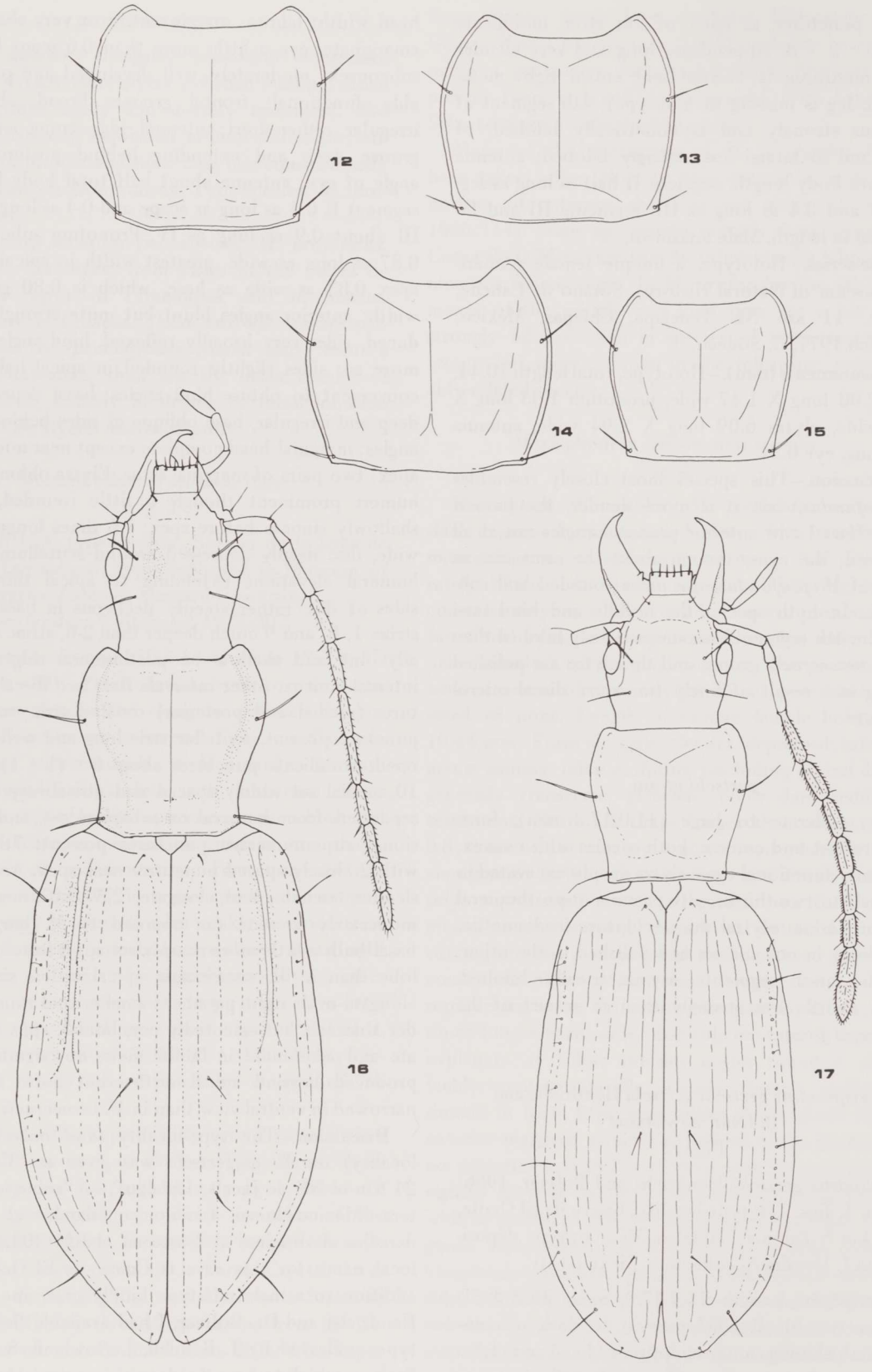
Mexisphodrus gertschi gertschi Hendrichs and Bolívar, new status
Fig. 12

Mexisphodrus gertschi Hendrichs and Bolívar, 1966: 8, pl. I, figs. 1-3; type-locality, Cueva de El Ocote, 1.5 km N Palomas, Hidalgo, México; type deposited in J. Hendrichs collection, Mexico City.

Description.—Length 14.4-17.0, mean 16.2 ± SD 1.1 mm (n = 6). Reddish-piceous to dark piceous-black, dull shining, microsculpture of head and elytra isodiametric but very fine, of pronotum finely transverse; form moderately robust and convex. Head 1/4 longer than wide, sides rounded, neck 0.8 greatest head width; labrum margin entire or very shallowly emarginate; eye a little more than 0.6 scape length, subconvex, moderately well developed and presumably functional; frontal grooves broad, shallow, irregular, rather short; antennal ridge strong, antennal groove deep and extending behind posterodorsal angle of eye; antenna about half total body length, segment II 0.4 as long as scape and 0.4 as long as III, III about 0.9 as long as IV. Pronotum subconvex, 0.87 as long as wide, greatest width in apical third, apex 0.83 as wide as base, which is 0.80 greatest width; anterior angles blunt but quite strongly produced, sides very broadly reflexed, hind angles even more so; sides slightly rounded in apical half then convergent to obtuse hind angles; basal depressions deep and irregular, base oblique at sides behind hind angles; marginal bead complete except near middle of apex; two pairs of marginal setae. Elytra oblong-oval, humeri prominent though a little rounded, sides shallowly sinuate before apex; 1.6 times longer than wide, disc deeply depressed around scutellum, posthumeral elevations extending to apical third and sides of disc rather steeply declivous in basal half; striae 1, 8, and 9 much deeper than 2-6, striae especially fine and shallow on posthumeral ridges, first interval convex, other intervals flat; two discal punctures (medial and posterior) on 2nd stria; scutellar puncture present, scutellar stria long and well developed; umbilicate punctures about 6 + (1 + 1) + (9-) 10, medial set widely spaced and not always clearly separated from humeral or subapical set, and occasional supernumerary punctures present; 7th stria with 2 closely spaced punctures near apex. Aedeagus slender, arcuate, and elongate, 2.57-3.07 mm long, moderately arcuate (as opposed to *M. purgatus*), basal bulb a little more sharply set apart from median lobe than in *M. veraecrucis*, apical orifice similarly elongate-oval, right paramere smaller and more slender than left but essentially conchoidal, apex attenuate and acuminate in lateral view, not significantly produced beyond apical orifice but more sharply narrowed in ventral view than in *M. veraecrucis*.

Discussion.—The type-locality (and only known locality) for *M. g. gertschi* was given as "Cueva a 24 Km al NE de Jacala, Hidalgo". . . ."sobre la carretera México-Nuevo Laredo, quedando al mano derecha al dirigirse al Norte en el KM 303.5;" the local name for this cave is Cueva de El Ocote. In addition to a male paratype kindly given me by Sr. Hendrichs and Dr. Bolívar, I had available five topotypes collected by J. Reddell, J. Rowland, S. and J. Peck on which to base the description given above.

The following three taxa are subjectively interpreted as subspecies of *M. gertschi*. No geographical



Figs. 12-17.—*Mexisphodrus* spp.: 12-15.— Pronotum, *M. gertschi* subspp.: 12, *M. g. gertschi;* 13, *M. g. ahuacatlan*, n. subsp.; 14, *M. g. sprousei*, n. subsp.; 15, *M. g. camposantos*, n. subsp.; 16, *M. purgatus*, n. sp.; 17, *M. spiritus*, n. sp.

or morphological intermediates are known, but all four taxa occur in a rather small area around the common corner of Hidalgo, San Luis Potosí, and Querétaro.

Mexisphodrus gertschi ahuacatlan, new subspecies
Fig. 13

Description.—Length 11.6-16.0, mean 14.0 ± SD 1.3 mm (n = 14), smaller than *M. g. gertschi.* Frontal grooves a little deeper, wider behind. Pronotum wider, L/W index about 0.8, sides more rounded, anterior angles less produced, hind angles a little more obtuse. Elytral sides shallowly but distinctly sinuate in basal third, longitudinal striae more deeply impressed and disc more strongly explanate toward sides in apical third.

Type-series.—Holotype male (American Museum of Natural History) and 8 paratypes, Sótano de Potrero, 1 km N Ahuacatlán, Mpo. de Xilitla, San Luis Potosí, México, 21 February 1973, R. W. Mitchell, S. Wiley, and T. R. Mollhagen. Additional material assigned to this taxon includes 4 specimens from Cueva de Potrerillos, Rancho de Potrerillos, 2 km WSW Ahuacatlán, 27 November 1972, J. Reddell and T. Raines; one specimen from Sumidero del Llano Conejo (=Cueva de Campamiento), 2 km E Cerro de la Luz, Querétaro, 8 June 1976, Roy Jameson; and one from the same cave, 30 April 1969, T. R. Evans.

Discussion.—Some of the Sótano de Potrero specimens were heavily infested with clusters of larval nematodes, not determined to family but attached to tarsi and elytral apexes in the manner of certain species of mermithids. Many of the specimens also were parasitized by occasional Laboulbeniales.

The populations treated here as subspecies of polytypic *M. gertschi* are all allopatric and inhabit different cave systems located a few kilometers apart in the Xilitla Plateau. From their relatively well-developed and presumably functional eyes one would suspect that populations of *M. gertschi* are troglophilic rather than troglobitic, yet the very limited distributions of the subspecies are more characteristic of troglobites. Cueva de Potrerillos is at a comparatively low elevation in contrast to the other caves, but it is nevertheless in limestone contiguous with that of the Xilitla Plateau.

Mexisphodrus gertschi sprousei, new subspecies
Figs. 7, 14

Description.—Length 12.5-17.3, mean 15.4 ± SD 1.9 mm (n = 4), intermediate in size between *M. g. gertschi* and *M. g. ahuacatlan* (but not geographically intermediate). Frontal grooves rather deep, about as in *M. g. ahuacatlan.* Pronotum very wide, L/W index 0.8 and sides very rounded, anterior angles as in *M. g. ahuacatlan,* hind angles strongly obtuse and base oblique behind each angle. Elytra not sinuate at sides in basal third, striae rather deep toward apex.

Type-series.—Holotype male (American Museum of Natural History) and one male and two female paratypes, Cueva del Agua, 700 m E La Silleta (about 8 km NW Xilitla), Mpo. de Xilitla, San Luis Potosí, México, 27 March - 1 April 1980, P. Sprouse, D. Pate, T. Treacy.

Discussion.—One of the three paratypes has the sides of the pronotum much more subparallel than the others, with hind angles much rounded and unilaterally an anterior discal puncture (in addition to the normal two pairs) on the third interval. The status of this unusually robust subspecies needs to be clarified by examination of larger series.

Mexisphodrus gertschi camposantos, new subspecies
Fig. 15

Description.—Length 11.0-13.4, mean 12.4 ± SD 0.9 mm (n = 7). Reddish piceous, smaller and more slender than other subspecies of *M. gertschi.* Frontal grooves relatively short and shallow. Pronotum wide (0.8 as long as wide), sides rounded and feebly sinuate before base, anterior and posterior angles about as in *M. g. gertschi.* Elytra with basal deplanation shallower, longitudinal striae finer than in any of the other subspecies, sides imperceptibly sinuate in basal third.

Type-series.—Holotype male (American Museum of Natural History) and two male paratypes, Sótano de Camposantos, 30 km SW Xilitla, Querétaro, México, 11 August 1966, J. R. Reddell. Additional specimens assigned to this subspecies are a female, Cueva del Niño, 12 July 1967, J. R. Reddell; and two males and one female, Cueva de las Tablas, 12 July 1967, J. R. Reddell and J. Fish; these two caves are quite close to the type-locality. Recently collected specimens from Sótano Inclinado, Sótano de Lombriz, and Sótano Hondo del Pinalito, all about 10 km N Jacala, Hidalgo, are also assigned to this subspecies.

Mexisphodrus purgatus, new species
Figs. 8, 16

Description.—A dark species with apparently functional eyes, very deep excavation of elytral disc, posthumeral ridges carinate, pronotum strongly cordiform, microsculpture of elytra isodiametric but very fine, polished-shining. Length 11.6-15.8, mean 13.75 ± SD 1.05 mm (n = 22). Form rather robust

and very convex, polished shining, reddish piceous to dark piceous, head and pronotum disc a little infuscated, appendages and elytra paler (except femora sometimes darker). Head about 1.4 times longer than wide, labrum not or very shallowly emarginate; antennal ridge very prominent but scarcely attaining anterior angle of eye, frontal grooves short and confluent with broad depressions medial to eyes, antennal groove deep and curving around to posterior angle of eye; eye 2/3 as long as scape, rather small, weakly convex; antenna 0.6 body length. Pronotum strongly cordiform, 1.0-1.1 as long as wide, sides rounded in apical 2/3, deeply and conspicuously sinuate in basal third; anterior angles prominent, blunt, and slightly produced, hind angles large and very obtuse, base oblique behind angles and rectilinear between them; disc strongly and broadly reflexed at sides; greatest width in about apical 3/8 at level of anterior marginals, posterior marginals in hind angles. Elytra strongly ventricose, margins sinuate in apical third, greatest width behind middle, 1.6 times longer than wide, apexes attenuate behind shallow subapical sinuation; disc deeply excavated in apical 3/4 between very conspicuous, carinate longitudinal ridges originating from base of 6th stria behind humerus, sides of ridge abruptly declivous between carinae and umbilicate puncture row, which lies between unusually deep 7th stria and more shallowly impressed 8th stria; umbilicate series 19-20, 2 small discal punctures in apical half on 3rd interval next to 2nd stria, scutellar puncture and short scutellar stria present; longitudinal striae very fine and regular, finely punctulate or not, intervals flat except for subconvex first interval alongside suture. Aedeagus 2.14-2.27 mm long, strongly arcuate, apex with lateral bosses in dorsal view and fine medial and lateral carinae in ventral view.

Type-series.—Holotype male (American Museum of Natural History) and 7 paratypes, Cueva del Tecolote, Los San Pedro (about 32 km NW Ciudad Victoria), Tamaulipas, México, 26 April 1980, P. Sprouse, T. Treacy, et al. Five additional paratypes, Cueva del Tecolote, Conrado Castillo (41 km NW Ciudad Victoria), 24 August 1973, D. McKenzie and R. Jameson.

Measurements (mm).—Holotype, total length 14.00, head 2.58 long X 2.08 wide, pronotum 2.83 long X 2.52 wide, elytra 7.74 long X 4.53 wide, antenna 6.48 long.

Discussion.—In addition to the type-series of 13 specimens, I have examined over 50 specimens from the following caves (all located between 32 and 41 km NW Ciudad Victoria): *Tamaulipas:* Cueva de los Allarines, 0.8 km N Conrado Castillo, 1900 m; Cueva de la Aprendiza, Conrado Castillo, 1920 m; Cueva de los Arcitos, Yerbabuena, 1500 m; Cueva de Borrego, 0.5 km S Conrado Castillo, 1980 m; Sótano de las Calenturas, 0.7 km S Yerbabuena, 1460 m; Sótano de la Cuchilla, 1.75 km N Conrado Castillo; Grieta de las Flores (=Pozo de Juan Fuentes Pérez), Conrado Castillo, 2000 m; Sótano de Jesús, 1 km S Rancho Revilla, 2210 m; Cueva del Moro, 2 km SE Yerbabuena; Sistema Purificación, Conrado Castillo, 1100 to 1900 m (specimens collected in Cueva del Brinco and Sumidero de Oyamel Sections); Cueva de Revilla (=Cueva de Rancho Revilla), Rancho Revilla, 2300 m; Cueva X, Conrado Castillo, 1950 m; *Nuevo León:* Cueva Chica del Ojo de Agua, 4 km WSW Dulces Nombres; Cueva de los Parajitos, 2 km N Tinajas, 7 km SE Dulces Nombres; Sótano de las Peñuelas, 3 km SW Dulces Nombres, 2010 m.

This distinctive species, easily recognized by its strongly cordiform pronotum, post-humeral carinae, small eyes, and polished-shining, almost opalescent integuments, is one of the most frequent terrestrial predators in the cave communities of the upper Río Purificación basin in western Tamaulipas and adjacent Nuevo León. *Mexisphodrus purgatus* coexists in this area with four endemic *Mexaphaenops* species: *M. mackenziei* Barr, *M. sulcifrons* Barr, *M. jamesoni* Barr, and *M. febriculosus* Barr (all described in Barr, 1981, this volume).

spiritus group

This group contains a single species with rather large, convex eyes, strongly cordiform pronotum with large, explanate hind angles, slightly ventricose and strongly convex elytra with finely impressed striae and flat intervals. Pronotum with 2 pairs of marginal setae. Elytra with isodiametric microsculpture; discal punctures 1-3, usually 2 pairs; 7th stria with two subapical punctures. Type-species: *M. spiritus*, new species.

Mexisphodrus spiritus, new species
Figs. 9, 17

Description.—Length 12.0-14.4, mean 13.0 ± SD 0.8 mm (n = 12). Form slender and convex, legs long and slender; color reddish-piceous, head and pronotum shining, polished, elytra dull shining. Head 1.3 times longer than wide, neck nearly 0.8 maximum width; eye rather large and convex, its diameter about 0.6 scape length; frontal grooves short, broad, irregular, antennal ridge and groove strong, usually 2-3 additional longitudinal wrinkles between antennal groove and frontal groove; antenna less than 0.6 body length. Pronotum strongly cordiform, more than 0.9 as long as wide, base 0.9 as wide as apex and 0.8 greatest width, which occurs about apical 0.4; anterior

angles briefly produced, blunt; sides conspicuously sinuate then subparallel before base, hind angles large, explanate, slightly obtuse; both pairs of marginal setae present; microsculpture evanescently transverse, disc polished shining. Elytra 1.7 times longer than wide, widest in apical 3/8, humeri strongly rounded, apexes briefly attenuate; disc strongly convex, scarcely deplanate at all near base; scutellar puncture and scutellar stria well developed; discal punctures variable, from 1-3 pairs, normally 2 (medial and posterior) pairs; umbilicate punctures about 6 + 2 + 8(-10); 7th stria with 2 subapical punctures, the terminal one usually small and inconspicuous at the extreme apex of the stria; longitudinal striae normally very fine and shallowly impressed, intervals quite flat (weakly convex in one specimen with deeper striae). Aedeagus 1.99-2.20, mean 2.08 mm (n = 3) long; smaller and more arcuate and apex less narrow than that of *M. gertschi.*

Type-series.—Holotype male (American Museum of Natural History) and 7 paratypes, from an unnamed sink (sótano) in Valle de los Fantasmas, 4 km NW San Francisco, Mpo. de Zaragoza, San Luis Potosí, 24 November 1966, J. Fish and J. Davis. An additional 8 specimens were seen from other caves in the vicinity: Sótano de la Golondrina, Valle de los Fantasmas; Sótano Puerto de los Lobos, 1.5 km S San Francisco; Sótano del Pájaro, Los Sótanos Unidos, 6 km WNW San Francisco; and Sótano de San Francisco No. 2, 0.5 km S San Francisco. These caves occur in a high (*ca.* 2300 m), semiarid region in western San Luis Potosí.

Measurements (mm).—Holotype, total length 12.00, head 2.45 long X 1.89 wide, pronotum 2.20 long X 2.32 wide, elytra 6.73 long X 3.89 wide, antenna 6.35 long.

Discussion.—This species in its morphology helps bridge the gap between *M. gertschi* and the species of the *boneti* group. The pronotum shape is very similar to that of *M. profundus*, but I suspect the species is more closely related to the *gertschi* group than to *profundus.* The caves of the Valle de los Fantasmas, including some in which *Mexisphodrus spiritus* has been taken, are also occupied by *Mexaphaenops fishi* Barr, an aberrant, troglobitic trechine.

boneti group

Elytra extremely convex, humeri rounded, margins slightly sinuate behind humeri, disc with 0-3 discal punctures, no basal deplanation and no posthumeral elevations; pronotum almost dolioliform but with very shallow sinuation in sides before base, with one (anterior) or no marginal setal pairs; length 8.8-12.4 mm. Head with 1-2 pairs of supraorbital setae; eye diameter less than length of scape, eye flat to weakly convex. Elytral microsculpture isodiametric, striae regular and very finely impressed to moderately impressed; 7th stria with one or two punctures near apex, according to species. Type species: *Rhadine (=Mexisphodrus) boneti* Bolívar and Hendrichs.

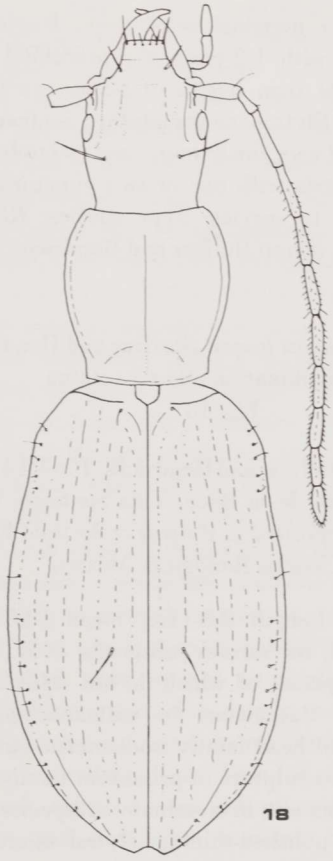
Mexisphodrus boneti boneti (Bolívar and Hendrichs), new combination and new status

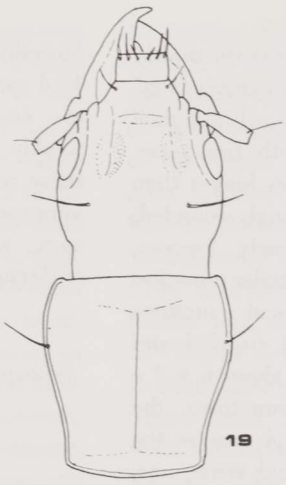
Fig. 18

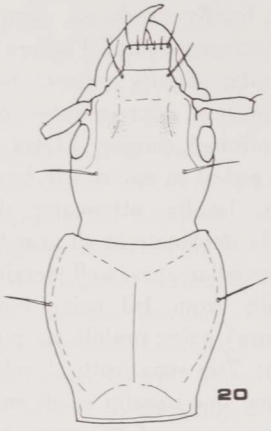
Rhadine boneti Bolívar and Hendrichs, 1964:14; type-locality, Cueva de la Boca, Villa Santiago, Nuevo León, type deposited in Bolívar collection, Escuela Nacional de Ciencias Biológicas, México.

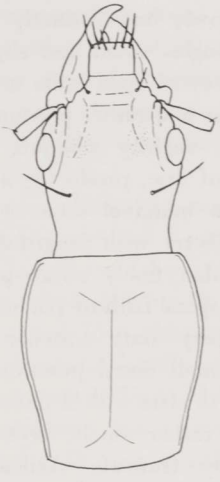
Description.—Length 8.8-11.9, mean 10.6 ± SD 0.9 mm (n = 34) for various subspecies of *M. boneti* s. lat., the subspecies of which do not differ significantly in size. Castaneous to castaneous-piceous; microsculpture of head faintly isodiametric but obsolescent and microsculpture of pronotum faintly transverse but obsolescent in nominate subspecies, head and pronotum polished-shining; elytral microsculpture strongly isodiametric and dull-shining. Head 1.7 times longer than wide; eye small and flat, its diameter about 0.6 length of scape, probably functional. Pronotum slightly longer than wide, vaguely subcordiform, sides very shallowly but distinctly sinuate in basal fifth; anterior angles small and slightly produced but general aspect of apex more or less truncate, hind angles obtuse and rather prominent; basal impressions moderate, slightly oblique, extended forward around sides of disc, producing a moderate lateral deplanation; no marginal setae; gutter continuous across base. Elytra with longitudinal striae very shallow and regular, finely seriate-punctulate, apical half of 8th and apical fifth of 7th more deeply impressed, intervals very flat; scutellar puncture present; one pair of small discal punctures behind middle on 2nd stria; 7th stria with 2 punctures near apex, the outermost rather small; elytral apexes finely and individually truncate. Aedeagus 1.61-1.70 mm, weakly arcuate and rather slender, apex briefly attenuate beyond apical orifice; right paramere about half as wide as left, slightly constricted in middle and widened and spatulate at apex; isodiametric microsculpture limited to lateral lobes either side of apical orifice.

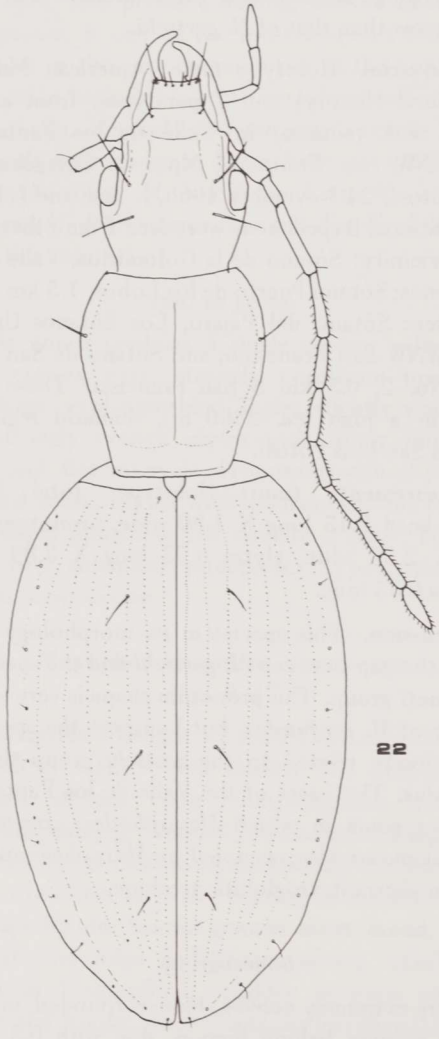
Discussion.—This subspecies is known only from La Cueva de la Boca, just northeast of Villa Santiago,











Figs. 18-22.—*Mexisphodrus* spp.: 18, *M. b. boneti* (Bol. & Hendr.); 19, *M. b. monterreyensis* n. subsp., head and pronotum; 20, *M. b. nortoni* n. subsp., head and pronotum; 21, *M. b. palmitensis* n. subsp., head and pronotum; 22, *M. valverdensis* n. sp.

which is located on Rt. 85 a few kilometers south of Monterrey. The subspecies *M. b. boneti* is more closely similar to *M. b. nortoni* than to *M. b. monterreyensis* or *M. b. palmitensis.* The polished-shining appearance of the head and pronotum is highly diagnostic.

Mexisphodrus boneti nortoni, new subspecies
Fig. 20

Description.—Similar to *M. b. boneti* in general form; head and pronotum less shining, microsculpture evident; pronotum widest before middle, anterior marginal setae present; elytral striae very fine, intervals flat.

Type-series.—Holotype male (American Museum of Natural History) and 42 paratypes, Cueva Chorros de Agua, 22 km W Montemorelos, Nuevo León, México, 19-25 June 1969, dogfood bait traps, S. B. and J. H. Peck, R. M. Norton.

Discussion.—Two specimens assignable to *M. b. nortoni* were collected in Cueva Sin Nombre, at Potrero Redondo, 17 km SW Villa Santiago, Nuevo León, by W. Elliott, 24 May 1980. Both *M. b. boneti* and *M. b. nortoni* differ from the other two subspecies of *boneti* and from *M. valverdensis* in the slightly produced prosternal process.

Mexisphodrus boneti monterreyensis, new subspecies
Fig. 19

Description.—Differs from the preceding in the distinct cervical constriction, shallow frontal grooves, and rather deep elytral striae, with weakly convex intervals; pronotum about as in *M. b. nortoni*, with one pair of anterior marginal setae, hind angles more nearly right, pronotum sides subparallel in basal fifth, marginal bead continuous with basal bead.

Type-series.—Holotype male (American Museum of Natural History) and 14 paratypes, small, unnamed caves near the top of Chipinque Mesa, Monterrey, Nuevo León, México, 24 June 1969, S. B. and J. H. Peck, R. M. Norton.

Discussion.—Most of the specimens were taken in the twilight zone at dogfood baits. *Rhadine chipinque* occurs in these caves.

Mexisphodrus boneti palmitensis, new subspecies
Figs. 10, 21

Description.—Resembles *M. b. boneti* in the slender head and form of the pronotum, which is widest near the middle; pronotum usually without marginal setae (one specimen out of 9 has anterior marginal setae); elytral striae rather deeply impressed, 0-1 punctures on 2nd stria behind middle. Microsculpture evident on dull-shining head and pronotum.

Type-series.—Holotype male (American Museum of Natural History) and one male paratype, Grutas del Palmito, near Bustamante, Nuevo León, México, 13 July 1963, W. Russell. Seven additional paratypes as follows, same cave: 18 March, 1967, R. Remington; May 1967, W. Russell; March 1960, Michel Barillet; 24 June 1964, S. B. Peck.

Discussion.—Grutas del Palmito is also the type-locality for *Mexaphaenops prietoi* Bolívar and *Rhadine araizai* Bolívar.

Mexisphodrus valverdensis, new species
Figs. 11, 22

Description.—Length 10.6-12.4, mean 11.9 ± SD 0.65 mm (n = 6), a little larger than *M. boneti.* Color darker piceous, tarsi, palps, and outer antennal segments pale, contrasting; microsculpture intense, dull-shining. Head with 2 pairs of supraorbital punctures; eye larger and more convex than in *M. boneti*, its diameter about 0.8 length of scape. Pronotum sides scarcely sinuate, oblique in basal fifth to more rounded, oblique, hind angles; one pair of marginal setae before middle. Elytra with longitudinal striae very shallow, slightly irregular, intervals very flat; scutellar puncture present; 3 pairs of discal punctures, anterior on 3rd interval, two posterior pairs on 2nd stria; 7th stria with only one obvious puncture near apex (second puncture may be represented by a minute puncture in gutter at apex of 2nd stria); elytral apexes simply attenuate.

Type-series.—Holotype male (American Museum of Natural History), two male and one female paratypes, Ladder Cave, 25 km NW Del Rio, Val Verde Co., Texas (U.S.A.), 2 April 1965, J. R. Reddell and K. Christiansen. One male paratype, Ladder Cave, 10 August 1963, J. R. Reddell. One male paratype, Sunset Cave, 20 km NW Del Rio, 14 December 1962, J. R. Reddell and W. Russell.

Measurements (mm).—Holotype, total length 10.63, head 2.33 long X 1.60 wide, pronotum 2.14 long X 2.01 wide, elytra 5.79 long X 3.65 wide, antenna 6.48 long.

Discussion.—Geographically *M. valverdensis* is separated from the range of *M. boneti* by the Rio Grande. The darker color, larger eyes, two pairs of supraorbital setae, and the full complement of three pairs of elytral discal punctures are all plesiomorphic characters distinguishing it from corresponding apomorphic character states in *M. boneti.*

Speocolpodes Barr

Barr, 1973:273, fig. 1. Type from Seamay Cave, Alta Verapaz, Guatemala; type deposited in American Museum of Natural History.

Description.—*Speocolpodes franiai*, the only species in this genus, is immediately distinguished from *Mexisphodrus* species by the elongate, subparallel head (L/W = 2.1) and pronotum (L/W = 1.25), elongate appendages (antenna length/body length = 0.85), and the very small eye rudiment, which is a pale areola without ommatidial vestiges. Two pairs of supraorbital setae and two pairs of pronotal marginal setae are present. The elytral disc is highly polished and convex, with finely transverse microsculpture (cf. *M. profundus* and *M. cancuc*); the scutellar stria is vestigial, only medial and posterior discal punctures are present, there is only one puncture at the apex of the 7th stria, and the umbilicate series consists of 6 + 2 + 6 punctures; elytral apexes are very finely and briefly truncate. The two known females measure 9.5 and 10.2 mm; males are unknown. Seamay Cave is located on the Finca Seamay, Senahú, Alta Verapaz, Guatemala.

Discussion.—*Speocolpodes* is almost certainly part of the same anchomenine lineage to which *Mexisphodrus* belongs. In addition to the more pronounced troglobitic morphology, it differs from *Mexisphodrus* species in the less sharply truncate prosternum base, and the 4th metatarsomeres are much less deeply bilobed. A general relationship between *Mexisphodrus*, *Speocolpodes*, and *Speleodesmoides* Mateu (1978), a cavernicole from western Venezuela, may be postulated, but it seems premature to speculate on phylogenetic details with so little information available.

Rhadine LeConte

LeConte, 1848:218; type-species, *R. larvalis*, by monotypy.

The species share a distinctive habitus, very elongate body form (except *R. euprepes)*, narrow (not triangular) prosternal base, 4th tarsomeres not bilobed, elytra very flat with reflexed margin and usually more or less dehiscent apexes. They are essentially apterous, reddish piceous in color (*R. euprepes* is dark piceous-black), and have the 3rd antennal segment conspicuously longer than the 4th segment (segments subequal in a few of the smaller troglobitic species).

In the present paper I have transferred "*R.*" *boneti* Bolívar and Hendrichs (1964) to *Mexisphodrus* and left "*R.*" *pelaezi* Bolívar and Hendrichs in *Platynus* s. lat.

Although Whitehead (1973) suggested subgeneric status for *Rhadine* in his all-inclusive *Platynus* s. lat., it seems to me a mistake to waste the informational and phyletic content afforded by retention of the genus. In my judgment *Rhadine* is a highly distinctive, monophyletic group including about 70 species; few such clear-cut groups exist among North American anchomenines. Our taxonomic system is not well served by lumping *Rhadine* with several hundred other species in as heterogeneous and difficult-to-define a taxon as *Platynus* s. lat.

Mexican species of *Rhadine* fall into four of the six species-groups which I established in an earlier paper (Barr, 1974)—the *larvalis* group *(euprepes)*, the *dissecta* group *(hendrichsi, reddelli)*, the *perlevis* group *(perlevis, leptodes, rotgeri, medellini, araizai, bolivari)*, and the *subterranea* group *(chipinque, elliotti)*. To six previously known Mexican species of the genus an additional five species are described as new.

larvalis group

In this group of medium-large species the pronotum margins are quite broadly reflexed, eyes are well developed, and the mentum foveae are glabrous. *Rhadine caudata* LeConte is a southeastern species whose range includes much of the area between the southern margins of Pleistocene glaciation and the Fall Line; it occurs often but locally in caves of Virginia, Kentucky, Tennessee, and Alabama. *Rhadine larvalis* LeConte inhabits the Gulf Coastal embayment of north Florida, south Alabama, and eastern Arkansas north to the vicinity of St. Louis (type-locality); it occupies a cave in south Alabama. *Rhadine ozarkensis* Sanderson and Miller is known only from one male and one female taken in a western Arkansas cave. *Rhadine euprepes* (Bates) is distributed from western Chihuahua south through Durango into Oaxaca; no cave collections have been made for this species.

Rhadine larvalis LeConte

LeConte, 1848:218.

Agonum (Rhadine) jonesi Barr, 1960:48; type-locality, Turks Cave, Conecuh Co., Alabama. NEW SYNONYMY.

Platynus jonesi: Choate and Rogers, 1976:364.

Comparison of the holotype and a specimen from Little Rock, Arkansas, with the type-series of *R. jonesi* has convinced me that *jonesi* is a junior synonym of *R. larvalis*. The Arkansas specimen (in my collection) was obtained in the flood plain of the Arkansas River by N. B. Causey. Choate and Rogers

Key to Mexican Species of *Rhadine*

1. Eyes reduced to minute, pale areolae; length only 5.7-7.6 mm; caves near Monterrey, Nuevo León 2
Eyes well developed; size larger 3

2(1). Smaller (5.7 mm) and more robust (Fig. 33); postantennal groove not attaining posterior supraorbital puncture; pronotum widest before middle; immediate vicinity of Monterrey (Chipinque Mesa) . . . . . *chipinque* n. sp.
Larger (6.5-7.6 mm) and more slender (Fig. 34); postantennal groove prolonged to posterior supraorbital puncture; pronotum widest near middle; vicinity of Potrero Redondo (17 km S Santiago) . . . . . *elliotti* n. sp.

3(1). Mentum with pair of rather deep, pubescent foveae (50X!) 4
Mentum with pair of shallow, glabrous foveae 5

4(3). Pronotum more slender, hind angles slightly reflexed; elytra with 3 discal punctures, striae fine and regular, finely punctulate, apexes slender, considerably produced and sharply acuminate (Fig. 25); cave in San Luis Potosí . . . . . *hendrichsi* n. sp.
Pronotum less slender, hind angles not reflexed at all; elytra with 4-5 discal punctures, striae very shallow and somewhat irregular, apexes briefly produced and dehiscent (Fig. 26); southwest Tamaulipas . . . . . *reddelli* n. sp.

5(3). Color pale reddish-testaceous, form rather slender; pronotum as long as wide or longer than wide (Figs. 27-29, 31-32), anterior angles not prominent, distinct hind angles present, with only one (anterior) or no marginal setae; elytral striae shallow, intervals flat, elytral apexes obliquely truncate and at least slightly dehiscent 6
Color dark piceous, form more robust; pronotum transverse, anterior angles produced and hind angles strongly rounded (Fig. 23), two pairs of marginal setae; elytral striae deeper, intervals weakly but distinctly convex, elytral apexes individually rounded (Fig. 24); Durango and western Chihuahua to Oaxaca . . . . . *euprepes* (Bates)

6(5). Femora with two rows of 7-9 long setae, these setae longer than width of femora; elongate, very slender species, pronotum nearly twice as long as wide (Fig. 31) 7
Femora with 2-4 setae which are shorter than or subequal to length of femora 8

7(6). Head narrower than pronotum, pronotum apex wider than base; elytral margin more deeply sinuate before apex, apexes briefly produced (Fig. 30); caves in northwest Nuevo León and adjacent Coahuila . . . . . *araizai* (Bolívar)
Head as wide as pronotum, pronotum apex and base widths subequal; elytral margin quite shallowly sinuate before apex, apexes slender, more produced, acute (Fig. 31); cave in eastern Coahuila . . . . . *bolivari* n. sp.

8(6). Pronotum slender, longer than wide; eyes smaller, less than length of temples behind; elytra with 3 discal punctures (or fewer) 9
Pronotum less than 0.05 longer than wide, strongly cordiform; eyes larger, their length greater than length of temples behind; elytra with 4 discal punctures (Fig. 32); Durango (La Ciudad) . . . . . *leptodes* (Bates)

9(8). Pronotum sides distinctly sinuate, hind angles about right 10
Pronotum sides feebly and vaguely sinuate, hind angles obtuse; Chihuahua . . . . . *perlevis* Casey

10(9). Size larger (9.5-12.5 mm); eye 0.75 as long as temple behind; margin of pronotum less deeply sinuate (Fig. 29); eastern San Luis Potosí . . . . . *medellini* Bolívar and Hendrichs
Size smaller (8.0-8.3 mm); eye less than 0.6 as long as temple behind; margin of pronotum more deeply sinuate (Fig. 28); southeast Coahuila to northeast Durango . . . . . *rotgeri* Bolívar and Hendrichs

(1976) report taking a north Florida specimen at night on a river bank. The south Alabama *(A. jonesi)* collection was made in a cave.

Rhadine euprepes (Bates)
Figs. 23, 24

Platynus euprepes Bates, 1884:93. "Cotypes,"La Ciudad, Durango, British Museum of Natural History and Museum National d'Histoire Naturelle, Paris.

Description.—Length 11.0-12.4 mm. Form moderately broad and depressed, dull shining, including pronotum disc; dark piceous, sometimes mouthparts, tarsi, and margins of pronotum and elytra paler. Head rounded, about as wide as long, neck 0.75 width measured across eyes; eye convex, slightly shorter than scape length but 1.5 times longer than temple behind; frontal impressions quite short and broad, not attaining level of eye, a few wrinkles between antennal ridge and frontal impressions, and a few very fine, oblique striae between supraorbital punctures; antenna 0.6 body length. Pronotum 0.9 as long as wide, anterior angles produced, hind angles almost completely rounded; both pairs of marginal setae present; disc microsculpture intense, transverse, dull shining. Elytra two-thirds longer than wide, apexes individually rounded and scarcely dehiscent; striae rather deep (for the genus), intervals subconvex; 3 discal punctures; about 20 umbilicate punctures (7 + 3 widely spaced + 10) on 8th stria; 2 small punctures close together at apex of 7th stria; scutellar puncture and scutellar stria well developed.

Discussion.—The type-locality is La Ciudad, Durango; I have examined material from Bates' collection in the British Museum. Four specimens from western Chihuahua were examined (3 between Creel and Batopilas, J. Reddell; and one specimen west of Madera, B. Rotger). The California Academy of Sciences collection contains specimens labeled "El Salto" (Durango) and "Oaxaca" which are typical *R. euprepes*, suggesting the species may be quite widely distributed in western México. No specimens of *R. euprepes* have been taken in caves, but this is probably a function of the comparatively low density of suitable caves in western México. The species is probably not closely related to other Mexican *Rhadine*, as suggested by the aberrant external morphology and the female stylus, which bears a long setal fringe on the basal segment and 3 stout outer spines on the apical segment.

dissecta group

This group ranges through the Great Plains and Rocky Mountains from southern Canada to San Luis Potosí and Tamaulipas, where it is newly recorded from México. Most of the species have a cordiform pronotum, but the two described here superficially resemble species of the *perlevis* group. The diagnostic feature which distinguishes species of this group is a pair of unusually deep and distinctly pubescent mental foveae. A few small scales are present in the internal sac, but these are much less conspicuous than the dense patch in species of the *perlevis* group.

Rhadine hendrichsi, new species
Fig. 25

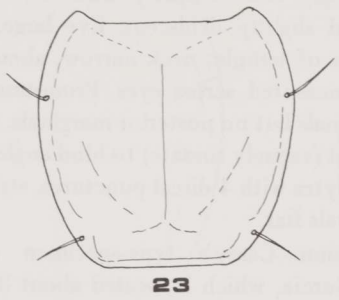
Description.—Distinguished by large, flat eyes; long and slender pronotum, elytra, and appendages; and abruptly and obliquely truncate elytral apexes which are narrowly produced, acuminate, and dehiscent. Head 1.5 times longer than wide; frontal grooves very shallow, associated wrinkles relatively few, antennal ridge short, antennal groove quite shallow and short; eye rather large, its length greater than scape length or length of temple behind, nearly flat; antenna very long and slender, 0.7 total body length. Pronotum 1.65 times longer than wide, widest about apical 0.3, apex slightly wider than base, base 0.65 greatest width; anterior angles rounded, apex truncate, sides convergent to hind angles with suggested very shallow sinuation, hind angles more or less obtuse, base rounded behind angles and shallowly emarginate between them; both pairs of marginal setae present. Elytra twice as long as wide, apexes abruptly and obliquely truncate, tips produced, slender, acuminate, dehiscent; 3 discal punctures, 16-17 umbilicate punctures, 7th stria with only one apical puncture, scutellar punctures small and inconspicuous, scutellar stria obsolete. Male unknown.

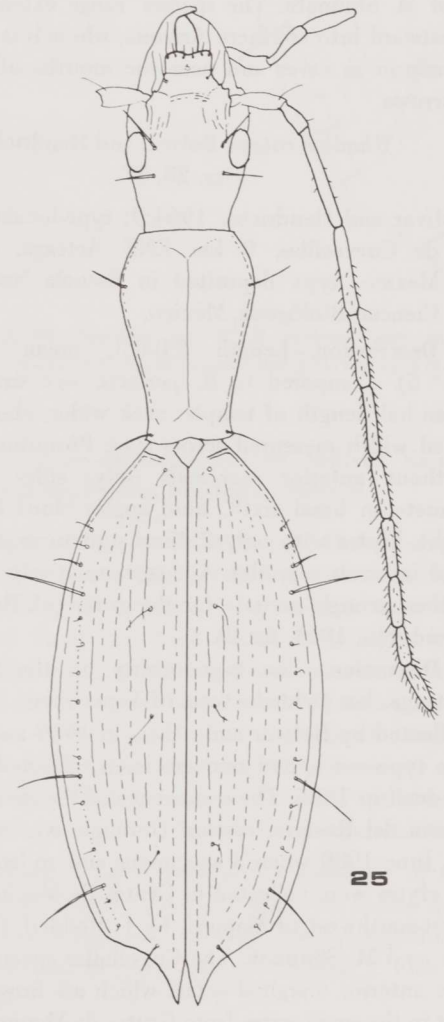
Type-series.—Holotype female (American Museum of Natural History), a unique, Sumidero 552, 50 km S Matehuala at Km. 552, San Luis Potosí, México, June 1965, W. Russell.

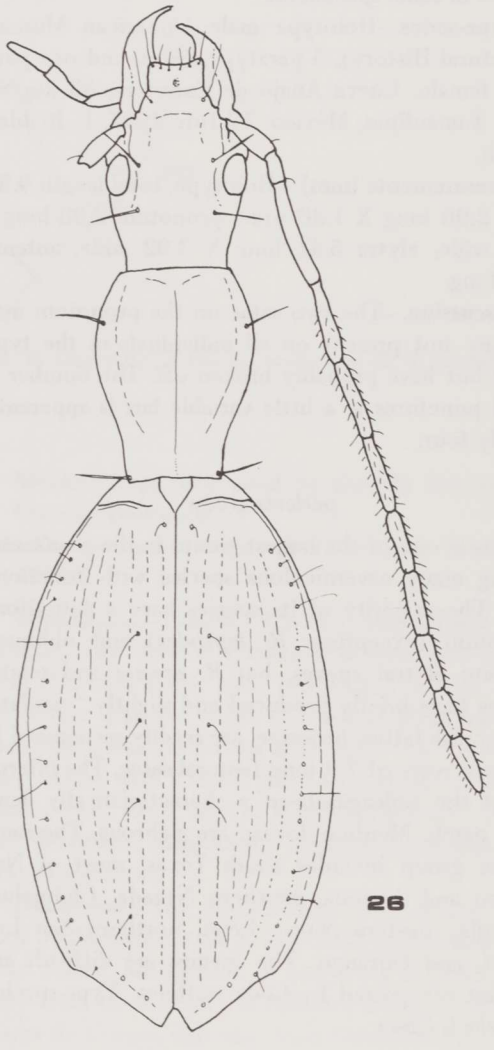
Measurements (mm).—Holotype, total length 9.00, head 1.82 long X 1.20 wide, pronotum 2.08 long X 1.26 wide, elytra 5.41 long X 2.64 wide, antenna 6.22 long.

Rhadine reddelli, new species
Figs. 26, 36

Description.—Differs from *R. hendrichsi* in broader form and less produced elytral apexes; 4-5 elytral discal punctures. Length 9.1-10.3, mean 9.8 ± SD 0.4 mm (n = 7). Head 1.5 times longer than wide, neck 0.7 width measured across eyes; eye about as long as temple and 0.7 as long as scape; frontal impressions very shallow, with several irregular, trans-







Figs. 23-26.—*Rhadine* spp.: 23, *R. euprepes* (Bates), pronotum; 24, *R. euprepes* (Bates), elytral apex; 25, *R. hendrichsi* n. sp.; 26, *R. reddelli* n. sp.

verse wrinkles, antennal groove shallow but continued to posterior angle of eye; antenna 0.7 as long as body. Pronotum 1.3 times longer than wide, widest about apical third, base slightly narrower than apex and 0.6 greatest width; both pairs of marginal setae present; anterior angles effaced, sides convergent in basal half with faint suggestion of sinuation, hind angles obtuse, base very shallowly emarginate at most. Elytra 1.8 times longer than wide, apexes briefly and broadly produced, dehiscent; 4 (-5) discal punctures on 3rd interval; umbilicate series about 16 (4 in humeral margin and 12 on 8th stria), small scutellar puncture and vague scutellar stria, two small punctures at apex of 7th stria; striae very shallow but somewhat irregular and intervals vaguely subconvex in some specimens.

Type-series.—Holotype male (American Museum of Natural History), 5 paratype males, and one paratype female, Cueva Abajo de Carretera, 33 km SW Tula, Tamaulipas, México, 17 July 1967, J. Reddell, J. Fish.

Measurements (mm).—Holotype, total length 9.88, head 2.08 long X 1.38 wide, pronotum 2.08 long X 1.57 wide, elytra 5.41 long X 3.02 wide, antenna 7.04 long.

Discussion.—The two setae on the pronotum margins are not present on all individuals in the type-series but have probably broken off. The number of discal punctures is a little variable but is apparently usually four.

perlevis group

This is one of the largest groups in the genus, containing many cavernicolous species with functional eyes. The majority of its species have a dolioliform pronotum (exception: *R. leptodes*) and obliquely truncate elytral apexes, but *R. araizai* and related species have briefly produced and slightly "caudate" apexes; the latter, however, are readily recognized by the twin rows of 7-9 long femoral setae. The internal sac of the aedeagus bears a characteristically dense scaly patch. Mentum foveae are glabrous. The range of the group includes south Texas, most of New Mexico and Arizona, southern Nevada, Chihuahua, Coahuila, western Nuevo León, northern San Luis Potosí, and Durango. The species are difficult and are best recognized by body outlines. Type-species: *R. perlevis* Casey.

Rhadine perlevis Casey
Figs. 27, 35

Casey, 1913:167; type-locality, Colonia García, Chihuahua, México, type deposited in U. S. National Museum of Natural History, Washington.

Description.—Length 8.6-10.8, mean 10.1 mm (n = 4). Slender, appendages elongate, elytral apexes very strongly and obliquely truncate, scarcely produced and slightly dehiscent. Eye large, more than 0.6 length of temple; neck narrow, about 0.6 width of head measured across eyes. Pronotum with anterior marginals but no posterior marginals, sides almost convergent (vaguely sinuate) to hind angles, which are obtuse. Elytra with 4 discal punctures, striae very fine and intervals flat.

Discussion.—Casey's type-specimen came from Colonia García, which is located about 80 km southeast of Casas Grandes in western Chihuahua. The only other Mexican specimens known are 4 examples taken in Grutas de Coyame, 6 km south of Coyame, Chihuahua, 22 June 1980, J. Reddell, D. McKenzie, and M. Shumate. The species' range extends northwestward into southern Arizona, where it is relatively common in caves and near the mouths of mammal burrows.

Rhadine rotgeri Bolívar and Hendrichs
Figs. 28, 37

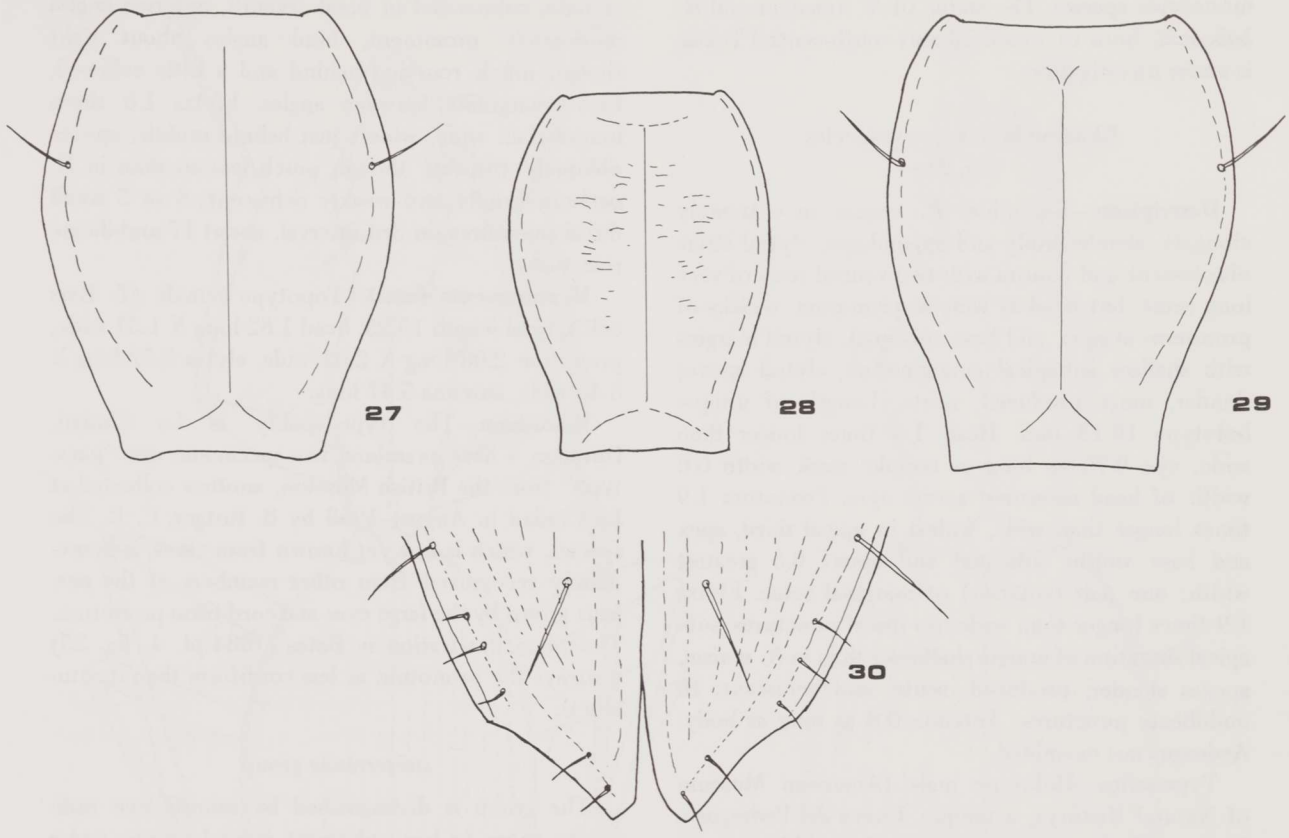
Bolívar and Hendrichs, 1964:9; type-locality, Gruta de Cuevecillas, 9 km ENE Arteaga, Coahuila, México, type deposited in Escuela Nacional de Ciencias Biológicas, México.

Description.—Length 8.0-8.3, mean 8.3 mm (n = 5). Compared to *R. perlevis*, eye smaller, less than half length of temple; neck wider, about 0.7 of head width measured across eyes. Pronotum with or without anterior marginals only; sides distinctly sinuate in basal sixth, hind angles blunt but about right. Elytra with only 2 discal punctures, striae fine and intervals very flat. Aedeagus relatively short and rather strongly arcuate for the group (cf. Bolívar and Hendrichs, 1964, fig. 2).

Discussion.—The type-locality, in the Sierra de Arteaga, has yielded a total of 4 specimens, 3 of them collected by Bolívar and others in 1959 and forming the type-series, and one specimen collected by J. R. Reddell in 1965. The occurrence of the species in the Sierra del Rosario, eastern Durango, was established 12 June 1980 when 3 specimens and an isolated pair of elytra were collected in Grutas de Mapimí, 15 km west-southwest of Mapimí, by J. Reddell, D. McKenzie, and M. Shumate. The Cuevecillas specimens lack the anterior marginal setae, which are however present in the small series from Grutas de Mapimí.

Rhadine medellini Bolívar and Hendrichs
Figs. 29, 38

Bolívar and Hendrichs, 1964:11. Type-locality, Cueva Carnicero, La Maroma, San Luis Potosí,



Figs. 27-30.—*Rhadine* spp.: 27, *R. perlevis* Casey, pronotum; 28, *R. rotgeri* Bol. & Hendr., pronotum; 29, *R. medellini* Bol. & Hendr., pronotum; 30, *R. araizai* (Bol.), elytral apexes.

México; type deposited in coll. Bolívar, Escuela Nacional de Ciencias Biológicas, México.

Description.—Length 9.5-12.5 mm. Closely similar to *R. perlevis;* head less wrinkled between antennal ridge and frontal impressions; pronotum sides subparallel in basal 0.3, hind angles about right. Eyes rather large, neck about two-thirds as wide as head measured across eyes. Pronotum 1.25 times longer than wide, widest near middle, one pair of marginal setae at apical third. Elytra a little narrower and flatter, striae slightly deeper; 3 discal punctures; umbilicate series of 5 + 11 (on 8th stria) punctures.

Discussion.—I have examined a paratype of this species from Cueva Carnicero, also two males from Sumidero de Matehuala, 1500 m, 3 km E Matehuala, San Luis Potosí, August 1966, J. Reddell, J. Fish, D. McKenzie.

Rhadine araizai (Bolívar)
Fig. 30

Spalaeorhadine araizai Bolívar, 1944:27; type-locality, Grutas del Palmito, near Bustamante, Nuevo León, México; type deposited in Escuela Nacional de Ciencias Biológicas.

Rhadine araizai araizai: Bolívar and Hendrichs, 1964:6.

Description.—Length 9.2-10.1 mm. Form very elongate and slender; femora with two rows of very long (?tactile) setae, each row with 7-9 setae which are longer than the width of a femur. Head narrower than pronotum; pronotum apex wider than pronotum base; elytra with 3 discal punctures, subapical emargination very deep, apexes briefly produced, slender, and dehiscent; longitudinal striation extremely shallow, obsolescent.

Discussion.—The type-locality cave is also occupied by *Mexaphaenops prietoi* Bolívar and *Mexisphodrus boneti palmitensis.* I have seen *R. araizai* not only from the Grutas del Palmito, a large cave in the Sierra de Gomas, but also from Cueva del Precipício, a few kilometers away, and from Cueva de los Lagos, in eastern Coahuila (now inundated by the Amistad Reservoir). Because the ranges of *R. araizai* and those of *R. howdeni* (Barr and Lawrence) and *R. babcocki* (Barr) are disjunct, I prefer to consider *R. araizai* as a

monotypic species. The status of *R. howdeni* and *R. babcocki*, both of which inhabit south-central Texas, is under investigation.

Rhadine bolivari, new species
Fig. 31

Description.—Resembles *R. araizai* in extremely elongate, slender body and appendages, elytral striae obsolescent and femora with two ventral rows of very long setae; but head as wide as pronotum, widths of pronotum at apex and base subequal, elytral margins with shallow subapical emargination, elytral apexes slender, more produced, acute. Length of unique holotype 10.13 mm. Head 1.6 times longer than wide; eye 0.75 as long as temple; neck width 0.6 width of head measured across eyes. Pronotum 1.9 times longer than wide, widest in apical third, apex and base widths subequal and about 0.6 greatest width; one pair (anterior) of marginal setae. Elytra 1.9 times longer than wide; no discal punctures; subapical sinuation of margin shallower than in *R. araizai*, apexes slender, produced, acute, and dehiscent; 16 umbilicate punctures. Antenna 0.8 as long as body. Aedeagus not examined.

Type-series.—Holotype male (American Museum of Natural History), a unique, Cueva del Pedregoso, 33 km SE Cuatro Ciénegas, Coahuila, México, 30 December 1967, J. Reddell, W. Russell, W. Calvert.

Discussion.—The type-locality is approximately 180 km west of Grutas del Palmito, where *R. araizai* occurs. This species is also closely allied to *R. howdeni* (Barr and Lawrence, 1960) and *R. babcocki* (Barr, 1960), which were considered subspecies of *R. araizai* by Bolívar and Hendrichs (1964). Although moderately large and presumably functional eyes are present in all four of these species, they are known only from caves.

Rhadine leptodes (Bates), new combination
Fig. 32

Platynus leptodes Bates, 1884:92, pl. 4, fig. 25.
Platynus leptomorphus: lapsus in plate label in above reference.

Description.—Length 9.6-10.3 mm. Eye unusually large and convex, about 1/7 longer than scape and 1/7 longer than temple behind; antenna rather short, less than 0.6 total body length; frontal grooves typically very shallow and wrinkled, antennal groove long and deep, extending to posterior angle of eye. Pronotum about as long as wide, elongate-cordiform, widest in apical three-eighths, apex and base subequal in width and 5/8 greatest width; anterior marginal setae present, no setae in hind angles; sides strongly arcuate, subparallel in basal seventh, anterior angles moderately prominent, hind angles about right though much rounded behind and a little reflexed, base emarginate between angles. Elytra 1.6 times longer than wide, widest just behind middle, apexes obliquely truncate though much less so than in *R. perlevis*, briefly and weakly dehiscent; 4 or 5 small discal punctures on 3rd interval, about 17 umbilicate punctures.

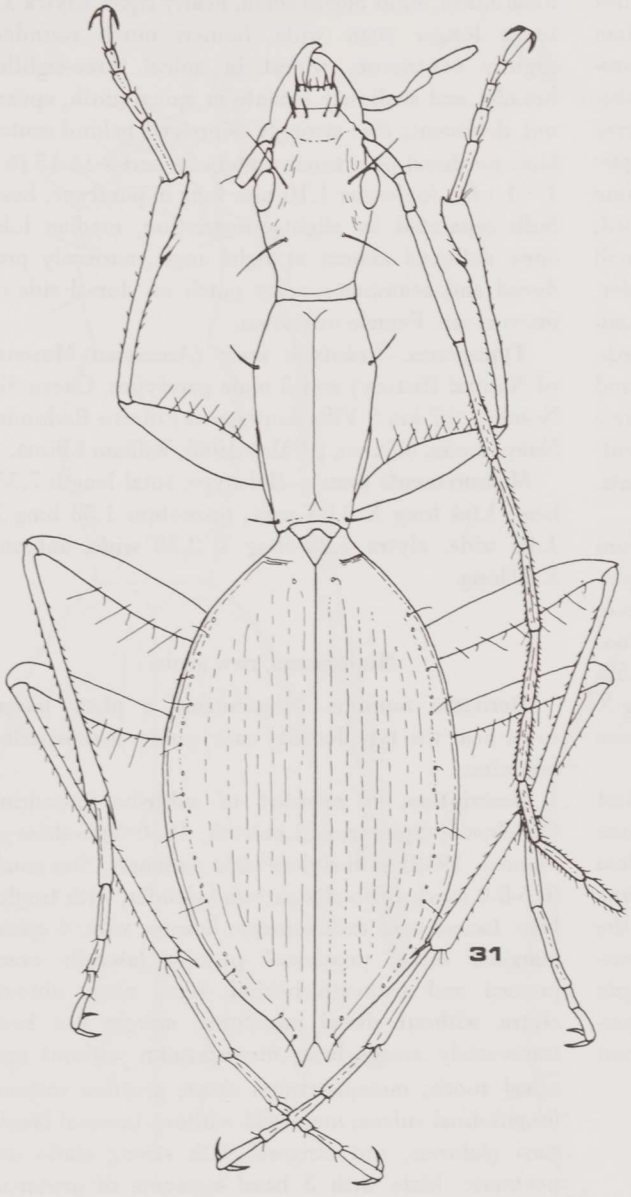
Measurements (mm).—Topotype female (T. Barr coll.), total length 10.25, head 1.82 long X 1.51 wide, pronotum 2.08 long X 2.01 wide, elytra 5.72 long X 3.46 wide, antenna 5.47 long.

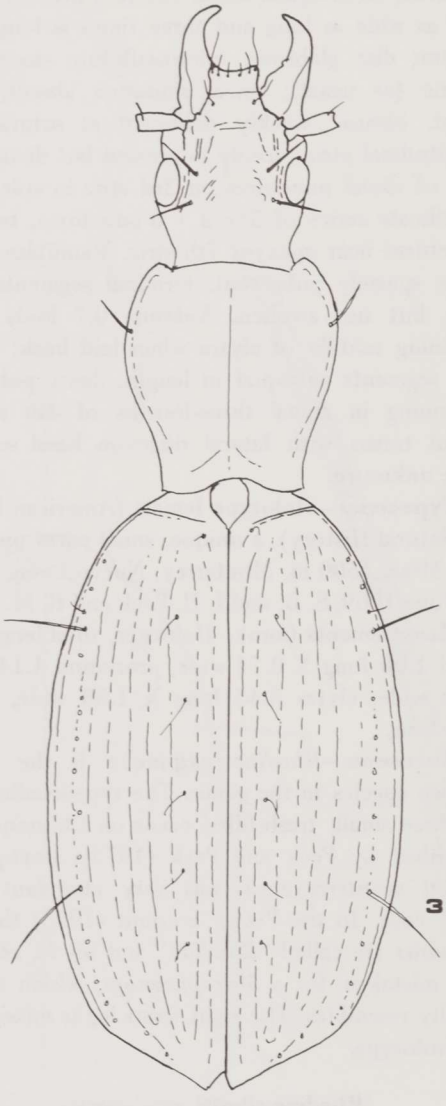
Discussion.—The type-locality is La Ciudad, Durango. I have examined two specimens, one "paratype" from the British Museum, another collected at La Ciudad in August 1963 by B. Rotger, C. R. The species, which is not yet known from caves, is immediately recognized from other members of the *perlevis* group by the large eyes and cordiform pronotum. The plate illustration in Bates (1884:pl. 4, fig. 25) portrays the pronotum as less cordiform than it actually is.

subterranea group

The group is distinguished by minute eye rudiments, more or less pubescent mental foveae, and a scaly patch in the internal sac of the aedeagus. All species are troglobitic. Previously all known species of the *subterranea* group occurred in the Balcones Fault Zone and eastern Edwards Plateau of Central Texas. However, two newly described species from Nuevo León share all the diagnostic group characters given by Barr (1974) and are the only troglobitic *Rhadine* species known from México. Both appear to be related to *R. persephone* Barr, a somewhat aberrant species occupying caves in northern Travis Co., Texas. They are readily keyed out in the first couplet of my key to species of this group (Barr, 1974:4-5), because they lack pronotal marginal setae; however, they are readily distinguished by small size *(R. chipinque)* or more slender habitus with very long antennal grooves *(R. elliotti).*

The *subterranea* group is probably derived from the *perlevis* group, although a less convincing case can be made for derivation from the *dissecta* group (Barr, 1974). In my judgment all species assigned to the group constitute a monophyletic assemblage, but *R. persephone*, *R. chipinque*, and *R. elliotti* form a rather distinctive subgroup in which the larger eye rudiments—probably non-functional—retain vestiges of ommatidia, and the pronotum margin is devoid of marginal setae. *Rhadine chipinque* is the smallest species in the genus.





Figs. 31-32.—*Rhadine* spp.: 31, *R. bolivari*, n. sp.; 32, *R. leptodes* (Bates.)

Rhadine chipinque, new species
Fig. 33

Description.—A member of the *subterranea* group with no marginal setae, distinguished by its small size, long antennal groove, blunt and obtuse hind angles of the pronotum (acute in *R. persephone*), and minute eye rudiment. Length of unique female holotype 5.68 mm. Form moderately robust and convex, about as in *R. persephone;* rufotestaceous, head and pronotum shining, elytra dull shining; integuments virtually glabrous. Head 0.7 as wide as long, neck about 0.8 greatest head width, surface nearly glabrous, sparse micropubescence on sides and below; labrum not emarginate; frontal grooves and frontal ridge weak, antennal ridge strong but barely attaining posterior margin of eye, antennal groove continued almost to but not attaining posterior supraorbital puncture, frontal grooves and intervening area to antennal ridge with many small wrinkles; eye rudiment quite small, about 0.04 X 0.10 mm, a small, oblique, oval areola. Pronotum nearly 0.8 as wide as long, widest in apical three-eighths, slightly wider than head; apex slightly wider than base and 0.7 maximum width; disc glabrous, subconvex; sides faintly sinuate in basal sixth, anterior

angles subdued, hind angles blunt and obtuse, not reflexed; no marginal setae. Elytra a little more than half as wide as long and three times as long as pronotum; disc glabrous, microsculpture strongly diametric (as usual); apical sinuation absent, apexes blunt, obtuse, weakly dehiscent at sutural angle; longitudinal striae feebly impressed but distinct; one pair of discal punctures on 3rd stria in apical third; umbilicate series of 5 + 2 + 6 punctures, two small punctures near apex of 7th stria. Mandibles slender, palps sparsely pubescent, terminal segments acuminate but not swollen. Antenna 0.7 body length, attaining middle of elytra when laid back; 3rd and 4th segments subequal in length, dense pubescence beginning in apical three-fourths of 4th segment. Front tarsus with lateral ridge on basal segments. Male unknown.

Type-series.—Holotype female (American Museum of Natural History), a unique, small caves on Chipinque Mesa, 1500 m, Monterrey, Nuevo León, México, 24 June 1969, S. B. and J. H. Peck and R. M. Norton.

Measurements (mm).—Holotype, total length 5.68, head 1.06 long X 0.74 wide, pronotum 1.14 long X 0.88 wide, elytra 3.45 long X 1.88 wide, antenna 4.00 long.

Discussion.—*Rhadine chipinque* is the smallest known species in the genus. The type-locality is one of three small, trash-filled caves on Chipinque Mesa described by Peck and Peck (1973); *Mexisphodrus boneti monterreyensis* was very abundant in the same cave. In the Pecks' account (1973) the *Mexisphodrus* are called "*Rhadine*" and the *R. chipinque* was mistaken for a *Mexaphaenops*, which it superficially resembles. The right front leg is missing from the holotype.

Rhadine elliotti, new species
Figs. 34, 39

Description.—Resembling *R. persephone* in general habitus and absence of pronotal marginal setae; differing in more slender head, antennal groove extending back to posterior supraorbital puncture; pronotum width 1.5 times base width (as in *R. chipinque*); aedeagal apex more sharply deflexed, produced, and attenuate. Length 6.5-7.6, mean 6.9 (n = 4). Head 1.9 times longer than wide, eye rudiment 0.12 X 0.20 mm, its long axis about one-third scape length, with vestiges of rudimentary ommatidia; antenna 0.7 body length; frontal grooves short, antennal ridge and groove very long, attaining posterior supraorbital puncture. Pronotum 1.4 times longer than wide, width at base two-thirds greatest width, apex width five-sixths base width; no marginal setae; anterior angles subdued, sides broadly and shallowly sinuate in basal ninth; hind angles small, nearly right. Elytra 1.9 times longer than wide, humeri much rounded, slightly ventricose, widest in apical three-eighths, broadly and shallowly sinuate in apical ninth, apexes not dehiscent; disc strongly depressed behind scutellum; no discal punctures; umbilicate series 14-15 (6 + 1 + 1 + 6). Aedeagus 1.10 mm long in paratype, basal bulb separated by slight constriction, median lobe apex deflexed almost at right angle, narrowly produced and acuminate; scaly patch on dorsal side of internal sac. Female unknown.

Type-series.—Holotype male (American Museum of Natural History) and 3 male paratypes, Cueva Sin Nombre, 17 km S Villa Santiago at Potrero Redondo, Nuevo León, México, 24 May 1980, William Elliott.

Measurements (mm).—Holotype, total length 7.55, head 1.64 long X 0.84 wide, pronotum 1.53 long X 1.10 wide, elytra 4.28 long X 2.30 wide, antenna 5.20 long.

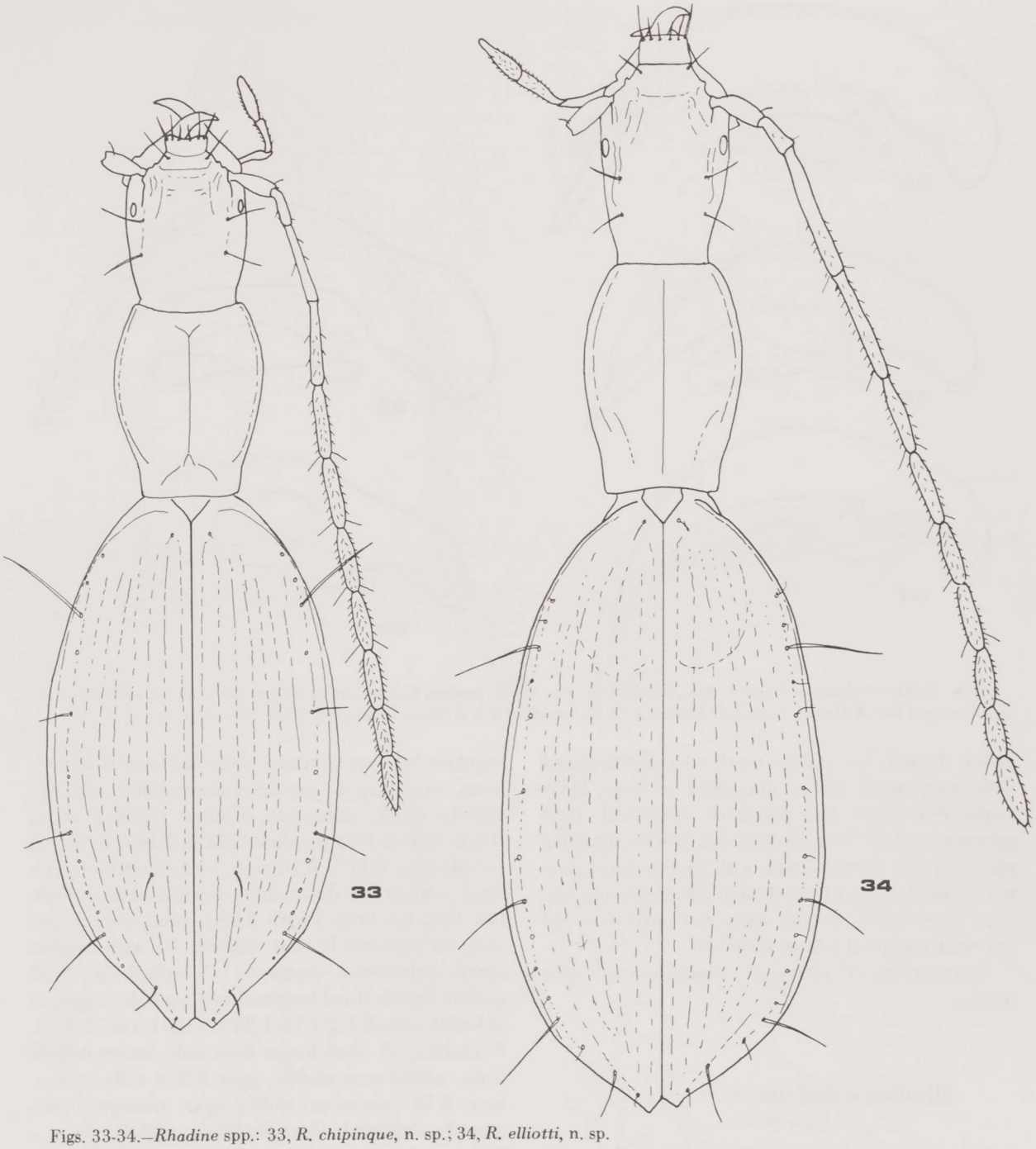
Miquihuana, new genus

Derivatio nominis.—Miquihuana, a place name, town near the type-locality cave; gender is designated feminine.

Description.—A member of subtribe Sphodrina Castelnau (=Sphodri of Lindroth, 1956=Sphodrini of Jeannel, 1942) with styloid right paramere. Size small (6.5-8.0 mm), form elongate and slender, with troglobitic facies; eyes rudimentary; labrum with 4 apical marginal setae; prosternal process laterally compressed and truncate behind; hind wings absent; elytra without discal punctures, margin not bent transversely across base; mesosternum without precoxal tooth; metepisternum short; protibia without longitudinal sulcus; metatibia without internal brush; tarsi glabrous, not strigose, with strong claws not pectinate. Male with 3 basal segments of protarsus with adhesive setae beneath; both male and female with only 2 marginal setae on last ventral sternite.

Habitus elongate and subconvex, resembling a troglobitic *Rhadine;* pale rufotestaceous, shining; elytral microsculpture isodiametric, dull shining, a little less intense than in *Rhadine.*

Head subtriangular, long and narrow; eye rudimentary, circular, with a few vestigial ommatidia, weakly convex, 0.12-0.18 mm; labrum singly emarginate, two setae at each side; frontal grooves short; antennal ridge prominent, with series of longitudinal wrinkles extending to posterior supraorbital puncture; antenna with heavy pubescence beginning on segment IV; mentum free, with very strong isodiametric microsculpture, tooth very short and bifid (grooved); 2 setae each side behind suture; glossa



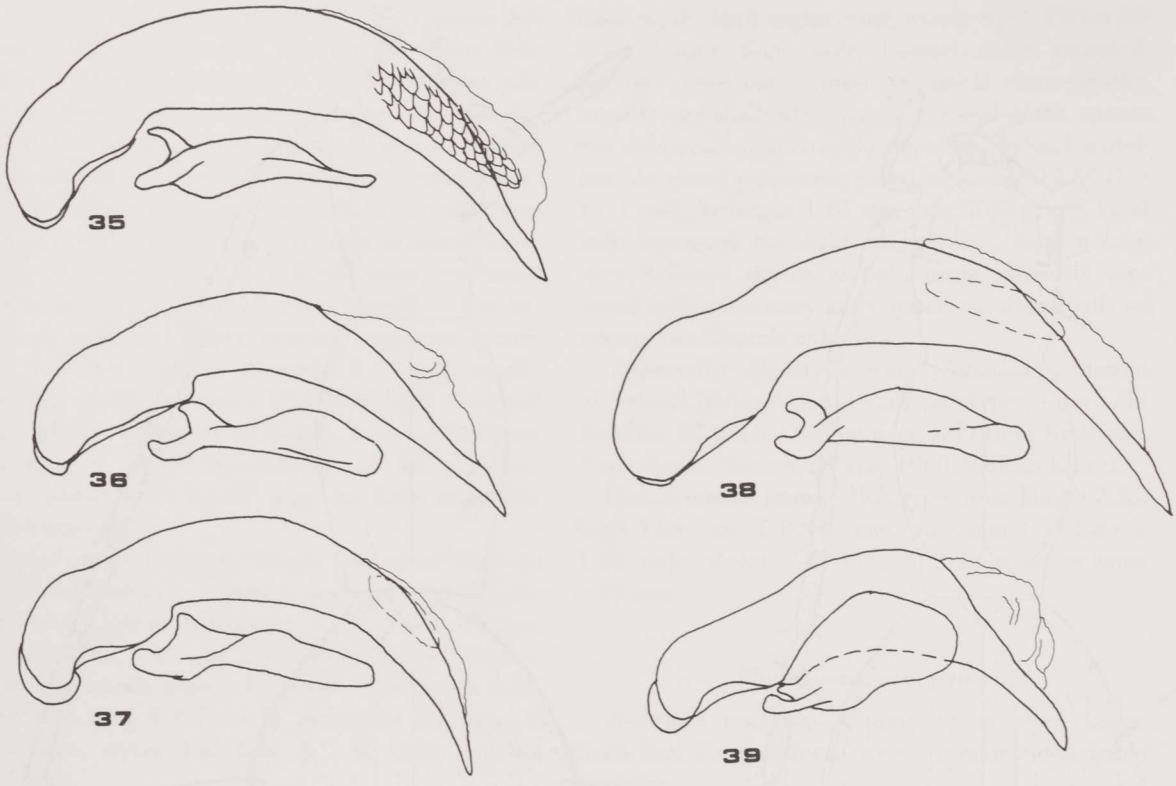
Figs. 33-34.—*Rhadine* spp.: 33, *R. chipinque*, n. sp.; 34, *R. elliotti*, n. sp.

long and slender, expanded at tip, which bears 2 setae, with fine, longitudinal carina; paraglossae slightly shorter than glossa; mental foveae very shallow and glabrous; last segments of palps fusiform, apexes obtuse.

Pronotum subdolioliform, anterior angles weak, hind angles rather large, obtuse, flattened, produced, base consequently emarginate; 2 pairs of marginal setae. Prosternal process laterally compressed, sharply truncate behind.

Elytra narrowly oval-elongate, humeri completely effaced, no subapical sinuation; discal punctures absent, umbilicate series short (11-13), 7th stria with one subapical puncture, small apical puncture at confluence of 1st and 2nd stria; margin narrow, not bent inward at base and not continued to apex; epipleura simple, not twisted.

Aedeagus with basal bulb not sharply bent nor separated from median lobe by constriction, apex simply obtuse and symmetric, without apical disc,



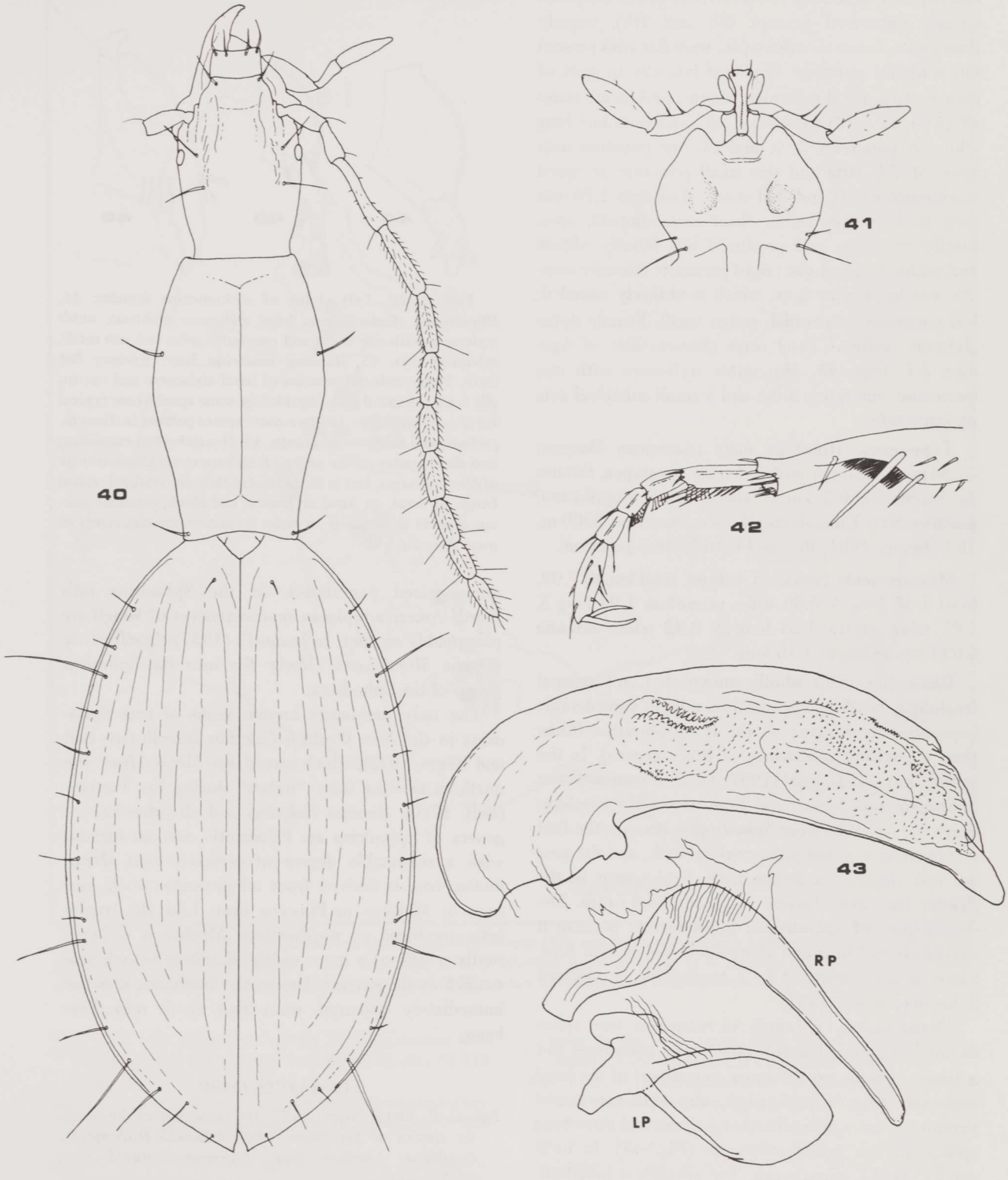
Figs. 35-39.—Aedeagi of *Rhadine* spp., left lateral view: 35, *R. perlevis* Casey (Grutas de Coyame); 36, *R. reddelli*, n. sp.; 37, *R. rotgeri* Bol. & Hendr. (Grutas de Mapimí); 38, *R. medellini* Bol. & Hendr., paratype; 39, *R. elliotti*, n. sp.

orifice dextral; internal sac much convoluted, armed with many small spines, one patch of large, blunt spines near base; left paramere conchoidal, right paramere styloid, long, slender, and arcuate, attaining apex of penis. Female stylus with basal segment glabrous; apical segment short and blunt, bearing one large blunt spine on both inner and outer side and one small subapical seta on inner side.

Type-species.—*Miquihuana rhadiniformis*, new species.

Miquihuana rhadiniformis, new species
Figs. 40-44

Description.—Length 6.4-8.0, mean 7.3 mm (n = 4). Form very strongly reminiscent of an elongate, slender, troglobitic *Rhadine* (e.g. *R. elliotti* or *R. austinica* Barr). Head 1.6 times longer than wide, somewhat triangular, with narrow neck; labrum with 2 setae each side, middle 2 setae apparently absent; clypeus with 1 seta each side; 2 pairs of supraorbital setae, anterior placed over eye rudiment, posterior before cervical constriction; frontal impressions short but rather broad and deep, ending above eye; antennal ridge prominent, numerous small, longitudinal wrinkles between antennal ridge and frontal impressions, extending to posterior supraorbital seta; eye slightly oblate, subconvex, without pigment, about 0.9 as high as long (smallest 0.12 X 0.14 mm, largest in holotype, 0.17 X 0.18 mm), with about 15-16 vestigial ommatidia discernible; antenna rather short, less than 0.6 body length, heavy pubescence beginning on segment IV but segment III with evident sparse pubescence, segments I-IV cylindrical, V-XI slightly flattened and longitudinally carinate, segments in length ratio 1:1:2:1.75:1.25:1.25:1:1:1:0.75:1.25. Pronotum 1.8 times longer than wide, rather dolioliform, widest near middle, apex 0.9 as wide as base, base 0.75 maximum width; apex truncate, sides scarcely sinuate; hind angles blunt, slightly acute, a little produced and flattened, base emarginate and without bead; disc depressed, irregular, with many fine, transverse strigae, marginal bead quite narrow; two pairs of marginal setae, anterior before middle, posterior in hind angles. Elytra very elongate-oval, humeri effaced, margin without subapical sinuation, apexes narrowly approximate and each with a tiny tooth; disc strongly convex but peculiarly depressed in apical third; margin narrowly beaded and narrowly reflexed, bead ending blindly near base, not bent inward to form transverse basal margin (which is thus



Figs. 40-43.—*Miquihuana rhadiniformis,* n. gen. and sp., Sótano de Riachuelo, Tamaulipas: 40, habitus; 41, mouthparts; 42, protarsus, holotype male; 43, aedeagus (actual length 1.16 mm): LP, left paramere; RP, right paramere.

absent), not continued to apex; striae rather deep and equally impressed (except 6th and 7th), vaguely punctulate, intervals subconvex, scutellar stria present but scutellar puncture displaced laterally to apex of sutural stria; discal punctures absent; umbilicate series of (11-) 12 (-13) punctures, all setiferous but long whips in punctures 3, 9, and 11; one puncture near apex of 7th stria and one small puncture at apical confluence of 1st and 2nd striae. Aedeagus 1.16 mm long in holotype, rather short and compact, apex briefly attenuate and produced but bluntly obtuse and without apical disc; right paramere strongly arcuate, not hooked at apex, which is obtusely rounded; left paramere conchoidal, rather small. Female stylus glabrous, without basal setae characteristic of Agonina (cf. Figs. 45, 46); outer stylomere with one inner and one outer spine and a small subapical seta on inner side.

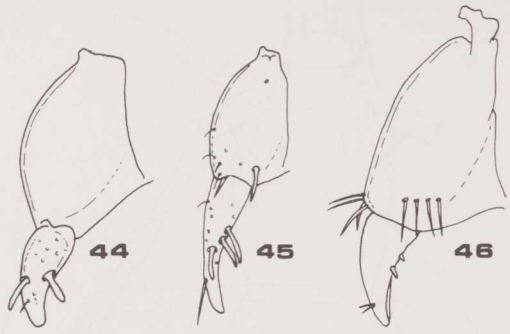
Type-series.—Holotype male (American Museum of Natural History) and 3 female paratypes, Sótano de Riachuelo, 6.5 km N and 2 km E Miquihuana, northwestern Tamaulipas, México, elevation 2500 m, 16 February 1981, Roy and Patti Mothes Jameson.

Measurements (mm).—Holotype, total length 7.99, head 1.35 long X 0.86 wide, pronotum 1.93 long X 1.07 wide, elytra 4.28 long X 2.42 wide, antenna 4.62 long, aedeagus 1.16 long.

Discussion.—This wholly unexpected and unusual troglobitic beetle is apparently a relic of considerable importance, belonging to the true Sphodrina *(Calathus* + Eurasian sphodrines of other genera). In the generic keys of Jeannel (1937, 1942) it comes closest to *Sphodropsis* Seidlitz and *Taphoxenus* Motschulsky; however, it differs from *Sphodropsis* because the first metatarsomere is not pubescent beneath, and the tarsi are not strigose; it differs from *Taphoxenus* in the slender tarsi and absence of a metatibial brush. The distribution of *Sphodropsis* is interesting because it extends from China and Mongolia to the eastern Alps, where it is represented by a troglophile, *S. ghilianii* Schaum (Jeannel, 1937).

Mexisphodrus, although it resembles true sphodrines in habitus, has two conchoidal parameres and a fringe of setae on the inner, apical part of the basal stylomere (Fig. 46). *Rhadine*, also with conchoidal parameres, has a setose basal stylomere and three long spines on the apical stylomere (Fig. 45). In both genera, unlike *Miquihuana*, the protibia is longitudinally ridged.

Given the highly conservative structure of the parameres and stylus, we have in *Miquihuana* (a) the first known instance of an undoubtedly troglobitic sphodrine and (b) the first indication of a hitherto



Figs. 44-46.—Left stylus of anchomenine females: 44, *Miquihuana rhadiniformis;* basal stylomere glabrous, outer stylomere with one inner and one outer spine and one small, subapical seta. 45, *Rhadine tenebrosa* Barr, Ramsay Bat Cave, Texas; reduced setation of basal stylomere and unusually long subapical seta (doubled in some species) are typical for genus; one inner and two outer spines present in *dissecta, perlevis,* and *subterranea* groups. 46, *Mexisphodrus cuetzalan;* two short, outer spines on apical stylomere are characteristic of *Mexisphodrus,* but in *M. cuetzalan* they are vestigial; apical fringe of setae on basal stylomere and short, geminate subapical setae in foramen on outer stylomere are characters of most Agonina.

unrecognized penetration of the Sphodrina into North America, epigean representatives of which are presumably extinct. In Jeannel's (1937) classificatory scheme *Miquihuana* clearly fits into the *Sphodrus* group of the Sphodrina.

The only previously known genus of true Sphodrina in the New World is *Calathus* Bonelli (see Ball and Nègre, 1972), which spread into México from the north in at least three "pulses" during the Tertiary (Ball, 1970). Because *Calathus* and all other known genera of Sphodrina are Palaearctic, we can surmise with a reasonable degree of certainty that *Miquihuana*, too, is derived from a Palaearctic stock, perhaps in Miocene or Pliocene time. Like the troglobitic trechines of northeastern México it is apparently a relic of a more widely distributed stock now extinct at the surface. Unlike the trechines, it is not immediately apparent what that stock may have been.

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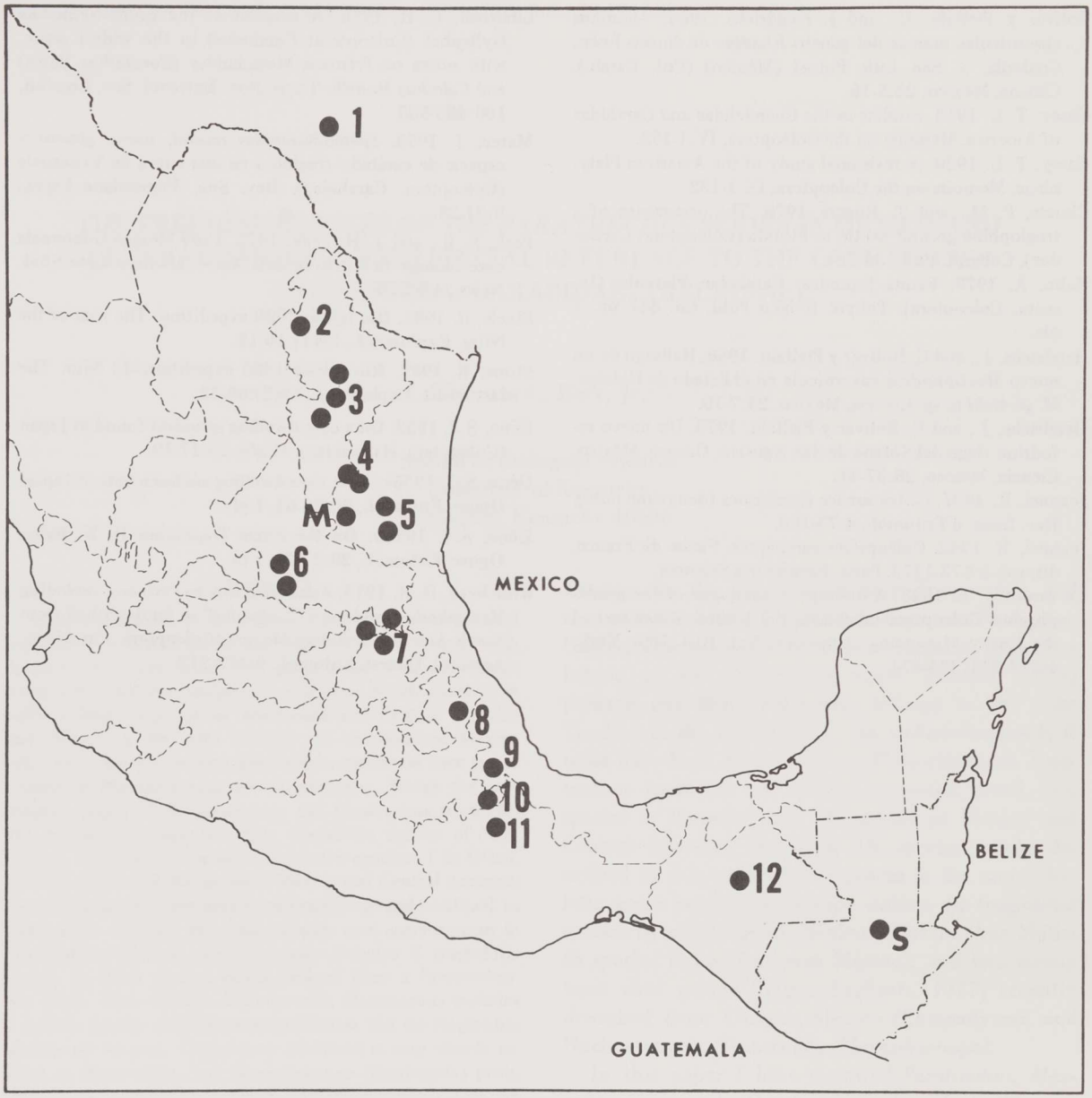

Fig. 47.—Distribution of *Mexisphodrus* (numerals), *Miquihuana* (M), and *Speocolpodes* (S): 1) *M. valverdensis;* 2) *M. boneti palmitensis,* 3) *M. boneti* subspp.; 4) *M. purgatus;* 5) *M. profundus;* 6) *M. spiritus;* 7) *M. gertschi* subspp.; 8) *M. cuetzalan;* 9) *M. veraecrucis;* 10) *M. zoquitlan;* 11) *M. urquijoi;* 12) *M. cancuc;* M: *Miquihuana rhadiniformis;* S: *Speocolpodes franiai.*

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THE TRECHINE BEETLES OF THE *PARATRECHUS* SERIES IN MEXICO AND CENTRAL AMERICA, WITH SPECIAL REFERENCE TO THE CAVE SPECIES (COLEOPTERA: CARABIDAE: TRECHINAE)

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ABSTRACT

Trechine beetles of the *Paratrechus* series are distributed from México southward through Central America and South America to central Brazil. The group arose from a Holarctic stock which became isolated in northern South America in early Tertiary and spread northward into Central America and México in the later Tertiary. In northeastern México relics of a more extensive distribution survive as cave populations of *Mexaphaenops* and *Paratrechus*. Today the geographic ranges of *Mexaphaenops* and *Paratrechus* are mutually exclusive except for three troglobitic species of *Paratrechus*. *Paratrechus* includes 33 known species: 1 in Brazil, 2 in Ecuador, and 30 species in México and Central America; its epigean species are usually micropterous and confined to cool, moist uplands, but four obligate cave species occur in northeastern México. *Mexaphaenops* includes 8 troglobitic species in three groups which evolved from a *Paratrechus*-like stock, now extinct above ground. *Mexitrechus* includes 6 known species in southwestern México, but no troglobitic species are known. *Chiapadytes* (México) is very closely related to *Paratrechus*, but *Mayaphaenops* (Guatemala) probably shares a common ancestry with *Mexitrechus;* both are monobasic troglobitic genera.

The genera *Paratrechus, Mexaphaenops,* and *Mexitrechus* are reviewed, keys to species are given, and the following new taxa are described and illustrated. *Paratrechus: contrarius* (Querétaro), *tacana* (Chiapas), *putzeysi* (Oaxaca), *cataractae* (Veracruz), *balli* (Oaxaca), *totontepec* (Oaxaca), *propior* (Hidalgo), *laticeps* (Tamaulipas), *reddelli* (Veracruz), *oaxaquensis* (Oaxaca), *jeanneli* (Oaxaca), *chiriquensis* (Panama), *franiai* (Guatemala), *erwini* (Veracruz), *pecki* (Costa Rica). *Mexaphaenops: mackenziei mackenziei* (Tamaulipas), *mackenziei gracilis* (Tamaulipas), *mackenziei dulcinominis* (Nuevo León), *febriculosus* (Tamaulipas), *jamesoni* (Tamaulipas), *sulcifrons* (Tamaulipas/Nuevo León). *Mexitrechus: mogotensis* (Guerrero).

The trechine beetles of México and Central America include obviously boreal elements (4 species of *Trechus* in the Sierra Volcánica Transversal) and elements emanating from South America *(Perileptus, Cnides, Trechisibus)*, but the great majority of species belong to the *Paratrechus* series. Jeannel (1931) pointed out that *Paratrechus* belongs to the tribe Trechini in the family Trec ae, and consequently it must have been derived from a Holarctic stock. *Paratrechus* itself has one species in central Brazil, two species in Ecuador, and 30 species in México and Central America, including 15 species newly described in this paper. Other genera in the same phyletic series are *Mexaphaenops* Bolívar (8 troglobitic species in northeastern México), *Mexitrechus* Mateu (6 species in southwestern México), and two monobasic cave genera (Vigna Taglianti, 1977) recently described from Chiapas, México *(Chiapadytes)*, and Huehuetenango, Guatemala *(Mayaphaenops)*.

In this paper I have reviewed *Paratrechus, Mexaphaenops,* and *Mexitrechus,* described 20 new species, and attempted to relate the cave fauna to epigean genera and species. No comprehensive monograph of the trechines of México and Central America is possible at the present time; substantially more collections are needed, both above and below the surface of the ground. The species assembled by various collectors have been rather different for the epigean fauna, and relatively few cave systems have been intensively investigated. This suggests that many more species and perhaps additional genera remain uncollected and unknown. The fragmentary material (3 species) from South America makes it especially difficult to interpret the zoogeography of the group. What I have done in this paper is to consolidate available information, add to it from material available to

me, and sketch the general outlines of the trechine fauna of the region as it is currently known, thus providing a basis for future studies. A hypothetical scenario of evolutionary and biogeographic events is offered as a tentative explanation for present distribution of epigean and cave species. This scenario can be strengthened, rejected, or modified by future discoveries.

Although species of *Paratrechus* have been described from Brazil (Jeannel, 1928:103) and Ecuador (Uéno, 1968:342, 347), the great majority of known species in the genus occur in México (23), Guatemala (3), Costa Rica (5), and Panama (1). No *Paratrechus* species have yet been reported from Belize, Honduras, El Salvador, or Nicaragua. Subgenera are probably premature and should await a more comprehensive view of the diversity of what will eventually be a much larger genus. I have grouped the known species into species groups which, being neutral taxonomic categories, may be modified in the future without cluttering the literature with available genus-group names. Some of these groups may, of course, become subgenera, particularly the *sylvaticus*, *erwini*, and *grandiceps* groups. In fact, subgenus *Hygroduvalius* has already been proposed for two pale species of *Paratrechus* with free mentum and 8 prebasilar setae (Bolívar, 1940; Barr, 1967a), but the discovery of *P. contrarius*, a cave species closely related to *P. pallescens* Barr, effectively destroys the concept of this subgenus, because *P. contrarius* is dark reddish-piceous and has the mentum and submentum fused. The presence of a suture between the mentum and submentum in the *Paratrechus* series has much less diagnostic value than it usually has in the Trechinae, where it is commonly of generic significance. In all three genera *(Paratrechus, Mexaphaenops, Mexitrechus)* there are species with the mentum free and also species in which the mentum and submentum are clearly fused. And in *Paratrechus* there are species, notably *P. mexicanus* and *P. halffteri*, in which some individuals have this suture open at the middle and closed at the sides.

The key diagnostic features of *Paratrechus* (other than its standing as a member of the Trechini) are the position of one or both elytral discal punctures on the 5th elytral stria (instead of the usual position on the 3rd stria) and the development of a rounded, discoidal, or mushroom-shaped "sensorial organ" at the apex of the aedeagus. In *Mexitrechus* the anterior discal puncture remains on the 5th stria, but it is variable in *Mexaphaenops* and is located on the 3rd stria in *Mayaphaenops*. The sensorial organ is absent in *Mexitrechus*, variable in *Mexaphaenops* (present, vestigial, or absent according to species), and absent in *Mayaphaenops*. In effect, *Mayaphaenops* may not even belong to the *Paratrechus* series, but it does show striking similarities to *Mexitrechus* in some other characters. Elongation of the head in *Mayaphaenops* and in 5 species of *Mexaphaenops* has led to "incomplete" frontal grooves which end blindly on the vertex rather than continuing around the sides of the head, a condition which René Jeannel has called "aphaenopsian." In three *Mexaphaenops* species, however, the frontal grooves do continue around the sides of the head, so we have the unusual situation of a mixed genus of aphaenopsian and non-aphaenopsian species. At the same time there is no doubt that the aphenopsian and non-aphaenopsian species belong to a monophyletic, closely related group.

Chiapadytes bolivari, carefully described and illustrated by Vigna Taglianti (1977), seems to be little more than a large *Paratrechus* species close to *P. sylvaticus* and *P. pallescens*. The posterior discal seta is on the 3rd elytral stria, but this character is approached in *P. reddelli*, *P. sylvarum*, *P. oaxaquensis*, *P. jeanneli*, and *P. reyesi*, in which this seta is on the 4th stria or 4th interval. However, I have not seen the unique holotype of *C. bolivari;* additional collections of this rare and interesting species would be useful in clarifying its status.

Mexitrechus Mateu, a distinctive genus within the *Paratrechus* series, is widely distributed from southwestern Durango to Guerrero and Oaxaca, then eastward into the Sierra Volcánica Transversal. Six species are known, two of them reported from caves, but no troglobitic species have been discovered. Two species, *M. tepoztlanensis* and *M. michoacanus*, occur without obvious geographic variation on opposite sides of the Río Balsas valley, in the Sierra Volcánica Transversal and the Sierra Madre del Sur. In both species Bolívar (1943a) reported occasional ± winged individuals, although the majority of specimens collected are micropterous. Whether *Mexitrechus* also occurs in the Chiapas highlands and elsewhere in the Cordillera in Central America remains to be seen, but the possibility is rather high, judging from the distributions of the Mexican species. The aedeagus lacks an apical sensorial organ; the *coarctatus* group has evolved a bizarrely produced and flattened aedeagal apex, contrasting with the simple apex in the *tepoztlanensis* group.

Mexaphaenops Bolívar includes 8 rather heterogeneous species from the caves of northeastern México, all of them from caves at comparatively high elevations. Curiously, the collective geographic distributions of *Mexaphaenops* and *Paratrechus* are mutually exclusive, with the exception of *P. laticeps*, *P. pallescens*, and *P. contrarius*, which are troglobitic. In

other parts of the world the transition from an epigean life style to life in caves appears to have been made among the trechines by an intermediate edaphobitic stage in deep soil and humus. Such was probably the case for the evolution of Mexican cave trechines, judging from the morphology and microhabitat selection in *P. sylvaticus*, an epigean species closely related to *P. pallescens* and *P. contrarius*, which are troglobites. A third troglobitic *Paratrechus*, *P. reddelli*, inhabits a lava cave in a spur of the Cofre de Perote, Veracruz; it is closely similar to *P. sylvarum*, an epigean, high-altitude endemic on Popocatépetl. *Paratrechus laticeps*, from a cave in northwest Tamaulipas, is sufficiently distinct that I have left it in a monobasic species group, but it is probably closest to the *mexicanus* group, whose species are dstributed from Oaxaca as far north as Hidalgo. There are thus at least three lineages in *Paratrechus* which have independently given rise to troglobites.

The insistence of René Jeannel (e.g. 1943) and Barr (e.g. 1967b, 1968) on the preponderance of temperate zone troglobites versus a paucity of troglobites in the tropics was certainly conditioned by greater familiarity with carabid beetles. In México it is generally true that troglobitic carabids are limited to regions of higher elevations; in tropical parts of México, however, the predator role of troglobitic carabids is assumed by a variety of troglobitic arachnids (J. R. Reddell, in litt.). In lowland caves and mines in Chiapas, Guerrero, Veracruz, Yucatán, Costa Rica and elsewhere various trogloxene and troglophile carabids occur, for example *Platynus colibor* Whitehead (=*Colpodes bicolor* Chaudoir) and epigean species of *Tachys*, *Ardistomis*, *Chlaenius*, and other riparian species likely to be washed into caves. The model of genetic changes during colonization of caves and speciation of troglobites proposed for the temperate zones (Barr, 1967b, 1968) may not be strictly applicable for Mexican and Central American cave carabids (see also Howarth, 1980). Nevertheless, restriction of troglobitic trechines in the region to caves at rather high altitudes (the "tierra fría" of climatologists) may ultimately permit an adaptation of this model. Upland areas in northeast México (parts of the Altiplanicie Central, Altiplanicie Septentrional, and the Sierra Madre Oriental) would have been much colder and wetter during Pleistocene glacial maxima than they are today. Epigean trechines in such areas would have become extinct during warmer and drier periods (interglacials), surviving only in caves.

The origin of *Paratrechus* and related genera remains a puzzle for which there is no wholly satisfactory solution (Jeannel, 1931). Derivation from a Holarctic stock seems almost certain. Yet the genus has representatives in Brazil and Ecuador. I have not seen *P. clermonti* Jeannel, from Brazil, but the two Ecuadorean species, *P. gressiti* and *P. grandiceps*, are distinguished from the Mexican and Central American species by a series of apomorphic characters that imply long residence in the locality which they presently inhabit. The following evolutionary and biogeographic scenario is based on patently fragmentary distributional information: there are almost certainly many species of *Paratrechus* (and other genera?) still undiscovered in México, Central America, and South America. As an hypothesis, however, the scenario is eventually subject to testing by future collecting and examination of trechines, and it can stand, fall, or be modified accordingly.

Stage I: A line of Holarctic Trechini reached northern South America, probably in late Cretaceous or early Tertiary and became isolated from North American trechines by subsidence of the Panamanian land bridge. This group of trechines evolved into the basal stock of the *Paratrechus* series.

Stage II: Reinvasion through Central America into México took place in two steps—one group giving rise to *Mexitrechus* and *Mayaphaenops* and a later group giving rise to *Paratrechus* and *Mexaphaenops*.

Stage III: The *Paratrechus* line expanded northward in the uplands as far as the Río Bravo (=Río Grande), probably in Miocene or Pliocene time. This migration was facilitated by occasional +-winged populations, but in mountain carabids there is strong selection pressure for microptery (Darlington, 1943).

Stage IV: Intermittent warming and drying during Pleistocene interglacial periods led to progressive aridity in northeastern México, resulting in extinction of epigean trechines north of the Sierra Volcánica Transversal. Only those species which had adapted to subterranean life were able to survive. This process may have occurred several times, the epigean fauna expanding northward during glacial maxima and contracting during interglacials, resulting in "pulses" of cave colonization. In the uplands to the south the alternating pluvial and semiarid climatic regimes resulted in alternate expansion and contraction of the ranges of epigean species and divergence of isolates in various mountainous regions. Whether the *Paratrechus* line also spread northward in the Sierra Madre Occidental we do not know; the area is probably too arid to support epigean species at present (other than *Mexitrechus occidentalis* in Durango), and its caves are relatively dry and dusty and unlikely to support survival of troglobitic relics (J. R. Reddell, in litt.).

Perileptus, *Cnides*, and *Trechus* have not yet been encountered in caves of México and Central America. Both *Perileptus* and *Cnides* share a similar habitus—very large, convex eyes, V-shaped labrum, last palpal segments narrower than penultimate segments, strongly cordiform pronotum, elytra very depressed and subparallel, no definitive apical groove. With so many similar characters, convergence of habitus is extremely unlikely. Yet the basal bulb of the aedeagus is closed in *Perileptus*, and there are two subequal basal lobes in *Cnides;* this feature caused Jeannel (1962) to remove *Cnides* from the Homaloderini and place it in the Trechodini. If, however, one accepts the hypothesis that a closed basal bulb evolved independently in *Perileptus* and also among other trechines, *Cnides* could be viewed as a South American isolate of the same group which produced *Perileptus* in the Old World. Although it is well established in the West Indies, the extent to which *Perileptus* occurs on the mainland and coexists with *Cnides* remains to be determined. Species of *Cnides* are found as far north as San Luis Potosí and Tamaulipas, northeastern México.

The four species of *Trechus* known from the volcanic massifs that ring Mexico City (see Mateu, 1974) include three which are closely related (*aztec* Jeannel, *hendrichsi* Mateu, *moctezuma* Mateu) to each other and perhaps more remotely to the *ovipennis* group (Alaska to southern California and the mountains of Arizona). *Trechus tolucensis* Bolívar, from the Nevado de Toluca crater, is quite different.

Finally, Jeannel (1962) has shown that *Trechus panamensis* Putzeys (1870) is a synonym of *Trechisibus (T.) politus* Brullé and almost certainly must have come from Chili, not from Panama. Consequently *Trechisibus*, with *Trechus*-like habitus and a premolar tooth, is not known from Central America.

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Key to Genera of Trechinae from México, Central America, and the West Indies

1. Eyes well developed, apparently functional, usually pigmented, with numerous facets 2
   Eyes absent or reduced to minute, pale areolae (flat or slightly convex); inhabitants of caves 6

2(1). Eyes glabrous; last segment of palps not or but slightly narrower than penultimate segment; labial palps with penultimate segment 4-setose at most. 3
   Eyes pubescent, very convex; last segment of palps narrower than penultimate segment, penultimate segment of labial palps plurisetose; small, pubescent species with body depressed and very subparallel; West Indies . . . . . *Perileptus* Schaum

3(2). Eyes very large, form subparallel and depressed, glabrous above and pubescent beneath; elytral striae 1, 2, and 8 deeply impressed and complete, stria 3 beginning at anterior discal puncture, no apical recurrent groove; aedeagus quite small, two subequal basal lobes not forming enclosed basal bulb, parameres with only 2 apical setae; active, winged species along streams at lower elevations, all of Central America, north to San Luis Potosí and Tamaulipas, México. . . . . *Cnides* Motschulsky
   Eyes smaller, form and elytral striation not as described; elytra with apical recurrent groove; aedeagus with basal bulb, parameres usually with 3-5 setae (2 in one species); species usually occurring in cooler, moist situations at higher altitudes 4

4(3). Elytra with anterior discal puncture on 5th stria; posterior discal on 5th, 4th, or 3rd stria or absent; apex of aedeagus with button-like "sensorial organ" OR satiny, blackish-piceous species with elongate body and strongly cordiform pronotum, epipleura visible from above, base narrower than apex; Panama north to central México 5

Elytra with anterior discal puncture on 3rd stria or 3rd interval; central México . . . . . *Trechus* Clairville

5(4). Pronotum strongly cordiform, base narrower than apex, epipleura visible from above in front of hind angles; color black or piceous, satiny, sometimes iridescent; elytral striae obsolescent, at most with shallow sutural stria, weak second stria, trace of 3rd or 4th striae; aedeagal apex simply attenuate or flattened and very conspicuously produced, no sensorial organ; Durango (La Ciudad), Guerrero, Oaxaca, Michoacán, Edo. de México, Morelos . . . . . *Mexitrechus* Mateu

Pronotum more transverse, apex and base width more nearly subequal, epipleura not visible from above; color usually dark piceous, occasionally black, pale piceous, or rufotestaceous; usually with several striae (sutural stria only: one species from Guatemala); northern Panama (Chiriquí) to central México (Michoacán, Hidalgo) . . . . . *Paratrechus* Jeannel

6(1). Pronotum strongly cordiform, base much narrower than apex, epipleura visible from above before hind angles; frontal grooves incomplete, color rufotestaceous, no trace of eye rudiment; apex of aedeagus simple, bluntly rounded; Huehuetenango province, Guatemala. . . . . *Mayaphaenops* Vigna Taglianti

Pronotum more transverse, or at least apex and base widths more nearly subequal, epipleura not visible from above; distinct areolar or lunate eye rudiment present; México. 7

7(6). Elytral humeri strongly rounded, more or less oblique to suture; frontal grooves complete or incomplete, head more or less subparallel; color rufotestaceous; Nuevo León, Tamaulipas, San Luis Potosí, Querétaro. . . . . *Mexaphaenops* Bolívar

Elytral humeri prominent, scarcely rounded; frontal grooves complete, head rounded; color pale piceous or dark reddish-piceous (if rufotestaceous then labrum very deeply emarginate and head very wide behind eyes; Tamaulipas) 8

8(7). Anterior discal puncture on 4th elytral stria, posterior discal on 3rd stria; pale piceous, elytral microsculpture transverse; length 6 mm; Chiapas . . . . . *Chiapadytes* Vigna Taglianti

Anterior discal puncture on 5th stria or 5th interval, posterior discal on 4th or 5th stria; pale piceous, dark piceous, reddish-piceous, or rufotestaceous; elytral microsculpture transverse or isodiametric; length under 6 mm; Querétaro (Pinal de Amoles and El Doctor platform), Veracruz (Cofre de Perote), Tamaulipas (Miquihuana) . . . . . *Paratrechus* Jeannel

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Paratrechus Jeannel

Jeannel, 1920:106 (subgenus). Type-species, *Trechus mexicanus* Putzeys, by original designation. Jeannel, 1928:104 (full genus). Mateu, 1974:195.

Description.—Length 4-6 mm, form *Trechus*-like, subglabrous. Head with complete frontal grooves, mentum free or fused to submentum, according to species, partial fusion occurring in a few species, 6-8 prebasilar setae; mentum tooth bifid; mandibles without premolar tooth. Pronotum more or less cordiform, usually transverse; one or two pairs of marginal setae (posterior pair absent in 2 species from Ecuador); hind angles usually large and well developed, sharp, sometimes laterally produced. Elytra elongate-oval to rounded-oval, humeri generally prominent to slightly rounded; microsculpture varying from strongly isodiametric to (usually) densely transverse and obsolescent; longitudinal striae usually well marked, deep to superficial, but in many species outer striae progressively obsolescent, only one stria present in one species (Guatemala), intervals subconvex to flat; anterior discal seta on 5th stria at level of 2nd or 3rd umbilicate puncture, posterior discal on 4th or 5th stria or 4th or 5th interval, or entirely absent; apical triangle complete, anterior apical puncture on 2nd stria apex, often where 2nd and 3rd striae join, lateral and posterior punctures on or

near apical groove; umbilicate punctures in closely aggregated groups; apical groove well developed, directed toward (4th-) 5th (-6th) stria. Aedeagus with well-developed basal bulb, apex with more or less prominent sensorial organ which varies from rounded to mushroom-shaped to flattened and discoidal; internal sac with dense armature of elongate, triangular spines; transfer apparatus anisotopic, consisting of (?one or) two subequal, hyaline, spade-shaped or elongate, triangular copulatory sclerites; parameres with 2-6, usually 3-4 apical setae. Males with two basal protarsal segments enlarged and dentate, adhesive setae beneath.

Discussion.—The aedeagal pattern is rather homogeneous within *Paratrechus*, in various groups and species shorter, thicker, and less arcuate, in others long, slender, conspicuously arcuate, with sharply deflexed basal bulb. The aedeagus in *P. erwini*, however, is exceptionally aberrant; the median lobe is twisted about 45° before the middle, and there are lateral wings (slightly asymmetrical) on either side before the blunt, rounded apex, which is tipped with a small, discoidal vestige of the sensorial organ; the entire aedeagus is very heavily sclerotized, piceous black. The pale body color, elongate habitus, hypertrophy of fixed setae, and deep, punctured elytral

Key to Species Groups of *Paratrechus* in México and Central America

The function of this key is primarily definitional. It is easier and faster for sorting out species when one has already acquired a familiarity with *Paratrechus*, but the more artificial key to species is recommended for routine identification purposes.

A. Prebasilar setae 6 in number . . . . . B
Prebasilar setae 8 in number . . . . . *sylvaticus* group

B(A). Color piceous, black, or reddish testaceous; aedeagus normal C
Color pale piceous, form slender and elongate; elytral striae deep and punctured; aedeagus heavily sclerotized, dark piceous, median lobe twisted, with lateral antapical wings (Fig. 33). . . . . *erwini* group

C(B). Elytral discal punctures 5-5 or 5-4 . . . . . D
Elytral discal punctures 5-0*; aedeagus rather short, thick, weakly arcuate (Figs. 28-31). . . . . *bifoveatus* group

D(C). Aedeagus moderately elongate and/or slender; México . . . . . E
Aedeagus rather short, thick, and arcuate (Figs. 25, 26); Costa Rica, Panama . . . . . *halffteri* group

E(D). Elytral discal punctures 5-5 . . . . . F
Elytral discal punctures 5-4 . . . . . G

F(E). Form moderately robust, color darker; pronotum with anterior angles weakly produced; aedeagus rather elongate, median lobe not strongly arcuate, length 0.9-1.3 mm, sensorial organ large and oblique (Figs. 8-14). . . . . *mexicanus* group
Form rather slender, color paler; pronotum apex truncate, anterior angles rounded, not produced; aedeagus slender, less than 1 mm long, median lobe evenly arcuate, sensorial organ rounded and rather small (Figs. 5, 6) . . . . . *osorioi* group

G(E). Form moderately robust, color dark piceous or rufotestaceous; aedeagus with median lobe moderate, not greatly produced nor slender, sensorial organ rounded. . . . . H
Form elongate, slender, and depressed; color dark reddish piceous; aedeagus with large basal bulb bent at right angle or more to slender, produced median lobe, sensorial organ discoidal and oblique (Fig. 18) . . . . . *sylvarum* group

H(G). Rufotestaceous, microphthalmous, in caves; elytral striae deeply impressed, intervals strongly convex (Fig. 15); Tamaulipas . . . . . *laticeps* group
Piceous, eyes normal, epigean; elytral striae shallowly impressed, intervals flat or subconvex (Fig. 19); Oaxaca . . . . . *oaxaquensis* group

*If specimen is from southwestern Oaxaca (Suchixtepec-Miahuatlán area), it is probably *P. hoegei (mexicanus* group), which has no posterior discal puncture but a *mexicanus*-like aedeagus (cf. Fig. 13).

striae of *P. erwini* appear again in *P. pecki*, a Costa Rican species unfortunately known only from a unique female.

Four species of *Paratrechus* have become troglobites, probably rather recently. They are presumably independently derived from three epigean or edaphobitic ancestors. *Paratrechus reddelli*, dark reddish piceous with slender habitus, has the mentum and submentum fused and only 6 prebasilar setae; the elytral microsculpture is finely transverse, and the eye rudiments are oblique and lunate. Habitus, color, and the long, slender aedeagus with strongly bent basal bulb are very reminiscent of *P. sylvarum*, an epigean species occurring high on the upper slopes of Popocatépetl. The habitat of *P. reddelli* is a lava tube on a spur of the Cofre de Perote, approximately 170 km northeast of Popocatépetl.

Paratrechus pallescens occurs in caves in the vicinity of Pinal de Amoles, Querétaro, where it is sympatric and syntopic with *Mexaphaenops elegans* (Barr, 1967a). It is pale flavocastaneous, has densely isodiametric elytral microsculpture, and the eye rudiments are flat, circular areolae; the mentum is free, and there are 8 prebasilar setae. The species is morphologically quite close in habitus, color, and labial characteristics to *P. sylvaticus*, which has functional eyes and transverse elytral microsculpture and occurs in wet, rotten wood in the Parque de Zempoala and the Desierto de los Leones south of Mexico City. *Paratrechus contrarius* is similar to *P. pallescens* in form and the possession of 8 prebasilar setae, but the isodiametric microsculpture of the elytra as well as the microsculpture of head and pronotum are much more intense, the eye rudiments are minute, convex spherules, and mentum and submentum are fused. The habitat is a cave on the El Doctor platform, near Lagunita, separated from the Pinal de Amoles karst by the deep valley of the Río Extórax.

Paratrechus laticeps, from a single cave in the Sierra Madre Oriental of northwest Tamaulipas, is the only rufotestaceous troglobite yet known in the genus. It is readily distinguished by the shape of the head, which is widest behind the eye rudiments, by the transverse elytral microsculpture, and the very deep elytral striae. The species is apparently a relic of a more widely distributed stock now extinct in epigean habitats, perhaps derived from a *mexicanus*-like ancestor. The eye rudiments are larger and the elytral humeri more pronounced than in *Mexaphaenops* species of comparable size. Nevertheless its assignment to *Paratrechus* rather than *Mexaphaenops* is somewhat arbitrary, reflecting the different degrees of subterranean evolution which various lineages of *Paratrechus* have undergone in various cave systems of northeastern México.

At present it seems best not to divide *Paratrechus* into subgenera. In future classifications subgenus *Hygroduvalius* Bolívar may be resurrected (with appropriate redefinition). The *erwini* group is a likely candidate for elevation to subgeneric standing (or distinct genus), as is the *grandiceps* group (two species, Ecuador, Uéno, 1968). Presumably *P. clermonti* (Brazil) should form a monobasic group. The Mexican and Central American species have been arranged in 9 species groups. Usually the position of the posterior elytral discal puncture is highly diagnostic, but I have placed *pecki* (5-0) with *erwini* (5-5 or 5-4) on the basis of distinctive external morphology. I suspect *reyesi* and perhaps *costaricensis*, both 5-4, are more closely related to *halffteri* and *chiriquensis*, both 5-5, than to Mexican species with the 5-5 discal puncture formula; and *hoegei* (5-0) seems clearly related to species of the *mexicanus* group on the basis of aedeagal form, even though other species of the group have the 5-5 formula.

Relationship among the groups is more difficult to determine. Although no formal character analysis will be attempted here, some of the principal character states are the following. The plesiomorphic state (putative) is given first, with the apomorphic state(s) in parentheses: piceous color (pale piceous or rufotestaceous), mentum free (mentum and submentum fused), 8 prebasilar setae (6 prebasilar setae), elytral discal formula 5-5 (5-4 or 5-0), large sensorial organ at apex of aedeagus (small sensorial organ), functional eyes (microphthalmous), deep elytral striae (shallow or obsolescent striae). In this context the most primitive group is the *sylvaticus* group and the most aberrant (highly apomorphic) is the *erwini* group. The *mexicanus* group appears to be rather primitive, and the *laticeps*, *oaxaquensis*, and *sylvarum* groups are probably apomorphic offshoots of the same stock. The *osorioi* group—and it is by no means certain that its two component species are really related—might fall somewhere between the *sylvaticus* and *mexicanus* clades. The general body form and rather short, thick form of the aedeagus suggest to me that the *bifoveatus* and *halffteri* groups are related; this supposition is at least biogeographically feasible. If the evolutionary and biogeographic scenario postulated earlier in this paper is correct, then the *grandiceps* and *clermonti* groups would probably represent still earlier branches, but so few species are now known from South America that it is scarcely productive to speculate about them at present.

Key to Mexican and Central American Species of *Paratrechus*

The key to species given by Mateu (1974) is outdated by descriptions of new species in this paper. In the new key offered below I have omitted *P. clermonti* (Brazil; see Jeannel, 1928), *P. grandiceps*, and *P. gressiti* (both from Ecuador; see Uéno, 1968). Two species included in Mateu's key, *tepoztlanensis* and *quirogai*, have been transferred in this paper to *Mexitrechus*. I have not seen 3 rare species described by Mateu *(costaricensis, altitudinis, beltrani)* nor *P. laevigatus* Jeannel; these four species were included in the key by drawing on diagnostic characters given in published descriptions. The key is admittedly artificial.

1. Specimen from Costa Rica or Panama 2
   Specimen from México or Guatemala 6

2(1). Color blackish- or reddish-piceous; elytra with 2 discal punctures; elytral striae shallow or deep but impunctate or vaguely punctulate 3
   Color pale piceous (castaneous); elytra with only one (anterior) discal puncture; elytral striae deep and rather strongly punctured (Fig. 34); Cerro de la Muerte, Costa Rica . . . . . *pecki*, n. sp.

3(2). Color dark reddish-piceous; inner elytral striae moderately deep, inner intervals distinctly subconvex; mentum and submentum completely separated by distinct suture. 4
   Color blackish-piceous; elytral striae all quite shallow, intervals flat; mentum fused to submentum, at least at sides (Figs. 22, 25); Cerro de la Muerte, Costa Rica . . . . . *halffteri* Mateu

4(3). Length 4.4-5.0, mean about 4.8 mm; pronotum strongly transverse, sides strongly rounded (Figs. 23, 24); elytra robust, sides rounded, 1.35-1.45 times longer than wide 5
   Length 4 mm; pronotum less transverse, elytra more elongate; Rosario de Desamparos, Costa Rica . . . . . *costaricensis* Mateu

5(4). Eye twice as long as temple; pronotum (Fig. 23) with anterior angles more prominent, base rectilinear; elytra more than 1.4 times longer than wide, posterior discal puncture on 5th stria or 5th interval; aedeagus (Fig. 26) with apical sensorial organ large and oblique; Cerro Punta, Chiriquí, Panama; Volcán Irazú, Costa Rica. . . . . *chiriquensis*, n. sp.
   Eye only 1.4 times longer than temple; pronotum (Fig. 24) with anterior angles subdued, base distinctly emarginate; elytra less than 1.4 times longer than wide, posterior discal puncture on 4th stria or 4th interval; aedeagus with apical sensorial organ small and rounded; Talamanca and Alajuela, Costa Rica . . . . . *reyesi* Mateu

6(1). Cave species with rudimentary eyes. 7
   Eyes normal, functional 10

7(6). Color dark reddish-piceous or yellowish-piceous 8
   Color rufotestaceous; head very wide behind eyes (Fig. 15), elytral striae deep and intervals convex; Tamaulipas . . . . . *laticeps*, n. sp.

8(7). Dark reddish-piceous; elytral microsculpture finely transverse; submentum with transverse row of 6 prebasilar setae; Cofre de Perote area, Veracruz. . . . . *reddelli*, n. sp.
   Piceous or yellowish-piceous; elytral microsculpture isodiametric; submentum with transverse row of 8 prebasilar setae 9

9(8). Dark piceous, elytral microsculpture intense, dull shining; mentum and submentum fused; posterior elytral discal puncture on 4th stria; eye rudiment distinctly convex; Querétaro (El Doctor platform) . . . . . *contrarius*, n. sp.
   Pale yellowish-piceous, elytral microsculpture shining; mentum free; posterior elytral discal puncture on 5th stria; eye rudiment flat; Querétaro (Pinal de Amoles) . . . . . *pallescens* Barr

10(6). Color pale, yellowish-piceous or reddish-testaceous 11
Color dark piceous (normal), appendages usually paler 13

11(10). Pale yellowish-piceous 12
Reddish-testaceous; 5.5 mm; eyes small, elytra subparallel with two punctures on 5th stria, striae superficial; Popocatépetl area, México . . . . . *altitudinis* Mateu

12(11). Mentum free, 8 prebasilar setae; elytral striae impunctate; aedeagus of normal form; Morelos and Distrito Federal, México . . . . . *sylvaticus* Bolívar
Mentum fused to submentum, 6 prebasilar setae; elytral striae deep and strongly punctured; aedeagus heavily sclerotized, dark piceous shining, median lobe with subapical lateral wings (Figs. 32, 33); Veracruz (Cofre de Perote). . . . . *erwini*, n. sp.

13(10). Elytra with only one (anterior) discal puncture, on 5th stria 14
Elytra with two discal punctures 20

14(13). Elytra more or less striate; at least 2-3 striae present. 15
Elytra with only one stria (sutural); eyes small; elytra quite robust and convex; Guatemala . . . . . *laevigatus* Jeannel

15(14). Color blackish piceous; elytral striae shallow, obsolescent at sides, elytral disc quite convex. 16
Color dark, somewhat reddish, piceous 17

16(15). 4.0-4.4 mm; aedeagus (Fig. 28) quite short, scarcely arcuate, parameres with only 2 apical setae; Guatemala (Totonicapam, Volcán Tajumulco, Volcán Tacaná) and Chiapas, México (Volcán Tacaná) . . . . . *bifoveatus* Jeannel
5.2-5.4 mm; aedeagus (Fig. 29) larger, parameres with 3 setae at apex; Veracruz, México (Cofre de Perote, Las Vigas) . . . . . *batesi* Mateu

17(15). Outer elytral striae obsolescent, striae rather shallow, impunctate or irregularly and variably punctulate; not from Popocatépetl area, México 18
Elytral striae all visible, deep, and punctured; length about 4.5 mm; Popocatépetl area . . . . . *beltrani* Mateu

18(17). Form moderately slender, elytra 1.4 times longer than wide, subconvex; México 19
Form robust, elytra 1.3 times longer than wide and very convex, with 3 inner striae (Fig. 27); aedeagus (Fig. 31) short, scarcely arcuate; Guatemala (Volcán Tajumulco). . . . . *franiai*, n. sp.

19(18). Frontal grooves subparallel on clypeus, eye slightly longer than temple; elytra with most striae visible though shallow; elytral apexes quite rounded; aedeagus shorter and thicker in vicinity of internal sac (Fig. 30); Michoacán . . . . . *bolivari* Mateu
Frontal grooves divergent on clypeus, eye as long as temple; elytra with two deeper inner striae, outer striae progressively obsolescent; elytral apexes slightly attenuate; aedeagus long and slender, feebly arcuate (Fig. 13); southwestern Oaxaca (Suchixtepec, Miahuatlán) . . . . . *hoegei* Jeannel

20(13). Elytra with posterior discal puncture on 4th stria or 4th interval 21
Elytra with posterior discal puncture on 5th stria or 5th interval 23

21(20). Form moderately robust, subconvex to convex; pronotum with anterior angles slightly produced; apical triangle compact, punctures close together; aedeagus with basal bulb bent at less than right angle, median lobe less slender, sensorial organ rounded; Oaxaca 22

Form slender, elongate, and depressed; pronotum apex truncate, anterior angles subdued; apical triangle with punctures widely spaced; aedeagus with large, deflexed basal bulb and long, slender median lobe, sensorial organ oblique and set off by constriction (about as in *P. reddelli*, cf. Fig. 18); Popocatépetl area, México. . . . . *sylvarum* Mateu

22(21). Pronotum and elytra rather convex, inner elytral intervals subconvex, striae finely punctulate; aedeagus (Fig. 21) much larger (1.2 mm) and more arcuate; Oaxaca (Puerto de Soledad). . . . . *jeanneli*, n. sp.

Pronotum and elytra subconvex, intervals flat, striae impunctate; aedeagus (Fig. 20) smaller (0.9 mm) and straighter; Oaxaca (between Cd. de Oaxaca and Guelatao) . . . . . *oaxaquensis*, n. sp.

23(20). Form more slender, pronotum with anterior angles subdued (Fig. 4); aedeagus shorter, median lobe more arcuate (Figs. 5, 6). 24

Form more robust, anterior angles of pronotum slightly produced (Fig. 7); aedeagus elongate, scarcely arcuate (Figs. 8-14). 25

24(23). Eye 0.8 as long as temple; mentum free; elytra with 6 striae; aedeagus as in Fig. 5; Chiapas (Volcán Tacaná). . . . . *tacana*, n. sp.

Eye 1.5 as long as temple; mentum and submentum fused; elytra with 3-5 striae; aedeagus as in Fig. 6; Hidalgo (El Chico, Barranca de los Marmoles) . . . . . *osorioi* Bolívar

25(23). Elytra very polished, shining, microsculpture essentially obsolete all over disc. 26

Elytral microsculpture consisting of transverse meshworks over most of disc, at most a few basal spots where it becomes locally obsolete. 28

26(25). Elytra with 5-7 visible striae; elytral apexes briefly attenuate 27

Elytra with only 2-3 inner striae, outer striae obsolete; elytral apexes quite broadly rounded, not at all attenuate; aedeagus as in Fig. 9; west-central Veracruz (Orizaba area) . . . . . *mexicanus* (Putzeys)

27(26). Length 4.4-5.0 mm; color uniformly dark piceous (except appendages); head rounded; pronotum 3/5 as long as wide; elytral intervals flat; aedeagus as in Fig. 10; northeast Oaxaca . . . . . *putzeysi*, n. sp.

Length 5.1-5.7 mm; head and pronotum dark piceous, elytra paler; head 4/5 as long as wide, pronotum 4/5 as long as wide; elytra with inner intervals weakly but distinctly convex; aedeagus as in Fig. 8; western Veracruz (Tequila). . . . . *cataractae*, n. sp.

28(25). Elytral microsculpture intense, nowhere obsolete 29

Elytral microsculpture with a few obsolete, polished spots, especially in basal third; aedeagus as in Fig. 12; color normal piceous; Oaxaca (Totontepec). . . . . *totontepec*, n. sp.

29(28). Color very dark piceous, not quite black; elytral microsculpture intense, satiny dull shining; aedeagus with median lobe very long and produced (Fig. 11); Oaxaca (La Cumbre) . . . . . *balli*, n. sp.

Color piceous, sometimes frons, antennal segments II-IV, and elytral disc infuscated; elytral microsculpture less intense; aedeagus (Fig. 14) much shorter; Hidalgo (Encarnación). . . . . *propior*, n. sp.

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sylvaticus group

Paratrechus sylvaticus Bolívar

Paratrechus (Hygroduvalius) sylvaticus Bolívar, 1941: 114. Type-locality, Parque de Zempoala, Morelos, México; type deposited in Bolívar coll., Escuela Nacional de Ciencias Biológicas, México. Mateu, 1974:206.

Description.—Length 5-5.6 mm. Mentum and submentum separated by complete suture; 8 prebasilar setae. Form rather elongate; color pale piceous, shining; elytral microsculpture densely transverse, obsolescent. Head as long as wide; eye 0.6 as long as temple; antenna half body length. Pronotum 0.8 as long as wide; anterior angles hardly produced, sides rounded, prominently sinuate before large and about

right hind angles, base very feebly emarginate; apex and base widths subequal and about 0.7 greatest width, which occurs in apical fourth. Elytra elongate-oval, 1.5 times longer than wide, apexes a little attenuate; disc depressed, humeri weak; anterior discal puncture on 5th stria at level of 4th umbilicate, posterior discal absent; apical triangle elongated; longitudinal striae rather deeply impressed, slightly irregular, intervals barely convex, all striae visible and some irregularly punctulate. Aedeagus with large and well rounded sensorial organ.

Discussion.—This species was collected beneath very rotten timbers in a forest of *Abies religiosa* in the Parque de Zempoala, northern Morelos, elevation 2800 m; a single female was subsequently taken in the Desierto de los Leones, Distrito Federal, elevation 3200 m (Bolívar, 1941). The description given above is based on a male paratype from Parque de Zempoala; total length range cited was given by Bolívar (1941). In a later paper Bolívar (1943b) described the larva of this species.

Paratrechus pallescens Barr
Fig. 3

Paratrechus (Hygroduvalius) pallescens Barr, 1967a: 161. Type-locality, Sótano de Tejamanil, Querétaro, México; type deposited in Museum of Comparative Zoology, Harvard University.

Paratrechus (H.) pallens: Mateu, 1974:206 (misprint).

Description.—Length 4.7-5.3 mm; pale piceous; eyes reduced to small, circular areolae; mentum free, 8 prebasilar setae. Head rounded; pronotum sides very feebly sinuate, hind angles obtuse; elytral microsculpture strongly isodiametric, both discal setae on 5th stria (at least touching 5th stria); aedeagus with arcuate median lobe, sensorial organ discoidal.

Discussion.—This troglobitic species is known from 4 caves near Pinal de Amoles, Querétaro: a) Sótano de Tejamanil, 0.5 km NE Tejamanil and 2.5 km SW Pinal de Amoles; b) Sótano del Buque, 20 km N Pinal de Amoles; c) Cueva del Judío, 2 km S Pinal de Amoles; and d) Sótano de la Escuela, Llano de San Francisco, 10 km NW Pinal de Amoles. In most of these caves it is associated with *Mexaphaenops elegans.*

Paratrechus contrarius, new species
Figs. 1, 2

Description.—A microphthalmous cave species resembling *P. pallescens*, but smaller and narrower, color darker, microsculpture similarly isodiametric but more intense, elytra more convex with posterior discal puncture on 4th stria, and aedeagus similar but smaller and straighter; eyes noticeably more convex. Length 4.6-4.9 mm. Form moderately robust, subconvex; dark piceous, very dull shining. Head as wide as long; labrum doubly emarginate; mentum fused to submentum, 8 prebasilar setae; eye rudiment distinctly convex, appearing as translucent spherules seen from above, with vestiges of ommatidia; antenna quite short, little more than 0.4 body length. Pronotum 7/8 as long as wide, cordiform, moderately convex; anterior angles more produced than in *pallescens*, sides shallowly sinuate in basal sixth, hind angles right and not produced to sides, base rectilinear; apex 0.9 as wide as base, which is 0.8 greatest width, which occurs in apical third. Elytra oblong, 1.5 times longer than wide, a little more convex than in *pallescens*, apexes rounded; striae deep but intervals a little less strongly convex; anterior discal puncture on 5th stria, posterior discal on 4th stria or 4th interval. Aedeagus similar to that of *pallescens* but a little smaller, 0.55 mm long in holotype, moderately arcuate, basal bulb bent at less than right angle, median lobe slightly swollen in vicinity of internal sac, sensorial organ rather large and quite rounded; parameres with 3 apical setae.

Type-series.—Holotype male (American Museum of Natural History) and one paratype male, Cueva del Rincón, near Lagunita, El Doctor platform, Querétaro, México, 21 November 1977, Roy Jameson.

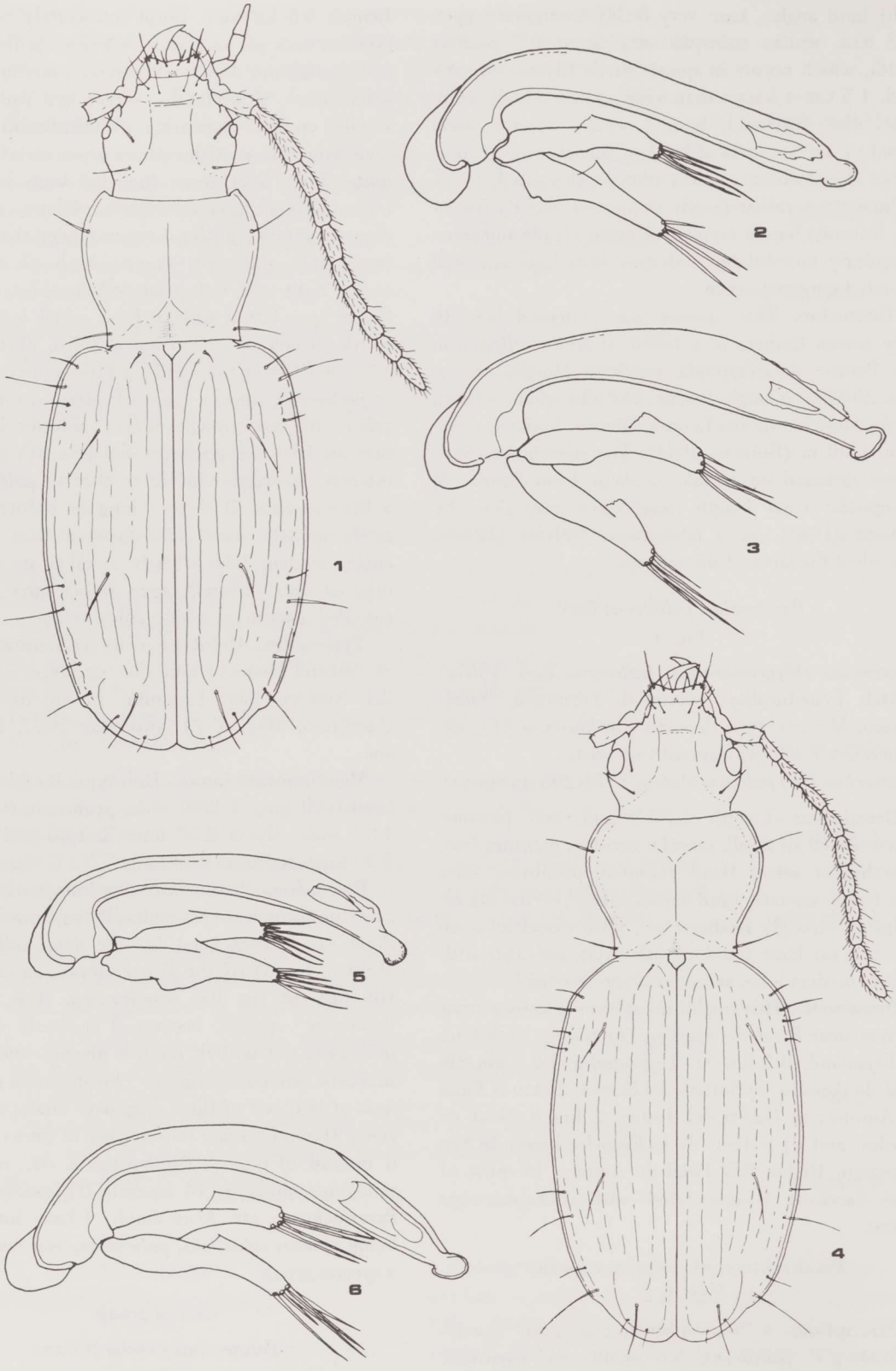
Measurements (mm).—Holotype, total length 4.59, head 0.90 long X 0.90 wide, pronotum 0.94 long X 1.09 wide, elytra 2.57 long X 1.68 wide, antenna 2.07 long, aedeagus 0.55 long.

Discussion.—*Paratrechus contrarius* occurs in a cave area which is geographically separated from the Pinal de Amoles karst by the deep valley (about 1000 m lower) of the Río Extórax, an east-flowing tributary of the Río Moctezuma. It is, indeed, a "contrary" species, because it is clearly close to *P. pallescens* yet is dark reddish piceous and has mentum and submentum fused. This destroys the usefulness of two out of three diagnostic characters of subgenus *Hygroduvalius;* the number of prebasilar setae, 8 instead of 6 as in *Paratrechus* s. str., is the only remaining character to separate *Hygroduvalius* from *Paratrechus* s. str. Accordingly, I have for the time being treated *sylvaticus*, *pallescens*, and *contrarius* as a species group.

osorioi group

Paratrechus osorioi Bolívar
Fig. 6

Bolívar, 1943a:174. Type-locality, El Chico, Hidalgo, México; type deposited in Bolívar coll., Escuela Nacional de Ciencias Biológicas, México.



Figs. 1-6.—*Paratrechus, sylvaticus* and *osorioi* groups: 1, *P. contrarius,* n. sp., Cueva del Rincón; 2, *P. contrarius,* aedeagus; 3, *P. pallescens,* aedeagus, Sótano de Tejamanil; 4, *P. tacana,* n. sp., Volcán Tacaná; 5, *P. tacana,* aedeagus; 6, *P. osorioi,* aedeagus, Barranca de los Marmoles. [Aedeagus scale is 4X habitus scale except where otherwise noted.]

Description.—Length 4.6-5.4, mean 4.6 ± SD 0.2 mm (n = 32). Form moderately slender, depressed; color rufocastaneous, rather pale, shining. Head 0.9 as long as wide; eyes large, nearly 0.2 longer than temples; mentum fused to submentum; antenna more than half total body length. Pronotum 0.7 as long as wide, cordiform, anterior angles slightly produced, sides sinuate in basal sixth, hind angles right to slightly acute; apex and base widths subequal and 2/3 greatest width, which occurs in apical third. Elytra rounded-oval, about 1.45 times longer than wide, disc depressed; posterior discal puncture on 5th interval touching 5th stria; striae rather deeply impressed, at least inner 3-5, inner intervals convex. Aedeagus 0.95-1.05 mm long, basal bulb deflexed at less than right angle to median lobe, which is feebly arcuate, swollen in region of internal sac; apical sensorial organ rounded, a little oblique; parameres slender, with 4-5 long apical setae.

Discussion.—George Ball collected this species at El Chico (Parque Nacional) and at Barranca de los Marmoles, 0.7 km W San Vicente, both localities in the state of Hidalgo.

Paratrechus tacana, new species
Figs. 4, 5

Description.—Length of unique holotype 4.7 mm. Form elongate and rather slender, depressed; color rufopiceous, shining. Head as long as wide; eye 0.8 as long as temple, weakly convex; mentum free; antenna less than half total body length. Pronotum 0.8 as long as wide, cordiform; anterior angles subdued, sides sinuate in basal sixth, hind angles right; base almost rectilinear; apex and base widths subequal, about 0.7 greatest width, which occurs in apical third. Elytra elongate-oval, not quite subparallel, humeri somewhat rounded, apexes slightly attenuate, disc depressed; posterior discal puncture on 5th interval but touching 5th stria; striae moderately deep, intervals subconvex, all striae well impressed except 7th and 8th. Aedeagus 0.71 mm long in holotype, basal bulb bent at right angle, median lobe short but slender and evenly arcuate, sensorial organ rather small and rounded; parameres with 5 apical setae.

Type-series.—Holotype male, a unique (American Museum of Natural History), Volcán Tacaná, Chiapas, México, 3500-3560 m, pine forest, 23 December 1976, H. E. Frania and D. L. C. Procter.

Measurements (mm).—Holotype, total length 4.72, head 0.86 long X 0.89 wide, pronotum 0.92 long X 1.16 wide, elytra 2.72 long X 1.71 wide, antenna 2.20 long, aedeagus 0.71 long.

Discussion.—This slender, elongate, depressed species of reddish piceous color resembles *P. osorioi,* to which it is probably related. It differs most conspicuously from *osorioi* in the smaller eyes, more slender and more depressed elytra, and in the rather even impression of the first 6 elytral striae. The aedeagi of the two species are similar, but in *P. tacana* the basal bulb is more sharply bent, the sensorial organ is more nearly round, and the parameres bear 5 setae instead of 4. The morphology and the elevation at which the unique specimen was collected suggest that this is a high-altitude endemic.

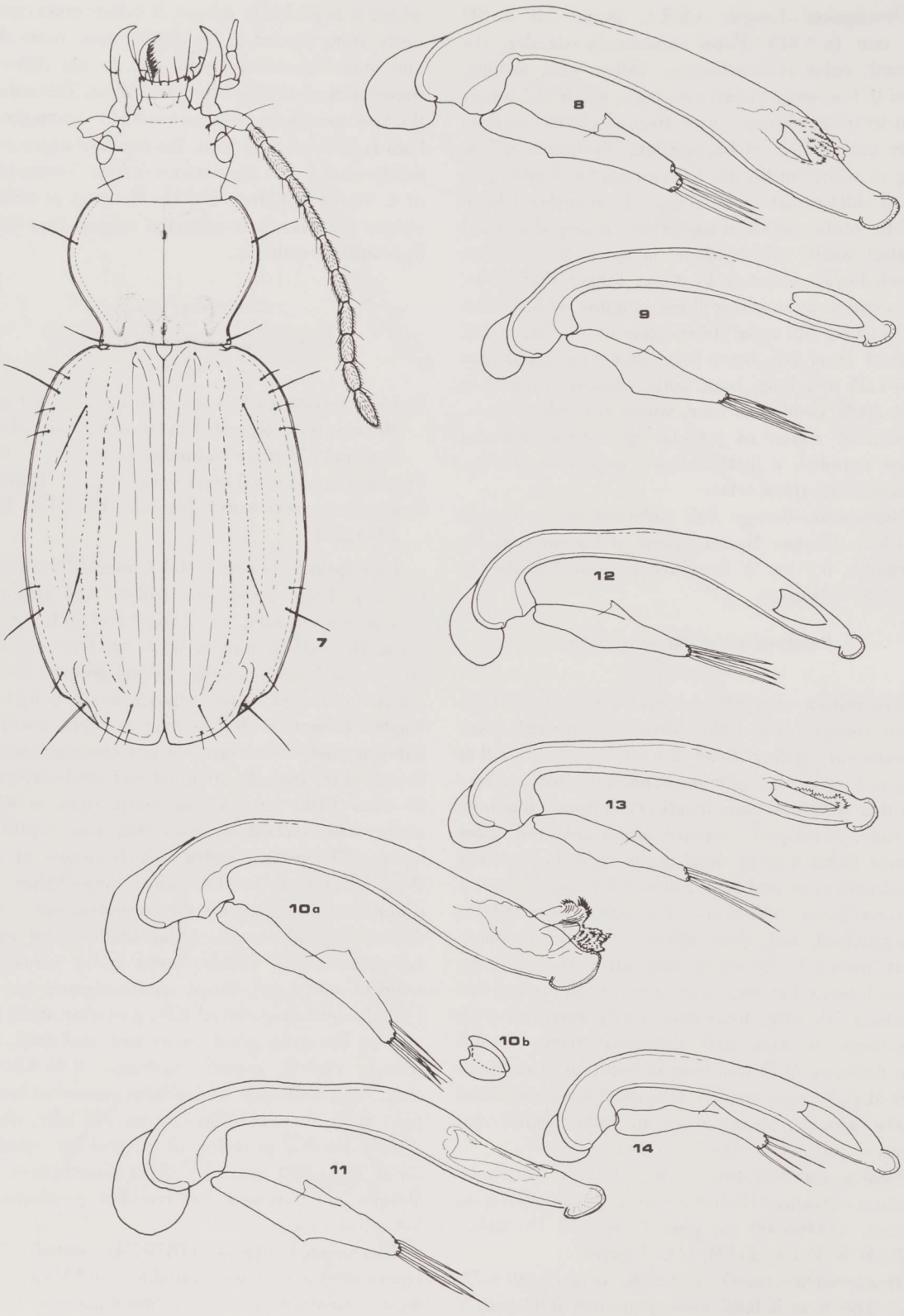
mexicanus group

Paratrechus mexicanus (Putzeys)
Fig. 9

Trechus mexicanus Putzeys, 1870:33. Type-locality, México; type deposited in Oberthür coll., Museum National d'Histoire Naturelle, Paris.
Trechus (Paratrechus) mexicanus: Jeannel, 1920:106.
Paratrechus mexicanus: Jeannel, 1928:78. Mateu, 1974:205.

Description.—Length 4.4-5.3, mean 4.9 ± 0.2 mm (n = 27). Form moderately robust and subconvex, dark piceous shining, appendages and elytral margins paler. Head 0.9 as long as wide; eye large and rather convex, as long as temple; frontal grooves divergent where continued onto clypeus; antenna half total length. Pronotum 3/4 as long as wide, cordiform, anterior angles moderate but not conspicuously produced, sides strongly rounded and shallowly sinuate in basal fifth, hind angles sharp, right or slightly acute, base rectilinear; apex and base width subequal, 2/3 greatest width, which occurs at apical third. Elytra about 1.4 times longer than wide, rounded-oval, apexes notably rounded and not produced; disc subconvex, striae shallow and regular, 2-3 inner striae visible, outer striae obsolescent, intervals quite flat; discal microsculpture very fine and obsolete over central disc; posterior discal puncture on 5th stria; apical groove wide and short, apical triangle closely spaced. Aedeagus 0.96-1.00 mm long, basal bulb large and bent at somewhat less than right angle to weakly arcuate median lobe, which is slightly swollen in region of internal sac; apical sensorial organ set apart by slight constriction, more oblique and flattened than rounded; parameres with 3-4 apical setae.

Discussion.—Putzeys (1870:34) noted: "Cette éspèce semble être assez variable," and Mateu (1974) drew attention to minor discrepancies between Putzeys' type and the aedeagal illustration given by Jeannel (1928:fig. 1305), offering his own illustrations of the aedeagi of the type and of a specimen from Orizaba (which is in the state of Veracruz,



Figs. 7-14.—*Paratrechus, mexicanus* group: 7, *P. cataractae,* n. sp., Cueva de la Cascada; 8, *P. cataractae,* aedeagus; 9, *P. mexicanus,* aedeagus, 15 km W Cuiyachapa, Veracruz; 10a, *P. putzeysi,* n. sp., aedeagus of paratype; 10b, transfer apparatus of same; 11, *P. balli,* n. sp., aedeagus of paratype, La Cumbre; 12, *P. totontepec,* n. sp., aedeagus of paratype; 13, *P. hoegei,* aedeagus, Miahuatlán; 14, *P. propior,* n. sp., aedeagus of paratype, Cueva del Cambio.

not Puebla as stated by Mateu). In my judgment "*P. mexicanus*" is a cluster of closely similar allopatric species distributed from Puebla and western Veracruz into central Oaxaca. Collections of *mexicanus*-like taxa are rather widely dispersed; no morphological and geographical intermediates are available. The George Ball collections include specimens from the following localities which I assign to *P. mexicanus;* all are in west-central Veracruz: 1) Cuiyachapa, 15.3 km W Coscomatepec, 2740-3050 m; 2) 15.3 km W Coscomatepec between Ixtapa and Cuiyachapa, cloud forest, 2300-2400 m; 3) 7.4 km W Coscomatepec, 1830 m, Arroyo Seco; 4) Río Peña Blanca, N of Ixtapa and W of Coscomatepec, 2060 m. The aedeagus in this series resembles that illustrated by Mateu (1974:fig. 16) from Orizaba, but is variable enough to include the illustration which he gives (Fig. 15) for Putzeys' type. The geographic range of *P. mexicanus* thus appears to be restricted to the lower, eastern slopes of the Pico de Orizaba (Citlatépetl), the highest peak in México.

Paratrechus putzeysi, new species
Fig. 10a, 10b

Description.—Closely similar to *P. mexicanus* in external form, color, and elytral microsculpture, differing most conspicuously in the form of the aedeagus and slightly attenuate elytral apexes. Length 4.4-5.0, mean 4.7 ± SD 0.2 mm (n = 22). Head rounded; mentum free; frontal grooves subparallel on clypeus; antenna half body length. Pronotum 3/4 as long as wide; anterior angles weak, sides sinuate basal fifth, hind angles slightly acute, base inclined slightly forward behind angles and very feebly emerginate in middle; apex and base width subequal and 3/4 maximum width, which occurs in apical third. Elytra 1.4 times longer than wide, apexes not so completely rounded as in *mexicanus,* posterior discal puncture on 5th stria; discal microsculpture obsolete, surface polished shining; 4 striae readily visible, traces of 5th and 6th present but 7th and 8th absent. Aedeagus large, about 1.1-1.2 mm long, basal bulb deflected at about same angle (less than right) and median lobe weakly arcuate as in *mexicanus,* but median lobe distinctly and consistently sinuate in region of internal sac.

Type-series.—Holotype male (American Museum of Natural History) and 20 paratypes, 62 km SSW Valle Nacional along the road to Ixtlán de Juárez (Route 175), 2400-2500 m, oak forest litter, Oaxaca, México, 24 May 1971, S. B. Peck.

Measurements (mm).—Holotype, total length 5.04, head 0.98 long X 0.99 wide, pronotum 0.98 long X 1.25 wide, elytra 2.73 long X 1.91 wide, antenna 2.46 long.

Discussion.—The type-locality is along the eastern edge of the Sistema Montañoso Poblano Oaxaqueño. An additional specimen was taken by G. E. Ball 64 km SSW of Valle Nacional along Route 175, but I have not made it a paratype.

Because of the availability of fresh material preserved in Barber's fluid by Dr. Peck, I took advantage of the opportunity to remove the internal sac in a specimen of *P. putzeysi.* Two copulatory pieces were evident (Fig. 10B), the left larger, spade-shaped, obscuring the right piece in left lateral view; the right piece is a little shorter but similarly spade-shaped with thickened apical margin, concave medially and forming a partial tube with the inner face of the left piece. In most aedeagal preparations of *Paratrechus* species the densely spiny wall of the internal sac makes it very difficult to see the copulatory pieces. However, in exceptionally well-cleared preparations the outlines of the left copulatory piece can be seen within the internal sac.

The eastern portion of the Oaxacan Sierra is bisected to the north by the lowland valley of the Río Quiotepec before it joins the Sierra Volcánica Transversal in southeastern Puebla and western Veracruz. Presumably this lowland is a significant barrier to micropterous *Paratrechus* species. Similarly the upper reaches of the Río Playa Vicente separate this species from the Zempoaltépetl region to the south, where the related species *P. totontepec* occurs, and the wide valley of the Río Grande, a tributary of Río Quiotepec, crosses Route 175 at Guelatao, possibly acting as a geographic barrier between *P. putzeysi* and *P. balli,* which occurs at La Cumbre northeast of C. de Oaxaca.

Paratrechus altitudinis Mateu

Mateu, 1974:205. Type-locality, Popocatépetl, México.

A reddish-testaceous species 5.5 mm or less in length, with the posterior discal puncture on the 5th elytral stria; eyes small; elytra elongate, striae superficial; aedeagus elongate, similar to that of *P. mexicanus* but with a subapical flexure in the median lobe, apical sensorial organ large. This species, taken by Mateu (1974) on Popocatépetl at an altitude of 4200 m, is known to me only from the literature.

Paratrechus cataractae, new species
Figs. 7, 8

Description.—Similar in form to *P. mexicanus* but larger, form very robust, subconvex, head and pronotum dark piceous, elytra paler, mouthparts and

appendages testaceous. Length 5.1-5.7, mean 5.4 ± SD 0.2 mm (n = 8). Head 5/6 as long as wide; eyes convex, as long as temples; frontal grooves subparallel on clypeus; antenna half body length; mentum free. Pronotum 0.8 as long as wide, hind angles large and about right, antebasal sinuation a little deeper than in *mexicanus.* Elytra 1.4 times longer than wide, disc very polished and shining, microsculpture obsolete, apexes not so abruptly rounded as in *mexicanus;* all striae visible but 1-4 deeper, inner intervals weakly convex, striae vaguely punctulate. Aedeagus of same form as *mexicanus* but larger, 1.24-1.27 mm.

Type-series.—Holotype male (American Museum of Natural History), two male and 5 female paratypes, Cueva de la Cascada, near Tequila, Veracruz, México, 6 August 1967, J. Reddell, J. Fish, and T. R. Evans.

Measurements (mm).—Holotype, total length 5.66, head 0.92 long X 1.10 wide, pronotum 1.16 long X 1.47 wide, elytra 3.12 long X 2.20 wide, antenna 2.82 long.

Discussion.—This is a larger species of the *mexicanus* group, known only from a cave but without modifications which would restrict it to life in caves. The Cueva de la Cascada is near the Sótano del Profesor and other caves in which the large anchomenine troglobite *Mexisphodrus veraecrucis* Barr is known to exist. The aedeagus, though closely similar to that of *mexicanus,* is about 1/5 longer; externally the species is diagnosed by contrasting color of head/pronotum and elytra and by deeper elytral striae and subconvex elytral intervals. The type-locality is approximately 20 km south of Orizaba; it is separated from the Citlaltépetl region, where *P. mexicanus* occurs, by the lowlands along the upper Río Blanco.

Paratrechus balli, new species
Fig. 11

Description.—Length 4.6-5.1, mean 4.9 ± SD 0.2 mm (n = 17). Form moderately robust and subconvex, resembling *P. mexicanus;* color very dark piceous, not quite black, shining; elytral microsculpture satiny, consisting of very fine, transverse meshes, not obsolete as in *mexicanus;* appendages and elytral margin paler. Head 0.9 as long as wide; eye about 0.1 longer than temple, rather convex; frontal grooves divergent where continued onto clypeus; mentum free, at least in middle; antenna half total body length. Pronotum 3/4 as long as wide, cordiform, anterior angles moderate, not produced, sides strongly rounded, shallowly sinuate in basal sixth, hind angles right, about as in *mexicanus,* base rectilinear; apex slightly wider than base, base 0.7 maximum width, which occurs at or slightly behind anterior marginal setae. Elytra rounded-oval, about 1.45 times longer than wide, apexes notably rounded; disc a little depressed in middle; striae shallow and regular, finely punctulate, 1-3 deeper, 4-5 feebly impressed, 6-7 obsolete, posterior discal puncture on 5th stria; apical groove wide and short, apical triangle compact, anterior apical puncture behind level of 8th umbilicate. Aedeagus of paratype 1.22 mm long, larger than that of *mexicanus,* median lobe considerably produced and sinuate in lateral view, apical sensorial organ about as in *mexicanus;* parameres with 3 or 4 apical setae.

Type-series.—Holotype male (American Museum of Natural History) and 16 paratypes, 6.6 km W La Cumbre (which is about 13 km NE Cd. de Oaxaca on Route 175), 2800 m, oak-pine-fir forest, Oaxaca, México, 18 July 1975, G. E. Ball and H. E. Frania.

Measurements (mm).—Holotype, total length 5.04, head 0.94 long X 1.03 wide, pronotum 0.98 long X 1.25 wide, elytra 2.85 long X 1.95 wide, antenna 2.54 long.

Discussion.—This species is externally rather close to *P. mexicanus,* differing primarily in darker color, slightly larger eyes, slightly depressed elytral disc, and satiny, densely transverse and anastomosing elytral microsculpture, which is evident over the entire disc and not obsolete as in *mexicanus.* From *P. totontepec,* which occurs in the eastern Oaxacan Sierra across the Río Grande valley in the Zempoaltépetl region, it is distinguished by more intense elytral microsculpture without local polished spots where the microsculpture is obsolescent. The aedeagus is thicker and much longer, although the basal bulb is bent at somewhat less than a right angle to the median lobe, and the apical sensorial organ is of the same form as in *mexicanus.* The long median lobe is sinuate and slightly reflexed in the region of the internal sac.

It is a great pleasure to name this species in honor of Dr. George E. Ball, University of Alberta, Edmonton, Alberta, Canada, in recognition of his great contributions to our knowledge of the carabid fauna of México.

Paratrechus totontepec, new species
Fig. 12

Description.—Closely similar to *P. mexicanus* in external form and color; differing in finely transverse elytral microsculpture, 5-6 striae, and aedeagal form. Length 4.2-4.9, mean 4.7 ± SD 0.2 mm (n = 8). Head slightly wider than long (L/W 0.95); mentum free, although suture quite faint. Pronotum 5/6 as long as

wide; anterior angles feeble, sides sinuate basal fifth, hind angles about right, not produced to sides, base feebly emarginate. Elytra 1.4 times longer than wide, apexes quite rounded, as in *P. mexicanus*, posterior discal puncture on 5th stria; all striae visible, but 5-6 inner striae more deeply impressed, intervals flat; elytral microsculpture consisting of very fine, transverse meshes, dull shining, with a few scattered spots where microsculpture is obsolescent and polished near center and base. Aedeagus slightly less than 1.0 mm long, resembling that of *P. mexicanus* but median lobe more slender basally, slightly thicker and a little more deflexed in apical half.

Type-series.—Holotype male (American Museum of Natural History), 3 male and 4 female paratypes, 16.6 km S Totontepec, Oaxaca, México, 15 July 1975, G. E. Ball and H. E. Frania.

Measurements (mm).—Holotype, total length 4.72, head 0.86 long X 0.90 wide, pronotum 1.05 long X 1.27 wide, elytra 2.57 long X 1.87 wide, antenna 2.46 long.

Discussion.—The type-locality is on the lower, north slopes of Zempoaltépetl in cloud forest among tree ferns, 2480-2540 m. The species is distinguished most readily by the form of the aedeagus; however the microsculpture of the elytra is predominantly transverse and far less polished than in *P. mexicanus* or *P. putzeysi*, though not as strongly transverse as in *P. balli*.

Paratrechus hoegei (Jeannel)
Fig. 13

Trechus hoegei Jeannel, 1920:107. Type-locality, "Oaxaca." "Cotypes" deposited in British Museum of Natural History, also Jeannel collection in Museum National d'Histoire Naturelle, Paris (apparently no lectotype has been selected).

Paratrechus hoegei: Jeannel, 1930:79. Mateu, 1974: 202.

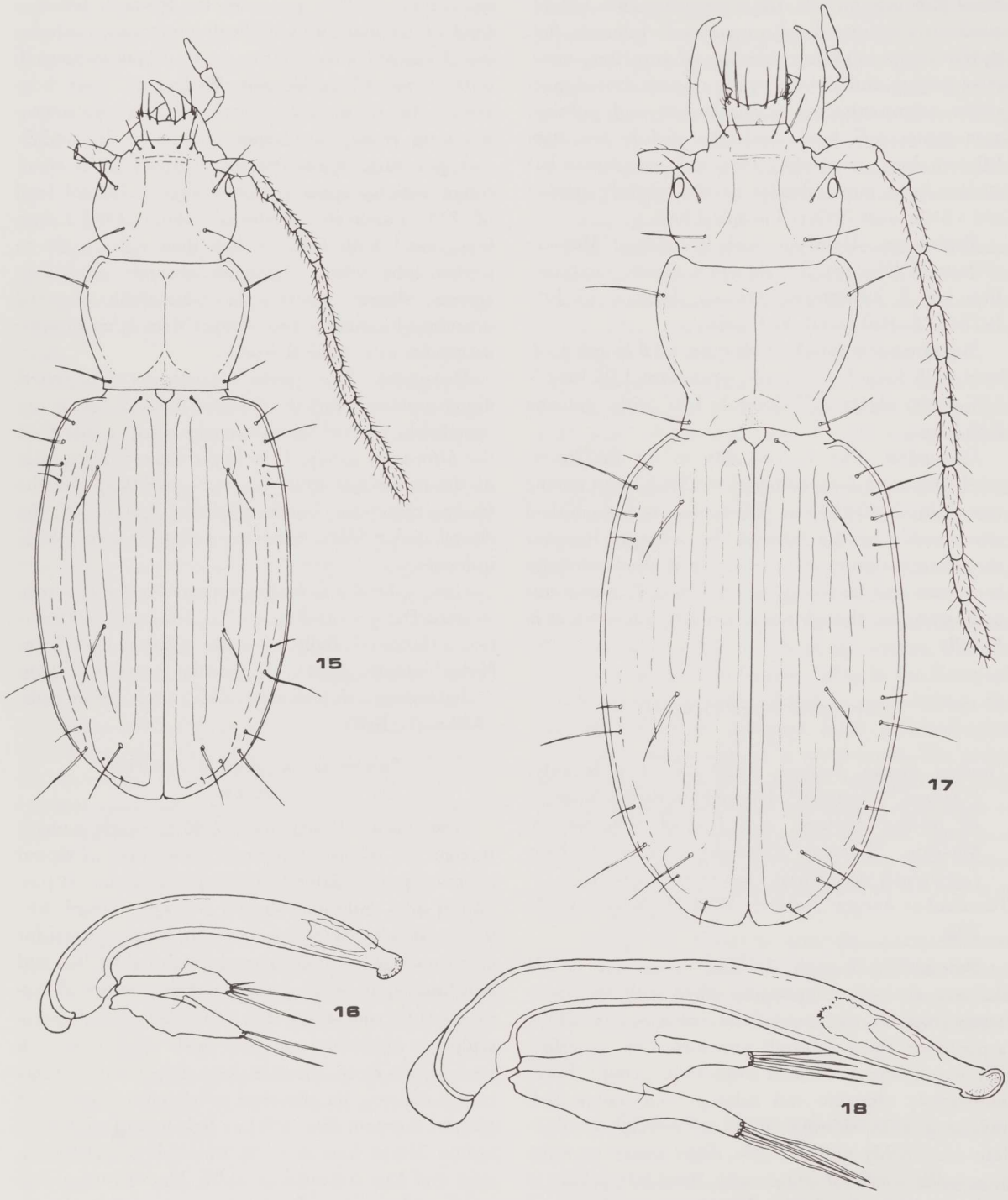
Description.—Length 4.5-5.5, mean 5.1 ± SD 0.2 mm (n = 30). Apparently allied with the *mexicanus* group by structure of the aedeagus, but lacking a posterior discal (elytral) puncture, thus superficially resembling *P. bolivari (bifoveatus* group). Form moderately elongate and subdepressed; color dark reddish-piceous, shining; elytral microsculpture obsolete over highly polished disc, slight transverse striation, with touch of iridescence. Head 0.9 as long as wide; mentum fused to submentum; eye large and convex, 0.2-0.3 longer than temple; antenna half body length. Pronotum convex, 0.8 as long as wide, anterior angles marked but scarcely produced, sides sinuate basal sixth, hind angles large and right or slightly acute, sharp, produced a little to sides; apex 0.9 as wide as base, base 3/4 greatest width, which occurs in apical third. Elytra oblong-oval, humeri prominent, apexes slightly attenuate, disc subconvex; anterior discal puncture far forward, between level of 1st and 2nd umbilicate punctures, posterior discal absent; inner 3 striae more deeply impressed, outer striae 4-7 feeble and obsolescent, inner 3 intervals flat to weakly convex; apical groove unusually long, ending in advance of level of 7th umbilicate puncture, apical triangle compact as in *mexicanus*, anterior apical puncture slightly behind level of 8th umbilicate. Aedeagus about 1.0-1.1 mm long, basal bulb bent at less than right angle to median lobe, which is elongate, slender, and weakly arcuate, slightly recurved in apical fifth, sensorial organ mushroomlike, less oblique than in *mexicanus;* parameres with 4 apical setae.

Discussion.—This species lacks the posterior elytral discal puncture, but the form of the aedeagus is unmistakably that of the *mexicanus* group rather than the *bifoveatus* group. It is larger than other species of the *mexicanus* group (except *cataractae*), and the finely transverse-obsolete microsculpture of the elytral disc exhibits transverse striations and a little iridescence.

Geographically *P. hoegei* appears limited to southwestern Oaxaca: a) Route 175, 5.7 km S Suchixtepec, 2160 m (G. Ball); b) Route 175 (km 144), 5 km N Suchixtepec, 2900 m (H. Howden); and c) 27.2 km S Miahuatlán, oak-pine zone, *Alnus* litter, bromeliads, 2440 m (G. Ball).

Paratrechus propior, new species
Fig. 14

Description.—Resembles *P. balli* in clearly evident, though less intense, transverse meshworks in elytral microsculpture, differing in deeper sinuation of pronotum sides and much shorter aedeagus. Length 4.6-5.2, mean 4.9 ± SD 0.2 mm (n = 8). Form as usual for *mexicanus* group, color piceous with lighter legs and mouthparts, in some specimens frons, antennal segments II-IV, and elytral disc infuscated; elytral microsculpture uniformly and very finely transverse, with meshworks. Head about as long as wide; eye moderately convex, its diameter subequal to length of temple; mentum free; antenna half body length. Pronotum 3/4 as long as wide, widest in apical fourth, apex and base subequal in width, base 0.7 maximum width; sides rather deeply sinuate in basal seventh; anterior angles moderately pronounced, hind angles large, sharp, and right; base rectilinear. Elytra 1.45 times longer than wide, subapical sinuation prominent; posterior discal on 5th interval, 4th stria usually



Figs. 15-18.—*Paratrechus, laticeps* and *sylvarum* groups: 15, *P. laticeps*, n. sp., Sótano de Riachuelo; 16, *P. laticeps*, aedeagus of holotype; 17, *P. reddelli*, n. sp., Cueva del Volcancillo; 18, *P. reddelli*, aedeagus of paratype.

broken at site of puncture; inner 3-5 striae deeply impressed, inner intervals convex, outer 2-4 striae progressively fainter; apical groove not unusually wide. Aedeagus of paratype 0.86 mm long, somewhat smaller than in most species of *mexicanus* group but of same form; basal bulb strongly deflexed, middle portion of median lobe straight, apical third a little deflexed and slightly swollen in region of internal sac, sensorial organ large and rounded; parameres with 3-4 long setae.

Type-series.—Holotype male (American Museum of Natural History), four male and three female paratypes, Cueva del Cambio, 2 km E Encarnación, Hidalgo, México, 20 March 1981, J. Reddell and T. Archey.

Measurements (mm).—Holotype, total length 5.09, head 1.04 long X 1.01 wide, pronotum 0.95 long X 1.22 wide, elytra 2.78 long X 1.93 wide, antenna 2.69 long.

Discussion.—This species occurs near the northern limit of epigean species of *Paratrechus*, in a cave near Encarnación, in the state of Hidalgo. It shows no modifications suggesting that it is cave-limited; the paler coloration may be phenotypic, resulting from development in an aphotic environment.

laticeps group

Paratrechus laticeps, new species
Figs. 15, 16

Description.—A rufotestaceous, microphthalmous cave species with head unusually wide behind eyes, deeply emarginate labrum, and deeply impressed elytral striae. Length 4.65-4.84 mm (n = 2). Form moderately robust and convex; rufotestaceous, shining; microsculpture of head isodiametric, of pronotum basically isodiametric with vague transverse tendency, of elytra transverse but not forming meshes, obsolescent on disc, which is very polished. Head slightly longer than wide, widest behind eyes, a little triangular, genae bulging, cervical constriction quite pronounced; labrum very deeply emarginate; frontal grooves long and quite deep, complete; eye rudiment about 0.09 X 0.11 mm, surrounded by piceous ring, a few vestigial ommatidia evident; mentum free, 6 prebasilar setae. Pronotum transverse-cordiform, 0.75 as long as wide, widest in apical fourth, sides convergent to hind angles with vague suggestion of sinuation before hind angles; anterior angles prominent and slightly produced; hind angles obtuse, weakly reflexed; marginal gutter rather wide, disc convex; base weakly bisinuate; anterior marginal setae placed just before maximum width, posterior setae in hind angles. Elytra 1.6 times longer than wide, a little subparallel, humeri quite prominent but not angular, disc convex but flattened on either side of suture, antapical sinuation quite shallow; striae deeply impressed, intervals strongly convex, scutellar stria short; apical groove wide, ending before level of 7th umbilicate puncture; posterior discal seta on 4th stria or 5th interval, striae and intervals more or less confluent at site of puncture; apical triangle complete. Aedeagus 0.73 mm long in holotype, basal bulb deflexed at more than right angle, median lobe straight, sensorial organ large and rounded, slightly oblique; parameres with only 2 long, apical setae, a short third seta present on left paramere in holotype.

Type-series.—Holotype male (American Museum of Natural History) and one female paratype, Sótano de Riachuelo, elevation 2500 m, 6.5 km N and 2 km E Miquihuana, northwest Tamaulipas, México, 16 February 1981, Roy and Patti Mothes Jameson.

Measurements (mm).—Holotype, total length 4.65, head 1.04 long X 0.98 wide, pronotum 0.83 long X 1.07 wide, elytra 2.69 long X 1.65 wide, antenna 2.60 long, aedeagus 0.73 long.

Discussion.—This species is readily distinguished from all other known cavernicolous *Paratrechus* species by the rufotestaceous color, the peculiar shape of the head, the deeply emarginate labrum, and the unusually deep elytral striae. It occurs farther north than any other described species of *Paratrechus*. The species coexists in the Sótano de Riachuelo with *Miquihuana rhadiniformis* Barr, a unique troglobitic sphodrine carabid. The Miquihuana cave area is isolated from the Río Purificación area (about 35 km to the northeast) by the Río Guayalejo and from the Sierra de Guatemala to the east by lower, barren desert. Not obviously very close to any other known species, *P. laticeps* is here treated as the sole representative of a monobasic species group which may have been derived from the same stock as the *mexicanus* group, judging from the form of the aedeagus. Apparently it is a relic of a more widely distributed line of *Paratrechus* which no longer exists at the surface in northeastern México.

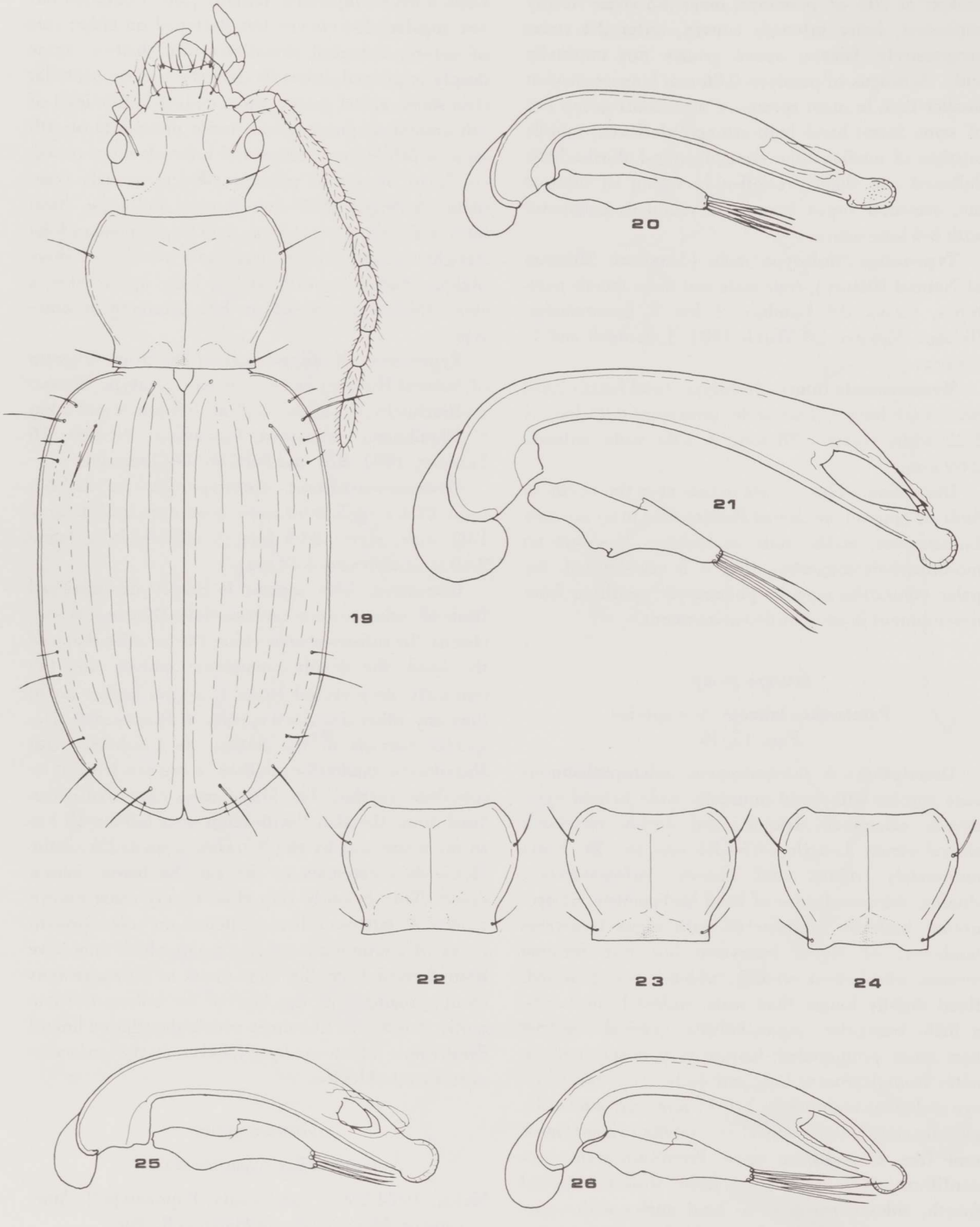
sylvarum group

Paratrechus sylvarum Mateu

Mateu, 1974:206. Type-locality, Popocatépetl, Amecameca, México; type in Mateu coll., Paris.

P. sylvanus: Mateu, 1974:200 (in key, typographical error).

Description.—Length 5.5-5.9 mm. Color pale castaneous, appendages slightly paler; form moderately elongate and rather depressed. Head 0.9 as long as



Figs. 19-26.—*Paratrechus, oaxaquensis* and *halffteri* groups: 19, *P. oaxaquensis,* n. sp.; 20, *P. oaxaquensis,* aedeagus of paratype; 21, *P. jeanneli,* n. sp., aedeagus of paratype; 22, *P. halffteri,* pronotum; 23, *P. chiriquensis,* n. sp., pronotum; 24, *P. reyesi,* pronotum; 25, *P. halffteri,* aedeagus, Villa Mills; 26, *P. chiriquensis,* aedeagus of paratype, Cerro Punta.

wide; eye about 0.2 longer than temple; frontal grooves wide and divergent where continued onto clypeus; antenna half body length. Pronotum 3/4 as long as wide, transverse-cordiform, apex truncate and anterior angles somewhat rounded, sides strongly rounded, sinuate in basal sixth, hind angles right and scarcely produced to sides, base almost rectilinear; apex about as wide as base, base 0.7 greatest width, which occurs rather far forward in apical fourth. Elytra oblong-oval, humeri fairly prominent, apexes at best feebly attenuate, 1.5 times longer than wide, disc depressed; inner 5 striae well impressed, inner 3 intervals feebly subconvex, outer intervals flat and outer striae obsolescent; posterior discal puncture on 4th stria or 4th interval; apical groove rather long, anterior apical puncture of apical triangle at level of 8th umbilicate puncture. Aedeagus long and slender, basal bulb perpendicular to axis of greatly produced median lobe, apical sensorial organ large, flattened, oblique, set off by constriction; parameres with 4-5 setae.

Discussion.—The description given above is based on a male paratype 5.7 mm long (in G. Ball coll.). Although Mateu indicated that the posterior discal puncture in this species is on the 5th stria, the specimen examined has this puncture on the 4th stria on the left elytron and on the 4th interval at the concatenation of the 3rd and 4th striae on the right elytron. The aedeagus closely resembles that of *P. reddelli* (cf. Fig. 18), a troglobitic species from Veracruz. *Paratrechus sylvarum* is apparently a high-altitude endemic, taken at 3200 m in a forest of *Abies religiosa* (Mateu, 1974).

Paratrechus reddelli, new species
Figs. 17, 18

Description.—A microphthalmous, troglobitic species with mentum and submentum fused and 6 prebasilar setae. Length 4.7-5.8, mean 5.3 mm. Dark castaneous with touch of deep red; form elongate and rather depressed. Head 0.9 as long as wide; eye rudiment lemon-shaped, about 0.06 mm, without facets; antenna elongate, more than 0.6 total body length. Pronotum 3/4 as long as wide, transverse-cordiform, widest in apical fourth, sides strongly convergent and deeply sinuate in basal fifth; anterior angles produced, hind angles large and slightly acute. Elytra elongate-oval, 1.6 times longer than wide, depressed; discal microsculpture finely and densely transverse; anterior discal puncture on 5th stria, posterior discal on 4th interval effecting confluence of 4th and 5th striae; apical groove short, directed toward 5th stria; longitudinal striae shallow, outer striae obsolescent. Aedeagus slender and elongate, 1.16 mm long in paratype, basal bulb nearly perpendicular to median lobe, which is greatly produced and feebly arcuate; apex with large, oblique sensorial organ; 3-4 setae on parameres.

Type-series.—Holotype male (American Museum of Natural History), 3 male and 2 female paratypes, Cueva del Volcancillo, 5 km SE Las Vigas, Veracruz, México, 8 January 1974, J. R. Reddell and Roy Jameson.

Measurements (mm).—Holotype, total length 5.20, head 0.92 long X 1.00 wide, pronotum 0.98 long X 1.29 wide, elytra 2.88 long X 1.84 wide, antenna 3.31 long.

Discussion.—This troglobitic species was discovered in a lava tube on a spur of the Cofre de Perote; epigean species in the same area include *P. batesi* and *P. erwini*, which belong to the *bifoveatus* and *erwini* groups, respectively. The only other known troglobitic *Paratrechus* species are *pallescens* and *contrarius* (central Querétaro) and *laticeps* (northwest Tamaulipas). The more elongate body form, elongate and arcuate aedeagus, 6 prebasilar setae, and transverse elytral microsculpture readily distinguish *P. reddelli* from those species. These same characters are closely similar to characters of *P. sylvarum*, with which *P. reddelli* almost certainly shares a rather recent common ancestry.

oaxaquensis group

Paratrechus oaxaquensis, new species
Figs. 19, 20

Description.—Length 4.9-6.0, mean 5.4 ± SD 0.3 mm (n = 30). Form rather robust, subdepressed; dark piceous, polished, appendages pale, elytral microsculpture very finely transverse, obsolescent on disc. Head a little wider than long, rather rounded; eye 1.0-1.1 times as long as temple and a little shorter than length of scape; mentum and submentum fused; antenna half body length. Pronotum cordiform, transverse, 0.8 as long as wide, anterior angles moderate, sides strongly rounded, conspicuously sinuate in basal seventh, hind angles prominent, sharp, a little less than right and laterally produced, base rectilinear; apex slightly wider than base and 0.7 greatest width, which occurs in apical third. Elytra about 1.45 times longer than wide, oblong-oval, subconvex but depressed near middle of disc; longitudinal striae impunctate, superficial but all visible, intervals flat, inner 3 striae deeper; posterior discal puncture on 4th interval, with 3rd and 4th striae usually inflected at site of puncture; apical groove wide, anterior apical puncture rather close to apex. Aedeagus 0.92-1.00 mm, weakly arcuate, sensorial organ large and rounded; parameres with only 3 apical setae.

Type-series.—Holotype male (American Museum of Natural History) and 63 paratypes, 147.5 km S Valle Nacional, Route 175, 2400 m, Oaxaca, México, 2 May 1966, G. E. Ball and D. R. Whitehead.

Measurements (mm).—Holotype, total length 5.52, head 1.01 long X 1.09 wide, pronotum 1.09 long X 1.37 wide, elytra 3.12 long X 2.15 wide, antenna 2.89 long, aedeagus 0.92 long.

Discussion.—This species is readily distinguished from most Mexican species of *Paratrechus* by the position of the posterior discal puncture on the 4th interval. The two species of the *sylvarum* group are more elongate and more depressed, and *P. jeanneli* is a little narrower and more convex, with finely punctulate inner striae and weakly convex inner intervals. In all three of these species the aedeagus is larger and more arcuate. *Paratrechus laticeps* is a rufotestaceous troglobite.

The type-locality, apparently along Route 175 between Guelatao and Oaxaca (city), consists of "madroño-oak-pine woods, rather dry" (Ball and Whitehead, 1967). Additional specimens, not paratypes, were collected by Ball on the Llano de las Flores, 22 km N Ixtlán de Juárez, Route 175, 2780 m.

Paratrechus jeanneli, new species
Fig. 21

Description.—Length 4.8-5.7, mean 5.3 ± SD 0.3 mm (n = 11). Color dark reddish-piceous, mouthparts, appendages, and elytral margin paler; form moderately elongate, microsculpture of elytral disc transverse but obsolescent, disc polished shining. Resembles *P. oaxaquensis* in having the posterior discal puncture on the 4th stria but differs in narrower and more convex pronotum, narrower and more convex elytra with punctulate striae, and much larger and more arcuate aedeagus. Head rounded, as wide as long; mentum free; eye about 0.2 longer than temple (as in *P. oaxaquensis*); antenna half body length. Pronotum 0.8 as wide as long, cordiform, disc convex; anterior angles prominent, sides strongly arcuate, sinuate in basal seventh, hind angles sharp, about right, not laterally produced, base rectilinear; apex and base widths subequal and 0.7 greatest width, which occurs in apical fourth. Elytra 1.45 times longer than wide, oblong-oval, disc subconvex, apexes slightly more attenuate than in *P. oaxaquensis;* striae moderately deep, inner intervals slightly convex, not flat; inner 4 striae deeper than 5th, 6th, and 7th striae, inner striae more or less distinctly punctulate; posterior discal puncture on 4th stria, 3rd and 4th striae usually concatenated at 4th interval at site of 4th discal; apical groove rather long, joining 7th stria at level of 7th umbilicate puncture. Aedeagus 1.22 mm long in paratype, much larger and more arcuate than in *P. oaxaquensis,* sensorial organ more round and median lobe swollen in region of internal sac; parameres with 4 or 5 long setae at apexes.

Type-series.—Holotype male (American Museum of Natural History) and 10 paratypes, 24.5 km E Teotitlán del Camino, Puerto de Soledad, Oaxaca, México, 2240 m, cloud forest, 15 July 1975, G. E. Ball and H. E. Frania.

Measurements (mm).—Holotype, total length 5.44, head 1.05 long X 1.05 wide, pronotum 1.09 long X 1.37 wide, elytra 3.12 long X 2.15 wide, antenna 2.89 long.

Discussion.—This species is named for that most eminent student of the trechine beetles, the late Dr. René Jeannel. For Jeannel the origin of *Paratrechus* was a challenging puzzle for which he found no entirely satisfactory solution (cf. Jeannel, 1931). We are still far from fully understanding the evolution and zoogeography of this interesting genus, but it is a pleasure to contribute to knowledge of the group and thus to honor Dr. Jeannel. The type-locality is in northeastern Oaxaca near the edge of the Huautla plateau.

halffteri group

Paratrechus halffteri Mateu
Figs. 22, 25

Mateu, 1974:204. Type-locality, Cerro de la Muerte, Costa Rica; type deposited in J. Nègre coll., Paris.

Description.—Length 4.2-5.4, mean 4.7 ± SD 0.4 mm (n = 20). Form convex and robust; color blackish-piceous, mouthparts, appendages, and elytral margin paler. Head 7/8 as long as wide; eye 1.5 times longer than temple; mentum fused to submentum in most specimens (about 80% of material examined) but in some specimens suture open in middle and closed at sides. Pronotum 0.7 as long as wide; anterior angles moderately prominent, sides rounded then sinuate in basal sixth, hind angles large, sharp, and more or less right; base a little wider than apex and 3/4 maximum width, which occurs in apical third. Elytra 1.3-1.4 times longer than wide, oblong, sides strongly rounded, disc convex; posterior discal seta on 5th stria or 5th interval; longitudinal striae shallow, outer striae obsolescent, intervals flat; apical groove rather wide. Aedeagus 0.83-0.88 mm long, basal bulb deflexed at nearly right angle, median lobe moderately arcuate, apical sensorial organ large and set apart by constriction; parameres with 3 apical setae.

Discussion.—In material available to me *P. halffteri* is the most abundant of the 5 species from Costa

Rica. Stewart B. Peck collected 15 specimens at Villa Mills, Cerro de la Muerte, 3000 m, including one specimen extracted from the gut of a salamander (*Bolitoglossa* sp.), and R. T. Allen obtained 12 specimens at Pensión Georgina, along the Pan-American Highway. Mateu (1974) noted the occurrence of a single specimen of *P. halffteri* at the same spot where two specimens (holotype and paratype) of *P. reyesi* were taken, demonstrating at least occasional sympatry and syntopy of these two similar species. Absence of *P. reyesi* from the Peck and Allen collections and from the type-series of *P. halffteri* collected by G. Halffter and P. Reyes in the Cerro de la Muerte strongly suggests that the two species occupy somewhat different microhabitats and, accordingly, different niches. At Villa Mills Peck took a single specimen of *P. pecki* (*erwini* group). *Paratrechus halffteri* is distinguished from all other known species of the genus in Costa Rica by its blackish-piceous color and shallow elytral striation, as well as by the complete or partial fusion of mentum and submentum.

Paratrechus chiriquensis, new species
Figs. 23, 26

Description.—Resembles *P. halffteri,* differing in larger eyes, narrower and less convex pronotum with more acute hind angles, deeper elytral striae, narrower apical groove, and a complete suture between mentum and submentum (mentum free). Length 4.4-5.0, mean 4.8 ± SD 0.2 mm (n = 12). Form rather robust and convex, color piceous with pale mouthparts, appendages (except outer antennal segments), and elytral margin. Head 7/8 as long as wide; eyes twice as long as temples; mentum and submentum separated by complete suture; antenna half body length. Pronotum 3/4 as long as wide; anterior angles prominent, sides strongly rounded, deeply sinuate in basal sixth, hind angles large, sharp, acute, laterally produced, base slightly emarginate; apex a little wider than base, base 5/8 greatest width, which occurs in apical third. Elytra rounded-oval, scarcely 1.5 times longer than wide, moderately convex; striae deeper than in *P. halffteri,* inner four intervals subconvex, outer striae shallower but all visible; posterior discal puncture on 5th stria or 5th interval; apical groove slightly narrower (between sutural stria and recurrent portion of groove) than in *P. halffteri.* Aedeagus 0.94-0.98 mm long, slender, slightly swollen before apex, with small but prominent apical sensorial organ; parameres with 3 apical setae.

Type-series.—Holotype male (United States National Museum of Natural History) and 11 paratypes, near Cerro Punta, Chiriquí, Panama, 1800-2400 m, 31 May 1972, T. and L. Erwin.

Measurements (mm).—Holotype, total length 4.91, head 0.83 long X 0.95 wide, pronotum 0.95 long X 1.25 wide, elytra 2.97 long X 2.05 wide, antenna 2.54 long, aedeagus 0.95 long.

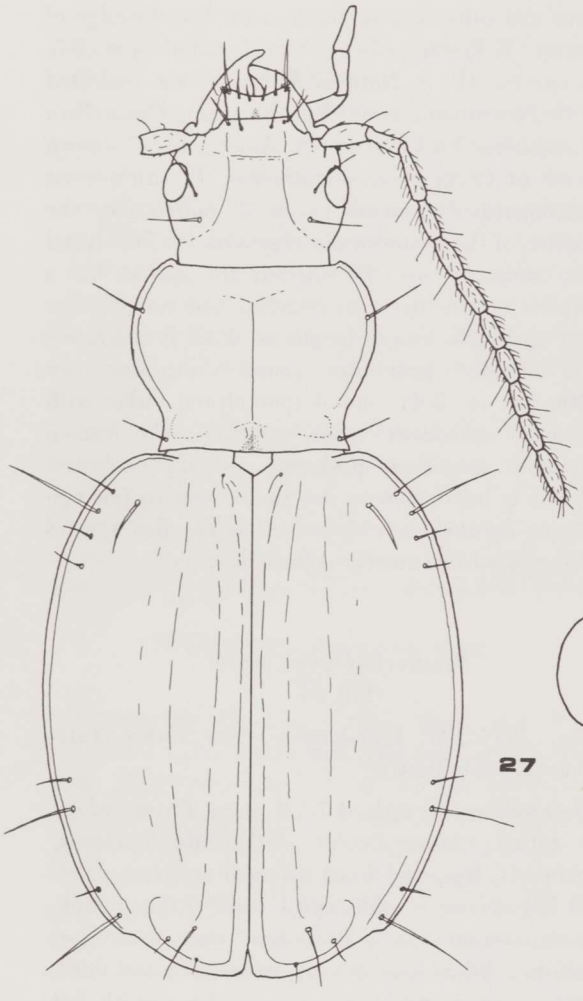
Discussion.—The type-series was collected under leaves and other debris beside a road at the edge of a forest (T. Erwin, in litt.). A single female, probably this species, (U. S. National Museum) was collected by F. Nevermann from Volcán Irazú, Costa Rica ("Subabhäng Vulkan Irazu"). Among the 5 known species of Costa Rican *Paratrechus, P. chiriquensis* is distinguished from all except *P. halffteri* by the presence of the posterior discal seta on the 5th elytral stria; compared with *P. halffteri* the species has a complete suture between mentum and submentum, larger eyes (2X temple length vs. 1.3X in *halffteri*), more slender pronotum (base width/maximum width 5/8 vs. 3/4), and deeper elytral striae with distinctly subconvex inner intervals. The known geographic ranges are probably mutually exclusive, but this is impossible to determine with so few collections. *Paratrechus chiriquensis* is the first species of the genus to be described from Panama.

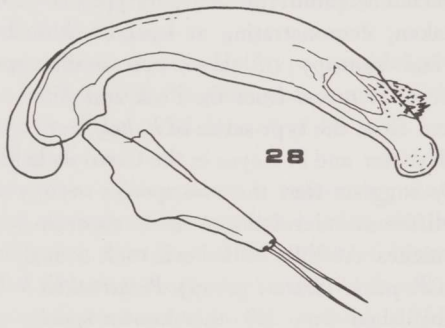
Paratrechus reyesi Mateu
Fig. 24

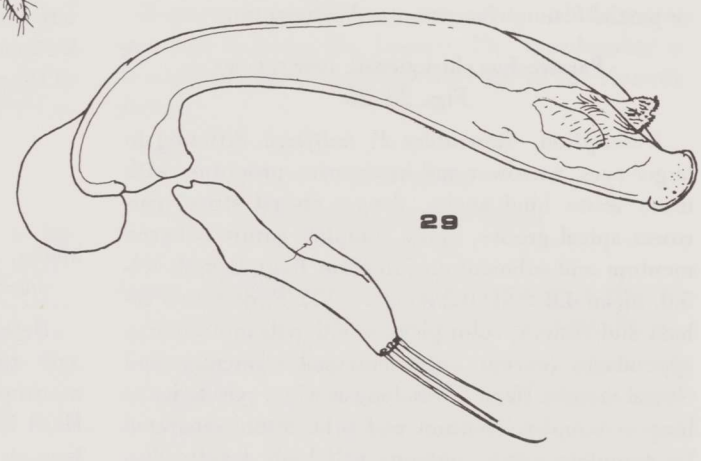
Mateu, 1974:203; type-locality, San Isidro, Talamanca, Costa Rica.

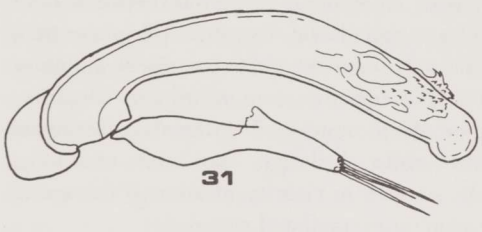
Description.—Length 4.7-5.0 mm. Form robust and rather convex; color dark reddish-piceous, mouthparts, legs, and basal antennal segments paler. Head 7/8 as long as wide; eye 1.4 longer than temple behind; mentum free. Pronotum very transverse, cordiform, 3/4 as long as wide, widest in apical third, widths at apex and base subequal, base width 5/8 greatest width; anterior angles subdued, sides very strongly rounded, deeply sinuate in basal sixth, hind angles large, sharp, a little less than right, laterally produced; base emarginate in middle between hind angles. Elytra rounded-oval, less than 1.4 longer than wide, moderately convex; posterior discal puncture on 4th interval at concatenation of 3rd and 4th striae; striae rather deep, inner 4-5 intervals subconvex; apical groove wide. Aedeagus about 0.9 mm long, median lobe swollen in vicinity of internal sac, apical sensorial organ quite small and rounded.

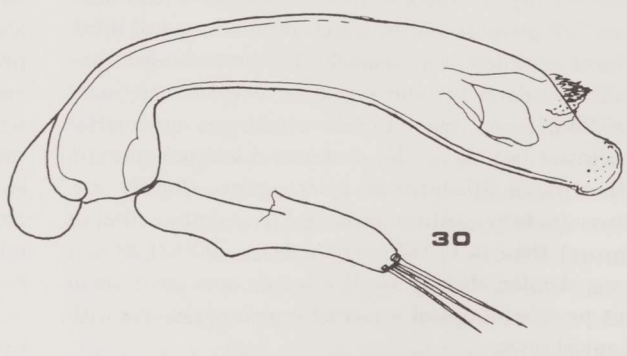
Discussion.—The above description was based on examination of a single male from Cartago, Alajuela, Costa Rica (U. S. National Museum), collected by P. J. Spangler. The species was originally described from one male and one female (holotype male in J. Nègre collection, Paris) collected between San











Figs. 27-31.—*Paratrechus, bifoveatus* group: 27, *P. franiai,* n. sp., San Marcos Sivinal; 28, *P. bifoveatus,* aedeagus, Volcán Tajumulco; 29, *P. batesi,* aedeagus, Cofre de Perote; 30, *P. bolivari,* aedeagus, Mil Cumbres; 31, *P. franiai,* aedeagus, San Marcos Sivinal.

Isidro General and the Cerro de la Muerte. The species is similar in proportions to *P. halffteri* but is redder, the pronotum (Fig. 24) is more transverse and its base is emarginate, the elytra are a little shorter and have much deeper longitudinal striae, and the sensorial button at the apex of the aedeagus is much smaller and rounded.

Paratrechus costaricensis Mateu

Mateu, 1974:203; type-locality, Rosario de Desamparos, Costa Rica.

This small (4 mm) species, which I have not seen, is described as having a less transverse pronotum and more elongate elytra than either *P. halffteri* or *P. reyesi.* It is reddish-piceous, has deeply striate elytra, and the aedeagus is more closely similar to that of *P. halffteri.* The posterior discal seta is situated on the 4th stria, about as in *P. reyesi.* The species was described on three specimens found by Mateu (1974) in the Clermont collection, Museum National d'Histoire Naturelle, Paris.

bifoveatus group

Paratrechus bifoveatus Jeannel
Fig. 28

Trechus (Paratrechus) bifoveatus Jeannel, 1920:107; type-locality, Totonicapam, Guatemala; type deposited in British Museum of Natural History.

Paratrechus bifoveatus: Jeannel, 1930:80. Mateu, 1974:201.

Description.—Length 4.0-4.4, mean 4.2 ± SD 0.1 mm (n = 15). Form robust and convex; color blackish-piceous, mouthparts and appendages paler. Head about as long as wide; eye rather small and convex, its diameter equal to length of temple; antenna quite short, scarcely 0.4 body length, segments short and oval. Pronotum 3/4 as long as wide, widest in apical fourth, anterior angles moderate, sides strongly rounded, basal sinuation brief but deep, hind angles small, acute, hardly produced to the sides. Elytra quite convex with strongly rounded sides, 1.5 times as long as wide; no posterior discal puncture; inner 3 striae shallow, intervals flat, outer striae obsolescent (a few specimens have more than 3 well-developed striae); apical groove rather short. Aedeagus about 0.65 mm, short and thick, sensorial organ rounded, reflexed on ventral side; parameres with only 2 apical setae (3-6 in all other species of *Paratrechus* examined except *P. laticeps*).

Discussion.—This distinctive species differs from other *Paratrechus* spp. which lack the posterior discal puncture in its small size, convexity, black color, short antenna with oval segments, and short, arcuate aedeagus with only two setae on the parameres. Two typical copulatory sclerites are present, contrary to Mateu's (1974) statement that they are absent in this species, but (as in all *Paratrechus* spp.) they are easily obscured by the dense spiny armature of the internal sac. Jeannel (1930) noted +-winged specimens among the series which he examined, but all the specimens I have seen are from the mountains and are micropterous. I have examined specimens collected by Champion at Totonicapam (British Museum of Natural History) and a small series taken by H. E. Frania and D. L. C. Procter in the Volcán Tajumulco (near San Marcos) and Volcán Tacaná in both northwestern Guatemala and adjacent Chiapas, México. The species apparently occurs in the foothills at elevations of about 1000-1200 m.

Paratrechus beltrani Mateu

Mateu, 1974:201. Type-locality, Amecameca, Popocatépetl area, México.

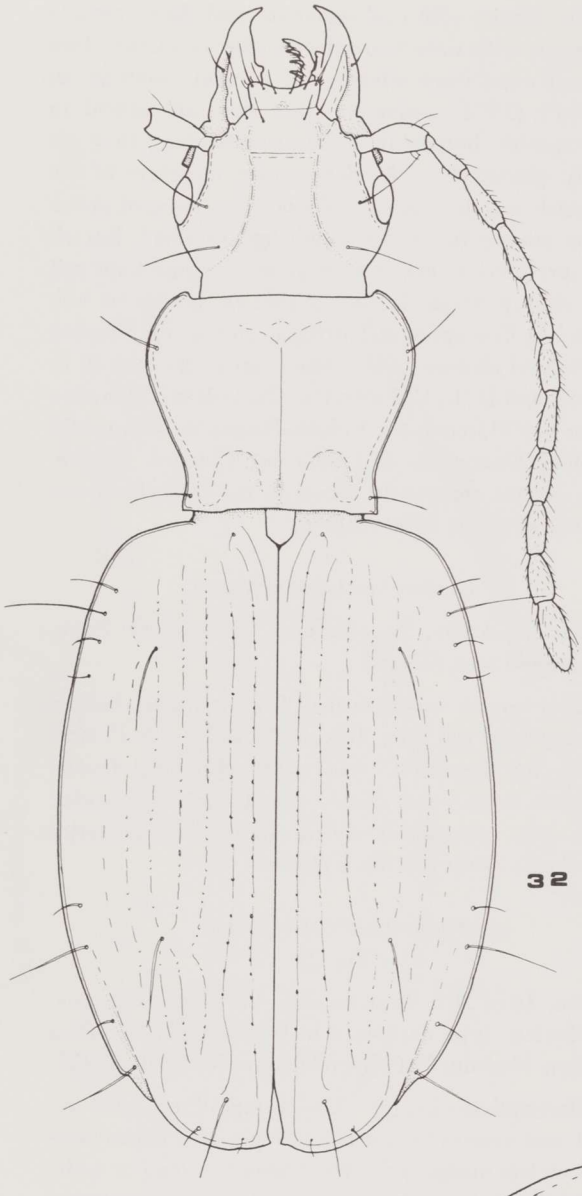
This species was described from a unique female, which I have not seen. It is similar in form to *P. bifoveatus* but larger (4.5 mm) with subparallel frontal grooves, larger eyes, deeply sinuate pronotum sides, and deep, punctured elytral striae. The posterior discal seta of the elytron is absent.

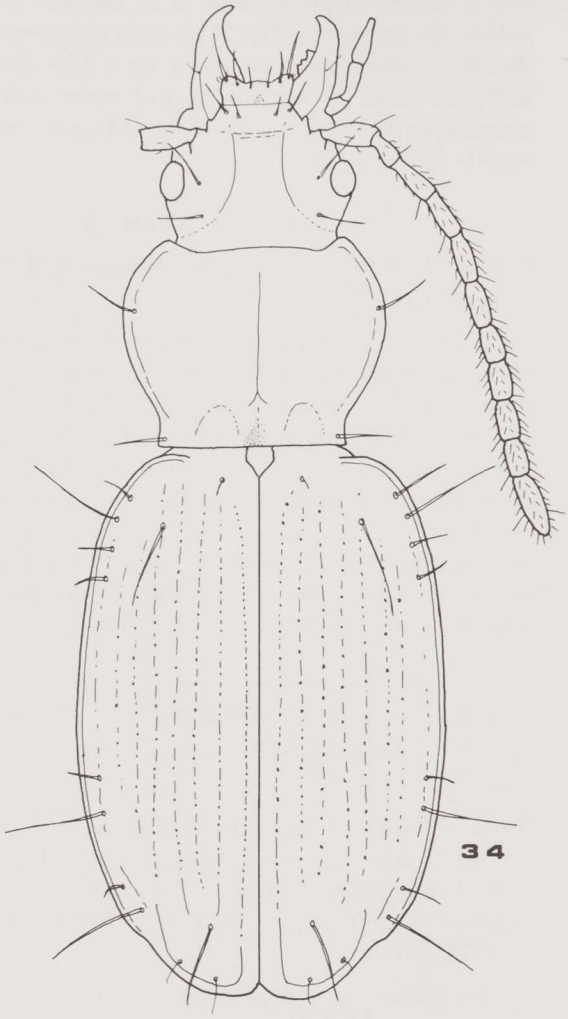
Paratrechus batesi Mateu
Fig. 29

Mateu, 1974:202. Type-locality, Las Vigas, Veracruz, México; type deposited in Oberthür-Bates collection, Museum National d'Histoire Naturelle, Paris.

Description.—Length 5.2-5.4 mm. Form very robust and convex; color blackish-piceous, appendages and elytral margin pale. Head about as long as wide; eye rather large and convex, 1/4 longer than temple; antenna half as long as body. Pronotum 3/4 as long as wide, widest in apical third, widths at apex and base subequal, base width 0.7 maximum width; anterior angles scarcely prominent, apex almost truncate, sides rounded, sinuate in basal sixth, hind angles about right. Elytra rounded-oval, very robust, less than 1.4 times longer than wide, convex; posterior discal puncture absent; inner 3 striae superficial, intervals flat, outer striae obsolescent. Aedeagus about 1.00 mm long, moderately arcuate, closely similar to aedeagus of *P. bolivari;* apex with well-developed, somewhat oblique sensorial button.

Discussion.—This species was described on a single male which Mateu discovered among the Bates specimens in the Oberthür collection. I have seen three additional specimens taken by G. Ball, T. Erwin, and





Figs. 32-34.—*Paratrechus, erwini* group: 32, *P. erwini,* n. sp., Cofre de Perote; 33, *P. erwini,* aedeagus of paratype; 34, *P. pecki,* n. sp., Cerro de la Muerte.

R. Leech on the north slope of the Cofre de Perote, 3550-3600 m, near Tembladora, Veracruz. A much larger series of *P. erwini* was collected in the same spot. The anterior puncture in the apical triangle was described by Mateu (1974) as unusually far forward, but this is an apparently individual variation not seen in the three specimens at hand.

Paratrechus bolivari Mateu
Fig. 30

Mateu, 1974:202. Type-locality, Mil Cumbres, Michoacán, México.

Description.—Length 4.6-5.4, mean 5.0 ± SD 0.2 mm (n = 30). Frontal grooves subparallel where they extend onto clypeus. Pronotum 0.75 as long as wide. Elytra 1.4 times longer than wide, disc slightly depressed near middle; striae moderately deep, all visible, intervals flat, striae irregularly punctulate; posterior discal puncture absent. Aedeagus 0.82-0.86 mm long, moderately arcuate, apical sensorial organ quite rounded and set off by a constriction.

Discussion.—This species was taken in considerable abundance by George Ball and his students at four localities in Michoacán: a) Mil Cumbres, Route 15, 33 km W Ciudad Hidalgo, 2500 m; b) Route 15, 43 km W Ciudad Hidalgo, 2750 m, south-facing ravine; c) 48 km W Ciudad Hidalgo, spruce-oak forest; d) Puerto Garnica, Route 15, 2800-2900 m. Both *Mexitrechus michoacanus* (Bolívar) and *M. quirogai* (Bolívar) were originally collected at Mil Cumbres, but *M. quirogai* is known only from the type-specimens. This species and *P. hoegei* are more elongate than other species of *Paratrechus* which lack the posterior discal puncture *(P. bifoveatus, P. franiai, P. laevigatus, P. batesi, P. beltrani);* unlike *P. bifoveatus* and *P. batesi,* which are black, they are reddish-piceous.

Paratrechus franiai, new species
Figs. 27, 31

Description.—Length 4.2-5.2, mean 4.7 mm (n = 4). Form robust and quite convex, blackish-piceous, with paler appendages and elytral margin, to dark rufopiceous, shining. Head about 0.8 as long as wide; eye moderately convex, as long as temple; mentum fused to submentum; antenna half total body length. Pronotum cordiform, 0.8 as long as wide; anterior angles subdued, sides strongly rounded and widest in apical third, sinuate in basal sixth; hind angles acute; base rectilinear; apex and base widths subequal and about 3/4 greatest width. Elytra only 1.3 times longer than wide, rounded-oval, strongly convex; anterior discal puncture at level between 1st and 2nd umbilicates; posterior discal absent; deep sutural and lightly impressed 2nd and 3rd striae, intervals flat, outer striae obsolescent; apical triangle compact, apical groove quite short. Aedeagus 0.73 mm long in holotype, feebly arcuate, short and rather thick, apical sensorial organ large and rounded; parameres with 3 setae.

Type-series.—Holotype male (American Museum of Natural History) and 3 female paratypes, Guatemala, San Marcos Sivinal, cloud forest, in leaf litter under rocks, 2620 m, 31 December 1976, H. E. Frania and D. L. C. Procter.

Measurements (mm).—Holotype, total length 4.78, head 0.80 long X 0.95 wide, pronotum 0.98 long X 1.25 wide, elytra 2.60 long X 2.01 wide, antenna 2.42 long, aedeagus 0.73 long.

Discussion.—In its rather robust, convex form this species resembles *Paratrechus laevigatus,* to which it is quite probably related; it differs, however, in the larger eyes and in having at least 3 elytral striae.

Paratrechus laevigatus Jeannel

Jeannel, 1930:81. Type-locality, "Guatemala, sans autre précision;" type deposited in Hamburg Museum.

Paratrechus laevigatus, described on a single female from an unknown locality in Guatemala, is distinguished by small eyes, only one elytral stria (the sutural), and absence of the posterior discal puncture. It is apparently related to *P. franiai,* which has a similar form but larger eyes and at least 3 elytral striae. Presumably it exists at a locality farther east in the Guatemala portion of the Cordillera, somewhere between Totonicapam and Guatemala City, and it is probably allopatric from *P. franiai.*

erwini group

Paratrechus erwini, new species
Figs. 32, 33

Description.—Length 5.1-5.8, mean 5.5 ± SD 0.2 mm (n = 25). Form elongate and subdepressed, color pale castaneous, dull shining, elytral microsculpture with transverse meshes. Head 0.8 as long as wide; eye shorter than temple; mentum free; antenna about half body length. Pronotum transverse-cordiform, 0.7 as long as wide, anterior angles subdued, sides arcuate in apical half, oblique, then prominently sinuate in basal fifth, hind angles sharp, slightly less than right; base very feebly emarginate; apex and base widths subequal, about 3/4 greatest width, which occurs in apical fifth; marginal gutter broad, continuous with broad, rounded basal foveae. Elytra elongate-elliptical, about 1.35 times longer than wide, disc depressed either side of suture; about 5 inner

striae rather deeply impressed, outer striae more superficial, striae punctured and often irregular; posterior discal puncture situated on 5th stria (usual), 4th stria, or 4th interval, in many specimens 3rd and 5th intervals irregularly confluent medial to posterior discal puncture; apical triangle complete; setae in discal, anterior apical, and umbilicate punctures a little longer than usual, hypertrophied. Aedeagus highly aberrant: length about 1.2 mm, heavily sclerotized, dark piceous shining, twisted in basal third, with prominent, subequal lateral flanges before rounded apex, apical sensorial organ very small, discoidal; parameres with 4 long apical setae.

Type-series.—Holotype male (American Museum of Natural History) and 24 paratypes, north slope of the Cofre de Perote, 3535-3695 m, near Tembladora, Veracruz, México, 25 August 1967, G. Ball, T. Erwin, R. Leech.

Measurements (mm).—Holotype, total length 5.68, head 0.86 long X 1.09 wide, pronotum 0.90 long X 1.29 wide, elytra 2.85 long X 2.11 wide, antenna 3.04 long, aedeagus 1.10 long.

Discussion.—This pale, elongate species with deep, finely punctured striae has no counterpart among known species of Mexican *Paratrechus*. The aedeagus is exceptional, more heavily sclerotized than in any other North American trechine, twisted in the apical two-thirds and bearing conspicuous lateral flanges, the left a little larger than the right; the apex is bluntly rounded and the apical sensorial organ is reduced to a small disc. Superficially *P. erwini* resembles *P. pecki*, a Costa Rican species; unfortunately *P. pecki* is known only from the female holotype, so that its aedeagus cannot be compared. The lateral wings of the aedeagus are similar to those seen in *Darlingtonea kentuckensis* Valentine (1952), a troglobitic trechine from southeastern Kentucky; in *Darlingtonea*, however, the aedeagus is not heavily sclerotized, and its copulatory pieces are nominally isotopic. Evidently *P. erwini* is a high-altitude endemic, found beneath stones about 500 m below the summit of the Cofre de Perote, where it coexists with *P. batesi*, a much less abundant species. In the same area is the Cueva del Volcancillo, a lava tube inhabited by a troglobitic species, *P. reddelli*.

Paratrechus pecki, new species
Fig. 34

Description.—Resembles *P. erwini* in pale color, elongate form, and deep, strongly punctured elytral striae, differing in larger eyes, more transverse and more convex pronotum, and the absence of a posterior discal seta on the elytron. Length of unique female holotype 4.80 mm. Form elongate, color pale, castaneous-yellow. Head slightly wider than long; mentum free, 6 prebasilar setae; eyes 0.1 longer than temples, small but very convex. Pronotum strongly transverse-cordiform, 3/4 as long as wide; sides strongly rounded, deeply sinuate in basal fifth, hind angles sharp and about right, base shallowly emarginate; apex and base widths subequal, about 2/3 greatest width, which occurs in apical third. Elytra elongate-oval, 1.6 times longer than wide, disc subconvex; striae rather deep and strongly punctured, inner intervals subconvex; posterior discal puncture absent. Male unknown.

Type-series.—Holotype, a unique female (American Museum of Natural History), Villa Mills, Cerro de la Muerte, Costa Rica, 3050 m, 2 August 1966, S. B. Peck.

Measurements (mm).—Holotype, total length 4.80, head 0.94 long X 0.98 wide, pronotum 1.01 long X 1.33 wide, elytra 2.21 long X 1.79 wide, antenna 2.50 long.

Discussion.—This species, apparently most closely related to *P. erwini*, is known from a single female collected along with 15 *P. halffteri* by S. B. Peck. From the other 4 species of *Paratrechus* thus far known from Costa Rica, *P. pecki* is immediately recognized by the pale color, deep and punctured elytral striae, and by the absence of the posterior discal seta. It would be of great interest to determine whether or not the aedeagus in this species has the same unusual form as that of *P. erwini*.

Chiapadytes Vigna Taglianti

Vigna Taglianti, 1977:327. Type-species, *Chiapadytes bolivari* Vigna Taglianti, by original designation and monotypy.

This genus is monobasic. The single known species, *C. bolivari*, was described from a single complete male and pieces of two other specimens taken in the Cueva de la Planta No. 2, San Cristóbal de las Casas, Las Piedrecitas, Chiapas, México. The species is microphthalmous, pale piceous, of the same general form as *Paratrechus sylvaticus* but larger (6 mm); mentum free, 8(-9) prebasilar setae; elytra with finely transverse microsculpture, anterior discal puncture on 4th stria, posterior discal on 3rd stria, apical triangle lacking posterior puncture. The aedeagus is of the same form as that of *P. pallescens*, with small but distinct apical sensorial organ. The excellent, detailed description of this species leads me to the conclusion that it probably belongs in *Paratrechus* and more precisely in the *sylvaticus* group. In any case it is the only known troglobitic trechine from

the Chiapas highlands (elevation 2180 m) and represents yet another instance of independent cave colonization and troglobitic evolution within the *Paratrechus* series.

Mexaphaenops Bolívar

Bolívar, 1942:352. Type-species, *Mexaphaenops prietoi* Bolívar, by original designation and monotypy.

Description.—Length 4.2-8.0 mm. Form elongate and rather convex; microphthalmous, more or less aphaenopsian; rufotestaceous shining, elytral microsculpture usually isodiametric, rarely finely transverse, never with meshes; humeri somewhat to greatly rounded, metathoracic wings vestigial; subglabrous. Head with frontal grooves incomplete (5 spp.) or not (3 spp.), sides subparallel or weakly rounded; mentum free (6 spp.) or fused to submentum (2 spp.), 6 or 8 prebasilar setae, according to species; mentum tooth medially grooved; glossa with 2 + 6 apical setae, paraglossae long, hyaline, and very slender; mandibles without premolar tooth; maxillary and labial palps rather coarsely pubescent to subglabrous, terminal segment of maxillary palps shorter than penultimate segment. Pronotum small, rather convex, 0.9-1.3 times as long as wide, essentially cordiform; margins with 0, 1, or 2 pairs of setae; front angles moderate, usually not produced, hind angles small, usually sharp, approximately right. Elytra convex, elongate-oval to oval, humeri always somewhat rounded but very strongly rounded and prehumeral borders oblique in some species; striae well developed (except in *fishi*), usually all visible, intervals flat to quite convex according to species; anterior discal puncture on 5th, 4th, or 3rd stria, posterior discal on 3rd, 4th, or 5th interval or absent; umbilicate series normal, well aggregated; apical triangle complete (4 spp.) or reduced to one or two punctures (4 spp.); apical groove well developed, recurrent portion directed toward apex of 4th, 5th, or 6th longitudinal stria. Anterior tibia grooved and pubescent on outer face. Male with two basal protarsomeres bearing adhesive setae beneath, but these segments feebly dentate and not or very feebly enlarged. Aedeagus with apical sensorial organ about as in *Paratrechus* (6 spp.) or vestigial (2 spp.); internal sac heavily armed with scales, copulatory pieces subequal, elongate-triangular or spade-shaped (about as in *Paratrechus*), anisotopic; parameres with 3-5 long apical setae.

Discussion.—*Mexaphaenops* includes 8 known species from caves in Nuevo León, Tamaulipas, Querétaro, and San Luis Potosí, in the Sierra Madre Oriental and the eastern part of the central Mexican plateau. The ranges of *Mexaphaenops* and *Paratrechus* are notably mutually exclusive, with the exception of three troglobitic species, *P. pallescens*, *P. contrarius*, and *P. laticeps*. In an earlier paper I outlined evidence for derivation of *Mexaphaenops* from *Paratrechus*, postulating an evolutionary series beginning with *Paratrechus sylvaticus* and running through *P. pallescens* to *M. elegans* (Barr, 1967a). The discovery of *P. contrarius*, with mentum and submentum fused, in addition to the demonstration that the diagnostic significance of a free mentum is not very great in the *Paratrechus* series, partly bridges the gap toward derivation of *Mexaphaenops* species in which mentum and submentum are fused *(prietoi* and *intermedius)*. Further, in *M. sulcifrons*, which is quite close to *prietoi* and *intermedius*, the mentum is free. And even though the apical sensorial organ of the aedeagus is vestigial in *prietoi* and *sulcifrons*, it is nevertheless present in *intermedius*. *Mexaphaenops mackenziei*, *M. jamesoni*, and *M. febriculosus*, described in the present paper, are not strictly aphaenopsian, but they extend the evolutionary series from *Paratrechus* of the *sylvaticus* series to *M. elegans* by filling the gaps between *P. pallescens* and *M. elegans*, *M. mackenziei* in particular being morphologically quite close to *elegans* but more plesiomorphic. The aedeagus of *P. contrarius* is remarkably similar—almost identical—to that of *M. mackenziei dulcinominis*.

The relative heterogeneity among the species of *Mexaphaenops* probably reflects heterogeneity of their *Paratrechus* ancestors, coupled with multiple cave colonization and parallel subsequent modifications for subterranean life. In this paper I have advanced the hypothesis that *Paratrechus* was derived by isolation of a Holarctic trechine stock in northern South America in late Cretaceous or early Tertiary. In late Tertiary time, probably Pliocene, this stock expanded northward into Central America and México as far as the Río Bravo (=Rio Grande). Subsequent warming and drying climatic trends led to widespread extinction of epigean trechine populations in the north, with survival possible only in the "tierra fría" of uplands in the south, or in caves. The sharp line between the area occupied by *Mexaphaenops* and the troglobitic species of *Paratrechus* versus the area occupied by epigean *Paratrechus* suggests that the process may have continued for some time and may be going on at present.

There are at least 3 species groups in *Mexaphaenops:* 1) the *mackenziei* group *(mackenziei, elegans, febriculosus, jamesoni)*, 2) the *fishi* group, with one

species; and 3) the *prietoi* group *(prietoi, intermedius, sulcifrons).* They are arranged in what I believe to be increasing order of apomorphy. Not all the apomorphic character states occur together in the same species, but there are more apomorphic characters in group 2 than in group 1, and more in group 3 than in group 2. In *Mexaphaenops* we are presumably observing, in René Jeannel's (1943) terms, "living fossils"—remnants of a more extensive epigean fauna that has been preserved through cave colonization and adaptation to cave existence.

mackenziei group

Mexaphaenops elegans Barr

Barr, 1967a:162, figs. 2, 5. Type-locality, Sótano de Tejamanil, Querétaro, México; type deposited in Museum of Comparative Zoology, Harvard University.

Key to Species of *Mexaphaenops* Bolívar

1. Elytra with anterior discal puncture on 3rd, 4th, or 5th stria; pronotum with 1-2 pairs of marginal setae 2
   Elytra without discal punctures; pronotum without marginal punctures; mentum free, 6 prebasilar setae; apical triangle reduced to lateral puncture only; length 4.8-5.5 mm; San Luis Potosí (Valle de los Fantasmas, Sótano de la Golondrina) . . . . . *fishi* Barr

2(1). Elytra with 2 discal punctures; apical triangle with 2-3 punctures; elytra rather elongate and slender. 3
   Elytra with a single discal puncture on 5th stria near base, posterior puncture absent; only one puncture (lateral) in apical triangle; elytra 1.4 times longer than wide, very convex; length 5.0-6.2 mm; NW Nuevo León (Bustamante) . . . . . *prietoi* Bolívar

3(2). Elytra with anterior discal puncture on 4th or 5th stria; apical triangle complete, consisting of anterior, lateral, and posterior punctures; mentum free 4
   Elytra with anterior discal puncture on 3rd stria, posterior discal on 3rd stria or 4th interval; anterior apical puncture absent; mentum and submentum fused; length 5.0-5.4 mm; Tamaulipas (Gómez Farías-Encino area) . . . . . *intermedius* Barr

4(3). Head with frontal grooves not unusually deep and sulciform; anterior discal puncture on 5th stria; submentum with transverse row of 8 prebasilar setae 5
   Head with very deep, elongate, sulciform frontal grooves (Fig. 41); anterior discal puncture on 4th stria, posterior discal on 5th interval; submentum with 6 prebasilar setae; length 4.2-4.7 mm; upper Río Purificación basin, Tamaulipas/Nuevo León . . . . . *sulcifrons, n. sp.*

5(4). Head with sides more or less rounded, frontal grooves shallowly continued around sides of head (complete); pronotum with two pairs of marginal setae; upper Río Purificación basin, Tamaulipas/Nuevo León 6
   Head with sides subparallel, frontal grooves ending on vertex, not continued around sides of head (incomplete); pronotum with only one pair (anterior) of marginal setae; Querétaro (Pinal de Amoles) . . . . . *elegans* Barr

6(5). Head with more pronounced cervical constriction, eye rudiment small but distinctly convex (Fig. 40); elytral humeri not completely rounded, disc not concave around scutellum 7
   Head with less abrupt cervical constriction, eye rudiment flat (Fig. 35); elytral humeri strongly rounded, prehumeral borders very oblique, disc concave either side of suture near scutellum; polytypic species, lengths ranging from 5.2-8.0 mm, means 5.8-7.0 mm . . . . . *mackenziei,* n. sp.

7(6). Elytra wider (L/W 1.54-1.60), disc evenly convex; aedeagus with basal bulb bent sharply downward, median lobe distinctly arcuate (Fig. 43); length 5.0-5.2 mm; Tamaulipas (Revilla, Conrado Castillo) . . . . . *jamesoni,* n. sp.
   Elytra narrower (L/W 1.63-1.67), disc convex but distinctly flattened near center; aedeagus less sharply arcuate (Fig. 42); length 4.6-6.0 mm; Tamaulipas (Yerbabuena) . . . . . *febriculosus,* n. sp.

Description.—Length 5.4-7.3 mm. Form very slender and elongate, convex; elytral microsculpture weakly transverse, not forming meshes, polished. Head 1.4 times longer than wide, sides subparallel; mentum free, 8 prebasilar setae; antenna 0.9 body length. Pronotum about 1/4 longer than wide, hind angles acute; only one pair of marginal setae (anterior). Elytra quite convex, 1.75 times longer than wide, prehumeral borders very oblique, disc deplanate around scutellum; striae rather deep, intervals convex; anterior discal puncture at juncture of 4th and 5th stria at level of 2nd umbilicate, posterior discal on 3rd stria; humeral set of umbilicate punctures rather evenly spaced; apical triangle complete. Aedeagus 0.88-0.93 mm long, with well-developed apical sensorial organ.

Discussion.—This species is known from 5 localities in the vicinity of Pinal de Amoles, Querétaro: a) Sótano de Tejamanil, 2.5 km west (type-locality); b) Cueva del Judío, 2 km south; c) Sótano del Buque, 20 km north; d) Sótano de la Escuela, 10 km northwest, in the Llano de San Francisco; and e) a roadside "mine" (actually a cave) near Pinal de Amoles (S. B. Peck). The nearly complete chaetotaxy and free mentum with 8 prebasilar setae led me to suggest (Barr, 1967a) that *M. elegans* was the most generalized species of *Mexaphaenops* known at the time, but in its elongate, slender form and incomplete frontal grooves, as well as loss of the posterior marginal setae of the pronotum it is more derivative than either *M. mackenziei* or *M. jamesoni*. The species was presumably derived from an edaphobitic ancestor very much like *M. mackenziei*, to which it is most closely related.

There are two errors in the original description of this species (Barr, 1967a): 1) the aedeagus of the holotype is 0.92 (not 0.52) mm long, and b) the two discal punctures of the elytra are not both on the 5th stria, as implied in the key; the posterior puncture is lateral to the 3rd stria as stated in the description and shown in the accompanying sketch (fig. 2). In most of the same cave localities *Paratrechus pallescens* coexists with *Mexaphaenops elegans*.

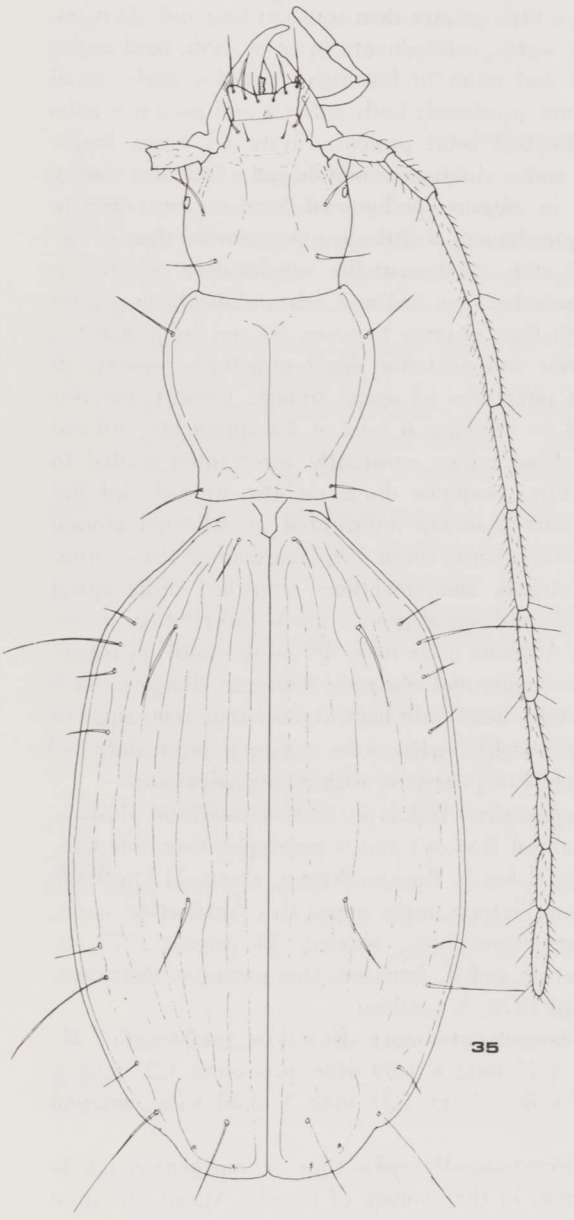
Mexaphaenops mackenziei mackenziei, new species and subspecies
Figs. 35, 37

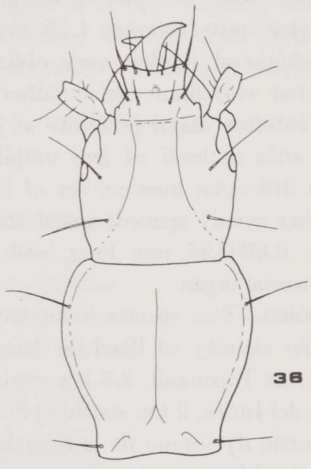
Description.—Resembles *M. elegans* in large size and small, flat eye rudiments, differing in wider head and pronotum, less convex elytra widest near the middle, and coarser and less polished elytral microsculpture. Length 6.0-8.0, mean 7.0 ± SD 0.5 mm (n = 17). Form slender, elongate, and convex; microsculpture isodiametric and locally obsolete on head, slightly transverse on pronotum disc, shallowly isodiametric on elytral disc, with vague transverse tendency. Head 1/4 longer than wide, sides a little rounded; eye rudiment 0.08-0.10 mm in diameter, about 0.2 as long as scape; frontal grooves long and deep, labrum singly emarginate. Pronotum cordiform, 0.9 as long as wide, widest in apical third, width at apex a little greater than width at base and 3/4 maximum width; sides sinuate in basal sixth, hind angles small and more or less right, anterior angles small and not produced; both anterior and posterior pairs of marginal setae present. Elytra 1.7 times longer than wide, widest near middle and a little less convex than in *elegans;* prehumeral borders very strongly oblique, humeri a little less pronounced than in *elegans* and circumscutellar deplanation shallower; distance between 3rd and 4th umbilicate punctures greater than distance between 1st and 3rd punctures; anterior and posterior discal punctures present, all three punctures of apical triangle present; anterior discal on 5th stria at level of 1st umbilicate, 3rd and 4th striae rather constantly interrupted medial to puncture, posterior discal on 4th interval, 3rd and 4th stria generally interrupted or inflected around site of puncture; seven deep, impunctate striae, intervals convex and sometimes irregular; entire apical triangle and apical groove much shorter than in *elegans*. Antenna quite long, 4/5 body length; all appendages slender and elongate. Aedeagus elongate, 1.15-1.22 mm, basal bulb bent at more than right angle to long, straight median lobe, sensorial organ flattened and oblique; parameres with 3 long apical setae.

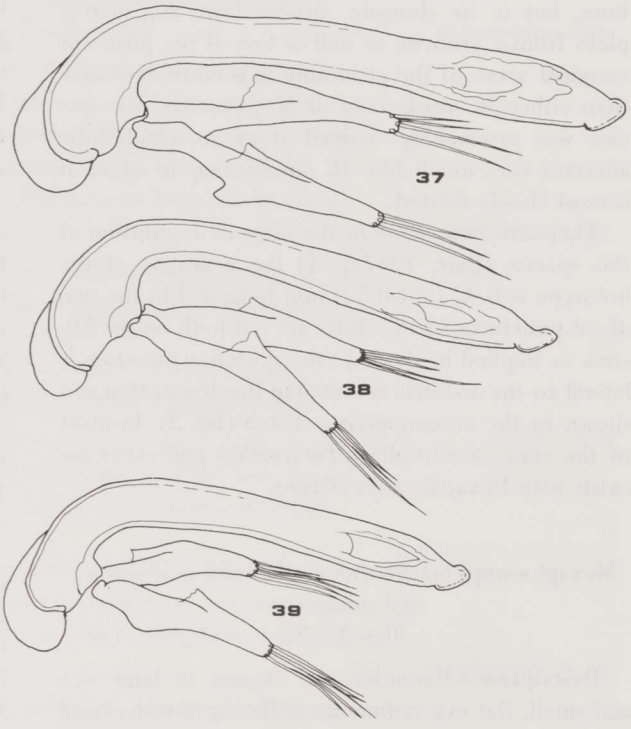
Type-series.—Holotype male (American Museum of Natural History) and 6 paratypes, Cueva de California, 2 km N Rancho Nuevo, about 34 km WNW Ciudad Victoria in the upper Río Purificación basin, western Tamaulipas, México, 23 August 1973, D. McKenzie and R. Jameson. One paratype, same cave, 6 April 1978, A. Grubbs.

Measurements (mm).—Holotype, total length 7.28, head 1.37 long X 1.09 wide, pronotum 1.25 long X 1.39 wide, elytra 4.21 long X 2.50 wide, antenna 5.85 long.

Discussion.—*Mexaphaenops m. mackenziei* inhabits caves in the vicinity of Rancho Nuevo, elevation 2500-2700 m, including Cueva de California (type-locality); Cueva del Vandalismo, 0.5 km SE Rancho Nuevo; Pozo del Lagartijo, 0.5 km SW fire tower on Mesas Juárez; Sótanos de Rancho Nuevo nos. 1 and 4; and Cueva del Camino, 1 km W Rancho Nuevo. A total of 23 specimens were examined. *Mexaphaenops jamesoni* coexists with *M. m. mackenziei* in the Rancho Nuevo area.







Figs. 35-39.—*Mexaphaenops* from Río Purificación area: 35, *M. m. mackenziei*, n. sp. and subsp., Cueva de California; 36, *M. m. gracilis*, n. subsp., head and pronotum, Sumidero de Oyamel; 37, *M. m. mackenziei*, aedeagus of paratype, Cueva de California; 38, *M. m. gracilis*, aedeagus, Cueva de los Allarines; 39, *M. m. dulcinominis*, n. subsp., aedeagus, Cueva del Ojo de Agua.

Mexaphaenops mackenziei gracilis, new subspecies
Figs. 36, 38

Description.—Differs from *M. m. mackenziei* in the more narrowly incised frontal grooves, which are not widened behind to the same extent as in the nominate subspecies, and in the narrower pronotum, which is as long as wide or slightly longer (L/W about 0.9 in *m. mackenziei*) and widest in apical fourth at level of anterior marginal setae (widest behind anterior marginals in *m. mackenziei*). Length 5.7-7.0, mean 6.3 ± SD 0.4 mm (n = 15), a little smaller than *M. m. mackenziei.*

Type-series.—Holotype male (American Museum of Natural History) and 4 paratypes, La Sistema Purificación, Sumidero de Oyamel section, near Conrado Castillo, 1900 m, Tamaulipas, México, 23 November 1977, Dale Pate; an additional 10 paratypes from the same cave system, including the Sumidero de Oyamel section, Cueva del Brinco section, and Cueva del Infiernillo section, March 1978–April 1980, collected by various members of the Association for Mexican Cave Studies.

Measurements (mm).—Holotype, total length 5.72, head 1.04 long X 0.86 wide, pronotum 1.04 long X 1.01 wide, elytra 3.34 long X 1.96 wide, antenna 4.71 long.

Discussion.—This trechine is relatively frequent but not abundant in the huge Sistema Purificación cave system in the upper Río Purificación basin in western Tamaulipas. An additional 14 specimens assigned to *M. m. gracilis* were taken in Cueva de los Allarines and Cueva del Tecolote, both near Conrado Castillo. *Mexaphaenops jamesoni* and *M. sulcifrons* are sympatric with *M. m. gracilis*, but are much rarer. For differentiation of these 3 taxa, see the discussion following the description of *M. jamesoni.*

Mexaphaenops m. mackenziei X *Mexaphaenops m. gracilis*

Two geographic races of *M. mackenziei* intergrade broadly in the caves of the Aserradero Revilla area, which lies between Rancho Nuevo and Conrado Castillo, the areas in which *M. m. mackenziei* and *M. m. gracilis* respectively occur. A total of 9 morphologically intermediate specimens were obtained from Sótano de Jesús, 2 km SE Revilla; Pozo del Maguey Verde, 1 km NW Revilla; and Cueva de las Papitas, 800 m SE Revilla. Two specimens of *M. jamesoni* were taken in Sótano de Jesús and *M. sulcifrons* occurs in other caves near Revilla.

Mexaphaenops mackenziei dulcinominis,
new subspecies
Fig. 39

Description.—Length 5.2-6.3, mean 5.8 mm (n = 4). Resembles *M. m. gracilis*, differing in smaller size; elytra more convex and a little wider (L/W 1.56-1.66 vs. 1.60-1.72 in *gracilis*), intervals a little less convex, microsculpture of disc scarcely transverse; distance between 3rd and 4th umbilicate punctures in humeral set not greater than distance between 1st and 3rd punctures. Aedeagus 0.86 mm long in holotype, similar in form to that of *M. m. mackenziei* but much smaller, basal bulb less sharply bent with respect to median lobe, parameres with 5 apical setae.

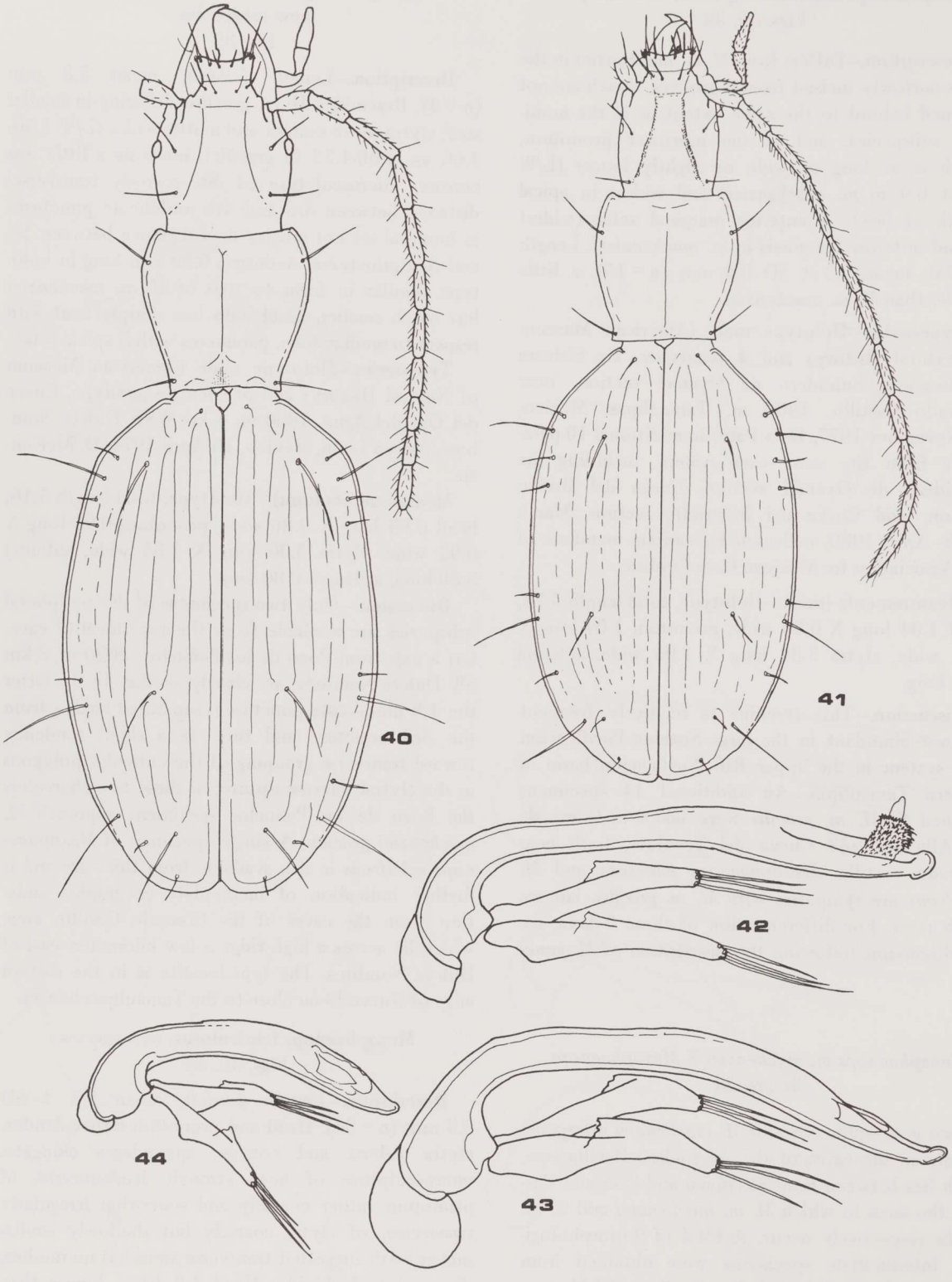
Type-series.—Holotype male (American Museum of Natural History) and one female paratype, Cueva del Ojo del Agua, 1980 m, 4 km WSW Dulces Nombres, Nuevo León, México, 10 April 1974, D. McKenzie.

Measurements (mm).—Holotype, total length 5.16, head 0.95 long X 0.80 wide, pronotum 0.95 long X 0.92 wide, elytra 3.06 long X 1.84 wide, antenna 3.89 long, aedeagus 0.86 long.

Discussion.—Only two specimens of this peripheral subspecies are available from the type-locality cave, but a pair from Pozo de los Peñuelos, 2020 m, 3 km SW Dulces Nombres, are closely similar. In the latter the 4th umbilicate puncture is separated farther from the 3rd puncture and there is a slight tendency toward transverse grouping of the cuticular polygons in the elytral microsculpture; in these two characters the Pozo de los Peñuelos specimens approach *M. mackenziei gracilis.* A single specimen of *Mexaphaenops sulcifrons* is also available from this cave and is further indication of incomplete geographic isolation from the caves of the Conrado Castillo area, which lie across a high ridge a few kilometers east of Dulces Nombres. The type-locality is in the eastern edge of Nuevo León close to the Tamaulipas border.

Mexaphaenops febriculosus, new species
Figs. 40, 42

Description.—Length 4.6-6.0, mean 5.4 ± SD 0.3 mm (n = 34). Head and pronotum rather slender, elytra robust and convex, appendages elongate; microsculpture of head strongly isodiametric, of pronotum rather coarsely and somewhat irregularly transverse, of elytra coarsely but shallowly isodiametric with suggested transverse areas but no meshes, disc polished shining. Head 1.2 times longer than wide, sides a little subparallel but constricted at cervicum (more so than in *mackenziei*); frontal grooves deep, slightly sulcate on vertex, continuing very shallow around sides of head (non-aphaenopsian);



Figs. 40-44.—*Mexaphaenops* from Río Purificación area: 40, *M. febriculosus,* n. sp., Sótano de las Calenturas; 41, *M. sulcifrons,* n. sp., Cueva X; 42, *M. febriculosus,* aedeagus of paratype, Sótano de las Calenturas; 43, *M. jamesoni,* n. sp., aedeagus of paratype, Sótano de Jesús; 44, *M. sulcifrons,* aedeagus of paratype, Cueva X.

eye rudiment distinctly convex in dorsal view, about 0.12 mm, granulate, with suggested rudimentary ommatidia; mentum free, submentum with 8 prebasilar setae; antenna 0.6 body length. Pronotum cordiform, 0.9 as long as wide; anterior angles prominent, sides arcuate and convergent behind, very shallowly sinuate before small, slightly obtuse hind angles; both anterior and posterior marginal setae present; apex and base width subequal, about 3/4 greatest width, which occurs in apical fourth. Elytra oblong-oval, 1.63-1.67 times longer than wide, prehumeral borders slightly oblique but far less so than in *mackenziei*, disc generally convex but flattened in middle; longitudinal striae deep, intervals quite convex; anterior discal puncture on 5th stria near level of 2nd umbilicate, posterior discal on 4th interval at level of 5th umbilicate; apical triangle complete, apical groove rather long, joining 5th stria at level of anterior apical puncture. Aedeagus about 1.0 mm long, basal bulb bent at right angle, median lobe long, slender, and scarcely arcuate, sensorial organ small and oblique, 3 long setae on parameres.

Type-series.—Holotype male (American Museum of Natural History) and 10 paratypes, Sótano de las Calenturas, 1470 m, 1 km SSE Yerbabuena in the upper Río Purificación drainage basin, 34 km NW Ciudad Victoria, Tamaulipas, México, 19 November 1979, Dale Pate and Peter Sprouse; 30 additional paratypes, same cave, 19-23 November 1979, J. Reddell, D. McKenzie, J. Atkinson, T. Treacy, and other members of the Association for Mexican Cave Studies.

Measurements (mm).—Holotype, total length 5.60, head 1.14 long X 0.94 wide, pronotum 0.94 long X 1.09 wide, elytra 3.28 long X 1.91 wide, antenna 3.43 long, aedeagus 1.04 long.

Discussion.—This species and *M. jamesoni* (described below) differ from all other species of the genus in the small but distinctly convex eye rudiments, which in dorsal view can be seen protruding from the sides of the head as translucent spherules. The cervical constriction is more marked and the humeri are far less rounded than in *M. mackenziei*, to which they are most closely related. The Sótano de las Calenturas lies several kilometers southeast and at a much lower elevation than the caves of the Rancho Revilla and Conrado Castillo areas where *M. jamesoni* coexists with *M. mackenziei*.

Mexaphaenops jamesoni, new species
Fig. 43

Description.—Closely similar to *M. febriculosus*, differing in wider and more convex elytra, less convex elytral intervals, more intense and somewhat less polished elytral microsculpture, and slightly larger and more arcuate aedeagus. Length 5.0-5.2 mm. Head 1.2 times longer than wide; mentum free, 8 prebasilar setae; eye rudiment convex; antenna 0.6 body length. Pronotum 0.9 as long as wide, shape as in *febriculosus;* two pairs of marginal setae. Elytra wider, 1.54-1.60 times longer than wide, convex and not flattened in center of disc; striae moderately deep but intervals a little less convex than in *febriculosus;* microsculpture shallowly isodiametric without transverse tendency, less polished; chaetotaxy as in *febriculosus.* Aedeagus 1.06 mm long in holotype, much more strongly arcuate, basal bulb larger, sensorial organ small and oblique; parameres with 3 apical setae.

Type-series.—Holotype male (American Museum of Natural History) and one female paratype, Sótano de Jesús, 2300 m, 2 km SE Revilla, Tamaulipas, México, August 1973, R. Jameson and D. McKenzie.

Measurements (mm).—Holotype, total length 5.20, head 0.98 long X 0.82 wide, pronotum 0.94 long X 1.05 wide, elytra 2.96 long X 1.87 wide, antenna 3.24 long, aedeagus 1.06 long.

Discussion.—This species, evidently quite close to *M. febriculosus*, is known from 5 specimens: 2 from the Sótano de Jesús (type-locality), 2 from Sótano de Rancho Nuevo No. 2, and one from Cueva del Coral (1 km N Conrado Castillo, near summit of Cerro Zapatero). The available material indicates no gene flow between *febriculosus* and *jamesoni*. If *jamesoni* were a geographic race of *febriculosus*, then one would expect to find a race of *mackenziei* in the Sótano de las Calenturas, but such is not the case. Certainly both *jamesoni* and *febriculosus* share a relatively recent common ancestry, but the evidence indicates that they are distinct, allopatric species.

In the Rancho Nuevo and Conrado Castillo areas *M. jamesoni* is readily distinguished from the much more abundant *M. mackenziei* by smaller size, convex eye rudiment, slightly produced anterior pronotum angles, more prominent (much less oblique) humeri, and closer spacing of the humeral set of umbilicate punctures (distance between punctures 3 and 4 not greater than distance between punctures 1 and 3). *Mexaphaenops sulcifrons*, which occurs in some of the same caves, has the sides of the head subparallel, eye rudiments flat, and very deep, sulciform frontal grooves which end blindly on the vertex instead of continuing around the sides of the head; it is smaller and has a small aedeagus without an apical sensorial organ.

It is a pleasure to name this species for Mr. Roy Jameson, who together with David McKenzie collected the first trechine beetles from the caves of the Río Purificación region.

fishi group

Mexaphaenops fishi Barr

Barr, 1967a:162, fig. 3. Type-locality, Valle de los Fantasmas (unnamed small cave), San Luis Potosí, México; type deposited in Museum of Comparative Zoology, Harvard University.

Description.—Length 4.8-5.5 mm. Form slender, elongate, convex; elytral microsculpture coarsely transverse in basal half but not forming meshes. Head subparallel, 1.4 times longer than wide; mentum free, 6 prebasilars; antenna 5/6 body length. Pronotum 1.2 times longer than wide; marginal setae absent; hind angles acute and produced backward, base emarginate. Elytra 1.6-1.7 times longer than wide, very convex, humeri effaced, widest behind middle; striae obsolescent; no discal punctures; 4th umbilicate puncture rather widely removed from humeral set; apical triangle reduced to lateral puncture only. Aedeagus about 0.6 mm long, moderately arcuate, sensorial organ conspicuous and rounded.

Discussion.—In the original description of this species it was stated that the long setae (whips) in umbilicate punctures 2, 6, and 8 were absent. The type-series included 4 specimens from a little cave in the Valle de los Fantasmas, 40 km E San Luis Potosí, 2800 m. A series of 7 specimens was collected 17 March 1972 by W. Elliott, R. Mitchell, et al. in the Sótano de la Golondrina, Puerta Altamira, 45 km E San Luis Potosí, 3000 m. In all of these specimens, 5 of which were tenerals, long whips were present in the normal place in the umbilicate punctures. Apparently these delicate setae had broken off in all of the specimens in the type-series.

Mexaphaenops fishi is rather aberrant both morphologically and geographically, occupying caves in a high desert 2800-3000 m above sea level, about 150 km NW of Pinal de Amoles (*M. elegans* localities), and 175 km SW of the Gómez Farías area (*M. intermedius* localities). The species has more chaetotaxial anomalies than any other species in *Mexaphaenops*, yet the mentum is free, and there is a well-developed, rounded sensorial organ at the apex of the aedeagus. Elytral striation is nearly obsolete, and the microsculpture of the elytra is a little transverse, at least in the basal half.

prietoi group

Mexaphaenops intermedius Barr

Barr, 1971:113, figs. 1, 2. Type-locality, Cueva de la Capilla, Tamaulipas, México; type deposited in American Museum of Natural History.

Vigna Taglianti, 1972:119.

Description.—Length 5.0-5.4 mm. Form more elongate than that of *M. prietoi*, elytra more slender and less convex; elytral microsculpture quite shallowly isodiametric, polished. Head with subparallel sides, 1.4 times longer than wide; mentum fused to submentum, 6 prebasilar setae; antenna 0.8 body length. Pronotum slightly longer than wide, similar to that of *M. prietoi*, two pairs of marginal setae, hind angles acute. Elytra 1.6 times longer than wide, moderately convex; striae feebly and irregularly impressed, intervals weakly convex basally and anastomosing or constricted near discal punctures; anterior discal on 3rd stria, posterior discal on 4th interval; umbilicate humeral series not unevenly spaced; anterior apical puncture absent from apical triangle. Aedeagus nearly 0.7 mm long, weakly arcuate, apical sensorial organ small but distinct; parameres with 3 apical setae.

Discussion.—This species is known from La Cueva de la Capilla and La Cueva de la Mina, both northwest of Gómez Farías (Barr, 1971; Vigna Taglianti, 1972). It is newly recorded from La Cueva de las Perlas, in the Gómez Farías region (J. R. Reddell) and the Sótano de la Joya de Salas, near Encino (Jean Jancewicz). Among other known species of *Mexaphaenops*, *M. intermedius* is probably most closely related to *M. prietoi*, and perhaps more remotely to *M. sulcifrons*.

Mexaphaenops prietoi Bolívar

Bolívar, 1942:353, figs. 1-6. Type-locality, Gruta del Palmito, Bustamante, Nuevo León; type deposited in Bolívar coll., Escuela Nacional de Ciencias Biológicas, México.

Description.—Length 5.0-6.2 mm. Form unusually robust and convex; elytral microsculpture finely isodiametric, dull shining. Head with sides subparallel, 1.4 times longer than wide; mentum and submentum fused, 6 prebasilar setae. Pronotum a little more than 0.9 longer than wide, sides rounded, widest at middle, hind angles small, acute; margin rather strongly reflexed; two pairs of marginal setae. Elytra less than 1.4 times as long as wide, strongly convex; one (anterior) discal puncture on 5th stria; humeral set of umbilicate punctures rather closely spaced; apical triangle reduced to one puncture (lateral); striae quite regular and well impressed, intervals subconvex near base but becoming flat by apical third. Aedeagus about 0.6 mm long, weakly arcuate, apical sensorial organ greatly reduced; parameres with 3 apical setae.

This species is known only from the type-locality, a large and well-known cavern in the Sierra de Gomas near the village of Bustamante in northwestern Nuevo

León. The cave is the northernmost locality for *Mexaphaenops* and is also inhabited by *Mexisphodrus boneti palmitensis* Barr and *Rhadine araizai* (Bolívar), two cave-associated anchomenine carabids.

Mexaphaenops sulcifrons, new species
Figs. 41, 44

Description.—A small species resembling *M. prietoi* and *M. intermedius* in subparallel head, narrow pronotum, and convex elytra, differing in sulciform frontal grooves, free mentum, and chaetotaxial features. Length 4.2-4.7, mean 4.4 ± SD 0.1 mm (n = 9). Head 1.5 times longer than wide, sides subparallel; frontal grooves deep, antennal ridge pronounced and doubled, grooves extended onto vertex, where each is delimited laterally by a low but sharp ridge; eye rudiment small, rounded, pale, circular; mentum free, 6 prebasilar setae; antenna 2/3 body length. Pronotum as long as wide, widest in apical third near anterior marginal setae, convergent behind, shallowly sinuate just before small, more or less right, blunt hind angles; both pairs of marginal setae present. Elytra very convex, 1.5 times longer than wide, with 5-6 rather deep longitudinal striae, intervals subconvex; chaetotaxy normal for *Paratrechus* series except for anterior discal puncture, which is on 4th stria, posterior discal on 5th stria or 5th interval; apical triangle complete; discal microsculpture rather strongly isodiametric. Aedeagus 0.60 mm long in holotype, basal bulb bent at right angle to median lobe, apex simply and finely attenuate in lateral view, without apical sensorial organ; parameres with 3 apical setae.

Type-series.—Holotype male (American Museum of Natural History), one male and two female paratypes, Cueva de Rancho Revilla, Tamaulipas, México, 22 August 1973, D. McKenzie and R. Jameson.

Measurements (mm).—Holotype, total length 4.72, head 0.90 long X 0.56 wide, pronotum 0.82 long X 0.82 wide, elytra 2.61 long X 1.70 wide, antenna 3.16 long, aedeagus 0.60 long.

Discussion.—This small species occurs in the Aserradero Revilla area, Conrado Castillo area, and Dulces Nombres area in the upper Río Purificación drainage basin in western Tamaulipas and eastern Nuevo León. A total of 9 specimens was examined: 4 from the type-locality, one from Cueva del Brinco section of the Sistema Purificación, 3 from Cueva X near Conrado Castillo, and one damaged male from Pozo de los Peñuelos, near Dulces Nombres, Nuevo León. It has not been taken in the Rancho Nuevo area or the Yerbabuena area. In the Conrado Castillo area it is sympatric but apparently not syntopic with *Mexaphaenops m. gracilis* and *M. jamesoni* (see the discussion under *M. jamesoni* for notes on differentiating these three taxa), and in the Pozo de los Peñuelos it coexists with *M. m. dulcinominis.*

The unusually deep frontal grooves, extended onto the vertex and laterally bounded by a sharp ridge, provide the most conspicuous diagnostic character in this smallest of all *Mexaphaenops* species. In *M. sulcifrons* the mentum is free, and the elytral and pronotal chaetotaxy is complete (unlike *prietoi* and *intermedius*); the absence of the apical sensorial organ at the tip of the aedeagus recalls the aedeagus of *prietoi.*

Mexitrechus Mateu

Mateu, 1974:207. No type-species designated, *Trechus coarctatus* Bates here proposed.

Description.—Species of medium-large size, anterior tibia grooved and pubescent on outer face, mentum free, 6 prebasilar setae, anterior discal seta situated on 5th stria, apical recurrent groove directed toward 5th stria. Head rounded, frontal grooves very deep and extended around sides of head; two supraorbital setae; labrum singly emarginate; clypeus with 2 or 4 setae; mentum tooth prominent, grooved; mentum separated from submentum by distinct suture, at least in middle; submentum with row of 6 prebasilar setae; eyes large and convex, about 1.5 times longer than length of temples behind. Pronotum strongly and transversely cordiform, convex, hind angles small and not explanate, epipleura visible from above near hind angles; one or two pairs of marginal setae, posterior pair absent in certain species. Elytra with anterior discal puncture on 5th stria, posterior discal on 3rd stria or absent; longitudinal striae reduced, 1-3 inner striae feebly impressed, outer striae obsolete; apical triangle complete; elytral microsculpture extremely fine and dense, evanescently transverse, slightly iridescent. Appendages long and slender. Aedeagus without apical sensorial organ, median lobe either simple and bluntly rounded at apex or greatly produced and dorsoventrally flattened; two subequal copulatory sclerites present, anisotopically arrranged in internal sac. Type-species: *Trechus coarctatus* Bates, here subsequently designated.

Discussion.—Mateu (1974) quite correctly stressed the distinctiveness of this group of species in the *Paratrechus* series by proposing the genus *Mexitrechus* for *coarctatus, michoacanus,* and *occidentalis.* However, *Paratrechus tepoztlanensis* and *P. quirogai* undoubtedly belong here, too: they have the same habitus and exhibit the characters listed in

the generic description above. Unlike the first three species mentioned, *P. tepoztlanensis* and *P. quirogai* have 4 clypeal setae, lack a posterior marginal seta on the pronotum, lack posterior discal punctures on the 3rd elytral stria, have somewhat more intense, satiny, elytral microsculpture, and possess a simpler aedeagus without the bizarrely produced and flattened median lobe of the first three species; the notch in the apical margin of the last abdominal sternite of males is not present in *tepoztlanensis* and *quirogai*.

The species of *Mexitrechus* are distributed in the Sierra Madre Occidental of Durango, the Oaxacan Sierra, the Sierra Madre del Sur, and the Sierra Volcánica Transversal west from Mexico City. Elsewhere in this paper the possibility that the Guatemalan cave isolate *Mayaphaenops* shares a common ancestry with *Mexitrechus* is considered. If the hypothesis is accepted that the *Paratrechus* series originated in northern South America, the *Mexitrechus* branch probably originated in an early northward dispersal through Central America into the Oaxacan Sierra, spreading into the Sierra Volcánica Transversal and ultimately the Sierra Madre Occidental. In this interpretation *Paratrechus* itself arrived later in southern México, spreading northward through the Sierra Volcánica Transversal and northeastward into the Sierra Madre Oriental, eventually retreating from the latter area,

Key to Species of *Mexitrechus* Mateu

1. Clypeus with 2 setae each side; pronotum without setae in hind angles; posterior discal seta of elytron absent; elytral microsculpture more intense, satiny, with finely transverse meshworks; male without notch in apical margin of last abdominal sternite; aedeagus with simple, arcuate median lobe, apex bluntly rounded. 2

   Clypeus with one seta each side; pronotum with marginal setae in apical third and also in hind angles; elytra with anterior discal seta on 5th stria and posterior discal seta on 3rd stria; elytral microsculpture extremely fine, obsolete, polished; male with deep, triangular notch in apical margin of last abdominal sternite; aedeagus with median lobe greatly produced and dorsoventrally flattened 4

2(1). Form less slender, pronotum hind angles sharp, right or acute; aedeagus with apex slightly produced and narrowed, feebly reflexed; Guerrero, Morelos, Edo. de México 3

   Form more slender, pronotum hind angles blunt and slightly obtuse; aedeagus with apex bluntly rounded, apex not produced; Mil Cumbres, Michoacán. . . . . *quirogai* (Bolívar)

3(2). Hind angles of pronotum moderately reflexed; color dark castaneous, appendages paler; aedeagus larger, more than 1 mm long, apex rather blunt; Morelos, Guerrero, México . . . . . *tepoztlanensis* (Bolívar)

   Hind angles of pronotum sharply reflexed and acute; head, pronotum disc, and segments 2-4 of antenna dark piceous, elytral disc piceous; appendages, scape, outer antennal segments, and elytral margin testaceous; aedeagus smaller, less than 1 mm long, apex narrower and sharper; Guerrero (Grutas del Mogote) . . . . . *mogotensis*, n. sp.

4(2). Elytra 1.5 times longer than wide, apical groove wide and short, recurrent portion not attaining level of anterior apical puncture; apical triangle strongly oblique, anterior apical puncture closer to suture than posterior apical puncture 5

   Elytra narrower, 1.6 times longer than wide, apical groove narrow and long, recurrent portion attaining level of anterior apical puncture; apical triangle not oblique, posterior apical puncture directly behind anterior apical; head wider than long (L/W 0.85), pronotum narrow at base (apex/base 1.2); aedeagus with produced portion of median lobe sharply reflexed; states of México, Guerrero, Michoacán . . . . . *michoacanus* (Bolívar)

5(4). Head as long as wide; pronotum narrower at base (apex/base 1.1); produced portion of aedeagal median lobe straight; Oaxaca. . . . . *coarctatus* (Bates)

   Head wider than long (L/W 0.9); pronotum base wider than apex (apex/base 0.95); produced portion of aedeagus median lobe sharply reflexed (as in *michoacanus*); vicinity of La Ciudad, Durango . . . . . *occidentalis* Mateu

where it has left troglobitic representatives, as the area became warmer and semiarid.

coarctatus group

Mexitrechus coarctatus (Bates)
Figs. 45, 48

Trechus coarctatus Bates, 1881:136, pl. 6, fig. 3. Type-locality, Oaxaca, México; type in British Museum of Natural History.

Mexitrechus coarctatus: Mateu, 1974:209.

Description.—Length 5.3-6.6, mean 6.1 ± SD 0.3 mm (n = 31). Piceous black, satiny-shining; form elongate and subconvex. Head as long as wide, eyes convex, 1.5 times longer than temples behind; labrum singly and rather deeply emarginate; frontal grooves deep; only 2 clypeal setae present; mentum usually incompletely fused to submentum, suture closed only at sides in most specimens examined but completely open in a few specimens. Pronotum strongly and transversely cordiform, 0.8 as long as wide, greatest width in apical third, width at apex 1.1 times width at base and 0.6 greatest width; sides strongly arcuate in apical 6/7, subparallel in basal seventh; hind angles about right and rather sharp; two pairs of marginal setae present. Elytra 1.5 times longer than wide, elongate, rather wide and subparallel, subconvex overall and depressed on central disc in basal half; anterior discal puncture on 5th stria, posterior discal on 3rd stria; apical triangle complete, punctures forming an oblique isosceles triangle, anterior apical nearest suture and 1.5 times farther from lateral and posterior punctures as the latter are from each other; apical groove wide, short, directed toward apex of 5th (?) stria; with one or two finely impressed inner striae, outer striae obsolete, sometimes represented by evanescent traces. Male with deep, triangular notch in apical margin of last abdominal sternite. Aedeagus very elongate, apex produced, apical margin finely umbonate in dorsal view, two copulatory sclerites present.

Discussion.—Mateu (1974) selected a lectotype from the Bates material in the Oberthür collection, Paris, presumably collected by Höge somewhere in the state of Oaxaca. Additional specimens from the type-series are preserved in the British Museum of Natural History, including a specimen labeled "type," which I have seen. All of the specimens which I have seen (38) are from 9 rather widely separated localities in Oaxaca: 1) Route 190, 55 km NW Oaxaca, oak forest; 2) Microondas Station, 0.8 km E Jct. Routes 190 and 125, elevation approximately 2530 m; 3) 147 km S Valle Nacional (Route 175), 2400 m; 4) 36.3 km N Juchatengo, 2160 m, 5) 15.7 km S Route 190, road to Ojo de Agua, oak-pine zone, *Alnus*, near stream in litter, 2320 m; 6) 2 km W Capulalpam, oak-pine-forest (dry), in litter, 2010 m; 7) west of Santa María Nizavaguita, 16°04' N X 95°50' W, oak-pine forest (dry), creek with *Alnus*, 1670 m; 8) 1.3 km N San Pedro y San Pablo Ayutla, Route 179, creek margin, 1960 m; 9) 14.3 km E Ixtlán de Juárez, oak-pine forest (dry), 2030 m. This material was collected by G. E. Ball and his associates. At locality 1) Ball (in litt.) reports: "North-facing slope, cut by narrow, deep gullies which are wet in their upper reaches—seeps, not abundant flowing water. Forest predominantly oak-pine-madroño, with ferns near gullies. Tree cover open, understory rather rich; litter rather deep (several inches) to about a foot in gullies; specimens. . .found only in litter in gullies, and in very wet places."

This species is clearly related to *M. michoacanus* and *M. occidentalis* by the form of the aedeagus, the presence of 2 clypeal setae, complete sets of pronotum marginal and elytral discal setae, and the notch in the last abdominal sternite of the male. The greatly produced and flattened aedeagal apex is highly diagnostic.

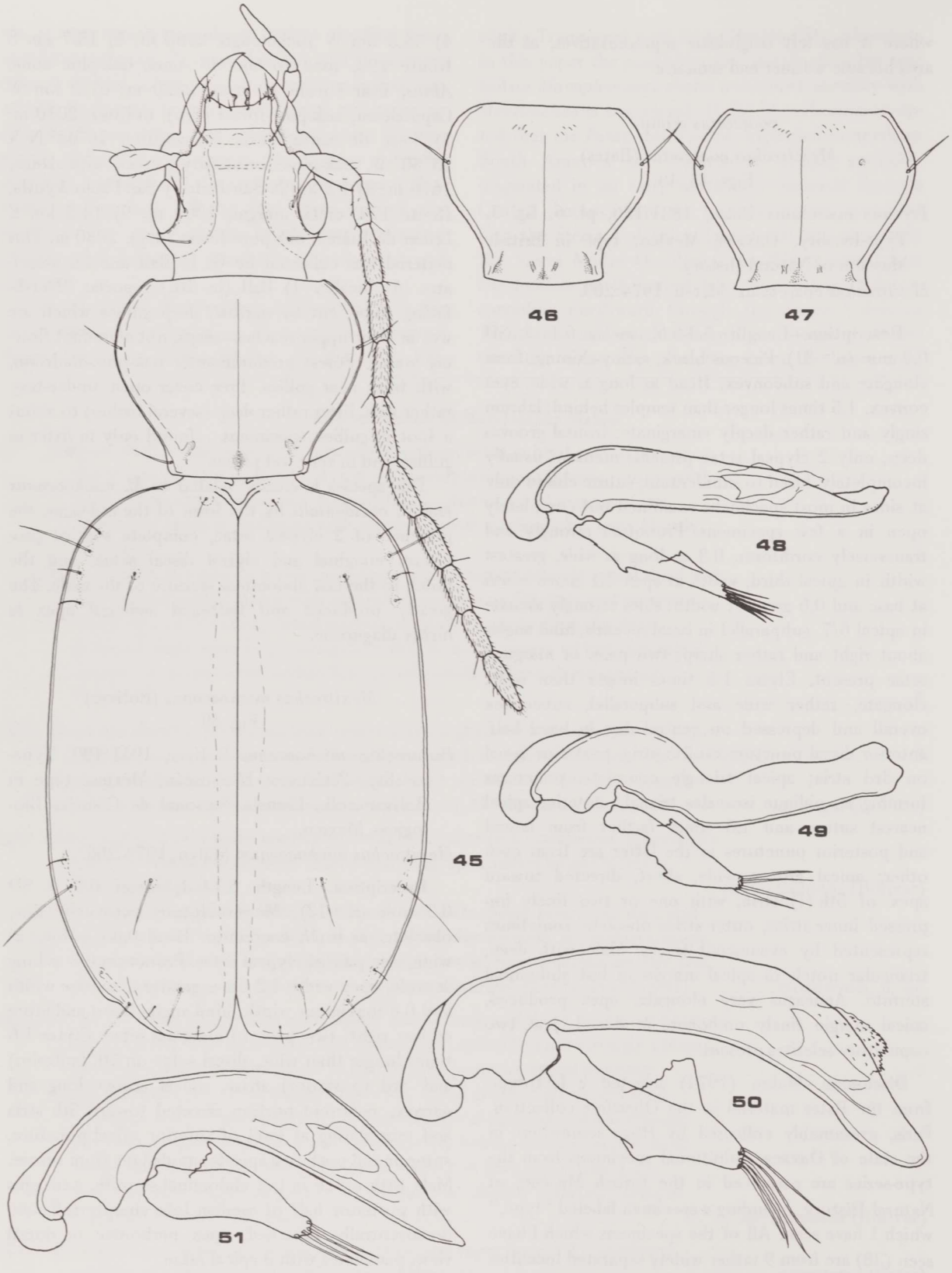
Mexitrechus michoacanus (Bolívar)
Fig. 49

Paratrechus michoacanus Bolívar, 1941:190. Type-locality, Zitácuaro, Michoacán, México; type in Bolívar coll., Escuela Nacional de Ciencias Biológicas, México.

Mexitrechus michoacanus: Mateu, 1974:208.

Description.—Length 5.1-6.3, mean 6.0 ± SD 0.3 mm (n = 13). Microsculpture extremely fine, obsolete, as in *M. coarctatus*. Head 0.85 as long as wide, one pair of clypeal setae. Pronotum 0.8 as long as wide, apex width 1.2 times greater than base width and 0.6 maximum width; hind angles blunt and more or less right; two pairs of marginal setae. Elytra 1.6 times longer than wide, discal setae on 5th (anterior) and 3rd (posterior) striae, apical groove long and narrow, recurrent portion directed toward 5th stria and terminating at level of anterior apical puncture; anterior and posterior apicals equidistant from suture. Male with notch in last abdominal sternite. Aedeagus with posterior half of median lobe sharply reflexed, dorsoventrally flattened, apex umbonate in dorsal view, parameres with 3 apical setae.

Discussion.—This species is close to *coarctatus* but is readily differentiated by characters given in the key and the abbreviated description above. I have seen 13 specimens: 1) 23.2 km W Chilpancingo, 1920 m,



Figs. 45-51.—*Mexitrechus:* 45, *M. coarctatus,* Oaxaca; 46, *M. tepoztlanensis,* pronotum of paratype, Tepoztlán; 47, *M. mogotensis,* n. sp., pronotum of holotype, Grutas del Mogote; 48, *M. coarctatus,* aedeagus, Oaxaca, length 1.50 mm.; 49, *M. michoacanus,* aedeagus, Zitácuaro, same scale as Fig. 48; 50, *M. tepoztlanensis,* aedeagus, Omiltemi, length 1.01 mm (twice scale of Fig. 48); 51, *M. mogotensis,* aedeagus of holotype, same scale as Fig. 50.

Guerrero; 2) Río de Molino, near Valle de Bravo, 1980 m, Edo. de México; 3) Omiltemi, 2225 m, Guerrero. All of these specimens were collected by G. E. Ball; the Omiltemi specimen was taken along with 15 specimens of *M. tepoztlanensis*. Ball (in litt.) described the site near Chilpancingo, where 8 specimens were collected, as follows: "Canyon, with rather steep slopes; palm-oak-pine association. Soil clay with little or no humus in canyon bottom; more humus on slopes. Soil generally dry, but damp around ponds in canyon bottom. Specimens collected in leaf litter near ponds, and in dry places on slopes."

Mexitrechus occidentalis Mateu

Mateu, 1974:208. Type-locality, "8 km antes de llegar a La Ciudad," Durango; type deposited in Mateu collection, Paris.

This species is remarkably close to *M. michoacanus*, differing principally in the relatively shorter elytra, slightly more rounded humeri, broader and shorter apical groove, and very oblique apical triangle. The aedeagus of the only known male (figured by Mateu, 1974:fig. 22, p. 223) shows the same pattern as that of *M. michoacanus*, but the ventral margin of the median lobe is not deeply scalloped out before the flexure of the long, reflexed, produced apex.

Although Mateu states that the posterior pronotal marginal seta is missing in the holotype, it is present in two females which I have seen: 1) 40 km W La Ciudad, H. F. Howden, in Canadian National Collection; and 2) 68 km SW La Ciudad, S. B. Peck, in T. Barr collection.

tepoztlanensis group

Mexitrechus tepoztlanensis (Bolívar)
new combination
Figs. 46, 50

Paratrechus tepoztlanensis Bolívar, 1941a:193. Type-locality, Tepoztlán, Morelos, México; type in Bolívar coll., Escuela Nacional de Ciencias Biológicas, México. Bolívar, 1943a:168. Mateu, 1974:200. Vigna Taglianti, 1972:119.

Description.—Length 5.2-6.0, mean 5.6 ± SD 0.2 mm (n = 18). Dark piceous, appendages paler. Head a little longer than wide, two pairs of clypeal setae. Pronotum 0.8 as long as wide, width at apex 0.6 maximum width and 1.05 base width; hind angles about right, produced slightly to the sides and usually sharp; pronotum with anterior marginal setae only, posterior setae absent. Elytra 1.5 times longer than wide, anterior discal puncture on 5th stria, posterior discal absent, 2-3 longitudinal striae present; apical groove wide and rather long, recurrent portion ending at level of anterior apical puncture; apical triangle oblique, anterior apical much closer to suture than posterior apical; microsculpture more intense than in *M. coarctatus*, fine transverse meshworks discernible, surface of disc satiny-iridescent. Aedeagus simple, arcuate, apex finely produced, quite bluntly rounded, and slightly reflexed; parameres typically with 5 long setae.

Discussion.—I have seen 18 specimens of this species, including a female paratype given me by Dr. Bolívar and two topotypes (R. T. Bell) from Tepoztlán, and 15 specimens from Omiltemi, 2225 m, Guerrero (G. E. Ball). Vigna Taglianti (1972) recorded *M. tepoztlanensis* from the Cueva de Coatepec, México, and illustrated male and female genitalia.

The habitat at Omiltemi was described by Ball (in litt.): "A wet canyon; soil loam, clay, and gravel. Vegetation oak-pine to cloud forest, the latter very rich in species, including large trees, Spanish moss and other bromeliads. Litter varying from deep to shallow (eight inches to thin layer). Exposed gravel along road, which is much like a stream bed. Specimens in wet places, under stones at edge of road." Further information on this locality was provided by Ball and Whitehead (1967).

Neither *M. tepoztlanensis* nor *M. michoacanus* seems deterred by the lowland valley of the Río Balsas, which separates the localities from which the two species have been collected in the Sierra Volcánica Transversal and the Sierra Madre del Sur, respectively. However, Bolívar (1943) discussed the variability of wings in these two species, noting that macropterous, brachypterous, and micropterous individuals occur. These more extensive geographic ranges (as well as that of *M. coarctatus*) contrast with the much more limited ranges of the predominantly micropterous species of *Paratrechus*.

Mexitrechus mogotensis, new species
Figs. 47, 51

Description.—Length 5.6-5.8 mm. Closely similar to *M. tepoztlanensis*, differing in wider head (L/W 0.9), proportionately greater width of pronotum apex (apex width/base width 1.12, apex width/max. width 0.66), and paler coloration: head, pronotum disc, and antennal segments 2-4 infuscated, elytral disc pale piceous; appendages, scape, outer antennal segments, and elytral margins testaceous; hind angles of pronotum laterally more strongly produced and acute, antebasal sinuation, in basal sixth, deeper. Aedeagus of holotype 0.88 mm long, shorter and more arcuate than in *tepoztlanensis*, apex narrower and sharper at tip; parameres with 4 apical setae.

Type-series.—Holotype male (American Museum of Natural History), Grutas del Mogote, Guerrero, México, 25 August 1965, J. R. Reddell; one female paratype, same cave, 22 December 1966, T. Raines.

Measurements (mm).—Holotype, total length, 5.84, head 0.98 long X 1.13 wide, pronotum 1.13 long X 1.39 wide, elytra 3.35 long X 2.26 wide, antenna 3.78 long, aedeagus 0.88 long.

Discussion.—The wider head, wider pronotum apex, and laterally explanate, very sharp hind angles of the pronotum are probably better diagnostic characters than the color, which may possibly be phenotypic. The aedeagus is quite different. The geographic position of the Grutas del Mogote, well within the known range of *M. tepoztlanensis*, makes it most unlikely that this taxon is a geographically

Fig. 52.—Distribution of troglobitic species of the *Paratrechus* series: 1, Gruta del Palmito *(Mexaphaenops prietoi);* 2, Río Purificación area *(M. mackenziei, M. jamesoni, M. febriculosus, M. sulcifrons);* 3, Sótano de Riachuelo *(Paratrechus laticeps);* 4, Gómez Farías area and Sótano de la Joya de Salas *(M. intermedius);* 5, Valle de los Fantasmas and Sótano de la Golondrina *(M. fishi);* 6, Pinal de Amoles area *(M. elegans, P. pallescens);* 7, El Doctor platform *(P. contrarius);* 8, Cueva del Volcancillo *(P. reddelli);* 9, San Cristóbal area *(Chiapadytes bolivari);* 10, Resumidero Chico *(Mayaphaenops sbordonii).*

peripheral subspecies. In any case the degree of difference between *tepoztlanensis/mogotensis* approaches that of *tepoztlanensis/quirogai* and *michoacanus/occidentalis.* In no way does *M. mogotensis* appear to be an obligate cave form, however, and epigean specimens should be looked for in the vicinity of the type cave.

Mexitrechus quirogai (Bolívar), new combination

Paratrechus (s. str.) *quirogai* Bolívar, 1943:171. Type-locality, Mil Cumbres, Michoacán, México; type in Bolívar coll., Escuela Nacional de Ciencias Biológicas, México.

Length 5.3 mm. Resembling *M. tepoztlanensis,* but pronotum hind angles not explanate and obtuse rather than acute; aedeagus with apex less attenuate than in *tepoztlanensis.*

This species is known only from two males taken at Puerto del Presidente Ortiz Rubio, Mil Cumbres, Michoacán. Both *M. michoacanus* and *Paratrechus bolivari* have been collected in the vicinity of Mil Cumbres. But *M. quirogai* clearly is closely related to *tepoztlanensis* and *mogotensis* and certainly belongs in *Mexitrechus.* I have not seen the type or paratype but have checked the characters given in the key with the late Dr. Bolívar (Bolívar, in litt.).

Mayaphaenops Vigna Taglianti

Vigna Taglianti, 1977:334, figs. 3, 4; type-locality, Resumidero Chico, Huehuetenango, Guatemala; type deposited in Vigna Taglianti collection, Rome.

This genus is known only from the unique male holotype of *M. sbordonii,* which I have not seen. However, the excellent and detailed description suggests that it may be related to *Mexitrechus. Mayaphaenops sbordonii* is a species of small size (4.4 mm), completely lacking an eye rudiment, with strongly cordiform pronotum in which epipleura are visible from above, nearly complete elytral chaetotaxy (lacking only the apical puncture of the apical triangle), the apex of the aedeagus briefly produced (lateral view) and bluntly rounded. The anterior discal puncture is situated on the 3rd stria.

The form of the pronotum, strongly cordiform with small, non-explanate hind angles and epipleura visible from above, is identical to that observed in *Mexitrechus.* Other similarities are a) mentum free, with 6 prebasilar setae; b) reduced elytral striation; c) fine, dense, and evanescently transverse elytral microsculpture; d) aedeagus with apex bluntly rounded, without a sensorial organ, resembling that of *M. tepoztlanensis, M. quirogai,* and *M. mogotensis);* and e) the presence of a distinct transfer apparatus (though apparently of a single lamella instead of two anisotopic pieces).

There are almost certainly many epigean and cavernicolous trechines in México and Central America which have not yet been discovered. The comparatively inaccessible and scarcely collected Cordillera in northwestern South America could ultimately yield many more undiscovered species which will fill in many gaps in phylogenetic series. For the moment we can indulge in phylogenetic speculation in the hope and realization that future discoveries will improve and correct our tentative theories. In this context the hypothesis that *Mayaphaenops* is derived from the same stock as *Mexitrechus* is both morphologically and geographically viable.

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REGRESSIVE EVOLUTION AND PHYLOGENETIC AGE: THE HISTORY OF COLONIZATION OF FRESHWATERS OF YUCATAN BY FISH AND CRUSTACEA[1]

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ABSTRACT

Distribution and composition of the limnic fauna of northern Yucatán are strongly influenced by the karstic character of the peninsula. In the inner parts epigean fish can only be found in the so-called cenotes. With the exception of two species all are secondary freshwater fish, which can be derived from the species-spectrum of the coastal lagoons. They remained behind when the sea retreated from parts of Yucatán in Pleistocene times.

In the vast subterranean cave system of Yucatán live a series of eye- and pigment-reduced fish and crustaceans of marine as well as limnic descent. They all originally started troglobitic evolution in caves of the former Pliocene shorelines, after having been isolated by the Pleistocene marine regression. Whereas the distribution of the cave fish still shows relations to the ancient Pliocene shoreline, the crustaceans have secondarily spread all over northern Yucatán.

The limnic cave species show a comparatively lesser degree of eye- and pigment-reduction than the marine derivatives. This is attributed to a more recent beginning of regressive evolution in these forms.

No characteristics of regressive evolution are shown by the widely distributed catfish *Rhamdia guatemalensis* (Pimelodidae) as well as by the characid *Astyanax fasciatus*, both of which have developed typical cavernicolous populations in other parts of México. This is possibly caused by an insular character of northern Yucatán during Pleistocene, by which the two salt-sensitive primary freshwater fish species were hindered from invading the peninsula until more or less recently. By this the distributional pattern of *Astyanax fasciatus*, which is restricted to a narrow coastal area in northern Yucatán, could be explained, too.

[1] This article is a revised translation of: H. Wilkens, 1979, Reduktionsgrad und phylogenetisches Alter: Ein Beitrag zur Besiedlungsgeschichte der Limnofauna Yukatans. Z. Zool. Syst. Evolut.-forsch., 17:262-272.

INTRODUCTION

The northern part of the Yucatán Peninsula of México is a flat karst plain without major differences of elevation. It is characterized by a vast subterranean freshwater system that reaches from the interior to the coastal area. Stagnant epigean fresh waters are found almost exclusively in numerous sinkholes, the so-called cenotes (for further details see Reddell, 1977). Surface rivers are absent north of the Río Champotón.

Cenotes usually have a more-or-less circular form of about a hundred or more meters in diameter. Depending on the surrounding elevation, the water surface lies almost at an equal level to the surroundings or considerably below this. Accordingly, narrow reed banks may develop, if vertical limestone walls do not border the water body.

The coasts of Yucatán are characterized by the existence of lagoons. They contain water of varying degrees hypo- or hyper-salinity and are subjected to tidal movements of greater or lesser intensity. Especially in the eastern coast region of Yucatán, several former lagoons have developed into freshwater lakes by being separated from the sea. This is true, for example, of the Laguna de Chichancanab, which is situated in interior Yucatán.

The paleogeographic development of Yucatán is characterized by the fact that as early as Pliocene, a central part of the peninsula lay above sea level. On the other hand, a broad surrounding coastal margin emerged as late as the Pleistocene. This part was

probably again submitted to marine transgressions of an unknown extent during the interglacial periods (Weyl, 1970a, 1970b; Wilhelm and Ewing, 1972; Ramos, 1976).

The karst character of the peninsula is responsible for the existence of a relatively large number of cave-dwelling animals, which belong mainly to the teleostean fish and crustacea (Hubbs, 1936; Cárdenas Figueroa, 1950; Solorzano, 1953; Hobbs and Hobbs, 1976; Holthuis, 1977; Reddell, 1977). During research projects on the tempo of regressive evolutionary processes it was necessary to study the history of colonization of epigean and hypogean freshwaters of Yucatán on a larger scale (Wilkens, 1973, 1979).

THE EPIGEAN ICHTHYOFAUNA

The ichthyofauna of the freshwaters of northern Yucatán is characterized by the occurrence of a low number of species. In the cenotes of the interior only the fish *Gambusia puncticulata yucatana* Regan, 1914 (Poeciliidae, Fink, 1971), *Cichlasoma urophthalmus* (Günther, 1862) (Cichlidae) and *Rhamdia guatemalensis* Günther, 1864 (Pimelodidae) are to be found. The isolated character of many of the localities causes a relatively high variability of meristic features and is the reason for the taxonomic description of several subspecies of these forms. It is only close to the coastlines that the number of species living in cenotes becomes larger. Here *Astyanax fasciatus* (Cuvier, 1819) [=*A. mexicanus* (Filippi, 1853)] (Miller, 1976) (Characidae), *Belonesox belizanus* Kner, 1860, *Poecilia sphenops* Cuvier and Valenciennes, 1864, or *P. velifer* (Regan, 1914) (Poeciliidae) may also be found (Fig. 1).

The ichthyofauna of the brackish, in part even hypersaline, lagoons distributed along the coast of Yucatán is relatively rich in species. Besides marine elements, mainly species of the families Cyprinodontidae (5) and Poeciliidae (5) are present (Hubbs, 1936). With the exception of *Astyanax fasciatus* and *Rhamdia guatemalensis* all forms typical of the cenotes can be found as well.

The composition and distribution pattern of the epigean freshwater fish fauna of northern Yucatán is strongly influenced by hydrological factors. On account of the lack of surface rivers not only does a series of ecotypes not even exist, but the spread of most species is made more difficult. However, the effects of this have probably been partly compensated by the fluctuations of marine interglacial trans- and regressions. In the course of these processes, species living in coastal lagoons invaded inland waters and were isolated there. For this reason the ichthyofauna of the cenotes has to be regarded as derived from the species spectrum of the lagoons; only the number of species is reduced.

The occurrence of only a low number of species has several reasons. The most important reason is that the cenotes are biotopes characterized by very few habitats. The lowest number of species therefore live in the deep-lying cenotes of interior Yucatán. As derivatives of the lagoon fauna, only the most euryeceous forms *(Cichlasoma urophthalmus* and *Gambusia puncticulata yucatana)* could persist. Contrary to this, the cenotes situated nearer to the coast are richer in species. In addition to *C. urophthalmus* and *G. puncticulata yucatana*, several live-bearing tooth carps can be found here *(Belonesox belizanus, Poecilia sphenops, P. velifera).*

The fish fauna of the lake-like Laguna de Chichancanab, which is represented by *Cyprinodon beltrani* and *Gambusia puncticulata yucatana*, must also be regarded as derived from that of the lagoons. *C. beltrani* is closely related to *C. variegatus*, a form which inhabits the coastal lagoons. *C. variegatus* as well as *G. puncticulata yucatana* are extremely resistant to high values of temperature and salinity as well as to low oxygen content. Both can be found under extremely hypersaline conditions and where temperatures are more than 30° C in lagoons. This shows that they are very tolerant to processes of evaporation and salt concentration that probably occurred when the Laguna de Chichancanab was separated from the sea.

Unlike the above-mentioned species, two fish, the pimelodid *Rhamdia guatemalensis* and the characin *Astyanax fasciatus*, cannot be regarded as lagoon derivatives. These are primary freshwater fish, which are according to Myers (1966) salt sensitive.

The wide distributional range of *Rhamdia guatemalensis* in northern Yucatán can be explained by the fact that this night-active catfish colonized this region by way of the subterranean freshwater system, whereas *Astyanax fasciatus* obviously did not succeed in doing so. The latter species is restricted relatively closely to the coast. On account of this distribution pattern of *Astyanax fasciatus*, it must be concluded that this species was not able to colonize Yucatán by use of the underground water system. As will be shown later, *Astyanax fasciatus* took advantage of slightly brackish coastal water systems.

THE SUBTERRANEAN FISH AND CRUSTACEAN FAUNA

The fauna of the subterranean freshwater system of Yucatán is mainly composed of crustaceans and teleostean fish. With regard to the number of species, the number of individuals, and the distrubiton range, the crustaceans play the dominant part. They are

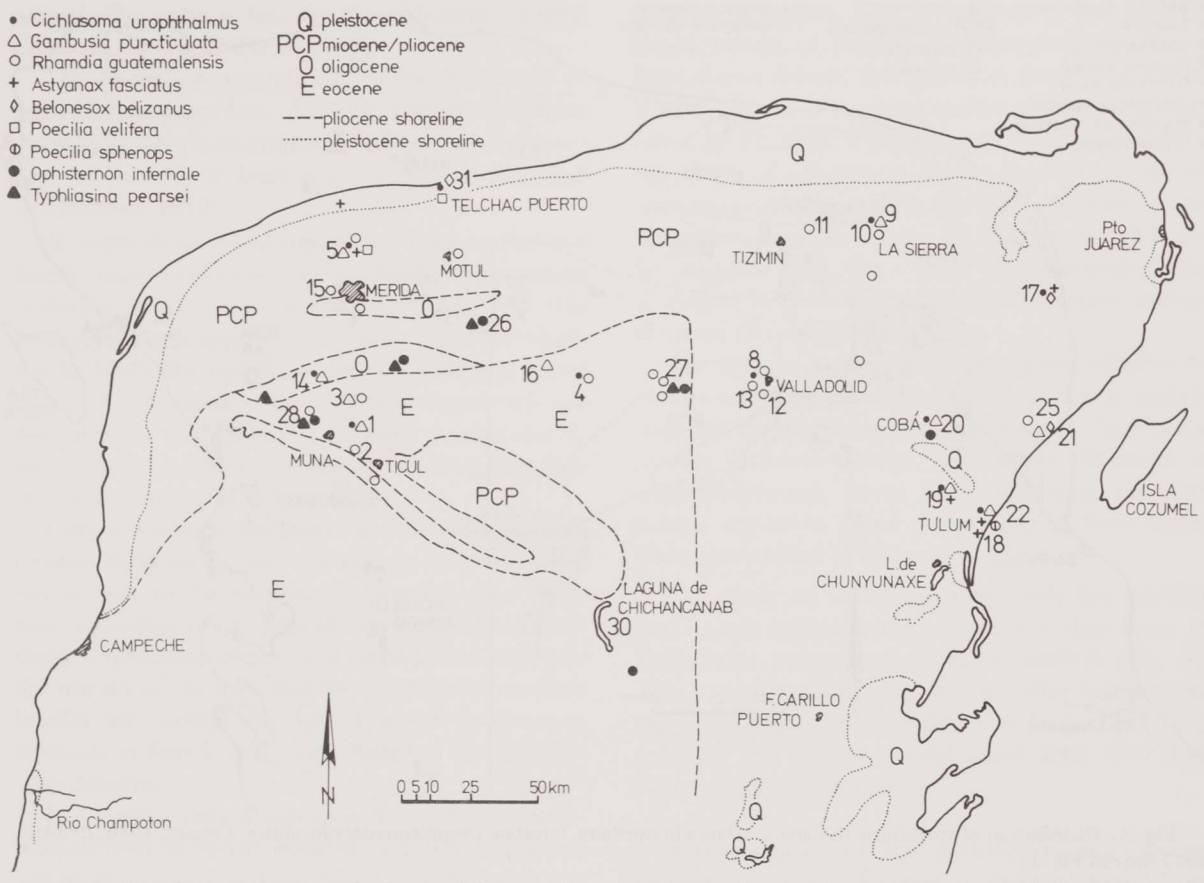

Fig. 1.—Distribution of epigean freshwater fish in northern Yucatán. (1) Cenote Sabacah, NE Sacalum; (2) Cenote Nohchén in Sacalum; (3) Cenote near Mukuyché; (4) Cenote Xtojil, Libre Unión; (5) Cenote in Dzibilchaltún; (6) Cenote Media Luna, Dzibilchaltún; (7) Cueva Santa Elena, 4 km S Telchac Puerto; (8) Cenote Zaci, Valladolid; (9) Cenote near La Sierra; (10) Cave near La Sierra; (11) Cenote N km 36 Tizimín-La Sierra; (12) Cenote Chichium, Valladolid; (13) Cenote Xkekén near Valladolid; (14) Cenote km 170 Mérida-Muna; (15) Cueva Luchil, Hacienda Tixcacal near Mérida; (16) Cenote Holcá; (17) Cenote km 267 Valladolid-Puerto Juárez; (18) Cave, Tulum, 3.7‰; (19) Cenote km 8 Tulum-Cobá; (20) Lakes at Cobá; (21) Cenote near Pamul; (22) Cenote 2 km N Tulum, 5.7‰; (24) Cueva Coop, Pamul; (25) Cueva Ajín, Pamul; (26) Cueva Hoctún; (27) Cueva Balaamcanche; (28) Cueva del Pochote; (30) Laguna de Chichancanab (de Santa Rosa); (31) Lagoons near Telchac Puerto. (Supplementary localities: Hubbs, 1936; geology: Ramos, 1976).

represented by four species of shrimps, *Creaseria morleyi* (Creaser, 1936) (Palaemonidae), *Typhlatya campecheae* Hobbs and Hobbs, 1976, *T. pearsei* Creaser, 1936, and *T. mitchelli* Hobbs and Hobbs, 1976 (Atyidae); by isopods [*Creaseriella anops* (Creaser, 1936)]; mysids *(Antromysis cenotensis* Creaser, 1936); and amphipods (*Mayaweckelia* specs.). With the exception of *Typhlatya campecheae* and an amphipod *(Mayaweckelia yucatanensis* Holsinger, 1977), which have only been found at few localities until now, the other species are spread all over northern Yucatán (Fig. 2).

In the subterranean cave systems of the peninsula, three species of fish can be found. They are *Typhliasina pearsei* (Hubbs, 1936) (Ophidiidae) (=*Ogilbia pearsei* according to Cohen and Nielsen, 1978), *Ophisternon infernale* (Hubbs, 1936) (Synbranchidae), and the pimelodid *Rhamdia guatemalensis*, which has already been mentioned. Whereas *Rhamdia guatemalensis*, like most of the crustaceans, is distributed almost all over northern Yucatán, the occurrence of *Ophisternon infernale* and *Typhliasina pearsei* is limited to a few localities. Furthermore, it can be observed that both forms are usually associated with each other. It is remarkable that so far *Rhamdia guatemalensis* has been found additionally only in a single cave.

ORIGIN AND EVOLUTION OF THE CAVERNICOLOUS FAUNA OF YUCATAN

The crustaceans as well as the fish living in the subterranean water systems are limnic, as well as marine, derivatives. The fish *Typhliasina pearsei*, the shrimp *Creaseria morleyi*, and the isopod *Creaseriella anops*

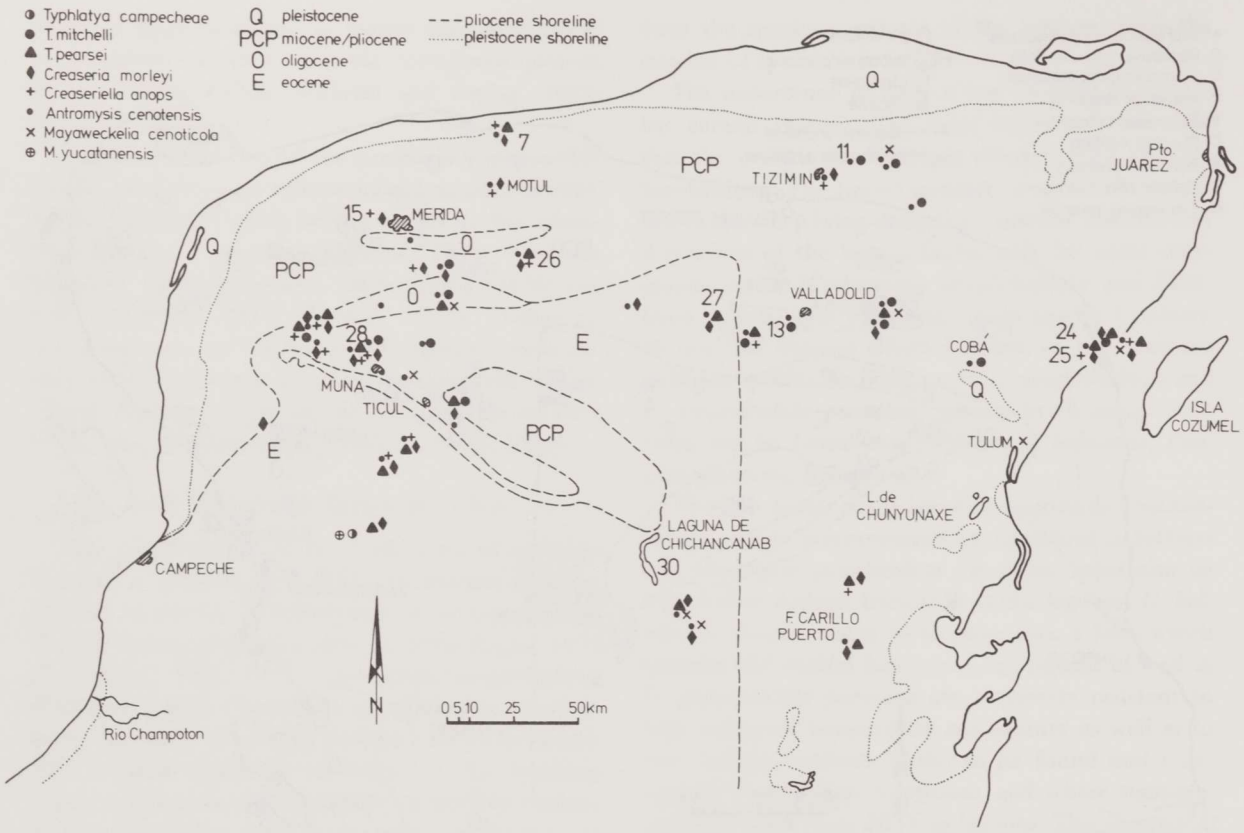

Fig. 2.—Distribution of troglobitic fish and crustacea in northern Yucatán. (Supplementary localities: Creaser, 1936; Reddell, 1977; legend Fig. 1).

are derived from marine forms. The ancestor of *Typhliasina pearsei* is *Ogilbia cayorum* Everman and Kendall, 1879, which can be found even today in littoral biotopes of adjacent regions (Steven-Suarez, 1975).

Contrary to this, the fish *Ophisternon infernale* and the amphipods are related to freshwater species (Greenwood and Rosen, 1976; Holsinger, 1977). The probable ancestor of *Ophisternon infernale* is *O. enigmaticum* (Greenwood and Rosen, 1976), a secondary freshwater fish living in México and even in Cuba. The origin of the shrimp genus *Typhlatya* is uncertain. A brackish ancestry can be supposed (Peck, 1974; Hobbs et al., 1977).

The transition of marine species to limnic cave forms is dependent on the existence of coastal caves. In these special biotopes, pre-adapted marine forms develop independent populations. One of the more essential prerequisites is viviparousness or a comparable way of hatching. Regressive evolutionary processes will only start when cave systems inhabited by such populations are isolated from the sea. At that moment the gene flow is interrupted (Riedl, 1966; Wilkens and Parzefall, 1974).

In the case of the marine cave derivatives of Yucatán, it is supposed that they started cavernicolous evolution in coastal caves of the Pliocene shoreline. Because the Pleistocene coasts were probably fluctuating, it is possible that populations did not have enough time for an evolutionary change from marine to limnic physiology. Furthermore, these populations were probably eliminated by the interglacial marine transgressions.

The supposed beginning of the cavernicolous evolution of cave animals along the Pliocene coast might also be verified by the position of the localities where the cave fish *Typhliasina pearsei* and *Ophisternon infernale* are found. Except for one, all of them show a relatively close position to the ancient Pliocene coast.

The great distance of these caves from one another supports the assumption that at least some populations have even a polytopic origin. As has been shown for a number of cave forms of *Astyanax fasciatus* in central México and for many other troglobitic species, eyes and pigment can be reduced convergently in different populations of one species.

The simultaneous beginning of the cavernicolous evolution of the marine derivatives is further supported by the fact that the degree of eye and pigment reduction in all populations seems not to diverge. There is no difference between the eye rudiments of two 100 km distant populations of *Typhliasina*

pearsei. The same is true for the widespread shrimp *Creaseria morleyi* (Wilkens, 1973).

The cavernicolous evolution of the cave forms of freshwater descent had obviously started simultaneously, too. This is demonstrated by the fish *Ophisternon infernale* in at least two populations (Parzefall and Wilkens, 1972).

It seems to be characteristic for Yucatán that the limnic cave derivatives started their cavernicolous evolution in caves of the Pliocene coast, also. This assumption is supported by the position of the localities in which the fish *Ophisternon infernale* is found today. Furthermore, the identical degree of eye reduction in the shrimps *Typhlatya pearsei* and *T. mitchelli* can hardly be explained, assuming that they started the process at different times.

Only secondarily do marine as well as limnic cave crustaceans seem to have spread over northern Yucatán by way of the subterranean water system. However, according to our present knowledge, the teleosteans *Typhliasina pearsei* and *Ophisternon infernale* did not do so. As indicated above, the localities they inhabit are, except for one in which *Ophisternon infernale* is found, still concentrated at the old Pliocene shoreline.

It is a remarkable observation that with one exception the two extremely reduced cave fish, as pointed out above, have not been found together with the widely distributed pimelodid *Rhamdia guatemalensis* at the same locality. The reasons for this latter fact and the restriction of *Typhliasina pearsei* and *Ophisternon infernale* to few caves located at the Pliocene shoreline are uncertain. It may be explained by ecological competition. Another explanation might be the isolation of the caves inhabited by them from the rest of the subterranean water system.

THE AGE OF THE AQUATIC FAUNA OF NORTHERN YUCATAN

As can be concluded from the paleographical development, the recent epigean freshwater ichthyofauna was only able to colonize the major part of northern Yucatán at the earliest from the beginning of Pleistocene times. Possibly this happened even later, because the cenotes as sinkholes and the subterranean system of caverns had to have developed before this. This must have happened during the time of a marine regression. Only after another transgression could fish populations then become isolated in waters remaining on the former sea bottom.

The extent of the different marine transgressions during Pleistocene can only be estimated approximately. Probably not all of them reached the former Pliocene shoreline. This is verified by the distributional pattern of the fish *Astyanax fasciatus*. As has been shown before, this species is distributed within a relatively narrow coastal border and not in the interior of Yucatán. This can only be explained by a low range of submersion during the last interglacial transgression, because this fish only colonized Yucatán by use of epigean waters. In this connection it can be expected that the extent of the transgressions decreased because a simultaneous elevation process occurred (Weyl, 1970a, 1970b).

The way in which the cavernicolous evolution of marine cave derivatives develops in general is responsible for the beginning of this process in *Typhliasina pearsei*, *Creaseria morleyi*, and *Creaseriella anops* at early Pleistocene times. Only following the first marine regression could populations of these forms become separated in former coastal caves.

The study of *Ophisternon infernale* has revealed that its eye rudiments are less reduced than those of *Typhliasina pearsei* and *Creaseria morleyi* (Fig. 3). This is explained as being due to a later beginning of regressive evolution. Probably this form could only colonize the former coastal caves after they had become at least brackish.

Whereas most of the above-mentioned species colonized northern Yucatán at the beginning of, or early in the Pleistocene, two of them, *Rhamdia guatemalensis* and *Astyanax fasciatus*, seem to diverge from this principle. As neotropic primary freshwater fish, both forms could only move northward after a land bridge was established in Middle America during the Pliocene. Since then, *Rhamdia guatemalensis* has reached the Isthmus of Tehuantepec (southern México); *Astyanax fasciatus* has meanwhile invaded the Rio Grande (Texas). This difference in success is due to the higher salt tolerance of *Astyanax fasciatus*, which is thus able to use slightly brackish waters for much quicker dispersal (Miller, 1966; Darnell, 1962).

Furthermore both species have developed troglobitic forms in continental México. These are the "*Anoptichthys*" populations of *Astyanax fasciatus* in the Sierra de El Abra (San Luis Potosí) (Mitchell et al., 1977) and those of *Rhamdia guatemalensis* in Oaxaca (Reddell, by letter) and Belize (Greenfield, by letter). They have not succeeded in developing populations of this kind in northern Yucatán yet. This discrepancy can be explained by the fact that Yucatán has been colonized by these two species only in very recent times. This interpretation is verified by the distributional pattern of *Astyanax fasciatus*, which only exists within that narrow coastal area which was probably submerged during the last

Fig. 3.—The eye rudiments of *Ophisternon infernale* (Synbranchidae) (a) and *Typhliasina pearsei* (Ophidiidae) (b): (1-2) cornea; (3) sclera; (4) eye chamber; (5) lens; (6) vitreous body; (9) ganglionic layer; (10) inner plexiform layer; (11) inner nuclear layer; (12) pigmentary epithelium; (13) chorioid.

interglacial or even in Holocene times. It is supposed that northern Yucatán was cut off from the continent by a channel during the larger part of the Pleistocene. This barrier could not be crossed by these two primary freshwater fish.

ACKNOWLEDGMENTS

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RABIA EN MURCIELAGOS DE LA CUEVA DEL GUANO, SANTA CATARINA, NUEVO LEON, MEXICO

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RESUMEN

Se reportan casos de rabia clínica en murciélagos *(Tadarida b. mexicana* y *Mormoops megalophylla)* encontrados en la Cueva del Guano (Tío Bartolo), a 15 Km. SE de Santa Catarina, Nuevo León. Desde 1959 a 1976, se han realizado estudios en esa cueva, encontrando un período cíclico que lleva a una conclusión de virósis en murciélagos y otras especies troglófilas que visitan a esa cueva.

ABSTRACT

Bats, *Tadarida b. mexicana* and *Mormoops megalophylla*, collected in Cueva del Guano (Tío Bartolo), 15 km SE Santa Catarina, Nuevo León, México, showed clinical rabies. The cave has been the subject of research (observations) continuously from 1959-1976. This research shows an apparent cyclical appearance of rabies in bats and other troglophilous species from that cave.

RESULTADOS

La Cueva del Guano (Tío Bartolo, Villa y Jiménez, 1961:501) se localiza a 15 Km. al SE de Santa Catarina, Nuevo León, por el Cañón de la Huasteca, en la Cañada del Jabalí, es una de tantas que se encuentran por esas áreas.

La Cueva del Guano, enclavada en el Cañón del Jabalí, en el Municipio de Santa Catarina, Nuevo León, ha sido visitada desde el 29 de Diciembre de 1959 a 1976.

Se han realizado observaciones de las poblaciones de murciélagos tales como: *Tadarida brasiliensis mexicana* y *Mormoops megalophylla.*

De acuerdo a las observaciones de campo, *Mormoops megalophylla* se ha considerado como una especie casi estacionaria, aunque nunca se han observado ejemplares jóvenes. Las poblaciones han sido muy variables, estimando 500 u 800 en Diciembre de 1959, de los cuales se colectaron 16 ejemplares; uno de ellos resultó positivo a la rabia (Villa y Jiménez, 1961).

Posteriormente, Villa (1955:457-552) reporta una extraña mortandad de *Mormoops,* de la Cueva del Diablo, cerca de Sabinas Hidalgo y en la Mina "Jesús María" en Vallecillo, Nuevo León, ambas a 115 Kms. al NO de la Cueva del Guano y lo relaciona con lo acontecido en las cavernas de Carlsbad, Nuevo México.

Entre los meses de Agosto y Septiembre de ese año, una gran cantidad de murciélagos murieron (Villa, 1966:77) aunque nada más en Nuevo México hicieron las pruebas virológicas en murciélagos, resultando más del 50% con anticuerpos contra la rabia (Villa, 1966).

Este hecho se ha venido repitiendo en la Cueva del Guano, y que el 8 de Abril de 1967, se efectuó una excursión. En esa época, encontramos una reducida colonia (2,000 ejemplares) de *Tadarida b. mexicana.* Esta especie es muy numerosa de Diciembre a Febrero. Para Abril solo queda "colonia residual", en ocasiones formada por machos y escasas hembras.

Llamó la atención el no encontrar ningún ejemplar vivo de *Mormoops megalophylla.* Revisando las paredes de la cueva se localizó un ejemplar muerto, sostenido de una pata, seco, con el hocico y las fosas nasales cubiertas de una secreción sanguinolenta (Foto 1).

En la sala izquierda de la entrada principal, sobre un montículo de guano, se encontraron muchos ejemplares de *Mormoops* muertos, de los cuales se colectaron 30. Junto a ellos se colectó un zorrillo

Foto 1.—Observese en el rostro la secreción humoral seca (saliva y sangre) en *Mormoops megalophylla*. Foto: Carlos H. Briceño, 8 Abril 1967.

Foto 2.—Ejemplares de *Mormoops megalophylla* y un zorrillo *(Mephitis mephitis)* encontrados en la Cueva del Guano, Santa Catarina, Nuevo León. Foto: Carlos H. Briceño, 8 Abril 1967.

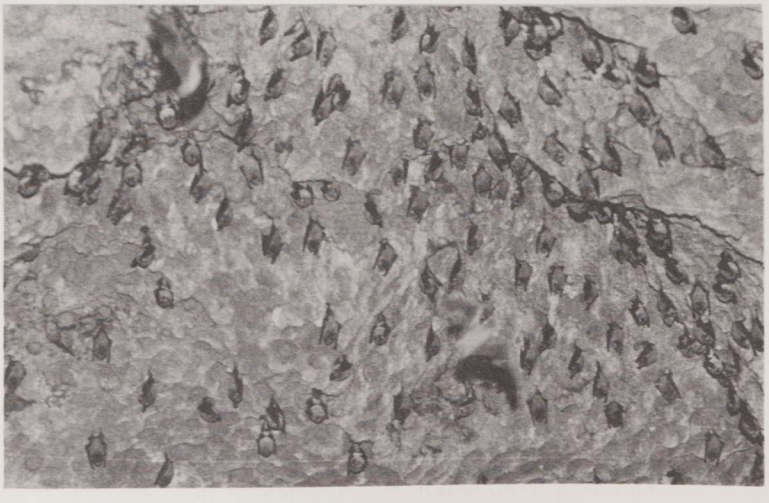

Foto 3.—Colonia de *Mormoops megalophylla* en la Cueva del Guano. Foto: Carlos H. Treviño, 8 Enero 1976.

Foto 4.—*Mormoops megalophylla*, pendiente de la pared de la Cueva del Guano. Nótese el dorso hendido por la deshidratación del cuerpo. Foto: Carlos H. Treviño, 8 Enero 1976.

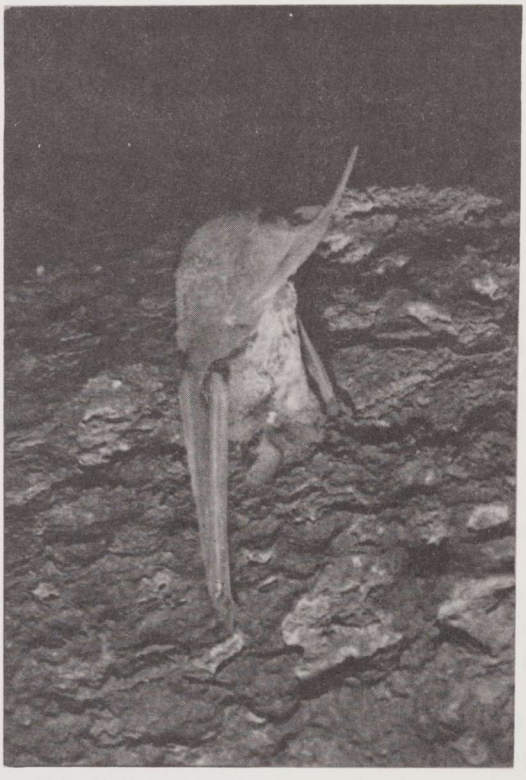

Foto 5.—Murciélago guanero *(Tadarida b. mexicana)* vivo, sujeto con los pulgares en el techo de una de las salas de la Cueva del Guano. Foto: Carlos H. Treviño, 8 Enero 1976.

Foto 6.—Parte de la colonia de *Tadarida b. mexicana*, la población se estimó en 10,000 en la Cueva del Guano. Foto: Carlos H. Treviño, 8 Enero 1976.

(Mephitis mephitis) muerto, semiseco, con los miembros posteriores rectos. Este hecho, en parte, lo confirma una publicación previa (Jiménez, 1961:10), donde se muestra la secuencia de la transmisión de la rabia entre murciélagos y mamíferos predatores troglófilos, que son mordidos al ir en busca de alimento.

Se realizaron salidas posteriores durante varios años y no fué, sino, hasta Enero de 1976, cuando se localizó una colonia de *Mormoops* estimada de 400 a 600 ejemplares (Foto 3).

Llamó la atención porque se encontraron varios ejemplares muertos, uno de ellos (Foto 4) pendiente de la pared, semejante al encontrado once años antes.

En el lado izquierdo de la cueva, a 30 metros de la entrada, había una colonia de cerca de diez mil ejemplares de *Tadarida b. mexicana.*

En la pared, cerca de la colonia principal (Foto 6) se colectó con vida un ejemplar que pendía de los pulgares (Foto 5).

Se colectaron 19 *Mormoops megalophylla* (11 machos y 8 hembras). Se les tomaron muestras de pulmón, sembradas en cultivo de Micosel (Sabouroud) e incubación por 24 horas a 37°C., con resultados negativos a histoplasmosis.

Este estudio se realizó con el objeto de detectar la histoplasmosis, ya que en la cueva del Guano se han registrado muertes humanas (Aguirre, 1959a:245 y 1959b).

No se realizaron pruebas diagnósticas para la determinación de la rabia en los ejemplares que se colectaron vivos.

CONCLUSIONES

Los hallazgos reportados en Nuevo León por Villa en 1955, son confirmados a los encontrados en la Cueva del Guano en los años 1959, 1967 y 1976. Los diferentes hallazgos muestran una secuencia cíclica de 8 a 12 años.

Las características clínicas que presentaron los ejemplares, tales como la rigidez del cuerpo, la secreción sanguinolenta en el rostro, la paralización, conducen a pensar que la muerte de los murciélagos *Tadarida b. mexicana* y *Mormoops megalophylla* y el Zorrillo *Mephitis mephitis*, sea debida a rabia.

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A CHECKLIST OF THE CAVE FAUNA OF MEXICO. VII. NORTHERN MEXICO

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ABSTRACT

A total of 175 species, of which 32 are troglobites, are reported from 87 subterranean localities in the Mexican states of Chihuahua, Coahuila, Durango, and Nuevo León. The area covered includes the Cross Ranges and Northern Sierra subdivisions of the Sierra Madre Oriental, the Basins and Ranges Province, and the Sierra Madre Occidental north of Parral, Chihuahua. The troglobites are distributed among the following groups: Hydrobiidae (Gastropoda, Mesogastropoda); Cirolanidae, Stenasellidae, and Trichoniscidae (Crustacea, Isopoda); Hadziidae (Crustacea, Amphipoda); Hyidae (Arachnida, Pseudoscorpionida); Schizomidae (Arachnida, Schizomida); Agelenidae, Leptonetidae, and Pholcidae (Arachnida, Araneae); Phalangodidae (Arachnida, Opilionida); Ricinoididae (Arachnida, Ricinuleida); Lithobiidae (Chilopoda, Lithobiomorpha); Polydesmidae and Rhachodesmidae (Diplopoda, Polydesmida); Cambalidae (Diplopoda, Spirostreptida); Campodeidae (Insecta, Diplura); Entomobryidae and Sminthuridae (Insecta, Collembola); Carabidae (Insecta, Coleoptera); and Ictaluridae (Teleostomi, Cypriniformes). All collecting localities are briefly described. A checklist with complete records and selected bibliographic citations includes all species known from the region.

INTRODUCTION

This is the seventh in a series of reports on the cave fauna of México. The earlier papers dealt with the cave fauna of the Sierra de Guatemala, Tamaulipas (Reddell and Mitchell, 1971b; Reddell and Elliott, 1973b), the Sierra de El Abra, San Luis Potosí and Tamaulipas (Reddell and Mitchell, 1971a; Reddell and Elliott, 1973a), the Valle de los Fantasmas region, San Luis Potosí (Elliott and Reddell, 1973), and southern México (Reddell, 1971a). Reddell (1981) summarized the cavernicole fauna of all of México. The present paper includes all published and unpublished records for the cave fauna of northern México. This area includes parts of the states of Coahuila, Nuevo León, Chihuahua, and Durango.

Members of the Association for Mexican Cave Studies have biologically investigated 46 caves and mines in this area. An additional 31 caves, springs, and wells have been visited by other biologists. Considering the extent of northern México this must be considered a preliminary survey.

Although about 175 species have been collected from subterranean localities in this region, it remains largely unstudied. Access is difficult in many areas and the caves are frequently located far from roads and high on the sides of mountains. Nevertheless, the collections that have been made give an adequate picture of the nature of the cavernicole fauna and allow some speculations on its relationships with the fauna of other parts of México.

The area covered by this report is bounded roughly by Ciudad Acuña, Monterrey, Torreón, Parral, Creel, and Ciudad Juárez. Physiographically it includes the Basins and Ranges Province, part of the Sierra Madre Occidental, and the Cross Ranges and Northern Sierra subdivisions of the Sierra Madre Oriental. Reddell (1981) gives a brief description of the cave regions and physiographic provinces covered by this report.

The cavernicole fauna of northern México is a mixture of temperate and tropical elements, but tropical elements predominate. Of 10 aquatic and 22 terrestrial troglobites known from this region, all but six are most closely allied with tropical species.

The troglophile fauna includes more temperate representatives, but it still is mostly tropical in its affinities. Of particular interest are several species representative of groups not known from the surface in northern México, especially the two ricinuleids from caves in Durango. This primarily tropical group is heavily dependent on high humidities, and its existence in the desert regions of northern México is a result of its ability to survive in caves. Similar examples include the highly cave-adapted diplurans, the trechine beetle *Mexaphaenops prietoi* Bolívar, and the rhachodesmid milliped *Ceuthauxus palmitonus* Chamberlin.

The only species clearly allied with temperate faunal elements are the spiders *Leptoneta limpida* Gertsch and *Cicurina coahuila* Gertsch, the millipeds *Cambala speobia* (Chamberlin) and *Speodesmus* n. sp., the snail *Coahuilix hubbsi* Taylor, and the fish *Prietella phreatophila* Carranza.

Of the aquatic fauna the snail and the fish are of probable freshwater origin. The cirolanid and stenasellid isopods and amphipods belong to groups which are predominantly marine.

The troglobites known from northern México are:

Snails
- *Coahuilix hubbsi* Taylor

Isopods
- *Conilera stygia* Packard
- *Speocirolana thermydronis* Cole and Minckley
- *Sphaerolana affinis* Cole and Minckley
- *Sphaerolana interstitialis* Cole and Minckley
- *Mexistenasellus coahuila* Cole and Minckley
- *Brackenridgia palmitensis* (Mulaik)
- *Cylindroniscus cavicolus* (Mulaik)

Amphipods
- *Mexiweckelia colei* Holsinger and Minckley
- *Mexiweckelia mitchelli* Holsinger
- *Mexiweckelia particeps* Holsinger

Pseudoscorpions
- *Leucohya heteropoda* Chamberlin
- *Leucohya magnifica* Muchmore

Schizomids
- *Schizomus* n. sp.

Spiders
- *Cicurina (Cicurella) coahuila* Gertsch
- *Leptoneta isolata* Gertsch
- *Leptoneta limpida* Gertsch
- *Anopsicus exiguus* (Gertsch)
- *Psilochorus delicatus* Gertsch
- *Psilochorus diablo* Gertsch

Opilionids
- *Hoplobunus osorioi* (Goodnight and Goodnight)

Ricinuleids
- *Pseudocellus reddelli* (Gertsch)

Centipedes
- *Garcibius osorioi* Chamberlin

Millipeds
- *Speodesmus* n. sp.
- *Ceuthauxus palmitonus* Chamberlin
- *Cambala speobia* (Chamberlin)

Diplurans
- *Paratachycampa boneti* Wygodzinsky
- *Podocampa cavernicola* (Wygodzinsky)

Collembolans
- *Oncopodura prietoi* Bonet
- *Pararrhopalites anops* Bonet and Tellez

Beetles
- *Mexaphaenops prietoi* Bolívar

Fish
- *Prietella phreatophila* Carranza

Most of the caves discussed in this report require no expertise in vertical techniques and will present few problems to a well-equipped biologist or explorer. The danger of contracting histoplasmosis in any cave in northern México is high. This debilitating lung disease is caused by the fungus *Histoplasma capsulatum* Darling. Epidemics following guano mining attempts have been reported for Cueva del Diablo and Cueva del Rincón de la Virgen, Nuevo León, and Cueva de la España and Cueva del Guano, Durango (Aguirre Pequeño, 1959; González Ochoa, 1957, 1959, 1961, 1964; Jackson, 1961; Bustamante, 1964). A group of cave explorers from The University of Texas at Austin contracted histoplasmosis following a visit to Cueva del Diablo, Nuevo León (Hershberger, 1967).

Rabies is another potential danger for those entering caves in northern México. Mysterious die-offs of bats in Cueva del Diablo, Nuevo León, and Sótano de Sauz, Chihuahua, may be a result of rabies epidemics in these populations. Care should be exercised in entering bat caves, particularly by anyone not having received immunization shots against rabies.

Exploration of Sótano de Sauz requires special caution. Air temperatures in this cave may exceed 41° C. Even in a dry cave such as this it is not possible to dispose of body heat efficiently, and the danger of heat exhaustion is great. Special precautions should be taken in the exploration of this cave (see Sprouse, 1977).

History

The first collection of a cavernicole in northern México was made by the distinguished Mexican zoologist D. A. L. Herrera. In about 1894 he collected a troglobitic cirolanid isopod from a well in

Monterrey. This species was described by Packard (1900a) as *Conilera stygia.*

In June 1940 Harry Hoogstraal visited Cueva del Diablo, Nuevo León, and collected a new species of spider.

The first significant contribution to our knowledge of the fauna of this area was not made until 1942 when C. Bolívar y Pieltain, F. Bonet, B. F. Osorio Tafall, D. Pelaez, and other members of the Escuela Nacional de Ciencias Biológicas de México visited Grutas de Villa de García, Cueva del Carrizal, and Grutas del Palmito, Nuevo León. Their collections included many species, the most notable of which were new species of troglobitic diplurans, collembolans, opilionids, pseudoscorpions, and carabid beetles.

During the course of the David Rockefeller Mexican Expedition of the American Museum of Natural History in the summer of 1947, Willis J. Gertsch visited Cueva del Diablo, Chihuahua. His collections included a new species of troglobitic *Psilochorus.* This cave was revisited in July 1956 by Gertsch and Vincent Roth.

The first blind fish from northern México was discovered by C. Bolívar y Pieltain and J. Carranza in August 1954. In a well near Músquiz, Coahuila, they collected specimens of a new species of catfish described by Carranza (1954) as *Prietella phreatophila.*

Important studies of the bat fauna of northern México were made during the 1950s by several researchers from México and the United States. In the years 1950-1955 Rollin H. Baker investigated numerous caves during a survey of the mammalian fauna of Coahuila. Bat banding operations were conducted by Bernardo Villa R., Denny G. Constantine, Bryan P. Glass, and E. Lendell Cockrum in many areas of northern México and the southern United States. An extensive study was made of the migration of *Tadarida brasiliensis mexicana* (Saussure). In November 1955 Villa R. visited Cueva del Diablo, Nuevo León, and discovered a massive die-off of bats in the cave (Villa R., 1956a).

In 1961 Carl L. Hubbs visited the marshes and springs in the vicinity of Cuatro Ciénegas de Carranza, Coahuila. Among collections made in the Pozos de la Becerra were specimens of the troglobitic snail *Coahuilix hubbsi* described by Taylor in 1966. The unusual nature of the fauna of this area led to an extensive study by G. A. Cole, W. L. Minckley, D. W. Taylor, and others. Between 1966 and 1968 their collections produced a new genus and two new species of amphipod, a new genus and species of stenasellid isopod, and a new genus and three new species of cirolanid isopod.

With the organization in 1962 of the Association for Mexican Cave Studies (AMCS) a new era in the study of the cavernicole fauna of México began. An extensive program of collecting in caves throughout México was initiated and continues to the present. Northern México has received considerable attention, and most of our information on this area is the result of the work of the AMCS.

The first caves in northern México to be visited by the AMCS were Cueva del Carrizal and Grutas del Palmito. During 1963 and 1964 many trips to these caves by William Russell, James Reddell, David McKenzie, and others resulted in the rediscovery of most of the previously recorded species as well as many undescribed forms. Study in these caves is continuing.

A visit by William Russell to Cueva de los Riscos, Durango, in August 1964 led to the discovery of several new troglobitic spiders and the most highly cave-adapted ricinuleid known. The ricinuleid was described by Gertsch (1971b) as *Cryptocellus reddelli.*

During July 1965 John Fish, Terry Raines, and James Reddell conducted a reconnaissance trip to desert regions in Coahuila, Chihuahua, and Durango, visiting caves near Cuatro Ciénegas de Carranza, Torreón, Parral, and Mapimí. The richness of the fauna inspired a trip to the area in February 1966 by William Bell and James Reddell. They also visited caves in the Sierra Madre Occidental near Santo Tomás. The latter trip resulted in the discovery of a second species of relict ricinuleid. This species, found in Cueva del Guano, Durango, was described by Gertsch (1971b) as *Cryptocellus mitchelli.*

In December 1967 James Reddell, William Russell, and William Calvert visited Cueva del León northwest of Músquiz and several caves in the Cañón del Pedregoso south of Cuatro Ciénegas de Carranza. Although dry, the caves nevertheless produced several undescribed species of interest.

In June 1972 Edward Alexander, William Elliott, Carl Kunath, Angie McLaughlin, and James Reddell visited caves in Chihuahua and Durango. Among the more significant discoveries were additional specimens of both relict ricinuleids from Durango, a new species of troglobitic leptonetid spider, and a new species of troglobitic amphipod. Four of the larger caves in this area were mapped.

In November 1975 Peter Sprouse and other cavers from The University of Texas at Austin located and explored Sótano de Sauz, Chihuahua. This 220-meter-deep cave was biologically unproductive, but their trip is of note in recording a massive die-off of *Mormoops megalophylla megalophylla* Peters.

David McKenzie, James Reddell, and Mark Shumate visited caves in the Sierra San Lorenzo, Coahuila; Torreón and Mapimí areas, Durango; and Jiménez, Santo Tomás, Creel, and Coyame areas, Chihuahua, in June 1980. Most of the caves proved to be dry, but spiders, millipeds, and carabid beetles of particular interest were collected. Three of the larger caves were mapped.

Cave Descriptions

Brief descriptions of the caves that have been biologically studied are included below. Numbers in parentheses following the cave name correspond to those in Fig. 1. Caves with no number were not visited by members of the Association for Mexican Cave Studies and are not located on the map.

Chihuahua

Grutas de Coyame (1). This cave is located about 6 km S of Coyame and about 100 m up the side of Cerro de la Cueva. The entrance is 1 m in diameter and drops about 10 m to a sloping floor. A poor but usable ladder allows access without equipment. At the bottom of the slope the cave opens into an elongate room about 40 m wide and more than 200 m long. The cave was once commercialized and must have been quite beautiful, but all but the largest speleothems are destroyed and graffiti covers the walls. The floor, which is of mud and flowstone, is littered with trash. Alcoves along the sides and a narrow passage at the back still retain many speleothems, some quite delicate. A description is in Reddell (1980).

Cueva del Diablo (5). This cave is located about 4 km W of Salaices and a few hundred meters north of the highway to Parral. The cave entrance is a sinkhole 30 m in diameter on the side of a low hill. A slope along the southwest edge of the entrance leads down to the bottom of the sink. The main part of the cave is reached through a low passage along the vertical back wall of the sink. After about 100 m, a largely artificial pit 15 m deep is crossed by a ladder. At the base of the ladder is a passage 3 m wide by 2 to 5 m high developed in white limestone. This main passage extends past several major passages to the right before ending at a 5 m high steel ladder leading up into a complex maze of passages which remains largely unexplored. At the base of the ladder a passage to the left leads into a maze of fissure-like passages connecting back into the main passage. This area contains several hundred meters of passages. From the lower parts of many of the fissures, low crawls lead down into small crystal-lined rooms, some of which have seasonal pools. The cave is poorly explored but probably contains more than one kilometer of passage. An incomplete map of the cave is in Reddell (1977).

Socavón de las Fisuras (3). This cave is located immediately to the north of Socavón de las Moscas in the same limestone outcrop. It was erroneously reported as Socavón de Santo Tomás by Reddell (1977). The cave receives some floodwater which enters an area of crevices at the end of a shallow arroyo. A narrow crevice leads down to a succession of narrow fissures, small dusty rooms, blocked domes, and dead-end passages. The cave appears to end at a depth of about 50 m.

Socavón de las Moscas (3). This cave is located in a small isolated outcrop of limestone about 8 km NNW of Santo Tomás. The cave has been previously referred to as Sótano Segundo de Santo Tomás. Some floodwater enters the large, complex sinkhole entrance through several small openings. These lead down into a series of fissure-like passages, which drop steadily to a depth of about 50 m. The cave is generally dry and contains much organic debris.

Cueva de los Muchachos (6). This cave is located on the slopes of a small hill about 2 km N of Salaices. A sink 1 m in diameter drops about 23 m to a horizontal fissure which ends abruptly after about 70 m (Fish, 1965).

Cueva de los Murciélagos (4). This cave is located about 1 km from the lumber camp of Chomachi about 35 km E of Creel and across the canyon from the famed Grutas de Chomachi. The entrance is about 20 m wide and 10 m high and extends over breakdown into a couple of rooms about 10 m in diameter and inhabited by a large colony of bats. A dug pit at the back leads down to a small passage which in turn leads to a second small entrance to the right of the main entrance. The cave is formed in ash-flow tuff.

Socavón del Pino (3). This cave is located about 2 km west of Socavón de Santo Tomás in the same limestone outcrop. A small arroyo empties into a sinkhole entrance about 8 m long, 4 m wide, and 5 m deep. From this a fissure passage extends down 5 and 7 m drops. From this point digging was necessary to reach a 5 m drop into a small room which was not entered but appeared to be the end of the cave.

Cueva del Salitre (7). This cave is located 13 km W of Villa Matamoros and is formed in ignimbrite. The entrance is 12 m high and 10 m wide and the floor slopes up for 33 m to meet the ceiling. The cave is inhabited by a colony of cave swallows.

Socavón de Santo Tomás (3). This cave is located about 0.5 km W of Socavón de las Moscas and is the largest cave in the area. Two long arroyos extend

from the base of the igneous hills to the south and then intersect the limestone, where they join and shortly afterwards empty into the cave by way of several large vertical entrances. The most accessible entrance is a large climbable sinkhole about 10 m deep. Along one side of this an unclimbable 11 m drop leads into a fissure passage. Upstream this passage extends beneath four entrances for about 75 m before ending in breakdown. Downstream a short drop leads into a passage about 15 m long that terminates in a 15 m unclimbable drop. A 5 m handline drop from the bottom of the 15 m pit leads directly to the top of a 65 m deep pit. The cave ends in a muddy room with a large pool in the center. Air temperature in the cave was 12° C. A map of the cave is in Reddell (1980). The caves referred to in Reddell (1977) as "Los Socavones de Santo Tomás" did not include the Socavón de Santo Tomás, but instead were Socavón de las Moscas and Socavón de las Fisuras.

Sótano Suciedad de Santo Tomás (3). This small sinkhole was located near Socavón de las Moscas and was formed by the recent collapse of soil into an underlying, unenterable fissure. An entrance 1 m in diameter led into a pit about 6 m deep and formed entirely in silt. An attempt to relocate the cave in June 1980 was unsuccessful, and the cave has probably filled.

Sótano de Sauz (2). This cave is located 30 km NW of the Ejido M. Benavides and 20 km S of Lajitas. A large arroyo enters a vertical entrance sink about 50 m deep. From the bottom a high guano- and cobble-floored passage extends for 130 m to a sharp bend to the left. Here the cave begins to descend more rapidly until an 18 m drop is encountered. At a depth of 130 m below the entrance the passage widens into a room 12 m wide and 15 m high. A 3 m drop at the end of this room leads to a cobble-floored crawlway. Beyond this crawlway the passage expands to a chamber 30 m in diameter and about 700 m long. The cave ends abruptly in a level area floored with mud and sedimented guano. The cave is 1226 m long and 220 m deep. A map of the cave is in Sprouse (1977). When the cave was explored in 1975 the floor was littered with the bodies of thousands of bats, and thousands of additional dead bats still clung to the cave walls. The air temperature in the cave rose gradually to 41° C in the terminal room.

Cave (Carimechi). This was reported only as a cave near Carimechi by Anderson (1972). No information is avilable on the cave.

Cavern (Carimechi). Anderson (1972) reported this as being a cavern in a canyon near Carimechi but gives no additional information on it.

Cave (Fern Canyon). Judd (1967) reports that this cave is located in Fern Canyon about "13 miles northwest of the Village of Santa Elena." He reports that it has a ceiling height of about 7 m at a point 10 m from the entrance. The extent of the cave is not known.

Cave (Maguarichic). This cave was reported by Knobloch (1942) as being located at "Mojarachic." This has since been identified as the village of Maguarichic. The cave is described only as being "shallow."

Cave (Santa Elena). This cave was reported by Villa R. (1967) as being located on the south side of Cañón de Santa Elena. No information is avilable on the cave.

Coahuila

Sumidero de Alicantre (18). This cave is located about 16 km W of Cuatro Ciénegas de Carranza. It is reported to be accessible through a sinkhole entrance which receives considerable floodwater. A sloping drop leads to a deep pool of water.

Cueva de Allende. This cave is located near the town of Allende (Villa R., 1967). No description is available.

Cueva de las Animas (21). This cave is located 21 km WNW of Candela at an elevation of 760 m. The natural entrance to the cave is a vertical sinkhole about 10 m high and 5 m wide that slopes down for about 10 m. At this point it drops vertically for about 13 m into a breakdown- and guano-floored chamber 50 m in diameter and 20 to 30 m high. Along the sides of the room, small dead-end passages slope up into domes with active formations and moist silt, but the main room is dry and dusty. A sloping passage to the left of the entrance room leads into a second room about 30 m in diameter and 15 m high. The cave has been mined for guano for many years and an adit has been dug through the limestone to intersect the entrance room near the floor. A partial map of the cave is in Rodríguez Cabo (1953) and a description in Reddell (1966b).

Cueva de la Bandurria. This cave is reported by Villa R. (1967) to be located 1.5 km N of Km. 612 on the highway from Saltillo to Torreón at an elevation of 1200 m. No description of the cave is available.

Pozo Barbado. This natural well is located 9.4 km S and 7.9 km W of Cuatro Ciénegas de Carranza (Cole and Minckley, 1972). No description is available.

Pozos de la Becerra. This complex of natural wells is located 13.7 km SSW of Cuatro Ciénegas de Carranza (Cole and Minckley, 1966) at an elevation of 790 m. The springs feeding this area originally

formed a lagoon between 25 and 150 m wide and 2 km long with water depths to more than 10 m. Subsequent canalization and utilization of the area has drastically lowered the water level in the lagoon so that it no longer appears to be a suitable habitat for the subterranean crustaceans originally collected from it.

Pozos Bonitos. This well is located at Churince, 14.73 km S and 7.05 km W of Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971), at an elevation of 780 m. No description is available.

Cueva de Buen Abrigo. This cave is reported by Villa R. (1967) to be located at "Noria cinco, 8 km Estación Coyote." This is near the village of Buen Abrigo about 19 km N of Matamoros. No description is available. The cave may be the same as Cueva del Guano.

Bocas del Carmen (20). This cave is located in a pass about 40 km W of Monclova on the south side of the highway to Cuatro Ciénegas de Carranza. Large conspicuous openings on the cliffs overlooking the highway lead into a series of dry rooms and passages.

Laguna Churince. This is located at Churince, 14.73 km S and 7.05 km W of Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971), at an elevation of 780 m. No description is available.

Cueva de Don Jesús. This cave, also known as Cueva de San Jesús, is reported by Baker (1956) as being "57 mi. N and 27 mi. W Saltillo." No description of the cave is available.

Cueva de Empalme (24). This cave is located at the base of the Sierra de Mayrán south of the highway from Torreón to Saltillo and about 1.6 km E of Empalme (=La Cuchilla) at an elevation of about 1100 m. A sloping, breakdown-floored entrance leads into a complex of small fissure passages. The cave is dry and floored with fine silt.

Cueva de los Escarabajos (24). This cave is located at the base of the Sierra de Mayrán near Cueva de Empalme. It consists of a sloping, silt-floored passage about 3 m wide, 3 m high, and 30 m long.

Laguna Escobeda. This spring-fed lagoon is located 9.8 km S and 2.3 km W of Cuatro Ciénegas de Carranza (Cole and Minckley, 1972). The subterranean isopods reported from it were collected about 3 m below the water surface and from travertine at the bottom of a detritus-choked spring opening.

Cueva del Granjeno (23). This cave is located on Cerro Buen Abrigo in the Sierra San Lorenzo about 5 km E of Buen Abrigo at an elevation of 1170 m. The entrance is a steeply sloping sinkhole which receives some floodwater. At the bottom of the entrance slope a narrow winding passage about 1.5 m wide and up to 3 m high extends for about 100 m before washed-in silt makes it necessary to dig to continue. The cave is formed in gypsum.

Cueva de los Grillos (24). This cave is also located at the base of the Sierra de Mayrán near Cueva de Empalme. It consists of a single small room floored with dry silt.

Cueva del Guano (23). This cave, once called Cueva del Agua because of a stream that has since dried up, is located near Cueva del Granjeno at an elevation of 1150 m. A rubble-floored sinkhole between two limestone ridges leads down a slope into a large breakdown-floored room. A mine shaft intersects the cave after about 75 m. Beyond the shaft the cave changes character and becomes a steeply sloping passage. The bottom side of this slope soon ends in breakdown, but it is possible to walk along the upper part of the passage for several hundred meters to a point at which a narrow passage leads into an extension of the main passage for about 100 m. The cave is generally floored with guano, and when it was visited in June 1980 the floor was littered with dead bats. No live bats were seen.

Cueva de la Herradura (17). This cave is located at the base of a 30 m high rock mound about 10 km E of Hermanas. An entrance 3 m wide by 2 m high leads to two rooms connected by a short passage. A passage from the end of the second room is about 30 m long. A second passage from the first room leads to a second entrance. This 130 m long cave was inhabited by a large colony of bats and was floored with dry, dusty guano.

Cueva Hundido (23). This cave is located about 8 km ESE of Buen Abrigo at an elevation of 1180 m. Reddell (1971b) erroneously identified this cave as Cueva de la Candelaria. Numerous mummies were removed from Cueva Hundido in the late 19th century. The cave entrance was visited in June 1980 but no attempt to explore the cave was made at that time. The entrance is an unclimbable sinkhole about 15 m in diameter and 10 m deep which drops into a large breakdown-floored room; it is not known if passages extend from this room.

Laguna Juan Santos. This spring-fed lagoon is located 8.5 km S and 8.0 km W of Cuatro Ciénegas de Carranza (Cole and Minckley, 1972). It is more than 100 m wide and is fed by thermal springs along the margins and from at least two 5-meter-deep depressions near the center.

Cueva de los Lagos (13). This cave is located about 24 km W of Ciudad Acuña and 3.5 km S of the Rio Grande and has been flooded by Amistad Reservoir. Before it was inundated a small arroyo led into a vertical entrance 3 m in diameter. A 10 m drop led into a steeply sloping fissure passage which termi-

nated in two small pools about 50 m below the surface. One major side passage extended to the east from the 10-meter-level for about 100 m before ending.

Cueva de Laguna Seca. This cave is located 8 km NW of Nazareno (Constantine, 1967). No description of this cave is available, but it is reported to have contained about a ton of fresh guano in 1957.

Cueva del León (15). This cave is located in the Sierra de Santa Rosa about 52 km WNW of Melchor Músquiz. The cave is entered through a horizontal opening 8 m high by 5 m wide. It extends with about the same dimensions for 200 m before ending abruptly. The floor is covered with guano throughout. A detailed location is provided by Rodríguez Cabo (1953).

West Laguna of Mojarral. This marshy area is located 11 km SW of Cuatro Ciénegas de Carranza. It is a large, clear pool about 25 m wide, 100 m long, and up to 5 m deep. It is fed by large springs, and the water exits by a subsurface channel and by small surface outflows (Minckley and Cole, 1968).

Cueva del Pedregoso (22). This well-known cave is located about 32 km SE of Cuatro Ciénegas de Carranza in the Cañón del Pedregoso. A washed-out road leads up the canyon to the cave entrance. A horizontal opening about 20 m above the floor of the canyon leads into a passage about 15 m high and 10 m wide. After some 350 m, a drop of 7 m leads into a large domed room with a naximum height of 25 m. The cave ends after an additional 50 m (Anonymous, 1968). The cave is dry except for the terminal room, which is slightly moist. It has been extensively mined for guano, and numerous holes up to several meters deep are in the cave floor.

Pedregoso Circle Cave (22). This cave is located in the Cañón del Pedregoso about 2 km downstream from Cueva del Pedregoso. A 10 m high, 5 m wide entrance at the base of a cliff leads into a spiraling passage. After about 60 m the passage narrows to 3 m wide and 1 m high. After 15 m it enlarges to 5 m high and 7 m wide. A small moist slope up to the right apparently leads to a filled entrance. Beyond this, a passage slopes up to the left and continues to a point about 160 m from the cave entrance. A low crawlway extends 17 m to open into a few small rooms and finally emerges as a hole 1 m in diameter, 7 m above the floor, and 10 m inside the cave entrance. Bats inhabit the large entrance passage.

Pedregoso Hidden Cave (22). This cave is located near Pedregoso Circle Cave. An entrance about 3 m high and 1.2 m wide leads down a slope into a fissure passage measuring 8 m high by 5 m wide. After about 10 m, a side passage to the left extends 25 m to an entrance 1 m in diameter. Beyond the side passage the cave extends 60 m, lowers to a crawlway, and ends after an additional 8 m. The cave is dry except in the terminal crawlway.

Pedregoso Pipe Cave (22). This cave is located near the entrance to Cañón del Pedregoso and is reached by a steep climb up the side of a talus slope. A walk-in entrance opens immediately into a room about 5 m high and 30 m in diameter. A low passage extends 30 m from this room. The cave has been mined for nitrates, and a pipe used in transporting the nitrates to the canyon floor leads from the cave entrance.

Pozo El Potrero (16). This natural well is located 8.5 km SSE of Melchor Músquiz at an elevation of 600 m. It is an artesian spring at the base of the Sierra de Santa Rosa. The main well is a crevice in the limestone at the base of a hillside of steeply dipping limestone. A square concrete platform with a gate to cover the well opens into an artificially modified chamber about 5 m deep and 3 m in diameter. Water supplying the well rises from a deep natural fissure in the limestone. The well is a major source of water for the town of Nueva Rosita. A second, somewhat deeper well located about 40 m away was not investigated.

Cueva de San Vicente (19). This cave is located about 6.5 km S of Boquilla and about 16 km SE of Cuatro Ciénegas de Carranza. The cave entrance is located about 70 m above the base of the cliff, which is itself about 300 m above the floor of the canyon. Access to the cave is by way of a mine tunnel 3 m in diameter and 100 m long from which a series of ladders extends upward to emerge from the floor of the cave. The cave consists of a single chamber 20 m wide and 120 m long. It has been extensively mined for nitrates, and the floor is covered by dry guano-covered breakdown.

Cueva del Vapor (23). This cave is located about 5 km E of Buen Abrigo at an elevation of 1150 m. The 10 m wide, 5 m high entrance leads into a breakdown-floored passage about 50 m long that ends in collapse. To the left of the main passage, a low crawlway extends down a short slope before it drops 3 m into a high 200 m long walking passage. The cave is formed by the solution of a gypsum bed in the limestone. A map is in Reddell (1980).

Cueva de Yeso (24). This cave is located about 0.5 km from Cueva de los Grillos at the base of the Sierra de Mayrán. It consists of a single small passage formed largely by solution of a layer of gypsum in the limestone.

Cave (El Chiflón). This cave is reported by Baker (1956) as being located at El Chiflón, "21.7 mi. west of Saltillo." No desciption is available.

Cave (Cuatro Ciénegas de Carranza). This cave is reported as being located 5.3 km W of Cuatro Ciénegas de Carranza (Williams, 1968). No description is available, other than that it is at least 20 m long.

Cave (Hacienda Las Pilas) (14). This cave is located on the Hacienda Las Pilas about 100 km SE of Boquillas del Carmen in the Serrania del Burro. The entrance is a large shelter 25 m wide, 1 to 3 m high, and 15 m deep. A 1 m high opening in the southeast corner of the shelter leads into a passage 2 to 3 m high. This passage extends for about 50 m, then turns and extends for an additional 40 to 60 m. Guano covers much of the floor of this passge. Near the end of the main passage two pits in the floor drop at least 5 m. These were not entered. A more detailed description is in Mollhagen (1977).

Cave (Hermanas). This cave is reported by Baker (1956) as being located about 10 km E of Hermanas at an elevation of 360 m. No description is available, but it is reported as having a high ceiling.

Cave (Puerto de Santa Ana). This cave is reported to be located on the north side of Puerto de Santa Ana, 7 km S of Nacimiento de los Indios at an elevation of 850 m. Baker (1956) describes it as having "a narrow entrance opening into a large room, the ceiling of which was estimated to be 75 feet above the guano-covered floor."

Cave (San Buenaventura). This cave is reported by Baker (1956) as being located "9 mi. W and 4 mi. S of San Buenaventura" at an elevation of 1800 ft. No description of the cave is available, although bats were reported to have been taken from "different quarters in darkened recesses of the cave."

Cave (San Pedro de las Colonias). This cave is reported by Baker (1956) as being located "26 mi. SW of San Pedro de las Colonias" at an elevation of 1100 m. It is described as being a "small, shallow cave."

Cave (Torreón). The only information on this cave is that of Baker (1956) who reports that "in 1952 an extensive guano mining operation was reported in progress in a cave southeast of Torreón."

Small (unnamed) seep near Pozo Barbado. No information is available on this locality reported by Cole and Minckley (1972).

Unnamed seep. This site is located 7.45 km S and 5.50 km W of Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971). No information is available on the locality.

Small (unnamed) spring (A). This spring is located in a raised marsh at the northern tip of the Sierra de San Marcos, 7.45 km S and 5.42 km W of Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971). No information is available on the locality.

Small (unnamed) spring (B). This spring is located 8.2 km S and 8.4 km W of Cuatro Ciénegas de Carranza (Cole and Minckley, 1972). No information is available on the locality.

Small (unnamed) spring (C). This spring is located 8.8 km S and 4.0 km W of Cuatro Ciénegas de Carranza (Cole and Minckley, 1972). No information is avilable on this locality.

Unnamed spring (D). This spring is located 8.15 km S and 2.29 km W of Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971). No information is available on this locality.

Spring-pool. This spring-pool is located 8.84 km S and 3.96 km W of Cuatro Ciénegas de Carranza, about 150 m W of the talus slope from the Sierra de San Marcos (Holsinger and Minckley, 1971). No information is available on the locality.

Small laguna. This lagoon is located 7.92 km W and 9.42 km S of Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971). No information is available on the locality.

Pozo (A). This natural well is located 8.2 km S and 4.7 km W of Cuatro Ciénegas de Carranza (Cole and Minckley, 1970). No information is available on this locality.

Pozo (B). This natural well is located 20.3 km S and 5.5 km E of Cuatro Ciénegas de Carranza (Cole and Minckley, 1970). No description of this locality is available.

Pozo (C). This natural well is located about 12 km SW of Cuatro Ciénegas de Carranza (Minckley and Cole, 1968) and is reported to be a spring tributary of the West Laguna of Mojarral. Its dimensions are 10 m by 12 m, by about 2 m deep. Water depth in the pit was 0.85 m.

Durango

Cueva de la Cucaracha (10). This cave is located across the canyon from Cueva de los Riscos and at about the same level. It consists of a single dry room about 15 m in diameter.

Cueva de la España. This cave is reported as being "2 km S, 11 km W Nazareno, 400 ft." (Smith, 1972). No information on the cave is available, but it is probably identical to Cueva del Guano in the Sierra de la España.

Cueva del Guano (12). This cave is probably identical to Cueva de la España. It is located in the Sierra de la España northwest of Picardías and about 20 km S of Ciudad Lerdo. The entrance is an impressive

horizontal opening 8 m high and 25 m wide. A passage averaging 10 m wide by 5 m high extends for 100 m before narrowing to a width of 5 m and extending an additional 30 m to a major intersection. This entrance passage is floored with guano-covered breakdown and is inhabited by a large bat colony. To the right at the intersection a steep slope leads down into a chamber 60 m long, 7 to 10 m high, and up to 20 m wide. It slopes steadily down over small breakdown before terminating abruptly. Two passages lead from this room. One to the right extends about 30 m to a Y-intersection. The passage to the right ends after about 10 m, while that to the left descends very steeply and ends after about 20 m. The other passage from the large room is a steep slope which leads up and intersects the entrance passage after about 20 m. This intersection constitutes a five-way junction. Besides the passage back to the entrance and that into the large room, one to the right extends about 30 m before ending in a small room. Two parallel passages constitute the other passages. One is about 6 m wide and 4 m high and ends after 35 m. The other opens into a room 35 m long, 15 m wide, and 7 to 8 m high. The cave has a total surveyed passage length of 549 m and the depth below the entrance is 59 m. Air temperature in the bat chamber was recorded as 26.5° C, while that in the large inner room was 24.5° C. A guano-mining operation in the cave terminated with the serious illness and death of several miners due to histoplasmosis. A map is in Reddell (1977).

Cueva de los Indios. This cave, for which no description is available, is located 11 km N of Compaña Balcones at an elevation of 1140 m (Baker and Greer, 1962).

Grutas de Mapimí (11). This cave is located in the Sierra del Rosario about 18 km SW of Mapimí. The cave is gated and locked. An entrance on the side of the hill opens immediately onto an 8 m drop into a small room from which a steep muddy slope leads into an enormous, well-decorated room several hundred meters long and up to 50 m wide. Slopes lead down in several places into large alcoves along the walls. The floor is largely of breakdown and flowstone and there is an abundance of large speleothems throughout the cave. There is a brief description of the cave in Reddell (1980).

Cueva de los Riscos (10). This cave is located about 330 m up on the side of the Sierra de la India about 7 km S of Mapimí. It has been heavily prospected for nitrates but apparently was never actively mined. The entrance is a small opening about 2.5 m wide and 1.5 m high. This abruptly opens into a large, heavily decorated chamber more than 20 m wide, 8 to 10 m high, and 120 m long. The floor is very irregular with large breakdown boulders, numerous, largely unexplored pits up to 15 m deep, and great masses of flowstone. At the end of the main chamber a slope leads up to a continuation of the room. This extends over massive breakdown boulders for about 30 m before terminating in a steep slope of loose rubble. A test pit about 8 m deep has been excavated at the base of the slope. A second passage, reached by way of a steep flowstone slope, is also located at the end of the main entrance chamber. This slope leads into a series of small rooms at different levels. Exploration has ended at the top of a 5 m deep unclimbable pit. A lower level continuation of the cave with large pools was reported by a local guide but has not been visited. With the exception of the small rooms at the back of the cave, which are somewhat moist, the cave is dry throughout. A map is in Reddell (1977).

Cueva de la Siguerita (8). This cave is located in the Cerro Siguerita near Rancho Descubridora about 40 km WNW of Mapimí at an elevation of 1600 m. The cave has been listed incorrectly as Cueva de la Siquita. It has been extensively mined for phosphates, and a metal platform has been constructed at the entrance. The entrance is a 7 m wide, 5 m high opening which leads directly into a passage 8 to 12 m wide, descending at an angle of about 55° to a depth of 64 m. Although part of this drop is climbable and some still usable ladders remain in place, a rope is required for part of the descent. To the left at the bottom of the entrance drop, the passage continues as a high fissure with up to 10 m of fill having been removed from the floor. A continuation of the main passage can be seen high above the floor but has not been reached. A steep slope leads down to a pool 1 m deep, inhabited by troglobitic amphipods. To the right from the entrance drop a passage about 15 m wide and high continues as a fissure for about 40 m before turning sharply to the left. It narrows to 10 m and continues over large breakdown blocks to open into a chamber 10 to 15 m high, 20 m wide, and 15 m long. A passage at the back of this room extends an additional 20 m before ending. The large inner room is inhabited by a large bat colony and the floor is covered with guano. The water temperature was 25.5° C and the air temperature was 23.3° C. A map is in Reddell (1977).

Cave (Ciudad Lerdo). This cave is reported to be 16 km W of Ciudad Lerdo at an elevation of 1500 m (Villa R., 1967). No description is available.

Lower mine (Grutas de Mapimí) (11). This is a largely unexplored mine with at least several hundred meters of passage located below the entrance to

Grutas de Mapimí. It contains several entrances and is intersected at several points by pits.

Mine (Puente de Ojuela) (9). This very large mine, now abandoned, is located immediately across the Puente de Ojuela about 7 km SE of Mapimí. The mine was only briefly visited but doubtless includes many kilometers of passage on several levels.

Nuevo León

Cueva del Carrizal (25). This cave is located about 10 km SE of La Candela at the base of Pico de Carrizal. The cave has developed on two levels, an upper complex of dry passages and a lower stream passage. The dry upper levels are entered by a shelter-like opening about 40 m above and to the south of the spring entrance. A 2 to 3 m high passage extends about 65 m, turns sharply right, and extends an additional 120 m before ending abruptly. A passage to the right near the entrance and one near the end of the upper level make connections with a large irregular chamber about 80 m long and up to 25 m wide. Steep slopes lead down to the stream passage. It is necessary to wade through 1 m deep water to enter the spring entrance. About 25 m inside the cave the stream divides. Water temperature in the left-hand stream is 31° C, while that in the right-hand stream is 23° C. The left-hand stream passage extends across the floor of the large chamber, enters a smaller passage and terminates in a siphon pool, known as the Baño Caliente, after about 80 m. Divers have entered this siphon and explored an extensive dry passage beyond. The main stream passage is 5 to 15 m wide and 5 to 12 m high except near the end where it gradually lowers to between 1 and 3 m in height. This passage ends in a siphon about 550 m from the entrance. Air temperature in the dry upper levels was 25° C, while temperatures in the main stream passage ranged from 22.5° C near the entrance to 26.5° C at the siphon. A discussion of the geology of the cave and a map are in Russell and Raines (1967).

Cueva de Constantín (29). Cueva de Constantín is located in the Sierra de Garia 8 km S of Espinazo in the Municipio de Mina. A small entrance opens into a large single chamber developed along the bedding plane of steeply dipping strata. The cave is about 330 m long and ranges in width from about 20 to 50 m and in height up to 10 m. It is heavily decorated with flowstone and other speleothems. A map of the cave is in Bittinger (1972).

Cueva del Diablo (27). This cave, also identified as "a bat cave at Sabinas Hidalgo," is located in the Sierra de Iguana about 7 km W of Sabinas Hidalgo. The entrance is about 160 m above the floor of the canyon and is an opening 8 m high and 10 m wide. Immediately inside the entrance there is a small joint-controlled fissure to the right which extends about 30 m. The main part of the cave is formed along a joint containing three sub-parallel passages on different levels. The main level extends about 80 m before ending. The cave is known to harbor *Histoplasma capsulatum* Darling, and several people investigating the cave have contracted histoplasmosis. The floor is largely covered with guano. Villa R. (1956a) reported a bat die-off in the cave. A sketch map and description are in Hershberger (1967).

Cueva de las Fisuras (28). This cave is located just above and south of the highway to Bustamante and about 16 km W of Sabinas Hidalgo in the Sierra de Santa Clara. The cave, dry throughout, consists of several interconnected fissures opening at the base of a cliff about 30 m above the road. The fissures range from 1 to 3 m in height and are usually less than 1 m in width. The cave is described by Russell and Raines (1967).

Grutas del Palmito (26). Grutas del Palmito is located about 7 km SSW of Bustamante in the Sierra de Gomas. The entrance is a small opening located on the south side of a canyon, about 330 m above the canyon floor and about 500 m above the valley in which the town of Bustamante is located. A talus slope from the entrance leads down into a room about 100 m wide, 200 m long, and 20 m high. A small passage to the left near the top of the entrance talus slope parallels the entrance room and terminates after about 100 m. This passage contains some organic debris and is the most biologically productive part of the cave. The entrance room contains comparatively little breakdown, and the floor is composed mostly of thin deposits of clay and secondary calcite deposits on bedrock. Several large travertine dams contain water during the entire year and are seasonally fed by a small spring along the left wall. Air temperature in the entrance room has been recorded as 20° C. A 15 m wide fissure has formed along the west wall of the inner part of the entrance room. It continues south beyond the end of the entrance room to the main part of the cave, forming a passage about 70 m long, 70 m high, and 15 m wide. A trail, called the Paso de Muerte, leads along the left side of this fissure. From the end of the Paso de Muerte a breakdown slope descends 80 m to a level, clay-floored area. This is the entrance into a chamber about 570 m long, 100 m wide, and more than 30 m high. Along the right side of this chamber a trail leads through massive formations that have enclosed parts of the main chamber to form small rooms, such as the Cathedral Room. At the end of

the main room, holes in flowstone lead down into an area of descending flowstone slopes, short drops, and small rooms, where the cave ends. Air temperature in the main part of the cave is 19.5° C. The cave has been heavily vandalized and areas are polluted with trash and human feces. The cave has been partially developed commercially and a gate placed over the entrance. A map is in Russell and Raines (1967).

Cueva del Precipicio (26). This cave is located in the Sierra de Gomas about 2 km SW of Grutas del Palmito. The large horizontal entrance is located on a cliff-face about 600 m above the canyon floor. A passage 6 m in diameter extends 450 m to a 45 m drop into a large canyon passage 15 to 20 m wide and up to 30 m high. This passage extends for 300 m to a 12 m drop into a room 60 m long, 40 m wide, and up to 70 m high. A steep breakdown slope leads up into a large room. This chamber is 170 m long, 45 m wide, and up to 30 m high and contains enormous speleothems up to 30 m high and 10 m in diameter. A slope down from this room is blocked by breakdown. The cave is about 700 m long and more than 150 m deep. A more detailed description is in Walsh (1973).

Cueva del Rincón de la Virgen. This cave is located in the west end of the Sierra del Fraile, 6.8 km N of Villa de García at an elevation of 1200 m. It is reported to be a medium-sized bat cave (Russell and Raines, 1967). Constantine (1967) reported that 10,000 Mexican free-tailed bats, *Tadarida brasiliensis mexicana* (Saussure), were found in the cave in November 1955.

Grutas de Villa de García (30). This world-famous commercial cave is located in the Sierra del Fraile, 7 km NW of Villa de García at an elevation of 1060 m. A cable car leads up a steep talus slope for about 300 m to the commercial cave entrance. This entrance leads into the principal chamber of the cave, a heavily decorated room 330 m long, up to 100 m wide, and from 10 to 60 m high. Near the end of the chamber a skylight entrance 100 m high illuminates part of the interior of the cave. A third entrance is located to the left of the room near the commercial entrance. A narrow passage extends to a 20 m wide opening, below which is a vertical drop on the cliff-face. Near the end of the main room a smaller room extends to the south. This room is about 50 m wide, 40 m high, and 165 m long. The cave contains several deep pools of water, but there is comparatively little input of organic matter. The area below the skylight has been paved and is cleaned regularly. Recent attempts to collect many of the species found by C. Bolívar y Pieltain, F. Bonet, and others have been largely unsuccessful. A map of the cave is in Russell and Raines (1967).

Unnamed cave (Bustamante) (26). This small cave was reported to be located approximately 7 km SSW of Bustamante in the Sierra de Bustamante. It is entered by a 1.2 m high entrance which leads into a room 12 m in diameter and 3 m in height (Fromén, 1974).

Unnamed pit (Bustamante) (26). This pit is located in the Sierra de Gomas about 7 km SSW of Bustamante. It is a vertical shaft about 60 m deep (Fromén, 1974).

Well (Monterrey). No information is available on this locality. It was reported by Packard (1900a), and it is not known whether the well is natural or artificial.

CHECKLIST OF SPECIES

The following list includes all available records for species known from northern México. The bibliographic citations generally include only those referring to the occurrence of the species within this area. The following symbols precede species for which an ecological status has been determined: + trogloxene (a species that makes use of caves for shelter or to complete part of its life cycle, but which is dependent on the epigeum for survival); * troglophile (a species that can complete its life cycle in the cave habitat but that shows no adaptations for a cave existence and may also occur outside of caves); and ** troglobite (a species that is dependent on the cave environment and that shows particular adaptations for the cave habitat, such as reduction or loss of eyes, elongation of appendages, and reduction of pigmentation). A question mark preceding a record indicates that the specimens obtained were inadequate to determine positively the identity of the species.

PHYLUM ANNELIDA

CLASS CLITELLATA

Order Oligochaeta

Unidentified microdrile earthworms (det. G.E. Gates)

Records.—*Durango:* Cueva de la Siguerita.

Comment.—The lower pools in this cave were inhabited by a large population of a transparent microdrile earthworm and by the troglobitic amphipod *Mexiweckelia mitchelli* Holsinger. This probable troglobite was too poorly preserved to allow identification.

PHYLUM MOLLUSCA

CLASS GASTROPODA

Order Basommatophora

Family Physidae

**Physa* sp. (det. L. Hubricht)

Records.—*Coahuila:* Cueva de los Lagos.

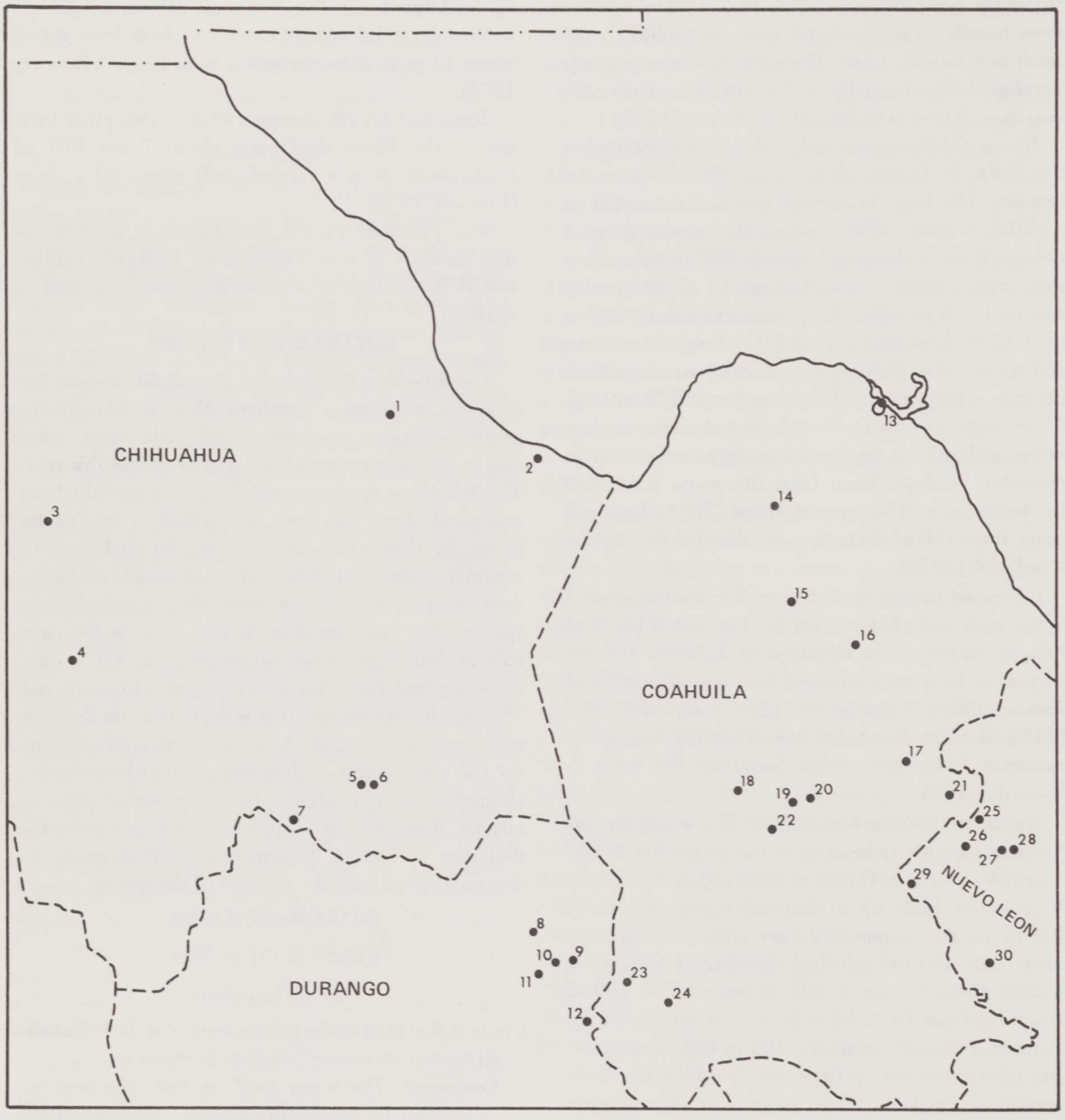

Fig. 1.—Map showing location of caves and mines visited by members of the Association for Mexican Cave Studies. 1, Grutas de Coyame; 2, Sótano de Sauz; 3, Socavón de las Fisuras, Socavón de las Moscas, Socavón de Santo Tomás, and Sótano Sociedad de Santo Tomás; 4, Cueva de los Murciélagos; 5, Cueva del Diablo; 6, Cueva de los Muchachos; 7, Cueva del Salitre; 8, Cueva de la Siguerita; 9, Mine (Puente de Ojuela); 10, Cueva de la Cucaracha and Cueva de los Riscos; 11, Grutas de Mapimí and Lower Mine (Grutas de Mapimí); 12, Cueva del Guano; 13, Cueva de los Lagos; 14, Cave (Hacienda Las Pilas); 15, Cueva del León; 16, Pozo El Potrero; 17, Cueva de la Herradura; 18, Sumidero de Alicantre; 19, Cueva de San Vicente; 20, Bocas del Carmen; 21, Cueva de las Animas; 22, Cueva del Pedregoso, Pedregoso Circle Cave, Pedregoso Hidden Cave, and Pedregoso Pipe Cave; 23, Cueva del Granjeno, Cueva del Guano, Cueva Hundido, and Cueva del Vapor; 24, Cueva de Empalme, Cueva de los Escarabajos, Cueva de los Grillos, and Cueva de Yeso; 25, Cueva del Carrizal; 26, Grutas del Palmito, Unnamed cave (Bustamante), and Unnamed pit (Bustamante); 27, Cueva del Diablo; 28, Cueva de las Fisuras; 29, Cueva de Constantín; 30, Grutas de Villa de García.

Comment.—A large population of snails of this genus inhabited the deep pools at the lowest level of this cave.

Order Mesogastropoda

Family Hydrobiidae

***Coahuilix hubbsi* Taylor

Records.—*Coahuila:* Pozos de la Becerra.

Bibliography.—Minckley, 1969; Reddell, 1971b, 1981; Taylor, 1966.

Comment.—This monotypic genus is most closely related to *Horatia (Hauffenia)*, an important element of the cave fauna of the Mediterranean region. The latter genus is also represented by two species in Texas caves. This species is known only by shells, presumably washed from subterranean passages.

Order Stylommatophora

Family Helminthoglyptidae

Humboldtiana n. sp. (det. F. G. Thompson)

Records.—*Chihuahua:* Cueva del Diablo.

Comment.—Juvenile specimens belonging to this genus and apparently representative of an undescribed species were taken from within the entrance area of this cave. Other species of this genus have been taken from archeological excavations in caves in Coahuila (Drake, 1951a).

Family Urocoptidae

Coelostemma greggi Drake

Records.—*Chihuahua:* Cueva del Diablo.

Bibliography.—Drake, 1951b.

Comment.—Only shells of this species were collected. This genus is relatively common in caves and the species may well live in the cave.

Coelostemma marrsi Drake

Records.—*Chihuahua:* Cueva del Diablo.

Bibliography.—Drake, 1951b.

Comment.—Live specimens of this snail were collected in the entrance area of the cave.

PHYLUM ARTHROPODA

CLASS CRUSTACEA

Order Isopoda

Suborder Flabellifera

Family Cirolanidae

**Undetermined genus and species

Records.—*Chihuahua:* Cueva del Diablo.

Comment.—Dead specimens of this family were observed in a lower-level pool of this cave, obviously fed by artesian flooding. The species remains to be rediscovered despite repeated searching at the site of the original find.

***Conilera stygia* Packard

Records.—*Nuevo León:* Well (Monterrey)

Bibliography.—Banta, 1907; Birstein, 1964 *[Conilera]*; Bolívar y Pieltain, 1950; Bowman, 1964, 1975; Chappuis, 1927; Cole and Minckley, 1966, 1972; Jeannel, 1943; Nicholas, 1962; Packard, 1894, 1900a, 1900b; Reddell, 1967a, 1971b, 1981; Richardson, 1904, 1905; Rioja, 1953a, 1953b, 1957, 1962; Straskraba, 1969; Vandel, 1964, 1965a; Van Name, 1936.

Comment.—This species was too poorly described to allow correct generic placement. The genus *Conilera* as currently understood is entirely marine.

***Speocirolana thermydronis* Cole and Minckley

Records.—*Coahuila:* Pozo (C), West Laguna of Mojarral, and Pozos de la Becerra.

Bibliography.—Argano, 1972 [*Speocirolana* (part)]; Bowman, 1975 [*Speocirolana* (part)], 1981a; Cole and Minckley, 1966, 1970, 1972; Contreras-Balderas and Purata-Velarde, 1981; Holsinger and Minckley, 1971; Minckley, 1969; Minckley and Cole, 1968; Reddell, 1971b, 1981; Straskraba, 1969 [*Speocirolana* (part)]; Taylor and Minckley, 1966 [*Speocirolana*].

Comment.—This species has been taken from the surface of flocculent sediment and from the interstices of porous travertine blocks about the edges of pools.

***Sphaerolana affinis* Cole and Minckley

Records.—*Coahuila:* Pozo (B) and other springs and wells near the type-locality.

Bibliography.—Cole and Minckley, 1970, 1972 [*Sphaerolana* spp. (part)]; Holsinger and Minckley, 1971; Minckley, 1969 [aberrant form of cirolanid]; Peck, 1977; Reddell, 1971b, 1981.

Comment.—This species has been collected at night as it roamed about plant roots in the bottom of the wells. The genus *Sphaerolana* is known only from the two species recorded here. This species has also been collected from a flooded mine adit about 30 m below the entrance of Cueva de la Boca, Nuevo León (Peck, 1977).

****Sphaerolana interstitialis** Cole and Minckley

Records.—*Coahuila:* Pozo (A) and small springs within a kilometer west of the type-locality.

Bibliography.—Brown, 1974; Cole and Minckley, 1970, 1972 [*Sphaerolana* spp. (part)]; Holsinger and Minckley; Minckley, 1969 [aberrant form of cirolanid]; Reddell, 1971b, 1981.

Comment.—This species is sympatric with *S. affinis*. One specimen was taken from the stomach contents of the aquatic box turtle *Terrapene coahuila* Schmidt and Owens.

Suborder Asellota

Family Stenasellidae

****Mexistenasellus coahuila** Cole and Minckley

Records.—*Coahuila:* Pozo Barbado, Laguna Escobeda, Laguna Juan Santos, small (unnamed) spring (B), small (unnamed) spring (C), and small (unnamed) seep near Pozo Barbado.

Bibliography.—Argano, 1974, 1977; Bowman, 1976 [*Mexistenasellus* (part)], 1981b; Cole and Minckley, 1970 [Stenasellinae], 1972; Holsinger, 1973; Holsinger and Minckley, 1971 [Stenasellinae undescribed genus]; Husson et al., 1974 [*Mexistenasellus* (part)]; Magniez, 1972, 1973a, 1973b, 1974, 1977, 1979; Minckley, 1969 [Stenasellinae, new genus]; Reddell, 1981.

Comment.—The genus *Mexistenasellus* is otherwise represented by two species in San Luis Potosí and one each in Nuevo León, Tamaulipas, and Veracruz.

Suborder Oniscoidea

Family Armadillidae

***Venezillo osorioi** (Mulaik)

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Mulaik, 1960; Nicholas, 1962; Reddell, 1971b, 1981.

Comment.—The genus *Venezillo* is represented in Mexican caves by eight species, none of which shows signs of adaptation for a cave existence.

***Venezillo tanneri** (Mulaik and Mulaik)

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Reddell, 1965b, 1971b, 1981; Schultz, 1965.

Comment.—Five specimens were collected from silt and rotting paper in darkness in the entrance room. Described from an epigean locality in Hidalgo County, Texas, the species is also known from caves in Val Verde County, Texas.

Family Porcellionidae

+Porcellio gertschi Van Name

Records.—*Coahuila:* Cueva de los Lagos.

Bibliography.—Reddell, 1971b, 1981; Schultz, 1965.

Comment.—This species was previously known only from El Bañito, Ciudad Valles, San Luis Potosí. The ecological status of the species is not known, but it is presumably a troglobite.

Family Trichoniscidae

****Brackenridgia palmitensis** (Mulaik)

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Bowman, 1965 [*Protrichoniscus palmitensis*]; Mulaik, 1960 [*P. palmitensis*]; Nicholas, 1962 [*P. palmitensis*]; Reddell, 1967a [*P. palmitensis*], 1971b, 1981; Vandel, 1965b [*P. palmitensis*].

Comment.—This species is known only from a single specimen. The description by Mulaik is unsatisfactory, and the relationship of this species to others in the genus is not known. Eight species in this genus have been described, seven of which are troglobites. The eighth is known from mountains in the vicinity of San Francisco, California. The troglobitic species range south from Texas to Chiapas.

****Cylindroniscus cavicolus** (Mulaik)

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Mulaik, 1960 [*Antroniscus cavicola*]; Nicholas, 1962 [*A. cavicola*]; Reddell, 1971b, 1981; Schultz, 1970.

Comment.—This poorly described species is known only from a single specimen. The genus *Cylindroniscus* includes additional troglobitic species in San Luis Potosí and Yucatán and epigean species in Cuba and Yucatán.

Order Amphipoda

Family Hadziidae

****Mexiweckelia colei** Holsinger and Minckley

Records.—*Coahuila:* Pozos Bonitos (Laguna Churince), unnamed seep, small (unnamed) spring (A), unnamed spring (D), spring-pool, and small laguna.

Bibliography.—Bousfield, 1977; Cole and Minckley, 1970 [undetermined gammarid amphipod]; Holsinger, 1973, 1977a, 1977b [*Mexiweckelia* (part)]; Holsinger and Longley,

1980 [*Mexiweckelia* (part)]; Holsinger and Minckley, 1971; Minckley, 1969 [eyeless, depigmented amphipod]; Reddell, 1971b, 1973a [*Mexiweckelia* (part)], 1981; Stock, 1977.

Comment.—The genus *Mexiweckelia* presently includes only the three species listed here.

***Mexiweckelia mitchelli* Holsinger

Records.—*Durango:* Cueva de la Siguerita.

Bibliography.—Holsinger, 1973, 1977a, 1977b [*Mexiweckelia* (part)]; Holsinger and Longley, 1980 [*Mexiweckelia* (part)]; Reddell, 1973a [*Mexiweckelia* (part)], 1973b [*Mexiweckelia*], 1977, 1981; Reddell and Kunath, 1972 [*Mexiweckelia*]; Stock, 1977.

Comment.—This species was abundant in two pools at the lowest level of the cave.

***Mexiweckelia particeps* Holsinger

Records.—*Coahuila:* Small (unnamed) spring (A).

Bibliography.—Bousfield, 1977; Holsinger, 1973, 1977a, 1977b [*Mexiweckelia* (part)]; Holsinger and Longley, 1980; Holsinger and Minckley, 1971; Reddell, 1971b, 1973a [*Mexiweckelia* (part)]; Stock, 1977.

Comment.—This large, rare species is now considered by Holsinger (pers. comm.) to represent an undescribed genus.

Family Hyalellidae

Hyalella azteca (Saussure)

Records.—*Coahuila:* Springs and wells near Cuatro Ciénegas de Carranza.

Bibliography.—Cole and Minckley, 1970.

Comment.—This ubiquitous species ranges through much of the United States south to Perú. It has been collected in caves in Texas and many parts of México.

CLASS ARACHNIDA

Order Scorpionida

Family Vaejovidae

Vaejovis sp. (det. W. J. Gertsch)

Records.—*Durango:* Cueva de los Riscos.

Comment.—Many immature specimens of this genus were collected from beneath rocks in the entrance room of this cave.

Vaejovis minckleyi Williams

Records.—*Coahuila:* Cave (Cuatro Ciénegas de Carranza).

Bibliography.—Williams, 1968.

Comment.—This species was described from a specimen taken 20 m inside the entrance to this cave. It is also known from a surface locality in the same area.

Order Pseudoscorpionida

Suborder Diplosphyronida

Family Hyidae

***Leucohya heteropoda* Chamberlin

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Anonymous, 1942 [pseudoscorpión troglobio]; Bolívar y Pieltain, 1944 [pseudoscorpiones nueva subfamilia]; Chamberlin, 1946; Chamberlin and Malcolm, 1960; Muchmore, 1969, 1972, 1973; Reddell, 1967a [*Leucohya heterodonta*], 1971b, 1981.

Comment.—This extremely attenuate species has been collected from the underside of small rocks in the entrance room. The genus is known only from the two species listed here.

***Leucohya magnifica* Muchmore

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Muchmore, 1972, 1973; Reddell, 1967a [undescribed genus and species of pseudoscorpion], 1971b [Hyidae, undescribed genus and species], 1973a, 1981.

Suborder Monosphyronida

Family Chernetidae

Undetermined genus and species (det. W. B. Muchmore)

Records.—*Chihuahua:* Cueva del Diablo, Cueva del Salitre; *Nuevo León:* Grutas del Palmito.

Comment.—The state of the systematics of the family Chernetidae is presently too confused to allow further identification of these specimens at this time.

**Neoallochernes* sp. (det. W. B. Muchmore)

Records.—*Coahuila:* Cueva de las Animas, Cueva del León; *Durango:* Cueva de los Riscos, Cueva de la Siguerita; *Nuevo León:* Cueva del Carrizal.

Comment.—The genus *Neoallochernes* is a common inhabitant of bat caves in México and the southwestern United States. All of the above specimens were taken from bat guano.

Order Schizomida

Family Schizomidae

***Schizomus* n. sp. (det. J. R. Reddell)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—This is the most northern cave population of *Schizomus* in México. It is closely related to *S. mexicanus* Rowland and its relatives from more southern México.

Order Amblypygida

Family Phrynidae

**Paraphrynus* sp. (det. J. R. Reddell)

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Reddell, 1967a [*Tarantula*], 1971b [*Tarantula* sp.].

Comment.—Amblypygids are abundant in the cave, where they roam across the cave floors and walls. The specific identity of this large species must away further study.

**Phrynus* sp. (det. J. R. Reddell)

Records.—*Coahuila:* Cueva del Guano, Pedregoso Circle Cave.

Comment.—The genus *Phrynus* is presently being revised by Diomedes Quintero. The determination of this material must await completion of his study.

Order Araneae

Infraorder Araneomorphae

Family Agelenidae

Undetermined genus and species (det. W.J. Gertsch)

Records.—*Chihuahua:* Socavón del Pino.

Comment.—Immature specimens belonging to this family were collected in this cave.

**Cicurina* sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Grutas de Coyame.

Comment.—Immature specimens assignable to this genus were collected under rocks in this cave.

***Cicurina (Cicurella) coahuila* Gertsch

Records.—*Coahuila:* Cueva de los Lagos.

Bibliography.—Brignoli, 1972; Gertsch, 1971a; Hoffmann, 1976; Reddell, 1973a, 1981.

Comment.—This eyeless spider is a member of a largely undescribed complex of troglobitic species distributed widely in Texas caves.

Family Araneidae

Araneus sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón de las Moscas, Socavón de Santo Tomás.

Comment.—Only immature specimens of this genus were collected in these two caves.

Metellina sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón de las Moscas, Socavón de Santo Tomás.

Comment.—Only immature specimens of this genus were collected in these two caves.

Family Clubionidae

Strotarchus sp. (det. W. J. Gertsch)

Records.—*Coahuila:* Pedregoso Pipe Cave.

Comment.—A single immature specimen belonging to this genus was collected in this cave. It is probably an accidental.

Syspira sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Cueva del Diablo.

Comment.—An immature specimen was taken from the entrance area.

Family Ctenidae

**Ctenus* sp. (det. W. J. Gertsch)

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Reddell, 1967a, 1971b.

Comment.—These large spiders frequent caves from southern Texas into México. Specimens were taken from the wall of the entrance room in Grutas del Palmito.

Family Filistatidae

Filistata arizonica (Chamberlin and Ivie) (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva de las Animas.

Comment.—This species was taken below the entrance and may be an accidental.

Filistatinella sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Cueva del Salitre.

Comment.—An immature specimen of this genus was taken in the entrance area; it is certainly an accidental.

**Filistatoides* n. sp. (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva de las Animas, Cueva de Empalme, Cueva del Granjeno, Cueva de los Grillos, Cueva del Guano, Cueva de la Herradura, Cueva de Pedregoso, Pedregoso Circle Cave, Pedregoso Hidden Cave, Cueva del Vapor, Cueva de Yeso; *Nuevo León:* Cueva de Carrizal.

Comment.—This spider is abundant in caves throughout the desert regions of northern México. It is usually found hanging from webs on the cave walls and ceiling.

Family Gnaphosidae

Zelotes rusticus (L. Koch) (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva del León.

Comment.—This spider was taken from the entrance area; it is certainly an accidental.

Family Leptonetidae

***Leptoneta isolata* Gertsch

Records.—*Nuevo León:* Grutas de Villa de García.

Bibliography.—Brignoli, 1972 [*Neoleptoneta isolata*], 1977 [*N. isolata*]; Gertsch, 1971a, 1974; Hoffmann, 1976; Reddell, 1967a [*Leptoneta*], 1973a [*N. isolata*], 1981.

Comment.—This essentially eyeless species is closely related to the Mexican troglophile *L. pecki* Gertsch.

***Leptoneta limpida* Gertsch

Records.—*Durango:* Cueva de los Riscos.

Bibliography.—Brignoli, 1977 [*Neoleptoneta limpida*], 1979 [*N. limpida*]; Gertsch, 1974; Hoffmann, 1976; Reddell, 1977, 1981.

Comment.—This species is more closely allied to cavernicole species of *Leptoneta* in Central Texas than to the other Mexican species of the genus. It was taken from near the end of the cave.

Family Linyphiidae

Meioneta sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón de las Fisuras.

Comment.—Only immature specimens of this genus were collected.

Scylaceus n. sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Cueva del Diablo.

Comment.—The ecological status of this undescribed species is unknown.

Family Lycosidae

Pardosa fallax Barnes (det. W. J. Gertsch)

Records.—*Chihuahua:* Cueva del Diablo.

Comment.—This spider was taken from the main entrance sink and is an accidental.

Pardosa vadosa Barnes (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón de las Moscas, Socavón del Pino.

Comment.—These spiders were collected from the bottom of the entrance drops and are certainly accidentals.

Family Mysmenidae

**Maymena chica* Gertsch

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Gertsch, 1960, 1971a, 1973; Hoffmann, 1976; Reddell, 1971b, 1981.

Comment.—This species is also known from caves in San Luis Potosí and Tamaulipas.

Family Nesticidae

**Eidmannella pallida* (Emerton) (det. W. J. Gertsch)

Records.—*Chihuahua:* Cueva del Diablo; *Coahuila:* Sumidero de Alicantre, Cueva del Granjeno.

Bibliography.—Gertsch, 1971a; Reddell, 1971b; Spieth, 1950.

Comment.—This is among the more common troglophile spiders in North America. It has been collected from numerous caves throughout México.

**Gaucelmus augustinus* Keyserling

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Gertsch, 1971a.

Comment.—This spider is a common troglophile in the caves of Texas and México. It is usually found hanging from webs along the cave walls.

Family Pholcidae

***Anopsicus exiguus* (Gertsch)

Records.—*Durango:* Cueva de los Riscos.

Bibliography.—Gertsch, 1971a [*Pholcophora exigua*], 1981; Hoffmann, 1976 [*P. exigua*]; Reddell, 1973a [*P. exigua*], 1977 [*P. exigua*], 1981 [*P. exigua*].

Comment.—This species is known only from the above cave. It was taken from the most remote part of the cave.

Metagonia sp. (det W. J. Gertsch)

Records.—*Coahuila:* Pozo de El Potrero.

Comment.—Immature specimens of this genus were found hanging in webs along the sides of this natural well.

**Metagonia candela* Gertsch

Records.—*Nuevo León:* Unnamed cave (Bustamante), Cueva del Carrizal.

Bibliography.—Gertsch, 1971a, 1973b; Hoffmann, 1976; Reddell, 1967a [*Metagonia*, undescribed species (part)], 1971b [*Metagonia* sp. (part)], 1973a, 1981.

Comment.—Although this species is known only from the above caves, it has large eyes and is presumably a troglophile.

**Metagonia serena* Gertsch

Records.—*Nuevo León:* Grutas de Villa de García.

Bibliography.—Gertsch, 1971a; Hoffmann, 1976; Reddell, 1967a [*Metagonia*, undescribed species (part)], 1971b [*Metagonia* sp. (part)], 1973a, 1981.

Comment.—This large-eyed species is known only from the above cave.

Modisimus sp. (det. W. J. Gertsch)

Records.—*Durango:* Cueva de los Riscos.

Comment.—Only immature specimens of this genus were collected.

**Modisimus pusillus* Gertsch

Records.—*Nuevo León:* Grutas de Villa de García.

Bibliography.—Brignoli, 1974a; Gertsch, 1971a, 1973; Hoffmann, 1976; Reddell, 1967a [*Modisimus* sp. (part)], 1971b [*Modisimus* sp. (part)], 1981.

Comment.—This eyed species is also known from a small cave near Galeana, Nuevo León.

Physocyclus sp. (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva de los Grillos; *Durango:* Mine (Puente de Ojuela), Cueva del Guano, Cueva de los Riscos, Cueva de la Siguerita.

Comment.—Only immature specimens of this genus were taken in these caves.

**Physocyclus enaulus* Crosby (Det. W. J. Gertsch)

Records.—*Chihuahua:* Cueva del Diablo, Cueva de los Muchachos; *Coahuila:* Cueva de los Lagos, Cueva del León.

Bibliography.—Gertsch, 1971a; Hoffmann, 1976; Reddell, 1981.

Comment.—This species is a common inhabitant of the entrance area of caves in the southwestern United States. It will probably prove to be more abundant in northern México than these records indicate.

**Physocyclus hoogstraali* Gertsch and Davis

Records.—*Coahuila:* Cueva de las Animas, Cueva de la Herradura; *Nuevo León:* Cueva del Diablo, Grutas de Villa de García.

Bibliography.—Gertsch, 1971a; Gertsch and Davis, 1942; Hoffmann, 1976; Nicholas, 1962; Reddell, 1967a, 1970a, 1971b, 1981.

Comment.—Nicholas (1962) listed this species as a troglobite, but it is probably a troglophile. It is usually found hanging in webs near the cave entrance.

**Physocyclus pedregosus* Gertsch

Records.—*Coahuila:* Pedregoso Circle Cave.

Bibliography.—Gertsch, 1971a; Hoffmann, 1976; Reddell, 1973a, 1981.

Comment.—This species is known only from this cave.

Psilochorus sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Sótano de Sauz; *Coahuila:* Cueva de la Herradura.

Comment.—Only immature specimens were collected in these caves.

**Psilochorus* n. sp. 1 (det. W. J. Gertsch)

Records.—*Chihuahua:* Grutas de Coyame.

Comment.—This undescribed species was collected in the main entrance room to the cave.

**Psilochorus* n. sp. 2 (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón de las Moscas.

Comment.—This undescribed species was collected from the lower levels of the cave.

**Psilochorus* n. sp. 3 (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva del Vapor.

Comment.—This undescribed species was collected from the main passage of the cave.

***Psilochorus delicatus* Gertsch

Records.—*Durango:* Cueva de los Riscos.

Bibliography.—Gertsch, 1971a; Hoffmann, 1976; Reddell, 1977, 1981.

Comment.—This species was collected from webs in the more remote areas of the cave.

***Psilochorus diablo* Gertsch

Records.—*Chihuahua:* Cueva del Diablo.

Bibliography.—Gertsch, 1971a; Hoffmann, 1976; Reddell, 1971a [*Psilochorus* sp. (part)], 1973a, 1977, 1981; Spieth, 1950 [*Psilochorus* new species].

Comment.—This species was found in the moister areas near the cave entrance, where it was hanging from webs.

**Psilochorus russelli* Gertsch

Records.—*Coahuila:* Cueva del Pedregoso, Pedregoso Circle Cave, Pedregoso Pipe Cave.

Bibliography.—Gertsch, 1971a; Hoffmann, 1976; Reddell, 1973a, 1981.

Comment.—Although this species is known only from the above cave, it is eyed and presumably a troglophile.

Family Salticidae

Undetermined genus and species (det. W.J. Gertsch)

Records.—*Chihuahua:* Socavón de las Moscas.

Comment.—This spider was collected below the entrance in leaf litter; it is an accidental.

Family Scytodidae

**Loxosceles aurea* Gertsch

Records.—*Durango:* Cueva del Guano.

Bibliography.—Brignoli, 1976; Gertsch, 1973; Hoffmann, 1976; Reddell, 1981.

Comment.—This species is known only from this cave and an epigean locality in southwestern Coahuila. It was collected from webs on guano-covered breakdown in Cueva del Guano.

**Loxosceles belli* Gertsch

Records.—*Coahuila:* Cueva de las Animas, Cueva de los Lagos.

Bibliography.—Brignoli, 1976; Gertsch, 1973; Hoffmann, 1976; Reddell, 1981.

Comment.—This species is known only from bat guano in these two caves.

**Loxosceles bolivari* Gertsch

Records.—*Nuevo León:* Cueva del Carrizal, Grutas de Villa de García.

Bibliography.—Brignoli, 1976; Gertsch, 1958, 1973; Hoffmann, 1976; Reddell, 1971b, 1981; Vogel, 1967.

Comment.—This species is known only from these two caves. It was collected from the dry upper-level parts of Cueva del Carrizal.

Family Selenopidae

Selenops mexicanus Keyserling (det. W.J. Gertsch)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—This species was collected from palm fronds along the entrance slope. It is presumably an accidental.

Family Theridiidae

**Achaearanea* sp. (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva de los Lagos.

Comment.—These immature specimens probably belong to the species *A. porteri* Banks, a common troglophile in Central Texas.

Achaearanea canionis Chamberlin and Gertsch (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón de las Moscas.

Comment.—These specimens were collected from webs near the cave entrance. The species has also been collected from caves in Nuevo León and San Luis Potosí. Its ecological status is uncertain.

Latrodectus hesperus Chamberlin and Ivie (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva del Vapor.

Comment.—This black-widow spider was taken from a web in the entrance area.

Latrodectus mactans Fabricius (det. W. J. Gertsch)

Records.—*Coahuila:* Cueva de los Lagos.

Comment.—This species of black-widow spider is occasionally found hanging in webs near cave entrances in Texas.

Steatoda apacheana Gertsch (det. W. J. Gertsch)

Records.—*Chihuahua:* Cueva de los Murciélagos.

Comment.—This specimen was taken from bat guano in darkness in this cave.

Family Uloboridae

Philoponella oweni Chamberlin (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón del Pino.

Comment.—This species was collected from the entrance passage of the cave. It is probably an accidental.

Family Zoropsidae

Zorocrates sp. (det. W. J. Gertsch)

Records.—*Chihuahua:* Socavón del Pino.

Comment.—Only immature specimens of this species were collected from near the cave entrance; it is presumably an accidental.

Order Opilionida

Suborder Laniatores

Family Phalangodidae

***Hoplobunus osorioi* (Goodnight and Goodnight)

Records.—*Nuevo León:* Cueva del Carrizal, Grutas del Palmito, Grutas de Villa de García.

Bibliography.—Bolívar y Pieltain, 1944 [*Chinquipellobunus osorioi*]; Bonet, 1946 [*Chipinquelobunus* (sic) *osorioi*]; Goodnight and Goodnight, 1944 [*C. osorioi*], 1945 [*C. osorioi*]; Reddell, 1967a [*C. osorioi*], 1971b, 1981.

Comment.—This species with reduced eyes is abundant along the stream passage in Cueva del Carrizal. It is known only from these three caves.

**Pellobunus mexicanus* Goodnight and Goodnight (det. C. J. Goodnight)

Records.—*Nuevo León:* Cueva del Carrizal, Grutas del Palmito.

Bibliography.—Goodnight and Goodnight, 1971; Reddell, 1973a [*Pellobusum* (sic) *mexicanus*], 1981.

Comment.—This species with slightly reduced eyes has also been reported from caves in Querétaro.

Suborder Palpatores

Family Phalangiidae

Undetermined genus and species

Comment.—Phalangiids, probably all belonging to the genus *Leiobunum*, are abundant in the entrance area of many caves in northern México. The taxonomy of this group is very difficult and only additional study will provide correct names for most of the specimens. *Leiobunum townsendi* Weed is an abundant species in the caves of Central Texas and doubtless occurs in caves in northern México.

Order Ricinulei

Family Ricinoididae

**Pseudocellus mitchelli* (Gertsch)

Records.—*Durango:* Cueva del Guano.

Bibliography.—Brignoli, 1974b [*Cryptocellus mitchelli*]; Cooke, 1972 [*C. mitchelli*]; Cooke and Shadab, 1973 [*C. mitchelli*]; Dumitresco and Juvara-Bals, 1973 [*C. mitchelli*]; Gertsch, 1971b [*C. mitchelli*]; Márquez Mayaudon and Elorduy de Conconi, 1974 [*C. mitchelli*]; Platnick, 1980; Reddell, 1971b [*Cryptocellus* sp. (part)], 1973a [*C. mitchelli*], 1977 [*C. mitchelli*], 1981 [*C. mitchelli*]; Reddell and Kunath, 1972 [ricinuleids].

Comment.—This relict ricinuleid was comparatively abundant on small patches of guano in the hot, moist inner rooms of this cave. Although it may be ecologically isolated by the desert surrounding the cave, the species shows no particular troglobitic adaptations.

****Pseudocellus reddelli** (Gertsch)

Records.—*Durango:* Cueva de los Riscos.

Bibliography.—Brignoli, 1974b [*Cryptocellus reddelli*]; Cooke and Shadab, 1973 [*C. reddelli*]; Dumitresco and Juvara-Bals, 1976 [*C. reddelli*]; Gertsch, 1971b [*C. reddelli*]; Márquez Mayaudon and Elorduy de Conconi, 1974 [*C. reddelli*]; Platnick, 1980; Reddell, 1967b [*Cryptocellus* new species], 1971b [*Cryptocellus* sp. (part)], 1973a [*C. reddelli*], 1973b [*C. reddelli*], 1977 [*C. reddelli*], 1981 [*C. reddelli*]; Reddell and Kunath, 1972 [*C. reddelli*].

Comment.—This is the most highly cave-adapted ricinuleid known. It is a rare species collected only from clay banks and among rocks in the small inner rooms at the end of Cueva de los Riscos.

Order Acarina

Suborder Metastigmata

Family Argasidae

*****Antricola mexicanus* Hoffmann (det. J. E. Keirans)

Records.—*Chihuahua:* Sótano de Sauz.

Comment.—More than 300 dead ticks belonging to this species were collected from dry guano and among the mummified remains of thousands of bats, *Mormoops megalophylla megalophylla* Peters.

Argas cooleyi Kohls and Hoogstraal (det. G. M. Kohls)

Records.—*Chihuahua:* Cueva del Salitre.

Comment.—This species was collected from cave swallow guano in the entrance room of this cave.

Ornithodoros sp.

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Anonymous, 1942; Reddell, 1971b.

Comment.—This unidentified tick was taken from bat guano.

Ornithodoros (Alectorobius) dyeri Cooley and Kohls

Records.—*Nuevo León:* Cueva del Diablo.

Bibliography.—Kohls et al., 1965; Reddell, 1971b.

Comment.—This tick was taken from the guano of *Mormoops megalophylla megalophylla.*

Suborder Prostigmata

Family Pterygosomidae

Hirstiella trombidiformes (Berlese)

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Cunliffe, 1952; Hoffmann, 1969.

Comment.—The genus *Hirstiella* is usually a parasite of lizards. Its host in this cave is unknown.

Family Rhagidiidae

Undetermined genus and species (det. R. W. Strandtmann)

Records.—*Nuevo León:* Grutas del Palmito, Grutas de Villa de García.

Comment.—Single specimens of mite of this family were collected in each of the above caves. Two species of *Rhagidia* are possibly troglobitic in Sótano de la Tinaja, San Luis Potosí.

Family Smaridiidae

Fessonia sp. (det. C. E. Yunker)

Records.—*Chihuahua:* Cueva del Salitre.

Comment.—Mites of this genus were taken from swallow guano. The larvae of this family are parasitic on insects, while the adults are predaceous.

Family Trombiculidae

Undetermined genus and species (det. R. L. Smiley)

Records.—*Coahuila:* Pedregoso Circle Cave.

Comment.—A single, unidentifiable, adult belonging to this family was collected in the above cave. Adult trombiculids are frequently abundant in bat caves in México. The larvae are parasitic on mammals.

Suborder Astigmata

Family Acaridae

*****Caloglyphus longipilus* Nesbitt

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Nesbitt, 1949; Reddell, 1971b.

Comment.—This species was taken from bat guano. It has also been reported from Grutas de Juxtlahuaca, Guerrero.

*****Caloglyphus paranomalus* Nesbitt

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Nesbitt, 1949; Reddell, 1971b.

Comment.—This guanophile is also known from caves in Michoacán and Veracruz.

Family Glycyphagidae

Glycyphagus domesticus DeGeer) (det. R. L. Smiley)

Records.—*Coahuila:* Cueva del Pedregoso.

Comment.—This widespread species was taken from bat guano. It has also been reported from caves in Chiapas and Guerrero.

CLASS CHILOPODA

Order Lithobiomorpha

Family Lithobiidae

****Garcibius osorioi*** Chamberlin

Records.—*Nuevo León:* Grutas de Villa de García.

Bibliography.—Bonet, 1946; Chamberlin, 1942, 1943a; Nicholas, 1962; Reddell, 1967a, 1971b, 1981.

Comment.—This pale, elongate centipede is unquestionably a troglobite. Its affinities, however, are not known.

Order Scolopendromorpha

Family Scolopendridae

Newportia (Scolopendrides) pelaezi Chamberlin

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Bolívar y Pieltain, 1944; Bonet, 1946; Bücherl, 1959; Chamberlin, 1942, 1943a; Nicholas, 1962; Reddell, 1971b, 1981.

Comment.—Although Nicholas (1962) listed this species as a troglobite, it does not appear to exhibit modifications for a cave existence. Other species of this genus are troglobites in caves in Tamaulipas and San Luis Potosí.

Order Scutigeromorpha

Family Scutigeridae

Scutigera carrizala Chamberlin

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Chamberlin, 1942, 1943a [*Scutigera carrizola* (sic)]; Nicholas, 1962; Reddell, 1971b, 1981.

Comment.—Nicholas (1962) listed this species as a troglobite, but it shows no adaptations for a troglobitic existence and is presumably a troglophile.

CLASS DIPLOPODA

Order Polydesmida

Family Polydesmidae

****Speodesmus** n. sp. (det. N. B. Causey)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—A single specimen belonging to this genus was collected from beneath a rock in the entrance room. The genus *Speodesmus* is known by several described and undescribed species in the caves of Central Texas, but the genus is otherwise not known from México.

Family Rhachodesmidae

Undetermined genus and species (det. N. B. Causey)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—This milliped was collected near the entrance to the cave and may represent an undescribed genus and species. This is the northern limit of the family Rhachodesmidae, and it may be a relict species surviving in the moist cave environment. It does not, however, appear to have undergone troglobitic modifications.

****Ceuthauxus palmitonus** Chamberlin

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Bolívar y Pieltain, 1944 [*Ceuthauxius* (sic) *palmitonus*]; Bonet, 1946; Causey, 1973; Chamberlin, 1942, 1943b; Loomis, 1968 [*Strongylodesmus palmitonus*]; Nicholas, 1962; Reddell, 1967a [*Ceuthauxus palmitensis* (sic)], 1971b [*Strongylodesmus palmitonus*], 1981.

Comment.—This large, white milliped is also a relict population restricted to the cave environment by the surrounding desert. Numerous specimens have been collected from silt, rotten wood, and an oatmeal trail in the cave.

Family Sphaeriodesmidae

Undetermined genus and species (det. N. B. Causey)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—Sphaeriodesmid millipeds were collected from the entrance area; their ecological status is unknown.

Family Xystodesmidae

Rhysodesmus sp. (det. N. B. Causey)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—This is certainly an accidental. No species of xystodesmid is known to have successfully invaded the cave habitat.

Order Spirostreptida

Family Cambalidae

****Cambala speobia** (Chamberlin)

Records.—*Coahuila:* Cueva de los Lagos.

Bibliography.—Causey, 1965 [*Cambala speobia* subspecies], 1968 [*Cambala*], 1971a; Loomis, 1968 [*C. speobia* new subspecies]; Mitchell and Reddell, 1971 [*C. speobia* subspecies]; Reddell, 1965b [*C. speobia* new subspecies], 1971b [*C. speobia* subsp.]; 1981; Shear, 1974; Shelley, 1979.

Comment.—This species is widespread in the caves of Central Texas. This is the only Mexican record for the species.

CLASS INSECTA

Order Thysanura

Family Lepismatidae

Allacrotelsa spinulata (Packard) (det. P. Wygodzinsky)

Records.—*Chihuahua:* Cueva del Salitre.

Comment.—This widespread species was taken from cave swallow guano in the entrance area of the cave; it is doubtless an accidental.

Ctenolepisma ciliata (Dufour)

Records.—*Chihuahua:* Cueva del Diablo.

Bibliography.—Wygodzinsky, 1972.

Comment.—This silverfish was collected from the entrance sink.

Order Diplura

Family Campodeidae

***Paratachycampa boneti* Wygodzinsky

Records.—*Nuevo León:* Grutas de Villa de García.

Bibliography.—Bonet, 1946a; Condé, 1955, 1975; Delamare Deboutteville, 1971 [*Paratachycampa*]; Nicholas, 1962; Paclt, 1957 [*Plusiocampa (Stygiocampa) boneti*]; Reddell, 1967a, 1971b, 1981; Vandel, 1964 [*Paratachycampa*], 1965a [*Paratachycampa*]; Wygodzinsky, 1944.

Comment.—This distinctive troglobite is known only from the above cave.

***Podocampa cavernicola* (Wygodzinsky)

Records.—*Nuevo León:* Grutas de Villa de García.

Bibliography.—Bonet, 1946 [*Parallocampa cavernicola*]; Condé, 1955 [*Parallocampa cavernicola*], 1975; Delamare Deboutteville, 1971 [*Parallocampa*]; Nicholas, 1962 [*Parallocampa cavernicola*]; Paclt, 1957 [*Meiocampa (Remycampa) cavernicola*]; Reddell, 1967a, [*Parallocampa cavernicola*], 1971b [*Parallocampa cavernicola*], 1981; Vandel, 1964 [*Parallocampa*], 1965a [*Parallocampa*]; Wygodzinsky, 1944 [*Parallocampa cavernicola*].

Comment.—This highly evolved troglobite is known only from the type-specimen.

Order Collembola

Family Entomobryidae

***Oncopodura prietoi* Bonet

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Anonymous, 1942 [*Onchopodura* (sic)]; Bolívar y Pieltain, 1944; Bonet, 1943, 1946; Christiansen and Bellinger, 1980; Guéorgiev, 1974 [*Oncopodura prietori* (sic)]; Nicholas, 1962; Reddell, 1971b, 1981; Salmon, 1964.

Comment.—This species is also known from caves in Tamaulipas and other parts of Nuevo León.

**Pseudosinella violenta* (Folsom) (det. K. Christiansen)

Records.—*Chihuahua:* Caves; *Coahuila:* Cueva de los Lagos; *Durango:* Cueva del Guano, Cueva de la Siguerita.

Bibliography.—Christiansen, 1973; Reddell, 1981.

Comment.—This is the common troglophile collembolan in the caves of Central Texas.

Family Hypogastruridae

**Acherontiella (Acherontiella) sabina* Bonet (det. K. Christiansen)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—This species is known also from caves in Oaxaca, San Luis Potosí, Tamaulipas, and other parts of Nuevo León.

Family Isotomidae

Cryptopygus sp. (det. K. Christiansen)

Records.—*Durango:* Cueva de la Siguerita.

Comment.—This genus is not otherwise represented in Mexican caves.

Family Neelidae

Megalothorax minimus Willem

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Bonet, 1947; Reddell, 1971b.

Comment.—This species has also been reported from caves in Yucatán; its ecological status is unknown.

Family Sminthuridae

***Pararrhopalites anops* Bonet and Tellez

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Bonet and Tellez, 1947; Cassagnau and Delamare Deboutteville, 1953; Nicholas, 1962; Reddell, 1967a, 1971b, 1981; Salmon, 1964; Stach, 1956.

Comment.—The genus *Pararrhopalites* is otherwise known only by an epigean species in Guerrero.

Order Blattaria

Family Polyphagidae

+*Arenivaga* sp. (det. A. B. Gurney)

Records.—*Coahuila:* Cueva de las Animas; *Durango:* Cueva de la Cucaracha, Cueva de los Riscos.

Comment.—Nymphs of this genus were collected from dry dusty entrance areas in each of the above caves.

Order Saltatoria

Family Gryllidae

**Paracophus sanctorum* Hubbell (det. T. H. Hubbell)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—This species is otherwise known from caves in Tamaulipas.

**Paracophus subapterus* Chopard

Records.—*Coahuila:* Cueva de las Animas; *Nuevo León:* Unnamed pit (Bustamante), Cueva del Carrizal, Grutas del Palmito.

Bibliography.—Barrera, 1968; Chopard, 1947, 1968; Hubbell, 1972; Leroy, 1967; Reddell, 1967a [*Paracophus apterus* (error for *subapterus)*], 1971b, 1973a [*Paracophus* (part)], 1981.

Comment.—The genus *Paracophus* includes troglophile and troglobite species from the above caves south to Hidalgo. In most caves specimens were collected from beneath rocks.

Family Rhaphidophoridae

+Undescribed genus no. 1, new species (det. T. H. Hubbell)

Records.—*Nuevo León:* Cueva de las Fisuras, Grutas del Palmito.

Bibliography.—Reddell, 1967a, 1971b.

Comment.—This unusual cricket is now under study by T. H. Hubbell.

+Undescribed genus no. 2, new species (det. T. H. Hubbell)

Records.—*Durango:* Cueva de los Riscos.

Comment.—This new genus and species is known only from this cave and is represented by only a few specimens.

+Undescribed genus no. 3, new species (det. T. H. Hubbell)

Records.—*Coahuila:* Cueva de los Grillos.

Comment.—This species was abundant on the ceiling near the cave entrance.

+?Undescribed genus nr. *Anargyrtes*, new species (det. T. H. Hubbell)

Records.—*Durango:* Lower Mine (Grutas de Mapimí); Grutas de Mapimí.

Comment.—This possible new genus was collected from the ceiling and among breakdown blocks.

+?Undescribed genus nr. *Pristoceuthophilus*, new species (det. T. H. Hubbell)

Records.—*Coahuila:* Sumidero de Alicantre.

Comment.—A hind femur collected in this cave possibly belongs to an apparent new genus also known from southern México.

+*Ceuthophilus* sp. (det. T. H. Hubbell)

Records.—*Chihuahua:* Cueva del Diablo, Socavón del Pino, Socavón de Santo Tomás.

Comment.—Juveniles of what is apparently the same species were collected in each of the above caves.

+*Ceuthophilus (Ceuthophilus)* n. sp. (*secretus* group) (det. T. H. Hubbell)

Records.—*Chihuahua:* ?Cueva del Diablo; *Coahuila:* Cueva de los Lagos.

Comment.—Material from Cueva del Diablo was too immature to verify its identity conclusively with material from Cueva de los Lagos.

+*Ceuthophilus (Ceuthophilus)* n. sp. *(spinosus* group) (det. T. H. Hubbell)

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Reddell, 1967a, 1971b.

Comment.—This species is seasonally abundant in the entrance room of the cave.

+*Ceuthophilus (Ceuthophilus)* n. sp. *(?utahensis* series) (det. T. H. Hubbell)

Records.—*Chihuahua:* Cueva de los Muchachos.

Comment.—This species was abundant in the entrance area of this cave.

+*Ceuthophilus (Ceuthophilus)* sp. prob. *conicaudus* Hubbell (det. T. H. Hubbell)

Records.—*Chihuahua:* Grutas de Coyame; *Coahuila:* Bocas del Carmen; *Durango:* Cueva de los Riscos.

Comment.—Only juveniles were collected in these caves, and their identity is uncertain.

+*Ceuthophilus (Ceuthophilus) variegatus* Scudder (det. T. H. Hubbell)

Records.—*Chihuahua:* Cueva del Diablo; *Coahuila:* Cueva Hundido, Cueva de Empalme, Cueva de los Grillos, Cueva de la Herradura.

Bibliography.—Hubbell, 1936, 1972; Reddell, 1966a, 1971b; Rehn and Hebard, 1912 [*Ceuthophilus mexicanus*]; Scudder, 1894 [*C. mexicanus*].

Comment.—This large cricket is frequently found in small numbers in caves in Texas and northern México. Cueva Hundido (mistakenly identified with Cueva de la Candelaria in Reddell, 1971b) is almost certainly the type-locality identified as "cave with mummies" by Scudder (1894).

+*Ceuthophilus (Geotettix) cunicularis* Hubbell (det. T. H. Hubbell)

Records.—*Coahuila:* Cueva de los Lagos.

Comment.—This species is abundant in the caves of Central Texas.

Order Psocoptera

Family Psyllipsocidae

**Psyllipsocus* sp. (det. E. L. Mockford)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—Only nymphs were collected in the above cave; this is probably *P. ramburii* Selys-Longchamps.

**Psyllipsocus ramburii* Selys-Longchamps (det. E. L. Mockford)

Records.—*Chihuahua:* Cueva del Diablo, Socavón del Pino; *Durango:* Cueva del Guano, Cueva de los Riscos.

Comment.—This species is known from caves in many parts of the world. In México it is known also from caves in Chiapas, Coahuila, Nuevo León, Puebla, San Luis Potosí, Veracruz, Tamaulipas, and Yucatán. In Cueva del Diablo it was abundant on small pieces of paper throughout the cave.

Family Ptiloneuridae

Undetermined genus and species (det. E. L. Mockford)

Records.—*Chihuahua:* ?Socavón de las Moscas.

Comment.—Nymphs tentatively assigned to the family Ptiloneuridae were collected near the cave entrance.

Order Hemiptera

Family Lygaeidae

Ligyrocoris litigiosus Stal (det. R. C. Froeschner)

Records.—*Chihuahua:* Socavón de Santo Tomás.

Comment.—This species was collected below the entrance drop; it is doubtless an accidental.

Family Pyrrhocoridae

Largus convivus Stal (det. R. C. Froeschner)

Records.—*Chihuahua:* Sótano Suciedad de Santo Tomás.

Comment.—This species was collected below the entrance drop.

Family Reduviidae

Undetermined genus and species (det. R. C. Froeschner)

Records.—*Coahuila:* Cueva de la Herradura; *Durango:* Cueva del Guano.

Comment.—Only nymphs of this family were taken in the above caves.

Reduviinae genus and species (det. R. C. Froeschner)

Records.—*Nuevo León:* Cueva de Constantín.

Comment.—Nymphs of an unidentifiable genus of the subfamily Reduviinae were collected in this cave.

Reduvius sp. (det. R. E. Ryckman and R. C. Froeschner)

Records.—*Durango:* Cueva del Guano; *Nuevo León:* Cueva del Carrizal.

Comment.—Specimens of this genus were taken from dry entrance areas in each cave.

Order Coleoptera

Family Alleculidae

**Hymenorus* sp. (det. T. J. Spilman)

Records.—*Coahuila:* Cueva de los Lagos.

Comment.—The genus *Hymenorus* is represented in the caves of Texas by two apparently troglophilic species.

Family Carabidae

***Mexaphaenops prietoi* Bolívar y Pieltain

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Barr, 1966 [*Mexaphaenops*], 1967a, 1967b, 1968, 1971, 1981b; Barrera, 1968; Bolívar y Pieltain, 1942, 1944; Erwin et al., 1977; Laneyrie, 1971; Reddell, 1967a, 1971b, 1981; Thinès and Tercafs, 1972 [*Mexaphaenops*]; Vandel, 1964 [*Mexaphaenops*], 1965a [*Mexaphaenops*]; Vigna Taglianti, 1972, 1977.

Comment.—This is the most northern locality for the genus *Mexaphaenops* which is otherwise known from caves in San Luis Potosí, Querétaro, Tamaulipas, and other parts of Nuevo León.

**Mexisphodrus boneti palmitensis* Barr

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Barr, 1981a; Reddell, 1966a [Undescribed genus and species of family Carabidae], 1967a [Undescribed genus of carabid].

Comment.—This subspecies is known only from the above cave. Other subspecies occur in Cueva de la Boca, caves on Cuesta de Chipinque, and Cueva de Chorros de Agua, all in Nuevo León.

**Platynus pelaezi* (Bolívar y Pieltain and Hendrichs)

Records.—*Nuevo León:* Grutas de Villa de García.

Bibliography.—Anonymous, 1942 [*Rhadine* (part)]; Barr, 1966 [*Rhadine* (part)], 1974 [*Rhadine pelaezi*], 1981a; Barrera [*R. pelaezi*]; Bolívar y Pieltain and Hendrichs, 1964 [*R. pelaezi*]; Erwin et al., 1977; Halffter, 1950 [*Rhadine* (part)]; Hendrichs and Bolívar y Pieltain, 1973 [*R. pelaezi*]; Reddell, 1967a [*R. pelaezi*]; 1971b [*R. pelaezi*], 1981; Whitehead, 1973.

Comment.—This species is known only from the above cave.

**Rhadine araizai* (Bolívar y Pieltain)

Records.—*Coahuila:* Cueva de los Lagos; *Nuevo León:* Grutas del Palmito, Cueva del Precipicio.

Bibliography.—Anonymous, 1942 [*Comstockia*]; Barr, 1960 [*Spelaeorhadine araizai*], 1966 [*Rhadine* (part)], 1968, 1974 [*S. araizai*], 1981a; Barr and Lawrence, 1960 [*S. araizai*]; Barrera, 1968 [*Spaeleorhadine* (sic) *araizai*]; Bolívar y Pieltain, 1942 [*Rhadine*], 1944 [*S. araizai*]; Bolívar y Pieltain and Hendrichs, 1964; Erwin et al., 1977 [*Platynus araizi* (sic)]; Hendrichs and Bolívar y Pieltain, 1973; Jeannel, 1949 [*S. araizai*], 1965 [*Spelaeorhadine*]; Mitchell and Reddell, 1971; Nicholas, 1962 [*S. araizai*]; Reddell, 1965a, 1966a, 1967a, 1971b [*R. araizai araizai*], 1981; Vandel, 1964 [*S. araizai*], 1965a [*S. araizai*]; Whitehead, 1973 [*P. araizai*].

Comment.—The genus *Rhadine* ranges from Canada south into San Luis Potosí. This species has been collected from the wall of Grutas del Palmito in a small side passage near the entrance.

**Rhadine bolivari* Barr

Records.—*Coahuila:* Cueva del Pedregoso.

Bibliography.—Barr, 1981a.

Comment.—A single specimen of this species was collected from the terminal room of the cave.

**Rhadine perlevis* Casey

Records.—*Chihuahua:* Grutas de Coyame.

Bibliography.—Barr, 1981a; Reddell, 1980 [*Rhadine*].

Comment.—Several specimens of this species were collected as they crawled on moist flowstone and from under rocks in the entrance room of the cave. This species is not otherwise known from Mexican caves; it ranges north into Arizona.

**Rhadine rotgeri* Bolívar y Pieltain and Hendrichs

Records.—*Durango:* Grutas de Mapimí.

Bibliography.—Barr, 1981a; Reddell, 1980 [*Rhadine*].

Comment.—This species, otherwise known only from Gruta de Cuevacillas, Coahuila, was taken from under rocks and on moist flowstone near the cave entrance.

**Tachys (Tachys) proximus* Say

Records.—*Coahuila:* Cueva de los Lagos.

Bibliography.—Barr and Reddell, 1967; Reddell, 1966a, 1971b, 1981.

Comment.—This small troglophile is also known from several caves in Central Texas.

Family Cleridae

Undetermined genus and species (det. T. C. Barr)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—This obvious accidental was taken near the cave entrance.

Family Dermestidae

**Dermestes carnivorus* Fabricius (det. J. M. Kingsolver)

Records.—*Coahuila:* Cueva de la Herradura, Cueva del León; *Durango:* Cueva del Guano.

Comment.—This common species was taken from guano in each of the above caves. It is also known from many bat caves in the southwestern United States and other parts of México.

Family Histeridae

Undetermined genus, nr. *Bacanius*, undetermined species (det. R. Wenzel)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—This species is probably a troglophile. Its exact determination must await further study.

Family Leiodidae

**Ptomaphagus (Adelops) cavernicola cavernicola* Schwarz

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Peck, 1966, 1968, 1971, 1973a, 1973b, 1977; Reddell, 1967a, 1967b, 1971b, 1981.

Comment.—This species of dung beetle is extremely abundant in this cave, particularly in areas where human feces have accumulated. It ranges throughout a wide area of the United States, but this is the only record for México.

Family Melyridae

Undetermined genus and species (det. D. M. Anderson)

Records.—*Durango:* Cueva de la Siguerita.

Comment.—A larva of this family was collected from the above cave. It is presumably an accidental.

Anthocomus sp. (det. J. M. Kingsolver)

Records.—*Durango:* Cueva de la Siguerita.

Comment.—This is presumably an accidental.

Family Ptinidae

**Niptus abstrusus* Spilman (det. T. J. Spilman)

Records.—*Coahuila:* Pedregoso Circle Cave, Pedregoso Pipe Cave, Cueva de San Vicente; *Durango:* Cueva del Guano.

Bibliography.—Ashworth, 1973 [*Niptus abstruses* (sic)]; Mitchell and Reddell, 1971; Reddell, 1973a [*N. abstrasus* (sic)], 1977, 1981; Reddell and Kunath, 1972 [spider beetles].

Comment.—This species was described from Fern Cave, Val Verde County, Texas. It has also been reported as a fossil from a fossil wood rat midden in a cave in Maravillas Canyon, Brewster County, Texas. In Cueva del Guano it was abundant in bat guano deposits. A second species of this genus, *N. abscondi-tus* Spilman, is considered to be a possible troglobite in Grutas del Xoxafi, Hidalgo.

Family Staphylinidae

Undetermined genus and species (det. L. H. Herman)

Records.—*Coahuila:* Cueva de los Lagos.

Comment.—A larva belonging to this family was collected in the above cave.

Aleocharinae genus and species (det. L.H. Herman)

Records.—*Durango:* Cueva de los Riscos.

Comment.—Specimens belonging to this subfamily cannot presently be placed in a genus due to the taxonomic difficulties of the group.

**Belonuchus* sp. nr. *moquinus* Casey (det. L. H. Herman)

Records.—*Nuevo León:* Grutas del Palmito.

Bibliography.—Reddell, 1967a, 1971b, 1981.

Comment.—This or closely allied species is abundant in the caves of Texas and México.

Neobisnius sp. nr. *sobrinus* Erichson (det. L. H. Herman)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—The ecological status of this species is unknown.

Family Tenebrionidae

+Alphitobius laevigatus (Fabricius) (det. T. J. Spilman)

Records.—*Coahuila:* Cueva de la Herradura.

Comment.—This species was taken from bat guano.

+Centrioptera infausta (LeConte) (det. T. J. Spilman)

Records.—*Coahuila:* Cueva de las Animas, Cueva de los Grillos.

Comment.—This species was collected from the dusty floor of Cueva de los Grillos and from bat guano in Cueva de las Animas.

+Cryptoglossa mexicana mexicana Champion (det. T. J. Spilman)

Records.—*Chihuahua:* Cueva del Diablo; *Coahuila:* Cueva de las Animas, Cueva de los Escarabajos, Cueva de los Grillos, Cueva de la Herradura, Cueva del León, Cueva de Yeso; *Durango:* Cueva del Guano, Cueva de la Siguerita; *Nuevo León:* Cueva del Carrizal, Grutas de Villa de García.

Bibliography.—Reddell, 1970b, 1971b.

Comment.—This common species is also known from caves in Central Texas. It is frequently found on bat guano and in dry dusty entrance areas of caves.

+Eleodes sp. (det. T. J. Spilman)

Records.—*Coahuila:* Cueva de Empalme, Cueva de los Grillos, Pedregoso Circle Cave, Pedregoso Hidden Cave, Cueva de San Vicente; *Durango:* Cueva de la Siguerita; *Nuevo León:* Grutas del Palmito, Grutas de Villa de García.

Comment.—Although specimens from Cueva de San Vicente and Cueva de la Siguerita were taken from dry bat guano, this genus is usually taken from the dry area near cave entrances.

+Eleodes hispilabris (Say) (det. T. J. Spilman)

Records.—*Coahuila:* Cueva de los Lagos.

Bibliography.—Reddell, 1966, 1971b.

Comment.—This species is also known from caves in western Texas.

Family Trogidae

Omorgus carinatus (Loomis) (det. O. L. Cartwright)

Records.—*Durango:* Cueva de la Siguerita.

Comment.—This species was taken from the entrance slope.

Order Diptera

Family Cecidomyiidae

Clinodiplosis araneosa Felt (det. R. J. Gagné)

Records.—*Durango:* Cueva de los Riscos.

Comment.—This fly was collected in the entrance room. Its ecological status is unknown.

Family Rhagionidae

Chrysopilus sp. (det. W. W. Wirth)

Records.—*Durango:* Cueva del Guano, Cueva de la Siguerita.

Comment.—These snipe flies were taken from bat guano. Their ecological status is uncertain, but they may be troglophiles.

Family Sciaridae

**Bradysia* sp. (det. R. J. Gagné)

Records.—*Durango:* Cueva de la Siguerita; *Nuevo León:* Grutas del Palmito.

Comment.—Flies of this genus are common inhabitants of caves throughout México.

Family Streblidae

Trichobius major Coquillett

Records.—*Nuevo León:* Cueva del Carrizal.

Bibliography.—Hoffmann, 1944, 1953; Reddell, 1971b.

Comment.—The host for this species of bat parasite in Cueva del Carrizal is unknown.

Family Tipulidae

Undetermined genus and species (det. W. W. Wirth)

Records.—*Nuevo León:* Cueva de Constantín.

Comment.—A larva belonging to this family was collected in this cave.

Order Hymenoptera

Family Formicidae

Camponotus sp. (det. R. Snelling)

Records.—*Chihuahua:* Socavón de las Moscas, Socavón del Pino.

Comment.—Ants belonging to this genus were collected in the entrance areas of these two caves.

Liometopum apiculatum Mayr (det. A. C. Cole)

Records.—*Chihuahua:* Cueva del Salitre.

Comment.—This species was collected from cave swallow guano in the above cave.

Paratrechina melanderi (Wheeler) (det. A. C. Cole)

Records.—*Coahuila:* Cueva de Empalme.

Comment.—This species was collected from the entrance area of the cave.

Sysphincta sp. (det. A. C. Cole)

Records.—*Coahuila:* Cueva de los Lagos.

Comment.—Ants belonging to this genus were collected near the cave entrance.

PHYLUM CHORDATA

CLASS TELEOSTOMI

Order Cypriniformes

Family Characidae

Astyanax mexicanus (Phillipi) (det. C. Hubbs)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—An eyed population of this species inhabits the spring area of the mouth of this cave and for some distance back into the cave itself. The troglobitic characin *A. jordani* (Hubbs and Innes) is known from many caves in San Luis Potosí and Tamaulipas.

Family Ictaluridae

***Prietella phreatophila* Carranza

Records.—*Coahuila:* Pozo El Potrero.

Bibliography.—Alvarez del Villar, 1970; Benjamin, 1970; Bolívar y Pieltain and Carranza, 1954 [Ameiuridae, ciego y depigmentado]; Carranza, 1954; Cole and Minckley, 1966 [*Priatella* (sic) *phreatophila*]; Contreras-Balderas, 1969; Hubbs, 1971; Husmann, 1967; Juberthie, 1974 [*Prietella*]; Longley and Karnei, 1979a, 1979b; Moore and Nicholas, 1978; Nicholas, 1962; Reddell, 1971b, 1981; Reddell and Mitchell, 1971c; Smith, 1956; Suttkus, 1961; Taylor, 1969; Thinès, 1969; Thinès and Durand, 1973; Thinès and Tercafs, 1972; United States Office of Endangered Species and International Activities, 1974; Vandel, 1964 [*Prietella phreaticola* (sic)], 1965a.

Comment.—This is one of only threee troglobitic catfishes described from North America. The other two species are *Satan eurystomus* Hubbs and Bailey and *Trogloglanis pattersoni* Eigenmanni, both known only from deep artesian wells near San Antonio, Bexar County, Texas. The caretaker at Pozo El Potrero reported that following heavy rains, water gushes out from the well bringing numerous blind fish with it. The well is frequently cleaned with algaecides, and fish may be found only sporadically in the well. This species has been placed on the United States List of Endangered Foreign Species.

Order Perciformes

Family Cichlidae

Cichlasoma cyanoguttatum (Baird and Girard) (det. M. Tandy)

Records.—*Nuevo León:* Cueva del Carrizal.

Comment.—This cichlid was found near the entrance in the stream emerging from the cave.

CLASS AMPHIBIA

Order Anura

Family Leptodactylidae

+*Syrrhophus* sp. (det. W. E. Duellman)

Records.—*Chihuahua:* Grutas de Coyame; *Durango:* Grutas de Mapimí.

Comment.—Frogs of this genus were collected near the entrance to each of these caves. Their specific determination must await additional specimens or further study.

+*Syrrhophus cystignathoides* (Cope) (det. J. D. Lynch)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—This frog was collected in the entrance room of the cave. It has also been found in caves in San Luis Potosí and Tamaulipas.

+*Syrrhophus longipes* (Baird) (det. J. D. Lynch)

Records.—*Nuevo León:* Grutas del Palmito.

Comment.—This species was collected near the cave entrance. It has also been found in caves in Querétaro, San Luis Potosí, and Tamaulipas.

CLASS REPTILIA
Order Squamata

Family Crotalidae

Crotalus atrox Baird and Girard

Comment.—No records of this species in the caves of northern México are available. The species, however, is abundant in the caves of western Texas and doubtless occurs in caves in northern México.

Family Iguanidae

Sceloporus jarrovii jarrovii Cope (det. D. A. Rossman)

Records.—*Chihuahua:* Cueva del Salitre.

Comment.—This lizard was taken from the wall of the cave in the vicinity of the entrance.

CLASS AVES
Order Passeriformes

Family Hirundinidae

+*Petrochelidon fulva pallida* Nelson

Records.—*Chihuahua:* Cueva del Salitre.

Comment.—Cave swallows inhabit the entrance room of this cave.

CLASS MAMMALIA
Order Chiroptera

Family Molossidae

+*Tadarida brasiliensis mexicana* (Saussure)

Records.—*Chihuahua:* Caves of northern Chihuahua; *Coahuila:* Cueva de Allende, ?Cueva de Don Jesús, Cueva de Laguna Seca, ?Cueva del León, Cave (El Chiflón), Cave (San Buenaventura), Cave (Torreón); *Durango:* Cueva de la España, Cueva del Guano; *Nuevo León:* Cueva del Rincón de la Virgen.

Bibliography.—Baker, 1956; Brand, 1937; Constantine, 1967; Glass, 1959; Malaga Alba and Villa R., 1957; Reddell, 1971b; Villa R., 1956b, 1967; Villa R. and Cockrum, 1962; Villa R. and Jiménez G., 1961.

Comment.—The Mexican free-tailed bat is frequently present in caves in northern México in vast numbers. The records listed above preceded by a question mark are reported by Baker (1956) to possess large deposits of guano believed to have been deposited by this species.

Family Mormoopidae

+*Mormoops megalophylla megalophylla* Peters

Records.—*Chihuahua:* Cave (Carimechi), Sótano de Sauz; *Coahuila:* Cueva del Buen Abrigo, Cave (Hermanas), Cueva de la Herradura, Cave (Puerto de Santa Ana); *Durango:* Cueva de la la España, Cueva del Guano; *Nuevo León:* Cueva del Diablo.

Bibliography.—Anderson, 1972; Baker, 1956; Burt and Hooper, 1941; Davis and Carter, 1962; Raines, 1968; Reddell, 1971b, 1977; Smith, 1972; Sprouse, 1977; Villa R., 1956a, 1967; Villa R. and Jiménez G., 1961.

Comment.—The old man bat is frequently present in caves in comparatively large numbers. A mass die-off of this species was reported by Villa R. (1956a) for the population in Cueva del Diablo. No live bats were observed in Sótano de Sauz, but many thousands of dead bats were present throughout the cave. All were mummified and many were still hanging from the cave walls. There was no indication of a natural disaster, although the air temperature in the back of the cave was recorded as 41° C.

+*Pteronotus parnellii mexicanus* (Miller)

Records.—*Chihuahua:* Cave (Carimechi).

Bibliography.—Burt and Hooper, 1941; Hall and Kelson, 1959; Villa R., 1967 [*Pteronotus rubiginosa mexicana*].

Comment.—This species is among the more abundant cavernicole bats in México.

Family Phyllostomatidae

+*Choeronycteris mexicana* Tschudi

Records.—*Coahuila:* Cueva de Don Jesús, Cueva de la Herradura, Cave (El Chiflón), Cave (San Buenaventura), Cave (San Pedro de las Colonias).

Bibliography.—Axtell, 1962; Baker, 1956; Reddell, 1971b.

Comment.—This species is usually present in caves in only small numbers.

+*Leptonycteris sanborni* Hoffmeister

Records.—*Chihuahua:* Cavern (Carimechi).

Bibliography.—Anderson, 1972.

Comment.—Twenty-five specimens of this nectarivous bat were collected in January.

Family Vespertilionidae

+*Antrozous pallidus pallidus* (LeConte)

Records.—*Chihuahua:* Caves of northern Chihuahua; *Durango:* Cueva de los Indios, Cave (Ciudad Lerdo).

Bibliography.—Baker and Greer, 1962; Brand, 1937; Hutchinson, 1950; Reddell, 1971b; Villa R., 1967.

Comment.—This species is not a frequent cave inhabitant in México.

+*Eptesicus fuscus pallidus* Young

Records.—*Coahuila:* Cave (San Buenaventura).

Bibliography.—Baker, 1956; Reddell, 1971b.

Comment.—Twenty-one individuals of this species were collected from the above cave.

+*Myotis subulatus melanorhinus* (Merriam)

Records.—*Chihuahua:* Cave (Santa Elena).

Bibliography.—Villa R., 1967.

Comment.—This is the only record for this species in Mexican caves.

+*Myotis thysanodes thysanodes* Miller

Records.—*Chihuahua:* Cave (Fern Canyon).

Bibliography.—Judd, 1967; Reddell, 1971b.

Comment.—This species is a comparatively common inhabitant of caves in western Texas. It is usually present in small numbers.

+*Myotis velifer incautus* J. A. Allen

Records.—*Coahuila:* Cueva de Allende, Cueva de la Bandurria, Cueva de Don Jesús, Cave (Hacienda Las Pilas), Cave (San Buenaventura); *Nuevo León:* Cueva del Carrizal, Cueva de las Fisuras.

Bibliography.—Baker, 1956; Malaga Alba and Villa R., 1957; Mollhagen, 1977; Reddell, 1971b; Villa R., 1967.

Comment.—The little brown bat is among the more common cave inhabitants of Texas and northern México. It is usually present in populations numbering in the hundreds but may also be found hanging in clusters of less than 100.

+*Plecotus mexicanus* (G. M. Allen)

Records.—*Chihuahua:* Cave (Maguarichic).

Bibliography.—Handley, 1959; Knobloch, 1942; Reddell, 1971b.

Comment.—This species is known from caves throughout much of México.

+*Plecotus townsendii australis* Handley

Records.—*Chihuahua:* Cueva del Diablo; *Coahuila:* Cave (Hacienda Las Pilas), Cave (San Buenaventura); *Durango:* Cueva de los Indios; *Nuevo León:* Cueva de las Fisuras.

Bibliography.—Anderson, 1972; Baker, 1956; Baker and Greer, 1962; Handley, 1959; Reddell, 1971b.

Comment.—Townsend's big-eared bat is usually found hanging in small groups. It is not as common a cave inhabitant in México as in the United States.

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