A REVIEW OF THE

CAVERNICOLE FAUNA OF MEXICO, GUATEMALA, AND BELIZE

BULLETIN 27 OF THE TEXAS MEMORIAL MUSEUM
THE UNIVERSITY OF TEXAS AT AUSTIN

by James R. Reddell

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TABLE OF CONTENTS

Introduction

México, Guatemala, and Belize, the three countries covered by the present study, contain one of the most diverse cavernicole faunas of any region in the world. This remarkable diversity may be explained in large part by the existence of extensive cave systems in a wide variety of habitats: deserts, high montane forests, and lowland tropical forests. The cavernicole fauna thus includes species with affinities to both temperate and tropical groups. In addition, there are numerous elements in the fauna which have been derived both from marine and freshwater ancestors, and from both northern and southern faunal assemblages. A majority of the terrestrial troglobites are most closely related to species still inhabiting the same area. A few, however, are representative of groups abundant in temperate North America but now extinct on the surface in the tropics.

The purpose of the present report is to give a broad overview of the cavernicole fauna of México, Guatemala, and Belize, and to provide the specialist with a checklist and bibliography as complete as possible of the cave-adapted (troglobite) species known from these three countries. There has as yet been no comprehensive study of the fauna of any of these countries, although Reddell (1971b) listed all of the published records of species from México. That report included a list of 926 species, of which fewer than 100 were troglobites, many of which were identified only to the family or generic level. Only one troglobite was known from Guatemala and none from Belize in 1971. A total of almost 2,000 species, including 279 troglobites, are now known from these three countries. Several hundred species, including numerous troglobites, await description and many groups remain unstudied for lack of a specialist in the group.

Recent studies on the cavernicole fauna of the region covered by this report have appeared in six separate volumes. Three of these (Reddell and Mitchell, 1971; Mitchell and Reddell, 1973; Reddell, 1977) have been based on the work of the Association for Mexican Cave Studies. The remaining three (Sbordoni and Argano, 1972; Sbordoni et al., 1974, 1977) have been the result of expeditions to México and adjacent Guatemala sponsored by the National Academy of Lincei in Rome. In addition to these six volumes, numerous publications have appeared in scientific journals. The fact that a large quantity of material remains unpublished may be readily realized when it is considered that additional volumes by both of these groups are presently in preparation. It is apparent, therefore, that the present study is to be considered a preliminary one upon which additional studies can be based.

Our knowledge of the cavernicole fauna of temperate North America, though still limited in comparison with that of Europe, is rapidly increasing. Since Nicholas (1960) published a list of the troglobites of the United States, several reports of varying degrees of completeness have been published on parts of the United States and Canada. These include studies on the cave fauna of Alabama (Peck and Peck, 1967),

Fig. 1.–Physiographic provinces of México, Guatemala, and Belize: 1, Baja California; 2, Buried Ranges; 3, Sierra Madre Occidental; 4, Basins and Ranges; 5, Edwards Plateau; 6, Sierra Madre Oriental; 7, Gulf Coastal Lowlands; 8, Central Mesa; 9, Neovolcanic Plateau; 10, Sierra Madre del Sur System; 11, Pacific Coastal Lowlands; 12, Chiapas-Guatemala Highlands; 13, Yucatán Peninsula.

Arkansas (McDaniel and Smith, 1976), Florida (Warren, 1961; Peck, 1970), Georgia (Holsinger and Peck, 1971), Hawaii (Howarth, 1972, 1973), Illinois and southeastern Missouri (Peck and Lewis, 1977), Kentucky (Barr, 1967b; Barr and Kuehne, 1971), Missouri (Craig, 1975, 1977), New Jersey (Nicholas, 1976), New Mexico (Barr and Reddell, 1967; Welbourn, 1978), Oklahoma (Black, 1971), Pennsylvania (Holsinger, 1976), Tennessee (Barr, 1961), Texas (Reddell, 1965b, 1966b, 1967e, 1970a, 1970b, 1970c; Reddell and Mitchell, 1969; Mitchell and Reddell, 1971; Lundelius and Slaughter, 1971), Virginia (Holsinger, 1963), volcanic caves of western North America (Peck, 1973b), West Virginia (Holsinger et al., 1976), and Canada (Peck and Fenton, 1973). Our knowledge of the fauna of tropical and subtropical America is much more limited (Peck, 1974b). Preliminary reports have now been published on the cave fauna of Puerto Rico (Peck, 1974a), Jamaica (Peck, 1976), Cuba (Orghidan et al., 1973, 1974; Silva Taboada, 1974), and Panama (Peck, 1971a). No summaries exist for the cave fauna of the remainder of the islands of the West Indies, the countries of Central America, nor any part of South America.

It is safe to assume that far less than half of the cave-inhabiting species of México, Guatemala, and Belize are now known. In México, which has been far more intensively studied than the other two countries, only a few areas are well known. The Sierra de Guatemala in Tamaulipas, the Sierra de El Abra in San Luis Potosí and Tamaulipas, and the Yucatán Peninsula are the only regions in México where a significant percentage of the fauna is known. Due to the outstanding work of the Italian biospeleologists much of Chiapas is now well collected, but a majority of their material remains unstudied. The cavernicole fauna of western, southwestern, and parts of southern México remain completely unknown. Of the 13 physiographic provinces (see Fig. 1) into which this region may be divided, no collections other than bats or bat-associated parasites have been made in Baja California, the Buried Ranges, the Central Mesa, or the Pacific Coastal Lowlands. The cavernicole fauna of the

Sierra Madre Occidental, Gulf Coastal Plain, and Neovolcanic Plateau remains virtually unknown. Many isolated limestone ranges in northern México, parts of the Sierra Madre Oriental, and much of the Sierra Madre del Sur System and Chiapas-Guatemalan Highlands have seen little or no study. The only collections of cavernicole invertebrates in Belize have been made in limited areas near Caves Branch and Augustine in Cayo District; the extensive areas of limestone in other parts of the country remain completely uninvestigated. A few biological collections have been made by American, French, and Italian cave biologists in some areas of Guatemala, but few of these have yet been studied, and large parts of the country remain unexamined.

The cavernicole fauna of the region under study includes representatives of 12 phyla (Table 1). Only five of these, however, contain troglobites: Platyhelminthes, Annelida, Mollusca, Arthropoda, and Chordata. The flatworm fauna is of special interest in containing the endemic marine relict family Dimarcusidae, known only by two troglobites from southern México. The molluscan fauna includes only a single freshwater temperate relict. This is in sharp contrast to the gastropod fauna of the United States which contains many troglobitic species of land snail. The arthropod fauna includes large numbers of troglobites, distributed through the classes Crustacea, Arachnida, Chilopoda, Diplopoda, and Insecta. The tropical American troglobite fauna is especially rich in numbers and diversity of shrimps, arachnids, and millipeds.

Important groups in the caves of the United States which are poorly represented in tropical American caves include the crayfishes and beetles. Few beetles are found to be troglobites in lowland tropical caves and even the beetle fauna of high elevation caves is depauperate in comparison to that of the eastern United States. It is speculated that the place of beetles (especially ground beetles) in the caves of México and Central America has been taken by arachnids. The arachnid fauna of caves in this region includes not only opilionids, spiders, and pseudoscorpions, but numerous representatives of the orders Amblypygida, Ricinulei, Schizomida, and Scorpiones.

One of the most characteristic aspects of the cavernicole fauna of México is the presence of troglobitic scorpions. Seven described and three undescribed blind scorpions are presently known from this country, the only troglobitic scorpions collected anywhere thus far, with the possible exception of one species in California.

Table 1.–Summary of cave inhabiting species known from México, Guatemala, and Belize.

	Troglobites	Other Species
Protozoa	0	9
Porifera	0	1
Cnidaria	0	1
Platyhelminthes	5	20
Rotifera	0	6
Nematoda	0	45
Acanthocephala	0	1
Ectoprocta	0	1
Annelida	2	24
Mollusca	1	82
Arthropoda	304	1263
Chordata	5	182
Total	317	1635

Finally, mention should be made here (as is discussed in more detail below) of the great diversity and abundance of troglobitic millipeds in the caves of this region. It is not uncommon for several species of troglobite to be present in the same cave, representing an equal number of families. This diversity is not only related to the greater diversity of tropical millipeds, but also reflects the presence in caves of at least two (and probably more) groups of temperate relicts. Of special interest is the presence of the families Cambalidae and Trichopetalidae, both of which are common elements of the cave fauna of the United States but known only from high elevation Mexican caves. This and other distributional aspects of the cavernicole fauna of México, Guatemala, and Belize are discussed in more detail below, but they are mentioned here to indicate the richness and diversity of the cave fauna of this region.

Most of the terms utilized in this report are common ones now widely used in the speleological literature. *Troglobite* is used to designate those species believed to be restricted to caves (i.e., obligate cavernicoles). They are usually characterized by loss or reduction of eyes and pigment and by elongation of appendages. Our knowledge, however, of the related endogean fauna (many species of which also exhibit eye and pigment reduction or loss) of tropical America is so limited that we cannot rely on these characteristics alone in determining the ecological status of the species. Many species with apparently functional eyes may also be cave-restricted and thus troglobites by the above definition. It is obvious that the evolution of a troglobite is not an instantaneous thing and that there will be a gradation from troglophile to troglobite as speciation progresses. For that reason some of the species listed as troglobites in this report may be found on the surface, while others not so listed may rightfully belong here. *Troglophiles* are considered to be those species which are capable of surviving and completing their life cycle either on the surface or in caves (facultative cavernicoles). Many of these are presently known only from caves and thus may now be cave-restricted but lack the extremes of adaptation that characterize the more highly evolved troglobites. The term *trogloxene* is used to designate those species (such as bats and some harvestmen and crickets) which habitually inhabit caves, but which are dependent on the surface for food or other necessities. *Accidentals* are considered those species which have fallen, washed, wandered, or otherwise accidentally entered the cave habitat and which presumably cannot survive or reproduce there.

Throughout this report I have used the local names for caves whenever they are known. In México several specialized terms are used for caves, some Spanish and others native. Since many of these terms are not found in dictionaries or else are used in somewhat different ways, the more common are listed here:

actún (a Mayan word used for cave)
caverna (a large cave)
cenote (a Mayan term used to indicate a cave or natural well containing water)
cueva (cave)
grutas (a large cave)
nacimiento (a spring, whether enterable or not)
pozo (a Spanish word applied to a natural well, but sometimes used for a vertical sink without water)
sima (a term most commonly used in southern México and referring to a vertical or nearly vertical pit)
sótano (a Spanish word applied to a vertical shaft)
sumidero or *resumidero* (a term applied to a cave which receives an active stream or the seasonal flow of an arroyo)

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HISTORY

México

The first biological investigation of a cave in México was conducted by Dominik Bilimek on January 14, 1866, when he visited Grutas de Cacahuamilpa, Guerrero (Bilimek, 1867). Among the 11 species reported was one troglobite, *Lepisma anophthalma*. The next important contribution to our knowledge of the cavernicole fauna of México was that of the distinguished Mexican zoologist, D. A. L. Herrera (1891). Among species he collected in Grutas de Cacahuamilpa was the same species of troglobite, described as *Lepisma cacahuamilpensis*. Herrera also collected a troglobitic cirolanid isopod from a well in Monterrey, Nuevo León, which was described by A. S. Packard (1900). With the exception of a few scattered records of bats, birds, fishes, and snails these are the only publications on Mexican cave fauna prior to 1936.

In the summer of 1932 Edwin P. Creaser, F. G. Hall, and A. S. Pearse investigated 35 cenotes and caves in the state of Yucatán. The volume resulting from their studies, published in 1936, has become a classic in biospeleological literature. Although emphasizing the taxonomy of the collected fauna, this work included one of the first studies ever made on the physical and chemical nature of karst waters in North America (Hall, 1936). Pearse's (1936d) observations on the ecology of cenotes and caves are of some interest to the student of the evolution of cave faunas. Although about 70 species were reported from caves and cenotes in the state of Yucatán, only four crustaceans were troglobites. Creaser (1936) described new species of isopod, mysid, and shrimp.

In the summer of 1936 A. S. Pearse continued his studies of the subterranean fauna of México with the exploration of 27 caves in various parts of the state of Yucatán. The results of this expedition were collected in a volume published in 1938 by the Carnegie Institution of Washington. A total of about 300 animal species were identified, of which many were new species. Ten species of troglobite were added to the cave fauna of Yucatán, of which eight were terrestrial. Two spiders (Chamberlin and Ivie, 1938b), one isopod (Creaser, 1938), one milliped (Chamberlin, 1938), three collembolans (Mills, 1938), one cricket (Hubbell, 1938), and two fish (Hubbs, 1938) were considered to be troglobites.

In 1936 Salvador Coronado discovered in Cueva Chica, San Luis Potosí, the first known species of eyeless characin. It was described by C. L. Hubbs and W. T. Innes (1936) as *Anoptichthys jordani.* The ease with which this species could be maintained in aquaria inspired an expedition in March 1940 by the New York Aquarium. The members of the party included C. M. Breder, Jr., E. B. Gresser, M. B. Bishop, William Bridges, S. C. Dunton, and Salvador Coronado. A thorough collection was made in the cave of both fish and invertebrates, and the initial results were published by Bridges (1940) and Breder (1942). The unique situation in which this species was found, its presence in vast numbers, the ease with which it could be raised in the laboratory, and its ability to interbreed with its surface ancestor *Astyanax mexicanus* (Filippi) have led to its study by numerous American and European workers over the past 43 years. The description of two additional species, *Anoptichthys antrobius* Alvarez (1946) and *Anoptichthys hubbsi* Alvarez (1947), inspired still further study of these remarkable fish. In the 38 years since the original description of *A. jordani* more than 200 publications have been more or less devoted to the study of the species.

In 1938 two distinguished Spanish biospeleologists, Federico Bonet and Cándido Bolívar y Pieltain, emigrated to México and began an intensive study of its cave fauna. Their work during the next 20 years greatly expanded our knowledge of the cave biology of México.

Their investigations began with a visit to Grutas de Cacahuamilpa on December 13-16, 1939. This expedition, conducted in conjunction with A. Dampf and D. Peláez, led to the discovery of many of the same species reported by Bilimek and of several new species (Bolívar, 1940). A second visit was made on June 13, 1940, by D. Peláez.

During December 1939 and January 1940, Horton H. Hobbs, Jr., A. F. Carr, Jr., and others visited a cave near Hacienda Potrero Viejo, Veracruz, resulting in the discovery of the first blind crayfish known from México (Hobbs, 1943). On May 7, 1940, Ivan T. Sanderson collected ricinuleids in Actún Kaua, Yucatán (Sanderson, 1941). During an expedition for the purpose of collecting insects and arachnids of medical importance, Harry Hoogstraal visited several caves in Nuevo León. This included a trip on June 16, 1940, to Cueva de la Boca and the discovery of the first troglobitic centiped known from México (Chamberlin, 1941).

In 1941 three trips of some importance were made by F. Bonet and C. Bolívar y Pieltain. On January 16 a visit to the large, Olmec cave, Grutas de Juxtlahuaca, Guerrero, led to the discovery of several troglobites. Trips on May 30 and November 11-13 to Grutas de Atoyac, Veracruz, also resulted in the discovery of several troglobites.

In April 1942 F. Bonet, C. Bolívar y Pieltain, B. F. Osorio Tafall, D. Peláez, F. Cárdenas, M. Correa, and J. Alvarez visited Cueva Chica and Cueva de Los Sabinos, San Luis Potosí (Anonymous, 1942a). Among the more remarkable discoveries in the latter cave were new species of troglobitic ricinuleid (Bolívar, 1946), isopod (Bolívar, 1950), fish (Alvarez, 1947), and phalangid (Goodnight and Goodnight, 1942). Cueva de Los Sabinos was revisited July 19 by C. Bolívar y Pieltain, B. F. Osorio Tafall, and M. Cárdenas. These two trips resulted in one of the more significant publications on the aquatic fauna of Mexican caves (Osorio Tafall, 1943).

The research by members of the Escuela Nacional de Ciencias Biológicas de México was expanded into

Nuevo León when, on July 13-19, 1942, C. Bolívar y Pieltain, F. Bonet, B. F. Osorio Tafall, D. Peláez, and others visited Cueva de la Boca, Grutas de Villa de García, Cueva del Carrizal, Grutas del Palmito, and other caves. A second trip to this area was made September 15-17, 1942, by C. Bolívar y Pieltain (Anonymous, 1942b). Collected on these two expeditions were new species of troglobitic dipluran (Wygodzinsky, 1944), collembolan (Bonet, 1943), phalangid (Goodnight and Goodnight, 1944), pseudoscorpion (Chamberlin, 1946), and beetle (Bolívar, 1942).

In September 1943 B. F. Osorio Tafall visited Yucatán. His collections in Actún Sabacá and Grutas de Balankanche resulted in the discovery of two species of pseudoscorpion representative of a new family, the Vachoniidae (Chamberlin, 1947). In November of the same year, C. Bolívar y Pieltain and B. F. Osorio Tafall visited Grutas de Acuitlapán, Guerrero.

During 1944 three of México's better known caves were revisited. On April 30 J. Alvarez and C. Tellez visited Grutas de Atoyac, Veracruz; on May 21 C. Bolívar y Pieltain, F. Bonet, J. Alvarez, and C. Tellez visited Cueva de Los Sabinos, San Luis Potosí; and on June 17 F. Bonet visited Cueva de la Boca, Nuevo León.

In April 1944 Dr. and Mrs. M. W. Stirling of the Bureau of American Ethnology of the Smithsonian Institution and Mr. R. H. Stewart of the National Geographic Society visited Cueva del Azufre, Tabasco, and collected specimens of blind fish, now identified as *Poecilia sphenops.*

In December 1945 F. Bonet, C. Bolívar y Pieltain, J. Alvarez, and other members of the Escuela Nacional de Ciencias Biológicas de México visited Cueva de El Pachón, Cueva del Abra, and Cueva de los Cuarteles in Tamaulipas and Cueva de El Jobo in San Luis Potosí. The most notable discovery of this expedition was the third population of blind fish of the genus *Anoptichthys* (described as *A. antrobius* by Alvarez in 1946).

In April 1946 B. J. Dontzin and E. Ruda revisited Cueva del Azufre, Tabasco, and collected a large series of blind and eyed *Poecilia sphenops.*

B. F. Osorio Tafall and M. Cárdenas Figueroa visited several caves in Yucatán as part of an expedition sponsored in March 1947 by the Secretaría de Recursos Hidráulicos (Anonymous, 1947). Their discoveries included specimens of the rare blind fish *Typhliasina pearsei* in Cenote del Pochote (Solorzano, 1953). The information gathered on this expedition served as material for an excellent study by Cárdenas Figueroa (1950) on the hydrobiology of Yucatán.

During the course of the David Rockefeller Mexican Expedition of the American Museum of Natural History in the summer of 1947, W. J. Gertsch visited Cueva del Diablo, Chihuahua, and collected an undescribed species of troglobitic *Psilochorus* (Spieth, 1950).

While conducting studies on the distribution and taxonomy of opilionids during the summer of 1948, C. J. Goodnight visited Grutas del Coconá, Tabasco, and several caves in Yucatán. Among many interesting species of arachnid collected were two eyeless species of amblypygid, not reported until they were described by Rowland (1973d).

In November 1950 Alejandro Villalobos of the Instituto de Biología de México began a series of investigations into the cavernicole fauna of México which was to result in the description of many new species of troglobite of great interest. His first expedition was to several caves in the vicinity of Comitán and Tuxtla Gutiérrez, Chiapas. His visit to Cueva del Tío Ticho resulted in the discovery of one of the more remarkable cavernicoles known from México, an eyeless crab described by Enrique Rioja (1953b) as *Typhlopseudothelphusa mocinoi.*

In November and December 1950 F. Bonet and others began the serious study of one of México's greatest karst regions, that of Xilitla, San Luis Potosí. This study of the Xilitla region was continued in January 1952 by F. Bonet in conjunction with R. Ortiz, J. V. Flores, M. Camacho, and A. González. In addition to collecting extensively they prepared detailed maps and descriptions of the caves they visited (Bonet, 1953a).

On November 11, 1951, C. Bolívar y Pieltain and Ana María Bolívar visited Grutas de Quintero, Tamaulipas. This collection included new species of cirolanid isopod (Rioja, 1953d) and pseudoscorpion (Beier, 1956).

In Decmber 1951 and May 1952 A. Villalobos visited Cueva del Ojo de Agua Grande, Veracruz. The fauna discovered included a remarkable species of troglobitic isopod (Rioja, 1953c).

In January 1953 A. Villalobos continued his investigations of the cavernicole fauna of México with a visit to Cenote de Sambulá at Motul, Yucatán. Among the fauna collected was a new species of trichonscid isopod (Rioja, 1958). In July C. J. Goodnight collected arachnids, including a new troglobitic spider, in Grutas de Atoyac, Veracruz.

The first study of the cavernicole fauna of Oaxaca was made in May 1954 by C. Bolívar y Pieltain, J. Carranza, and others. A visit to Grutas de Monteflor resulted in the collection of a new species of troglobitic pseudoscorpion (Beier, 1956). In August 1954

C. Bolívar and J. Carranza investigated wells and mines in the vicinity of Músquiz, Coahuila. The most significant discovery made was of the first blind catfish in México (Bolívar and Carranza, 1954); this species was described as *Prietella phreatophila* by Carranza (1954).

In December 1955 Malcolm S. Gordon, R. Deering, and J. Till made the third trip to Cueva del Azufre, Tabasco, and once again collected a series of *Poecilia sphenops.*

In July 1956 W. J. Gertsch and Vincent Roth revisited Cueva del Diablo, Chihuahua, and visited Cueva de El Ocote, Hidalgo. In the latter cave they collected specimens of new species of spider (Gertsch, 1971a) and carabid beetle (Hendrichs and Bolívar, 1966).

Grutas del Coconá, Tabasco, was visited in 1958 by A. Villalobos, where he discovered the first troglobitic amphipod known from México and reported the presence of a troglobitic planarian (Villalobos, 1960). The planarian was later rediscovered and described by Mitchell and Kawakatsu (1972) as a new family, genus, and species (Dimarcusidae, *Dimarcus villalobosi).* On February 15 and July 27, 1958, Grutas del Mogote, Guerrero, was visited by Raymond de Saussure, at which time he collected specimens of a troglobitic rhachodesmid milliped (Causey, 1973).

On March 20, 1959, Stanley Kiem visited a cave near the Hacienda San Bernardo, Yucatán, now identified as Actún Xpukil. He discovered a species of troglobitic milliped which was described by Loomis (1962) as *Orthoporus kiemi.* A large series of living and preserved troglobitic *Poecilia sphenops* was collected in Cueva del Azufre, Tabasco, in March 1959 by A. G. Dinkins.

Visits were made by A. Villalobos in April and September 1960 to Grutas del Coconá, Tabasco. The results of these trips remain largely unpublished.

In 1961 the distinguished American ichthyologist, 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 on April 6 were specimens of the troglobitic snail *Coahuilix hubbsi,* described by Taylor in 1966.

In November 1962 C. Bolívar y Pieltain and A. Urquijoi visited Grutas de Acuitlapán, Guerrerro. Their collections included the troglobitic pseudoscorpion *Albiorix bolivari* Beier (1963).

With the organization in 1962 of the Speleological Survey of México in Austin, Texas, a new era in the study of the cavernicole fauna of México was initiated. In November 1962 the first expedition of the newly organized group (now called the Association for Mexican Cave Studies) was undertaken. A few small collections in caves were made by the four members of this expedition, T. R. Evans, T. W. Raines, J. R. Reddell, and W. H. Russell. This material included specimens of new genera and species of isopod from Sótano de Huitzmolotitla, San Luis Potosí (Schultz, 1964), and milliped from Sótano del Arroyo, San Luis Potosí (Causey, 1963). Because of the interest of this initial small collection, an active program of collection and study of the cavernicole fauna of México was initiated and continued to the present. It is impossible to recount in detail here the history of the work of the Association for Mexican Cave Studies during the last 17 years. More than 1000 species have been collected in more than 500 caves during this period. The following account will emphasize only the more distinctive discoveries of this period.

On March 2, 1963, W. H. Russell visited Cueva del Carrizal, Nuevo León, collecting among other species a new troglobitic hyid pseudoscorpion (Muchmore, 1972a). On October 26 of the same year he also visited Cueva de la Porra near Xilitla, San Luis Potosí. This collection included specimens of a new genus and species of cambalid milliped (Causey, 1964a).

The activities of the Association for Mexican Cave Studies increased in 1964 with explorations in the karst areas of Tequila, Veracruz; Sierra de Guatemala, Tamaulipas; and Xilitla, San Luis Potosí. On June 2 Terry Raines and William Bell entered a deep pit near Tequila, Sótano del Profesor, which was notorious for having been the disposal site for the body of a murdered school teacher. Among the fauna collected about the remains of the unfortunate teacher was a new genus and species of carabid beetle (Barr, 1965). Also in June Larry Manire, David McKenzie, and James Reddell visited what was to prove to be one of the more notable faunal areas in North America, the Sierra de Guatemala, Tamaulipas. Among numerous species of troglobite were new species of gryllid (Hubbell, 1972), glomeroid milliped (Causey, 1964b), rhachodesmid milliped (Causey, 1971b), and pseudoscorpion (Muchmore, 1972a). In November exploration by Terry Raines and William Bell in one of the deeper caves in North America, Sótano de Tlamaya, at Xilitla, resulted in the discovery of a new species of cavernicole earthworm (Gates, 1967). In addition to these visits to distinct karst regions, a trip by W. H. Russell to Cueva de los Riscos in Durango led to the discovery of a troglobitic ricinuleid (Gertsch, 1971b) and spiders (Gertsch, 1971a).

In January and June of 1965 David McKenzie, Orion Knox, and others continued work in the Sierra de Guatemala, most notably with the mapping and exploration of Sótano de la Joya de Salas. Two species of carabid beetle of great interest were discovered (Barr, 1966a; 1967a). On April 8, 1965, Jorge Urquijo and Antonio Guerrero revisited Sótano del Profesor at Tequila, Veracruz, and obtained additional specimens of the blind carabid *Mexisphodrus veraecrucis.*

In July 1965 William Russell led a reconnaissance trip to Huautla de Jiménez, Oaxaca. This great karst region now is known to include some of the deeper known caves in the Western Hemisphere. Many new species were obtained on the trip, but most of the results remain unpublished. During the same month John Fish, Terry Raines, and James Reddell conducted a reconnaissance trip to several caves in north central México, including caves in Coahuila, Chihuahua, and Durango. In August William Bell, John Fish, and James Reddell explored caves in Hidalgo, Guerrero, and Veracruz; among the fauna collected were new species of troglobitic spider beetle (Spilman, 1968) and rhachodesmid milliped (Causey, 1973).

In February 1966 William Bell and James Reddell explored several caves in Coahuila, Chihuahua, and Durango. The most notable find was a second species of relict ricinuleid from western México, in Cueva del Guano, Durango (Gertsch, 1971b). In June several gypsum caves near Galeana, Nuevo León, were visited by David McKenzie, Orion Knox, A. Richard Smith, and James Reddell. New species of catopid (Peck, 1973c) and blind spider (Gertsch, 1971a) were discovered in Resumidero del Pablillo.

In August 1966 Francis Abernethy, Robert W. Mitchell, and William Rhodes visited several caves in the Sierra de Guatemala, Tamaulipas. While exploring Cueva de la Mina, Rhodes discovered the first eyeless scorpion in the world. It was described by Mitchell (1968) as *Typhlochactas rhodesi.* Also in August John Fish, David McKenzie, James Reddell, and Richard M. Smith made the first biological collections in the gypsum karst area of Matehuala, San Luis Potosí; the karst region of Valle de los Fantasmas, San Luis Potosí; and the karst region of Pinal de Amoles, Querétaro. In Sótano de Tejamanil, Querétaro, they discovered two species of eyeless trechine beetle (Barr, 1967d). In November John Fish and Jonathan Davis discovered a third new species of trechine in a second visit to Valle de los Fantasmas (Barr, 1967d). In December Terry Raines led a trip to the Cañón de Huasteca in Nuevo León. He discovered in Grutas de San Bartolo a new species of troglobitic schizomid (Rowland, 1973a).

In June 1967 Francis Abernethy, Robert Mitchell, James Reddell, and Pierre Strinati visited several caves in the Sierra de Guatemala and Sierra de El Abra. This resulted in the collection of new species of collembolans (Christiansen, 1973), as well as supplementing previous collections. During the same year collections by Robert Mitchell, James Reddell, Suzanne Wiley, and other members of the Department of Biology of Texas Tech University in Lubbock, Texas, were made in numerous caves in these two karst regions. Discoveries included many new populations of troglobite and troglophile, including blind fish of the genus *Astyanax*.

In July 1967 John Fish, James Reddell, and Philip Russell explored caves near Pinal de Amoles, Querétaro; Ciudad de Maíz and Xilitla, San Luis Potosí; and Ciudad Victoria, Tamaulipas. Among many troglobites collected were specimens of the first species of blind theraphosid tarantula (Gertsch, 1971a) and new species of rhaphidophorid and gryllid crickets (Hubbell, 1972).

T. R. Evans, John Fish, James Reddell, and Mills Tandy in August 1967 visited caves near Córdoba and Tequila, Veracruz; Huautla de Jiménez, Oaxaca; and at several localities in Chiapas. Numerous troglobites of considerable interest were obtained, but probably the most singular discovery was of a second species of troglobitic scorpion in Cueva del Ojo de Agua de Tlilapan, Veracruz. This species was described by Mitchell (1968) as *Typhlochactas reddelli.* Other species of interest included additional specimens of the blind crab, *Typhlopseudothelphusa mocinoi*, in Cueva del Tío Ticho, Chiapas; a new species of troglobitic collembolan near Huautla de Jiménez, Oaxaca (Christiansen, 1973); and a new species of cavernicolous ricinuleid from Chiapas (Gertsch, 1971b). In September John Fish and William Russell made the first collections in the caves of the karst region of Aquismón, San Luis Potosí.

Collections in 1968 were made primarily in the Sierra de Guatemala and Sierra de El Abra by R. W. Mitchell, James Reddell, and their associates at Texas Tech University. Cueva de la Capilla, near El Porvenir in the Sierra de Guatemala, was visited for the first time on January 28 by John George, R. W. Mitchell, James Reddell, and Francis Rose. Discovered in this cave were new species of cave-adapted earthworm (Gates, 1971), spider (Gertsch, 1971a), phalangid (Goodnight and Goodnight, 1971), catopid beetle (Peck, 1968), and trechine beetle (Barr, 1971).

Several caves in the Valle de los Fantasmas region of San Luis Potosí were visited in November 1968 by William Elliott, Jimmy Jarl, and members of the Southwest Texas Grotto at San Marcos, Texas. Among the fauna collected was a new genus and species of troglobitic milliped (Causey, 1969).

Between 1966 and 1968 numerous collections were made by G. A. Cole, W. L. Minckley, D. W. Taylor, J. J. Landye, and others in the pozos and springs in the vicinity of Cautro Ciénegas de Carranza, Coahuila. This unusual region produced a new genus and two new species of amphipod (Holsinger and Minckley, 1971), a new genus and species of stenasellid isopod (Cole and Minckley, 1972), and a new genus and two new species of cirolanid isopod (Cole and Minckley, 1970).

In January 1969 several caves in the Sierra de El Abra were visited by R. W. Mitchell, James Reddell, and William Russell. A collection made in Cueva Pinta included a new species of trichoniscid isopod (Schultz, 1970a). In March several caves in the Sierra de Guatemala and Sierra de El Abra were visited by R. W. Mitchell, James Reddell, Suzanne Wiley, and others. The most notable collection was of a new species of pseudoscorpion in Cueva de la Florida, Tamaulipas (Muchmore, 1972c). Aerial reconnaissance of the Sierra de El Abra was conducted by Robert W. Mitchell, Richard O. Albert, and William Russell during 1969 with the result that numerous new caves containing blind fish of the genus *Astyanax* were located. On July 31, 1969, William Elliott collected the third species of blind scorpion to be found; it was taken from Sótano de Yerbaniz, San Luis Potosí, and was described by Mitchell (1971b) as *Typhlochactas elliotti*.

From June 18 to September 13, 1969, Stewart B. Peck and James H. Peck conducted a field trip to many parts of México and Guatemala (Peck and Peck, 1973). Their field trip resulted in the collection of several new species of troglobite. Among areas visited were Cuesta de Chipinque, Cueva de Chorros de Agua, and Cueva de la Boca, Nuevo Leon; the Sierra de Guatemala and northern Sierra de El Abra, Tamaulipas; the southern Sierra de El Abra and the Xilitla region, San Luis Potosí; Pinal de Amoles, Querétaro; Paraje Nuevo and Tlilapan, Veracruz; the Chiapas highlands; and several areas in Guatemala. Among the many new species discovered were blind spiders (Gertsch, 1971a) and blind millipeds (Shear, 1972; 1974).

From October 10 to December 9, 1969, the Accademia Nazionale dei Lincei of Italy sponsored a zoological expedition to México. It was conducted by Valerio Sbordoni, Roberto Argano, and Vittorio Parisi. They visited 17 caves during the course of their expedition, including caves in the Sierra de Guatemala, Tamaulipas; Sierra de El Abra, San Luis Potosí and Tamaulipas; western Xilitla region, Querétaro; Cacahuamilpa region of Guerrero and México; and caves near Orizaba and Córdoba, Veracruz. Although most of their collections included only species previously studied, several at that time were still undescribed and a few additional forms of interest were obtained. Many of the results of this expedition were collected in a volume edited by Sbordoni and Argano and published in 1972.

In March 1970 two German zoologists, Horst Wilkens and Jakob Parzefall, visited several caves in the vicinity of Micos, San Luis Potosí, for the primary purpose of collecting and studying new populations of blind *Astyanax*. Among the fauna collected were two new species of troglobitic stenasellid isopod in Cueva del Huisache (Magniez, 1972). The Sierra de Tamaulipas, Tamaulipas, was visited for the first time when, on October 31, 1970, William Russell, Gil Ediger, and Jill Ediger explored and made collections in two caves there. Most of the remaining work of the Association for Mexican Cave Studies in 1970 was devoted to the continuing study of the caves of the Sierra de El Abra.

In January 1971 Jerry Cooke, William Elliott, Robert W. Mitchell, James Reddell, Suzanne Wiley, and others from Texas Tech University were joined by Dr. Masaharu Kawakatsu of Fuji Women's College, Japan, on a trip to the Sierra de Guatemala, Tamaulipas. Among numerous specimens collected were two troglobitic and one troglophilic flatworm of the genus *Dugesia*, the first to be reported from México (Mitchell and Kawakatsu, 1973a).

The Second Zoological Mission to México sponsored by the Accademia Nazionale dei Lincei was conducted from January 24 to April 11, 1971, by Valerio Sbordoni, Roberto Argano, and Aldo Zullini. This expedition was devoted entirely to extreme southern México and adjacent Guatemala. Two caves were visited in Tabasco and 24 in Chiapas. The results of this trip, together with additional studies of species collected on the First Zoological Mission to México, were published in 1974 in a volume edited by Sbordoni, Argano, and Zullini. This expedition to southern México resulted in the discovery of many species of interest, among them the first nematodes to be reported from caves in Chiapas (Zullini, 1974), new species of troglobitic amphipods (Ruffo and Vigna Taglianti, 1974), shrimp (Holthuis, 1974), opilionid (Silhavý, 1974), milliped (Shear, 1974), anilline beetle (Vigna Taglianti, 1974), histerid beetle (Vomero, 1974), and ricinuleid (Brignoli, 1974c).

In September 1971 Terry Raines visited several caves in the Cañón de Huasteca region of Nuevo León. In Sótano del Anticlino he discovered a new species of endemic earthworm (Gates, 1973). In November David McKenzie and William Russell visited Cueva del Ojo de Agua de Manantiales, San Luis Potosí, where they collected a new genus and species of troglobitic trichopolydesmid milliped (Causey, 1973). They also visited Cueva del Huisache in the Micos region of San Luis Potosí and found a new genus and species of troglobitic cirolanid isopod (Bowman, 1975). Also during November David McKenzie visited several caves in southern México, including Grutas de Atoyac, Veracruz, and Grutas del Coconá, Tabasco.

The biological activities of the Association for Mexican Cave Studies reached their highest level during 1972. David McKenzie visited several caves in Yucatán in January. Among collections of interest were additional specimens of the troglobitic spirostreptid *Orthoporus zizicolens.*

On March 27-30 the Grupo Espeleológico Mexicano conducted an expedition to the Huautla de Jiménez region of Oaxaca, which was directed by Jorge Urquijo. In Sótano de San Agustín, Jesús Hernández López collected specimens of a new species of troglobitic carabid beetle (Hendrichs and Bolívar, 1973).

William Elliott, Pam Lynn, Mike McEachern, and Ron Ralph continued the investigation of the karst region of Valle de los Fantasmas, San Luis Potosí, in May 1972 with the exploration of several caves in that area (Elliott and Reddell, 1973). In June study was continued in the Pinal de Amoles region when numerous new caves were located and explored by William Russell, Terry Raines, Ron Ralph, and others. Discoveries included additional populations of blind trechine beetles, spiders, millipeds, and isopods. Most of these results remain unpublished.

Study of the cave fauna of northwestern México was resumed with a trip to this area on June 10-22, 1972, by Ed Alexander, William Elliott, Carl Kunath, Angie McLaughlin, and James Reddell. Caves were visited in the vicinities of Parral, Chihuahua, and Mapimí and Picardías, Durango (Reddell, 1973c). Among the more significant discoveries were additional specimens of both species of relict ricinuleid from Durango, a new species of troglobitic amphipod (Holsinger, 1973), and a new species of leptonetid spider (Gertsch, 1974).

During August 1972 Jerry Cooke, Rexell Mitchell, Robert W. Mitchell, and William Russell visited caves in Chiapas, Tabasco, and Yucatán. The fauna collected included a new family, genus, and species of troglobitic planarian *(Dimarcus villalobosi),* a new species of planarian of the genus *Dugesia* (Mitchell and Kawakatsu, 1973b), a new species of asellid isopod (Bowman, 1976), a new species of troglobitic pseudoscorpion (Muchmore, 1973a), and specimens of the blind crab *Typhlopseudothelphusa mocinoi* from two additional localities.

The intensive study of the caves of the Pinal de Amoles region continued in November 1972 with exploration in several caves by Roy Jameson, Peter Strickland, and others. The area was also visited in December by Roy Jameson and others, at which time a collection in Cueva de Emilia resulted in the discovery of the first troglobitic homopteran known from México (Fennah, 1973).

Caves in the Sierra de El Abra, Tamaulipas, and Aquismón and Xilitla regions of San Luis Potosí were visited November 21-29, 1972, by Jan Lewis, James Reddell, Terry Raines, Jack White, and others. The collections included new species of opilionid (Goodnight and Goodnight, 1973), pseudoscorpion (Muchmore, 1973c), and milliped (Causey, 1973).

One of the more successful expeditions conducted by members of the Association for Mexican Cave Studies was that made from December 22, 1972, to January 8, 1973, by David McKenzie, Martha Helen McKenzie, Stuart Murphy, and James Reddell (Reddell, 1973e). Caves were visited in the Sierra de Tamaulipas, Tamaulipas; the Tezonapa region, Veracruz; and the Acatlán, Valle Nacional, San Sebastian de las Grutas, and Apoala regions of Oaxaca. Although many undescribed species were found in all of the regions visited, the most productive were the Tezonapa, Acatlán, and Valle Nacional regions. At Tezonapa collections included a new species of glomerid milliped (Causey, 1973). The spectacular cave near Acatlán, Cueva del Nacimiento del Río San Antonio, yielded specimens of numerous troglobites, including the first cavernicolous alpheid shrimp known (Hobbs, 1973b), a palaemonid shrimp (Hobbs, 1973b), the second troglobitic crayfish from México (Hobbs, 1973a), a mysid (Bowman, 1973), a still undescribed catfish, and the second species of blind theraphosid known (Gertsch, 1973). The Valle Nacional region proved to be almost as biologically amazing. The two most productive caves were Cueva del Guano and Cueva del Guayabo. New troglobitic species included crayfish and palaemonid shrimp (Hobbs, 1973b), pseudoscorpions, and isopods.

In February 1973 a second extensive cave was discovered near Acatlán. This cave, Cueva de Laguna Verde, has been little studied biologically, but collections by Peter Strickland and James Rodemaker included specimens of blind crayfish and shrimp.

Serious study of the cave fauna of the Yucatán Peninsula by members of the Association for Mexican Cave Studies began in 1973. In a trip from February 16 to May 14, partly supported by The Museum, Texas Tech University, Mary Butterwick, David McKenzie, Martha Helen McKenzie, Stuart Murphy, and James Reddell visited numerous caves in Veracruz, Oaxaca, Campeche, and Yucatán. The most significant find in the non-Yucatán areas was of a new species of troglobitic pseudoscorpion in

Cueva del Diablo near Orizaba, Veracruz; it remains undescribed. Collections were made in one cave in Campeche and in about 40 in Yucatán. Attempts were made to revisit as many of the caves studied by Pearse in 1936 as was possible; numerous new caves of great interest were also located. In addition to more specimens of all of the troglobites previously reported and many new species of troglophile, collections included new blind spiders (Gertsch 1977b), shrimp (Hobbs and Hobbs, 1976), pseudoscorpion (Muchmore, 1977), and amphipod (Holsinger, 1977). Of particular interest were additional populations of the rare blind fish *Typhliasina pearsei* and *Ophisternon infernale.*

During July 1973 a visit to the Yucatán Peninsula was made by Dr. Masaharu Kawakatsu, Robert W. Mitchell, James Reddell, J. Mark Rowland, and others. Collections were made in many caves and epigean localities in the state of Yucatán.

The Third Zoological Mission to México sponsored by the Accademia Nazionale dei Lincei was conducted from July 20 to October 11, 1973, by Valerio Sbordoni, Roberto Argano, Aldo Zullini, and Vincenzo Vomero. A total of 45 caves were visited in several parts of Chiapas and adjacent Huehuetenango, Guatemala. Among the more notable discoveries of this expedition were new species of troglobitic stenasellid isopod (Argano, 1977), amphipod (Ruffo and Vigna Taglianti, 1977), palaemonid shrimp (Holthuis, 1977), opilionid (Silhavý, 1977), and milliped (Shear, 1977a).

In August 1973 David McKenzie, Roy Jameson, and others made collections in several caves in the Rancho Nuevo region of Nuevo León and Tamaulipas. Among species of interest were new, still undescribed species of trechine beetle and the second species of troglobitic catopid known from México (Peck, 1977).

In December 1973 Peter Sprouse, Peter Strickland, and others visited several caves in the Aquismón region of San Luis Potosí. Additional populations of several troglobites and a still undescribed new species of endemic earthworm were found.

From December 21, 1973, to January 12, 1974, William Elliott, Bob Harr, Roy Jameson, David McKenzie, and James Reddell conducted biological investigations in the caves of the Zacapoaxtla-Cuetzalan area of Puebla, the Acatlán region of Oaxaca, and the Soledad Atzompa and Cofre de Perote areas of Veracruz. Each area produced species of interest. Among many species discovered in the Zacapoaxtla-Cuetzalan region were new crayfish (Hobbs, 1975), spiders, and millipeds (Causey, 1975b). A return visit to Cueva del Nacimiento del Río San Antonio in Oaxaca resulted in the collection of a new species of troglobitic cyphophthalmid opilionid (Shear, 1977b), the first record for this suborder in México. Collections in the Soledad Atzompa region included specimens of several rare troglobites also known from the Tequila region but also new species of spider and milliped. Finally, study of Cueva del Volcancillo, a lava tube on Cofre de Perote, was the first investigation of the biology of a lava tube in México. Although not a cave well-suited for fauna, Cueva del Volcancillo possessed many species of interest, including troglobitic opilionids, millipeds, and trechine beetles. Most of the results of this expedition remain unpublished.

The caves of the Micos region and the Sierra de El Abra, San Luis Potosí, were biologically studied from May 15 to June 8, 1974, by William Elliott, John Prentice, Carmen Soileau, and others. The primary emphasis was on obtaining specimens and other information on *Astyanax jordani.*

The members of the second expedition were Andy Grubbs, David McKenzie, James Reddell, and Suzanne Wiley; Robert W. Mitchell, William Russell, and others joined the expedition for part of the time. Their studies included the biological investigation of four caves in Tabasco, eight caves in Campeche, 14 caves in Quintana Roo, and 13 caves in Yucatán. In addition to further delineating the ranges of many troglobites, the expedition resulted in the discovery of new species of blind spiders, amblypygid, and milliped (Grubbs, 1975).

The fourth expedition sponsored by the Accademia Nazionale dei Lincei was conducted from July 30 to October 20, 1975. The personnel on this expedition were Roberto Argano, Valerio Sbordoni, Vincenzo Vomero, and Aldo Zullini. Thirty caves were visited in Chiapas; studies of the phreatic biotope were also made in Chiapas, Campeche, Quintana Roo, and Yucatán. Among the more significant discoveries of this expedition were new species of troglobitic asellid isopod, amphipod, crab, and trechine beetle (Sbordoni et al., 1977).

In August 1975 Andy Grubbs, David McKenzie, and Suzanne Wiley made the first biological study of caves in the karst region of San Nicolas de los Montes, San Luis Potosí. Their most notable discovery was of a new genus and species of troglobitic chactid scorpion.

An expedition in December 1975 by Dennis Barnes, Tom Byrd, Marcia Cossey, Andy Grubbs, Shari Larason, and Terry Sayther to the Acatlán region, Oaxaca, included biological collections in several caves. Their discoveries included a new species of blind diplocentrid scorpion, described by Francke

(1979) as *Diplocentrus cueva.* A new species of troglobitic homopteran was collected in this same month by Mike McEachern in Cueva de Cayetano, Oaxaca.

Further studies were made in December 1975 and January 1976 by Dennis Barnes, Tom Byrd, Marcia Cossey, Andy Grubbs, and Jim Rodemaker in the caves of the San Nicolas de los Montes region, San Luis Potosí.

December 1975 to January 1976 Peter Sprouse, Peter Strickland, and Carmen Soileau made collections in caves in the Sierra el Pino, San Luis Potosí and near Pinalito, Hidalgo.

Biological investigations were made of several caves in the San Juan area, Querétaro, in January 1976, by Roy Jameson and Patty Mothes, and in March 1976 by Alexia Cochrane, Gill Ediger, Andy Grubbs, and Roy Jameson.

June 8-15, 1976, Roy Jameson and Patty Mothes collected new species of blind planaria, tarantula, and milliped in caves northwest of Xilitla in Querétaro (Jameson, 1977).

In November 1976 the Río Purificación area of Tamaulipas was the object of intensive study. Collections by Andy Grubbs and Peter Sprouse included new species of planarian, opilionid, and trechine beetle.

Collections in the Huautla de Jiménez region, Oaxaca, December 1976 to January 1977 by Roy Jameson and Patty Mothes included blind millipeds, opilionids, carabid beetles, and a new genus and species of eyeless scorpion of unknown familial affinities.

An expedition from December 15, 1976, to January 15, 1977, by Andy Grubbs, David McKenzie, James Reddell, and Carmen Soileau included visits to the Sierra de Tamaulipas, Tamaulipas; the Cuetzalan region, Puebla; the Acatlán region, Oaxaca; and the Jalapa, Cuitlahuac, and Atoyac regions, Veracruz. A total of 38 caves were studied; collections included new species of mysid (Bowman, 1977b), crayfish, shrimp, spider, milliped, and homopteran.

The first visit to the karst region of Zoquitlán, Puebla, was made by Preston Forsythe, Jim Rodemaker, Peter Strickland, and others in January 1977. Their collections included a new genus and species of snail and blind opilionids, millipeds, and carabid beetles.

In January 1977 Robert W. Mitchell and Linda Faulkenberry collected, among other species of interest, a new species of cirolanid isopod in the caves of the San Nicolas de los Montes region, San Luis Potosí.

Collections were made by Carmen Soileau in March 1977 in caves in the vicinity of Yochib, Chiapas.

The study of the Río Purificación region, Tamaulipas, intensified in 1977 with expeditions in March, May, November, and December. The principal collectors in this area were Gill Ediger, David McKenzie, Dale Pate, and Peter Sprouse. Their collections included troglobitic stenasellid and trichoniscid isopods, spiders, opilionids, centipeds, and carabid beetles.

During an expedition in April-May 1977 to Huautla de Jiménez, Oaxaca, Tracy Johnson and Bill Steele collected blind millipeds, opilionids, and carabid beetles in several caves.

In May 1977 Roy Jameson and Patty Mothes continued their study of the caves in the region northwest of Xilitla in Querétaro. Their collections included blind planaria, isopods, spiders, opilionids, and millipeds.

Roy Jameson and Patty Mothes in November and December 1977 made the first study of the caves of the San Joaquín, Querétaro, region (Mothes, 1978). Among their collections were new species of blind milliped.

December 1977 to January 1978 Jean Jancewicz, Roy Jameson, Dino Lowery, and Steve Zeman collected troglobitic amblypygids, spiders, millipeds, and carabid beetles in several caves in the Huautla de Jiménez region of Oaxaca.

In January 1978 Jerry Atkinson, Preston Forsythe, Jocie Hooper, and Peter Strickland revisited the Zoquitlán, Puebla, area (Atkinson, 1978). Their collections included a new species of blind nesticid spider (Gertsch, in press).

Terry Sayther in January 1978 collected blind isopods and other fauna of interest in several caves in the Atoyac region, Veracruz.

The caves of the Purificación region of Tamaulipas were the object of intensive study during 1978, with the primary emphasis being placed on the Sistema Purificación, Cueva X, Sumidero de Oyamel, and Cueva de los Allarines. The principal collectors during this period were William Elliott, Andy Grubbs, David McKenzie, Dale Pate, Terry Raines, Peter Sprouse, Terri Treacy, and Lisa Wilk. Among the more notable finds were undescribed species of troglobitic planaria, isopod, pseudoscorpion, opilionid, milliped, and centiped.

An expedition to the Huautla de Jiménez, Oaxaca, region in April and May 1978 by Bill Steele, Bill Stone, Andy Grubbs, Mike McEachern, Jill Dorman, Jim Smith, and others, resulted in the collection of troglobitic scorpions, opilionids, millipeds, and carabid beetles.

Those species of troglobite which have been described from México are listed in Table 2 in the chronological order of their description.

Belize

The cave fauna of Belize has been little studied and most collections have been made in caves near Augustine and Caves Branch in Cayo District.

Paul Williams studied the phlebotomine sandflies of four caves near Augustine and one near Millionario between January 1964 and May 1969 (Williams, 1976c).

Marie and Charles Goodnight collected, among other species, opilionids in one of the Rio Frio caves, Cayo District, on July 1, 1971 (Goodnight and Goodnight, 1977).

A small collection of invertebrates was made by David McKenzie on January 19, 1972, in St. Augustine Cave, Cayo District.

Most of our knowledge of the cave fauna of Belize is the result of a study by S and J. Peck during July and August 1972. They visited several caves near Augustine and Caves Branch and obtained several species of unusual interest. Among their collections were new species of troglobitic spider (Gertsch, 1973b), pseudoscorpion (Muchmore, 1973a), opilionid (Goodnight and Goodnight, 1977), and milliped (Shear, 1973).

On July 20, 1972, Charles Goodnight visited a cave near Augustine and collected a new species of troglobitic pseudoscorpion (Muchmore, 1973b).

During July and August 1976 Logan McNatt, Tom Miller, and Michael Shawcross studied several caves near Caves Branch, Cayo District. Most of these collections remain unstudied, but a troglobitic opilionid was described by Goodnight and Goodnight (1977). Other specimens of interest included undescribed species of troglobitic milliped and charontid amblypygid. Logan McNatt made additional collections in this same region in May 1977.

The troglobites which have been described from Belize are listed in chronological order in Table 2.

Guatemala

The first cave inhabiting species to be described from Guatemala was the cricket *Arachnomimus cavicola* Saussure. This species was collected by George C. Champion during the period of 1879-1881 in Grutas de Lanquín, Alta Verapaz (Saussure, 1897).

Dr. Giaquinto Mira, an Italian physician studying malaria and sleeping sickness in Guatemala in 1933, visited Cueva de Sepacuite, Alta Verapaz, and obtained a series of a new species of catopid beetle, described by Jeannel (1936) as *Ptomaphagus (Adelops) giaquintoi*. Additional specimens of the same species were obtained in 1948 from Grutas de Lanquín by R. D. Mitchell (Peck, 1973c).

On June 13, 1959, William A. Varnedoe collected a new species of milliped in Grutas El Silvino, Izabal. Also in June he visited and made collections in Grutas de Lanquín, Alta Verapaz; Cueva Jobitzinaj, Petén; and Cueva Camán, Sololá.

In 1960 and 1961 W. E. Duellman, J. Knox Jones, Jr., and others collected bats from caves in several areas of Guatemala (Jones, 1966).

Collections were made in Cueva de Tabacal and Cueva de los Resadores, Huehuetenango, in November 1967 by David McKenzie. In the latter cave he found a remarkable troglobitic isopod (Schultz, 1977).

During January and February 1968 the Explorers Club of New York sponsored an expedition to Alta Verapaz (Gurnee, 1968). The biologist for this expedition was Bro. G. Nicholas, and he made collections in 12 caves (Nicholas, 1968). Probably the most notable find of this expedition was a new genus and species of cave inhabiting crab (Smalley, 1970) from Cueva Seamay. Other species of interest included a still undescribed troglobitic planarian in Grutas de Lanquín. This is the only cavernicole planarian known from Guatemala.

In August 1969 Stewart B. and James H. Peck visited eight caves in Izabal and Alta Verapaz (Peck and Peck, 1973). Among the fauna of interest were blind amphipods (Ruffo and Vigna Taglianti, 1974), spider (Gertsch, 1973b), and pseudoscorpion (Muchmore, 1973b).

During the course of the 1971 Italian Zoological Mission to México, three caves in Petén were visited by Valerio Sbordoni, Roberto Argano, and Aldo Zullini (1974).

D. Dreux, P. Joubert, and O. Rubio of the Centre d'Études et de Recherches Speléologiques en Milieu Tropical explored numerous caves in many parts of Guatemala (Dreux, 1976). Their biological collections in Alta Verapaz included, most notably, two new species of blind crab, described by Delamare Deboutteville (1976) as *Typhlopseudothelphusa juberthiei* and *T. mitchelli*.

On January 22, 1972, David McKenzie made a collection in Cueva Jobitzinaj, Petén. This included a new species of ricinuleid, described by Gertsch (1977a) as *Cryptocellus cookei*. In May 1972 several caves in the Montañas de Cuilco near La Libertad, Huehuetenango, were visited by David McKenzie and Stuart Murphy. Their collections included a new genus and species of rhaphidophorid cricket (Hubbell,

Table 2.—Chronological list of troglobites described from México, Guatemala, and Belize.

México

1867. *Lepisma anophthalma* Bilimek [=*Anelpistina anophthalma*]
1891. *Lepisma cacahuamilpensis* Herrera [syn. of *Anelpistina anophthalma*]
1900. *Conilera stygia* Packard
1936. *Anoptichthys jordani* Hubbs and Innes [=*Astyanax jordani*]
1936. *Cirolana anops* Creaser [=*Creaseriella anops*]
1936. *Antromysis cenotensis* Creaser [=*Antromysis (Antromysis) cenotensis*]
1936. *Palaemon morleyi* Creaser [=*Creaseria morleyi*]
1936. *Typhlatya pearsei* Creaser
1938. *Porcellio pearsei* Creaser [=*Trichorhina pearsei*]
1938. *Wanops coecus* Chamberlin and Ivie [=*Oonops coecus*]
1938. *Anopsicus pearsei* Chamberlin and Ivie [=*Pholcophora pearsei*]
1938. *Gymnostreptus zizicolens* Chamberlin [=*Orthoporus zizicolens*]
1938. *Trogolaphysa maya* Mills [=*Troglopodetes maya*]
1938. *Cyphoderus innominatus* Mills
1938. *Sulcuncus falciferus* Mills [=*Metasinella falcifera*]
1938. *Tohila atelomma* Hubbell
1938. *Typhlias pearsei* Hubbs [=*Typhliasina pearsei*]
1938. *Pluto infernalis* Hubbs [=*Ophisternon infernale*]
1941. *Nuevobius cavicolens* Chamberlin
1942. *Diaptomus (Microdiaptomus) cokeri* Osorio Tafall
1942. *Protrichoniscus bridgesi* Van Name [=*Brackenridgia bridgesi*]
1942. *Serrobunus boneti* Goodnight and Goodnight [=*Hoplobunus boneti*]
1942. *Garcibius osorioi* Chamberlin
1942. *Newportia sabina* Chamberlin [=*Newportia (Scolopendrides) sabina*]
1942. *Cavota crucis* Chamberlin [=*Cleidogona crucis*]
1942. *Bonetesmus verus* Chamberlin
1942. *Ceuthauxus palmitonus* Chamberlin
1942. *Pararachistes amblus* Chamberlin [=*Pararhachistes amblus*]
1942. *Mexaphaenops prietoi* Bolívar
1943. *Procambarus rodriguezi* Hobbs [=*Procambarus (Austrocambarus) rodriguezi*]
1943. *Oncopodura atoyacense* Bonet
1943. *Oncopodura prietoi* Bonet
1944. *Chinquipellobunus osorioi* Goodnight and Goodnight [=*Hoplobunus osorioi*]
1944. *Plusiocampa (Litocampa) atoyacensis* Wygodzinsky [=*Litocampa atoyacensis*]
1944. *Paratachycampa boneti* Wygodzinsky
1944. *Juxtlacampa juxtlahuacensis* Wygodzinsky
1944. *Parallocampa (Parallocampa) cavernicola* Wygodzinsky [=*Podocampa cavernicola*]
1945. *Acherontides atoyacense* Bonet
1945. *Spelaeogastrura guerrerense* Bonet
1946. *Leucohya heteropoda* Chamberlin
1946. *Cryptocellus osorioi* Bolívar
1946. *Acherontides potosinus* Bonet
1946. *Anoptichthys antrobius* Alvarez [=syn. of *Astyanax jordani*]
1947. *Vachonium boneti* Chamberlin
1947. *Vachonium maya* Chamberlin
1947. *Pararrhopalites anops* Bonet and Tellez
1947. *Anoptichthys hubbsi* Alvarez [syn. of *Astyanax jordani*]
1950. *Protrichoniscus villalobosi* Rioja [=*Brackenridgia villalobosi*]
1950. *Cirolana (Speocirolana) pelaezi* Bolívar [=*Speocirolana pelaezi*]
1951. *Sphaeromicola cirolanae* Rioja
1951. *Protrichoniscus acostai* Rioja [=*Brackenridgia acostai*]
1951. *Typhlolepidomysis quinterensis* Villalobos [=*Spelaeomysis quinterensis*]
1953. *Typhlotricholigioides aquaticus* Rioja
1953. *Typhlopseudothelphusa mocinoi* Rioja
1953. *Cirolana (Speocirolana) bolivari* Rioja [=*Speocirolana bolivari*]
1954. *Prietella phreatophila* Carranza
1956. *Trichorhina boneti* Rioja
1956. *Cordioniscus laevis* Rioja [=*Mexiconiscus laevis*]
1956. *Paravachonium bolivari* Beier
1956. *Troglohya carranzai* Beier
1958. *Cylindroniscus maya* Rioja
1960. *Spherarmadillo cavernicola* Mulaik
1960. *Trichorhina atoyacensis* Mulaik
1960. *Trichorhina yucatanensis* Mulaik [syn. of *Trichorhina pearsei*]
1960. *Protrichoniscus potosinus* Mulaik [syn. of *Brackenridgia bridgesi*]
1960. *Protrichoniscus palmitensis* Mulaik [=*Brackenridgia palmitensis*]
1960. *Antroniscus cavicola* Mulaik [=*Cylindroniscus cavicola*]
1960. *Antroniscus balamensis* Mulaik [syn. of *Cylindroniscus maya*]
1960. *Bogidiella tabascensis* Villalobos
1962. *Orthoporus kiemi* Loomis [syn. of *Orthoporus zizicolens*]
1962. "Cave form of *Poecilia sphenops* Valenciennes" reported from México
1963. *Albiorix bolivari* Beier
1963. *Mexiterpes sabinus* Causey
1964. *Mexiconiscus tlamayaensis* Schultz [syn. of *Mexiconiscus laevis*]
1964. *Glomeroides caecus* Causey
1964. *Glomeroides promiscus* Causey
1964. *Mexicambala russelli* Causey
1965. *Cambala speobia* (Chamberlin)—1st record for México
1965. *Mexisphodrus veraecrucis* Barr [=*Platynus (Mexisphodrus) veraecrucis*]
1966. *Coahuilix hubbsi* Taylor
1966. *Speocirolana thermydronis* Cole and Minckley
1966. *Mexisphodrus profundus* Barr [=*Platynus (Mexisphodrus) profundus*]
1967. *Antroforceps bolivari* Barr
1967. *Mexaphaenops elegans* Barr
1967. *Mexaphaenops fishi* Barr
1967. *Paratrechus (Hygroduvalius) pallescens* Barr
1968. *Eodrilus mexicanus* Gates
1968. *Ptomaphagus (Adelops) troglomexicanus* Peck
1968. *Typhlochactas rhodesi* Mitchell
1968. *Typhlochactas reddelli* Mitchell
1968. *Niptus absconditus* Spilman
1969. *Tyrannochthonius troglobius* Muchmore
1969. *Poterpes egeo* Causey [=*Mexiterpes egeo*]
1969. *Poterpes fishi* Causey [=*Mexiterpes fishi*]

Table 2.—(continued)

1970. *Eodrilus albus* Gates [=*Eodrilus albidus*]
1970. *Sphaerolana affinis* Cole and Minckley
1970. *Sphaerolana interstitialis* Cole and Minckley
1970. *Cylindroniscus vallesensis* Schultz
1971. *Cyathura sbordonii* Argano
1971. *Mexiweckelia colei* Holsinger and Minckley
1971. *Mexiweckelia particeps* Holsinger
1971. *Typhlochactas elliotti* Mitchell
1971. *Agastoschizomus lucifer* Rowland
1971. *Schizomus cookei* Rowland
1971. *Schizomus mitchelli* Rowland
1971. *Schizomus reddelli* Rowland
1971. *Euagrus cavernicola* Gertsch
1971. *Aphonopelma stygia* Gertsch [=*Schizopelma stygia*]
1971. *Cicurina coahuila* Gertsch [=*Cicurina (Cicurella) coahuila*]
1971. *Cicurina mina* Gertsch [=*Cicurina (Cicurusta) mina*]
1971. *Tegenaria blanda* Gertsch
1971. *Tegenaria caverna* Gertsch
1971. *Leptoneta capilla* Gertsch
1971. *Leptoneta delicata* Gertsch
1971. *Leptoneta isolata* Gertsch
1971. *Leptoneta reclusa* Gertsch
1971. *Nesticus nahuanus* Gertsch
1971. *Metagonia atoyacae* Gertsch
1971. *Metagonia pachona* Gertsch
1971. *Metagonia pura* Gertsch
1971. *Metagonia tlamaya* Gertsch
1971. *Pholcophora exigua* Gertsch
1971. *Pholcophora gruta* Gertsch
1971. *Psilochorus delicatus* Gertsch
1971. *Psilochorus diablo* Gertsch
1971. *Cryptocellus reddelli* Gertsch
1971. *Hoplobunus inops* Goodnight and Goodnight [=*Troglostygnopsis inops*]
1971. *Rhagidia trisetatus* Elliott and Strandtmann [=*Rhagidia trisetata*]
1971. *Rhagidia weyerensis* (Packard)—1st México record
1971. *Strongylodesmus harrisoni* Causey
1971. *Unculabes crispus* Causey
1971. *Unculabes versatilis* Causey [syn. of *Unculabes crispus*]
1971. *Bonetesmus novenus* Causey [syn. of *Bonetesmus verus*]
1971. *Mexicambala blandus* Causey [=*Mexicambala blanda*]
1971. *Mexicambala fishi* Causey
1971. *Mexicambala inopis* Causey
1971. *Mexaphaenops intermedius* Barr
1972. *Opisthobursa mexicana* Benazzi
1972. *Dimarcus villalobosi* Mitchell and Kawakatsu [syn. of *Opisthobursa mexicana*]
1972. *Conasellus pasquinii* Argano [=*Caecidotea pasquinii*]
1972. *Mexistenasellus coahuila* Cole and Minckley
1972. *Mexistenasellus parzefalli* Magniez
1972. *Mexistenasellus wilkensi* Magniez
1972. *Vejovis gracilis* Gertsch and Soleglad [=*Vaejovis gracilis*]
1972. *Aphrastochthonius parvus* Muchmore
1972. *Aphrastochthonius russelli* Muchmore
1972. *Leucohya magnifica* Muchmore
1972. *Mexobisium paradoxum* Muchmore
1972. *Paravachonium superbum* Muchmore
1972. *Pachychitra grandis* Muchmore
1972. *Nesticus arganoi* Brignoli
1972. *Cleidogona baroqua* Shear
1972. *Cleidogona pecki* Shear
1972. *Mexiterpes metallicus* Shear
1972. *Paracophus caecus* Hubbell
1972. *Paracophus cladonotus* Hubbell
1972. *Paracophus lippus* Hubbell
1973. *Dugesia barbarae* Mitchell and Kawakatsu
1973. *Dugesia typhlomexicana* Mitchell and Kawakatsu
1973. *Dugesia mckenziei* Mitchell and Kawakatsu
1973. *Sphaeromicola coahuiltecae* Hobbs and Hobbs
1973. *Mexiweckelia mitchelli* Holsinger
1973. *Spelaeomysis olivae* Bowman
1973. *Alpheopsis stygicola* Hobbs
1973. *Macrobrachium villalobosi* Hobbs
1973. *Neopalaemon nahuatlus* Hobbs
1973. *Procambarus (Austrocambarus) oaxacae oaxacae* Hobbs
1973. *Procambarus (Austrocambarus) oaxacae reddelli* Hobbs
1973. *Aphrastochthonius major* Muchmore
1973. *Tyrannochthonius pallidus* Muchmore
1973. *Mexobisium maya* Muchmore
1973. *Troglohya mitchelli* Muchmore
1973. *Vachonium kauae* Muchmore
1973. *Schizomus bartolo* Rowland
1973. *Schizomus firstmani* Rowland
1973. *Schizomus pecki* Rowland
1973. *Schizomus lukensi* Rowland
1973. *Tarantula chacmool* Rowland [=*Paraphrynus chacmool*]
1973. *Tarantula chiztun* Rowland [=*Paraphrynus chiztun*]
1973. *Euagrus anops* Gertsch
1973. *Schizopelma reddelli* Gertsch
1973. *Theotima pura* Gertsch
1973. *Metagonia martha* Gertsch
1973. *Hoplobunus apoalensis* Goodnight and Goodnight
1973. *Hoplobunus planus* Goodnight and Goodnight
1973. *Glomeroides addititius* Causey
1973. *Acutangulus alius* Causey
1973. *Ceuthauxus constans* Causey
1973. *Tylogoneus minus* Causey
1973. *Tylogoneus rainesi* Causey
1973. *Pseudosinella bonita* Christiansen
1973. *Pseudosinella strinatii* Christiansen [=*Pseudosinella petrustrinatii*]
1973. *Cixius orcus* Fennah
1973. *Oeclidius hades* Fennah
1973. *Mexisphodrus urquijoi* Hendrichs and Bolívar [=*Platynus (Mexisphodrus) urquijoi*]
1974. *Troglocubanus perezfarfanteae* Villalobos
1974. *Mexistenasellus magniezi* Argano
1974. *Mexicerberus troglodytes* Schultz
1974. *Bogidiella arganoi* Ruffo and Vigna Taglianti
1974. *Bogidiella sbordonii* Ruffo and Vigna Taglianti
1974. *Bithynops luscus* Holthuis
1974. *Leptoneta limpida* Gertsch
1974. *Cryptocellus sbordonii* Brignoli
1974. *Caecoa arganoi* Silhavý
1974. *Hoplobunus queretarius* Silhavý
1974. *Troglostygnopsis anophthalma* Silhavý
1974. *Ortholasma sbordonii* Silhavý
1974. *Glomeridesmus sbordonii* Shear
1974. *Glomeroides pellucidus* Shear

Table 2.—(concluded)

1974. *Cleidogona felipiana* Shear
1974. *Bonetesmus ojo* Shear
1974. *Aceratophallus scutigeroides* Shear
1974. *Unculabes arganoi* Shear
1974. *Unculabes causeyae* Shear
1974. *Unculabes porrensis* Shear
1974. *Speodesmus pecki* Shear
1974. *Mexanillus sbordonii* Vigna Taglianti
1974. *Troglobacanius bolivari* Vomero
1974. *Troglobacanius maya* Vomero
1974. *Troglobacanius reddelli* Vomero
1974. *Troglobacanius sbordonii* Vomero
1975. *Mexilana saluposi* Bowman
1975. *Agastoschizomus huitzmolotitlensis* Rowland
1975. *Schizomus pallidus* Rowland
1975. *Paraphrynus baeops* Mullinex
1975. *Paraphrynus velmae* Mullinex
1975. *Reddellobus troglobius* Causey
1976. *Caecidotea chiapas* Bowman
1976. *Typhlatya campecheae* Hobbs and Hobbs
1976. *Typhlatya mitchelli* Hobbs and Hobbs
1976. *Opisthobursa josephinae* Benazzi
1977. *Neogovea mexasca* Shear
1977. *Troglophiloscia laevis* Schultz
1977. *Mayaweckelia cenoticola* Holsinger
1977. *Mayaweckelia yucatanensis* Holsinger
1977. *Antromysis (Antromysis) reddelli* Bowman
1977. *Diplocentrus anophthalmus* Francke
1977. *Diplocentrus mitchelli* Francke
1977. *Vachonium cryptum* Muchmore
1977. *Metagonia torete* Gertsch
1977. *Metagonia chiquita* Gertsch
1977. *Theotima martha* Gertsch
1977. *Cicurina maya* Gertsch [=*Cicurina (Cicurella) maya*]
1977. *Orthoporus spelaeus* Causey
1977. *Ptomaphagus (Adelops) mckenziei* Peck
1977. *Caecidotea vomeroi* Argano
1977. *Caecidotea zullinii* Argano
1977. *Etlastenasellus mixtecus* Argano
1977. *Bogidiella michaelae* Ruffo and Vigna Taglianti
1977. *Bogidiella niphargoides* Ruffo and Vigna Taglianti
1977. *Bogidiella orchestipes* Ruffo and Vigna Taglianti
1977. *Bogidiella vomeroi* Ruffo and Vigna Taglianti
1977. *Macrobrachium acherontium* Holthuis
1977. *Trichodactylus (Rodriguezia) mensabak* Cottarelli and Argano
1977. *Hoplobunus zullinii* Silhavý
1977. *Mexotroglinus sbordonii* Silhavý
1977. *Cleidogona hunapu* Shear
1977. *Polylepiscus vomeroi* Shear
1977. *Caramba delburro* Shear
1977. *Caramba delnegro* Shear
1977. *Caramba grandeza* Shear
1977. *Chiapadytes bolivari* Vigna Taglianti
1978. *Matta mckenziei* Shear
1978. *Diplocentrus cueva* Francke
1979. *Paraphrynus reddelli* Mullinex
1979. *Pseudosinella aera* Christiansen
1979. *Pseudosinella finca* Christiansen—1st Mexico record

Belize

1973. *Mexobisium goodnighti* Muchmore
1973. *Vachonium belizense* Muchmore
1973. *Metagonia jarmila* Gertsch
1973. *Jarmilka alba* Shear
1977. *Stygnomma pecki* Goodnight and Goodnight
1977. *Cynortina misteca* Goodnight and Goodnight

Guatemala

1936. *Ptomaphagus (Adelops) giaquintoi* Jeannel
1972. *Aphrastochthonius verapazanus* Muchmore
1973. *Mexobisium guatemalense* Muchmore
1973. *Telema mayana* Gertsch
1973. *Pseudosinella finca* Christiansen
1973. *Speocolpodes franiai* Barr
1974. *Bogidiella holsingeri* Ruffo and Vigna Taglianti
1974. *Aceratophallus scutigeroides* Shear
1974. *Paraliochthonius strinatii* Beier
1975. *Juxtlacampa hauseri* Beier
1976. *Typhlopseudothelphusa juberthiei* Delamare Deboutteville
1976. *Typhlopseudothelphusa mitchelli* Delamare Deboutteville
1977. *Colombophiloscia cavernicola* Vandel—1st Guatemala record
1977. *Caecidotea mitchelli* Argano
1977. *Bogidiella pasquinii* Ruffo and Vigna Taglianti
1977. *Tridontomus loomisi* Shear
1977. *Mayaphaenops sbordonii* Vigna Taglianti

1977). In August 1972 S. and J. Peck visited Cueva Nojohnaj Cohultunich, Petén.

In January 1973 Henry Frania and Michael Shawcross discovered a new genus and species of troglobitic carabid beetle in Cueva Seamay, Alta Verapaz (Barr, 1973).

The Swiss biospeleologist, Pierre Strinati, visited caves in Guatemala during April 1973. His collections in Cueva Chirrepeck, Alta Verapaz, included a new troglobitic pseudoscorpion (Beier, 1974) and dipluran (Condé, 1975).

On September 30, 1973, Valerio Sbordoni, Roberto Argano, and Aldo Zullini visited Cueva de las Calaveras, Huehuetenango.

In September 1975 Roberto Argano, Valerio Sbordoni, Vincenzo Vomero, and Aldo Zullini visited 11 caves in the Altos de los Cuchamatanes, Huehuetenango. Among the more notable discoveries were new species of bogidiellid amphipod and a new genus and species of trechine beetle (Sbordoni et al., 1977).

All species of troglobite which have been described from Guatemala are listed in Table 2 in the chronological order of their description.

Fig. 2.—Map showing the location of the cave regions discussed in the introduction: 1, Santa Elena; 2, Salaices; 3, Rancho Descubridora; 4, Sierra de la India; 5, Ciudad Lerdo; 6, Ciudad Acuña; 7, Sierra de Santa Rosa; 8, Hermanas; 9. Cuatro Ciénegas de Carranza; 10, Monclova; 11, Sierra de las Animas; 12, Sierra de Mayrán; 13, Pico de Carrizal; 14, Sierra de Iguana; 15, Sierra de Gomas; 16, Sierra de Santa Clara; 17, Sierra de Garia; 18, Sierra del Fraile; 19, Cañón Huasteco; 20, Cuesta de Chipinque; 21, Sierra de Arteaga; 22, Sierra de Tarillal; 23, Sierra de la Silla; 24, Potrero Redondo; 25, Cerro de la Boca; 26, Galeana; 27, Cañón de Santa Rosa; 28, Cerro de la Cochina; 29, Matehuala; 30, Villa Hidalgo; 31, Zaragoza; 32, Purificación; 33, Cerro El Aire; 34, Altas Cumbres; 35, Sierra de Tamaulipas; 36, Tula; 37, Sierra de Guatemala; 38, La Libertad; 39, Piedra Paloma; 40, Sierra El Pino; 41, Sierra de El Abra; 42, Sierra de Alvarez; 43, Rayón; 44, San Nicolas de los Montes; 45, Micos; 46, Puente de Dios; 47, Aquismón; 48, San Juan; 49, Tancoyol; 50, Xilitla Plateau; 51, Ahuacatlán; 52, Laguna Colorado; 53, Xilitla; 54, Pinal de Amoles; 55, Jacala; 56, San Joaquín; 57, Tonoltongo; 58, Lagunilla; 59, Xicotepec de Juárez; 60, Cuetzalan; 61, Cerro de la Estrella; 62, Cacahuamilpa; 63, Taxco; 64, Colotlipa; 65, Jalapa; 66, Buena Vista; 67, Atoyac; 68, Orizaba; 69, Tezonapa; 70, Acatlán; 71, San Pablo Zoquitlán; 72, Huautla de Jiménez; 73, Santiago Apoala; 74, Valle Nacional; 75, San Sebastián de las Grutas; 76, Malpaso; 77, Ixtacomitán; 78, Teapa; 79, Tapijulapa; 80, Palenque; 81, Simojovel and Tila; 82, Bochil and Soyalo; 83, Tuxtla Gutiérrez; 84, San Cristóbal de las Casas; 85, Altamirano; 86, Rancho del Cielito; 87, Comitán de Domínguez; 88, Montebello; 89, Motozintla; 90, Santa Ana Huistá; 91, Montañas de Cuilco; 92, Altos Cuchumatanes; 93, Yaxchilán; 94, Flores; 95, Raxrujá; 96, Cobán; 97, Lanquín; 98, Senahú; 99, Lago de Izabal; 100, Augustine; 101, Caves Branch; 102, Sierra de Bolonchén; 103, Sierra de Ticul; 104, Coastal Plain.

CAVE REGIONS

Only the cave regions of México, Guatemala, and Belize which have been studied with respect to their invertebrate fauna are discussed. The greatest emphasis has naturally been placed on the better studied regions, and this discussion is further limited by the incomplete knowledge of the physiography and geology.

The definition of cave regions varies greatly from area to area. In general I have attempted to define regions on the basis of isolation from other regions. This has been simple in some areas, particularly in northern México where isolated limestone ranges such as Pico de Carrizal and the Sierra de Gomas are separated by noncavernous deposits. In other areas, however, the definition of regions has been more arbitrary. An example is in southern San Luis Potosí and adjacent Hidalgo and Querétaro. Despite the fact that this area is a rather contiguous region of limestone, five regions have been defined: Aquismón, Xilitla, Laguna Colorado, Xilitla Plateau, and Jalapa. These regions show some distinct faunal differences and some differences in elevation, geology, and vegetation. Only with further study and the availability of detailed geologic and topographic maps can these and many other regions be defined more naturally.

In the description of each region I have commented briefly, where possible, on geology, karst morphology, elevation, and cave type. I have also included a general discussion of the composition and relationships of the cave fauna. The locations of the cave regions discussed below are given in Fig. 2.

The discussion of physiographic provinces follows, more from convenience than conviction, the system proposed by Raisz (1964). Other systems which deserve consideration include those of West (1964), Alcorta Guerrero (1966), and Russell (1969). Table 3 summarizes by physiographic province and cave region the cavernicole fauna and number of biologically investigated caves in México, Belize, and Guatemala.

Sierra Madre Occidental

The northern portion of the Sierra Madre Occidental consists of a series of north-south ranges lying between the ranges of the Sonoran desert and the main plateau of the Sierra. It extends from the United States into northeastern Sonora. The principal mass of the Sierra Madre Occidental is a broad high plateau formed of Tertiary volcanics extending from northern Chihuahua into northern Jalisco where it is bounded on the south by the Río Santiago. The eastern slopes of the Sierra tend to be gentle, but the western side is abrupt and cut by deep gorges, including Barranca del Cobre, with a depth of more than 2,000 meters. Although most of the area is formed of igneous rock, a few isolated outcrops of Cretaceous limestone have been exposed by erosion of the overlying Tertiary deposits. King (1939) has discussed the geology of the northern Sierra Madre Occidental, and his geologic map shows a few of the larger of these outcrops.

Speleologically, this region is virtually unstudied. Many large shelter and shelter-like caves have been reported, but only one has been biologically investigated. The limestone region which has been studied is a limited area near the town of Santo Tomas to the west of Ciudad Guerrero in central Chihuahua. A large limestone cave is known from southern Chihuahua near Guadalupe y Calvo but has not been visited by speleologists.

Santo Tomas, Chihuahua.—This region consists of an isolated outcrop of Cretaceous limestone of only a few kilometers extent. Water flowing south off a low range of igneous hills sinks in several sumidero-type entrances at the ends of arroyos. The water is reported to emerge from a spring or springs a few kilometers away. Only three caves have been investigated, the largest of which is the Socavón de Santo Tomas, which attains a depth of 110 meters and a length of about 200 meters. The fauna of the region is limited and no troglobites are known. Of the 11 species thus far identified only spiders of the genera *Meioneta* (Linyphiidae) and *Psilochorus* (Pholcidae) appear to be troglophiles.

Villa Matamoros, Chihuahua.—The Villa Matamoros region is an area of Tertiary volcanics south of the city of Parral. The only cave investigated is Cueva del Salitre, a 40-meter-long passage formed in ignimbrite and inhabited by a colony of cave swallows. Seven species have been identified from the cave; of these only chernetid pseudoscorpions and spiders of the genus *Filistatinella* (Filistatidae) are true cave associates.

Edwards Plateau

Raisz (1964) includes this area as part of the Gulf Coastal Plain province, but I feel it should be included with the Edwards Plateau of Central Texas. It consists of a narrow band of Cretaceous limestone extending from a few kilometers northwest of Ciudad Acuña to the Serranías del Burro. It has been isolated from the Edwards Plateau proper by the incision of the Rio Grande.

Ciudad Acuña, Coahuila.—The only cave known from this region is Cueva de los Lagos, now inundated

Table 3.—Number of troglobites, troglophiles, total species, and biologically investigated caves in México, Guatemala, and Belize, arranged by physiographic province, state, and cave region. Numbers following the region name refer to the location map (Fig. 2); Santo Tomas and Villa Matamoros regions not shown on map.

Region	Troglobites Aquatic	Troglobites Terrestrial	Troglophiles Aquatic	Troglophiles Terrestrial	Total Species	Caves
Sierra Madre Occidental						
Chihuahua						
Santo Tomas	0	0	0	2	3	3
Villa Matamoros	0	0	0	1	7	1
Edwards Plateau						
Coahuila						
Ciudad Acuña (6)	0	2	1	10	17	1
Basins and Ranges						
Chihuahua						
Salaices (2)	0	1	0	5	17	2
Santa Elena (1)	0	0	0	2	5	3
Coahuila						
Cuatro Ciénegas de Carranza (9)	7	0	1	10	25	25
Durango						
Rancho Descubridora (3)	1	0	1	7	12	1
Sierra Madre Oriental						
Coahuila						
Hermanas (8)	0	0	0	6	10	2
Monclova (10)	0	0	0	0	1	1
Sierra de las Animas (11)	0	0	0	7	9	1
Sierra Arteaga (21)	0	0	0	8	17	1
Sierra de Mayrán (12)	0	0	0	5	8	4
Sierra de Santa Rosa (7)	1	0	0	5	9	3
Durango						
Ciudad Lerdo (5)	0	0	0	8	13	4
Sierra de la India (4)	0	4	0	5	14	2
Hidalgo						
Jacala (55)	0	3	3	17	39	10
Lagunilla (58)	0	1	0	5	15	1
Tonoltongo (57)	0	0	0	2	3	1
Nuevo León						
Cañón Huasteco (19)	0	2	0	14	23	3
Cañón de Santa Rosa (27)	2	0	0	0	4	3
Cerro de la Boca (25)	0	1	0	14	16	1
Cuesta de Chipinque (20)	0	2	0	8	12	3
Galeana (26)	0	1	0	16	23	7
Pico de Carrizal (13)	0	3	0	12	25	1
Potrero Redondo (24)	0	1	0	4	6	2
Sierra del Fraile (18)	0	6	0	7	14	2
Sierra de Garia (17)	0	0	0	0	2	1
Sierra de Gomas (15)	0	10	0	20	36	4
Sierra de Iguana (14)	0	0	0	1	3	2
Sierra de Santa Clara (16)	0	0	0	0	1	1
Sierra de la Silla (23)	2	3	0	16	33	2
Sierra El Tarillal (22)	0	0	0	5	5	1
Zaragoza (31)	0	0	0	2	3	3
Nuevo León and Tamaulipas						
Purificación (32)	4	15	2	46	100	33

Table 3.—(continued)

Region	Troglobites Aquatic	Troglobites Terrestrial	Troglophiles Aquatic	Troglophiles Terrestrial	Total Species	Caves
Puebla						
Cuetzalan (60)	1	10	7	43	87	20
Xicotepec de Juárez (59)	0	0	0	3	11	4
Querétaro						
Ahuacatlán (51)	0	1	0	12	17	9
Laguna Colorado (52)	0	2	0	17	31	5
Pinal de Amoles (54)	0	6	0	31	46	21
San Joaquín (56)	0	1	0	2	4	3
San Juan (48)	0	1	0	15	18	7
Tancoyol (49)	0	1	0	3	5	3
Xilitla Plateau (50)	0	4	1	12	19	3
San Luis Potosí						
Aquismón (47)	4	8	4	20	57	15
Cerro de la Cochina (28)	0	0	0	1	7	1
La Libertad (38)	0	0	0	4	12	4
Matehuala (29)	0	0	0	5	8	2
Micos (45)	6	0	1	12	30	8
Piedra Paloma (39)	0	0	0	1	2	2
Puente de Dios (46)	0	0	0	7	7	1
Rayón (43)	0	0	2	8	10	1
San Nicolas de los Montes (44)	3	1	2	11	25	16
Sierra de Alvarez (42)	0	2	4	41	95	26
Sierra El Pino (40)	2	3	0	9	22	6
Xilitla (53)	1	17	4	80	181	31
San Luis Potosí and Tamaulipas						
Sierra de El Abra (41)	8	25	35	103	306	62
Tamaulipas						
Altas Cumbres (34)	0	0	0	3	7	3
Sierra de Guatemala (37)	9	36	5	83	273	67
Tula (36)	0	0	0	2	2	1
Villa Hidalgo (30)	0	0	0	3	3	1
Gulf Coastal Plain						
Tamaulipas						
Cerro El Aire (33)	0	0	0	1	2	1
Sierra de Tamaulipas (35)	2	2	0	21	49	7
Neovolcanic Plateau						
Distrito Federal						
Cerro de la Estrella (61)	0	1	0	2	8	1
Veracruz						
Buena Vista (66)	0	0	2	6	11	3
Jalapa (65)	0	2	0	12	30	15
Sierra Madre del Sur System						
Guerrero						
Colotlipa (64)	0	4	0	17	35	1
Taxco (63)	0	0	0	6	11	2
Guerrero and México						
Cacahuamilpa (62)	0	6	2	46	91	14
Oaxaca						
Acatlán (70)	7	18	3	37	91	21
Huautla de Jiménez (72)	0	8	0	31	46	21

Table 3.—(concluded)

Region	Troglobites Aquatic	Troglobites Terrestrial	Troglophiles Aquatic	Troglophiles Terrestrial	Total Species	Caves
Oaxaca (concluded)						
San Sebastián de las Grutas (75)	0	3	0	11	21	4
Santiago Apoala (73)	0	2	0	13	30	6
Valle Nacional (74)	4	4	2	22	42	5
Puebla						
San Pablo Zoquitlán (71)	0	1	0	10	17	9
Veracruz						
Atoyac (67)	8	15	5	55	111	25
Orizaba (68)	0	12	0	49	104	28
Tezonapa (69)	0	2	0	9	14	1
Chiapas-Guatemala Highlands						
Chiapas						
Altamirano (85)	3	1	4	7	16	9
Bochil and Soyalo (82)	0	3	1	9	16	6
Comitán de Domínguez (87)	1	4	0	11	25	2
Ixtacomitán (77)	0	0	0	2	4	3
Malpaso (76)	0	2	0	5	16	10
Montebello (88)	1	4	10	19	49	8
Motozintla (89)	1	4	0	3	8	2
Palenque (80)	0	0	0	0	2	1
Rancho del Cielito (86)	1	2	0	2	7	2
San Cristóbal de las Casas (84)	7	7	2	21	53	38
Simojovel and Tila (81)	3	1	1	5	17	8
Tuxtla Gutiérrez (83)	0	1	12	39	81	22
Tabasco						
Tapijulapa (79)	2	1	0	11	20	1
Teapa (78)	3	5	1	17	59	12
Cayo, Belize						
Augustine (100)	0	1	0	16	35	7
Caves Branch (101)	0	7	0	19	33	8
Alta Verapaz, Guatemala						
Cobán (96)	2	3	0	8	18	6
Lanquín (97)	1	3	1	17	47	7
Raxrujá (95)	0	0	4	0	4	3
Senahú (98)	1	7	1	4	18	5
Huehuetenango, Guatemala						
Altos Cuchumatanes (92)	2	2	1	2	13	12
Montañas de Cuilco (91)	0	0	0	3	5	5
Santa Ana Huistá (90)	0	0	0	3	11	3
Izabal, Guatemala						
Lago de Izabal (99)	0	0	0	7	12	4
Petén, Guatemala						
Flores (94)	0	0	0	11	15	5
Yaxchilán (93)	0	0	0	11	13	3
Yucatán Peninsula						
Campeche						
Sierra de Bolonchén (102)	5	5	6	45	94	18
Campeche, Quintana Roo, and Yucatán						
Coastal Plain (104)	10	14	33	116	515	157
Yucatán						
Sierra de Ticul (103)	3	14	3	79	290	41

by the waters of the Amistad Reservoir. The cave, which consists largely of a steeply sloping passage ending in a deep pool, is formed in the Salmon Peak Formation of Cretaceous age (Smith, 1970) at an elevation of 330 meters.

The fauna, as is to be expected, is closely related to that of Texas immediately across the Rio Grande. Of the 17 species identified, two are troglobites: the agelenid spider *Cicurina (Cicurella) coahuila* Gertsch and the cambalid milliped *Cambala speobia* (Chamberlin). The latter species is widespread in Central Texas. Troglophiles include the porcellionid isopod *Porcellio gertschi* Van Name, the pholcid spider *Physocyclus enaulus* Crosby, a scytodid spider of the genus *Loxosceles,* the collembolan *Pseudosinella violenta* (Folsom), and the carabid beetles *Rhadine araizai* (Bolívar) and *Tachys (Tachys) proximus* Say.

Basins and Ranges

The Basins and Ranges province consists of an area of folded and faulted mountain ranges separated by wide valleys and basins. The mountains are generally oriented along a northwest-southeast axis and frequently enclose large closed basins *(bolsones).* The most notable of these is the Bolsón de Mapimí in Durango, but the Bolsón de Cuatro Ciénegas de Carranza in Coahuila is of particular importance because of its rich endemic subterranean aquatic fauna. The western ranges are largely igneous, but to the east they tend to be composed of folded Cretaceous sediments. This province extends from the southwestern United States into northern Durango and southern Coahuila. It is bounded on the west by the Sierra Madre Occidental, on the east by the Sierra Madre Oriental, and on the south by the Cross Ranges of the Sierra Madre Oriental. The average elevation of the filled basins is about 1,200 meters, with the mountains rising up to several thousand meters above the valleys. Russell and Raines (1967) have described the general geology of the Laredo-Monterrey area with special reference to cave origins. Brand (1937) includes a concise account of the physiography and geology of northwestern Chihuahua.

Despite its proximity to the United States, this area has been little studied speleologically. Only six caves are known for the province outside of the vicinity of Cuatro Ciénegas de Carranza. Most work even in the Cuatro Ciénegas de Carranza region has been in the waters flowing into the basin itself, with the caves in the mountains surrounding the basin remaining virtually unknown.

Salaices, Chihuahua.—This region includes several low limestone hills in the vicinity of Salaices, a small town on the highway between Jiménez and Parral. The only caves known are Cueva de los Muchachos, a vertical sinkhole dropping to a short horizontal passage, and Cueva del Diablo. The latter cave is an extensive maze containing more than one kilometer of explored passage (Reddell, 1977a). The only fauna recorded from Cueva de los Muchachos is a species of rhaphidophorid cricket. Cueva del Diablo is generally dry but it does contain 16 species, of which one is a possible troglobite. Cirolanid isopods found dead in a low pool remain to be rediscovered. The only apparent troglobite is the endemic pholcid spider *Psilochorus diablo* Gertsch. The troglophile fauna includes the nesticid spider *Eidmannella pallida* (Emerton), the pholcid spider *Physocyclus enaulus* Crosby, and the psocid *Psyllipsocus ramburii* Selys-Longchamps. The fauna is typical of the arid regions of northern México and adjacent United States.

Santa Elena, Chihuahua.—This is a poorly defined region located south of Santa Elena Canyon on the Rio Grande. The only cave to be investigated with respect to its invertebrate fauna is Sótano de Sauz, a 220-meter-deep cave with an unusually high air temperature. A massive die-off of the bat *Mormoops megalophylla megalophylla* Peters was reported by Sprouse (1977). The only probable troglophile identified from the cave is a pholcid spider of the genus *Psilochorus.*

Cuatro Ciénegas de Carranza, Coahuila.—This region includes the Bolsón de Cuatro Ciénegas de Carranza and several ranges of mountains which surround it. The basin is about 40 kilometers wide (east to west) and 30 kilometers long (north to south) and is formed at an elevation of about 740 meters. The surrounding mountains attain elevations of more than 3,000 meters. Minckley (1969) has provided an excellent summary of the geology, hydrology, and physiography of this region. The deposits in the closed basin include alluvium, detrital deposits from the mountains, and gypsum (mostly in the form of sand or gypsite). Drainage in the basin is almost entirely subterranean and water rising from deep sources along the bases of the mountains either emerges as springs or flows underground through solution channels. Collapse of the poorly consolidated gypsite and other deposits allows access to these subterranean streams through the means of shallow natural wells or *lagunas.* The surrounding mountains are formed largely of Cretaceous limestone.

Only five caves have been investigated in this region. One of these, Cueva de San Vicente, is located in the Sierra de San Vicente to the east of the basin, while the remaining four occur in Cañón del Pedregoso in the Sierra de San Marcos to the west of the basin. Cueva de San Vicente is a large single-room cave heavily mined for phosphates. The cave is very dry and the fauna of no particular interest. Of the caves in Cañón del Pedregoso, only Cueva del Pedregoso is extensive. It consists of more than 1,000 meters of large passage, but is dry except near the end of the cave. No troglobites are known among the terrestrial fauna. Of the 17 terrestrial species reported, 10 are probable troglophiles. These include species typical of the cave fauna of northern México and adjacent Texas, such as the filistatid spider *Filistatoides* n. sp., the nesticid spider *Eidmannella pallida* (Emerton), and the pholcid spiders *Physocyclus pedregosus* Gertsch and *Psilochorus russelli* Gertsch. Other apparent troglophiles include the spider beetle *Niptus abstrusus* Spilman (also known from caves in Texas and Durango) and beetles of the genus *Rhadine*.

By contrast, the aquatic fauna includes several endemic species of crustacean which are highly modified for phreatic existence. These include three species of cirolanid isopod (*Speocirolana thermydronis* Cole and Minckley, *Sphaerolana affinis* Cole and Minckley, and *Sphaerolana interstitialis* Cole and Minckley), the stenasellid isopod *Mexistenasellus coahuila* Cole and Minckley, and the hadziid amphipods *Mexiweckelia colei* Holsinger and Minckley and *Mexiweckelia particeps* Holsinger. The genus *Sphaerolana* is known only from the Sierra de la Silla south of Monterrey and from the Cuatro Ciénegas de Carranza region. *Speocirolana* is represented by several species in the Sierra Madre Oriental of Nuevo León, Tamaulipas, San Luis Potosí, and Puebla. *Mexistenasellus* is known from caves in the Sierra Madre Oriental in Tamaulipas and San Luis Potosí and in the Sierra Madre del Sur of Veracruz. *Mexiweckelia* is known also from a cave in Durango and an artesian well in Texas. These species are all presumably of marine origin. The remaining troglobite from this area is the hydrobiid snail *Coahuilix hubbsi* Taylor. This endemic species belongs to the tribe Horatiini and has its closest affinities to species from Texas and the Mediterranean region.

Rancho Descubridora, Durango.—This region is comprised of an isolated limestone range located to the northwest of Mapimí. The only cave investigated is Cueva de la Siquita (Reddell, 1977a). A vertical entrance leads down into a horizontal passage which has been mined for phosphates. At the lowest point in the cave two deep pools contain the only troglobite known from the cave, the hadziid amphipod *Mexiweckelia mitchelli* Holsinger. Of the 11 other species recorded from the cave all are typical of the arid caves of northern México. Troglophiles include pholcid spiders of the genus *Physocyclus* and the collembolan *Pseudosinella violenta* (Folsom).

Sierra Madre Oriental

The Sierra Madre Oriental is a series of folded ranges extending from the Big Bend region of Texas southeast to Monterrey; here it turns more to the south and extends to Tamazunchale where it turns more to the east to terminate in the Neovolcanic Plateau near Jalapa, Veracruz. Although some igneous rocks occur in the northern portion of the Sierra, the principal rocks are Cretaceous limestone. Jurassic gypsum occurs in valleys between some ranges, especially between Monterrey and Ciudad Valles. Russell and Raines (1967) summarize the geology of the Sierra Madre Oriental with respect to speleogenesis. Heim (1940), Humphrey (1956), and Wall et al. (1961) have discussed the geology of parts of the Sierra Madre Oriental. Of particular value is the guidebook published by the Congreso Geológico Internacional (Maldonado-Koerdell, 1956), which discusses the geology of the highway from Reynosa, Tamaulipas, to México, D. F.

Raisz (1964) has defined four subdivisions of the Sierra Madre Oriental. The Northern Section extends from the Big Bend of Texas to Monterrey. This is a structurally complex region with some volcanism in the north and with a series of folded ranges, commonly separated by wide debris-filled valleys. The High Sierra extends from Monterrey to near Jalapa. In general the High Sierra rises abruptly from the Gulf Coastal Plain to attain elevations in excess of 3,000 meters in many places. The massive Cretaceous limestone forming the Sierra Madre Oriental in this region is highly cavernous, and in many areas there has been extensive surface karst development. From Saltillo to west of Torreón a series of east-west ranges, referred to by Raisz (1964) as the Cross Ranges, terminate in the Sierra Madre Occidental. Except near Torreón these ranges have hardly been investigated for caves. The geology of this part of the Sierra Madre Oriental has been treated by de Cserna (1956). South of the Cross Ranges and west of the High Sierra is a series of mountains, referred to by Raisz (1964) as the Lower Ranges. These are separated by wide valleys, some of which contain Jurassic gypsum. The gradation into the Central Mesa is indistinct.

Except for the Yucatán Peninsula, the Sierra Madre Oriental is the part of México best known for its caves and cave biology. More than 400 caves have been biologically investigated in this province, but most of the emphasis has been placed on just a few areas, such as the Sierra de El Abra, Sierra de Guatemala, Sierra de Alvarez, and Purificación regions.

Although a few caves in the Northern Section have been well studied, many ranges remain unvisited. Very little is known of the caves and cave biology between Monterrey and the Purificación region or between Xilitla and Jalapa. The Low Ranges and the Cross Ranges remain virtually unknown.

Hermanas, Coahuila.—This is a poorly defined region located near the small town of Hermanas. Cueva de la Herradura is the only cave with studied invertebrate fauna. This small, dry bat cave is located in a small outcrop of limestone in the plains in front of the main ranges of the Sierra Madre Oriental. No troglobites are known among the 10 species reported. The fauna is typical of that of the arid parts of northern México and includes the filistatid spider *Filistatoides* n. sp., the pholcid spiders *Physocyclus hoogstraali* Gertsch and Davis and *Psilochorus* sp., the dermestid beetle *Dermestes carnivorus* Fabricius, and the tenebrionid beetles *Alphitobius laevigatus* (Fabricius) and *Cryptoglossa mexicana mexicana* Champion.

Monclova, Coahuila.—This region is located to the west of the town of Monclova. The only cave that has been studied is Bocas del Carmen, a small shelter-like cave located on the cliffs overlooking the highway to Cuatro Ciénegas de Carranza. The cave is dry and generally unproductive biologically. The only species so far identified is a camel cricket of the genus *Ceuthophilus.*

Sierra de las Animas, Coahuila.—The Sierra de las Animas is an isolated range formed of Cretaceous limestone east of Monclova. The only cave known is Cueva de las Animas at an elevation of 760 meters. It has been extensively mined for phosphates and now consists of one large dry room with a few small moist alcoves. No troglobites have been found in the cave. The troglophile fauna is typical of that of northern México and includes three troglophilic spiders: the filistatid *Filistatoides* n. sp., the pholcid *Physocyclus hoogstraali* Gertsch and Davis, and the scytodid *Loxosceles belli* Gertsch. The only other non-guano-associated troglophile known from the cave is the gryllid cricket *Paracophus subapterus* Chopard.

Sierra Arteaga, Coahuila.—The Sierra Arteaga is located east of the town of Arteaga; it comprises Cretaceous limestone of the Aurora and Cupido Formations (de Cserna, 1956). The only cave that has been studied in the region is Gruta de Cuevecillas, which is an elongated chamber subdivided by formations into smaller "rooms." The cave is moist only in the lower sections. Of the 17 species recorded from the cave none are troglobitic and several are apparent troglophiles. These include the agelenid spider *Tegenaria gertschi* Roth, the filistatid spider *Filistatinella crassipalpis* Gertsch, the pholcid spider *Metagonia coahuila* Gertsch, the collembolan *Pseudosinella reddelli* Christiansen, the psocid *Psyllipsocus ramburii* Selys-Longchamps, and the carabid beetle *Rhadine rotgeri* (Bolívar and Hendrichs). This fauna is typical of that of the northern High Sierra.

Sierra de Mayrán, Coahuila.—The Sierra de Mayrán is an east-west trending range of mountains to the south of the now-dry Laguna de Mayrán. It is formed of Cretaceous limestone of the Aurora Formation (de Cserna, 1956). Only four small caves, all at the northern base of the range at an elevation of about 1,150 meters, have been investigated. These caves are formed by the solution of gypsum beds in the limestone and are very dry. No troglobites are known, but eight species of troglophile and trogloxene have been identified. The fauna, which is typical of the arid regions of northern México, includes spiders of the genera *Filistatoides* (Filistatidae) and *Physocyclus* (Pholcidae) and tenebrionid beetles of the genera *Centrioptera, Cryptoglossa,* and *Eleodes.*

Sierra de Santa Rosa, Coahuila.—The Sierra de Santa Rosa is located east and north of Músquiz. It is a southern extension of the general uplift terminating in México in the Sierra del Carmen and Serranías del Burro. The geology of the northern part of the Sierra de Santa Rosa has been discussed by Smith (1970). Only two caves in this region have been investigated with respect to their invertebrate fauna. Cueva del León is a horizontal bat cave containing a large population of the Mexican freetail bat *Tadarida brasiliensis mexicana* (Saussure). Its invertebrate fauna includes species typical of freetail bat caves. The only troglophile known from the cave is the pholcid spider *Physocyclus enaulus* Crosby, a species abundant in northern México and the southwestern United States. The only other cave studied is the natural well Pozo de El Potrero to the east of Músquiz. It is inhabited by a spider of the pholcid genus *Metagonia* and by the troglobitic ictalurid catfish *Prietella phreatophila* Carranza, a species most closely related to blind catfish from Central Texas.

Ciudad Lerdo, Durango.—This is a poorly defined region which includes several arid mountain ranges to the south of Ciudad Lerdo. The geology of this region has been discussed by Kellum (1936). The principal cavernous deposits are Cretaceous formations of Aptian-Albian limestone. The only cave which has been examined for its invertebrate fauna is Cueva del Guano, located in the Sierra de la España. This range is near the western limit of the Cross Ranges of the Sierra Madre Oriental. Cueva del Guano is a large horizontal cave inhabited by several species of bat, including the Mexican freetail bat *Tadarida brasiliensis mexicana* (Saussure) (Reddell, 1977a). Of the 11 species known from the cave, the most interesting is the ricinuleid *Cryptocellus mitchelli* Gertsch. As in the case of *C. reddelli* Gertsch in Cueva de los Riscos near Mapimí, this is an obvious relict now isolated in Cueva del Guano by the surrounding desert; it does not show troglobitic adaptations, however. Much of the fauna is typical of that of Mexican freetail bat caves. Troglophiles include spiders of the pholcid genus *Physocyclus* and the scytodid genus *Loxosceles*, the collembolan *Pseudosinella violenta* (Folsom), the psocid *Psyllipsocus ramburii* Selys-Longchamps, and the spider beetle *Niptus abstrusus* Spilman. With the exception of the ricinuleid, the fauna is typical of that of western Texas and the arid regions of northern México.

Sierra de la India, Durango.—Sierra de la India is located to the south of Mapimí and is formed of Cretaceous limestone of the Aurora Formation (Clemons and McLeroy, 1966). One of the two caves investigated in this region, Cueva de la Cucaracha, is small and of no biological interest. The other, Cueva de los Riscos, is a large horizontal cave still not fully explored (Reddell, 1977a). The fauna of this cave is very interesting in that it contains four troglobites and 10 other identified species. Of particular interest is the presence in the cave of the highly cave-adapted ricinuleid *Cryptocellus reddelli* Gertsch. Other species of troglobite include the leptonetid spider *Leptoneta limpida* Gertsch and the pholcid spiders *Pholcophora exigua* Gertsch and *Psilochorus delicatus* Gertsch. With the exception of *L. limpida* these troglobites are typical elements of the cavernicole fauna of the Sierra Madre Oriental to the east and southeast. *Leptoneta limpida*, however, has its closest affinities with species of the same genus in Central Texas. The troglophile fauna includes pholcid spiders of the genera *Modisimus* and *Physocyclus* and the psocid *Psyllipsocus ramburii* Selys-Longchamps. The troglobite fauna presumably represents relict species now restricted to the cavernicole habitat by the surrounding desert.

Jacala, Hidalgo.—This region extends from the Río Moctezuma the north to near Zimapán on the south. It is bounded on the west by the Río Moctezuma and on the east by the Río Amajaque. The geology of this region has been discussed by Bodenlos (1956). The principal limestone unit in the area is the massive El Abra (=El Doctor) Formation. Karst development is extensive in some areas, but the region remains virtually unknown speleologically. Ten caves have been biologically investigated but only five have been studied with respect to their invertebrate fauna. The largest cave in the region is Cueva de El Tenango, a small resurgence cave about 300 meters long. The only other cave of consequence studied is Sótano del Hondo de Pinalito, a vertical cave that descends in several drops to a depth of 175 meters.

Three of the 39 species reported from the caves of this region are troglobites. The schizomid *Agastoschizomus* n. sp. is known from two caves; it is closely related to *A. huitzmolotitlensis* Rowland from the Xilitla region. The remaining two troglobites are an undescribed species of nicoletiid thysanuran and the gryllid cricket *Paracophus cladonotus* Hubbell. The latter species is also known from the Xilitla region. The troglophile fauna contains species generally known from the Xilitla and Aquismón regions. Species of interest include the crayfish *Procambarus (Ortmannicus) toltecae* Hobbs, the agelenid spider *Tegenaria rothi* Gertsch, the nesticid spiders *Gaucelmus calidus* Gertsch and *Nesticus hoffmanni* Gertsch, the pholcid spiders *Coryssocnemis iviei* Gertsch and *C. simoni* O. P.-Cambridge, the scytodid spider *Loxosceles tenango* Gertsch, the gryllid cricket *Paracophus placonotus* Hubbell, and the carabid beetle *Platynus (Mexisphodrus) gertschi* (Hendrichs and Bolívar).

Lagunilla, Hidalgo.—The only cave which has been investigated in the Lagunilla region is the famed Grutas de Xoxafí. This cave is formed in an isolated outcrop of El Abra (=El Doctor) Limestone (Segerstrom, 1962). The cave has been only partially explored but is known to be extensive. The 15 species reported from it doubtless represent a small percentage of the fauna. The only troglobite is the ptinid beetle *Niptus absconditus* Spilman. The troglophile fauna includes two endemic spiders, *Physocyclus reddelli* Gertsch and *Psilochorus fishi* Gertsch, both of which are closely related to species known from other parts of the Sierra Madre Oriental.

Tonoltongo, Hidalgo.—The Tonoltongo region consists of an isolated deposit, known as the Tonoltongo Bank, of El Abra (=El Doctor) Limestone (Segerstrom, 1962). The only cave known from the region is the Grutas de Tonoltongo, from which emerge the waters of the Río Tonoltongo. The water flowing from the cave is highly mineralized and quite warm. Only three species have been identified from the cave; these include two possible troglophilic carabid beetles of the genus *Schizogenius*.

Cañón Huasteco, Nuevo León.—Cañón Huasteco is a spectacular canyon bordered for much of its length by high, vertical cliffs. The geology of the region is discussed in Maldonado-Koerdell (1956). The principal limestone units are the Cupido, Cuesta del Cura, and Aurora Formations. Two of the caves (known collectively as Grutas de San Bartolo) are horizontal passages located at the base of a cliff at an elevation of about 900 meters. The third cave which has been biologically studied is a small, dry vertical pit at an elevation of about 740 meters.

Two troglobites are among the 23 species known from this region. *Schizomus bartolo* Rowland is closely related to species known from San Luis Potosí and Tamaulipas. An undescribed milliped of the family Trichopolydesmidae is of uncertain affinities. The troglophile fauna includes the leptonetid spider *Leptoneta pecki* Gertsch, the scytodid spider *Loxosceles luteola* Gertsch, and the pyrgodesmid milliped *Myrmecodesmus ilymoides* (Shear). Gruta Norte de San Bartolo is inhabited by a large colony of the Mexican freetail bat *Tadarida brasiliensis mexicana* (Saussure).

Cañón Santa Rosa, Nuevo León.—This ill-defined region is located west of the town of Iturbide and includes the Cañón Santa Rosa and adjacent mountains. The region is bounded on the west by the gypsum deposits of the Galeana region. The geology of this region is complex; the principal cavernous limestone is the Cupido Limestone, but the La Peña and other formations are exposed (Padilla y Sánchez, 1978). Only two caves have been visited, and the only fauna reported are aquatic species, the troglobitic cirolanid isopod *Speocirolana* n. sp. and its entocytherid ostracod associate *Sphaeromicola cirolanae* Rioja. This isopod is known only from this region.

Cerro de la Boca, Nuevo León.—This range of Cretaceous limestone is located about 20 kilometers southwest of Montemorelos. The only cave known is Cueva de Chorros de Agua at an elevation of 700 meters. It is essentially horizontal and only about 40 meters long. The fauna includes one troglobite, the leptonetid spider *Leptoneta reclusa* Gertsch. Among the 15 other species reported from the cave are ctenid spiders of the genus *Ctenus*, the pholcid spider *Metagonia placida* Gertsch, a collembolan of the genus *Pseudosinella*, the leiodid beetle *Dissochaetus aztecus* Szymczakowski, and staphylinid beetles of the genera *Belonuchus* and *Stilicolina.* All of these species are typical members of the fauna of the Sierra Madre Oriental.

Cuesta de Chipinque, Nuevo León.—Cuesta de Chipinque is located immediately to the south of Monterrey. Several small caves and sinkholes occur on the Cuesta, only two of which have received biological study. Both are formed in Cretaceous limestone at an elevation of about 1,500 meters.

Twelve species, of which one is a troglobite, have been identified from the caves of the region. The troglobitic spider *Nesticus nahuanus* Gertsch is also recorded from caves to the east and south of this region. The troglophile fauna includes species typical of the fauna of the Sierra Madre Oriental, such as the collembolan *Pseudosinella reddelli* Christiansen, the leiodid beetle *Ptomaphagus (Adelops) leo* Peck, and the rhachodesmid milliped *Ceuthauxus mediator* Chamberlin.

Galeana, Nuevo León.—The Galeana region is an extensive area of karst developed on Jurassic gypsum of the Olivido Formation. The geology has been mapped by Moor (1980). Almost all of the drainage is subterranean, with numerous sinkholes ranging in size from a few meters to more than 200 meters in diameter and up to 100 meters in depth. One of the larger caves, Resumidero de Pablillo, receives the floodwaters of an extensive area (Russell and Raines, 1967). Seven caves, ranging in elevation from 1,740 to 2,000 meters, have been studied. Since most of the caves are small and probably of comparatively recent origin, few troglobites are to be expected from the region.

The only cave-adapted species among the 23 recorded is the spider *Nesticus nahuanus* Gertsch, which is widespread in the northern High Sierra. The troglophile fauna is closely related to that of the northern Sierra Madre Oriental and includes spiders of the agelenid genus *Tegenaria* and the pholcid genera *Metagonia, Modisimus, Physocyclus,* and *Psilochorus.* Other elements of the fauna include the widespread collembolan *Pseudosinella reddelli* Christiansen and the endemic leiodid beetle *Ptomaphagus (Adelops) gypsum* Peck.

Pico de Carrizal, Nuevo León.—Pico de Carrizal is the eroded core of a Tertiary igneous intrusion which rises more than 1,500 meters above the surrounding plain. A ring of much lower hills is developed on lower Cretaceous limestone (Russell and Raines, 1967). The only cave known in this area is Gruta de Carrizal, a largely horizontal cave which has served as a collecting point for water falling on the mountain; an active stream emerges from the cave entrance.

Three of the 25 species recorded from the cave are troglobites: the pseudoscorpion *Leucohya magnifica* Muchmore, an undescribed species of the schizomid genus *Schizomus,* and the opilionid *Hoplobunus osorioi* (Goodnight and Goodnight). The genus *Leucohya* is known only by this and a second species from Grutas del Palmito to the south. *Hoplobunus osorioi* is known from this cave, Grutas del Palmito, and Grutas de Villa de García; the presence of small eyes and its occurrence in three isolated mountain ranges indicate it is a recent troglobite. The undescribed species of *Schizomus* is closely related to species occurring in the Sierra Madre Oriental to the south. The troglophile fauna also has its closest affinities to the fauna of the Sierra Madre Oriental to the south and includes the endemic pholcid spider *Metagonia candela* Gertsch, the phalangodid harvestman *Pellobunus mexicanus* Goodnight and Goodnight, and the gryllid cricket *Paracophus subapterus* Chopard.

Potrero Redondo, Nuevo León.—This ill-defined region occurs to the west and southwest of Villa de Santiago. The two caves which have been studied are formed in Cretaceous limestone. Sótano de la Anticlina is a large single-room pit, while Sótano de Potrero Redondo is a vertical cave with some horizontal development at the bottom.

The only troglobite among the six species recorded from the region is the nesticid spider *Nesticus nahuanus* Gertsch, which is also known from caves to the north. The troglophile fauna includes the endemic octochaetid earthworm *Trigaster albida* Gates and millipeds of the rhachodesmid genus *Strongylodesmus* and sphaeriodesmid genus *Sphaeriodesmus.*

Sierra del Fraile, Nuevo León.—The Sierra del Fraile is formed almost entirely of vertical-bedded Cupido Limestone of lower Cretaceous age (Russell and Raines, 1967). The only cave which has been studied is the spectacular commercial cave, Grutas de Villa de García. It has been much modified by commercialization, and recent attempts at collection have been largely unproductive. It is located at an elevation of 1,060 meters. A second cave, Cueva del Rincón de la Virgen, houses a large colony of Mexican freetail bats, *Tadarida brasiliensis mexicana* (Saussure), but has not been studied for its invertebrate fauna.

Of the 13 species of invertebrate known from Grutas de Villa de García, six are troglobites: the leptonetid spider *Leptoneta isolata* Gertsch, the opilionid *Hoplobunus osorioi* (Goodnight and Goodnight), an undetermined rhagidiid mite, the lithobiid centipede *Garcibius osorioi* Chamberlin, and the campodeid diplurans *Parallocampa (Parallocampa) cavernicola* Wygodzinsky and *Paratachycampa boneti* Wygodzinsky. Of these species, *L. isolata* is clearly most closely related to species known from the Sierra Madre Oriental to the south. *Hoplobunus osorioi* occurs also in Grutas del Palmito and Gruta del Carrizal to the north. The other species are of uncertain affinities. The troglophile fauna includes the pholcid spiders *Metagonia serena* Gertsch, *Modisimus pusillus* Gertsch, and *Physocyclus hoogstraali* Gertsch and Davis; the scytodid spider *Loxosceles bolivari* Gertsch; and the carabid beetle *Platynus pelaezi* (Bolívar and Hendrichs).

Sierra de Garia, Nuevo León.—This range is located in western Nuevo León near the town of Espinazo. The only cave which has been investigated is Cueva de Constantín, a single-room cave which is heavily decorated with speleothems. The fauna recorded from the cave includes undetermined reduviid hemipterans and crane flies.

Sierra de Gomas, Nuevo León.—The Sierra de Gomas is a north-south range located south of the town of Bustamante. It is composed to a large extent of the massive Cupido Limestone of Cretaceous age (Fuentes, 1964; Russell and Raines, 1967). Although collections have been made in four caves in the area, the only cave which has been well studied is Grutas del Palmito. This cave, now commercialized, is among the larger and more beautiful in México. The small entrance is located about 500 meters above the floor of the plain. From the large entrance chamber a steep breakdown-floored slope descends into a chamber about 100 meters wide, 600 meters long, and up to 30 meters high. Total depth of the cave is about 220 meters, making it one of the deeper caves in northern México.

The fauna of the cave is very rich, with 10 troglobites being represented. The troglobite fauna, with one possible exception, is closely related to the fauna of the Sierra Madre Oriental. Troglobites include the trichoniscid isopods *Brackenridgia palmitensis* (Mulaik) and *Cylindroniscus cavicolus* (Mulaik); the hyid pseudoscorpion *Leucohya heteropoda* Chamberlin; the opilionid *Hoplobunus osorioi* (Goodnight and Goodnight); the rhachodesmid milliped *Ceuthauxus palmitonus* Chamberlin; the trichopolydesmid milliped *Speodesmus* sp.; the collembolans *Oncopodura prietoi* Bonet and *Pararrhopalites anops* Bonet and Tellez; and the trechine beetle *Mexaphaenops prietoi* Bolívar. This is the northern limit of the range for the genera *Cylindroniscus, Ceuthauxus, Pararrhopalites,* and *Mexaphaenops. Hoplobunus* reaches its northern limit in Texas, where it is represented only by two relict troglobites. *Brackenridgia* and *Oncopodura* range from southern México well into the United States. *Speodesmus* is apparently a relict of a more northern distribution. It is well represented in the caves of Texas and New Mexico, but only *S. pecki* Shear in the Sierra de El Abra occurs south of Grutas del Palmito.

The troglophile fauna includes widespread species, such as the nesticid spider *Gaucelmus augustinus* Keyserling which ranges from the United States into southern México. A few species are typical of the cave fauna of the Sierra Madre Oriental, such as the mysmenid spider *Maymena chica* Gertsch; the pholcid spider *Metagonia candela* Gertsch; the opilionid *Pellobunus mexicanus* Goodnight and Goodnight; the scolopendrid centipede *Newportia pelaezi* Chamberlin; the collembolan *Acherontiella sabina* Bonet; and the gryllid cricket *Paracophus subapterus* Chopard. Two species are temperate in their affinities: the carabid beetle *Rhadine araizai araizai* (Bolívar) and the leiodid beetle *Ptomaphagus (Adelops) cavernicola cavernicola* Schwarz.

Sierra de Iguana, Nuevo León.—The Sierra de Iguana is a north-south trending range formed of Cretaceous limestone and located north of the highway from Sabinas Hidalgo to Villaldama. The only cave that has been investigated in this area is Cueva del Diablo, a dry horizontal cave inhabited by the bat *Mormoops megalophylla megalophylla* Peters. The only troglophile known is the pholcid spider *Physocyclus hoogstraali* Gertsch and Davis.

Sierra de Santa Clara, Nuevo León.—The Sierra de Santa Clara is a range of Cretaceous limestone located south of the Sierra de Iguana (Fuentes, 1964). Only one cave is known, Cueva de las Fisuras; this is a series of dry, fissure-like passages in the northern cliffs. The only species identified from the cave is an undescribed genus and species of rhaphidophorid cricket.

Sierra de la Silla, Nuevo León.—The Sierra de la Silla is a mountain range located south-southwest of Monterrey. The only cave which has been studied in this region is Cueva de la Boca, at an elevation of 540 meters. It is a large horizontal passage developed in the Cupido Limestone and is now being mined for phosphates (Russell and Raines, 1967). A small mine adit, now partially flooded, located about 40 meters below Cueva de la Boca has also been studied.

The mine adit was found to contain two species of troglobitic isopods, the cirolanid *Sphaerolana affinis* Cole and Minckley and an undescribed species of the stenasellid genus *Mexistenasellus.* The former species is also known from springs and natural wells at Cuatro Ciénegas de Carranza, Coahuila. The genus *Mexistenasellus,* also known from Cuatro Ciénegas de Carranza, ranges into Veracruz. Two of the 32 terrestrial species recorded from Cueva de la Boca are troglobites: the nesticid spider *Nesticus nahuanus* Gertsch and the lithobiid centipede *Nuevobius cavicolens* Chamberlin. *Nesticus nahuanus* is also known from other nearby parts of Nuevo León. The centipede is of particular interest in that the only other species in the genus occurs in a cave in Tennessee in the United States.

The troglophile fauna includes principally elements typical of the Sierra Madre Oriental. Of note are the pholcid spiders *Metagonia placida* Gertsch and *Modisimus rainesi* Gertsch; the collembolans *Pseudosinella* sp. and *Acherontiella sabina* Bonet; the carabid beetle *Platynus boneti* (Bolívar and Hendrichs); and the staphylinid beetle *Stilicolina* n. sp. The leiodid beetle *Ptomaphagus (Adelops) cavernicola aditus* Peck is an endemic subspecies belonging to a species ranging from the United States into Nuevo León. The remaining fauna is closely associated with the guano of Mexican freetail bats, *Tadarida brasiliensis mexicana* (Saussure), a large colony of which inhabits the cave.

Sierra El Tarillal, Nuevo León.—The Sierra El Tarillal is a range of Cretaceous limestone mountains located about 20 kilometers east of Arteaga. The geology of this region has been discussed by de Cserna (1956). The only cave which has been investigated is Cueva de las Vigas at an elevation of 2,300 meters. This 100-meter-long cave has been much modified by mining activities. The fauna is typical of that of the northern Sierra Madre Oriental and includes five species of troglophile: the agelenid spiders *Cicurina* sp. and *Tegenaria ?gertschi* Roth, the pholcid spiders *Coryssocnemis simoni* O. P.-Cambridge and *Metagonia coahuila* Gertsch, and undetermined staphylinid beetles.

Zaragoza, Nuevo León.—This is an area of Jurassic gypsum deposits located along the western slopes of the Sierra Madre Oriental near the town of Zaragoza. Three species, two of which are troglophiles, are known from the three small caves which have been visited. The troglophiles are ptilodactylid beetles of the genus *Ptilodactyla* and staphylinid beetles of the genus *Belonuchus.*

Purificación, Nuevo León and Tamaulipas.—This major karst region is located west of the town of El Barretal. Caves are known from massive Cretaceous limestone of the Tamaulipas Formation at elevations from 1,100 to 2,200 meters. Much of the drainage is subterranean with several caves receiving considerable floodwater. Surface karst features include sinkholes, dolinas, pinnacles, and karren. Many of the caves are small single-room pits, but others are quite extensive. The two largest caves in the region are Sótano de las Calenturas and Sistema Purificación. The first receives the floodwater of a large arroyo and contains large amounts of organic debris and a small active stream. Sistema Purificación is a complex, multi-level cave with several active streams. The cave is the longest in México; more than 35 kilometers have been surveyed to date. It has a vertical range of almost 900 meters, the highest entrance being at 1,980 meters and the lowest at 1,100 meters. Pate (1979) and Treacy (1979) have described several of the caves in the region.

About 100 species, of which 19 are troglobites, have been identified from the 33 caves which have been studied but much of the material remains undetermined or undescribed. The aquatic fauna includes three undescribed species of isopod: a cirolanid belonging to the genus *Speocirolana*, an asellid of the genus *Caecidotea*, and a stenasellid of the genus *Mexistenasellus.* The terrestrial troglobite fauna includes an undescribed genus and species of chactid scorpion; a second species of this genus is known from the San Nicolás de los Montes region. Three undescribed species of pseudoscorpion have been found; these belong to the genera *Aphrastochchonius, Typhloroncus,* and *Paravachonium.* The troglobitic spider fauna includes a tarantula of the genus *Schizopelma* and the leptonetid *Leptoneta isolata* Gertsch. The latter species is also known from Grutas de Villa de García, Nuevo León. Other troglobites, all undescribed endemics, include an opilionid of the genus *Hoplobunus*, a scolopendrid centipede of the genus *Newportia*, several as yet undetermined millipeds, and three species of carabid beetle of the genus *Mexaphaenops.* The highly cave-adapted leiodid beetle, *Ptomaphagus (Adelops) mckenziei* Peck, is known only from caves in this region.

The troglophile fauna includes undescribed spiders of the genera *Euagrus, Cicurina, Tegenaria, Nesticus,* and *Ctenus.* The spiders *Eidmannella pallida* (Emerton), *Coryssocnemis abernathyi* Gertsch, *Modisimus rainesi* Gertsch, and *M. reddelli* Gertsch are abundant in the caves of the region. The troglophile milliped fauna, though not well studied, includes species of the genera *Cleidogona, Myrmecodesmus, Strongylodesmus,* and *Sphaeriodesmus.* Other troglophiles of interest include the collembolans *Pseudosinella reddelli* Christiansen and *Pseudosinella* sp., the carabid beetle *Platynus (Mexisphodrus)* n. sp., and the leiodid beetle *Dissochaetus aztecus* Szymczakowski. Both the troglobite and troglophile fauna is typical of that of the Sierra Madre Oriental.

Cuetzalan, Puebla.—This is one of the major karst regions in México but remains poorly known. The region is bounded on the south by the Río Apulco and on the north by the Río Tecuantepec. It extends from near Cuetzalan on the east to Zapotitlán on the west. Elevations range from about 250 meters to more than 2,000 meters. Drainage is almost entirely subterranean with floodwaters entering many caves; active streams running from the higher elevations frequently enter sumidero-type cave entrances. Springs are numerous along the banks of the Río Tecuantepec. Caves tend generally to be large trunk channels containing active streams (Davis, 1974; Reddell, 1974; Sprouse, 1979). Several caves are long, with one surveyed for more than 10 kilometers.

The fauna of the area is not yet well known systematically, and the 87 species determined from the 20 investigated caves are only a small percentage of those which will eventually be known. The only aquatic troglobite from the region is the widespread cirolanid isopod *Speocirolana pelaezi* (Bolívar). The only terrestrial troglobite thus far described is the endemic spirobolellid milliped *Reddellobus troglobius* Causey. Other troglobites include an ideoroncid pseudoscorpion, a schizomid of the genus *Schizomus*, an amblypygid of the genus *Paraphrynus*, a tarantula of the genus *Schizopelma*, a leptonetid spider of the genus *Leptoneta*, a pholcid spider of the genus *Metagonia*, a glomerid milliped of the genus *Glomeroides*, an undescribed genus and species of the milliped family Trichopolydesmidae, and a collembolan of the genus *Acherontides.*

The streams in the caves of this region support an abundance of troglophilic crayfish, including *Procambarus (Paracambarus) ortmanni* (Villalobos), *P. (Villalobosus)* n. sp., and *P. (V.) xochitlanae* Hobbs. Terrestrial troglophiles of interest include a vaejovid scorpion of the genus *Vaejovis*, a species of the amblypygid genus *Paraphrynus*, an agelenid spider of the genus *Tegenaria*, a ctenid spider of the genus *Ctenus*, a mysmenid spider of the genus *Maymena*, the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch, pholcid spiders of the genera *Coryssocnemis* and *Pholcophora*, the uloborid spider *Philoponella signatella* (Roewer), a cleidogonid milliped of the genus *Cleidogona*, a pyrgodesmid milliped of the genus *Myrmecodesmus*, a rhachodesmid milliped of the genus *Strongylodesmus*, a sphaeriodesmid milliped of the genus *Sphaeriodesmus*, a collembolan of the genus *Pseudosinella*, the psocid *Psyllipsocus ramburii* Selys-Longchamps, cixiid homopterans, an undescribed species of carabid beetle of the genus *Platynus (Mexisphodrus)*, and staphylinid beetles of the genera *Belonuchus* and *Homaeotarsus.* The fauna of the region appears to be typical of that of the Sierra Madre Oriental.

Xicotepec, Puebla.—This region is located near the town of Xicotepec; it is poorly known and defined. Biological records are available for four caves in this area, but only two have been visited by AMCS members. The latter caves are small horizontal passages in a cliff face. No troglobites are known from this region, and of the 11 species recorded only three are probable troglophiles: the armadillid isopod *Venezillo llamasi* Rioja, the nesticid spider *Eidmannella pallida* (Emerton), and the psocid *Psyllipsocus ramburii* Selys-Longchamps.

Ahuacatlán, Querétaro.—This region is located in one of the western ranges of the Sierra Madre Oriental just west of the town of Jalpan. All of the caves known from the region are formed in the El Abra (=El Doctor) Limestone. The geology of the region has been discussed by Segerstrom (1961) and Smith (1972). Karst development is represented by large dolinas, sinkholes, and lapiez. The Río Jalpan has been captured by a large cave and now runs through a natural tunnel (known as Puente de Dios) for 1.5 kilometers. Most of the caves are vertical pits, with the Sotanito de Ahuacatlán attaining a depth of 320 meters.

This region has been little studied biologically; only nine caves have received attention. The only troglobite among the 17 species identified is the cixiid homopteran *Cixius orcus* Fennah. The troglophile fauna includes the diplurid spider *Euagrus luteus* Gertsch, a ctenid spider of the genus *Ctenus*, a pholcid spider of the genus *Modisimus*, a scytodid spider of the genus *Loxosceles*, a rhachodesmid milliped of the genus *Strongylodesmus*, campodeid diplurans, the gryllid cricket *Paracophus placonotus* Hubbell, the carabid beetle *Platynus acuminatus* (Chevrolat), and a leiodid beetle of the genus *Ptomaphagus (Adelops)*. All of these species are typical of the cave fauna of the Sierra Madre Oriental to the east.

Laguna Colorado, Querétaro.—This region is the western extension of the karst region of Xilitla, San Luis Potosí. All of the caves investigated are formed in the El Abra (=El Doctor) Limestone. Karst development is not as great as near Xilitla, but large shallow dolinas and numerous sinkholes occur. Bonet (1953a) has discussed the regional geology and physiography and includes a map of the largest cave in the region, Cueva del Madroño. The elevation of this cave is 1,810 meters. The remaining four caves studied are small.

The only two troglobites thus far recorded are the opilionid *Hoplobunus queretarius* Silhavý and the rhachodesmid milliped *Unculabes arganoi* Shear. Both are closely related to other species in the Sierra Madre Oriental. Although 29 other species have been recorded from the region, many are mites identified only to family. The determined troglophile fauna includes such typical elements of this general area as the leptonetid spider *Leptoneta* sp., the pholcid spider *Metagonia maximiliani* Brignoli, the cleidogonid milliped *Cleidogona* sp., the rhachodesmid milliped *Strongylodesmus* sp., the collembolan *Lepidocyrtus* sp., the gryllid cricket *Paracophus placonotus* Hubbell, the carabid beetle *Platynus (Mexisphodrus)* sp., and the leiodid beetle *Ptomaphagus (Adelops) leo* Peck.

Pinal de Amoles, Querétaro.—This region is located immediately west of the Ahuacatlán region and consists of an extensive area of Cretaceous limestone of the El Abra (=El Doctor) Formation. A geological map of the region is included in Segerstrom (1961). Karst development includes many large dolinas, sinkholes, and lapiez. Most of the caves investigated have been rather small, but Sótano del Buque is 1,149 meters long and attains a depth of 506 meters (Jefferys, 1979) Although 21 caves have been studied, the region remains largely unknown.

A total of 46 species have been identified from the caves of the region. Of these, six are troglobites: the agelenid spider *Tegenaria caverna* Gertsch, the leptonetid spider *Leptoneta delicata* Gertsch, the trichopetalid milliped *Mexiterpes metallicus* Shear, the rhachodesmid milliped *Strongylodesmus* sp., and the carabid beetles *Mexaphaenops elegans* Barr and *Paratrechus (Hygroduvalius) pallescens* Barr. All of these species are most closely related to species known from other parts of the Sierra Madre Oriental. Troglophiles of interest include the diplurid spider *Euagrus luteus* Gertsch; an agelenid spider of the genus *Tegenaria;* a ctenid spider of the genus *Ctenus;* the nesticid spiders *Eidmannella pallida* (Emerton), *Gaucelmus augustinus* Keyserling, and *Nesticus vasquezae* Gertsch; the pholcid spiders *Coryssocnemis iviei* Gertsch, *C. simoni* O. P.-Cambridge, and *Physocyclus reddelli* Gertsch; the scytodid spider *Loxosceles aranea* Gertsch; the phalangodid harvestman *Pellobunus mexicanus* Goodnight and Goodnight; the cleidogonid millipeds *Cleidogona mayapec* Shear and *C. totonaca* Shear; a rhachodesmid milliped of the genus *Strongylodesmus;* the gryllid cricket *Paracophus placonotus* Hubbell; the carabid beetles *Platynus tlamayaensis* (Barr) and *P. (Mexisphodrus)* sp.; and staphylinid beetles of the genera *Belonuchus* and *Philonthus*.

San Joaquín, Querétaro.—This region is located south of the Pinal de Amoles region. The geology has been studied by Wilson et al. (1955). All of the caves known are formed in the El Abra (=El Doctor) Limestone. Karst development includes dolinas, sinkholes, and lapiez. Much of the drainage is internal. The elevation is about 2,400 meters.

This region remains essentially unstudied; only three caves have been investigated. Of the three species which have been identified, two spiders are troglophiles: the pholcid *Coryssocnemis simoni* O. P.-Cambridge and an undescribed species of nesticid of the genus *Nesticus*.

San Juan, Querétaro.—Only seven caves have been biologically examined in this region, which is located north of the Ahuacatlán region. Stone and Jameson (1977) have published a comprehensive report on the region, including descriptions of all caves and a general study of the geology. All of the caves known are formed in Cretaceous limestone of the El Abra Formation. The large caves are characterized by considerable vertical development with two (Hoya de las Conchas and Sótano de Nogal) being more than 500 meters deep. Elevations range from 1,000 to 1,500 meters, with most of the caves occurring at about 1,400 meters. Drainage is almost entirely internal and many of the caves receive considerable runoff.

Of the 18 species determined from the caves of the region, the only troglobite is an unidentified isopod of the family Trichoniscidae. The remainder of the fauna is typical of the Sierra Madre Oriental and includes the nesticid spider *Eidmannella pallida* (Emerton), the opilionid *Hoplobunus* sp., the centipede *Newportia* n. sp., the collembolan *Pseudosinella reddelli* Christiansen, and the gryllid cricket *Paracophus* sp.

Tancoyol, Querétaro.—This region is located immediately west of the Xilitla Plateau. Little is known about the region, but karst development includes large dolinas and sinkholes. The largest cave in the region is the largely vertical El Socavón, which attains a depth of about 200 meters.

Only five species have been reported from the three caves that have been biologically investigated. The only troglobite is the opilionid *Hoplobunus queretarius* Silhavý, also known from the Laguna Colorado region to the south. Troglophiles include an agelenid spider of the genus *Tegenaria*, a ctenid spider of the genus *Ctenus*, and a pholcid spider of the genus *Physocyclus*.

Xilitla Plateau, Querétaro and San Luis Potosí.—This region includes an area of high elevation karst lying north of Xilitla and including parts of the states of Querétaro and San Luis Potosí. No collections have yet been made in the San Luis Potosí part of the region. Fish (1978; 1979) has discussed the geology, physiography, and caves of the region. The caves are formed in the Cretaceous El Abra Limestone, and there is extensive karst development, with dolinas, sinkholes, pinnacles, and lapiez present. Elevations range from about 1,500 to 2,900 meters. Although a few deep caves occur, such as the 559-meter-deep Sótano de Trinidad, the three caves which have been biologically investigated are relatively horizontal.

Much of the fauna from this region awaits study, but 19 species, of which four are troglobites, have been identified. The troglobites include trichoniscid isopods, the diplurid spider *Euagrus* n. sp., the opilionid *Hoplobunus* sp., and the rhachodesmid milliped *Unculabes crispus* Causey. The last species is also known from the Xilitla region to the south, and the others have their closest affinities with that region. The troglophile fauna includes flatworms of the genus *Dugesia;* the agelenid spider *Tegenaria selva* Roth; the nesticid spiders *Eidmannella pallida* (Emerton), *Gaucelmus augustinus* Keyserling, and two undescribed species of the genus *Nesticus;* the opilionid *Karos depressus* Goodnight and Goodnight; and the carabid beetle *Platynus (Mexisphodrus)* sp.

Aquismón, San Luis Potosí.—This region is located west of the town of Aquismón and extends from the Xilitla Plateau north for about 20 kilometers; it is bounded on the west by the Río Santa María. Elevations range from about 400 to 1,000 meters. Karst development in the region is spectacular in places, with large deep dolinas, huge sinkholes, karren, and haystack hills. Most of the drainage is subterranean and several caves receive considerable floodwater. Caves range from small pits and shallow horizontal passages to enormous vertical shafts such as Hoya de las Guaguas and Sótano de las Golondrinas. The principal limestone unit in the region is the El Abra (=El Doctor) Formation. Raines (1968) includes a discussion of the geology and physiography.

A total of 57 species, of which 10 are troglobites, has been reported from the 15 caves studied. The only aquatic troglobites are the cirolanid isopods *Speocirolana bolivari* (Rioja) and *S. pelaezi* (Bolívar). Terrestrial troglobites, all of which are typical elements of this general area, include the trichoniscid isopod *Mexiconiscus laevis* (Rioja); the amblypygid *Paraphrynus velmae* Mullinex; the opilionid *Hoplobunus planus* Goodnight and Goodnight; the glomerid milliped *Glomeroides* sp.; the trichopetalid milliped *Mexiterpes fishi* (Causey); the rhachodesmid milliped *Unculabes crispus* Causey; the cambalid milliped *Mexicambala russelli* Causey; and the gryllid cricket *Paracophus cladonotus* Hubbell. Except for *H. planus* and *M. fishi* all of these species are also known from the Xilitla region.

The troglophile fauna includes flatworms of the genus *Dugesia;* the crayfish *Procambarus (Ortmannicus) toltecae* Hobbs; the spiders *Ctenus mitchelli* Gertsch, *Gaucelmus* sp., and *Metagonia* sp.; the rhachodesmid millipeds *Strongylodesmus* sp. and *Unculabes columbinus* Causey; the collembolan *Pseudosinella* sp.; the gryllid cricket *Paracophus placonotus* Hubbell; carabid beetles of the genera *Ardistomis* and *Tachys;* and the leiodid beetles *Dissochaetus* sp. and *Proptomaphaginus microps* Peck.

Cerro de la Cochina, San Luis Potosí.—This is a small limestone range located west of Matehuala. The only cave studied is Cueva del Cochino, a dry horizontal cave located at an elevation of 1,560 meters. No troglobites are known from the region and the only apparent troglophile is the psocid *Psyllipsocus ramburii* Selys-Longchamps.

La Libertad, San Luis Potosí.—This is an area of desert located west of Ciudad del Maíz at an elevation of about 1,000 meters. The four caves investigated are all shallow, dry sinkholes formed in Jurassic gypsum. No troglobites are known from this region and only 12 species have been identified. Of these, four are presumed troglophiles: the diplurid spider *Euagrus* sp., the pholcid spider *Physocyclus reddelli* Gertsch, the carabid beetle *Agonum* sp., and the staphylinid beetle *Stilicolina* n. sp. The fauna is typical of that of the drier areas of northern México.

Matehuala, San Luis Potosí.—This region consists of an area of karst developed on Jurassic gypsum. Most of the drainage is internal, with runoff entering through shallow gypsum sinks. The two caves investigated in the region, Sumidero de Matehuala at an elevation of 1,500 meters and Sumidero 552 at an elevation of 1,330 meters, are both small.

Eight species have been determined from this region, none of which is troglobitic. The troglophile fauna includes the pholcid spider *Physocyclus merus* Gertsch, carabid beetles of the genus *Rhadine*, and ptilodactylid beetles of the genus *Ptilodactyla*. The fauna resembles that of other arid regions to the west of the Sierra Madre Oriental.

Micos, San Luis Potosí.—This region is located near the town of Micos in a series of north-south trending ranges. The seven caves that have been visited are located at the base of the range at an elevation of about 250 meters. Several of these caves receive floodwater. Mitchell et al. (1977) discuss the general geology and physiography of the region and include descriptions of some of the caves.

The 30 species known from this region include six aquatic troglobites: the entocytherid ostracod *Sphaeromicola coahuiltecae* Hobbs and Hobbs, the cirolanid isopod *Mexilana saluposi* Bowman, the stenasellid isopods *Mexistenasellus parzefalli* Magniez and *M. wilkensi* Magniez, the anthurid isopod *Cyathura* n. sp., and the blind characin *Astyanax jordani* (Hubbs and Innes). The aquatic fauna is quite different from that of other parts of the general region. With the exception of *A. jordani* all of these species are endemic to this region. Terrestrial troglophiles, on the other hand, are typical of the Sierra Madre Oriental. Included are ctenid spiders of the genus *Ctenus*, the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus augustinus* Keyserling, the scytodid spider *Loxosceles valdosa* Gertsch, the opilionid *Karos parvus* Goodnight and Goodnight, the pyrgodesmid milliped *Myrmecodesmus monasticus* (Causey), the gryllid cricket *Paracophus placonotus* Hubbell, alleculid beetles of the genus *Lystronychus*, and staphylinid beetles of the genus *Homaeotarsus*.

Piedra Paloma, San Luis Potosí.—This is a limited area of gypsum karst located east of Ciudad del Maíz. The most notable cave known from the region is Sumidero de Piedra Paloma, a largely vertical cave into which much floodwater runs. The only troglophile known from the region is the theridiid spider *Achaearanea porteri* Banks.

Puente de Dios, San Luis Potosí.—This is a poorly defined region located southwest of Ciudad Valles. The Puente de Dios is a cave passage through which the Río Santa María runs for a short distance. The only cave investigated in the region is a small one located along the banks of the river.

No troglobites are known from this region; troglophiles include the pholcid spiders *Modisimus boneti* Gertsch and *Physocyclus* sp., the scytodid spider *Loxosceles* sp., the rhachodesmid milliped *Strongylodesmus* sp., the gryllid cricket *Paracophus placonotus* Hubbell, and the leiodid beetle *Ptomaphagus (Adelops) elabra* Peck.

Rayón, San Luis Potosí.—This ill-defined region is located near the town of Rayón on the highway from Ciudad Valles to San Luis Potosí. The only cave that has been studied is a small horizontal resurgence known as Cueva del Agua.

Ten species, none troglobitic, have been identified from the cave. These include several troglophiles, all typical of the Sierra Madre Oriental. The crayfish *Procambarus (Ortmannicus) villalobosi* Hobbs is known only from here and from one cave in the San Nicolás de los Montes region. Terrestrial troglophiles include spiders of the genera *Ctenus* and *Maymena*, the gryllid cricket *Paracophus placonotus* Hubbell, the leiodid beetles *Dissochaetus aztecus* Szymczakowski and *D. hetschkoi* Reitter, and staphylinid beetles of the genus *Belonuchus*.

San Nicolás de los Montes, San Luis Potosí.—This region is located northwest of Ciudad Valles near the town of San Nicolás de los Montes. Elevations range from about 600 to 1,700 meters, with most of the known caves lying at about 900 meters. Although a few arroyos drain part of the region, most drainage is internal. The water level is generally shallow and several small lakes occur, the most notable of which is Laguna Grande. Karst development is characterized by numerous small sinkholes and shallow depressions. All of the 16 caves studied are small pits or shallow horizontal caves; many contain water.

The aquatic fauna includes three troglobites: the entocytherid ostracod *Sphaeromicola cirolanae* Rioja and the cirolanid isopods *Speocirolana* n. sp. and *S. pelaezi* (Bolívar). The only terrestrial troglobite is an undescribed genus and species of chactid scorpion; a second species of the same genus is known from the Purificación region to the north. The troglophile fauna is typical of the general region and includes the crayfish *Procambarus (Ortmannicus) villalobosi* Hobbs, the amblypygid *Paraphrynus pococki* Mullinex, the ctenid spider *Ctenus mitchelli* Gertsch, the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus augustinus* Keyserling, the opilionids *Karos gratiosus* Goodnight and Goodnight and *K. projectus* Goodnight and Goodnight, and the gryllid cricket *Paracophus placonotus* Hubbell.

Sierra de Alvarez, San Luis Potosí.—This is one of the westernmost ranges of the Sierra Madre Oriental and is located east of the city of San Luis Potosí. Karst development is considerable, with most drainage being subterranean. Karst forms include dolinas, sinking streams, lapiez, and pinnacles. The greatest development is in an area known as Valle de los Fantasmas, where numerous pinnacles give an eerie appearance during times of fog. The caves are formed in the El Abra (=El Doctor) Limestone. Cserna and Bello-Barradas (1963) have studied the regional geology. Brief descriptions of the caves and a checklist of the fauna are in Elliott and Reddell (1973). There have been 26 caves investigated biologically; these range in elevation from 2,100 to 2,350 meters.

This is one of the better-known regions in México with respect to its invertebrate cave fauna, with 95 species having been identified. Of these, only two are troglobites: the trichopetalid milliped *Mexiterpes egeo* (Causey) and the trechine beetle *Mexaphaenops fishi* Barr. Both belong to genera known from other parts of the Sierra Madre Oriental. The rarity of troglobites in this high altitude region is surprising, but may be a reflection of greater aridity and less diverse flora. The troglophile fauna is also typical of the Sierra Madre Oriental. It includes the tarantula *Schizopelma elliotti* Gertsch; the agelenid spider *Tegenaria selva* Roth; the mysmenid spider *Maymena chica* Gertsch; the nesticid spider *Eidmannella pallida* (Emerton); the pholcid spiders *Coryssocnemis abernathyi* Gertsch, *Metagonia punctata* Gertsch, and *Psilochorus concinnus* Gertsch; the opilionids *Cynorta jamesoni* Goodnight and Goodnight and *Karos parvus* Goodnight and Goodnight; millipeds of the genera *Myrmecodesmus, Strongylodesmus,* and *Tiphallus;* the collembolan *Pseudosinella reddelli* Christiansen; and carabid beetles of the genera *Bembidion, Platynus,* and *Platynus (Mexisphodrus).*

Sierra El Pino, San Luis Potosí.—This region is a mountain range east of Ciudad del Maíz with elevations from about 1,100 to 1,900 meters. The region remains poorly known, and only six caves have been visited. Large sinkholes are known on top of the range but are unvisited. Water falling on the western side of the range drains into a closed lake or into caves located in a wide, shallow arroyo. Two of these caves and a few on the slopes of the mountain have been studied.

The fauna of the region includes two aquatic and three terrestrial troglobites: the entocytherid ostracod *Sphaeromicola cirolanae* Rioja, the cirolanid isopod *Speocirolana pelaezi* (Bolívar), a trichopolydesmid milliped, the collembolan *Pseudosinella petrustrinatii* Christiansen, and the gryllid cricket *Paracophus lippus* Hubbell. All are typical representatives of the fauna of the Sierra Madre Oriental. The troglophile fauna includes the ctenid spider *Ctenus mitchelli* Gertsch, the gryllid cricket *Paracophus* n. sp., the scydmaenid beetle *Euconnus (Napochus)* sp., the scarabaeid beetle *Onthophagus cuevensis* Howden, and staphylinid beetles of the genus *Belonuchus.*

Xilitla, San Luis Potosí.—The Xilitla region is one of the great karst regions in North America. Massive reef deposits of Cretaceous El Abra (=El Doctor) Limestone are highly cavernous, and numerous major caves and pits exist in the region. As considered in this report, the region extends west from the eastern face of the Sierra Madre Oriental to near the San Luis Potosí-Querétaro border just past the town of Ahuacatlán. It is bordered on the north by the high Xilitla Plateau, on the west by the Laguna Colorado region, and on the south by the Río Moctezuma. Elevations range from about 100 to about 1,200 meters. Much of the drainage is subterranean, with water emerging from large springs, some vauclusian in nature, along the east face of the range. Karst development is frequently intense with large dolinas, sinkholes, lapiez, and pinnacles present. Although several large caves exist, drainage does not appear to be as highly integrated as in the Purificación region, and no systems to rival that of the Sistema Purificación are likely. In addition to numerous vertical shafts, some more than 100 meters in depth, large chambers and vertical cave systems exist. Among the more important caves are Sótano de Huitzmolotitla with more than three kilometers of passage and Sótano de Tlamaya with a vertical depth of about 400 meters. Carrasco (1970) has discussed the stratigraphy of the general area and concluded that the name El Abra should be applied to the limestone of the area. Bonet (1953a) has discussed the geology and physiography, and includes maps and descriptions of many of the caves. Russell and Raines (1967) add information on geology and describe additional caves.

The cave fauna of this region is rich and, compared to many other parts of México, well known. Collections have been made in 31 caves and 163 species have been identified, of which 18 are troglobites. The fauna, both troglobitic and troglophilic, is typical of that of the Sierra Madre Oriental. The only aquatic troglobite known from the region is the endemic acanthodrilid earthworm *Eodrilus mexicanus* Gates. The terrestrial troglobite fauna includes nine endemic species: the squamiferid isopod *Trichorhina boneti* Rioja, the chthoniid pseudoscorpion *Tyrannochthonius pallidus* Muchmore, the protoschizomid *Agastoschizomus huitzmolotitlensis* Rowland, the diplurid spider *Euagrus anops* Gertsch, the pholcid spider *Metagonia tlamaya* Gertsch, the glomerid milliped *Glomeroides caecus* Causey, the rhachodesmid milliped *Unculabes porrensis* Shear, the trichopolydesmid milliped *Tylogoneus rainesi* Causey, and a new species of the collembolan genus *Sminthurus*. The remaining species of troglobite are all restricted to this and contiguous regions. They include the trichoniscid isopod *Mexiconiscus laevis* (Rioja), the amblypygid *Paraphrynus velmae* Mullinex, the tarantula *Schizopelma stygia* (Gertsch), the rhachodesmid milliped *Unculabes crispus* Causey, the cambalid milliped *Mexicambala russelli* Causey, the collembolans *Pseudosinella* sp. and *Acherontides potosinus* Bonet, and the gryllid cricket *Paracophus cladonotus* Hubbell.

Among the more notable troglophiles are the crayfish *Procambarus (Ortmannicus) toltecae* Hobbs; the agelenid spiders *Tegenaria decora* Gertsch and *T. selva* Roth; the ctenid spider *Ctenus mitchelli* Gertsch; the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch; the pholcid spiders *Coryssocnemis iviei* Gertsch and *Metagonia amica* Gertsch; the opilionids *Karos dybasi* (Goodnight and Goodnight), *K. gratiosus* Goodnight and Goodnight, and *K. projectus* Goodnight and Goodnight; the cleidogonid milliped *Cleidogona* sp.; the paradoxosomatid milliped *Oxidus gracilis* (Koch); the pyrgodesmid millipeds *Myrmecodesmus amarus* (Causey) and *M. potosinus* (Shear); the gryllid cricket *Paracophus placonotus* Hubbell; the carabid beetles *Platynus tlamayaensis* (Barr), *Platynus (Mexisphodrus)* sp., and *Tachys* spp.; the leiodid beetles *Dissochaetus aztecus* Szymczakowski and *Proptomaphaginus microps* Peck; the scarabaeid beetle *Onthophagus incensus* Say; and staphylinid beetles of the genera *Belonuchus*, *Homaeotarsus*, and *Stilicolina*.

Sierra de El Abra, San Luis Potosí and Tamaulipas.—The Sierra de El Abra was the first major karst region in México to receive intense study, both speleologically and biologically. Bonet (1953b) discussed the geology and hydrology of the region, with special emphasis on cavern development. More recently the area has been studied by Russell and Raines (1967), Mitchell et al. (1977), and Fish (1977). The Sierra de El Abra is developed on reef limestone, largely of the El Abra Limestone. It extends from near Ciudad Mante, Tamaulipas, to the Río Tamuín southeast of Ciudad Valles, San Luis Potosí. It is about 20 kilometers wide at its widest point. The east face of the range is a prominent near-vertical scarp up to about 300 meters high. The top of the range, which at its highest point is more than 600 meters above the plains to the east, forms a generally level plateau marked by many large dolinas and deep vertical shafts. To the west a comparatively gentle slope extends to the vicinity of the Inter-american Highway. Seasonal runoff in this area flows along several large arroyos before being captured by spectacular phreatic cave systems, some extensive. Water entering the west slopes of the range emerges from large springs, some of which are vauclusian. To the north the Sierra de El Abra is separated from the Sierra de Guatemala by the Río Boquillas, and to the south it is bounded by the Río Tamuín. A small outcrop of El Abra Limestone occurs south of the Río Tamuín in the Tantobal Dome and is included with the Sierra de El Abra for convenience. Caves in the region vary greatly from one part of the range to the other. Along the western slopes long, largely horizontal passages extend from the ends of deep incised arroyos. Fish (1974, 1977) has described some of these caves and discussed their geology. Mitchell et al. (1977) have described briefly the caves of the region which are inhabited by the blind fish *Astyanax jordani* (Hubbs and Innes) and discussed their speleogenesis. The caves on top of the range include large vertical shafts, some up to 200 meters in depth, frequently terminating in enormous chambers. Cueva de Diamante, near the highest point on the range, reaches a total depth of 621 meters, making it one of the deepest caves in México. Caves along the eastern face of the range are generally horizontal and many doubtless represent fossil resurgences.

The fauna of the Sierra de El Abra is among the better known in México, and 306 species, of which 33 are troglobites, have been identified from the 62 caves studied. The best known member of the fauna is the blind characin *Astyanax jordani*, now known from 21 caves in the Sierra de El Abra. This species is also known from caves in the Micos region and the Sierra de Guatemala. Four other aquatic troglobites are known from other regions: the entocytherid ostracod *Sphaeromicola cirolanae* Rioja, the cirolanid isopods *Speocirolana bolivari* (Rioja) and *S. pelaezi* (Bolívar), and the mysid *Spelaeomysis quinterensis*

(Villalobos). Endemic aquatic troglobites include the diaptomid copepod *Diaptomus (Microdiaptomus) cokeri* Osorio Tafall, the microcerberid isopod *Microcerberus* n. sp., and the palaemonid shrimp *Troglocubanus perezfarfanteae* Villalobos. The terrestrial troglobite fauna includes the rhagidiid mite *Rhagidia weyerensis* (Packard), also known from caves in the United States. Other species known from other regions include the squamiferid isopod *Spherarmadillo cavernicola* Mulaik, the trichoniscid isopod *Brackenridgia bridgesi* (Van Name), the opilionid *Hoplobunus boneti* (Goodnight and Goodnight), the scolopendrid centipede *Newportia sabina* Chamberlin, and the collembolan *Pseudosinella petrustrinatii* Christiansen. Endemic troglobites are the trichoniscid isopod *Cylindroniscus vallesensis* Schultz, the chactid scorpion *Typhlochactas elliotti* Mitchell, the chthoniid pseudoscorpions *Aphrastochthonius parvus* Muchmore and *A. russelli* Muchmore, the vachoniid pseudoscorpions *Paravachonium* n. sp. and *P. bolivari* Beier, the protoschizomid *Agastoschizomus lucifer* Rowland, the schizomids *Schizomus cookei* Rowland and *S. mitchelli* Rowland, the amblypygid *Paraphrynus baeops* Mullinex, the pholcid spider *Metagonia pachona* Gertsch, the ricinuleids *Cryptocellus* n. sp. and *C. osorioi* Bolívar, the rhagidiid mite *Rhagidia trisetata* Elliott and Strandtmann, the trichopetalid milliped *Mexiterpes sabinus* Causey, the trichopolydesmid milliped *Speodesmus pecki* Shear, an undescribed genus and species of nicoletiid thysanuran, the kinnarid homopteran *Oeclidius hades* Fennah, and the histerid beetle *Troglobacanius bolivari* Vomero.

The aquatic troglophile fauna includes several species of protozoans, rotifers, ostracods, copepods, the crayfish *Procambarus (Ortmannicus) acutus cuevachicae* (Hobbs), and the characin *Astyanax mexicanus* (Phillipi). About 100 terrestrial species are probable troglophiles in the Sierra de El Abra. It is not possible here to do more than list some of the more distinct or widespread species. The arachnid fauna includes the schizomid *Schizomus mexicanus* Rowland, the amblypygid *Paraphrynus pococki* Mullinex, the ricinuleid *Cryptocellus pelaezi* Coronado, the opilionids *Cynorta jamesoni* Goodnight and Goodnight and *Karos parvus* Goodnight and Goodnight, and the palpigrade *Koenenia hanseni* Silvestri. Troglophilic spiders include the ctenid *Ctenus mitchelli* Gertsch; the leptonetid *Leptoneta rainesi* Gertsch; the mysmenid *Maymena chica* Gertsch; the nesticids *Eidmannella pallida* (Emerton) and *Eidmannella* n. sp.; the pholcids *Metagonia pasquinii* Brignoli, *Metagonia tinaja* Gertsch, *Modisimus boneti* Gertsch, *Pholcophora elliotti* Gertsch, and *Physocyclus globosus* (Taczanowski); and the scytodid *Loxosceles valdosa* Gertsch. The milliped fauna includes the pyrgodesmids *Myrmecodesmus errabundus* (Shear) and *M. sabinus* (Chamberlin) and the spirostreptid *Orthoporus mimus* Chamberlin. Apterygote insect troglophiles include the campodeid dipluran *Campodea (Campodea) chica* Wygodzinsky, the japygid dipluran *Allojapyx allodontus* (Silvestri), and the collembolan *Acherontiella sabina* Bonet. Two species of troglophile gryllid cricket are known, *Paracophus apterus* Chopard and *P. placonotus* Hubbell. Numerous species of beetle are troglophiles in the region. These include the carabid *Pachyteles urrutiai* Bolívar, the leiodids *Dissochaetus aztecus* Szymczakowski and *Ptomaphagus (Adelops) elabra* Peck, scydmaenids of the genera *"Connophron"* and *Euconnus (Napochus)*, and staphylinid beetles of the genera *Belonuchus*, *Homaeotarsus*, and *Stilicolina*. Both the troglophile and troglobite fauna of this region are typical of the Sierra Madre Oriental, with its closest affinities lying with the Sierra de Guatemala to the north and somewhat less with that of the ranges to the west and southwest.

Altas Cumbres, Tamaulipas.—This is a poorly defined region located to the southwest of Ciudad Victoria on the highway to Tula. Of the three caves known for the region, only two have been investigated with respect to their invertebrate fauna. Both are small fissure-like caves with a limited fauna. Of four invertebrates identified, three are troglophiles: the leptonetid spider *Leptoneta bonita* Gertsch, the pholcid spider *Modisimus reddelli* Gertsch, and the gryllid cricket *Paracophus apterus* Chopard. These are typical elements of the cave fauna of the general region.

Sierra de Guatemala, Tamaulipas.—The Sierra de Guatemala is a range located immediately north of the Río Boquillas and to the west of the town of Gómez Farías. It is bounded on the north by the Río Guayalejo; on the west it descends abruptly to the plains east of Jaumave. Elevations range from 170 to about 2,200 meters. Martin (1958) has summarized the geology, physiography, vegetation, and climate of the region. His study of the reptiles and amphibians of the region also includes much useful biogeographic information. The principal limestone unit is the El Abra (=El Doctor) Limestone (Russell and Raines, 1967; Priego de Wit, 1974). Most of the drainage is internal, with water flowing from two major springs, the Nacimiento del Río Frío to the south and the Nacimiento del Río Sabinas to the north. These springs are vauclusian in nature. Caves are known throughout the area, but most are small. The town of Gómez Farías is built on a small ridge of igneous rock immediately east of the Sierra de Guatemala. In the shallow valley separating this ridge and the main range, several caves receive floodwater via shallow arroyos. These caves are largely vertical and attain depths up to 148 meters below their entrances. Water has been encountered in three of these (Mitchell et al., 1977). Karst development in the Sierra de Guatemala includes numerous dolinas, pinnacles, lapiez, and sinkholes. A few small springs emerge to flow short distances before sinking. Most of the explored caves on or near the top of the range are small sinkholes ranging from a few meters to more than 100 meters in depth. Several large chambers and phreatically formed passages have been encountered; the most notable of these are Cueva de la Mina, Cueva de la Capilla, and Cueva del Infiernillo. These well-decorated caves usually have permanent pools of standing water, occasionally inhabited by aquatic troglobites. Elliott (1973b) has included descriptions of several caves in the area. Along the northern edge of the Sierra de Guatemala several significant caves have been discovered. These include long, horizontal caves which may represent fossil resurgences. The largest cave in the range is Sótano de la Joya de Salas, located on the western side of the range in a large closed valley. The cave receives massive amounts of wet-season floodwater and attains a depth of 376 meters. In general, karst development in the Sierra de Guatemala appears to be in a rather early stage and it appears doubtful that a major cave system, such as the Sistema Purificación, will be found.

The Sierra de Guatemala is among the better-known areas in México with respect to its invertebrate fauna. From the 67 caves which have been studied, 273 species, including 45 troglobites, are known. This is largely a reflection of the great range in elevation and the variety of habitats. The aquatic troglobite fauna includes two flatworms, *Dugesia barbarae* Mitchell and Kawakatsu and *D. typhlomexicana* Mitchell and Kawakatsu. These are closely related to the troglophile *D. guatemalensis* Mitchell and Kawakatsu, also known from caves in the region. The aquatic earthworm *Eodrilus albidus* Gates has been found in pools in two caves; it is closely related to the troglobitic *E. mexicanus* Gates from the Xilitla region. The microcerberid isopod *Mexicerberus troglodytes* Schultz is a marine relict known only from Cueva de la Mina. Its affinities are unclear. The remaining aquatic troglobites are also known from caves in the Sierra de El Abra. These are the entocytherid ostracod *Sphaeromicola cirolanae* Rioja, the cirolanid isopods *Speocirolana bolivari* (Rioja) and *S. pelaezi* (Bolívar), and the characin *Astyanax jordani* (Hubbs and Innes). The last species is known from caves at Gómez Farías and from the area immediately to the north of Ocampo along the southern edge of the range.

The terrestrial troglobite fauna is the richest of any region in México and includes a wide variety of species. Most of the species are endemic, but several are also known from the Sierra de El Abra and one occurs to the north. The collembolan *Oncopodura prietoi* Bonet was described from Grutas del Palmito in the Sierra de Gomas. Six species are also known from caves in the Sierra de El Abra: the squamiferid isopod *Spherarmadillo cavernicola* Mulaik, the trichoniscid isopod *Brackenridgia bridgesi* (Van Name), the amblypygid *Paraphrynus baeops* Mullinex, the opilionid *Hoplobunus boneti* (Goodnight and Goodnight), the centipede *Newportia sabina* Chamberlin, and the collembolan *Pseudosinella petrustrinatii* Christiansen. Of the remaining fauna some species are known from both high and low elevations, while others may be restricted to either highland or lowland caves. Species which are known from all elevations are the glomerid milliped *Glomeroides promiscus* Causey, the rhachodesmid milliped *Strongylodesmus harrisoni* Causey, the opilionid *Hoplobunus inops* Goodnight and Goodnight, and the gryllid cricket *Paracophus caecus* Hubbell. The cambalid milliped *Mexicambala blanda* Causey is known both from medium and low elevations, while its sibling species *M. inops* Causey occurs at higher elevations. Species which are apparently restricted to low elevations include the pseudoscorpion *Paravachonium superbum* Muchmore, the schizomid *Schizomus reddelli* Rowland, the ochyroceratid spider *Theotima pura* Gertsch, the trichopolydesmid milliped *Tylogoneus minus* Causey, and the histerid beetles *Troglobacanius reddelli* Vomero and *T. sbordonii* Vomero. Of these species all but the milliped are probably tropical forms not likely to occur at higher elevations. The nearest relative of the milliped occurs in the Xilitla region and thus it may also be found at higher elevations.

The high-elevation fauna is of particular interest. It includes the chactid scorpion *Typhlochactas rhodesi* Mitchell, the pseudoscorpions *Aphrastochthonius major* Muchmore and *Tyrannochthonius troglobius* Muchmore, the diplurid spider *Euagrus cavernicola* Gertsch, the agelenid spiders *Cicurina (Cicurusta) mina* Gertsch and *Tegenaria blanda* Gertsch, the leptonetid spider *Leptoneta capilla* Gertsch, the pholcid spider *Metagonia pura* Gertsch, the palpatorid opilionid *Ortholasma sbordonii* Silhavý, the cleidogonid milliped *Cleidogona pecki* Shear, the rhachodesmid milliped *Unculabes causeyae* Shear, a trichopolydesmid milliped possibly belonging to the genus

Speodesmus, an undescribed homopteran belonging to the family Kinnaridae, the leiodid beetle *Ptomaphagus (Adelops) troglomexicanus* Peck, and the carabid beetles *Antroforceps bolivari* Barr, *Mexaphaenops intermedius* Barr, and *Platynus (Mexisphodrus) profundus* (Barr). All of the troglobites appear to be typical elements of the fauna of the Sierra Madre Oriental.

The aquatic troglophile fauna includes the dugesiid flatworm *Dugesia guatemalensis*, the hyalellid amphipod *Hyalella azteca* (Saussure), the dytiscid beetle *Hydroporus belfragei* Sharp, and the characin *Astyanax mexicanus* (Hubbs and Innes). The flatworm is endemic to the Sierra de Guatemala, but the remaining species are widespread.

The terrestrial troglophile fauna contains an estimated 83 species, a number of which are possibly endemic to the Sierra de Guatemala. It is not possible to do more than mention some of the more distinctive or important species here. Endemic species include the syarinid pseudoscorpion *Pachychitra similis* Muchmore; the agelenid spider *Cicurina (Cicurusta) iviei* Gertsch; the mysmenid spider *Maymena grisea* Gertsch; the pholcid spiders *Coryssocnemis clarus* Gertsch, *Metagonia capilla* Gertsch, *M. secreta* Gertsch, *M. suzanne* Gertsch, and *M. mckenziei* Gertsch; the cleidogonid milliped *Cleidogona crystallina* Shear; the pyrgodesmid millipeds *Myrmecodesmus cornutus* (Shear), *M. egenus* (Causey), *M. errabundus* (Shear), and *M. gelidus* (Causey); the sphaeriodesmid milliped *Sphaeriodesmus nortoni* Shear; the gryllid cricket *Paracophus reddelli* Hubbell; and the staphylinid beetle *Stenopholea reddelli* Herman.

Several troglophiles are known only from the Sierra de Guatemala and Sierra de El Abra. These include the schizomid *Schizomus mexicanus* Rowland, the amblypygid *Paraphrynus pococki* Mullinex, the scytodid spider *Loxosceles valdosa* Gertsch, and the carabid beetle *Pachyteles urrutiai* Bolívar. Among more widespread troglophiles mention may be made of the agelenid spider *Tegenaria selva* Roth, the ctenid spider *Ctenus mitchelli* Gertsch, the mysmenid spider *Maymena chica* Gertsch, the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus augustinus* Keyserling, the pholcid spiders *Coryssocnemis abernathyi* Gertsch and *Modisimus reddelli* Gertsch, the tetrablemmid spider *Matta sbordonii* (Brignoli), the opilionid *Cynorta jamesoni* Goodnight and Goodnight, the collembolans *Pseudosinella reddelli* Christiansen and *Acherontiella sabina* Bonet, the gryllid crickets *Paracophus apterus* Chopard and *P. placonotus* Hubbell, the leiodid beetles *Dissochaetus aztecus* Szymczakowski and *Ptomaphagus (Adelops) elabra* Peck, the scarabaeid beetle *Onthophagus cuevensis* Howden, and staphylinid beetles of the genera *Belonuchus*, *Homaeotarsus*, *Philonthus*, and *Stilicolina*.

Tula, Tamaulipas.—This ill-defined region is located southwest of Tula and comprises an area of gypsum karst. The one cave studied in the region is at an elevation of 1,030 meters and is formed in Jurassic gypsum. The only two species thus far identified are both troglophiles common in this part of México: the carabid beetle *Rhadine rotgeri* (Bolívar and Hendrichs) and the staphylinid beetle *Stilicolina* n. sp.

Villa Hidalgo, Tamaulipas.—This poorly defined region is located to the north of the Río Blanco in the mountains west of Villa Hidalgo. The only cave that has been visited is Cueva de la Virgen, a small two-room cave about 60 meters in length and heavily polluted. No troglobites are known from the region and only three species, all probable troglophiles, have been identified: the nesticid spider *Eidmannella pallida* (Emerton), the endemic gryllid cricket *Paracophus sanctorum* Hubbell, and the alleculid beetle *Hymenorus* sp.

Gulf Coastal Lowland

The Gulf Coastal Lowland province is a generally level plain extending from Texas to the Yucatán Peninsula. It is broken in two places, first near Jalapa where the Neovolcanic Plateau reaches the coast and farther south by the Volcanes de los Tuxtlas. Alcorta Guerrero (1966) includes only the area north of the Neovolcanic Plateau in this province and places the southern portion in a separate province. Most of the Gulf Coastal Lowland is covered by non-cavernous deposits, but one major and several smaller ranges of Cretaceous limestone are exposed. The most extensive of these is the Sierra de Tamaulipas to the east of Ciudad Victoria. Other smaller ranges such as the Cerro el Aire and the Sierra de San Carlos also occur in this area. Muir (1936) has discussed the geology of this region. With the exception of one cave in the Cerro el Aire and three in the Sierra de Tamaulipas, this province remains unknown with respect to its invertebrate cave fauna.

Cerro el Aire, Tamaulipas.—The Cerro el Aire is located in the vicinity of the town of Abasolo immediately north of the Sierra de Tamaulipas. The only cave which has been visited is a small vertical pit, Sótano de Abasolo. Only two species of spider have been identified; one of these, the scytodid *Loxosceles* sp., is an apparent troglophile.

Sierra de Tamaulipas, Tamaulipas.—This range of Cretaceous limestone extends north-south for about 100 kilometers. It is bounded on the north by the

Río Soto la Marina and terminates a short distance south of Aldama. Although narrow in the northern part it widens to about 60 kilometers in the south. The highest peaks approach 1,400 meters in elevation. The principal cavernous rock unit is the Tamaulipas Limestone (Muir, 1936). Martin et al. (1954) have discussed the Sierra de Tamaulipas with respect to geology, climate, vegetation, and vertebrate fauna. The only caves that have been studied in the region are located at low elevations along the eastern side of the range. Nothing is known of the karst features or cave potential of high elevations, although a few caves have been reported by vertebrate biologists. Two caves were visited about 50 kilometers southwest of Soto la Marina, approximately midway in the range. One of these is a resurgence cave, but neither is very large. The third known cave is Cueva de los Cuarteles near Aldama in the extreme southern part of the range. This is a large, horizontal cave with many entrances and more than one kilometer of passage. One part of the cave contains a large bat population, while another area consists of a single major passage interrupted along its length by numerous large skylight entrances. A sizable spring is located near the cave and it is likely that Cueva de los Cuarteles is a fossil resurgence.

Despite our general paucity of knowledge of the invertebrate fauna of the region 45 species, of which four are troglobites, have been thus far identified. The troglobitic fauna includes the cirolanid isopod *Speocirolana pelaezi* (Bolívar) and its entocytherid ostracod associate, *Sphaeromicola cirolanae* Rioja. These species are also known from caves in San Luis Potosí and Tamaulipas in the Sierra Madre Oriental. The remaining two troglobites are schizomids, *Schizomus lukensi* Rowland and an undescribed species of *Schizomus.* Both are closely related to species in the Sierra de El Abra and Sierra de Guatemala and presumably represent relicts of a widespread species ancestral to species in all three regions. The terrestrial troglophile fauna is also closely related to the fauna of the Sierra Madre Oriental, with some species occurring in both regions. Three arachnids are endemic to the caves of the Sierra de Tamaulipas: the pholcid spiders *Pholcophora bolivari* Gertsch and *P. mitchelli* Gertsch and the opilionid *Stygnomma tuberculata* Goodnight and Goodnight. Other species of interest include the amblypygid *Paraphrynus pococki* Mullinex, the ctenid spider *Ctenus mitchelli* Gertsch, the mysmenid spider *Maymena chica* Gertsch, the nesticid spider *Gaucelmus augustinus* Keyserling, the pholcid spider *Modisimus texanus* Banks, the scytodid spider *Loxosceles devia* Gertsch and Mulaik, and the collembolans *Pseudosinella violenta* (Folsom) and *Acherontiella sabina* Bonet.

Neovolcanic Plateau

The Neovolcanic Plateau forms a great band across central México from the Pacific coast in Jalisco to the Gulf of México east of Jalapa, Veracruz. Hundreds of volcanos, most now extinct, rise from a comparatively level plain formed by ash and lava deposits. Two volcanos, Jorullo and Paricutín, have erupted in recent times and an eruption south of México City covered prehistoric settlements in the Pedregal de San Angel. A chain of large peaks, including Tancítaro, Toluca, Popocatepetl, Malinche, Orizaba, and Cofre de Perote, dominates the landscape. The average elevation in this province is above 2,500 meters, with Orizaba rising to 5,747 meters above sea level. In a few areas erosion has exposed older sedimentary rocks, some of which are known to be cavernous. None of these inliers have been investigated for caves. Lava tubes are abundant throughout much of the area, but they have been little studied speleologically. Caves on the slopes of Cerro Xictle to the south of México City have been studied with respect to their bat and associated ectoparasitic fauna, but general invertebrate collections have not been made. One cave on Cerro de la Estrella to the east of México City has been visited and others are known to exist. Two caves on the slopes of Cofre de Perote have been examined with collections made in one. A third cave near Jalapa has been studied, and three caves near the town of Buena Vista have been visited. The presence of troglobites in the caves on Cerro de la Estrella and Cofre de Perote indicates the existence of a potentially rich cavernicole fauna on the Neovolcanic Plateau.

Cerro de la Estrella, Distrito Federal.—This small peak is located south of Tapijulapa on the eastern edge of México City. It is formed of Pliocene volcanic deposits (Schlaepfer, 1968). One cave has been biologically investigated, but other larger ones are reported. This cave is generally dry and heavily polluted with trash and human feces. Of eight species identified from the cave, an undetermined genus and species of nicoletiid thysanuran is the only possible troglobite. The troglophilic fauna includes the nesticid spider *Eidmannella pallida* (Emerton) and an undescribed species of the pholcid genus *Coryssocnemis.*

Buena Vista, Veracruz.—This is an ill-defined region in the immediate vicinity of the town of Buena Vista. Three caves, none very well-suited for cavernicoles, have been studied. One cave is small, horizontal, and of little interest; the second, Cueva de Cantil Blanco, consists of a single 80-meter-long horizontal passage with a small stream issuing from it; the third is a large, poorly-explored bat cave, Cueva de Camposantos, which consists of one or more large chambers. The stream in Cueva de Cantil Blanco was inhabited by the snail *Melanoides maculata* (Born) and an undescribed species of palaemonid shrimp of the genus *Macrobrachium*. The terrestrial troglophile fauna consists only of the pholcid spider *Physocyclus globosus* (Taczanowski) and an undescribed species of the scytodid spider genus *Loxosceles*. The remainder of the fauna consists of accidentals or bat guano associates.

Jalapa, Veracruz.—This poorly defined and studied region consists of the volcanic regions in the general vicinity of Jalapa, including Cofre de Perote to the east. Only two caves have been investigated with respect to their invertebrate fauna. One, Cueva del Infiernillo, is a lava cave entered by a 10-meter deep sinkhole. A single large passage about 200 meters long is now accessible. The cave contains much guano and is not suitable for troglobites. The second cave, Cueva del Volcancillo, is located on the slopes of Cofre de Perote. The entrance opens onto the wall of the crater of a subsidiary cone, El Volcancillo, and extends for more than 1,000 meters as a large tube. Numerous caves occur on Cofre de Perote and the area should prove rich biologically. Two troglobites have been identified from Cueva del Volcancillo, an undescribed species of the cleidogonid milliped genus *Cleidogona* and an undescribed carabid beetle of the genus *Paratrechus*. The troglophile fauna of the region includes the amblypygid *Paraphrynus aztecus* (Pocock), a scorpion of the genus *Vaejovis*, agelenid spiders of the genus *Tegenaria*, the nesticid spider *Eidmannella pallida* (Emerton), the pholcid spider *Modisimus* n. sp., the scytodid spider *Loxosceles* n. sp., the cleidogonid milliped *Cleidogona* n. sp., campodeid diplurans, and the collembolan *Schaefferia* sp.

Sierra Madre del Sur System

According to Raisz (1964) the Sierra Madre del Sur System includes all of the area between the Neovolcanic Plateau and the Isthmus of Tehuantepec, with the exception of a narrow strip along the Pacific Ocean and the Gulf Coastal Lowland to the north. He subdivides this province into five sections: the Balsas-Mexcala Basin, the Oaxaca Upland, the Northeast Folded Ranges, the Southern Slope, and the Northern Section. The Southern Slope is a mountainous area along the Pacific coast; the Northern Section is the coastal area in Colima and immediate vicinity. Neither of these regions has been studied speleologically and will not be discussed here.

The Balsas-Mexcala Basin is a structurally complex region largely drained by the Tepalcatepec, Balsas, and Mexcala rivers. It is bounded on the north by the Neovolcanic Plateau, on the northwest by the Northern Section, on the south by the Southern Slope and on the east by the Oaxaca Upland. The rivers flow at elevations of 300 to 600 meters, while to the south the land rises to the heights of the Sierra Madre del Sur at 2,000 to 3,000 meters. To the east the basin widens to form a broad plateau dissected by several rivers. Part of the area is covered by Tertiary volcanics, but Cretaceous limestone is exposed in many places. Along the northern edge of the region, erosion has removed the overlying volcanic rocks to expose heavily karsted Cretaceous deposits. This is most notably seen in the Cacahuamilpa Region, as discussed below. Bonet (1971) has discussed the physiography and geology of the Cacahuamilpa region, while Fries (1956) has reported on the geology along the highway between México, D. F., and Acapulco, Guerrero.

With the exception of the Cacahuamilpa region the Balsas-Mexcala Basin has been little studied speleologically. Only 17 caves have been examined for their invertebrate fauna, but reports on bats in many parts of the area indicate that it will prove to be of the greatest interest speleologically. Extensive limestone deposits, considerable local relief, and high rainfall have contributed to the development of many extensive cave systems.

The Oaxaca Upland is a higher area than the basin to the west and has an overall plateau-like character. To the north it is much dissected and in the center lies the Valley of Oaxaca. The region is geologically complex with granites, metamorphic rocks, and sedimentary deposits exposed. Cretaceous limestone crops out particularly in the southern part of the upland. The area has been little studied speleologically and only ten caves have been visited. These are located at 1,800 to 2,000 meters elevation in the vicinities of San Sebastián and Santiago Apoala.

The Northeast Folded Ranges is a disjunct part of the Sierra Madre Oriental extending from Córdoba, Veracruz, to Tehuantepec, Oaxaca. It consists largely of Cretaceous limestone, but volcanic deposits in some areas cover the limestone. The geology of the northern part of the area has been discussed by Contreras V. (1956). This part of México is among the more speleologically important areas in the country. Heavy rainfall, high relief, and massive limestone deposits have contributed to the development of some of the more significant caves in México. It is also one of the better known parts of México with respect to its invertebrate cave fauna. Among the 108 caves studied are many large stream caves (particularly in the Acatlán region of Oaxaca) and some of the deeper caves in the world. Extensive karst development south of Orizaba, Veracruz, and in the Huautla de Jiménez region of Oaxaca has resulted in nearly complete internal drainage. Deep, incised river canyons at the base of these plateau-like regions has provided the relief necessary for the development of deep vertical cave systems, one of which is more than 1,000 meters deep. Knowledge of the cave fauna of the area, however, is limited to the northern part of the mountains. Extensive cave systems have been reported from the southern part of the ranges but remain unstudied.

Colotlipa, Guerrero.—This region is located in eastern Guerrero in the vicinity of the town of Colotlipa. The general geology of this part of Guerrero is described by Fries (1956). The principal limestone unit is the Morelos Formation of Cretaceous age. The Colotlipa region is poorly known and defined and only Grutas de Juxtlahuaca has been studied. This large cave, now partially developed as a tourist attraction, is famous for its Olmec burials and paintings. The cave is essentially horizontal and contains a small stream and deep pools. With more than five kilometers of surveyed passage, it is among the longer caves in México (Roy, 1974).

Despite the fact that 35 species, of which four are troglobites, have been identified from the cave, the fauna remains poorly studied. Several rooms are inhabited by a large bat population, ten species of which have been identified. The terrestrial troglobite fauna includes the pholcid spider *Pholcophora gruta* Gertsch, the rhachodesmid milliped *Pararhachistes amblus* Chamberlin, the campodeid dipluran *Juxtlacampa juxtlahuacensis* Wygodzinsky, and a collembolan of the genus *Trogolaphysa*. All of these species are endemic to Grutas de Juxtlahuaca and are all closely related to other species in southern México and Guatemala. Several troglophiles are endemic to the cave; these include the armadillid isopods *Venezillo articulatus* (Mulaik) and *V. boneti* (Mulaik), the tridenthchoniid pseudoscorpion *Tridenchthonius juxtlahuaca* Chamberlin and Chamberlin, the pholcid spider *Physocyclus bicornis* Gertsch, the pygrodesmid milliped *Myrmecodesmus colotlipa* (Chamberlin), and the spirostreptid milliped *Orthoporus guerreronus* (Chamberlin). Other troglophiles include the armadillid isopod *Venezillo cacahuamilpensis* (Bilimek), the amblypygid *Paraphrynus mexicanus* (Bilimek), the scutigerid centipede *Scutigera linceci* (Wood), the nicoletiid thysanuran *Anelpistina boneti* (Wygodzinsky), and the carabid beetle *Platynus segregatus* (Bates). These are all typical elements of the fauna of southern México and many are also reported from Grutas de Cacahuamilpa.

Taxco, Guerrero.—This a poorly defined region near the city of Taxco in northern Guerrero. The principal cave-forming limestones in the region are the Cretaceous Mexcala and Morelos formations (Fries, 1956). Although numerous caves are known from reports by zoologists studying bats, only two have been examined with respect to their invertebrate fauna, and neither of these is well known. Spiders were collected from a small cave on the outskirts of Taxco, but nothing is known of the cave. The only other cave examined is Pozo Meléndez, a vertical cave system to the south of Taxco. Of eleven species of invertebrate reported from the area the only troglophiles of note are the agelenid spider *Tegenaria mexicana* Roth, the scytodid spider *Loxosceles misteca* Gertsch, and the paradoxosomatid milliped *Oxidus gracilis* (Koch).

Cacahuamilpa, Guerrero and México.—This region is located in northern Guerrero and adjacent México in Valle de Ixtapán immediately south of the slopes of the volcano Nevada de Toluca. The region is flanked on the east and west by plains of volcanic deposits and on the south by the Sierra de Tenerias. The geology, speleologenesis, and caves of the area are discussed in detail by Bonet (1971). This is among the more interesting karst regions in México, with several large caves known, the most famous of which is Grutas de Cacahuamilpa. This large horizontal commercial cave has been known for hundreds of years and is described in numerous popular and scientific articles. Other well-known caves include Grutas de la Estrella and the two large river caves (Grutas del Río Chontalcoatlán and Grutas del Río San Jerónimo) which emerge from two enormous entrances, collectively called the Dos Bocas, below Grutas de Cacahuamilpa. The caves of the region are formed in Cretaceous limestone, principally of the Morelos and Mezcala formations. Most of the area was covered by volcanic deposits, but as erosion exposed the underlying limestone karst topography several major streams invaded preexisting cave systems and now run for several kilometers through underground channels.

Fourteen caves have been investigated with respect to their invertebrate fauna, but most of the well-known caves are large stream passages and not well suited to cavernicoles. Additional work in the smaller, drier caves is needed to further elucidate the nature of the fauna of the area. Although 91 species have been recorded, only six are troglobites. This paucity may be due to our limited knowledge of the region or to the possibility that filling or burial of the caves by volcanic deposits prevented the development of a rich troglobitic fauna. The troglobites known from the region include the pseudoscorpion *Albiorix bolivari* Beier, an undescribed species of the schizomid genus *Schizomus*, the opilionid *Caecoa arganoi* Silhavý, the rhachodesmid milliped *Ceuthauxus constans* Causey, the thysanuran *Anelpistina anophthalma* (Bilimek), and the collembolan *Spelaeogastrura guerrerense* Bonet. Two copepods, *Macrocyclops albidus* (Jurine) and *Mesocyclops* sp. nr. *brazilianus* Kiefer, are the only probable aquatic troglophiles. The terrestrial troglophile fauna is closely allied with the cavernicole fauna of southern México, but several species are known only from the caves of this region. These include the pseudoscorpion *Lechytia cavicola* Muchmore; the pholcid spiders *Physocyclus modestus* Gertsch, *Psilochorus cordatus* (Bilimek), and *Psilochorus tellezi* Gertsch; the ricinuleid *Cryptocellus boneti* Bolívar; the opilionid *Cynortina minutus* (Goodnight and Goodnight); the pyrgodesmid milliped *Myrmecodesmus acona* (Shear); and the carabid beetle *Tachys (Tachyura) unistriatus* (Bilimek). Other troglophiles of interest include the armadillid isopods *Venezillo cacahuamilpensis* (Bilimek) and *V. osorioi* (Mulaik), the amblypygid *Paraphrynus mexicanus* (Bilimek), the agelenid spider *Tegenaria mexicana* Roth, the mysmenid spider *Maymena mistica* Gertsch, the scytodid spiders *Loxosceles boneti* Gertsch and *L. misteca* Gertsch, the carabid beetles *Paratrechus (Paratrechus) tepoztlanensis* Bolívar and *Platynus (Stenoplatynus) umbripennis* (Casey), the leiodid beetle *Ptomaphagus (Adelops) spelaeus* (Bilimek), and the scarabaeid beetle *Onthophagus vespertilio* Howden, Cartwright, and Halffter.

Acatlán, Oaxaca.—This region includes a series of mountain ranges located near the town of Acatlán in extreme northern Oaxaca. The principal cavernous formation is the Escamela Limestone of Cretaceous age (Lozano Romen, 1955). The mountains arise abruptly from an alluvial plain on which sugarcane is grown. No caves have yet been visited on the high slopes or tops of the ranges where pits and *sumideros* are reported to occur. Numerous caves exist on the slopes of the mountains, and several sizable streams emerge from cave entrances at the base of the ranges. One stream now utilizes the main passage in Cueva de Juan Sánchez for more than a kilometer (Byrd, 1976). Other notable caves in the area include Cueva de la Finca, Cueva de Laguna Verde, Cueva de las Maravillas, and Cueva del Nacimiento del Río San Antonio, each of which contains several kilometers of passage.

The cavernicole fauna of this still poorly studied region is among the richer in México. From the 21 caves biologically investigated, 91 species, of which 25 are troglobites, have thus far been identified. The region is particularly rich in aquatic troglobites with seven species known: the mysids *Spelaeomysis olivae* Bowman and *Antromysis (Antromysis) reddelli* Bowman, the alpheid shrimp *Alpheopsis stygicola* Hobbs, the palaemonid shrimps *Macrobrachium* n. sp. and *M. villalobosi* Hobbs, the crayfish *Procambarus (Austrocambarus) oaxacae reddelli* Hobbs, and an undescribed species of catfish of the genus *Rhamdia*. The mysids and alpheid shrimp are presumably marine relicts, while the other species probably have a freshwater origin. With the exception of *A. stygicola*, which is otherwise unknown from fresh water in the New World, the remaining species are all closely related to the fauna of southern México. The terrestrial troglobite fauna includes the diplocentrid scorpion *Diplocentrus cueva* Francke, an undescribed species of pseudoscorpion of the genus *Tyrannochthonius*, the schizomid *Schizomus ?firstmani* Rowland, an amblypygid of the genus *Paraphrynus*, the tarantula *Schizopelma reddelli* Gertsch, the pholcid spiders *Metagonia martha* Gertsch and *Pholcophora* n. spp., the cyphophthalmid opilionid *Neogovea mexasca* Shear, an undescribed opilionid of the genus *Hoplobunus*, undescribed millipeds of the families Oniscodesmidae and Trichopolydesmidae, an undescribed thysanuran of the family Nicoletiidae, collembolans of the subfamily Paronellinae and the genera *Pseudosinella* and *Acherontides*, and an undescribed cixiid homopteran.

The troglophile fauna has not, for the most part, undergone systematic study, but a few species have been identified. These include the schizomid *Schizomus portoricensis* (Chamberlin), the amblypygid *Paraphrynus aztecus* (Pocock), the mysmenid spiders *Maymena delicata* Gertsch and *M. mayana* (Chamberlin and Ivie), and the leiodid beetles *Dissochaetus hetschkoi* Reitter and *Ptomaphagus (Adelops) reddelli* Peck. In addition to these species many undetermined or undescribed troglophiles are known. Among the more significant of these are scorpions of the genus *Vaejovis*, pseudoscorpions of the genera *Albiorix* and *Tyrannochthonius*, diplurid spiders of the genus *Euagrus*, ctenid spiders of the genus *Ctenus*, pholcid spiders of the genus *Pholcophora*, scytodid spiders of the genus *Loxosceles*, pyrgodesmid millipeds of the genus *Myrmecodesmus*, campodeid diplurans, leiodid beetles of the genus *Proptomaphaginus*, scydmaenid beetles of the genera *Euconnus (Napochus)* and *Scydmaenus*, and staphylinid beetles of the genus *Belonuchus*. Both the troglophile and troglobite faunas of the Acatlán region are typical of the cavernicole fauna of other parts of southern México. The only unusual species is *Neogovea mexasca;* this is the only troglobitic cyphophthalmid in the New World and the only species recorded for México or Central America.

Huautla de Jiménez, Oaxaca.—This region is a high plateau located near the town of Huautla de Jiménez in northern Oaxaca near the Puebla border. This plateau, at an elevation of about 2,000 meters, is bounded on the south by the valley of the Río Santo Domingo at an elevation of less than 350 meters, on the north and west by the valley of the Río Coyomeapan and the Río del Camarón, and on the northeast by the Miguel Alemán Reservoir at an elevation of less than 100 meters (Anonymous, 1965). The greatest development of karst has been in the higher parts of the plateau to the east and southeast of Huautla de Jiménez. Most of the drainage on the plateau is internal, the water emerging from springs in the river valleys more than 1,500 meters below. Karst forms present on the plateau include lapiez, pinnacles, and large dolinas. Many of these dolinas contain pits, and the larger—such as that in which Sótano de San Agustín is found—are more than 100 meters deep and one kilometer long. The maturity of the karst, the great local relief, and massive Cretaceous limestone have provided the factors necessary for the development of extensive integrated cave systems. The larger caves include Sótano de Agua de Carrizo, La Grieta, Sótano del Río Iglesia, and Sótano de San Agustín. The last cave has a depth of more than 1,000 meters and is among the deeper in the world. Active streams flow through the deep caves. Russell (1965), Fish and Russell (1966), Boon (1969), Stone (1977, 1979a), and Steel (1978) describe some of the caves. In addition to caves on the plateau, several caves in the valley of the Río Coyomeapan have been studied. These are generally small, horizontal caves with a rich fauna.

The invertebrate fauna of the region, though still poorly known includes 46 identified species, of which eight are troglobites. The troglobitic fauna includes a scorpion of uncertain affinities, an undescribed tarantula of the genus *Schizopelma,* an undescribed pholcid spider of the genus *Pholcophora,* the cleidogonid milliped *Cleidogona baroqua* Shear, the cambalid milliped *Mexicambala fishi* Causey, the collembolan *Pseudosinella bonita* Christiansen, an undescribed genus and species of nicoletiid thysanuran, and the carabid beetle *Platynus (Mexisphodrus) urquijoi* (Hendrichs and Bolívar). The troglobites all belong to genera known from the Sierra Madre Oriental as well as Oaxaca and Puebla.

The troglophile fauna, though poorly known taxonomically, belongs, as does the troglobite fauna, to groups common both in southern México and the Sierra Madre Oriental. Species included are a schizomid of the genus *Schizomus;* an amblypygid of the genus *Paraphrynus;* ctenid spiders of the genus *Ctenus;* mysmenid spiders of the genus *Maymena;* the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch; pholcid spiders of the genera *Coryssocnemis, Metagonia,* and *Modisimus;* opilionids of the genera *Hoplobunus* and *Karos;* the rhachodesmid milliped *Rhachodesmus digitatus* Causey; sphaeriodesmid millipeds of the genus *Sphaeriodesmus;* campodeid diplurans; collembolans of the genus *Pseudosinella;* carabid beetles of the genus *Platynus;* and staphylinid beetles of the genus *Belonuchus.*

San Sebastián de las Grutas, Oaxaca.—This region is located in the Oaxaca Upland to the north of Sola de Vega. It comprises an ill-defined area of Cretaceous limestone at elevations of 1,800 to 2,100 meters. Karst development consists principally of large shallow dolinas. Two of the caves studied are small pits and a third is a small horizontal cave. The fourth cave, Grutas de San Sebastián, is a large, essentially horizontal cave with a large stream in a lower level.

The troglobitic fauna includes an undescribed milliped of the family Trichopolydesmidae, an undescribed nicoletiid thysanuran, and a collembolan of the genus *Acherontides.* The troglophile fauna includes the endodontid snail *Helicodiscus singleyanus* (Pilsbry), a schizomid of the genus *Schizomus,* the mysmenid spider *Maymena delicata* Gertsch, the nesticid spider *Gaucelmus augustinus* Keyserling, a pholcid spider of the genus *Physocyclus,* the opilionid *Hoplobunus oaxacensis* Goodnight and Goodnight, and a pyrgodesmid milliped of the genus *Myrmecodesmus.* These species all belong to genera common to the caves of southern México.

Santiago Apoala, Oaxaca.—This is a little-studied area of limestone karst located about 20 kilometers northeast of Asunción Nochixtlán in northern Oaxaca on a high plateau at an elevation of about 2,240 meters. Karst development consists of numerous large, shallow dolinas, from a few of which pits descend. Drainage appears to be almost entirely internal, but no large integrated systems have been discovered. Of the six caves visited only two are of any great extent. One of these, Comedor del Diablo, is a deep vertical system still poorly explored; the other, Cueva de Apoala, is located more than 200 meters below the edge of the plateau and consists of a large passage from which a stream emerges. It is also poorly explored.

The cave fauna of this rather isolated region is potentially of considerable interest, but it has been little studied. Of 30 species identified, only two are troglobites, the endemic opilionid *Hoplobunus apoalensis* Goodnight and Goodnight and an undescribed collembolan of the subfamily Paronellinae. The troglophile fauna includes the nesticid spiders *Gaucelmus augustinus* Keyserling and *Nesticus* n. sp., the pholcid spiders *Coryssocnemis* sp. and *Psilochorus murphyi* Gertsch, a cleidogonid milliped of the genus *Cleidogona*, a collembolan of the genus *Pseudosinella*, and the carabid beetle *Mexitrechus coarctatus* (Bates).

Valle Nacional, Oaxaca.—This region is an area of Cretaceous limestone located near the town of Valle Nacional in northern Oaxaca. All of the caves studied have been near Valle Nacional at an elevation of less than 100 meters, but the mountains to the south rise to an elevation of more than 2,000 meters. Karst in the form of large dolinas occurs at higher elevations and this area deserves study. Two of the five caves visited are small and of little interest. Grutas de Monteflor is a well-decorated, horizontal cave with several hundred meters of passage. Cueva del Guano has a large bat population in its upper levels, but a lower-level stream passage contains good habitats for both aquatic and terrestrial invertebrates. The largest cave in the area, Cueva del Guayabo, is a long, horizontal cave which has not been well explored; pools in the lower part of the cave are apparently left from seasonal artesian flooding.

This region, still poorly known biologically, contains 42 identified species of cavernicole, of which eight are troglobites. The aquatic troglobitic fauna includes the endemic palaemonid shrimp *Neopalaemon nahuatlus* Hobbs, an undescribed stenasellid isopod, and the crayfishes *Procambarus (Austrocambarus) oaxacae oaxacae* Hobbs and *P. (A.) oaxacae ?reddelli* Hobbs. The latter subspecies is separated from the other by the Río Valle Nacional and is otherwise known from caves in the Acatlán and Atoyac regions. The terrestrial troglobite fauna includes the hyid pseudoscorpion *Troglohya carranzai* Beier, an undescribed genus and species of trichopolydesmid milliped, an undescribed nicoletiid thysanuran, and a collembolan of the subfamily Paronellinae. The terrestrial troglophile fauna includes several endemic species: the schizomids *Schizomus moisii* Rowland and *S. stewarti* Rowland, the opilionid *Hoplobunus spinooculorum* Goodnight and Goodnight, the pyrgodesmid milliped *Myrmecodesmus amplus* Causey, and the leiodid beetle *Ptomaphagus (Adelops) reddelli* Peck. Other troglophiles, all typical representatives of the cavernicole fauna of southern México, include the amblypygid *Paraphrynus aztecus* (Pocock), ctenid spiders of the genus *Ctenus*, the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the nesticid spider *Eidmannella pallida* (Emerton), the tetrablemmid spider *Matta sbordonii* (Brignoli), cleidogonid millipeds of the genus *Cleidogona*, campodeid diplurans, the collembolan *Acherontiella sabina* Bonet, scydmaenid beetles of the genus *Scydmaenus*, and staphylinid beetles of the genus *Belonuchus*.

San Pablo Zoquitlán, Puebla.—This region is located in extreme southeastern Puebla and comprises an area of Cretaceous limestone with much internal drainage. Although nine caves have been biologically investigated, the region remains poorly known. Cave development in the area appears to be largely vertical and several caves attain considerable depth. The most notable of these are Sótano de Coyomeapan which terminates in a sump at 166 meters (Atkinson, 1978) and Cueva de Xocotlat which has been explored to a depth of 339 meters, but remains largely unexplored (Atkinson and Forsythe, 1979). These two caves have very large streams and exploration is difficult and hazardous.

Only 17 species have been identified, of which the only troglobite is an eyeless nesticid spider of the genus *Nesticus*. The troglophile fauna includes the amblypygid *Paraphrynus mexicanus* (Bilimek), agelenid spiders of the genera *Cicurina* and *Tegenaria*, the pholcid spider *Coryssocnemis abernathyi* Gertsch, an opilionid of the genus *Hoplobunus*, nicoletiid thysanurans, and staphylinid beetles of the genus *Stilicolina*.

Atoyac, Veracruz.—This region is located east of Córdoba and comprises Cretaceous limestone mountains extending from the vicinity of Cuitlahuac northwest for about 30 kilometers. The exact extent of the region is not known but includes the town of Atoyac and the higher mountains north of Potrero. Elevations range from less than 300 meters to more than 1,000 meters. At higher elevations near the village of Manzanillo, karst development is moderate with numerous shallow dolinas, many small pits, lapiez, and pinnacles. Much of the drainage is internal, water exiting from large springs at much lower elevations. No large caves are known from the higher elevations and most were found to be short, horizontal tunnels or small pits. At and near the base of the range, however, several significant caves were found. The most notable of these is the famous Grutas de Atoyac, a horizontal cave of several hundred meters in length, located on the cliffs overlooking the canyon of the Río Atoyac. Other interesting caves include Cueva de Sala de Agua north of Cuitlahuac and Cueva del Ojo de Agua Grande north of Potrero Viejo, from both of which large streams emerge. Despite the fact that 25 caves are known for the region, it has not been given the attention it obviously deserves and remains only barely studied.

The cavernicole fauna of the Atoyac region is among the richer in southern México, both with respect to its aquatic and terrestrial troglobite fauna. Of 111 species identified from the Atoyac region, 23 are troglobites. The aquatic troglobites include an undescribed species of flatworm of the genus *Dugesia*, the asellid isopod *Caecidotea pasquinii* (Argano), the stenasellid isopod *Mexistenasellus magniezi* Argano, the anthurid isopod *Cyathura sbordonii* Argano, the trichoniscid isopod *Typhlotricholigioides aquaticus* Rioja, the bogidiellid amphipod *Bogidiella arganoi* Ruffo and Vigna Taglianti, and the crayfishes *Procambarus (Austrocambarus) oaxacae reddelli* Hobbs and *P. (A.) rodriguezi* Hobbs. With the exception of the crayfish *P. (A.) oaxacae reddelli* all of these species are endemic to this region. *Typhlotricholigioides* is an endemic genus, while *Bogidiella arganoi* and the two crayfishes are most closely allied with species known only from southern México. The remaining fauna belongs to genera ranging widely in southern México and the Sierra Madre Oriental. The terrestrial troglobites include the squamiferid isopod *Trichorhina atoyacensis* Mulaik, the trichoniscid isopod *Brackenridgia villalobosi* (Rioja), the scorpion *Vaejovis gracilis* Gertsch and Soleglad, the schizomid *Schizomus firstmani* Rowland, the pholcid spiders *Metagonia atoyacae* Gertsch and *Pholcophora troglodyta* Gertsch and undescribed species of both genera, the glomerid milliped *Glomeroides pellucidus* Shear, the cleidogonid milliped *Cleidogona crucis* (Chamberlin), the oniscodesmid milliped *Bonetesmus verus* Chamberlin, the campodeid dipluran *Plusiocampa (Litocampa) atoyacensis* Wygodzinsky, an entomobryid collembolan of the genus *Trogolaphysa*, the hypogastrurid collembolan *Acherontides atoyacense* Bonet, and the oncopodurid collembolan *Oncopodura atoyacense* Bonet. This fauna, like the aquatic species, is closely allied both to that of southern México and the Sierra Madre Oriental.

The troglophile fauna is typical of the cave fauna of southern and eastern México. Aquatic species of interest include a flatworm of the genus *Dugesia*, the asellid isopod *Caecidotea puebla* (Cole and Minckley), and an undescribed crayfish of the genus *Procambarus (Austrocambarus)*. The terrestrial fauna includes several species known only from this region: the armadillid isopod *Cubaris mirandai* Rioja; the schizomid *Schizomus sbordonii* Brignoli; the watobiid centipede *Cruzobius atoyacus* Chamberlin; and the pyrgodesmid millipeds *Myrmecodesmus clarus* (Chamberlin) and *M. fuscus* (Causey). Other troglophiles include a chthoniid pseudoscorpion of the genus *Tyrannochthonius;* an undescribed schizomid of the genus *Schizomus;* the amblypygid *Paraphrynus aztecus* (Pocock); a ctenid spider of the genus *Ctenus;* the mysmenid spiders *Maymena delicata* Gertsch and *M. mayana* (Chamberlin and Ivie); the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch; pholcid spiders of the genera *Metagonia* and *Modisimus;* a scytodid spider of the genus *Loxosceles;* the opilionids *Hoplobunus robustus* Goodnight and Goodnight and *Karos rugosus* Goodnight and Goodnight; a milliped of the genus *Sphaeriodesmus;* campodeid diplurans; a collembolan of the genus *Pseudosinella;* a cixiid homopteran; the leiodid beetle *Dissochaetus hetschkoi* Reitter; scydmaenid beetles of the genera *Euconnus (Napochus)* and *Scydmaenus;* and staphylinid beetles of the genera *Belonuchus* and *Homaeotarsus.*

Orizaba, Veracruz.—This region includes the high mountains located south of the cities of Orizaba and Ciudad Mendoza. Elevations range from about 1,000 to more than 1,500 meters. Several limestone units crop out in the area, the most important of which appear to be the Coyametla-Orizaba Formation and the Maltrata-Guzmantla Formation (Salínas, 1960). The greatest development of karst occurs in the higher areas near the towns of Tequila and Soledad Atzompa, with the principal karst forms being large dolinas and deep vertical sinkholes. Drainage in these areas is largely internal, and the water entering caves in the area probably emerges from several large springs at the base of the mountains south of Orizaba and Ciudad Mendoza. One of these springs flows from the entrance of Cueva Macinga, a cave about 200 meters long. Other caves at lower elevations may have served as exits for water at earlier times. These include Cueva del Diablo, a 200-meter-long cave near Ciudad Mendoza and Cueva del Ojo de Agua de Tlilapan, a two-room cave located above a large spring south of Orizaba. Caves in the vicinity of Tequila are mostly pits ranging in depth from a few meters to more than 100 meters. One large cave, Cueva de la Cascada, is essentially a single horizontal passage containing a small stream. All of the caves visited near Soledad Atzompa are largely vertical, with one, Sótano Itamo, attaining an explored depth of 454 meters.

The fauna of this region is still incompletely known, but 104 species, including 12 troglobites, have been identified. The terrestrial troglobite fauna includes the trichoniscid isopod *Brackenridgia villalobosi* (Rioja), the chactid scorpion *Typhlochactas reddelli* Mitchell, the hyid pseudoscorpion *Mexobisium paradoxum* Muchmore, an undescribed ideoroncid pseudoscorpion, the schizomid *Schizomus* *pallidus* Rowland, the nesticid spider *Nesticus arganoi* Brignoli, the oniscodesmid milliped *Bonetesmus ojo* Shear, the rhachodesmid milliped *Acutangulus alius* Causey, an undescribed species of the milliped family Trichopolydesmidae, a collembolan of the genus *Pseudosinella*, a kinnarid homopteran, and the carabid beetle *Platynus (Mexisphodrus) veraecrucis* (Barr). With the exception of the two millipeds, all of the fauna belongs to groups widespread in southern and eastern México. *Bonetesmus* and *Acutangulus* are primarily restricted to southern México.

The troglophile fauna includes several endemic species, among which are the schizomid *Schizomus lanceolatus* Rowland; the pholcid spiders *Coryssocnemis placidus* Gertsch and *Modisimus beneficus* Gertsch; and the opilionid *Karos brignolii* Silhavý. Other troglophiles of interest include the amblypygid *Paraphrynus aztecus* (Pocock); ctenid spiders of the genus *Ctenus;* the mysmenid spiders *Maymena cascada* Gertsch and *M. mayana* (Chamberlin and Ivie); the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch; pholcid spiders of the genera *Coryssocnemis* and *Psilochorus;* the tetrablemmid spider *Matta sbordonii* (Brignoli); the opilionids *Hoplobunus robustus* Goodnight and Goodnight and *Karos rugosus* Goodnight and Goodnight; a rhagidiid mite; cleidogonid millipeds of the genus *Cleidogona;* sphaeriodesmid millipeds of the genus *Sphaeriodesmus;* campodeid diplurans; collembolans of the genus *Pseudosinella;* the psocid *Psyllipsocus ramburii* Selys-Longchamps; the carabid beetles *Paratrechus (Paratrechus) mexicanus* Putzeys and *Platynus tlamayaensis* (Barr); scydmaenid beetles of the genus *Euconnus;* and staphylinid beetles of the genus *Belonuchus.* This fauna is also typical of that of southern and eastern México.

Tezonapa, Veracruz.—This poorly defined region is located about 20 kilometers west-southwest of the town of Tezonapa. The only cave visited, Cueva de Ungurria, is located now on an island in the Río Tonto. The lower parts of the cave are flooded as a result of raised water levels from the Miguel Alemán Reservoir. The cave itself now has limited access, but considerable karst development on the island indicates that the area is promising.

The fauna of Cueva de Ungurria includes 14 species, of which two are troglobites. The troglobites are the glomerid milliped *Glomeroides addititius* Causey and a collembolan of the subfamily Paronellinae. The troglophile fauna includes a species of the schizomid genus *Schizomus*, the amblypygid *Paraphrynus aztecus* (Pocock), a scytodid spider of the genus *Loxosceles*, campodeid diplurans, and a scydmaenid beetle of the genus *Scydmaenus.*

Chiapas-Guatemala Highlands

The Chiapas-Guatemala Highlands province is a title applied by Raisz (1964) to the mountainous regions of Guatemala and Belize and the mountains of México east of the Isthmus of Tehuantepec. The area has been concisely described by West (1964), and the discussion below relies heavily upon his account. A series of arcuate ranges and depressions begins in Chiapas, extends generally northwest-southeast into Guatemala where it continues more nearly west-east. The first major range is a series of igneous mountains, the northern part of which is the Sierra Madre de Chiapas, rising from the Pacific coastal plain. To the north of this is a major depression known as the Chiapa Depression in México and the Motagua Valley in Guatemala. Rising from this is a second major series of mountains. The southern part of the range is a high, plateau-like region that begins as the Sierra de San Cristóbal in Chiapas, becomes the Altos Cuchumatanes and highlands of Alta Verapaz in Guatemala, and finally the Sierra de Santa Cruz near the Caribbean coast. Along the northern edge of this plateau lies a series of folded ranges. Beginning in México as the Sierra de los Lacandones, the ranges descend to form low, knob-like mountains in the southern Petén of Guatemala, and then rise to form the Maya Mountains of Belize.

The geology of the Chiapas-Guatemala Highlands is complex and not very well known. Gutiérrez Gil. (1956) and Olivas (1956) have summarized the geology of Chiapas. The geology of southeastern México and northern Guatemala is discussed by López Ramos (1969), while Vinson (1962), Bonis (1969), and Nagle et al. (1977) briefly summarize Guatemalan geology. Dixon (1957) gives an account of the geology of southern Belize.

The Sierra Madre de Chiapas is a batholith of Paleozoic age composed mainly of granite and diorite partly covered in the southern part by Cretaceous rocks. The Guatemalan continuation is largely mantled by lava and ash deposits. Most of the area is, of course, noncavernous, but two caves in the Motozintla region have been studied.

The Chiapa Depression is a wide basin drained by the Río Grijalva and its tributaries. The basin rises gradually from about 700 meters along the Guatemalan border to about 900 meters in the northwest. The Río Grijalva cuts through the basin, its canyon gradually increasing in depth. It finally dissects the Sierra de San Cristóbal in the great gorge known as El Sumidero. The principal rock units in the area are of Cretaceous age, but some Eocene and Oligocene deposits occur. The Guatemalan portion of this depression is drained by the Río Motagua and is generally more dissected than in Chiapas. Numerous caves are known in the Chiapa Depression, mostly in the vicinities of Tuxtla Gutiérrez, Ocozocoautla, and Malpaso.

The central plateau of Chiapas is among the great karst regions in México. The plateau rises steeply from the Chiapa Depression to an elevation of about 2,300 meters. Parts of the plateau, such as near San Cristóbal de las Casas, are rolling plains with numerous shallow dolinas. In other areas there is the greatest development of karst in México, with sinkholes, dolinas, poljes, and sinking streams occurring everywhere on the Cretaceous limestone surface. This is the best-studied part of Chiapas; 48 caves have been studied biologically. This surface continues on a lesser scale into the Altos Cuchumatanes of Guatemala which attains an altitude of more than 3,000 meters. Farther east in Alta Verapaz the topography is more rugged; and in the vicinity of Cobán, it is broken into three parallel mountain ranges separated by basins. Karst development in this area is notable, with large caves, dolinas, sinking streams, and other solution features being abundant.

The northern side of the plateau is composed of a series of folded ranges in Cretaceous and Tertiary rocks. As the ranges pass into Guatemala, they decrease in height until they are hills in the southern Petén. In Belize the land rises in the Maya Mountains, where intrusive rocks and Pennsylvanian and older deposits are exposed. Limestones of Cretaceous to Eocene age are exposed to the north, south, and west of the Maya Mountains and support a mature karst topography.

Altamirano, Chiapas.—This region is located near the towns of Altamirano and Ocosingo in the folded mountains north of the high plateau. Eight caves have been studied, seven of which are described by Sbordoni et al. (1977). The caves are generally horizontal and at least one, Sumidero de Panteón, receives considerable floodwater.

The caves appear to be quite rich biologically, but little has been published on them to date. Of 16 species thus far reported, four are troglobites. Three of the troglobites are aquatic and include the asellid isopod *Caecidotea vomeroi* Argano and the bogidiellid amphipods *Bogidiella sbordonii* Ruffo and Vigna Taglianti and *B. tabascensis* Villalobos. The last species is also known from Grutas del Coconá near Teapa, Tabasco. The only terrestrial troglobite is an undescribed roach of the genus *Nelipophygus*. This is the only troglobitic roach in México; the genus is otherwise known from Jamaica where a troglobitic species also occurs. The troglophile fauna includes the amphipod *Hyalella azteca* Saussure, the ochyroceratid spider *Ochyrocera fagei* Brignoli, the oonopid spider *Oonops chickeringi* Brignoli, the pholcid spider *Coryssocnemis pecki* Gertsch, and the roach *Nesomylacris lateralis* Fisk. Except for the widespread amphipod *H. azteca* and the spider *C. pecki*, all of the troglophiles are endemic to this region. The latter species is also known from caves in the San Cristóbal de las Casas region.

Bochil and Soyalo, Chiapas.—This region is located to the northwest of San Cristóbal de las Casas. The six caves studied occur at elevations ranging from 1,250 to 1,600 meters and are described by Sbordoni et al. (1974, 1977). Several of the caves are rather large and generally horizontal. Sumidero del Naranjo receives some floodwater, and Cueva del Nacimiento del Río Santo Domingo contains a large stream.

Although most of the cave fauna remains to be reported on, 16 species have been identified, of which three are troglobites. The troglobites are the opilionid *Troglostygnopsis anophthalma* Silhavý, the glomeridesmid milliped *Glomeridesmus ?sbordonii* Shear, and the trichopolydesmid milliped *Caramba delnegro* Shear. The opilionid and trichopolydesmid milliped are endemic to the region, but *G. sbordonii* is also known from Grutas del Coconá, Tabasco. The troglophile fauna includes the crayfish *Procambarus (Austrocambarus) sbordonii* Hobbs, the schizomid *Schizomus arganoi* Brignoli, the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the nesticid spider *Eidmannella pallida* (Emerton), the pyrgodesmid milliped *Synoptura italolegata* (Shear), the sphaeriodesmid millipeds *Sphaeriodesmus golondrinensis* Shear and *S. redondo* Shear, the roach *Aglaopteryx chiapas* Fisk, and a species of leiodid beetle of the genus *Ptomaphagus (Adelops)*. With the exception of the two spiders and the milliped *S. italolegata* all of these species are endemic to the region. The spiders are widespread in southern México and *S. italolegata* is also known from other parts of Chiapas east into the Yucatán Peninsula.

Comitán de Domínguez, Chiapas.—This region is located in the vicnity of the town of Comitán de Domínguez in eastern Chiapas. The principal cavernous formation in the region is the Sierra Madre Limestone of Cretaceous age (Gutiérrez Gil, 1956). Only two caves have been studied in this area, the largest of which is Cueva del Tío Ticho (Sbordoni et al., 1974). This cave is a sinkhole about 60 meters deep, with a stream at the bottom. The other cave is small and of little interest. Both caves are located at an altitude of about 1,700 meters.

The fauna of the region is of considerable interest and further study should greatly increase the number of species known. Of the 25 species recorded, five are troglobites: the trichoniscid isopod *Brackenridgia acostai* (Rioja), the crab *Typhlopseudothelphusa mocinoi* Rioja, the syarinid pseudoscorpion *Pachychitra grandis* Muchmore, an undescribed species of schizomid of the genus *Schizomus*, and the carabid beetle *Mexanillus sbordonii* Vigna Taglianti. *Brackenridgia acostai* is also known from the Montebello region, and *T. mocinoi* has been found in the San Cristóbal de las Casas region. Troglophiles of interest include the leptonetid spider *Archoleptoneta obscura* Gertsch, the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch, the pholcid spider *Pholcophora evansi* Gertsch, the ricinuleid *Cryptocellus ?bolivari* Gertsch, the pyrgodesmid milliped *Synoptura tioticho* (Shear), the psocid *Psyllipsocus ramburii* Selys-Longchamps, and the carabid beetle *Platynus colibor* Whitehead. All are typical elements of the cave fauna of southern México.

Ixtacomitán, Chiapas.—This region is located in extreme northwestern Chiapas near the Tabasco border. Very little work has been done in this region and only three caves have been studied. Most of the material collected remains to be studied. Sbordoni et al. (1977) described the two caves studied by them. They are located at elevations of 180 and 280 meters. The largest cave, Sótano de Malpaso, is a 38-meter-deep sinkhole dropping to a short passage.

Only four species have been reported so far from this region, none of which are troglobites. The only two probable troglophiles are the phalangodid opilionids *Paramitraceras femoralis* Goodnight and Goodnight and *Sbordonia armigera* Silhavý. The latter species is endemic to Sótano de Malpaso.

Malpaso, Chiapas.—This region is located in western Chiapas near the border of Veracruz. The caves all occur along the Río de la Venta, Río Negro, and Lago de Malpaso at elevations from 115 to 130 meters. The caves range in size from small, shelter-like rooms to long, largely unexplored stream caves; these are described by Sbordoni et al. (1977).

Most of the fauna remains to be studied, but 16 species, of which two are troglobites, have been identified from the 10 caves examined. The troglobites, both endemic to this region, are the opilionid *Mexotroglinus sbordonii* Silhavý and the trichopolydesmid milliped *Caramba delburro* Shear. Troglophiles include the cleidogonid milliped *Cleidogona hunapu* Shear, nicoletiid thysanurans, and leiodid beetles of the genus *Ptomaphagus (Adelops)*.

Montebello, Chiapas.—This region is located in eastern Chiapas near the Guatemalan border and is centered around the enclosed basin known as Lagunas de Montebello. The eight caves studied are at elevations from 1,470 to 1,600 meters and are described by Sbordoni et al. (1974, 1977). Although most of the caves are rather small, Grutas de Zapaluta is quite large with more than a kilometer of surveyed passage. A map of Grutas de Zapaluta is in Thompson (1972). Several of the caves near Lagunas de Montebello contain water, and one (Cueva del Arco) is a stream passage. The karst topography in the vicnity of Lagunas de Montebello is well developed and resembles Yucatán by having large cenote-like water-filled sinkholes.

Much of the fauna of this region remains to be studied, but 49 species, of which five are troglobites, have been identified. The troglobites are the trichoniscid isopod *Brackenridgia acostai* (Rioja), the palaemonid shrimp *Bithynops luscus* Holthuis, the hyid pseudoscorpion *Troglohya mitchelli* Muchmore, an undescribed schizomid of the genus *Schizomus*, and the rhachodesmid milliped *Aceratophallus ?scutigeroides* Shear. *Brackenridgia acostai* is also known from the Comitán de Domínguiz region, and the milliped is tentatively identified with a species otherwise known from caves in Alta Verapaz, Guatemala. The remaining species are known only from this region. The shrimp genus *Bithynops* includes only two species, the troglobitic *B. luscus* and the troglophilic *B. perspicax* Holthuis, also known from this region.

The troglophilic fauna includes, in addition to *B. perspicax*, two crayfish, *Procambarus (Austrocambarus) mirandai* Villalobos and *P. (A.) pilosimanus* (Ortmann). The terrestrial troglophile fauna includes the armadillid isopod *Venezillo chiapensis* Rioja, the amblypygid *Paraphrynus williamsi* Mullinex, the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch, the pholcid spider *Pholcophora evansi* Gertsch, the ricinuleid *Cryptocellus bolivari* Gertsch, pyrgodesmid millipeds of the genus *Synoptura*, the carabid beetle *Platynus colibor* Whitehead, and staphylinid beetles of the genus *Belonuchus*. All of the troglophiles are representative of genera common throughout southern and eastern México.

Motozintla, Chiapas.—This region is located in southeastern Chiapas along the northern slopes of the Sierra Madre de Chiapas. The two caves studied are formed in the Cretaceous Sierra Madre Limestone (López Ortiz, 1962; Santiago Acevedo, 1962) at elevations of 2,140 and 2,560 meters. These two fairly large caves are described in Sbordoni et al. (1977).

The fauna of this region remains in large part unstudied, but eight species, of which five are troglobites, have been reported. The large number of troglobites indicates that additional discoveries of interest await study. The only aquatic troglobite known from the region is the bogidiellid amphipod *Bogidiella* sp. cf. *vomeroi* Ruffo and Vigna Taglianti. *Bogidiella vomeroi* is known from the Simojovel and Tila region. The terrestrial troglobites are the opilionid *Hoplobunus zullinii* Silhavý, the trichopolydesmid millipeds *Caramba grandeza* Shear and *Tylogoneus* sp., and the leiodid beetle *Ptomaphagus (Adelops)* sp. The troglophiles are the pyrgodesmid millipeds *Myrmecodesmus inornatus* Shear and *Synoptura zullinii* (Shear) and the sphaeriodesmid milliped *Sphaeriodesmus trullatus* Shear. The genus *Caramba* is known only from caves in Chiapas; otherwise the fauna is typical of that of southern and eastern México.

Palenque, Chiapas.—This is a poorly defined region located south of Palenque and including Salto de Agua. The only cave so far visited is Cueva del Salto de Agua, a large seasonal resurgence located near the town of Salto de Agua. Two species, an undetermined rhachodesmid milliped and an ant of the genus *Pachycondyla*, have been identified.

Rancho del Cielito, Chiapas.—This region is located near the village of Colonia Galeana in western Chiapas. The only caves studied in the area are Cueva de las Canícas at an elevation of 1,350 meters and Cueva del Cerro Brujo at 1,320 meters. The first cave is a 20-meter-deep sinkhole leading to a small passage; the latter cave is complex and only partially explored. Both caves are described by Sbordoni et al. (1974).

The fauna of this region remains poorly studied and only seven species, of which three are troglobites, have been reported. The troglobites are the trichoniscid isopod *Brackenridgia* sp., the bogidiellid amphipod *Bogidiella sbordonii* Ruffo and Vigna Taglianti, and the ricinuleid *Cryptocellus sbordonii* Brignoli. All are typical elements of the Chiapas fauna. The troglophiles are the mysmenid spider *Maymena sbordonii* Brignoli and the nesticid spider *Eidmannella pallida* (Emerton). *Maymena sbordonii* is known only from this region, while *E. pallida* is a widespread species throughout North America.

San Cristóbal de las Casas, Chiapas.—This region, located on the plateau-like Sierra de San Cristóbal, extends from San Cristóbal de las Casas to the vicinity of Comitán de Domínguez. Karst development is considerable and includes areas of dolinas with little relief. Other areas, however, contain the greatest development of karst in North America, with huge sinkholes, sinking streams, poljes, and pinnacles. The geology along the highway from San Cristóbal de las Casas to Comitán de Domínguez is discussed by Gutiérrez Gil (1956). The caves, many of which are described by Sbordoni et al. (1974, 1977), are probably formed in the Sierra Madre Limestone and occur at elevations from 1,820 to 2,520 meters. The caves range from shallow pits with minimal horizontal extent to large horizontal caves and stream systems. Grutas de Rancho Nuevo is located about 10 kilometers from San Cristóbal de las Casas on the highway to Comitán de Domínguez and is an extensive horizontal system with more than two kilometers of surveyed passage (Thompson, 1972). Several major caves are known in the vicinity of Huixtán. The largest of these is Sumidero Yochib with a depth of 213 meters and a surveyed length of 3,316 meters (Van Note, 1977). Sumidero Yochib contains one of the larger underground streams in México and is very dangerous. Other major stream caves in the Huixtán area are Cueva Mapachero and Salida de Cruz Pilal.

The San Cristóbal de las Casas region is one of the better studied in Chiapas with respect to its invertebrate cave fauna despite the fact that much of the material collected by the Italian biospeleologists remains unstudied. The 38 investigated caves contain 53 identified species, of which 14 are troglobites. The aquatic fauna is particularly interesting and includes seven troglobites: the dimarcusid flatworm *Opisthobursa josephinae* Benazzi; the dugesiid flatworm *Dugesia mckenziei* Mitchell and Kawakatsu; the asellid isopod *Caecidotea chiapas* Bowman; the bogidiellid amphipods *Bogidiella orchestipes* Ruffo and Vigna Taglianti, *B. sbordonii* Ruffo and Vigna Taglianti, and *B. tabascensis* Villalobos; and the crab *Typhlopseudothelphusa mocinoi* Rioja. With the exception of *B. tabascensis* (known also from Grutas del Coconá, Tabasco) and *T. mocinoi* (known also from the Comitán de Domínguez region) all of these species are endemic to this region. The terrestrial troglobites are an undescribed species of schizomid of the genus *Schizomus*, the opilionid *Troglostygnopsis anophthalma* Silhavý, a glomerid milliped of the genus *Glomeroides*, the cleidogonid milliped *Cleidogona felipiana* Shear, a collembolan of the subfamily Paronellinae, and the carabid beetle *Chiapadytes bolivari* Vigna Taglianti. The last species is the only troglobitic trechine beetle in Chiapas and is endemic to this region.

The only aquatic troglophile in the region is the ubiquitous amphipod *Hyalella azteca* (Saussure). Terrestrial troglophiles of interest are the agelenid spider *Tegenaria florea* Brignoli; the leptonetid spider *Archoleptoneta arganoi* (Brignoli); the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch; the pholcid spiders *Coryssocnemis pecki* Gertsch, *Modisimus propinquus* O. P.-

Cambridge, and *Pholcophora bispinosa* Gertsch; the ricinuleid *Cryptocellus bolivari* Gertsch; the pyrgodesmid millipeds *Myrmecodesmus fissus* (Causey) and *Synoptura tioticho* (Shear); the sphaeriodesmid millipeds *Sphaeriodesmus cruzbelem* Shear and *S. zontehuitz* Shear; the roach *Aglaopteryx chiapas* Fisk; and the histerid beetle *Anapleus wenzeli* Vomero. All of these species are typical representatives of the cavernicole fauna of eastern and southern México.

Simojovel and Tila, Chiapas.—This region is located in north-central Chiapas in the vicinity of the towns of Simojovel and Tila. The eight caves studied in the region are described by Sbordoni et al. (1977) and are located at elevations of 810 to 1,790 meters. The caves are generally large and most contain either standing or running water. Several remain largely unexplored and may prove to be quite extensive.

Of the 17 identified species, four are troglobites. The aquatic fauna includes the asellid isopod *Caecidotea zullinii* Argano, the bogidiellid amphipod *Bogidiella vomeroi* Ruffo and Vigna Taglianti, and the trichodactylid crab *Trichodactylus (Rodriguezia) mensabak* Cottarelli and Argano. The last species is the only troglobite in the family Trichodactylidae. The two crustaceans are known with certainty only from this region, but are closely related to species occurring elsewhere in Chiapas, Oaxaca, and Veracruz. The only terrestrial troglobite is the euryurid milliped *Polylepiscus vomeroi* Shear. This species is of special interest in that it is the only troglobite in the family Euryuridae. The troglophile fauna includes the nesticid spider *Gaucelmus calidus* Gertsch and the pyrgodesmid milliped *Synoptura italolegata* (Shear); both are widespread in southern México.

Tuxtla Gutiérrez, Chiapas.—This region is located in the Chiapa Depression and includes caves in the vicinity of Tuxtla Gutiérrez, Berriozabal, and Ocozocoautla. Most of the caves are described by Sbordoni et al. (1974, 1977) and are located at elevations ranging from 460 to 950 meters. The region is characterized by relatively low relief and numerous small mesa-like hills. Gutiérrez Gil (1956) and Olivas (1956) have discussed the geology of the region. Cretaceous and Eocene limestone crops out in the area. The principal Cretaceous formations are the Ocozocoautla and Sierra Madre Limestones, and most of the caves probably are formed in one of these formations. Cueva Cerro Hueco, a horizontal cave from which a stream emerges, may be formed in an unnamed Eocene limestone. Cave development in the area is generally horizontal, although a few sinkholes up to 75 meters in depth are known. Many of the caves visited are small, but some are large and of greater interest. Hoyo de Don Nicho to the west of Ocozocoautla contains a stream passage several hundred meters long at the bottom of a 20-meter-deep sinkhole. The largest cave in the area is Cueva del Chorreadero. This is a major stream cave 345 meters deep and with more than three kilometers of surveyed passage (Thompson, 1972; Shawcross et al., 1974).

The Tuxtla Gutiérrez region is the best-studied part of Chiapas, with 81 species having been identified from the 22 investigated caves. The fauna, however, includes only one possible troglobite, an undescribed milliped of the family Trichopolydesmidae. The aquatic fauna includes, in addition to several species of nematode, the crayfish *Procambarus (Austrocambarus) mirandai* Villalobos and the catfish *Rhamdia guatemalensis* Günther. Both endemic and more widely distributed species are represented in the terrestrial troglophile fauna. The endemic species are the isopod *Trichorhina vandeli* Rioja; the pholcid spiders *Coryssocnemis facetus* Gertsch, *Metagonia mcnatti* Gertsch, and *Modisimus tzotzile* Brignoli; the scytodid spider *Loxosceles tehuana* Gertsch; the opilionid *Akdalima vomeroi* Silhavý; the pyrgodesmid milliped *Synoptura rodriguezi* (Shear); the roach *Pseudomops nigrimaculis* Fisk; and the scydmaenid beetle *Euconnus (Madagassoconus) arganoi* Franz. Other troglophiles of interest are the schizomid *Schizomus portoricensis* (Chamberlin), the amblypygid *Paraphrynus aztecus* (Pocock), the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch, the pholcid spiders *Modisimus propinquus* O. P.-Cambridge and *Physocyclus globosus* (Taczanowski), the opilionid *Arganotus macrochelis* (Goodnight and Goodnight), the pyrgodesmid milliped *Synoptura italolegata* (Shear), the carabid beetle *Platynus colibor* Whitehead, and the leiodid beetle *Dissochaetus curtus* Portevin. All of these species are typical representatives of the fauna of southern México.

Tapijulapa, Tabasco.—This region is located near the town of Tapijulapa in south-central Tabasco near the Chiapas border. The only cave studied in the area is Cueva del Azufre a few kilometers south of Tapijulapa at an altitude of 50 meters. The geology of this region has been examined by Salas and López Ramos (1951) who report the presence of Cretaceous limestone of the Guayal Formation in the area of Tapijulapa. A stream of sulphurous water flows from the cave, which is about 500 meters long and contains a large bat colony in one part.

The fauna of the cave remains somewhat imperfectly known, but 20 species, of which two are troglobites, have been identified. The two troglobites are flatworms of the genus *Dugesia* and a blind population of the fish *Poecilia sphenops* Valenciennes. Troglophiles recorded from the cave include the trichodactylid crab *Trichodactylus (Rodriguezia) bidens* Bott, the chernetid pseudoscorpion *Lustrochernes ?minor* Chamberlin, an undescribed amblypygid of the genus *Phrynus*, an araneid spider of the genus *Tetragnatha*, the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the nesticid spiders *Eidmannella pallida* (Emerton) and *Gaucelmus calidus* Gertsch, and a hemipteran of the genus *Belostoma*.

Teapa, Tabasco.—This region is located near the town of Teapa in south-central Tabasco along the border of Chiapas. Contreras V. (1958) has discussed the geology of this region and reported the presence of the Sierra Madre Limestone. The karst in this area is well developed with lapiez, pinnacles, towers, and other forms occurring in abundance. The known caves all occur at elevations of about 40 meters, but immediately to the south the main mass of the mountains of Chiapas rises to more than 2,700 meters. Many caves are known to exist in this region from which numerous species of bat have been reported. Only five caves, however, have been studied with respect to their invertebrate fauna. With the exception of the large, semi-commercial Grutas del Coconá, all are small and of limited interest. Grutas del Coconá, however, is an extensive horizontal cave with almost one kilometer of passage. The cave is a fossil resurgence and deep lakes occur there with occasional running water in the back portions of the cave.

Although 59 species have been reported from the caves of the Teapa region, 23 of these are bats. The remaining fauna is particularly rich and includes eight troglobites. Three aquatic troglobites are known: the dimarcusid flatworm *Opisthobursa mexicana* Benazzi, the bogidiellid amphipod *Bogidiella tabascensis* Villalobos, and the palaemonid shrimp *Macrobrachium acherontium* Holthuis. The shrimp and flatworm are endemic to this region, and the amphipod has been tentatively identified from caves in Chiapas. The terrestrial troglobites are the hyid pseudoscorpion *Mexobisium maya* Muchmore, the schizomid *Schizomus pecki* Rowland, the amblypygid *Paraphrynus chiztun* (Rowland), the glomeridesmid milliped *Glomeridesmus sbordonii* Shear, and the histerid beetle *Troglobacanius maya* Vomero. With the possible exception of *G. sbordonii* which has been tentatively identified from a cave in Chiapas, all of these species are endemic to the Teapa region. All are also closely related to other species from eastern and southern México. *Glomeridesmus sbordonii* is of interest in being the only troglobitic member of the order Glomeridesmida in the New World. The genus *Troglobacanius* is otherwise known only from caves in San Luis Potosí and Tamaulipas.

The troglophile fauna includes a schizomid *Schizomus trilobatus* Rowland, an amblypygid of the genus *Phrynus*, the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the oonopid spider *Triaeris patellaris* Bryant, the pholcid spider *Modisimus iviei* Gertsch, the pyrgodesmid milliped *Cryptyma cocona* Shear, nicoletiid thysanurans, the leiodid beetle *Ptomaphagus (Adelops) tabascensis* Sbordoni, and the scydmaenid beetle *Scydmaenus teapanus* Franz. These species all belong to genera common to southern and eastern México.

Augustine, Cayo, Belize.—This region is located in west-central Belize on an outcrop of Cretaceous-Eocene limestone to the west of the Maya Mountains and south of the Río On. Elevations in this region range from 400 to 500 meters. Very little work has been done and there is confusion about how many caves have been studied. Seven names have been applied to caves in the area, but some of these are probably synonymous. The caves for which even fragmentary descriptions are available are associated with streams, the most notable of which is the Río Frío which passes through the region. The geology of the general area has been briefly discussed by Dixon (1957).

The fauna of the Augustine region is poorly known and of 35 species reported, only 23 are closely associated with caves. The only troglobite known is a hyid pseudoscorpion, *Mexobisium goodnight* Muchmore. Other troglophiles include the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the scytodid spider *Loxosceles yucatana* Chamberlin and Ivie, the opilionids *Erginulus serratipes* (Cambridge) and *Cynortina acanthotibialis* Goodnight and Goodnight, the pyrgodesmid millipeds *Myrmecodesmus brevis* Shear and *Rettenmeyeria cryptymoides* Shear, and the leiodid beetles *Dossochaetus hetschkoi* Reitter and *Ptomaphagus (Adelops) barbarae* Peck. Of particular interest is the presence in the caves of large numbers of psychodid flies, some of which are apparently troglophilic. The most abundant of these are *Lutzomyia beltrani* (Vargas and Díaz Nájera), *L. deleoni* (Fairchild and Hertig), *L. shannoni* (Dyar), and *L. trinidadensis* (Newst.). The fauna of this region is typical of that of southern México, although the presence of psychodid flies of the genus *Lutzomyia* has not been reported outside of southern Belize. The milliped *R. cryptymoides* is also the only cavernicole recorded for that genus.

Caves Branch, Cayo, Belize.—This region is located in central Belize north of the Maya Mountains. The terrain is characterized by well-developed *cockpit* karst, with hundreds of steep hills separated by enclosed valleys. Drainage is almost entirely subterranean and numerous major caves are found in the region. The caves are formed in Cretaceous limestone and occur at elevations from 40 to 120 meters (Dixon, 1957; Graham et al., 1980). Caves Branch is a stream flowing off the Paleozoic rocks of the Maya Mountains, across the karst surface eventually to enter the Sibun River. For about three kilometers in a direct line, and much more underground, it passes through a major cave, the Caves Branch Cave System. Most of the caves in the area have numerous entrances, known locally as *breakouts*, where collapse has opened the underground stream passage to the surface. Footprint Cave, a major cave, has only one entrance but more than seven kilometers of surveyed passage and includes both an upper-level dry area and a lower active stream passage (Graham et al., 1980).

The Caves Branch region is still inadequately studied biologically, but 33 species, including seven troglobites, have been identified. The troglobites include the vachoniid pseudoscorpion *Vachonium belizense* Muchmore, an undescribed schizomid of the genus *Schizomus*, an undescribed species of charontid amblypygid, the pholcid spider *Metagonia jarmila* Gertsch, the opilionids *Cynortina mistica* Goodnight and Goodnight and *Stygnomma pecki* Goodnight and Goodnight, and the cambalid milliped *Jarmilka alba* Shear. This fauna is particularly interesting in that it contains several quite distinctive elements. The charontid amblypygid is the only troglobitic representative of this family in North America; the opilionid genera *Cynortina* and *Stygnomma* are not otherwise known to have troglobites on mainland North America; and *Jarmilka alba* is an aberrant member of a family not otherwise known south of Oaxaca, México. The pseudoscorpion genus *Vachonium* is known only from caves in the Yucatán Peninsula and Belize. The remaining troglobites, as well as the troglophiles, are all typical members of the cavernicole fauna of southern México. Troglophiles of interest include the spiraxid snail *Streptostyla meridana meridana* (Morelet), the amblypygid *Paraphrynus raptator* (Pocock), the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), ochyroceratid spiders of the genera *Ochyrocera* and *Theotima*, an opilionid of the genus *Stygnomma*, the pyrgodesmid milliped *Myrmecodesmus unicorn* Shear, and the leiodid beetle *Ptomaphagus (Adelops) barbarae* Peck.

Cobán, Alta Verapaz, Guatemala.—This region is located in the vicinity of the town of Cobán in southwestern Alta Verapaz. The terrain in much of the region is characterized by a mature karst with numerous uvalas, dolinas, and solution valleys and by almost complete internal drainage. The principal limestone unit in the area was mapped by Walper (1960) as undifferentiated Ixcoy and Cobán Formations. Only four caves have been studied with respect to their invertebrate fauna. One, Cueva Chirrepeck, is located to the south of Cobán; two, Grotte C3 and Grotte G3, are in the Sierra de Pampur to the west of Cobán; and the third, Cueva Chiacam, is in the Sierra de Chama to the northeast of Cobán. Nothing is known of the nature of Cueva Chirrepeck, but the remaining caves are described in Delamare Deboutteville (1976) as being small and containing water.

Most of the collecting in this region was done by Swiss and French biospeleologists and reports on most of their material have not yet been published. The eighteen species which have been identified include five troglobites and several troglophiles of interest. The troglobites are the pseudothelphusid crabs *Typhlopseudothelphusa juberthiei* Delamare Deboutteville and *T. mitchelli* Delamare Deboutteville, the chthoniid pseudoscorpion *Paraliochthonius strinatii* Beier, the trichopolydesmid milliped *Chirrepeckia lyncilecta* Hoffman, and the campodeid dipluran *Juxtlacampa hauseri* Condé. The crab genus *Typhlopseudothelphusa* is otherwise known only by a species in Chiapas and the dipluran genus *Juxtlacampa* by a species in Guerrero. *Chirrpeckia* is a monotypic genus and *P. strinatii* is the only troglobite in the genus in North America. Troglophiles of interest include the neobisiid pseudoscorpion *Ideobisium simile* Balzan, the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the nesticid spider *Gaucelmus strinatii* Brignoli, the opilionid *Arganotus strinatii* Silhavý, and the pyrgodesmid milliped *Synoptura petrinus* (Hoffman). The last three species are endemic to this region, but otherwise the fauna is typical of southern México.

Lanquín, Alta Verapaz, Guatemala.—This region is located in east-central Alta Verapaz in the vicinity of the town of Lanquín. The geology, with special reference to karst morphology and speleogenesis, has been discussed by Smith (1968). The principal cave-bearing formations in the area are the Campur Formation of Cretaceous age and the Chochal Formation, probably of Permian age. The largest cave in the region, Grutas de Lanquín, is formed in the Campur Formation. The terrain is typical of many tropical regions and is referred to by Smith (1968) as *kegelkarst.* This is very similar to karst forms also referred to as *mogote* karst and *cockpit* karst. It is characterized by isolated conical hills separated by funnel-shaped dolinas, usually floored with red soil. In other parts of the region karst development is less mature and is characterized by shallower dolinas with more gentle slopes. Elevations range from about 300 to more than 1,500 meters. Most of the caves are rather small and generally horizontal, but Grutas de Lanquín is extensive. This commercial cave, a map of which is in Gurnee (1968), contains more than a kilometer of surveyed passage. A large stream flowing through part of the cave emerges below the entrance to become the Río Lanquín.

The Lanquín region is the best-studied part of Guatemala, with 47 species, four of which are troglobites, having been identified to date. The only aquatic troglobite is an undetermined flatworm of the family Dimarcusidae. The terrestrial troglobites are the hyid pseudoscorpion *Mexobisium guatemalense* Muchmore, the collembolan *Pseudosinella finca* Christiansen, and the leiodid beetle *Ptomaphagus (Adelops) giaquintoi* Jeannel. The flatworm and *M. guatemalense* are known only from this region, but the other species are also found in the adjacent Senahú region. Endemic troglophiles include the pseudothelphusid crab *Isabellagordonia (Isabellagordonia) longipes* Pretzmann, the amblypygid *Paraphrynus emaciatus* Mullinex, the pholcid spider *Modisimus gracilipes* Gertsch, the scytodid spider *Loxosceles guatemala* Gertsch, and the gryllid cricket *Arachnomimus cavicola* Saussure. More widespread troglophiles include the oonopid spider *Triaeris patellaris* Bryant, the pholcid spider *Metagonia blanda* Gertsch, the pyrgodesmid milliped *Cryptyma guatemala* Shear, and scydmaenid beetles of the genera *Euconnus (Napochus)* and *Scydmaenus.*

Raxrujá, Alta Verapaz, Guatemala.—This region, located in the vicinity of the town of Raxrujá in northern Alta Verapaz, has been studied by French speleologists. The geology, physiography, and speleogenesis of the region have been discussed by Courbon and Dreux (1976). The principal formations in the region are the Sepur, Campur, and Cobán Formations of Cretaceous age. Karst development, which is typical of that known as *kegelkarst,* is primarily formed on the Campur Formation. Of the three caves studied in the area, two are quite small. The third is the Sistema del Río Candelaria which represents the underground course of the Río Candelaria and actually consists of several isolated caverns having a total of about 17 kilometers of passage. A map of the cave is in Delamare Deboutteville and Juberthie (1976).

Essentially nothing has yet been published on the cave fauna of this region and only four species have so far been identified. Two species of shrimp of the genus *Macrobrachium* have been recorded for Sistema del Río Candelaria. The crayfish *Procambarus (Austrocambarus) pilosimanus* (Ortmann) is a troglophile in the other caves of the region.

Senahú, Alta Verapaz, Guatemala.—This region is located to the southeast of the Lanquín region in extreme eastern Alta Verapaz. The geology, physiography, and speleogenesis of the region are discussed by Smith (1968). The principal cave-forming limestone in the vicinity of Senahú is the Chochal Formation of Permian age. Karst development is less well developed than in the Lanquín region, but numerous widely spaced hills surrounding sinks occur. At higher elevations the terrain is characterized by shallow dolinas. Of the five caves investigated in this region, all are rather small with the exception of the Sistema de Seamay-Sejul which contains a stream and more than 1.5 kilometers of surveyed passage.

Of 18 species identified from the region, eight are troglobites. The only aquatic troglobite is the bogidiellid amphipod *Bogidiella holsingeri* Ruffo and Vigna Taglianti. Two species of terrestrial troglobite, the collembolan *Pseudosinella finca* Christiansen and the leiodid beetle *Ptomaphagus (Adelops) giaquintoi* Jeannel, are shared with the Lanquín region. The rhachodesmid milliped *Aceratophallus scutigeroides* Shear has been tentatively identified from a cave in Chiapas. The remaining species are all endemic to this region. These include the chthoniid pseudoscorpion *Aphrastochthonius verapazanus* Muchmore, the telemid spider *Telema mayana* Gertsch, the tridontomid milliped *Tridontomus loomisi* Shear, and the carabid beetle *Speocolpodes franiai* Barr. *Tridontomus loomisi* belongs to a family of millipeds known only from this region. *Speocolpodes* is an endemic genus but is closely allied to *Platynus (Mexisphodrus)* in southern and eastern México. The remaining species are both typical representatives of the cavernicole fauna of southern México. The troglophile fauna includes the pseudothelphusid crab *Isabellagordonia (Phrygiopilus) acanthophallus* (Smalley), a diplurid spider of the genus *Euagrus,* the pholcid spider *Metagonia blanda* Gertsch, and the pyrgodesmid milliped *Cryptyma guatemala* Shear.

Altos Cuchumatanes, Huehuetenango, Guatemala.—The Altos Cuchumatanes is a range of mountains extending across much of southern Alta Verapaz. The top of the range is plateau-like with extensive development of dolina karst. The geology of part of the region is shown on a geologic map published by the Guatemala Instituto Geográfico Nacional (1968b).

The principal cavernous formation in the region is the Ixcoy Limestone of Cretaceous age. Elevations on the plateau range from 2,500 to 3,300 meters. Most of the caves are small and many take the flow of small streams. Sbordoni et al. (1977) described the caves which have been studied.

The Italian biospeleologists who studied this region have yet to publish most of the results of their work and only 13 species have been identified to date. The aquatic fauna includes two endemic species, the asellid isopod *Caecidotea mitchelli* Argano and the bogidiellid amphipod *Bogidiella pasquinii* Ruffo and Vigna Taglianti. The terrestrial troglobites are the philosciid isopod *Colombophiloscia cavernicola* Vandel (also known from Venezuelan caves) and the carabid beetle *Mayaphaenops sbordonii* Vigna Taglianti. Troglophiles of interest include the hyalellid amphipod *Hyalella azteca* (Saussure), a pyrgodesmid milliped of the genus *Synoptura*, and a carabid beetle of the genus *Paratrechus*.

Montañas de Cuilco, Huehuetenango, Guatemala.—This region is located in southwestern Alta Verapaz south and southwest of the town of La Libertad. The top of the Montañas de Cuilco forms a plateau at an average elevation of about 3,000 meters. The five caves visited occur at elevations of 2,880 to 3,120 meters. The geology of the northern part of the region has been studied by Boyd (1966), Davis (1966), and Anderson (1967). A geologic map of the region has been published by the Guatemala Instituto Geográfico Nacional (1967, 1968a). The principal cavernous formation in the area is the Ixcoy Limestone (sometimes not differentiated from the Cobán Formation) of Cretaceous age. Karst development on the plateau is primarily dolina karst with almost complete internal drainage. This region has been little studied speleologically and few caves are known. All of the caves which have been biologically investigated are small, shallow pits with little horizontal extent.

The fauna of this promising region is essentially unknown and only five species have been identified. No troglobites are known, and the only probable troglophiles are an undetermined species of milliped of the family Peridontodesmidae, a rhachodesmid milliped of the genus *Aceratophallus*, and a staphylinid beetle of the genus *Philonthus*. The rhaphidophorid cricket *Hypsobadistes gracilior* Hubbell, because of its extremely long legs and delicate body, is probably restricted to the use of caves, though still dependent on the surface for food.

Santa Ana Huistá, Huehuetenango, Guatemala.—This region is located in west-central Huehuetenango near the Chiapas, México, border. The investigated karst region is in the vicinity of the village of El Tabacal about six kilometers west-northwest of the town of Santa Ana Huistá. There has been little study of the area and only three caves have been examined for their invertebrate fauna. The principal limestone units in the region are the Ixcoy and Cobán Formations of Cretaceous age. The Río Huistá sinks in a large cave known as El Sumidero, but sumps after about 400 meters. The stream re-emerges from a sump in the largest cave in the region, Cueva de Agua Escondida; this large, treacherous stream has been surveyed for almost four kilometers (Broughton and Boon, 1975). The only other cave for which information is available is Cueva de las Calaveras, a small, little explored pit about 10 meters deep (Sbordoni et al., 1977).

Very little is known of the cave fauna of this region and only 11 species, none troglobitic, have been reported. Troglophiles include the nesticid spiders *Gaucelmus augustinus* Keyserling and *G. calidus* Gertsch and the endemic pyrgodesmid milliped *Synoptura shawcrossi* (Shear).

Lago de Izabal, Izabal, Guatemala.—This region is located in eastern Guatemala near the Gulf of Honduras. The principal city in the area is the port of Puerto Barrios. There has been little study of the area, with only two caves having been explored. One, Cueva de la Coche, is located near the Río Dulce about 2.5 kilometers from the Gulf. It is reported by Peck and Peck (1973) as being small and only about 83 meters long. The larger cave, Gruta El Silvino, is located 34 kilometers west of Puerto Barrios to the south of Lago de Izabal. This cave, a map of which is in Gurnee (1962), contains more than 0.5 kilometer of dry passage, where an unexplored stream passage is encountered.

Only 12 species, none troglobitic, have been reported for this region. Troglophiles include the grapsid crab *Sesarma (Holometopus) roberti* H. Milne Edwards, the schizomid *Schizomus silvino* Rowland and Reddell, the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the ochyroceratid spider *Ochyrocera formosa* Gertsch, the pholcid spiders *Metagonia blanda* Gertsch and *Pholcophora quieta* Gertsch, the pyrgodesmid milliped *Calymmodesmus inquinatus* Causey, and scydmaenid beetles of the genus *Scydmaenus*. This fauna is typical of Guatemala and southern México.

Flores, Petén, Guatemala.—This region is located in central Petén south of the town of Flores. The terrain consists of the low, rolling hills which constitute the lowland area of the Chiapas-Guatemalan Highlands province. Although five caves have been biologically studied, the only one for which information is available is Cueva Jobitzinaj, located south of Flores. A partial map of this poorly explored cave shows more than 0.5 kilometer of generally horizontal passage (Gurnee, 1962).

Only 15 species, none troglobitic, have been reported from the caves of the region. The most interesting member of the troglophile fauna is the ricinuleid *Cryptocellus cooki* Gertsch, a species closely related to *C. pearsei* Chamberlin from Yucatán. The urocoptid snail *Brachypodella speluncae* (Pfeiffer) is also a probable troglophile restricted to the Petén. The leiodid beetle *Ptomaphagus (Adelops) barbarae* Peck, tentatively identified from the region, is otherwise known as a troglophile in caves in Belize. The remaining species are all also known as troglophiles in the caves of the Yucatán Peninsula and other parts of southern México and adjacent Guatemala. These include the amblypygid *Paraphrynus raptator* (Pocock), the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the scytodid spider *Loxosceles yucatana* Chamberlin and Ivie, the paradoxosomatid milliped *Orthomorpha coarctata* (Saussure), and a pyrgodesmid milliped of the genus *Synoptura*.

Yaxchilán, Petén, Guatemala.—This region is located in the Petén east of the Río Usumacinta and across the river from the ruins of Yaxchilán in Chiapas, México. Salas (1962) has studied the geology of the region; the caves are probably formed in the Cretaceous Repasto Limestone. The three caves that have been biologically investigated are located at elevations of 100 to 240 meters. The work in this region has been done by Italian biospeleologists and most of their results remain unpublished. The caves are described by Sbordoni et al. (1974). Two of the caves are small, but Cueva de Juan Flores (=Cueva de Yaxchilán) contains about 840 meters of surveyed passage (McEachern, 1974).

Only 13 species, none troglobitic, have thus far been reported from the caves of this region. Two of the troglophiles, the diplurid spider *Euagrus lynceus* Brignoli and the oonopid spider *Triaeris lacandona* Brignoli, are endemic to the region. The pyrgodesmid milliped *Calymmodesmus inquinatus* Causey is also known from caves in other parts of Guatemala. The remaining troglophiles are closely allied with the fauna of other parts of Guatemala and southern México. These include a squamiferid isopod of the genus *Trichorhina*, the schizomid *Schizomus portoricensis* (Chamberlin), the mysmenid spider *Maymena mayana* (Chamberlin and Ivie), the pholcid spider *Pholcophora ?speophila* (Chamberlin and Ivie), the scytodid spider *Loxosceles yucatana* Chamberlin and Ivie, and a pyrgodesmid milliped of the genus *Myrmecodesmus*.

Yucatán Peninsula

The Yucatán Peninsula is a limestone platform projecting northward from Central America. It is divided politically into the Mexican states of Campeche, Quintana Roo, Yucatán, and eastern Tabasco; the Petén of Guatemala north of Flores; and Belize north of the Maya Mountains. Reddell (1977b) has summarized the geology, physiography, and karst features of the Mexican portion of the Peninsula. Northern Yucatán is generally low, with elevations gradually increasing from sea level to about 30 meters in the south. The Sierra de Ticul rises abruptly from the southwestern Yucatán plains to elevations of 70 to 100 meters. The Sierra de Bolonchén lies south of the Sierra de Ticul in the state of Campeche. The northern part of the Sierra de Bolonchén is a distinct range, but to the south it is broken into numerous low hills separated by valleys, some containing ponds and lakes. This hilly region continues south into the Petén of Guatemala. The peninsular part of Belize is also low, rolling terrain. North of the Río Hondo, which serves as the boundary between Belize and México, essentially all drainage is internal. Except for the Río Champotón in Campeche no streams of any consequence flow in the Mexican part of the Peninsula. Small lakes and ponds occur in the hilly regions of Campeche and saline lakes are found in southern Quintana Roo, but otherwise there is not much standing water. The eastern Petén and Belize have several sizable streams flowing into the Río Hondo or Caribbean Sea. Parts of the Petén contain large closed basins, some with permanent water but others, nearly filled with alluvium, form broad marshes during the wet season.

With the exception of a few minor deposits of gypsum and marl cropping out in southern Quintana Roo and Campeche and alluvium on the floors of the broader valleys in the Campeche hill district, all of the Mexican part of the Yucatán Peninsula is on limestone. Limestone is also the principal rock type in the peninsular part of Belize and in the Petén of Guatemala. It is in places covered by extensive alluvial deposits, especially in the closed basins in the Petén, along the river valleys of the Petén and Belize, and along the Caribbean coast. Butterlin and Bonet (1963) mapped the stratigraphy of the Mexican part of the Peninsula including the extreme northern edge of Belize and the Petén. The 1:500,000 geologic map of Guatemala published by the Guatemala Instituto Geográfico Nacional (1975) includes the general geology of Belize and the Petén.

Pleistocene and Holocene deposits crop out in eastern Campeche and along the northern coast of Yucatán, but most of the Peninsula is covered by rocks of Paleocene to Pliocene age. A few Cretaceous outcrops occur in the Petén and Belize but are not extensive. The Pliocene and Miocene formations generally crop out along the coast of the Peninsula, with Eocene and older rocks inland. The Sierra de Ticul and most of the hill district of Campeche are formed of rocks of Eocene or Paleocene age.

The Mexican part of the Yucatán Peninsula is the best-studied area in México or Central America with respect to its invertebrate cave fauna. No caves have yet been visited in either the Petén or northern Belize, although they are known to exist. A total of 216 caves, cenotes, and other subterranean habitats have been biologically investigated in Campeche, Quintana Roo, and Yucatán. Reddell (1977b) includes descriptions of 191 of these localities. Study has been made both of large open-air cenotes and true caves. The term "cenote," though generally thought to apply to a deep, well-like cavity, may refer to either pond-like water-floored sinkholes, deep water-floored shafts, or true caves with bodies of water in total darkness. The more open cenotes generally do not contain troglobites but may harbor species also found as troglophiles in the cavernous cenotes. Of approximately 565 species known from the caves and cenotes of the Yucatán Peninsula, 115 are known only from open-air cenotes. The fauna of the Peninsula includes 12 aquatic and 28 terrestrial troglobites. A general summary of the cavernicole fauna is in Reddell (1977b).

Sierra de Bolonchén, Campeche.—The Sierra de Bolonchén is located in northern Campeche immediately south of the Sierra de Ticul. The region designated by this name also includes all of the hill district of Campeche. In much of this area there are numerous distinct rounded hills, ranging in elevation from 100 to 300 meters, and separated by large, flat-bottomed valleys up to five kilometers wide. Most of these valleys are dry, but some contain shallow lakes. The only prominent karst features in addition to the closed basins are *sumideros*—caves which receive the seasonal flow of arroyos. Four limestone units crop out in this region: the Icaiché Formation, the Pisté and Xcabal Members of the Chichén Itzá Formation, and undifferentiated rocks of Paleocene or Eocene age. The Icaiché Formation is Paleocene or Eocene in age and is exposed only in southeastern Campeche and adjacent Guatemala. The only cave of note believed to be formed in the Icaiché Formation is Volcán de los Murciélagos, a large, tunnel-like cave more than one kilometer long. Undifferentiated Eocene or Paleocene rocks crop out in much of Campeche. Although large caves occur in these rocks in the Sierra de Ticul, no caves of consequence have been found in them in Campeche. The Chichén Itzá Formation is Eocene. The Pisté Member crops out in the higher parts of the Sierra de Bolonchén south of the Sierra de Ticul and continues south and east along the border of Campeche, Yucatán, and Quintana Roo. The largest caves in Campeche, including large sumideros such as Grutas de Xtacumbilxunam and Grutas de San Antonio, are formed in this rock unit. The Xcabal Member crops out only in a small area between Champotón and Escárcega in western Campeche. One large cave, Grutas de Monte Bravo, is known from this unit.

The caves in this region are among the larger in the Peninsula and attain much greater depths than caves in either the Sierra de Ticul or Coastal Plain. Grutas de Xtacumbilxunam with a depth of at least 105 meters is the deepest cave in the Peninsula. Several of the caves contain deep standing pools, and at least one (Grutas de San José) contains a flowing stream.

The Sierra de Bolonchén is the least-known part of the Peninsula, but 94 species, of which 10 are troglobites, have been identified from the 18 caves studied. The troglobite fauna includes species known only from this region and species shared by other parts of the Peninsula. The endemic fauna includes the amphipod *Mayaweckelia yucatanensis* Holsinger, the atyid shrimp *Typhlatya campecheae* Hobbs and Hobbs, the diplocentrid scorpion *Diplocentrus mitchelli* Francke, and the tetrablemmid spider *Matta mckenziei* Shear. Two species, the atyid shrimp *Typhlatya pearsei* Creaser and the palaemonid shrimp *Creaseria morleyi* (Creaser), are found throughout the Peninsula. The remaining troglobites are known only from the Coastal Plain and the Sierra de Bolonchén. These are the amphipod *Mayaweckelia cenoticola* Holsinger, the oonopid spider *Oonops coecus* (Chamberlin and Ivie), and the pholcid spider *Metagonia torete* Gertsch. The only other troglobite known from the Sierra de Bolonchén is an undetermined species of milliped of the family Trichopolydesmidae.

The troglophile fauna is generally shared by other parts of the Yucatán Peninsula. Aquatic troglophiles include the physid snail *Stenophysa* sp., the copepods *Mesocyclops ellipticus* Kiefer and *Paracyclops fimbriatus* (Fischer), and the amphipod *Hyalella azteca* (Saussure). Troglophiles include the spiraxid snails *Streptostyla meridana meridana* (Morelet) and *S. ventricosula* (Morelet); the schizomid *Schizomus portoricensis* (Chamberlin); the amblypygid *Paraphrynus raptator* (Pocock); the amaurobiid spider *Goeldia tizamina* (Chamberlin and Ivie); the mysmenid spider *Maymena mayana* (Chamberlin and Ivie); the nesticid spider *Eidmannella pallida* (Emerton); the oonopid spider *Triaeris patellaris* Bryant;

the pholcid spiders *Metagonia maya* Chamberlin and Ivie, *M. yucatana* Chamberlin and Ivie, and *Pholcophora speophila* (Chamberlin and Ivie); the scytodid spider *Loxosceles yucatana* Chamberlin and Ivie; the opilionid *Erginulus bimaculata* Goodnight and Goodnight; pyrgodesmid millipeds of the genera *Calymmodesmus* and *Synoptura;* rhachodesmid millipeds of the genus *Aceratophallus;* the spirostreptid milliped *Orthoporus solicolens* Chamberlin; the leiodid beetles *Dissochaetus hetschkoi* Reitter and *Ptomaphagus (Adelops) tabascensis* Sbordoni; scydmaenid beetles of the genus *Euconnus (Napochus);* and the ant *Paratrechina pearsei* (Wheeler).

Sierra de Ticul, Yucatán.—The Sierra de Ticul rises abruptly from the coastal plain in southern Yucatán near its border with Campeche. Elevations range from 70 meters in the north to about 100 meters in the south. The only rocks cropping out in the region are undifferentiated limestone units of Eocene or Paleocene age. Karst development is limited to caves and minor surface features, such as shallow solutional weathering. The Sierra de Ticul is made up of two narrow ridges separated by a shallow valley. Caves in the first ridge receive no significant run-off and tend to have large collapse sinkholes dropping into large rooms. Some of the larger caves, such as Actún Xpukil, contain several large rooms connected by narrow passages. Others, such as Actún Loltún and Actún Sabacá, have long, linear passages. Caves in the second ridge tend to be entered by small vertical or near-vertical pits, some dropping more than 30 meters. Larger caves, such as Actún Chac, usually consist of single passages gradually descending to water. A few of the caves in this part of the range receive considerable floodwater.

The fauna of the Sierra de Ticul is very well known with 290 species, including 17 troglobites, identified from the 41 caves studied. The aquatic troglobite fauna includes the cirolanid isopod *Creaseriella anops* (Creaser), the atyid shrimp *Typhlatya pearsei* Creaser, and the palaemonid shrimp *Creaseria morleyi* (Creaser). The two shrimp are known from all parts of the Peninsula, while the isopod is also known from the Coastal Plain. The terrestrial troglobite fauna includes species endemic to the Sierra de Ticul and species found in other parts of the Peninsula. The endemic species are the philosciid isopod *Troglophiloscia laevis* Schultz, the scorpion *Diplocentrus anophthalmus* Francke, the vachoniid pseudoscorpions *Vachonium boneti* Chamberlin and *V. cryptum* Muchmore, the amblypygid *Paraphrynus reddelli* Mullinex, the agelenid spider *Cicurina (Cicurella) maya* Gertsch, the spirostreptid milliped *Orthoporus zizicolens* (Chamberlin), and the collembolan *Metasinella falcifera* (Mills). Species shared with the Coastal Plain are the squamiferid isopod *Trichorhina pearsei* (Creaser), the amblypygid *Paraphrynus chacmool* (Rowland), the collembolans *Cyphoderus innominatus* Mills and *Troglopodetes maya* (Mills), and the gryllid cricket *Tohila atelomma* Hubbell. The only other troglobite is an undetermined species of milliped of the family Trichopolydesmidae.

The only aquatic troglophiles are the copepods *Mesocyclops ellipticus* Kiefer, *Paracyclops fimbriatus* (Fischer), and *Diaptomus texensis* M. S. Wilson. The terrestrial troglophile fauna contains about 79 species, of which some are endemic to the Sierra de Ticul. These include the diplocentrid scorpion *Diplocentrus reddelli* Francke, the syarinid pseudoscorpion *Pachychitra maya* Chamberlin, the oonopid spider *Oonops mitchelli* Gertsch, the pholcid spider *Pholcophora maria* Gertsch, and the rhachodesmid millipeds *Aceratophallus calcehtokanus* Chamberlin and *A. oxkutzcabus* Chamberlin. Troglophiles restricted to the Yucatán Peninsula are the acanthodrilid earthworms *Balanteodrilus pearsei* Pickford and *Eodrilus oxkutzcabensis* Pickford; the clubionid spider *Tixcocoba maya* Gertsch; the oonopid spider *Oonops reddelli* Gertsch; the pholcid spiders *Metagonia iviei* Gertsch, *M. maya* Chamberlin and Ivie, and *M. yucatana* Chamberlin and Ivie; the ricinuleid *Cryptocellus pearsei* Chamberlin and Ivie; the chelodesmid milliped *Chondrodesmus sabachanus* Chamberlin; the pyrgodesmid milliped *Calymmodesmus viabilis* (Chamberlin); the spirostreptid milliped *Orthoporus solicolens* Chamberlin; the collembolan *Lepidocyrtus pearsei* Mills; the ant lion *Eremeleon longior* Banks; and the ant *Paratrechina pearsei* (Wheeler). Among the more interesting troglophiles with a wider distribution are the cyclophorid snail *Neocyclotus dysoni berendti* (Pfeiffer); the pomatiid snail *Choanapoma largillierti* (Pfeiffer); the spiraxid snails *Euglandina cylindracea* (Phillips), *Streptostyla meridana meridana* (Morelet), and *S. ventricosula* (Morelet); the schizomid *Schizomus portoricensis* (Chamberlin); the amblypygid *Paraphrynus raptator* (Pocock); the mysmenid spider *Maymena mayana* (Chamberlin and Ivie); the nesticid spider *Eidmannella pallida* (Emerton); the scytodid spider *Loxosceles yucatana* Chamberlin and Ivie; the tetrablemmid spider *Matta sbordonii* (Brignoli); and the leiodid beetles *Dissochaetus hetschkoi* Reitter and *Ptomaphagus (Adelops) tabascensis* Sbordoni.

Coastal Plain, Campeche, Quintana Roo, and Yucatán.—The Coastal Plain of the Yucatán Peninsula includes all of the state of Quintana Roo, all of Yucatán except for the Sierra de Ticul, and a narrow strip along the northwest coast of Campeche. Reddell (1977b) recognizes four subdivisions: the Coastal

Beach and Supra-tidal Zone, the Northwestern Coastal Plain, the Northeastern Coastal Plain, and the Eastern Block Fault District. The first and last of these are of limited speleological interest. The other two subdivisions exhibit quite different morphology, but are so similar faunally that they are here treated as one unit. The northwestern Coastal Plain is characterized by very low relief (usually less than two meters locally), little soil, flat-lying limestone and dolomite, and the absence of deep caves and cenotes. The water level is generally less than 10 meters below the surface. The Northeastern Coastal Plain has much greater relief and extensive karst development. The terrain is largely characterized by the presence of numerous cenotes, some more than 30 meters deep. This is best seen in the vicinity of Chichén Itzá. In extreme northwestern Yucatán and adjacent Quintana Roo, the terrain is more rolling with large shallow dolinas and few cenotes. At the highest part of the plain, near Cobá in Quintana Roo, cenotes are generally absent and several lakes may be found. Along the Caribbean coast in Quintana Roo cenotes are generally shallow and water occurs less than 10 meters below the surface, but extensive solutional features exist. In some areas cave passages have collapsed, leaving long, sinuous furrows at the surface. Pleistocene and Holocene deposits occur along the northern coast of the Peninsula, but inland the principal rock units are the Pisté Member of the Chichen Itzá Formation and the Carrillo Puerto Formation. The Chichén Itzán Formation is of Eocene age; the Carrillo Puerto Formation is Miocene or Pliocene in age. In extreme southern Quintana Roo and Campeche Eocene limestone is exposed, along with minor outcrops of other formations.

Cavern development in the Coastal Plain has been extensive and thousands of caves doubtless exist in this region. Most caves in the Northwestern Coastal Plain are small and terminate in deep pools of water. The presence of large passages below water has been demonstrated by underwater exploration of Cenote Xlaká north of Mérida where a horizontal passage was discovered 48 meters below the water surface. Caves in the Northeastern Coastal Plain vary from area to area. Near Cobá, where the water table is quite high, only a few small caves are known. Along the Caribbean coast, extensive cave systems probably occur, but the few examined were largely collapsed as a result of thin roofs. These caves consisted of long, maze-like passage complexes. The principal cave area lies in the state of Yucatán, where several major caves are known. The largest of these are Actún Kaua, a complex maze cave with an estimated 10 kilometers of known passage, and the archaeological cave site of Grutas de Balankanche. The latter cave consists of several large passages, some containing water and having a length of more than one kilometer. The most distinctive aspect of this area is the presence of numerous large cenotes. Many of these have sloping walls, but others (such as the Cenote de Sagrado) are deep, partly water-filled vertical shafts. A few cenotes contain horizontal passages leading from the entrance chamber, but most cenotes are entirely or largely open.

The Coastal Plain of Yucatán is the best-studied area in México and Central America. A total of 157 caves, cenotes, and other subterranean habitats have been biologically studied. The total fauna, counting species known only from open-air cenotes and not likely to occur in more truly subterranean habitats, includes about 515 species. Of these, 24 species are troglobites and an estimated 149 are troglophiles. Of ten aquatic troglobites six are restricted to the Coastal Plain, one occurs also in the Sierra de Ticul, one also in the Sierra de Bolonchén, and the remaining two occur in all three regions. The endemic species are the asellid isopod *Caecidotea* sp., the bogidiellid amphipod *Bogidiella* sp., the mysid *Antromysis cenotensis* Creaser, the atyid shrimp *Typhlatya mitchelli* Hobbs and Hobbs, the brotulid fish *Typhliasina pearsei* (Hubbs), and the synbranchid eel *Ophisternon infernale* (Hubbs). The cirolanid isopod *Creaseriella anops* (Creaser) is also known from the Sierra de Ticul, while the hadziid amphipod *Mayaweckelia cenoticola* Holsinger occurs also in the Sierra de Bolonchén. The atyid shrimp *Typhlatya pearsei* Creaser and the palaemonid shrimp *Creaseria morleyi* (Creaser) occur in all three regions.

The trichoniscid isopod *Cylindroniscus maya* Creaser, the vachoniid pseudoscorpions *Vachonium kauae* Muchmore and *V. maya* Chamberlin, the ochyroceratid spider *Theotima martha* Gertsch, the pholcid spiders *Metagonia chiquita* Gertsch and *Pholcophora pearsei* (Chamberlin and Ivie), and the spirostreptid milliped *Orthoporus spelaeus* Causey are known only from the Coastal Plain. Species common to both the Coastal Plain and the Sierra de Ticul are the squamiferid isopod *Trichorhina pearsei* (Creaser), the amblypygid *Paraphrynus chacmool* (Rowland), the collembolans *Cyphoderus innominatus* Mills and *Troglopedetes maya* (Mills), and the gryllid cricket *Tohila atelomma* Hubbell. The only species shared by the Coastal Plain and the Sierra de Bolonchén are the oonopid spider *Oonops coecus* (Chamberlin and Ivie) and the pholcid spider *Metagonia torete* Gertsch.

The aquatic troglophile fauna contains an estimated 33 species, most of which are common elements of the groundwater fauna. Species known only from the Coastal Plain are the ostracods *Cypridopsis inaudita* Furtos, *C. mexicana* Furtos, and *C. yucatanensis* Furtos; the pimelodid catfishes *Rhamdia guatemalensis decolor* Hubbs, *R. guatemalensis depressa* Barbour and Cole, and *R. guatemalensis stygaea* Hubbs; and the cichlid fish *Cichlasoma urophthalmus ericymba* Hubbs. Among the more abundant aquatic species with wider distributions are the copepods *Eucyclops serrulatus* (Fischer), *Macrocyclops albidus* (Jurine), *Mesocyclops ellipticus* Kiefer, *Mesocyclops leuckarti* (Claus), *Mesocyclops (Thermocyclops) tenuis* (Marsh), *Paracyclops fimbriatus* (Fischer), *Tropocyclops prasinus* (Fischer), and *Diaptomus (Leptodiaptomus) novamexicanus* Herrick; the melitid amphipod *Quadrivisio lutzi* (Shoemaker); and the limnesiid mite *Limnesia paucispina* Wolcott.

Terrestrial troglophiles known only from the Coastal Plain are the oniscid isopod *Hoctunus vespertilio* Mulaik; the trichoniscid isopod *Trichoniscus hoctuni* Mulaik; the chernetid pseudoscorpion *Parazaona cavicola* Chamberlin; the laelapid mite *Haemolaelaps glasgowi* (Ewing); the uropodid mite *Uropoda pearsei* Wharton; the erythraeid mite *Erythraeus bisetosa* Wharton; the galumnid mite *Galumna jacoti* Wharton; the oribatellid mite *Oribatella monospicus* Wharton; the oribatulid mite *Scheloribates luchili* Wharton; the pyrgodesmid millipeds *Calymmodesmus alienus* (Chamberlin), *C. isidricus* (Chamberlin), *C. hoctunanus* (Causey), and *C. muruztunicus* (Chamberlin); the rhachodesmid milliped *Aceratophallus hoctunanus* Chamberlin; the sphaeriodesmid milliped *Cylionus kauanus* Chamberlin; the psocid *Psyllipsocus yucatan* Gurney; and the ant *Brachymyrmex cavernicola* Wheeler. Troglophiles restricted to the Yucatán Peninsula are the acanthodrilid earthworms *Balanteodrilus pearsei* Pickford and *Eodrilus oxkutzcabensis* Pickford, the amaurobiid spider *Goldia tizamina* (Chamberlin and Ivie), the clubionid spider *Tixcocoba maya* Gertsch, the oonopid spider *Oonops reddelli* Gertsch, the pholcid spiders *Metagonia iviei* Gertsch and *M. maya* Chamberlin and Ivie; the ricinuleid *Cryptocellus pearsei* Chamberlin and Ivie; the opilionid *Erginulus bimaculata* Goodnight and Goodnight; the pyrgodesmid milliped *Calymmodesmus viabilis* (Chamberlin), the spirostreptid milliped *Orthoporus solicolens* Chamberlin, the collembolan *Lepidocyrtus pearsei* Mills, the ant lion *Eremeleon longior* Banks, and the ant *Paratrechina pearsei* (Wheeler). Some of the more widely distributed troglophiles are the cyclophorid snail *Neocyclotus dysoni berendti* (Pfeiffer); the pomatiid snail *Choanopoma largillierti* (Pfeiffer); the spiraxid snails *Euglandina cylindracea* (Phillips), *Streptostyla meridana meridana* (Morelet), and *S. ventricosula* (Morelet); the urocoptid snail *Brachypodella dubia* Pilsbry; the schizomid *Schizomus portoricensis* (Chamberlin); the amblypygid *Paraphrynus raptator* (Pocock); the mysmenid spider *Maymena mayana* (Chamberlin and Ivie); the nesticid spider *Eidmannella pallida* (Emerton); the pholcid spiders *Modisimus iviei* Gertsch, *Pholcophora speophila* (Chamberlin and Ivie), and *Physocyclus globosus* (Taczanowski); the scytodid spider *Loxosceles yucatana* Chamberlin and Ivie; the pyrgodesmid milliped *Synoptura italolegata* (Shear); the leiodid beetles *Dissochaetus hetschkoi* Reitter and *Ptomaphagus (Adelops) tabascensis* Sbordoni; and the ant *Erebomyrma urichi* (Wheeler).

DISTRIBUTION

The distribution and relationships of the cavernicole fauna of México, Guatemala, and Belize remain poorly known. In few instances can we delineate the range of any species of troglobite. It possible, nevertheless, to perceive some general distributional patterns and to draw a few conclusions with respect to the distribution and relationships of the cavernicole fauna of these three countries. Although it is tempting to speculate on the zoogeography of the cavernicole fauna as well, I feel it premature to do so at this time. Far too little is known of the past climatic history of the region and of the faunal distributions and relationships to confidently analyze the zoogeography of the fauna in any but the most general sense.

It is beyond the scope of this study to discuss the geologic, hydrographic, and other factors which are important in obtaining a general understanding of the distribution and evolution of the cavernicoles of México and Central America. This region is among the more complex in the world, and even a discussion of the general features of its geology, hydrography, climate, and vegetation would take far more space than can be devoted to it here. The regional geology has been discussed by Schuchert (1935) in a pioneering work. Maldonado-Koerdell (1964) and West (1964) have provided useful summaries of the geology of Central America. The geology of México has been summarized by Garfías and Chapin (1949). The hydrography of México has been discussed by de la O. de Carreño (1951, 1954) and that of Middle America by Tamayo and West (1964). Vivo Escoto (1964) has summarized the climate of México and Central America. A good introduction to the vegetation of the region is that of Wagner (1964). A few significant studies of specific areas have been cited in the section on Cave Regions above.

The aquatic fauna of México and Central America includes cavernicole species derived from both freshwater and marine ancestors; the terrestrial fauna includes species with both temperate and tropical affinities. The purpose of the present discussion is to outline briefly the distribution of some species belonging to each category.

Aquatic Troglobites

Marine relicts.—Species which are apparently derived from marine ancestors include triclad turbellarians, isopods, amphipods, mysids, shrimp, and fish.

The flatworm family Dimarcusidae is known only from Mexican caves and is apparently a member of the marine suborder Maricola and without obvious close relatives. Two species of this family, *Ophistobursa mexicana* Benazzi and *O. josephinae* Benazzi, occur in caves in Tabasco and Chiapas respectively. Both have been found in association with bogidiellid amphipods, another group of marine relicts.

The isopod fauna includes representatives of the families Cirolanidae, Stenasellidae, Anthuridae, and Microcerberidae. The distribution of the Cirolanidae is of particular interest. Most of the species are known from one or more caves in the same karst region. This is true of *Speocirolana thermydronis* Cole and Minckley, *Mexilana saluposi* Bowman, and *Sphaerolana interstitialis* Cole and Minckley. *Speocirolana bolivari* (Rioja) has been found only in the Sierra de El Abra, Sierra de Guatemala, and Aquismón regions, contiguous karst regions along the eastern face of the Sierra Madre Oriental in San Luis Potosí and Tamaulipas. *Sphaerolana affinis* Cole and Minckley occurs both in the Cuatro Ciénegas de Carranza region, Coahuila, and Sierra de la Silla, Nuevo León. *Creaseriella anops* (Creaser) has been found both in the Coastal Plain and Sierra de Ticul of the Yucatán Peninsula. This is a continuous limestone area, and subterranean dispersal is likely. Of some interest is the distribution of *Speocirolana pelaezi* (Bolívar). This species is the most widely distributed aquatic troglobite in México and has been found in the Sierra de Tamaulipas and Sierra de Guatemala, Tamaulipas; the Sierra El Pino, Sierra de El Abra, and Aquismón regions, San Luis Potosí; and the Cuetzalan region, Puebla. It is likely, therefore, that its range extends the length of the Sierra Madre Oriental. It has an altitudinal range of about 1200 meters.

The stenasellid isopods of México range from Coahuila to Veracruz. The genus *Mexistenasellus* is represented by species in the Cuatro Ciénegas de Carranza, Micos, and Atoyac regions. Each species is restricted to subterranean habitats in its respective region. The monotypic genus *Etlastenasellus* has been collected only from a well in Oaxaca and is presumably a phreatobite.

The family Anthuridae contains two Mexican troglobites, one each in a cave in the Atoyac region of Veracruz and in the Micos region of San Luis Potosí.

The only described microcerberid isopod known from México is *Mexicerberus troglodytes* Schultz, which appears to be endemic to the Sierra de Guatemala, Tamaulipas. Other species of this family occur as inhabitants of the interstitial zone in Cuba.

Two families of amphipod, both apparently of marine origin, have contributed to the cavernicole fauna of México and Guatemala. The Bogidiellidae, with the single genus *Bogidiella*, is represented by nine species in extreme southern México (Oaxaca, Chiapas, Veracruz, Tabasco) and Guatemala (Huehuetenango, Alta Verapaz). Possibly undescribed species have been taken in southern Puebla and Campeche. Several of the species are known only from wells and may be phreatobites, but others are clearly cave associated. Two genera of the family Hadziidae have been described from Mexican caves (*Mayaweckelia* with two species in Yucatán and adjacent Campeche and *Mexiweckelia* with two species in the Cuatro Ciénegas de Carranza region, Coahuila, and one species in the Rancho Descubridora region, Durango.

The order Mysidacea includes four Mexican troglobites in two families. The Lepidomysidae is represented by *Spelaeomysis olivae* Bowman from a cave in the Acatlán region of Oaxaca and by *S. quinterensis* (Villalobos) from caves in the Sierra de El Abra and Sierra de Guatemala. Two species of the family Mysidae are troglobites in México: *Antromysis (A.) cenotensis* Creaser from the Coastal Plain of the Yucatán Peninsula and *A. (A.) reddelli* Bowman from a cave in the Acatlán region of Oaxaca.

Most of the troglobitic shrimp inhabiting the caves of México are probably derived from marine ancestors. This speculation is greatly strengthened by the fact that they are found only in the areas bordering the Gulf of Mexico and Caribbean Sea. Three families have been found in Mexican caves: the Alpheidae, Atyidae, and Palaemonidae.

The Alpheidae is represented only by *Alpheopsis stygicola* Hobbs from caves in the Acatlán region of Oaxaca. With the exception of two Old World species, all members of this family are marine.

The Atyidae includes three species of the genus *Typhlatya* in the Yucatán Peninsula. Although the family Atyidae includes both freshwater and marine species, the distribution of the genus *Typhlatya* (Cuba, Puerto Rico, Dominican Republic, Ascension

Island, Galápagos Islands, Yucatán Peninsula) indicates that the Mexican species are derived from one or more ancestral marine species.

The family Palaemonidae is generally well represented in subterranean waters and six species are apparent troglobites in México. *Troglocubanus perezfarfanteae* Villalobos is the only Mexican member of a genus also known from caves in Cuba. The genera *Creaseria* and *Neopalaemon* are monotypic and known only from species inhabiting caves in the Yucatán Peninsula and the Valle Nacional region of Oaxaca, respectively. Both are probably of marine origin.

The blind fish *Typhliasina pearsei* (Hubbs) is known only from caves in the Yucatán Peninsula and is clearly a marine relict having as its closest relative a species now inhabiting marine littoral waters.

Most of the marine relicts inhabiting caves in México are found in the vicinity of the Gulf of Mexico or Caribbean Sea. The Yucatán species are distributed along the ancient Pliocene shoreline and have not yet been found significantly farther inland. Other species inhabit the Sierra Madre del Sur, Chiapas-Guatemalan Highlands, and Sierra Madre Oriental along their faces bordering the Gulf of Mexico. It is likely that these species have all been derived from ancestral species inhabiting shallow waters of the Cretaceous sea. Some may have undergone a preliminary epigean freshwater stage before entering caves, but this is impossible to determine. Some of the phreatobitic species probably inhabited an interstitial habitat grading from salt through brackish to fresh water. Species of amphipod and isopod found in the subterranean habitats of the regions of Rancho Descubridora, Durango, and Cuatro Ciénegas de Carranza, Coahuila, are certainly derived from species inhabiting the Cretaceous embayment that covered the region. Holsinger (1977a) postulates a late Cretaceous or early Tertiary age for the invasion of cave habitats in this general area.

Most of the species of marine relict known from México and Guatemala occur at comparatively low elevations, but a few (such as *Opisthobursa josephinae*, *Mexicerberus troglodytes*, and various species of *Bogidiella*) are found at higher elevations. In some instances these distributions may reflect an original pattern of invasion as the seas receded, but in others it seems possible that migration occurred from lower elevations via a flooded interstitial or cavernous zone.

Speocirolana pelaezi is of interest in that it ranges from Tamaulipas to Puebla and inland from the Sierra de Tamaulipas to the Sierra El Pino along the western face of the Sierra Madre Oriental. Dispersal among these regions is now not possible and the assumption is justifiable that its distribution reflects multiple invasions by its ancestral species and a subsequent lack of divergence.

Freshwater derivatives.—Troglobites which have apparently evolved from freshwater ancestors include diaptomid copepods, triclad turbellarians, asellid isopods, shrimp, crayfish, crabs, and fish. All of these species are closely related to species now inhabiting epigean habitats in the same general area.

Three troglobitic flatworms of the family Dugesiidae are known from caves in México, and other species await description. All belong to the widespread genus *Dugesia* which is found in epigean habitats throughout México. Two species (*D. typhlomexicana* Mitchell and Kawakatsu and *D. barbarae* Mitchell and Kawakatsu) are known only from caves in the Sierra de Guatemala and are closely related to the troglophilic *D. guatemalensis* Mitchell and Kawakatsu from the same region. The third species (*D. mckenziei* Mitchell and Kawakatsu) is known only from caves in the San Cristóbal de las Casas region, Chiapas. All of the described species of troglobitic *Dugesia* are known from high elevation caves, but possible troglobites are known from lower elevations.

The diaptomid copepod *Diaptomus (Microdiaptomus) cokeri* Osorio Tafall is known only from caves in the Sierra de El Abra, San Luis Potosí. Although the subgenus is monotypic, the genus *Diaptomus* ranges widely throughout North America.

Isopods of the family Asellidae are represented in the caves of México and Guatemala by five described and several undescribed species of the genus *Caecidotea.* This genus ranges throughout North America, although only one epigean species, *C. communis* (Say), is known from México. The described troglobites are from caves in Huehuetenango, Guatemala, and Chiapas and Veracruz, México.

Three troglobitic shrimp from México are probably of freshwater origin. *Macrobrachium villalobosi* Hobbs from the Acatlán region of Oaxaca and *M. acherontium* Holthuis from a cave in Tabasco are almost certainly derived directly from a freshwater ancestor, albeit one which may itself have been partly dependent on marine waters for the completion of its life cycle as are other species of the genus. The genus *Bithynops* is known only from one troglobite and one troglophile in caves of the Montebello region of Chiapas. It is likely that the troglobitic *B. luscus* Holthuis has evolved quite recently and possibly from the troglophilic *B. perspicax* Holthuis, which inhabits caves of the same region.

Three troglobitic crayfish have been described from Mexican caves: *Procambarus (Austrocambarus) rodriguezi* Hobbs from Veracruz, *P. (A.) oaxacae*

oaxacae Hobbs from the Valle Nacional region of Oaxaca, and *P. (A.). oaxacae reddelli* Hobbs from caves in the Atoyac region of Veracruz and the Acatlán and Valle Nacional regions of Oaxaca. These species are both closely related to species now inhabiting the same region.

Crabs of the families Pseudothelphusidae and Trichodactylidae are represented in the caves of México and Guatemala. Three pseudothelphusid crabs of the cave-restricted genus *Typhlopseudothelphusa* have been described, one from Chiapas, México, and the remaining two from Alta Verapaz, Guatemala. *Typhlopseudothelphusa* is closely related to the epigean genus *Potamocarcinus*. The family Trichodactylidae is represented only by *Trichodactylus (Rodriguezia) mensabak* Cottarelli and Argano from Cueva de Nicolas Bravo, Chiapas. Its closest relative is an epigean species also known from Chiapas.

The fish fauna of Mexican caves includes four described species of freshwater origin. The characin *Astyanax jordani* (Hubbs and Innes) occurs in caves in the Sierra de El Abra, Micos region, and Sierra de Guatemala. This species is very recently derived from the epigean *Astyanax mexicanus* (Filippi). Its distribution in the caves of three isolated regions is presumably the result of multiple invasions and a convergent loss of eyes and pigment. The ictalurid catfish *Prietella phreatophila* Carranza has been found only in Pozo El Potrero near Músquiz, Coahuila. This species is an inhabitant of artesian waters and is most closely related to the more northern genus *Noturus*. The poeciliid *Poecilia sphenops* Valenciennes includes one population in a cave in Tabasco which has reduced eyes and pigmentation. This population is apparently a hybrid between typical *P. sphenops* and an unknown eyeless population. The synbranchid eel *Ophisternon infernale* (Hubbs) occurs only in caves in Yucatán and Quintana Roo. It is probably a comparatively recent derivative of *O. enigmaticum* Rosen and Greenwood or common ancestor. *Ophisternon enigmaticum* inhabits freshwater from southern México into South America.

With the exception of *Diaptomus (Microdiaptomus) cokeri*, *Prietella phreatophila*, and the species of *Dugesia* and *Caecidotea*, all of the freshwater-derived troglobites in this region are most closely related to epigean species with strong tropical affinities. Also with the exception of *Dugesia* and some species of *Caecidotea*, all are known from lowland caves.

Finally, mention should be made of four troglobitic species which have secondarily invaded freshwater and which are most closely allied with terrestrial species. These include two species of earthworm of the genus *Eodrilus* and two species of trichoniscid isopod. *Eodrilus albidus* Gates from the Sierra de Guatemala and *E. mexicanus* Gates from the Xilitla region are known only from pools in these caves. The genus *Eodrilus* is a tropical group frequently collected at lower elevations, but these two high elevation species may now be restricted to the cave habitat and to an aquatic or semi-aquatic existence. The trichoniscid isopod *Typhlotricholigioides aquaticus* Rioja is known only from pools in Cueva del Ojo de Agua Grande, Veracruz. This species would appear to be restricted to the aquatic habitat. *Mexiconiscus laevis* (Rioja) from caves in the Xilitla and Aquismón regions of San Luis Potosí is usually collected from pools, and Vandel (1970) postulates an amphibious existence wherein part of its life is spent in water and part on land. Both of these monotypic genera of isopod are believed by Vandel (1970) to be closely related to a Spanish aquatic troglobite.

Aquatic Troglophiles

The aquatic troglophile fauna is not well known but includes various planktonic forms such as copepods, ostracods, and cladocerans, and larger crustaceans and fishes. Although some of the microcrustaceans (notably several species of ostracod from Yucatán) are known only from subterranean habitats, this is likely to be a reflection of inadequate collections rather than restriction to underground waters. Some crayfish species inhabiting caves as troglophiles are also known only from caves, but, again, this is a reflection of the bias for cave collections in karst regions and not an indication of isolation in caves.

Few non-troglobitic fish have been collected from caves in this region, but several species, such as *Rhamdia guatemalensis* Günther and *Cichlasoma urophthalmus* (Günther) in Yucatán and *Astyanax mexicanus* (Filippi) throughout México, are common in caves.

Terrestrial Troglobites

A majority of the terrestrial troglobites in this region are most closely related to tropical species. The fauna also includes species which occur both in caves and on the surface but which are members of predominantly temperate groups. A few species appear to be true temperate relicts of groups that once inhabited the surface in this region but are now cave restricted. Most of the terrestrial troglobites are found at high elevations, but a significant number occur in lowland caves. The following discussion will outline the general distribution of some significant groups and discuss the relationships of the more interesting species.

Temperate relicts.—A few species of troglobite are known from Mexican caves which belong to groups unknown from the surface in this region. These include the centipede *Nuevobius cavicolens* Chamberlin, millipeds of the families Cambalidae and Trichopetalidae, and collembolans of the genera *Acherontides* and *Oncopodura.* In our present state of knowledge of the endogean fauna of tropical and subtropical regions, we can only speculate that these groups will not be found on the surface. It would appear, however, that they represent true relicts of a fauna once widespread throughout México but now to be found only in caves.

The centipede *Nuevobius cavicolens* Chamberlin is known only from Cueva de la Boca in the Sierra de la Silla, Nuevo León. The only other species in the genus is a troglobite from Tennessee (U.S.A.).

The milliped families Cambalidae and Trichopetalidae are unknown on the surface in México or Central America. It is likely that these species are survivors of a once-widespread fauna inhabiting the temperate forests that once covered parts of this region. These forests are now represented only by relict pockets at higher elevations of the Chiapas-Guatemalan Highlands, Sierra Madre del Sur, and Sierra Madre Oriental.

The family Cambalidae is an important element of the cave and endogean fauna of the United States. One aberrant species, *Jarmilka alba* Shear, is known only from a cave in Belize. The genus *Mexicambala* includes described species from caves in Oaxaca, San Luis Potosí, and Tamaulipas. It is probably a relict of a group once widespread in México but that is now restricted to caves. Finally, *Cambala speobia* (Chamberlin) has been collected in Cueva de los Lagos, Coahuila. This is a common species in the caves of Central Texas immediately north of the Rio Grande.

The family Trichopetalidae is a significant group in the cave and endogean habitats of the southeastern United States. In México it is represented only by the genus *Mexiterpes* with four troglobitic species from caves in San Luis Potosí and Querétaro. The most highly cave-adapted species (*M. sabinus* Causey) occurs at comparatively low elevations in the Sierra de El Abra. The remaining species, which occur at much higher elevations, retain ocelli and are apparently more recent troglobites. It would appear that these were inhabitants of a temperate forest which became extinct earlier at lower elevations than at higher ones.

Two genera of collembolans appear to be temperate relicts in the caves of México. The hypogastrurid genus *Acherontides* is known only from two Mexican caves, *A. atoyacense* Bonet in Veracruz and *A. potosinus* Bonet in the Xilitla region of San Luis Potosí. Other species of the genus occur in Rumania, Japan, and Afghanistan. The oncopodurid genus *Oncopodura* includes *O. atoyacense* Bonet from Veracruz and *O. prietoi* Bonet from Nuevo León and possibly Tamaulipas. Other species of the genus occur in Europe, Japan, and the United States.

There are several other groups which are unknown from the epigean habitat in México but include troglobites. Among the more important of these are six described and several undescribed millipeds of the family Trichopolydesmidae, agelenid spiders of the genus *Cicurina,* and ptinid beetles of the genus *Niptus.* It is likely, however, that as the endogean fauna of México becomes better known these groups will also be found in surface habitats.

The family Trichopolydesmidae is known from the epigeum in México only by two species in Baja California. All of the remaining species are troglobites. These are divided among three genera, *Caramba* with three species in Chiapas, *Speodesmus* with one species in Tamaulipas, and *Tylogoneus* with two species in San Luis Potosí and Tamaulipas. Each of these species is known only from the type-locality.

The spider genus *Cicurina* is a major element of the cave and epigean fauna of Texas and other parts of the United States. In México three troglobites and one troglophile have been described. The troglobites are known from caves in Yucatán, Tamaulipas, and Coahuila, and the troglophile from caves in Tamaulipas. With more collections from high elevations in México, this genus will almost certainly be found in endogean habitats.

Two species of beetle of the family Ptinidae are known from Mexican caves: *Niptus absconditus* Spilman, a possible troglobite from Hidalgo, and *N. abstrusus* Spilman, a troglophile from caves in Texas (U.S.A.) and Coahuila and Durango, México. Neither species has been collected from the surface, but it is likely that *N. abstrusus* or other species of the genus will be found there with more collecting.

Species with temperate affinities.—Several groups of cavernicole are members of genera containing both epigean and cavernicole species, but which have closer affinities to temperate species than to species inhabiting México. These include trichoniscid isopods of the genus *Brackenridgia,* scorpions of the genus *Typhlochactas,* pseudoscorpions of the genus *Aphrastochthonius,* and spiders of the genera *Tegenaria, Leptoneta,* and *Nesticus.*

The isopods of the genus *Brackenridgia* are among the most commonly collected animals in the caves of México. Although only five species have thus far been described, the genus occurs in caves from Nuevo León into Guatemala. The known distributions of the species are quite limited but will doubtless be found to be much wider with study of unidentified material. All species of the genus known from México are troglobites, as are two species found in Texas caves. The only epigean species of the genus is *B. heroldi* (Arcangeli) from caves and surface localities in California. The troglobitic species occur from low to high elevations and presumably represent a relict of a widespread fauna that ranged thoughout the western and southwestern United States into Central America but has now become extinct on the surface, except in the mountains of California.

Another group which is probably a relict of a once-widespread temperate fauna is the scorpion genus *Typhlochactas.* This genus includes three described troglobites from caves in Veracruz, San Luis Potosí, and Tamaulipas, and a litter-inhabiting species from high elevation forests in Oaxaca. As in some other groups, the most highly cave-adapted species occurs in low elevations. The evolution and distribution of *Typhlochactas* are discussed in more detail in the Systematic Review below.

Knowledge of the pseudoscorpion fauna of México, both cave and epigean, is very limited, but the chthoniid genus *Aphrastochthonius* would appear to be a member of a group with significant temperate affinities. Four troglobites in this genus have been described from this region, each known only from the type-locality. These occur in Tamaulipas, San Luis Potosí, and Alta Verapaz, Guatemala. Other troglobites in the genus have been found in Alabama, New Mexico, and Cuba. One epigean species has been described from leaf litter in Chiapas.

Agelenid spiders of the genus *Tegenaria* are an important element of the cavernicole fauna of México. This genus is frequently collected on the surface in the United States, but appears to be rare in caves outside of México, where two troglobites and seven troglophiles have been described.

The family Leptonetidae is a largely Nearctic group containing numerous troglobites and troglophiles in the caves of the United States and México. With the exception of a few epigean species, most of the records for this family south of the United States are from caves. This may reflect a bias for cave collections, but nevertheless the group as a whole is certainly aligned with the Nearctic fauna. Troglobites have been collected from caves in the Sierra Madre Oriental from Tamaulipas, Querétaro, and Nuevo León. One species, *Leptoneta limpida* Gertsch from Cueva de los Riscos, Durango, is most closely related to species from Texas caves and is now a relict isolated by the surrounding desert.

Although some species of the spider family Nesticidae range widely throughout North America well into Central America, the family has reached its greatest degree of radiation in Nearctic regions. The genus *Nesticus* is unknown from the surface in México and includes troglobites from Veracruz, Tamaulipas, Nuevo León, and Puebla.

Species with tropical affinities.—The vast majority of the cavernicole fauna of México is made up of Neotropical elements. In some instances all or most of the species in these groups known from México, Guatemala, and Belize are troglobites, but in most cases there are closely related taxa both on the surface and underground. It is not possible to do more here than to mention some of the more significant species and briefly outline distributional patterns as they are presently known.

Two families of milliped which include troglobites reach their northern distributional limit in southern México. The Glomeridesmidae ranges from Panamá into México south of the Isthmus of Tehuantepec. The only Mexican species is the troglobite *Glomeridesmus sbordonii* Shear from caves in Chiapas and Tabasco. With the exception of one epigean species in Tabasco, the family Oniscodesmidae is represented in México only by two troglobites in Veracruz: *Bonetesmus ojo* Shear from the Orizaba region and *B. verus* Chamberlin from the Atoyac region.

Two species of philosciid isopod are troglobites in Mexican and Guatemalan caves; both belong to genera known only from the tropics. *Colombophiloscia cavernicola* Vandel was described from caves in Venezuela and has since been reported by Schultz (1977) from a cave in Huehuetenango, Guatemala. Even if this species proves to be an undescribed one, it is obviously a tropical element and one of the few having close affinities with the South American fauna. The only other species of the genus occur in Ecuador and the Galápagos Islands. The other troglobitic philosciid known from this region is *Troglophiloscia laevis* Schultz from a cave in Yucatán; the only other species of the genus is a Cuban troglobite.

Several tropical groups include species of troglobite in more northern México, but which are otherwise not found on the surface outside of southern México. Included among these is the sphaeroniscid isopod *Spherarmadillo cavernicola* Mulaik from caves in the Sierra de El Abra and Sierra de Guatemala. This genus and its relatives are not found on the surface north of Veracruz. The squamiferid isopod genus *Trichorhina* includes epigean and cavernicole species in México and Cuba. Three troglobites and one troglophile are known. The troglophile has been found in Chiapas, while the troglobites occur in Yucatán, Veracruz, and San Luis Potosí. The troglobite *T. boneti* Rioja from higher elevations in the Xilitla region of San Luis Potosí is the only species to occur north of Veracruz. A third genus of isopod, *Cylindroniscus*, also has a similar distributional pattern. Endogean species are known from Cuba and Yucatán, while troglobites occur in Yucatán, Nuevo León, and San Luis Potosí.

Two families of pseudoscorpion include representatives in both the Old World and New World tropics. The Vachoniidae contains one African genus and two Central American genera. The Central American species are all troglobites divided between two genera: *Vachonium* with one species in Belize and four in Yucatán and *Paravachonium* with two species in Tamaulipas. The family Hyidae contains several epigean species from Asia and epigean and troglobitic species from the New World. Two of the genera, *Leucohya* with two species in isolated mountain ranges of Nuevo León and *Troglohya* with one species each in Chiapas and Oaxaca, contain only troglobites. The third genus, *Mexobisium*, contains troglobites in Belize, Guatemala, and Tabasco and Veracruz, México. Epigean species have been described from Cuba and southern México.

One of the more interesting species known from Mexican caves is the cyphophthalmid *Neogovea mexasca* Shear from caves in the Acatlán region of Oaxaca. This is the only species of the suborder known from México and is a member of a genus otherwise found only in Brazil and Guyana.

The milliped order Glomerida is largely tropical, although some species do occur in the United States. The genus *Glomeroides*, however, includes epigean species in México, Guatemala, and California (U.S.A.). The only species known from the surface in México are restricted to the extreme southern part of the country; troglobites have been taken from caves at low elevations in Veracruz and from higher elevations in the Sierra Madre Oriental of San Luis Potosí and Tamaulipas.

The carabid beetle tribe Trechini includes numerous species in the genera *Paratrechus* and *Mexitrechus* from high-elevation, endogean habitats in southern México and Central America. The northernmost species of *Paratrechus* is *P. (Hygroduvalius) pallescens* Barr, a troglobite from caves in Querétaro. Three trechine genera, probably derived from the same lineage as *Paratrechus*, are known only from caves: *Chiapadytes* with one species in the San Cristóbal de las Casas region of Chiapas, *Mayaphaenops* with one species from Huehuetenango, Guatemala, and *Mexaphaenops* with four high-elevation species in Querétaro, San Luis Potosí, and Tamaulipas. The latter genus also includes a species from Grutas del Palmito, Nuevo León, which has apparently been isolated by the surrounding desert.

Most of the remaining species of troglobite known from caves in this region are members of groups present both on the surface and in caves throughout the region, although some may not occur at higher elevations. It is not possible here to do more than mention a few examples to illustrate various aspects of their general distribution.

Three arachnid orders which are almost entirely tropical in their distribution are the Schizomida, Amblypygida, and Ricinulei. These are all found in surface habitats throughout tropical and subtropical America and all contain both troglobite and troglophile representatives.

The order Schizomida ranges from South America north into the southern United States and is an important element of the cavernicole fauna of México, Guatemala, and Belize. The family Protoschizomidae includes only four species, two of which are epigean species from Colima and Tamaulipas. The genus *Agastoschizomus* includes two troglobitic species: *A. lucifer* Rowland from caves in the Sierra de El Abra, San Luis Potosí; and *A. huitzmolotitlensis* Rowland from the Xilitla region of San Luis Potosí. The latter species is the only described species in the order from higher elevations in México. The family Schizomidae includes numerous troglophilic and troglobitic species from Guatemala into Nuevo León, Mexico. The eight presumed troglobites are from Veracruz, Tabasco, San Luis Potosí, Oaxaca, Tamaulipas, and Nuevo León. The more northern species appear to be isolated in caves by the surrounding desert.

Numerous species of amblypygid of the genus *Paraphrynus* have been reported from caves. Species from Tamaulipas, Yucatán, Tabasco, and San Luis Potosí are troglobitic. All but one of these are lowland troglobites; *P. velmae* Mullinex occurs at higher elevations in the Xilitla and Aquismón regions of San Luis Potosí.

The order Ricinulei, once thought to be incredibly rare and still seldom collected, has been found to be a significant component of the cavernicole fauna of parts of México and Guatemala. Most of the described species are epigean or troglophilic, but three appear to be cave restricted: *Cryptocellus sbordonii* Brignoli from Chiapas, *C. osorioi* Bolívar from San Luis Potosí and Tamaulipas, and *C. reddelli* Gertsch from the Sierra de la India of Durango. The last species is apparently isolated by the surrounding desert.

The phalangodid harvestman genus *Hoplobunus* ranges from Central America into Texas. This is a large genus with numerous epigean species, most known only from the southern part of its range. Troglobitic species have been described from Chiapas, Oaxaca, Querétaro, San Luis Potosí, Tamaulipas, and Nuevo León. With the exception of *H. boneti* (Goodnight and Goodnight) from caves of the Sierra de El Abra and Sierra de Guatemala and *H. osorioi* (Goodnight and Goodnight) from three isolated mountain ranges in Nuevo León, all of the species are restricted to high elevations. Two additional high-elevation relicts, both assigned by Silhavý (1974) to the genus *Troglostygnopsis*, may also belong in *Hoplobunus*. Two troglobitic species of *Hoplobunus* in Texas are apparently tropical relicts in a temperate region.

The milliped family Rhachodesmidae ranges from Central America into Nuevo León and has been a major contributor to the troglobite and troglophile fauna of this region. Six genera of this family contain troglobites, all but one of which also contain epigean species. *Aceratophallus* ranges north into Chiapas and Yucatán, with several troglophiles known from Yucatán. The only troglobite is *A. scutigeroides* Shear from Alta Verapaz, Guatemala, and possibly Chiapas. *Acutangulus* includes five species from Veracruz, but the only troglobite is *A. alius* Causey from the Orizaba region. Two troglobitic species of *Ceuthauxus* have been described, one from the Cacahuamilpa region of Guerrero and the other from Grutas del Palmito, Nuevo León. This genus ranges from Morelos and Veracruz into Coahuila. The genus *Pararhachistes* includes two epigean and one troglobitic species in Guerrero. Several species of *Strongylodesmus* have been described from México, but the only troglobite is *S. harrisoni* Causey from the Sierra de Guatemala. This is a fairly recent troglobite and may now be restricted to caves at higher elevations. The most important genus of rhachodesmid milliped in Mexican caves is *Unculabes*. This genus includes only five species, all known only from caves in San Luis Potosí, Querétaro, and Tamaulipas. All but one of these are troglobitic.

México contains a rich troglobitic gryllid cricket fauna, with four species in two genera described. *Tohila atelomma* Hubbell is a species known only from caves in the Yucatán Peninsula. It is apparently most closely related to the genus *Paracophus*. The latter genus is known only from the Sierra Madre Oriental, where three troglobitic and five troglophilic species are found. The three troglobites—*P. caecus* Hubbell from the Sierra de Guatemala, *P. cladonotus* Hubbell from southern San Luis Potosí and adjacent Hidalgo, and *P. lippus* Hubbell from the Sierra El Pino region of San Luis Potosí—are restricted to high elevations.

The last group to warrant mention here includes species belonging to genera which are widespread in both tropical and temperate regions. Among the more important of these groups are spiders of the families Dipluridae, Theraphosidae, and Pholcidae; millipeds of the families Cleidogonidae and Spirostreptidae; entomobryid collembolans of the genus *Pseudosinella;* and beetles of the family Leiodidae.

The spider suborder Mygalomorphae tends to be poorly represented in caves, but two families include troglobites in México. The Dipluridae includes two described troglobites, *Euagrus anops* Gertsch from the Xilitla region and *E. cavernicola* Gertsch from the Sierra de Guatemala; both occur only at high elevations. The family Theraphosidae is represented in Mexican caves by two troglobites: *Schizopelma reddelli* Gertsch from caves in the Acatlán region of Oaxaca and *S. stygia* (Gertsch) from the Xilitla region. The first species occurs at low elevations, while the latter is found at higher ones.

One of the most characteristic features of the cavernicole fauna of this region is the presence in caves of numerous spider species belonging to the family Pholcidae. Troglobitic species are found in the genera *Metagonia*, *Pholcophora*, and *Psilochorus*. *Metagonia* includes lowland troglobites in Veracruz, Oaxaca, Tamaulipas, the Yucatán Peninsula, and Belize. Highland troglobites are found in the Sierra de Guatemala and Xilitla regions. Two of the three troglobitic species of *Pholcophora* in México are known from lowland caves in Guerrero and the Yucatán Peninsula. The third species of *Pholcophora* and the two troglobitic *Psilochorus* species are found in the caves of Chihuahua and Durango where they are isolated by the surrounding desert.

The cleidogonid milliped genus *Cleidogona* is of interest in that the most highly cave-adapted species in the genus, *C. crucis* (Chamberlin) from the Atoyac region of Veracruz, is found at the lowest elevation of any of the troglobites. The remaining troglobitic species of the genus are found at higher elevations in the states of Oaxaca, Chiapas, and Tamaulipas. The genus *Cleidogona* ranges from Central America into the United States; Shear (1972) speculates that the genus originated in the Mexican highlands.

Although only two species of the spirostreptid milliped genus *Orthoporus* have become troglobites, they are of particular interest in that they are the only troglobites in the genus. The species of *Orthoporus* tend to have very wide ranges and to be highly vagile. *Orthoporus spelaeus* Causey has been found only in one cave in the Coastal Plain of Yucatán; *O. zizicolens* (Chamberlin) appears to be restricted to caves in the Sierra de Ticul, Yucatán.

The collembolan family Entomobryidae includes several genera with cave representatives, but the most important by far is *Pseudosinella.* This widely distributed genus contains troglobitic species in Alta Verapaz, Guatemala, and Oaxaca and Tamaulipas, México. The genus is now under revision, and more meaningful data on its distribution in México and Central America should be forthcoming.

One of the more important beetle families to inhabit caves in North America is the Leiodidae. Numerous species of this family have invaded Mexican and Central American caves, but only two troglobites have been described. These two species, *Ptomaphagus (Adelops) troglomexicanus* Peck from the Sierra de Guatemala and *P. (A.) mckenziei* Peck from the Purificación region of Tamaulipas and Nuevo León, are both restricted to high elevations.

As is apparent from the above, the terrestrial troglobite fauna of México and Central America includes an assortment of species derived from ancestors with a variety of affinities. Perhaps one of the more interesting aspects of the fauna of this region is the admixture of temperate and tropical derivatives in the same caves. This alone is a good indication of the complexity of the past history of the region. Species derived from ancestors adapted for colder climates now coexist in the same caves with species derived from those adapted for warmer climates.

Also of no slight interest is the existence of numerous troglobites in caves in areas of lowland tropical forests. It has been one of the axioms of modern biospeleology (Vandel, 1964; Mitchell, 1969a) that terrestrial troglobites are rare in tropical regions. The presence of a rich troglobitic fauna at high elevations can be readily explained by the model of Barr (1968a) in which past climatic changes extirpated the epigean fauna, allowing for divergence to occur in the cavernicole populations of that fauna. Climatic fluctuations during the Pleistocene, though presumably less severe in México and Central America, certainly were felt at higher elevations and may have allowed for the extinction of the surface ancestors of the present-day troglobites. The existence of a rich troglobitic fauna at lower elevations in tropical regions is now uncontested. Not only do we have a rich fauna in lowland parts of México and Central America, but studies by Howarth (1973) in Hawaii, and by Peck (1976) in Jamaica and other islands of the West Indies prove the existence of a rich tropical troglobite fauna in other areas as well. Only with much additional study, both of existing collections and in under-investigated areas, can a really comprehensive model be proposed for the evolution of this fauna. It is possible, however, that the Pleistocene climatic fluctuations were felt sufficiently at lower elevations to cause the extinction of surface populations of many groups in some karst regions. The more vagile species, such as beetles, were able to repopulate the areas before divergence occurred, while groups such as millipeds, isopods, and the smaller arachnids had time to become genetically isolated from the re-invading stock. The preponderance of the smaller, more delicate species in lowland tropical caves would seem to give credence to this hypothesis.

Terrestrial Troglophiles

The terrestrial troglophile fauna of México, Guatemala, and Belize contains both species which are abundant on the surface and species known only from caves. Some of the latter may eventually prove to be cave restricted, although they do not yet exhibit the reduction or loss of eyes and pigmentation to be found in the troglobites. Other species known only from caves belong to groups of endogean forms in which eyes are absent and pigmentation reduced. The present brief discussion of Mexican troglophiles will outline the various groups of troglophiles with respect to their general distribution. For further details on the distribution of the more important species, see the Systematic Review section which follows.

A few species which are troglophilic in caves in this region have extremely wide ranges. Among these, mention may be made of the nesticid spiders *Gaucelmus augustinus* Keyserling and *Eidmannella pallida* (Emerton). These two species are important members of the cavernicole communities of the United States, México, and Central America. The preponderance of records for the two species in caves in many areas reflects both a predilection for the cavernicole habitat and a bias towards cave collections. One other example of wide distribution should suffice here. This is that of the leiodid beetles of the genus *Dissochaetus.* Some species of this genus range from South America into northern México. Although cave records for the southern part of the range are rare (as are collections), numerous troglophile populations occur in México, Guatemala, and Belize.

Many species with more limited ranges will be found in caves wherever they are available. This is especially true of the more mesic-adapted forms, such as many millipeds, isopods, arachnids, and soft-bodied insects. Examples include various species of armadillid and porcellionid isopod, rhachodesmid milliped, laniatorid harvestmen, and collembolan. Two specific examples may be cited, both belonging to comparatively rare arachnid orders. The schizomid *Schizomus mexicanus* Rowland and the ricinuleid *Cryptocellus pelaezi* Coronado are abundant, both in caves and on the surface in the caves of the Sierra de El Abra. During the wet season both species may be frequently collected under rocks in this area, as well as in caves; but with the onset of the dry season both species retreat into the soil and may be found only in caves. Another interesting species with respect to its distribution is *Schizomus portoricensis* (Chamberlin). This species is known throughout many parts of tropical America. Sexual populations are known from the surface in mainland México and from caves in Chiapas; peripheral populations are apparently parthenogenetic. An analysis of cavernicole populations in Yucatán indicate that facultative parthenogenesis has been a significant factor in the abundant colonization of the caves of that region (Rowland and Reddell, 1977).

In some arid regions of northern México species occur only in caves , while being found on the surface in more mesic areas of their ranges. Examples of this type of distribution are to be found in the pholcid spiders, and most notably *Physocyclus enaulus* Crosby and *P. hoogstraali* Gertsch and Davis. Although it would be premature to do more than speculate, it is possible that cave populations of these and other species may now be isolated and will eventually become genetically distinct from the parental stock.

Numerous species of troglophile in the caves of this region are known only from caves. This is particularly true with respect to many arachnids and millipeds. There can be little doubt but that many of these will eventually be found in endogean situations; a bias both for cave collections and the study of cavernicoles by taxonomists has emphasized the cavernicole fauna at the expense of the related endogean forms. Among the groups in which this occurrence is most notable are schizomids, pseudoscorpions, opilionids, the smaller spiders, and the more delicate millipeds. These groups tend to seek a moist, dark habitat of a sort frequently overlooked by the casual collector. Collecting during drier periods in areas with marked dry and wet seasons will also fail to turn up the more mesic-adapted forms. The cavernicole habitat, with its nearly constant conditions of temperature and humidity, provides a stable environment at almost all times and thus the chances are greater for finding these forms. Also in many caves food is scarce in comparison with that on the surface and even the casual visitor to a cave can quickly locate troglophile and troglobite species because of their concentration in a few areas where organic matter has accumulated. In the case of the smaller, more secretive forms, such as the pyrgodesmid millipeds and most pseudoscorpions, only intensive search, including the use of special extraction techniques, will result in their discovery on the surface.

Systematic Review

The following is a review of the known cavernicole fauna of México, Guatemala, and Belize, with special emphasis on those species which are of unusual interest or which make a significant contribution to the ecology of the cave habitat. This is in no sense a complete list of species recorded from the caves of this region. The tables which accompany each major section record the number of species of each family known from caves in this area; comparatively few species are referred to by name in the text. No complete list of the known cave fauna of these countries is available, although Reddell (1971b) includes all published records for México up to 1971.

The checklist of cave-adapted species is as complete as possible. As has been discussed above, the use of the term "troglobite" is arbitrary, and, since we cannot in many instances know if a species is restricted to the cave habitat, I include in the checklist part of this review all of those species which appear significantly more cave adapted than other related species. All references to each species are given with as accurate page citations as is possible. A question-mark following the year in the citation indicates that the paper in question is known to refer to that particular species but that I have not seen the paper. Type-locality data are given as listed in the original description; the correct name of the cave or locality is included in parentheses. Cave names are those currently used by the Association for Mexican Cave Studies. Locations and alternate names of the caves are given in the locality list in the Appendix.

Phylum Protozoa

With the exception of the study by Osorio Tafall (1943) of two caves in the Sierra de El Abra, San Luis Potosí, there are no published records of free-living protozoans from caves in México (see Table 4). This is a group worthy of study as shown by preliminary studies of Protozoa in the United States and Europe.

Class Rhizopodea

Order Amoebida

Family Amoebidae

The only species in this family reported from Mexican caves is an undetermined species of *Amoeba* from Cueva Chica, San Luis Potosí.

Class Actinopodea

Order Heliozoida

Family Actinophryidae

An undetermined species of *Actinophrys* was reported from Cueva Chica, San Luis Potosí.

Order Arcellinida

Family Arcellidae

Arcella vulgaris Ehrenberg was found in Cueva de Los Sabinos, San Luis Potosí.

Family Difflugiidae

Centropyxis aculeatus Ehrenberg was taken in both Cueva Chica and Cueva de Los Sabinos, San Luis Potosí.

Table 4.—Summary of cave inhabiting Protozoa.

	Troglobites	Other Species
Rhizopodea		
Amoebida		
Amoebidae	0	1
Actinopodea		
Heliozoida		
Actinophryidae	0	1
Arcellinida		
Arcellidae	0	1
Difflugiidae	0	1
Zoomastigophorea		
Kinetoplastida		
Trypanosomatidae	0	3
Ciliatea		
Gymnostomatida		
Colepidae	0	1
Peritrichida		
Vorticellidae	0	1
Total	0	9

Class Ciliatea

Order Gymnostomatida

Family Colepidae

Coleps sp. cf. *hirtus* (Müller) was collected from Cueva Chica, San Luis Potosí.

Order Peritrichida

Family Vorticellidae

Vorticella sp. cf. *microstoma* Ehrenberg was collected in Cueva Chica, San Luis Potosí.

Phylum Porifera

Class Demospongiae

Order Haplosclerina

Family Spongillidae

Penney and Racek (1968) described *Spongilla cenota* from Cenote Grande de Xanabá and Cenote Xtolok, Yucatán. These two cenotes contain large open-air bodies of water, and the sponge recovered from them is certainly not a part of the true cave fauna.

Phylum Cnidaria

Class Hydrozoa

Order Hydroidea

Family Hydridae

Osorio Tafall (1943) reported an unidentified species of *Hydra* from Cueva de Los Sabinos, San Luis Potosí. This is surely a form washed into the cave from the surface.

Phylum Platyhelminthes

The phylum Platyhelminthes is represented in caves both by free-living members of the class Turbellaria and by numerous species of parasite of the classes Trematoda and Cestoda (see Table 5). The parasites have been found in bats, fishes, and amphibians; they are not discussed further since they are not a part of the true cave fauna.

Class Turbellaria

Order Tricladida

The triclad turbellarian fauna of Mexican caves is poorly known in comparison to that of the United States. Many collections have been made recently in Mexican and Guatemalan caves, and once this material has been studied we will have a far better concept of the nature and relationships of the Mexican and Central American troglobitic and troglophilic planarian fauna.

Suborder Maricola

Family Dimarcusidae

One of the more exciting events in recent years in Mexican cave biology was the description of the first marine relict troglobitic flatworms. Unfortunately, the first species was discovered and described inde-

Table 5.—Summary of cave inhabiting Platyhelminthes.

	Troglobites	Other Species
Turbellaria		
Tricladida		
Maricola		
Dimarcusidae	2	0
Paludicola		
Dugesiidae	3	1
Terricola		
Bipaliidae	0	1
Geoplanidae	0	1
Rhynchodemidae	0	2
Trematoda		
Digenea		
Acanthostomidae	0	1
Allocreadidae	0	1
Anenterotrematidae	0	2
Clinostomidae	0	1
Hemiuridae	0	1
Lecithodendriidae	0	4
Plagiorchiidae	0	1
Strigeidae	0	1
Urotrematidae	0	1
Cestoda		
Cyclophyllidea		
Anoplocephalidae	0	1
Pseudophyllidea		
Bothriocephalidae	0	1
Total	5	20

pendently by an Italian and by American and Japanese specialists. Benazzi (1972) published the description of *Opisthobursa mexicana* in a very brief and uncertain fashion, while a complete description by Mitchell and Kawakatsu (1972) of *Dimarcus villalobosi* appeared very shortly afterwards. Mitchell and Kawakatsu also erected the family Dimarcusidae in their paper to include this remarkable species. Benazzi and Giannini (1974) described the family Opisthobursidae for the same species. Although the nomenclatorial status of the species is still in doubt, it appears that Benazzi's name has priority. The family Dimarcusidae clearly has priority and is thus the correct name for the family, with the family Opisthobursidae falling as a junior synonym to it.

Opisthobursa josephinae Benazzi

Opisthobursa josephinae Benazzi, 1976:533-536, pl. 1 (fig. 1-2), pl. 2(fig. 3-4); Ball, 1977a:151, 153; Ball, 1977b:27; Pasquini, 1977:3.

Opisthobursa (part): Ball, 1977a:154; Ball, 1977b: 27, 29, fig. 1, 3.

Type-locality.—Pozza Casa Bell, S. Cristóbal de las Casas, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 3.

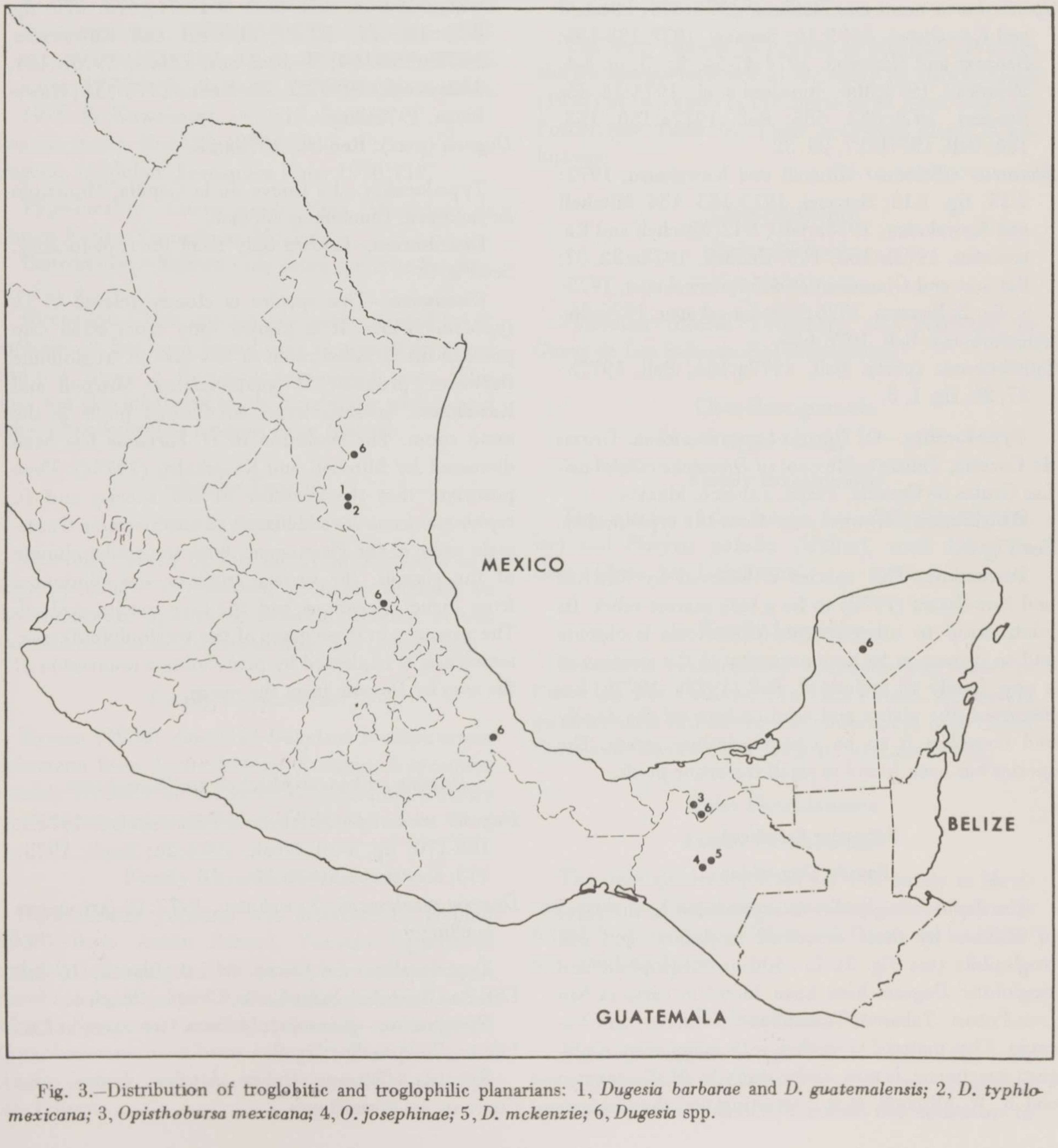

Fig. 3.—Distribution of troglobitic and troglophilic planarians: 1, *Dugesia barbarae* and *D. guatemalensis;* 2, *D. typhlomexicana;* 3, *Opisthobursa mexicana;* 4, *O. josephinae;* 5, *D. mckenzie;* 6, *Dugesia* spp.

Discussion.—This large, troglobitic flatworm is similar to *O. mexicana* in many respects but is more than twice as long. Since the dimarcusid planarians belong to the Maricola, a primarily marine group, the discovery of this relict species at 2,115 meters in elevation is very interesting. Marine relict species at altitudes in excess of 1,000 meters are rare, but in México they include *Mexicerberus troglodytes* Schultz and *Speocirolana pelaezi* Bolívar in the caves of the Sierra de Guatemala, Tamaulipas.

Opisthobursa mexicana Benazzi

Turbelárido cavernícola: Villalobos, 1960:332.

Opisthobursa mexicana Benazzi, 1972:405; Mitchell and Kawakatsu, 1972:16; Benazzi, 1973:133-134; Benazzi and Giannini, 1974:47-54, fig. 3, pl. 1-4; Sbordoni, 1974:366; Sbordoni et al., 1974:14, 15; Benazzi, 1976:533, 535; Ball, 1977a:150, 153, 154; Ball, 1977b:27, 29, 32.

Dimarcus villalobosi Mitchell and Kawakatsu, 1972: 2-15, fig. 1-13; Benazzi, 1973:133, 134; Mitchell and Kawakatsu, 1973a:640, 642; Mitchell and Kawakatsu, 1973b:168, 169; Reddell, 1973a:32, 37; Benazzi and Giannini, 1974:54; Kawakatsu, 1975: 7, fig. 2; Benazzi, 1976:533; Kawakatsu, 1976:36.

Opisthobursa: Ball, 1976:649.

Opisthobursa (part): Ball, 1977a:154; Ball, 1977b: 27, 29, fig. 1, 3.

Type-locality.—Of *Opisthobursa mexicana:* Grutas de Coconá, Tabasco, México; of *Dimarcus villalobosi:* Las Grutas de Coconá, Teapa, Tabasco, México.

Distribution.—Known only from the type-locality. See Fig. 3.

Discussion.—This species is believed by Mitchell and Kawakatsu (1972) to be a true marine relict. Its relationship to other species of Maricola is obscure and so distant as to have necessitated the erection of a new family to include it. Ball (1977a; 1977b) has discussed the status and relationships of the family and considers it to be a very primitive group. The species has been found in small travertine pools.

Suborder Paludicola

Family Dugesiidae

The family Dugesiidae is represented in the caves of México by three described troglobites and one troglophile (see Fig. 3). In addition, troglophilic and troglobitic *Dugesia* have been found in caves in San Luis Potosí, Tabasco, Tamaulipas, Veracruz, and Yucatán. This material, together with many related epigean specimens, is now under study by M. Kawakatsu and R. W. Mitchell. It is interesting that the Mexican paludicolan flatworms belong to the Dugesiidae rather than to the Planariidae or Kenkiidae. The latter two families predominate in the cave fauna of the United States and include numerous troglobites. No *Dugesia* is known as a troglobite in the United States although a few populations are troglophiles in Texas and probably elsewhere.

Dugesia barbarae Mitchell and Kawakatsu

Dugesia sp. II: Reddell and Mitchell, 1971b:182; Reddell and Elliott, 1973b:182.

Dugesia barbarae Mitchell and Kawakatsu, 1973a: 641, 646-649, 662, 663, 661-671, 673, 675, fig. 4-5, 10, 15, 28-30; Mitchell and Kawakatsu, 1973b:168-169; Reddell and Elliott, 1973b:181, 182; Kenk, 1974:22, 28; Kenk, 1975:113; Kawakatsu, 1976:36.

Dugesia (part): Reddell, 1973a:32.

Type-locality.—La Cueva de la Capilla, Municipio de Jaumave, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 3.

Discussion.—This species is closely related to *D. typhlomexicana.* It is known only from small drip pools in the terminal room of this cave. A troglophilic flatworm, probably *D. guatemalensis* Mitchell and Kawakatsu, inhabits larger silt-floored pools in the same room. The evolution of *D. barbarae* has been discussed by Mitchell and Kawakatsu (1973a). They postulate that the ancestor of this species and *D. typhlomexicana* invaded caves in the Sierra de Guatemala early in the Pleistocene. With the colder climate of the glacials, the surface ancestor was eliminated from higher elevations and the cave species evolved. The presence in these caves of the troglophilic *D. guatemalensis* is explained by postulating a re-invasion of the area by *Dugesia* from the north.

Dugesia mckenziei Mitchell and Kawakatsu

Dugesia mckenziei Mitchell and Kawakatsu, 1973b: 165-170, fig. 1-10; Kenk, 1974:26; Kenk, 1975: 113; Kawakatsu, 1976:36.

Dugesia mackenziei: Kawakatsu, 1977:18 (erroneous spelling).

Type-locality.—La Cueva de Los Llanos, 15 km ESE San Cristóbal de las Casas, Chiapas, México.

Distribution.—Known only from two caves at Los Llanos, Chiapas. See Fig. 3.

Records.—*Chiapas:* Cueva de Los Llanos and Cueva de los Murciélagos.

Discussion.—This is a minute-eyed, scarcely pigmented species apparently most closely related to *D. guatemalensis*, known only from the Sierra de Guatemala, Tamaulipas. It is presumably a recent troglobite. It inhabits a slow moving stream which probably runs through both caves from which the species is known.

Dugesia typhlomexicana Mitchell and Kawakatsu

Dugesia sp. I: Reddell and Mitchell, 1971b:182, fig. 1-2; Reddell and Elliott, 1973b:182.

Dugesia typhlomexicana Mitchell and Kawakatsu 1973a:641, 642-646, 647, 649, 662, 663, 666-671, 673, fig. 1-3, 9, 13-14, 22, 24-27; Mitchell and Kawakatsu, 1973b:168, 169; Reddell and Elliott, 1973b:181, 182; Kenk, 1974:22, 28; Kawakatsu, 1975:7, fig. 2; Kenk, 1975:113; Kawakatsu, 1976:36; Kawakatsu, 1977:17, fig. 3A.

Dugesia (part): Reddell, 1973a:32.

Dugesia, troglobia: Fernández Ruiz, 1976:717.

Type-locality.—Cueva de la Mina, Municipio de Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 3.

Discussion.—This species is closely related to *D. barbarae*. It has been found only in a small drip pool mid-way down a flowstone-breakdown slope. This pool was also inhabited by the troglobitic trichoniscid isopod *Brackenridgia bridgesi* (Van Name).

Suborder Terricola

Family Bipaliidae

The only record of this family in México is of a single specimen of *Bipalium*, probably referable to the widespread species *B. kewense* Moseley. It was found in Sótano de Huitzmolotitla, San Luis Potosí.

Family Geoplanidae

Hyman (1938) described *Geoplana multipunctata* Fuhrmann from Actún Loltún, Yucatán. A specimen possibly referable to the genus *Geoplana* has recently been collected in Actún Sabacá, Yucatán.

Family Rhynchodemidae

Diporodemus yucatani was described by Hyman (1938) from Actún Sabacá, Yucatán. Specimens probably belonging to this species have recently been found among leaf litter in the entrance sink of Actún Sabacá. Specimens possibly belonging to the genus *Rhynchodemus* have been collected from Cueva del Lencho Virgen, Oaxaca, and Sótano del Pozo, San Luis Potosí.

Table 6.—Summary of cave inhabiting Rotifera.

	Troglobites	Other Species
Bdelloidea		
Bdelloida		
Philodinidae	0	1
Monogonata		
Flosculariacea		
Flosculariidae	0	1
Ploima		
Brachionidae	0	2
Lecanidae	0	2
Total	0	6

Phylum Rotifera

The only records of rotifers in Mexican caves are the six species included in the study by Osorio Tafall (1943) of two caves in the Sierra de El Abra, San Luis Potosí (see Table 6). Their ecological status is unknown.

Class Bdelloidea

Order Bdelloida

Family Philodinidae

Philodina roseola Ehrenberg was collected in Cueva de Los Sabinos, San Luis Potosí.

Class Monogononta

Order Ploima

Family Brachionidae

Two species of this family, *Lepadella patella* (Müller) and *Platyias patulus* (Müller), were found in Cueva Chica, San Luis Potosí.

Family Lecanidae

Monostyla closterocerca Schmarda was found in Cueva de Los Sabinos, San Luis Potosí. *Monostyla quadridentata* Ehrenberg was collected in both Cueva Chica and Cueva de Los Sabinos, San Luis Potosí.

Order Flosculariacea

Family Flosculariidae

The only species reported for this family in Mexican caves is *Sinantherina socialis* (Linnaeus); it was found both in Cueva Chica and Cueva de Los Sabinos, San Luis Potosí.

Phylum Nematoda

Although numerous species of nematodes have been reported as parasites from the cave inhabiting bats and fishes of México, these do not constitute in any way a part of the true cave fauna and are not further discussed here (see Table 7). Zullini (1974) has, however, produced an excellent paper on the Nematoda of the soil and water of Chiapas and adjacent Guatemala. His report includes records of seven aquatic and seven soil species of nematodes from caves in Chiapas and Guatemala. A second study of the aquatic nematode fauna of southern México included numerous records of species from wells, cenotes, and caves (Zullini, 1977).

Class Adenophorea

Order Araeolaimida

Family Plectidae

Plectus cirratus Bastian was found in the mud from the floor of pools in Cueva del Panteón and Grutas del Rancho Nuevo, Chiapas. This widespread species was also found in stream sediment near Huistán, Chiapas (Zullini, 1974).

Order Monhysterida

Family Monhysteridae

Monhystera paludicola de Man was collected from the bottom of the stream in Cueva Chorreadero, Chiapas. It was also found in surface streams (Zullini, 1974).

Order Chromadorida

Family Cyatholaimidae

Prodesmodora circulata (Micoletzky) was found only in the mud of Cueva Chorreadero, Chiapas (Zullini, 1974).

Order Enoplida

Family Alaimidae

Alaimus primitivus de Man, a common species in Europe and America, was collected from mold in Cueva Chorreadero, Chiapas (Zullini, 1974). An undetermined species of *Amphidelus* was found in damp, guano-rich mud in Grutas de Zapaluta, Chiapas (Zullini, 1977).

Family Axonchiidae

Axonchium sbordonii Zullini was described from slime in Sima del Ojito, Chiapas (Zullini, 1974); it is known only from this cave.

Family Ironidae

Ironus ignavus Bastian was collected from water in Cueva Chorreadero, Chiapas (Zullini, 1974), and from water and bottom mud in a cenote at Yokdzonot, Yucatán (Zullini, 1977). *Ironus longicaudatus* de Man was found in slime in Sima del Ojito, Chiapas (Zullini, 1974), and in water and bottom sediment in Cenote Xtojil, Yucatán (Zullini, 1977).

Family Longidoridae

Xiphinema index Thorne and Allen was reported by Zullini (1974) from mud in Cueva del Tepesquintle, Huehuetenango, Guatemala, and from Sima del Ojito, Chiapas. This is a common species in Europe, America, and Africa. Zullini (1977) reported *X. basiri* Siddiqi from wells in Mérida and Teya, Yucatán.

Table 7.—Summary of cave inhabiting Nematoda.

	Troglobites	Other Species
Adenophorea		
Araeolaimida		
Plectidae	0	1
Monhysterida		
Monhysteridae	0	1
Chromadorida		
Cyatholaimidae	0	1
Enoplida		
Alaimidae	0	2
Axonchiidae	0	1
Ironidae	0	2
Longidoridae	0	2
Mononchidae	0	5
Tripylidae	0	3
Dorylaimida		
Dorylaimidae	0	6
Secernentea		
Ascaridida		
Ascaridiidae	0	1
Heterocheilidae	0	2
Filariidea		
Dipetalonematidae	0	1
Filariidae	0	1
Oxyuridea		
Cruziidae	0	1
Oxyuridae	0	3
Spirurida		
Rhabdochonidae	0	1
Rictulariidae	0	1
Seuratidae	0	1
Strongylida		
Trichostrongylidae	0	6
Trichuridea		
Trichuridae	0	2
Tylenchida		
Tylenchidae	0	1
Total	0	45

Family Mononchidae

Mononchus longicaudatus Cobb was reported from mud in Cueva del Panteón, Chiapas (Zullini, 1974); it is a cosmopolitan species. *Clarkus venezolanus* (Loof), previously known only from Venezuela, was collected from slime in Sima del Ojito, Chiapas (Zullini, 1974). *Mononchus* sp. and *Mylonchulus sigmaturus* (Cobb) were found in Grutas de Zapaluta, Chiapas (Zullini, 1977). *Mylonchulus sigmaturellus* Mulvey was taken in Cenote Xtojil, Yucatán, and *Mylonchulus lacustris* (Cobb) was found in a well at Tamhek, Yucatán (Zullini, 1977).

Family Tripylidae

Two species of this family were reported from caves in Chiapas by Zullini (1974). *Trischistoma monhystera* (de Man), previously known only from Italy, Germany, and Sumatra, was collected in Cueva del Panteón, Chiapas. *Tripyla tenuis* Brzeski was found in sediment in Cueva Chorreadero, Chiapas. Zullini (1977) reported *Trischistoma arenicola* (de Man) from Cenote Xtojil, Yucatán.

Order Dorylaimida

Family Dorylaimidae

Chitwood (1938) described *Dorylaimus yucatanensis* from Cueva Luchil, Yucatán. This species has since been placed in the synonymy of *Eudorylaimus granuliferus* (Cobb). Zullini (1974) reported *Mesodorylaimus bastiani* (Bütschli) from mud in Cueva del Panteón, Chiapas. Zullini (1977) reported four additional species of this family from wells and cenotes in Yucatán and Tabasco. He also reported *Mesodorylaimus* sp. and *Aporcelaimellus* sp. from guano-rich mud in Grutas de Zapaluta, Chiapas.

Phylum Ectoprocta

Class Phylactolaemata

Order Phylactolaemata

Family Plumatellidae

Lacourt (1968) reported two species of the bryozoan genus *Plumatella* from cenotes in Yucatán: *P. emarginata* Allman from Cenote Xtolok and *P. evelinae* (Marcus) from Cenote del Country Club. Both cenotes are large and open, and these species certainly are not a part of the true cave fauna.

Phylum Annelida

Class Clitellata

Order Branchiobdellida

Family Branchiobdellidae

The branchiobdellid worms are commensals of crayfishes and isopods. Two species are known from Mexican caves (Holt, 1973). *Cambarincola acudentatus* Holt is of special interest in that it has been found only on the troglobitic cirolanid isopods *Speocirolana pelaezi* (Bolívar) and *S. bolivari* (Rioja) in Grutas de Quintero, Tamaulipas. The second species, *C. susanae* Holt, is known from the crayfish *Procambarus acutus cuevachicae* (Hobbs) in Cueva Chica, San Luis Potosí.

Table 8.—Summary of cave inhabiting Annelida.

	Troglobites	Other Species
Clitellata		
Branchiobdellida		
Branchiobdellidae	0	2
Haplotaxida		
Haplotaxina		
Tubificidae	0	1
Lumbricina		
Acanthodrilidae	2	3
Glossoscolecidae	0	1
Lumbricidae	0	3
Megascolecidae	0	2
Ocnerodrilidae	0	1
Octochaetidae	0	5
Hirudinea		
Arhynchobdellae		
Erpobdellidae	0	1
Rhynchobdellae		
Glossiphoniidae	0	2
Ichthyobdellidae	0	1
Piscicolidae	0	1
Incertae Sedis		
Aelosomatidae	0	1
Total	2	24

Order Haplotaxida

Suborder Haplotaxina

Family Tubificidae

The family Tubificidae is represented in Mexican caves only by a record of *Aulophorus* sp. in Cueva de Los Sabinos, San Luis Potosí (Osorio Tafall, 1943). Numerous collections of small aquatic oligochaetes remain unstudied. Specimens from caves in the Sierra de Guatemala, Tamaulipas, and from Cueva de la Siquita, Durango, were found in unusual situations (drip pools and deep spring-fed pools) and in direct association with aquatic troglobites. The extreme transparency of these specimens and the circumstances in which they were found strongly indicate that they are troglobitic.

Suborder Lumbricina

Earthworms are not uncommon in caves but are frequently in very poor condition, indicating that they have been washed in with soil and will not survive. In many caves they abound and obviously reproduce. It is noteworthy that of only 17 earthworms endemic to México, seven are known solely from caves. Of the epigean species all are rare and seldom collected from caves. Gates (1971) speculates that the native earthworm fauna has been largely eliminated by the hardy exotic species which now are widespread in México. The abundance of endemic species in caves may well reflect the ability of these worms to survive in that environment. In addition to the seven endemic earthworms, at least 11 exotic species have been collected from Mexican caves (see Table 8).

Family Acanthodrilidae

Five species belonging to the family Acanthodrilidae have been found in Mexican caves. Of the four species which have been positively determined, all are known only from the cave habitat and two appear to be troglobites. Undetermined specimens of a probably endemic species of *Diplocardia* have been found in caves in San Luis Potosí and Tamaulipas. Pickford (1938) described *Eodrilus oxkutzcabensis* and *Balanteodrilus pearsei* from caves in Yucatán. The latter species has recently been collected from a moist silty area in Actún Loltún, Yucatán (Gates, 1977). The remaining two species are troglobites and discussed below.

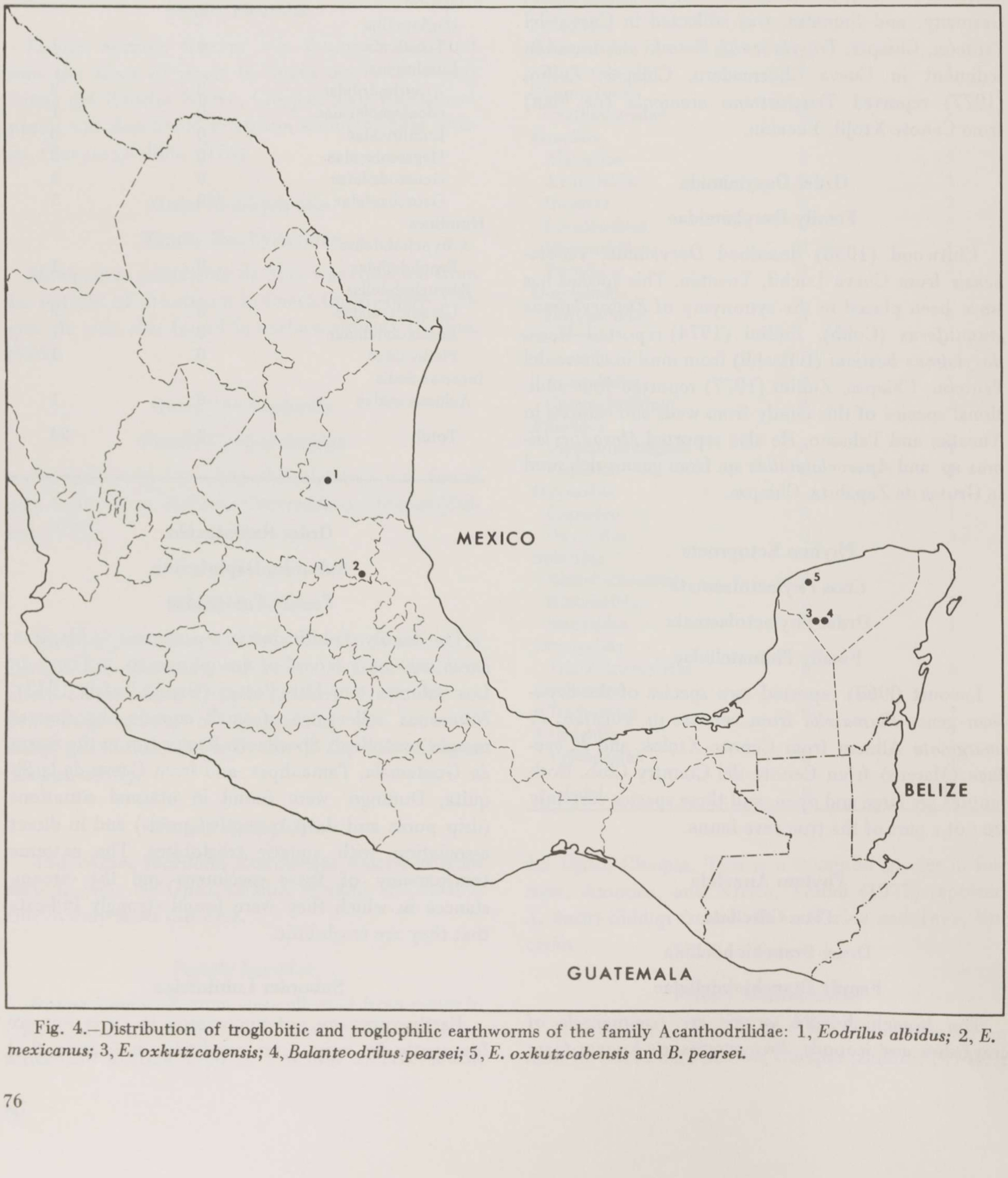

Fig. 4.—Distribution of troglobitic and troglophilic earthworms of the family Acanthodrilidae: 1, *Eodrilus albidus;* 2, *E. mexicanus;* 3, *E. oxkutzcabensis;* 4, *Balanteodrilus pearsei;* 5, *E. oxkutzcabensis* and *B. pearsei.*

Eodrilus albidus Gates

Eodrilus albus Gates, 1970:267-269 (nom. preocup.); Reddell, 1971b:13; Reddell and Mitchell, 1971b: 183, fig. 7; Mitchell and Kawakatsu, 1973a:675, 676; Gates, 1973:21; Reddell, 1973a:37; Reynolds and Cook 1976:67.

Eodrilus sp.: Gates, 1971:7-8; Gates, 1973:21.

Eodrilus albidus Gates, 1973:21 (nom. nov.); Reynolds and Cook, 1976:67.

Large earthworm, probably *Eodrilus albus:* Mitchell and Kawakatsu, 1973a:657.

Eodrilus (part)· Reddell, 1973a:32.

Type-locality.—Cueva de la Perra (=Capilla), La Perra (=El Porvenir), 15 miles northwest of Gómez Farías, Tamaulipas, México.

Distribution.—Known from the type-locality and possibly one other cave in the Sierra de Guatemala, Tamaulipas. See Fig. 4.

Records.—*Tamaulipas:* Cueva de la Capilla and ?Cueva de las Perlas.

Discussion.—This species is included as a troglobite strictly on the basis of its habitat and the transparency of the body wall. It is only known to inhabit mud-floored drip pools in darkness in the two above caves. The integument is thin and pigmentation is greatly reduced. Other members of the genus are known only from tropical lowland areas. Specimens from Cueva de las Perlas were poorly preserved but probably belong to this species.

Eodrilus mexicanus Gates

Eodrilus, undescribed: Reddell, 1967d:106.

Eodrilus mexicanus Gates, 1968:63-70; Gates, 1970: 267, 268, 269; Gates, 1971:7-8; Reddell, 1971b: 183; Gates, 1972:26; Reddell, 1973a:37; Reynolds and Cook, 1976:136.

Eodrilus: Peck and Peck, 1973:67.

Eodrilus (part): Reddell, 1973a:32.

Type-locality.—Sótano de Tlamaya, San Luis Potosí, México.

Distribution.—Known only from caves in the vicinity of Xilitla, San Luis Potosí. See Fig. 4.

Records.—*San Luis Potosí:* Cueva de la Porra, Cueva del Salitre, and Sótano de Tlamaya.

Discussion.—This species is known only from drip pools in each of the above caves. It is essentially pigmentless and, when alive, is so transparent that internal organs are easily visible. For this reason, and because the genus is otherwise one of a strictly lowland tropical distribution, this species is considered a possible troglobite. A record of this species from Sótano de San Agustín, Oaxaca (Gates, 1972), is doubtless an error in identification or curation.

Family Glossoscolecidae

This family is represented in Mexican caves only by specimens of *Pontoscolex* sp. cf. *corethrurus* (Mueller) from Sótano de Huitzmolotitla, San Luis Potosí.

Family Lumbricidae

Three species, all exotics, are known from Mexican caves. *Dendrodrilus rubidus* (Savigny) has been collected in caves in San Luis Potosí, Tamaulipas, and Veracruz (Gates, 1973, 1977). *Octolasion tyrtaeum* (Savigny) is known from several caves in Querétaro and San Luis Potosí (Gates, 1971, 1973). Specimens of *Aporrectodea rosea* (Savigny) have been found only in Sótano de la Joya de Salas, Tamaulipas (Gates, 1971).

Family Megascolecidae

Two species of the family Megascolecidae have been collected in Mexican caves. *Pheretima diffringens* (Baird) is frequently found in stream caves and has been taken from mud and beneath rotting wood in Oaxaca, Puebla, San Luis Potosí, and Veracruz (Gates, 1971, 1977). *Pheretima hawayana* (Rosa) was collected from wet mud under rotting wood in Sumidero de Cuetzeltemanes, Puebla (Gates, 1977).

Family Ocnerodrilidae

Eukerria saltensis (Beddard) was collected from wet guano and silt in Cueva de la Florida, Tamaulipas (Gates, 1971). this is the only species of this family reported from Mexican caves.

Family Octochaetidae

Five species of the family Octochaetidae have been found in Mexican caves. Pickford (1938) reported *Dichogaster affinis* (Michaelsen) and *D. bolaui* (Michaelsen) from caves in Yucatán. Undetermined specimens of *Dichogaster* have been found in caves in San Luis Potosí and Tamaulipas. The genus *Trigaster* is represented by three cave species (presumably troglophiles) in San Luis Potosí and Nuevo León. *Trigaster reddelli* and *T. vallesensis* were described by Gates (1971) from Sótano de Yerbaniz, San Luis Potosí; *T. albidus* Gates is known only from Sótano del Anticlino, Nuevo León (Gates, 1973). These three species are extremely abundant and obviously thriving in deep mud in these two caves.

Class Hirudinea

Leeches are only rarely collected in caves, but in at least several localities they constitute a significant part of the aquatic fauna. A very large population of an undetermined species is present in Grutas de San José, Campeche. In addition to the free-living species others are known to be parasites of snails and fishes.

Order Arhynchobdellae

Family Erpobdellidae

The predaceous leech *Erpobdella triannulata* Moore was reported from Cenote Xtolok, Yucatán, by Moore (1936).

Order Rhynchobdellae

Family Glossiphoniidae

Glossiphonia magnidiscus was described by Moore (1938) from Cenote de Sambulá, Motul, Yucatán. It was a parasite of the pimelodid catfish *Rhamdia guatemalensis decolor* Hubbs.

Family Ichthyobdellidae

Cystobranchus sp. was reported by Moore (1936) to be a parasite of *R. guatemalensis decolor* in Cenote de Sambulá. It is also known from open-air cenotes in northern Yucatán.

Family Piscicolidae

Piscicola platense Cordero is a parasite of *R. guatemalensis decolor* in Cenote de Sambulá (Motul) and Cenote de Sambulá (Mérida), Yucatán (Moore, 1938).

Phylum Mollusca

Class Gastropoda

The snail fauna of Mexican caves is poorly known despite the fact that 82 species have been identified (see Table 9). Many of these are known only from paleontological and archeological excavations, and doubtless were washed or carried into the caves. Other species are known only from open-air cenotes in Yucatán (Bequaert and Clench, 1933, 1936, 1938) and are not a part of the true cave fauna. The only possible troglobite is an aquatic species of the family Hydrobiidae. The absence of terrestrial troglobitic snails from caves in México is not unexpected. No terrestrial snails are troglobites in caves in Texas or other states of the southwestern United States. Terrestrial snails are also rare in the troglobitic fauna of tropical caves in general, although species of the genus *Opeas* with reduced eyes have been described from caves in Assam and Malaya.

Order Archaeogastropoda

Family Helicinidae

This is the only family of archaeogastropod snail represented in the Mexican cave fauna. *Ceres nelsoni* Dall and *Helicina chrysocheila* Binney are known from caves in the Xilitla and Aquismón regions, San Luis Potosí. The former species is a conspicuous element of the entrance area fauna and is presumably a trogloxene. *Oligyra arenicola* (Morelet) has been collected from several caves in Yucatán. The other species of this family are known only from single caves each and are of uncertain status.

Order Mesogastropoda

Family Cyclophoridae

Although several species of this family have been found in caves, most were dead. The only important species is the troglophile *Neocyclotus dysoni berendti* (Pfeiffer), which is known from numerous cenotes and caves in Yucatán (Bequaert and Clench, 1936, 1938).

Family Hydrobiidae

This family of aquatic snails includes two species associated with the subterranean habitat. Bequaert and Clench (1936, 1938) reported the presence of *Pyrgophorus coronatus* (Pfeiffer) in several caves in

Table 9.—Summary of cave inhabiting Gastropoda.

	Troglobites	Other Species
Archaeogastropoda		
Helicinidae	0	8
Mesogastropoda		
Chondropomidae	0	1
Cyclophoridae	0	3
Hydrobiidae	1	1
Pilidae	0	1
Pomatiidae	0	3
Potamididae	0	1
Thiaridae	0	3
Basommatophora		
Ancylidae	0	1
Physidae	0	4
Planorbidae	0	5
Stylommatophora		
Achatinidae	0	9
Charopidae	0	1
Endodontidae	0	2
Ferussaciidae	0	1
Fruticicolidae	0	1
Helminthoglyptidae	0	3
Orthalicidae	0	7
Polygyridae	0	1
Pupillidae	0	2
Spiraxidae	0	12
Urocoptidae	0	6
Xanthonychidae	0	1
Zonitidae	0	4
Total	1	81

Yucatán. Specimens of *Pyrgophorus* are known from Grutas de San Antonio, Campeche. The probable troglobite *Coahuilix hubbsi* Taylor is discussed below.

Coahuilix hubbsi Taylor

Coahuilix hubbsi Taylor, 1966:156, 163, 180-181, fig. 8-13; Minckley, 1969:39; Reddell, 1971b:77.
Coahuilix: Taylor, 1966:175, 180.

Type-locality.—Northernmost pool of Pozos de la Becerra, 14 km southwest of Cuatro Ciénegas, Coahuila, México.

Distribution.—Known only from the type-locality.

Discussion.—This species is known only by shells, but it is included here because it apparently was washed from the subterranean habitat by the springs feeding Pozos de la Becerra. This interesting snail is a member of the tribe Horatiini, a group known from the vicinity of the Mediterranean and from subterranean waters in Texas and Alabama. *Horatia (Hauffenia) micra* (Pilsbry and Ferris) has been reported from shells in the Guadalupe River, Texas, where it has probably been washed from one of the numerous caves or springs along the river. Undescribed troglobitic species of *Horatia (Hauffenia)* are known from the artesian well at San Marcos, Hays County, and from Salamander Cave, Travis County, Texas. A record of *H. (H.) micra* from a cave in Alabama is probably of an undescribed form. The distribution of the Horatiini corresponds to the general pattern exemplified also by the isopod families Cirolanidae and Stenasellidae.

Family Pomatiidae

Bequaert and Clench (1936, 1938) reported *Choanopoma largillierti* (Pfeiffer) from caves and cenotes in Yucatán. This species has recently been collected from several additional Yucatán caves.

Family Thiaridae

A large population of *Melanoides maculata* (Born) was found in Cueva de Cantil Blanco, Veracruz. This is a species introduced from southeast Asia.

Order Basommatophora

Family Physidae

Three genera of physid snails are closely associated with the cave habitat in México. *Aplexa spiculata abbreviata* (Fischer and Crosse) was found in Grutas de Balankanche, Yucatán (Bequaert and Clench, 1938). Species of the genus *Physa* are known from several caves in Coahuila, San Luis Potosí, and Tamaulipas, but remain unstudied. *Stenophysa* sp. has proven to be a significant troglophile in several caves in Campeche.

Family Planorbidae

Although several planorbid snails have been reported from archeological sites in Yucatán, none appears to be inhabiting the caves. *Helisoma trivolvis* (Say), however, is a possible troglophile in Sótano de la Joya de Salas, Tamaulipas.

Order Stylommatophora

This is doubtless the most important group of snails inhabiting caves in México. The order is represented by about 50 species in 13 families. Only a few of the more significant species are discussed here.

Family Achatinidae

This is among the better represented families to be found in caves, with nine species in five genera having been determined to date. The genus *Lamellaxis* is one of the more frequently encountered groups, with three determined species, and many specimens from several areas in México await study. *Lamellaxis gracilis* (Hutton) is an abundant troglophile in the caves of Oaxaca, San Luis Potosí, and Yucatán. *Lamellaxis martensi* (Pfeiffer) was reported from Grutas de Balankanche, Yucatán, by Bequaert and Clench (1936). *Lamellaxis micra* (d'Orbigny) is present in numerous caves in Yucatán. Other species of achatinid snail known from Mexican caves include: *Leptinaria mexicana* (Pfeiffer) from San Luis Potosí and Puebla; *Opeas pyrgula* (Schmacker and Boettger) from Grutas de Cacahuamilpa, Guerrero; *O. yucatanense* Pilsbry and *Subulina octona* (Brugiere) from Yucatán; and *S. porrecta* von Martens from Grutas de Juxtlahuaca, Guerrero. All of these species are apparent troglophiles.

Family Charopidae

The only record for this family in Mexican caves is of an undescribed genus and species found in Cueva del Río Texocotla, Puebla. It is presumably a troglophile.

Family Endodontidae

Helicodiscus singleyanus (Pilsbry) is commonly present on cave walls and floors in large numbers. It has been found in caves in Oaxaca and Tamaulipas.

The genus *Helicodiscus* is a significant element of the Texas cave fauna.

Family Orthalicidae

Although seven species of the family Orthalicidae have been reported from caves, the only one which is known with certainty to live in caves is *Bulimulus unicolor* (Sowerby). This species was reported from several caves in Yucatán (Bequaert and Clench, 1936, 1938); it has been collected from several additional caves recently.

Family Spiraxidae

This is the most important family of snails with respect to the cave ecosystem, with species of *Euglandina*, *Spiraxis*, and *Streptostyla* having been found as troglophiles. *Euglandina cylindracea* (Phillips), *Streptostyla meridana meridana* (Morelet), and *Streptostyla ventricosula* (Morelet) are frequently collected in the caves of the Yucatán Peninsula. *Streptostyla jilitlana* Dall is an important species in the high altitude caves of Querétaro and San Luis Potosí. Eggs, newly hatched young, and adults of *Streptostyla bartschi* (Dall) have been found in the inner rooms of Cueva de la Mina, Tamaulipas (Reddell and Mitchell, 1971b). This species is also known from other caves in San Luis Potosí and Tamaulipas.

Family Urocoptidae

Brachypodella dubia Pilsbry and *Microceramus concisus* (Morelet) are frequently encountered species in the caves of the Yucatán Peninsula. Thompson (1967) reported *Brachypodella speluncae* (Pfeiffer) from two caves in El Petén, Guatemala. A new species of the genus *Coelocentrum* is known from caves in Tamaulipas.

Family Xanthonychidae

The only species of this family known from Mexican caves is an undescribed species of *Xanthonyx* from Cueva de la Capilla, Tamaulipas. It was found on the wall of the cave near a small upper entrance.

Family Zonitidae

Several species of zonitid snail are known from Mexican caves. The only one which is common is *Hawaiia minuscula* (Binney), known from caves in Campeche, Veracruz, and Yucatán.

Class Pelecypoda

Few clams have ever been recorded from caves and then usually from the vicinity of spring entrances. A small undetermined species is known from Cueva del Nacimiento del Río San Antonio, Oaxaca. This species inhabits the stream passage in large numbers and is pigmentless with a thin shell allowing the internal organs to be observed. The determination of its ecological status must await further study.

Phylum Arthropoda

Class Crustacea

The class Crustacea is second only to the Arachnida in the number and diversity of troglobites present in Mexican and Guatemalan caves. Of the eight orders of subterranean crustaceans represented, six contain troglobites (see Table 10). Two additional orders, the Thermosbaenacea and the Bathynellacea, are present in the caves of Texas and other parts of the world but are not yet known from México or Central America. This lack is probably a reflection on collecting techniques rather than an indication of the absence of these groups. In general the plankton

Table 10.—Summary of cave inhabiting Crustacea.

	Troglobites	Other Species
Branchiura		
Arguloida		
Argulidae	0	2
Copepoda		
Calanoida		
Diaptomidae	1	3
Cyclopoida		
Cyclopidae	0	10
Harpacticoida		
Ameiridae	0	5
Canthocamptidae	0	2
Ostracoda		
Podocopa		
Cypridae	0	12
Darwinulidae	0	1
Entocytheridae	2	10
Branchipoda		
Cladocera		
Chydoridae	0	1
Daphnidae	0	7
Malacostraca		
*Isopoda	40	16
Amphipoda		
Bogidiellidae	9	0
Hadziidae	5	0
Hyalellidae	0	1
Melitidae	0	1
Mysidacea		
Lepidomysidae	2	0
Mysidae	2	0
*Decapoda	17	18
Total	78	89

*For summary by families see Tables 11-12.

of Mexican caves is unknown, but recent collections in southern México by Dr. Valerio Sbordoni and his colleagues have included emphasis on planktonic forms.

Subclass Branchiura

Order Arguloida

Family Argulidae

Two species of argulid have been taken in association with fish in the cenotes of Yucatán (Wilson, 1936). *Argulus chromidis* Kroyer was found in the intestine of *Rhamdia guatemalensis depressa* Barbour and Cole in Cenote Chica de Xanabá; *A. rhamdiae* Wilson was found on the skin of *R. guatemalensis depressa* in Cenote Scan Yui.

Subclass Copepoda

Copepods are an important element in the cave fauna of México but remain poorly known. Only one species is definitely troglobitic, but others may prove to be so once they are more carefully studied. A total of 20 species of non-troglobitic copepod are now known from the underground waters of México (see Table 10).

Order Calanoida

Family Diaptomidae

Two diaptomids have been identified from caves in México, one of which is a troglobite and is discussed below. *Diaptomus texensis* M. S. Wilson has been collected from a small drip pool in Actún Loltún, Yucatán.

Diaptomus (Microdiaptomus) cokeri Osorio Tafall

Diaptomus nueva especie y subgénera: Anonymous, 1942a:221.

Diaptomus (Microdiaptomus) cokeri Osorio Tafall, 1942:206, 207-210, fig. 1-17; Osorio Tafall, 1943: 49, 50, 51, 52, 53, 68, 69; Rioja, 1953a:287, 288, 292; Wilson, 1959:780; Nicholas, 1962:168; Vandel, 1964:131; Vandel, 1965a:107; McKenzie, 1965a:38; Reddell, 1971b:17; Reddell and Mitchell, 1971a:141; Reddell and Elliott, 1973a:171.

Microdiaptomus: Osorio Tafall, 1946:153.

Diaptomus cokeri: Bolívar, 1950:216; Tamayo, 1962:vol. III:260.

Diaptomus (Microdiaptomus) cokersi: Barrera, 1968: 311 (erroneous spelling).

Microdiaptomus cokeri: Thinès and Tercafs, 1972: 66.

Type-locality.—Cueva Chica, Ciudad Valles, San Luis Potosí, México.

Distribution.—Known only from two caves near Valles, San Luis Potosí.

Records.—*San Luis Potosí:* Cueva Chica and Cueva de Los Sabinos.

Discussion.—This species of fresh-water origin has, to my knowledge, not been collected since it was first reported. The subgenus *Microdiaptomus* includes only this species.

Order Cyclopoida

Family Cyclopidae

Nine species of cyclopid copepods have been identified from Mexican caves. Osorio Tafall (1943) reported the presence of *Cyclops (Acanthocyclops) vernalis robustus* Sars and *Mesocyclops (Thermocyclops) inversus* (Kiefer) from caves near Valles, San Luis Potosí. *Eucyclops serrulatus* (Fischer) and *Tropocyclops prasinus* (Fischer) are known from caves in San Luis Potosí (Osorio Tafall, 1943) and cenotes and caves in Yucatán (Wilson, 1936; Pearse and Wilson, 1938). *Macrocyclops albidus* (Jurine) is a frequent inhabitant of caves, and in México it is known from caves in Yucatán (Wilson, 1936; Pearse and Wilson, 1938), San Luis Potosí (Osorio Tafall, 1943), Campeche, and Guerrero. A probable new species of *Mesocyclops* related to *M. brazilianus* Kiefer has been collected in Grutas del Mogote, Guerrero. Yeatman (1977) redescribed *Mesocyclops ellipticus* Kiefer from Grutas de Xtacumbilxunam, Campeche. This species, also known from caves in Oaxaca and Yucatán, is probably that reported as *M. leuckarti* (Claus) from caves and cenotes in Yucatán (Wilson, 1936; Pearse and Wilson, 1938). *Mesocyclops (Thermocyclops) tenuis* (Marsh) is known from caves and cenotes in Yucatán (Wilson, 1936; Pearse and Wilson, 1938) and from caves in Campeche. *Paracyclops fimbriatus* (Fischer) is one of the more frequently encountered copepods in North American caves; in México it has been found in caves in the states of San Luis Potosí (Osorio Tafall, 1943), Yucatán, and Campeche.

Order Harpacticoida

Family Ameiridae

Nitocra sp. was reported by Osorio Tafall (1943) from Cueva Chica and Cueva de Los Sabinos, San Luis Potosí. Wilson (1936) identified four species of *Nitocra* from caves and cenotes in Yucatán, but only *N. pusilla* Sars from Cenote de Sambulá (Motul) is associated with true cave waters. Pearse and Wilson (1938) reported *Nitocrella subterranea* (Chappuis) from Grutas de Balankanche, Yucatán, but this United States species may be misidentified.

Family Canthocamptidae

Two genera of canthocamptid copepod have been recorded from Mexican caves. *Canthocamptus* sp. was identified from Cueva de Los Sabinos, San Luis Potosí, by Osorio Tafall (1943). *Attheyella pilosa* Chappuis was reported by Wilson (1936) from Cueva Luchil, Yucatán, and is listed by Nicholas (1962) as a troglobite. This species is a commensal of crayfishes in Kentucky and Indiana and furthermore occurs on crayfish in an epigean locality in Kentucky (Bowman et al., 1968). Nicholas (1962) also lists *Moraria cristata* Chappuis as a troglobite from "unnamed cave at Cienga, near Progreso, Yucatán." This species was taken from a *cienega* (a large open pond) and not a cave.

Subclass Ostracoda

Order Podocopa

The ostracods of Mexican caves are very poorly known. A total of 25 species have been identified, but eight are known only from open-air cenotes in Yucatán and 12 are commensals on crayfish and isopods (see Table 10). The remaining five species surely constitute a very small percentage of the free-living ostracods inhabiting caves in México.

Family Cypridae

Osorio Tafall (1943) reported *Candona* sp. and *Cypris* sp. from caves near Valles, San Luis Potosí. Furtos (1936, 1938) described *Cypridopsis inaudita, C. mexicana,* and *C. yucatanensis* from caves in Yucatán. *Chlamydotheca arcuata* (Sars) has recently been collected from Cueva de El Pachón, Tamaulipas. None of these show any signs of adaptation for a cave existence.

Family Darwinulidae

The only species of this family reported from subterranean waters is *Darwinula stevensoni* (Brady and Robertson); it was found in Cenote Xlaká, Yucatán (Furtos, 1936).

Family Entocytheridae

Twelve species of entocytherid ostracod, two of which are troglobites and commensals of cirolanid isopods, have been collected from Mexican caves. The remaining species are all associated with crayfish. Hart and Hart (1974) in a review of the family have included all synonymies and records. *Ankylocythere bidentata* (Rioja) is known from caves in Chiapas, Oaxaca, and Veracruz; *A. maya* Hobbs from caves in Oaxaca; *A. sinuosa* (Rioja) from Cueva Chica, San Luis Potosí; *A. toltecae* Hobbs from caves in Hidalgo and San Luis Potosí; *A. villalobosi* Hobbs from Grutas de Zapaluta, Chiapas; and *Entocythere claytonhoffi* Rioja from caves in Chiapas, Oaxaca, and San Luis Potosí. *Entocythere mexicana* Rioja, *Uncinocythere bicuspida* (Rioja), *U. cuadricuspida* (Rioja), and *U. dobbinae* (Rioja) have all recently been found in caves in the Cuetzalan region of Puebla.

Sphaeromicola cirolanae Rioja

Sphaeromicola cirolanae Rioja, 1951a:170-179, fig. 1-16; Rioja, 1953a:289-290, 291, 292; Levinson, 1959:259; Nicholas, 1962:168; Hart, 1962:122, 139; Vandel, 1964:303; Vandel, 1965a:254; Reddell, 1967b:82; Reddell, 1971b:18; Hobbs, 1971: 2, 3, 7, 8-9, 45-47, fig. 30-31; Reddell and Mitchell, 1971a:142; Hobbs and Hobbs, 1973:39-41, fig. 1a, b; Reddell and Elliott, 1973a:171-172; Reddell and Elliott, 1973b:181, 183; Holt, 1973: 4; Hart and Hart, 1974:15, 164-165, pl. XLIII(fig. 8-14), LXI; Danielpol, 1977:22, 34-36, 39, fig. 10; Hart, 1978:724, 725, 727, 728, 729, fig. 1, 8-9.
Sphaeromicola sp.: Reddell, 1967b:82.

Type-locality.—Cueva de los Sabinos, San Luis Potosí, México.

Distribution.—Known from caves in Nuevo León, San Luis Potosí, and Tamaulipas. See Fig. 5.

Records.—*Nuevo León:* Cueva La Chorrera; *San Luis Potosí:* Sótano del Arroyo, Cueva de la Curva, Cueva de La Lagunita, Sótano de Matapalma, Sotanito de Montecillos, Sótano de Pichijumo, Sótano de las Piedras, Cueva de Los Sabinos, Sótano del Tigre, and Sótano de Yerbaniz; *Tamaulipas:* Bee Cave, Cueva de la Florida, Sótano del Molino, Cueva de El Pachón, Grutas de Quintero, and Sótano de El Venadito.

New records.—*San Luis Potosí:* Cueva de las Lagunitas; *Tamaulipas:* Cueva del Agua de Simón Salinas (det. H. H. Hobbs, Jr.).

Discussion.—*Sphaeromicola cirolanae* is a commensal of isopods of the family Cirolanidae. It has been taken from *Speocirolana bolivari* (Rioja) in Grutas de Quintero, Tamaulipas; from *Speocirolana* n. sp. in Cueva La Chorrera, Nuevo León; and from *Speocirolana pelaezi* (Bolívar) in all of the above caves except Cueva La Chorrera. There are nine described species of *Sphaeromicola*, only two of which occur in México. Six species are found in the Mediterranean region: three are troglobites, one is marine, and two are epigean fresh-water species. *Sphaeromicola moria* Hart is a troglobite known from *Cirolanides texensis* Ulrich in Rambie's Cave, Uvalde County, Texas (Hart, 1978).

Sphaeromicola coahuiltecae Hobbs and Hobbs

Sphaeromicola coahuiltecae Hobbs and Hobbs, 1973: 41, fig. 1c-g; Hart and Hart, 1974:15, 165, pl. XLIII(fig. 15-18), LXI; Hart, 1978:724, 725, 728, 729, fig. 1.

Type-locality.—Cueva del Huisache, 4 km NW Micos, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 5.

Discussion.—The host of this species is not known with certainty. It was taken from sediment in a jar containing four species of aquatic isopod: *Mexistenasellus parzefalli* Magniez, *M. wilkensi* Magniez, *Mexilana saluposi* Bowman, and an undescribed species of *Cyathura.* Since all other Mexican records for *Sphaeromicola* are from cirolanids, it is probable that *Mexilana saluposi* is the host for this species.

Subclass Branchipoda

Order Cladocera

Family Chydoridae

The only species of this family known from Mexican caves is *Alona* sp.; it was found in Cueva de Los Sabinos, San Luis Potosí (Osorio Tafall, 1943).

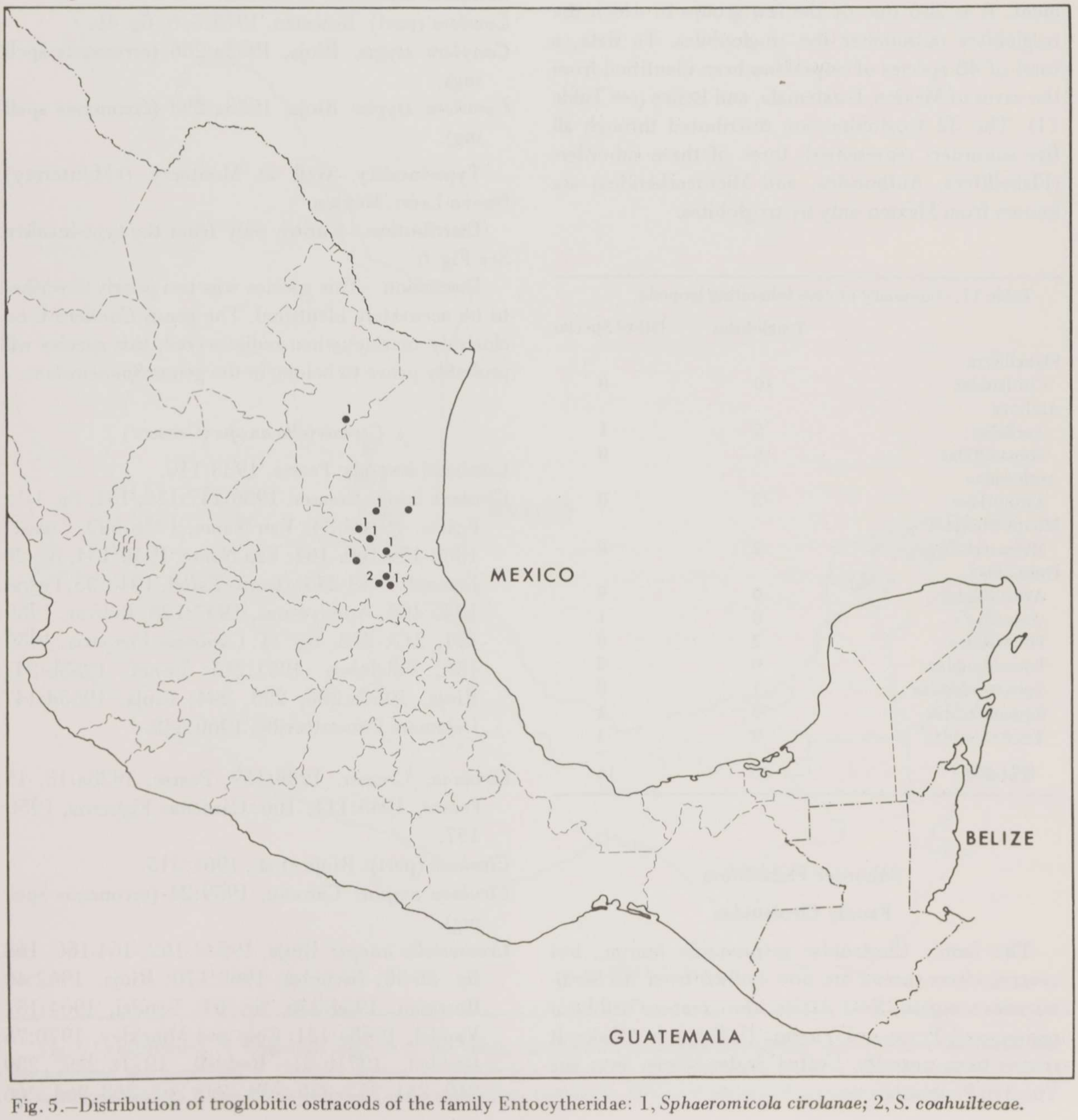

Fig. 5.—Distribution of troglobitic ostracods of the family Entocytheridae: 1, *Sphaeromicola cirolanae;* 2, *S. coahuiltecae.*

Family Daphnidae

Wilson (1936) reported seven species of cladocerans of the genera *Ceriodaphnia*, *Daphnia*, *Moina*, and *Simocephalus* from cenotes in Yucatán. One of these, *C. cornuta* Sars, has recently been collected in Cenote Bolchén, Campeche. *Ceriodaphnia lacustris* Birge was reported from Cueva de Los Sabinos, San Luis Potosí (Osorio Tafall, 1943).

Subclass Malacostraca

Order Isopoda

The order Isopoda is the most abundant group to be found in the waters of Mexican caves and is among the more important inhabiting the terrestrial environment. It is also one of the few groups in which the troglobites outnumber the troglophiles. To date, a total of 48 species of isopod has been identified from the caves of México, Guatemala, and Belize (see Table 11). The 32 troglobites are distributed through all five suborders represented; three of these suborders (Flabellifera, Anthuridea, and Microcerberidea) are known from México only by troglobites.

Table 11.—Summary of cave inhabiting Isopoda.

	Troglobites	Other Species
Flabellifera		
Cirolanidae	10	0
Asellota		
Asellidae	5	1
Stenasellidae	6	0
Anthuridea		
Anthuridae	2	0
Microcerberidea		
Microcerberidae	2	0
Oniscoidea		
Armadillidae	0	9
Oniscidae	0	1
Philosciidae	2	0
Porcellionidae	0	3
Sphaeroniscidae	1	0
Squamiferidae	3	1
Trichoniscidae	9	1
Total	40	16

Suborder Flabellifera

Family Cirolanidae

The family Cirolanidae is primarily marine, but cavernicolous species are now known from the Mediterranean region, East Africa, the greater Caribbean region, and Texas and Virginia (U.S.A.). In México it ranges from near the United States border into the Yucatán Peninsula.

Conilera stygia Packard

Eyeless asellid crustacean: Packard, 1894:732.

Conilera stygia Packard, 1900:300-301; Packard, 1901:228; Richardson, 1905:116, 120; Banta, 1907:78; Chappuis, 1927:72; Van Name, 1936: 31, 426-427; Jeannel, 1943:255-256; Bolívar, 1950:211, 217, fig. 11; Rioja, 1953a:294; Rioja, 1953d:147, 168; Rioja, 1957:447; Nicholas, 1962:170; Rioja, 1962:40; Bowman, 1964:233, 234, 236, fig. 61; Vandel, 1964:150; Vandel, 1965a:120; Cole and Minckley, 1966:17, 21; Reddell, 1967a:24; Straskraba, 1969:22; Reddell, 1971b:20; Bowman, 1975:1.

"Conilera" stygia: Cole and Minckley, 1972:321.

Conilera: Chappuis, 1927:142.

Conilera (part): Bowman, 1975:5, 6, fig. 4b.

Conylera stygia: Rioja, 1953a:286 (erroneous spelling).

Comilera stygia: Rioja, 1953a:293 (erroneous spelling).

Type-locality.—Well at Monterey (=Monterrey), Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 6.

Discussion.—This species was too poorly described to be accurately identified. The genus *Conilera* is exclusively marine; when rediscovered, this species will probably prove to belong in the genus *Speocirolana*.

Creaseriella anops (Creaser)

Cirolanid isopods: Pearse, 1933:110.

Cirolana anops Creaser, 1936:117-120, 131, fig. 1-12; Pearse, 1936d:24; Van Name, 1936:523; Creaser, 1938:159-160, 164; Van Name, 1940:134, fig. 26; Jeannel, 1943:255; Osorio Tafall, 1943:55; Pearse, 1945:165; Anonymous, 1947:128; Bolívar, 1950: 211, 217, 218, fig. 11; Cárdenas Figueroa, 1950: 156; Villalobos, 1951:215; Bonet, 1953b:241; Rioja, 1953a:286, 293, 294; Rioja, 1953d:147; Delamare Deboutteville, 1960:648.

Cirolana: Creaser, 1938:159; Pearse, 1938a:13, 15; Pearse, 1945:111, 166; Cárdenas Figueroa, 1950: 157.

Cirolana (part): Rioja et al., 1961:315.

Cirolana ampos: Carreño, 1959:24 (erroneous spelling).

Creaseriella anops: Rioja, 1953d:162, 164-166, 168, fig. 36-58; Nicholas, 1962:170; Rioja, 1962:40; Bowman, 1964:236, fig. 61; Vandel, 1964:151; Vandel, 1965a:121; Cole and Minckley, 1970:76; Reddell, 1971b:21; Reddell, 1977b:229, 239, 240, 251, 253, 255, 258, 260, 262, 263, 264, 266, 267, 268, 273, 274, 277, 278, 283, 291; Ruffo and Vigna Taglianti, 1977:167.

Craeseriella: Straskraba, 1969:22; Juberthie, 1974:81 (erroneous spelling).

Craeseriella anops: Rioja, 1962:40 (erroneous spelling).

Creaseriella: Rioja, 1953d:147, 161; Rioja, 1957: 447; Bowman, 1964:234; Straskraba, 1969:4, 28; Cole and Minckley, 1970:77-78; Cole and Minckley, 1972:321; Bowman, 1975:5, 6, 7, fig. 4c.

Cresseriella anops: Rioja, 1971:509 (erroneous spelling).

Type-locality.—San Bulha Cave (=Cenote de Sambulá) at Motul, Yucatán, México.

Distribution.—Known from many caves in Quintana Roo and Yucatán and a well in Campeche. See Fig. 6.

Records.—*Campeche:* Well (Campeche); *Quintana Roo:* Cenote de San Martín and Cenote de Tos Virlol; *Yucatán:* Cenote de las Abejas, Cueva Amil, Cenote Calchuhuim, Cueva Chac Mol, Cenote de la Culebra, Actún Chac, Actún Góngora, Cenote de Hoctún, Actún Kaua, Cenote de Kankirixché, Actún Okobichén, Cenote del Pochote, Cenote de Sambulá (Mo-

Fig. 6.—Distribution of troglobitic isopods of the family Cirolanidae: 1, *Sphaerolana affinis, Sphaerolana interstitialis,* and *Speocirolana thermydronis;* 2, *Conilera stygia;* 3, *Sphaerolana affinis;* 4, *Speocirolana* n. sp. 1; 5, *Speocirolana* n. sp. 2; 6, *Speocirolana pelaezi;* 7, *Speocirolana pelaezi* and *Speocirolana bolivari;* 8, *Mexilana saluposi;* 9, *Creaseriella anops.*

tul), Cueva de San Isidro, Cueva de Santa Elena, Pozo de Santa Elena, Cueva Xconsacab, and Actún Xpukil.

Discussion.—This is one of three genera of cirolanids capable of rolling into a ball, one being *Sphaerolana* (discussed below) and the other *Faucheria* from France. *Faucheria* and *Creaseriella* have been combined into the subfamily Faucheriinae, but this is probably an artificial grouping. The ability to roll into a ball has probably evolved more than once in the cirolanids (Cole and Minckley, 1970). Relationship to *Sphaerolana* is quite remote. *Creaseriella* is a monotypic genus. *Creaseriella anops* is usually found crawling along the bottom or sides of pools. In at least one instance it was found clinging to the underside of a small floating piece of "cave ice" on the surface of the pool. When disturbed, this species quickly rolls into a tight ball and falls to the bottom of the pool.

Mexilana saluposi Bowman

Cirolanidae, undescribed member of: Hobbs and Hobbs, 1973:39, 41; Hart and Hart, 1974:165.

Speocirolana: Magniez, 1973:163 (misidentification).

Mexilana saluposi Bowman, 1975:2-6, 7, fig. 1-3.

Mexilana: Bowman, 1975:1-2, 5, 6, 7, fig. 4d.

Type-locality.—Cueva del Huisache, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 6.

Discussion.—This species is the only member of the genus *Mexilana.* It has been found in association with an undescribed anthurid isopod of the genus *Cyathura* and with the stenasellid isopods *Mexistenasellus parzefalli* and *M. wilkensi.* The fauna of Cueva del Huisache is very different from that of the nearby Sierra de El Abra. Our knowledge of the area in which this cave is located is still too poor to allow any speculations as to why the faunas of the two regions are so unlike.

Speocirolana bolivari (Rioja)

Cirolana sp.: Rioja, 1951a:170, 178; Rioja, 1953a: 290, 291, 293.

Cirolana, otra especie: Villalobos, 1951:215.

Cirolana (part): Bonet, 1953b:242; Rioja et al., 1961:315.

Cirolana (Spaeocirolana) nueva especie: Rioja, 1953a: 289 (erroneous spelling).

Cirolana (Speocirolana) bolivari Rioja, 1953d:147, 148, 149-160, fig. 1-3, 5-8, 10-32, 34; Rioja, 1957:455; Nicholas, 1962:170; Rioja, 1962:40; Vandel, 1964:150; Vandel, 1965a:119.

Cirolana bolivari: Rioja, 1953e:11, fig. 5; Paclt, 1971:424; Rioja, 1971:509; Sbordoni and Argano, 1972:9.

Speocirolana (part): Bowman, 1964:233, 234; Straskraba, 1969:23; Argano, 1972b:33; Bowman, 1975:5, 6, 7, fig. 4c.

Speocirolana bolivari: Bowman, 1964:236, fig. 61; Reddell, 1965a:19; Cole and Minckley, 1966:18, 19, 20, 21; Reddell, 1967b:82; Minckley and Cole, 1968:3, 4; Edwards, 1971:3; Elliott, 1971:1, 10, 17, 19, 20, 27-28, 34, 37-38, 39, 40, 44, fig. 12-13; Hobbs, 1971:3, 46; Reddell, 1971b:21; Reddell and Mitchell, 1971a:142; Reddell and Mitchell, 1971b:183, 184; Elliott, 1973a:31; Elliott and Mitchell, 1973:171, 175, 176, 179, 181-182, 184, 185, 186-187, 188, fig. 5; Hobbs and Hobbs, 1973:41; Holt, 1973:4, 13; Magniez, 1973:163; Reddell and Elliott, 1973a:171, 172; Reddell and Elliott, 1973b:181, 183; Hart and Hart, 1974:164.

Speocirolano bolivari: Holt, 1973:11 (erroneous spelling).

Blind isopods: Reddell, 1973b:77.

Type-locality.—Cueva (=Grutas) de Quintero, km 560 de la carreterra de Valles al Mante, Tamaulipas, México.

Distribution.—Known from one cave each in the Sierra de El Abra and Sierra de Guatemala, Tamaulipas; and the Aquismón region, San Luis Potosí. See Fig. 6.

Records.—*Tamaulipas:* Bee Cave and Grutas de Quintero.

New record.—*San Luis Potosí:* Spring at La Laja (det. T. E. Bowman).

Discussion.—This species is abundant in Grutas de Quintero, where it cohabits standing pools with *S. pelaezi.* Although it presumably ranges throughout the Sierra de El Abra, it is obviously very rare. The genus *Speocirolana* is represented only by the three troglobites listed here and by undescribed species from near Linares, Nuevo León, and San Nicolas, San Luis Potosí. Elliott and Mitchell (1973) examined the temperature preference responses of this species and found that it still retains a temperature preferendum. They speculate that the species is the descendant of a marine species which directly colonized caves along the front of the Sierra de El Abra, perhaps as early as the Cretaceous.

Speocirolana pelaezi (Bolívar)

CiroLánidos: Anonymous, 1942a:221.

Cirolana nueva especie: Osorio Tafall, 1942:210; Osorio Tafall, 1943:46, 50, 51; Rioja, 1953e:11.

Cirolana (part): Osorio Tafall, 1946:153; Bonet, 1953b:242; Rioja et al., 1961:315.
Cirolana pelaezi: Osorio Tafall, 1943:54-55, 57, 67, 69 (nomen nudum); Bonet, 1953b:241; Rioja, 1953a:288; Tamayo, 1962:vol. III:260; Vandel, 1964:303; Vandel, 1965a:254; Sbordoni and Argano, 1972:9.
Cirolana (Speocirolana) pelaezi Bolívar, 1950:211, 212-216, 217, 218, fig. 1-12; Rioja, 1951a:170, 178; Villalobos, 1951:215; Rioja, 1953d:147, 148, 149, 151, 152, 159, fig. 4, 9, 33, 35; Rioja, 1957:455; Hart, 1962:139; Nicholas, 1962:170; Rioja, 1962:40; Vandel, 1964:150; Schultz, 1965: 101, 102; Vandel, 1965a:119; Barrera, 1968:309.
Cirolana (Spaeocirolana) pelaezi: Rioja, 1953a:288, 289, 290, 291, 293 (erroneous spelling).
Conilera stygia Packard: Dearolf, 1953:226 (misidentification).
Speocirolana (part): Bowman, 1964:233-234; Straskraba, 1969:23; Argano, 1972b:33; Bowman, 1975:5, 6, 7, fig. 4c.
Speocirolana pelaezi: Bowman, 1964:236, fig. 61; Reddell, 1965a:19; Reddell, 1965d:49; Cole and Minckley, 1966:18, 19, 20, 21; Reddell, 1967b: 82; Minckley and Cole, 1968:3, 4; Elliott, 1971: 10; Hobbs, 1971:3, 46; Reddell, 1971b:21; Reddell and Mitchell, 1971a:141-143, fig. 10, 27; Reddell and Mitchell, 1971b:183; Reddell and Mitchell, 1971d:cover; Elliott and Mitchell, 1973: 175; Hobbs and Hobbs, 1973:39, 40, 41; Holt, 1973:4, 13; Magniez, 1973:163; Mitchell and Kawakatsu, 1973a:671; Reddell and Elliott, 1973a:171, 172; Reddell and Elliott, 1973b:181, 183; Hart and Hart, 1974:164; Fernández Ruiz, 1976:717; Danielpol, 1977:35.
Speocirolano pelaezi: Holt, 1973:11 (erroneous spelling).

Type-locality.—Cueva de Los Sabinos, cerca de Valles, San Luis Potosí, México.

Distribution.—Known from caves in Puebla, San Luis Potosí, and Tamaulipas. See Fig. 6.

Records.—*San Luis Potosí:* Sótano del Arroyo, Sótano de Coatimundi, Cueva de la Curva, Cueva Chica, Cueva de La Lagunita, Sótano de Matapalma, Sotanito de Montecillos, Sótano de Pichijumo, Sótano de las Piedras, Cueva de Los Sabinos, Sótano del Tigre, Sótano de la Tinaja, and Sótano de Yerbaniz; *Tamaulipas:* Cueva de la Florida, Cueva de la Mina, Sótano del Molino, Cueva de El Pachón, Grutas de Quintero, Cueva de Ojo de Agua de Manantiales, and Sótano de Vasquez.

New records.—*Puebla:* Grutas de Atepolihuit; *San Luis Potosí:* Cueva del Agua, Cueva de Agua Vendita, Cueva de Berna Be B, Cueva de Las Lagunitas, Spring at La Laja, Cueva de la Luz, Small cave near Hoya Quital, and Hoya Quital; *Tamaulipas:* Cueva del Agua de Simón Salinas and Bee Cave (det. T. E. Bowman).

Discussion.—This species is remarkable because of its great range, occurring in the Sierra de Tamaulipas, Sierra de El Abra, Sierra de Guatemala, Aquismón region, near Ciudad de Maíz in the Sierra el Pino, and in the Cuetzalan region. In addition it has an altitudinal range of at least 1200 meters. It usually inhabits still pools and lakes floored with silt or guano. It has been taken in direct association with *S. bolivari* in Grutas de Quintero, Bee Cave, and the spring at La Laja.

Speocirolana thermydronis Cole and Minckley

Speocirolana thermydronis Cole and Minckley, 1966: 17-22, fig. 1-21; Minckley and Cole, 1968:2-4; Minckley, 1969:24-25; Cole and Minckley, 1970: 71, 80; Holsinger and Minckley, 1971:441; Reddell, 1971b:21; Cole and Minckley, 1972:321.
Speocirolana: Taylor and Minckley, 1966:21.
Speocirolana (part): Straskraba, 1969:23; Argano, 1972b:33; Bowman, 1975:5, 6, 7, fig. 4c.

Type-locality.—Posos de la Becerra, 9.8 miles SSW Cuatro Ciénegas, Coahuila, México.

Distribution.—Known only from spring-fed "posos" southwest of Cuatro Ciénegas de Carranza, Coahuila. See Fig. 6.

Records.—*Coahuila:* Posos de la Becerra, El Mojarral, and an unnamed poso (12 km SW Cuatro Ciénegas).

Discussion.—*Speocirolana thermydronis* has been taken from interstices in blocks of porous travertine along the sides of natural wells (posos). The habitat in which these isopods has been found is well described by Minckley (1969). Cole and Minckley (1966) speculate that the genus is of pre-Tertiary origin; they also discuss the evolution of the genus.

Sphaerolana affinis Cole and Minckley

Aberrant cirolanid (part): Minckley, 1969:25.
Sphaerolana affinis Cole and Minckley, 1970:75-76, 78-79, 80, fig. 28-40; Holsinger and Minckley, 1971:441; Reddell, 1971b:21; Peck, 1977c:67.
Sphaerolana (part): Cole and Minckley, 1970:71-72; Cole and Minckley, 1972:321.

Type-locality.—Small poso *ca.* 20.3 km south and 5.5 km east of Cuatro Ciénegas de Carranza, Coahuila, México.

Distribution.—Known from spring-fed wells near Cuatro Ciénegas, Coahuila; and from a flooded mine near Villa Santiago, Nuevo León. See Fig. 6.

Records.—*Coahuila:* Small poso about 20.3 km S and 5.5 km E of Cuatro Ciénegas; other posos near Cuatro Ciénegas; *Nuevo León:* Flooded mine about

30 m below entrance of Cueva de la Boca, near Villa Santiago.

Discussion.—*Sphaerolana* is one of three genera of cirolanids capable of rolling into a ball, the other two being *Faucheria* and *Creaseriella* (see under *Creaseriella anops* above). It appears to be only slightly related to either genus. The two species of the genus are quite secretive during the day but roam in the spring mouths and in mud about plant roots in the bottom of the wells at night. Cole and Minckley (1970) discuss the evolution of the genus.

Sphaerolana interstitialis Cole and Minckley

Aberrant cirolanid (part): Minckley, 1969:25.

Sphaerolana interstitialis Cole and Minckley, 1970: 72-75, 76, 78-79, 80, fig. 1-27, 40; Holsinger and Minckley, 1971:441; Reddell, 1971b:21; Brown, 1974:44, 45.

Sphaerolana (part): Cole and Minckley, 1970:71-72; Cole and Minckley, 1972:321.

Type-locality.—Small, unnamed pit *ca.* 8.2 km south and 4.7 km west of Cuatro Ciénegas de Carranza, Coahuila, México.

Distribution.—Small springs and posos near Cuatro Ciénegas, Coahuila. See Fig. 6.

Records.—*Coahuila:* Small unnamed poso about 8.2 km S and 4.7 km W of Cuatro Ciénegas; three small springs within 1 km W of this poso.

Discussion.—One specimen of this species was taken from the stomach contents of the aquatic box turtle *Terrapene coahuila* Schmidt and Owens (Brown, 1974). It has been taken in association with *S. affinis* in one poso (Cole and Minckley, 1970).

Suborder Asellota

Family Asellidae

The family Asellidae is an extremely abundant part of the cavernicole fauna of the temperate regions of the United States, but until recently was not known from México. Five species of asellid, four of which are troglobites, have been described from wells and caves in southern México; a single troglobitic species is known from a cave in Guatemala.

Caecidotea chiapas Bowman

Caecidotea chiapas Bowman, 1976:340-345, 354, 355, fig. 1-39; Argano, 1977:103-105, 110, 112, 114, 116; Ruffo and Vigna Taglianti, 1977:134, 141; Sbordoni et al., 1977:74, pl. IIa.

Aselli troglobi: Sbordoni et al., 1977:56.

Type-locality.—Cueva de los Murciélagos, 15 km ESE of San Cristóbal de las Casas, Chiapas, México.

Distribution.—Known from four caves and a well near San Cristóbal de las Casas, Chiapas. See Fig. 7.

Records.—*Chiapas:* Well in casa Bell (San Cristóbal de las Casas), Cueva de Los Llanos, Cueva de los Murciélagos, Cueva de la Planta n. 2, and Cueva de la Planta n. 3.

Discussion.—This species is most closely related to *C. pasquinii.* It was taken from a small stream in Cueva de Los Llanos and Cueva de los Murciélagos.

Caecidotea mitchelli Argano

Caecidotea mitchelli Argano, 1977:112-116, fig. 5-6; Ruffo and Vigna Taglianti, 1977:146.

Type-locality.—Cueva de los Resadores, Santa Eulalia, Huehuetenango, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 7.

Discussion.—This species was taken from pools in association with *Bogidiella pasquinii.* It is a member of the *chiapas* species group and appears to be closely related to *C. pasquinii.*

Caecidotea pasquinii (Argano)

Conasellus pasquinii Argano, 1972a:35-42, fig. 1-3; Bowman, 1976:339.

Caecidotea pasquinii: Bowman, 1976:344, fig. 39; Argano, 1977:103, 112.

Type-locality.—Well in the pueblo of San Joan (=Juan) de la Punta, on the road between Veracruz and Córdoba, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 7.

Discussion.—This species is closely related to *C. communis* (Say), a widespread species known, in México, from the states of México, Puebla, and Veracruz. Argano (1972a) considers that *C. pasquinii* is a fairly recent troglobite, probably evolved from *C. communis* or a common ancestor. Creaser (1938) reported the presence in Grutas de Balankanche, Yucatán, of an undescribable species of *Caecidotea.*

Caecidotea vomeroi Argano

Caecidotea vomeroi Argano, 1977:110-112, fig. 4; Ruffo and Vigna Taglianti, 1977:131.

Type-locality.—Cueva de Chital no. 2, Ococingo (=Ocosingo), Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 7.

Discussion.—This species belongs to the *chiapas* species group and appears to be most closely related to *C. zullinii.* It was taken in association with the amphipod *Bogidiella tabascensis* and troglobitic planaria.

Caecidotea zullinii Argano

Caecidotea zullnii Argano, 1977:105-110, 112, 114, fig. 1-3; Ruffo and Vigna Taglianti, 1977:151.

Type-locality.—Cueva de Chanchaniptic, Sitala, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 7.

Discussion.—This species is a member of the *chiapas* species group and appears to be closely related to *C. vomeroi*. It was taken in association with *Bogidiella vomeroi* and troglobitic planaria.

Family Stenasellidae

The family Stenasellidae is found in the peri-Mediterranean area, east-central Asia, tropical Africa, and México. The appearance of the family in the Cuatro Ciénegas basin implies a pre-Tertiary origin for the family and provides a further link between the peri-Mediterranean and greater Caribbean regions (Cole and Minckley, 1972). Magniez (1974a) has discussed the evolution and ecology of the family. He contends that the stenasellids had their origin in the littoral gravels, from which they migrated into the

Fig. 7.—Distribution of troglobitic isopods of the suborder Asellota: 1, *Mexistenasellus coahuila;* 2, *Mexistenasellus* n. sp. 1; 3, *Mexistenasellus* n. sp. 2; 4, *M. parzefalli* and *M. wilkensi;* 5, *M. magniezi;* 6, *Caecidotea pasquinii;* 7, *Etlastenasellus* n. sp.; 8, *E. mixtecus;* 9, *C. chiapas;* 10, *C. zullinii;* 11, *C. vomeroi;* 12, *C. mitchelli;* 13, *Caecidotea* sp.

underflow of rivers, alluvial gravels, and finally the karstic waters.

Etlastenasellus mixtecus Argano

Etlastenasellus mixtecus Argano, 1977:117-121, fig. 7-8; Ruffo and Vigna Taglianti, 1977:166.

Type-locality.–Pozzo, villaggio di Etla, Oaxaca, Oaxaca, México.

Distribution.–Known only from the type-locality. See Fig. 7.

Discussion.–*Etlastenasellus* is a monotypic genus which shows some affinities both to the Mexican *Mexistenasellus* and to the African *Magniezia*. It was taken from phreatic waters in association with *Bogidiella arganoi*, *B. niphargoides*, and *B. michaelae*.

Mexistenasellus coahuila Cole and Minckley

Stenasellinae, undescribed genus: Minckley, 1969: 25; Holsinger and Minckley, 1971:441.

Mexistenasellus coahuila Cole and Minckley, 1972: 314, 315-319, fig. 1-31; Magniez, 1972:19, 20, 23, 29; Holsinger, 1973:11; Magniez, 1973:164, 168; Argano, 1974:102; Magniez, 1974a:50, 51, 56, 57, 58, 59, fig. 11C, 13; Magniez, 1974b:100; Argano, 1977:116.

Mexistenasellus coahuili: Magniez, 1974a:57 (erroneous spelling).

Mexistenasellus (part): Husson et al., 1973:122; Magniez, 1973:181; Magniez, 1974a:7, 9, 25, 50-51, 56-57, 64, 69, fig. 1; Bowman, 1976:339.

Type-locality.–Eastern end of Laguna Juan Santos, 8.5 km south and 8.0 km west of Cuatro Ciénegas de Carranza, Coahuila, México.

Distribution.–Known only from springs and spring-fed pools southwest of Cuatro Ciénegas, Coahuila. See Fig. 7.

Records.–*Coahuila:* Pozo Barbado, Laguna Escobeda, Laguna Juan Santos, Small unnamed spring (8.2 km S, 8.4 km W Cuatro Ciénegas), Small unnamed spring (8.8 km S, 4.0 km W Cuatro Ciénegas), and Small unnamed seep near Pozo Barbado.

Discussion.–The genus *Mexistenasellus* is known only from the four subterranean forms discussed here and from undescribed species from Nuevo León and Tamaulipas.

Mexistenasellus magniezi Argano

Mexistenasellus magniezi Argano, 1974:98-102, fig. 1-3; Magniez, 1974a:58, 59, fig. 13; Ruffo and Vigna Taglianti, 1974:120; Argano, 1977:116.

Mexistenasellus (part): Magniez, 1974a:7, 9, 25, 50, 51, 56-57, 64, 69, fig. 1; Bowman, 1976:339.

Type-locality.–Well on the outskirts of the village of Paraje Nuevo, near Córdoba, Veracruz, México.

Distribution.–Known only from the type-locality. See Fig. 7.

Discussion.–This species is very similar to *M. coahuila* in its dimensions and general body form. Since both of these species inhabit a similar (phreatic) biotope, this is not surprising.

Mexistenasellus parzefalli Magniez

Mexistenasellus parzefalli Magniez, 1972:19-24, 30, pl. 1-3; Hobbs and Hobbs, 1973:39; Husson et al., 1973:122; Magniez, 1973:163-170, pl. 1-2; Argano, 1974:102; Magniez, 1974a:50, 51, 57-58, 59, fig. 11C, 13; Magniez, 1974b:122, 123, 125, 126, 128; Bowman, 1975:7; Argano, 1977:116.

Mexistenasellus (part): Magniez, 1973:181; Magniez, 1974a:7, 9, 25, 50-51, 56-57, 64, 69, fig. 1; Bowman, 1976:339.

Type-locality.–Cueva del Huizache (=Huisache), Ciudad Valles, San Luis Potosí, México.

Distribution.–Known only from the type-locality. See Fig. 7.

Discussion.–This species is more closely related to *M. wilkensi* than to the other two species of the genus. It is very different from *M. coahuila* and *M. magniezi* which inhabit phreatic waters rather than the open waters of caves. It was found crawling on the bottom of a small pool over which bats roosted.

Mexistenasellus wilkensi Magniez

Mexistenasellus wilkensi Magniez, 1972:19, 20, 23, 24-29, 30, pl. 4-6; Hobbs and Hobbs, 1973:39; Husson et al., 1973:122; Magniez, 1973:163, 164; Argano, 1974:102; Magniez, 1974a:10-11, 57, 58, 59, fig. 2C, 13; Magniez, 1974b:115, 123, 126; Bowman, 1975:7; Argano, 1977:116.

Mexistenasellus (part): Magniez, 1973:181; Magniez, 1974a:7, 9, 25, 50-51, 56-57, 64, 69, fig. 1; Bowman, 1976:339.

Type-locality.–Cueva del Huizache (=Huisache), Ciudad Valles, San Luis Potosí, México.

Distribution.–Known only from the type-locality. See Fig. 7.

Discussion.–This species is most closely related to *M. parzefalli*. It was found in direct association with *M. parzefalli*, the cirolanid *Mexilana saluposi*, and an undescribed anthurid of the genus *Cyathura*.

Suborder Anthuridea

Family Anthuridae

Cyathura sbordonii Argano

Cyathura sbordonii Argano, 1971:304, fig. 1-4; Argano, 1972b:26-33, fig. 1-3; Peck and Peck, 1973: 68.

Cyathura new species: Sbordoni and Argano, 1972: 19.

Type-locality.—Cueva del Ojo de Agua Grande, Paraje Nuevo, Córdoba, Veracruz, México.

Distribution.—Known only from two caves in Veracruz. See Fig. 8.

New record.—*Veracruz:* Cueva de la Sala de Agua (Ejido Colonia) (det. T. E. Bowman).

Discussion.—The genus *Cyathura* consists primarily of marine species, but four freshwater forms have been described. One of these, *C. milloti* Chappuis, Delamare, and Paulian, is known only from an interstitial habitat on Reunion Island; it is not closely related to the other three freshwater species. These three species constitute the *specus* group (Argano, 1972b). *Cyathura specus* Bowman is known from a cave in Cuba, *C. currassavica* Storck from a spring in the island of Curaçao, and *C. sbordonii* from a cave in Veracruz. *Cyathura sbordonii* is most closely related to *C. specus.* The distribution of the subterranean *Cyathura* is similar to that of the Cirolanidae, Stenasellidae, Bogidiellidae, and Hadziidae. Argano (1972b) speculates that the three subterranean species evolved from a common interstitial ancestor widely distributed throughout the Caribbean region. The recent discovery of an undescribed species near Valles in San Luis Potosí only serves to emphasize

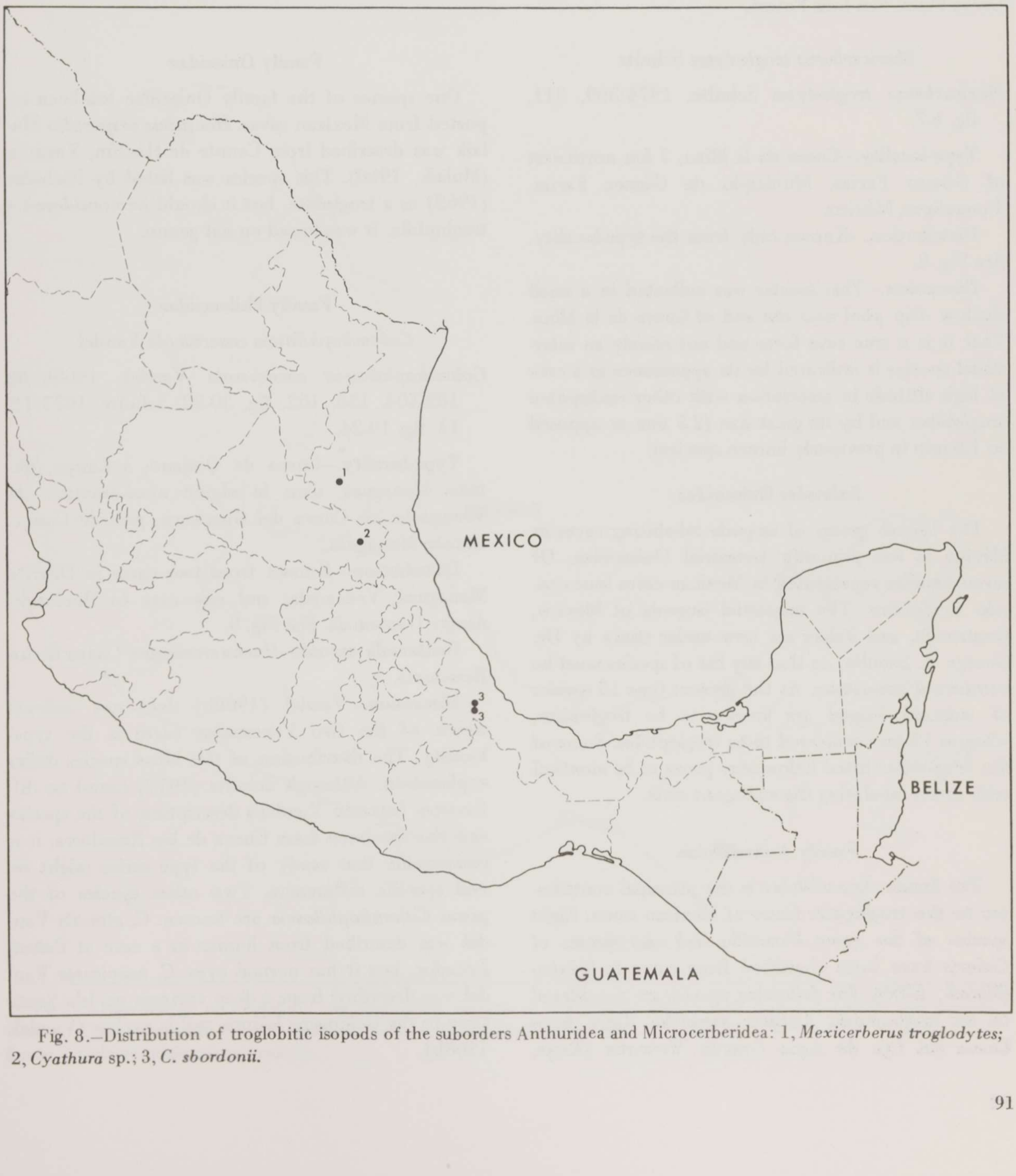

Fig. 8.—Distribution of troglobitic isopods of the suborders Anthuridea and Microcerberidea: 1, *Mexicerberus troglodytes;* 2, *Cyathura* sp.; 3, *C. sbordonii.*

the similarities between the distribution of this group and that of the others.

Suborder Microcerberidea

Family Microcerberidae

The family Microcerberidae in North America is represented only by marine interstitial forms of the genera *Microcerberus* and *Yvesia* and by the troglobite discussed below. Although some species of *Microcerberus* have been collected from caves in Europe, the species discussed below was the first cave record for the suborder in the New World. An undescribed species of *Microcerberus* is known from Cueva Pinta, San Luis Potosí.

Mexicerberus troglodytes Schultz

Mexicerberus troglodytes Schultz, 1974:309, 311, fig. 1-7.

Type-locality.—Cueva de la Mina, 7 km northwest of Gómez Farías, Municipio de Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 8.

Discussion.—This species was collected in a small shallow drip pool near the end of Cueva de la Mina. That it is a true cave form and not merely an interstitial species is indicated by its appearance in a cave at high altitude in association with other undisputed troglobites and by its great size (2.5 mm as opposed to 1.6 mm in previously known species).

Suborder Oniscoidea

The largest group of isopods inhabiting caves in México is the primarily terrestrial Oniscoidea. Of seven families represented in Mexican caves four contain troglobites. The terrestrial isopods of México, Guatemala, and Belize are now under study by Dr. George A. Schultz, so that any list of species must be considered premature. At the present time 15 species of oniscoid isopod are known to be troglobites, whereas 15 are considered to be troglophiles. Some of the troglobites listed below may prove to be identical with forms inhabiting the endogean zone.

Family Armadillidae

The family Armadillidae is the principal contributor to the troglophile fauna of Mexican caves. Eight species of the genus *Venezillo* and one species of *Cubaris* have been identified from caves in México (Mulaik, 1960). The following species are considered to be troglophiles: *Cubaris mirandai* Rioja from Cueva del Ojo de Agua Grande, Veracruz (Rioja, 1954); *Venezillo articulatus* (Mulaik) and *V. boneti* (Mulaik) from Grutas de Juxtlahuaca, Guerrero (Mulaik, 1960); *V. cacahuamilpensis* (Bilimek) from caves in Guerrero and México (Bilimek, 1867; Mulaik, 1960; Rioja, 1954); *V. chiapensis* Rioja from Grutas de Zapaluta, Chiapas (Rioja, 1955a); *V. llamasi* Rioja from Cueva de Patla, Puebla (Rioja, 1954); *V. osorioi* (Mulaik) from caves in Guerrero and Nuevo León (Mulaik, 1960); *V. pleogoniophorus* (Rioja) from Cueva de Los Sabinos, San Luis Potosí (Rioja, 1952); and *V. tanneri* (Mulaik and Mulaik) from Grutas del Palmito, Nuevo León (Schultz, 1965). These isopods are usually found on bat guano or organic debris, and none show any adaptations for a cave existence.

Family Oniscidae

One species of the family Oniscidae has been reported from Mexican caves. *Hoctunus vespertilio* Mulaik was described from Cenote de Hoctún, Yucatán (Mulaik, 1960). This species was listed by Nicholas (1962) as a troglobite, but it should be considered a troglophile. It was found on bat guano.

Family Philosciidae

Colombophiloscia cavernicola Vandel

Colombophiloscia cavernicola Vandel, 1968b:98, 102-104, 156, 162, fig. 30-32; Schultz, 1977:12, 13, fig. 19-24.

Type-locality.—Cueva de Quijano, à Caripe, distrito Monaguas, dans la région nord-orientale du Venezuela; or Cueva del Guacharo, près de Caripe, distrito Monaguas.

Distribution.—Known from two caves in Distrito Monaguas, Venezuela, and one cave in Huehuetenango, Guatemala. See Fig. 9.

Guatemala record.—*Huehuetenango:* Cueva de los Resadores.

Discussion.—Vandel (1968b) does not indicate which of the two Venezuelan caves is the type-locality. The distribution of this blind species defies explanation. Although Schultz (1977) found no differences between Vandel's description of the species and the specimen from Cueva de los Resadores, it is conceivable that study of the type series might reveal specific differences. Two other species of the genus *Colombophiloscia* are known. *C. alticola* Vandel was described from humus in a cave at Baños, Ecuador, but it has normal eyes. *C. naevigesta* Vandel was described from a deep crevasse on Isla Santa Cruz in the Galapagos Islands and is eyeless (Vandel, 1968b).

Troglophiloscia laevis Schultz

Troglophiloscia laevis Schultz, 1977:9-12, 13, fig. 1-18.

Troglophiloscia levis: Reddell, 1977b:229, 239, 240, 273 (erroneous spelling).

Type-locality.—Actún Xpukil, 3 km S of Calcehtok, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 9.

Discussion.—This species is known only from a single male. The only other species in the genus is *T. silvestrii* Brian, a troglobite described from Grutas de Bellamar, near Matanzos, Cuba.

Family Porcellionidae

The family Porcellionidae is represented in Mexican caves by two species of the genus *Porcellio* and by one of *Porcellionides. Porcellio gertschi* Van Name was collected in Cueva de los Lagos, Coahuila (Schultz, 1965). *Porcellio laevis* Latreille was identified from Grutas de Cacahuamilpa, Guerrero, and from Cenote Ixil, Yucatán. Creaser (1938) reported the genus *Porcellionides* from numerous caves in

Fig. 9.—Distribution of troglobitic and troglophilic isopods of the families Philosciidae, Sphaerioniscidae, and Squamiferidae: 1, *Spherarmadillo cavernicola;* 2, *Trichorhina boneti;* 3, *T. atoyacensis;* 4, *T. vandeli;* 5, *T. pearsei;* 6, *Troglophiloscia laevis;* 7. *Colombophiloscia cavernicola.*

Yucatán but did not identify the species; he indicated that it was probably a troglobite. Numerous recent collections from the Yucatán Peninsula contain specimens probably applicable to that reported by Creaser, but remain unstudied.

Family Sphaeroniscidae

Spherarmadillo cavernicola Mulaik

Spherarmadillo cavernicola Mulaik, 1960:84, 179, 180-181, fig. 334-341; Nicholas, 1962:170; Schultz, 1970b:125, fig. 11-17; Reddell, 1971b: 22; Reddell and Mitchell, 1971a:143; Reddell and Mitchell, 1971b:183; Reddell and Elliott, 1973a: 171; Reddell and Elliott, 1973b:181; Fernández Ruiz, 1976:717.

Type-locality.—Cueva de los Sabinos, San Luis Potosí, México.

Distribution.—Known from one cave each in the Sierra de El Abra, San Luis Potosí, and the Sierra de Guatemala, Tamaulipas. See Fig. 9.

Records.—*San Luis Potosí:* Cueva de Los Sabinos; *Tamaulipas:* Cave (Rancho del Cielo).

Discussion.—A record of this species from Huatusco, Veracruz (Mulaik, 1960) is doubtless an error and is presumably applicable to *S. huatuscensis* Mulaik. The species belonging to the genus *Spherarmadillo* are only very poorly separated from those of the genus *Sphaeroniscus. Spherarmadillo cavernicola* is more closely related to *S. huatuscensis* from Veracruz than to the only other species of the genus, *S. schwarzi* Richardson, from Guatemala. Schultz (pers. comm.) expresses the opinion that this species may be an endogean form, but it is apparently still known only from the cave habitat. It is, therefore, retained in this list with some reservations.

Family Squamiferidae

The family Squamiferidae is represented in Mexican caves by four species of the genus *Trichorhina*, three of which are anophthalmic and included here. A fourth species, *T. vandeli* Rioja, is known only from Cueva Cerro Hueco, Chiapas, and possesses reduced eyes; it is probably a troglophile. The remaining four species are epigean forms. Vandel (1964) indicated that all of these species are probably endogeans, and he may be correct. The epigean isopod fauna of México is only poorly known, and until careful collections of the endogean habitat have been made, any speculations on the relationships of these species are premature.

Trichorhina atoyacensis Mulaik

Trichorhina atoyacensis Mulaik, 1960:83, 140, 141, fig. 127-130; Nicholas, 1962:171; Lemos de Castro, 1964:1; Reddell, 1971b:22.

Type-locality.—Cueva (=Grutas) de Atoyac, Atoyac, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 9.

Discussion.—Schultz (pers. comm.) has indicated that this species may be synonymous with *T. pearsei* (Creaser) and *T. boneti* Rioja. If these species prove to be identical, they are almost certainly not troglobites, since these cave regions are so widely separated and the troglobitic faunas so distinct.

Trichorhina boneti Rioja

Oniscidae sp. D: Bonet, 1953a:24, 65.

La forma afín al género *Troglophiloscia:* Bonet, 1953a:27, 30, 33.

Trichorhina boneti Rioja, 1956:451-456, fig. 15-27; Mulaik, 1960:83, 140, 144-147, fig. 618-630; Nicholas, 1962:171; Lemos de Castro, 1964:1; Reddell, 1967d:106; Reddell, 1971b:22.

Oniscidae, unidentified genus and species: Reddell, 1971b:21 (Cueva del Ahuate n. 2 record only).

Type-locality.—Cueva de Ahuate número dos, puerto de Ahuate, al SO. de Xilitla, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 9.

Discussion.—This is the most northern record for the genus in México. Schultz (pers. comm.) has indicated that this species may be synonymous with *T. pearsei.*

Trichorhina pearsei (Creaser)

Porcellio: Pearse, 1938a:13, 15; Pearse, 1945:111, 166.

Porcellio pearsei Creaser, 1938:160, 162, 163, fig. 1-8; Pearse, 1945:166; Rioja, 1953a:286, 295; Mulaik, 1960:166, 170-171; Nicholas, 1962:171.

Porcellio pearsi: Vandel, 1950:206, 207 (erroneous spelling).

Trichorhina yucatanensis Mulaik, 1960:83, 140, 142, 144, fig. 146-150; Lemos de Castro, 1964:1, 2.

Trichorhina yucatensis: Nicholas, 1962:171 (erroneous spelling).

Trichorhina pearsei: Lemos de Castro, 1964:1, 2; Reddell, 1971b:22; Reddell, 1977b:229, 239, 240, 268, 270, 273, 274, 276, 285.

Type-locality.—Of *Porcellio pearsei:* Balaam Canche Cave (=Grutas de Balankanche), near Chichén Itzá, Yucatán, México; of *Trichorhina yucatanensis:* Cueva de Gorgosa (=Actún Góngora), Oxkutzcab, Yucatán, México.

Distribution.—Known from seven caves in Yucatán. See Fig. 9.

Records.—*Yucatán:* Grutas de Balankanche, Actún Góngora, Actún Puz, Cenote de Sambulá (Motul), Cueva Primera del Camino a San Roque, Actún Sazich, and Actún Xpukil.

Discussion.—This is an eyeless species but may prove to be an endogean form. One eyeless epigean species, *T. xoltumae* Mulaik, is known from Xoltum, Yucatán (Mulaik, 1960). Numerous collections of cave and epigean isopods from the Yucatán Peninsula are now under study by Dr. George A. Schultz. Further speculation on the ecologic status of this species is premature.

Family Trichoniscidae

Brackenridgia acostai (Rioja)

Protrichoniscus acostai Rioja, 1951b:181-189, fig. 1-23; Rioja, 1953a:290, 291, 295; Rioja, 1953b: 217; Rioja, 1955b:49-53, 61, fig. 19-26; Mulaik, 1960:82, 100, 102-105, fig. 552-570; Nicholas, 1962:172; Vandel, 1965c:352, 354, fig. 1.

Protrichoniscus (part): Rioja, 1953e:11.

Protrichonischus acostai: Rioja, 1955a:208 (erroneous spelling).

Brackenridgia acostai: Reddell, 1971b:23.

Type-locality.—Cueva de toma de agua para la población de Comitán (=Cueva del Tío Ticho), Chiapas, México.

Distribution.—Known from two caves near Comitán, Chiapas. See Fig. 10.

Records.—*Chiapas:* Cueva del Tío Ticho and Grutas de Zapaluta.

Discussion.—The genus *Brackenridgia* is a member of the First Division of the subfamily Trichoniscinae. This division is considered by Vandel (1965c) to be the most primitive. Members of it are found in Europe and North America. *Brackenridgia* includes eight species, seven of which are troglobites. The eighth, *B. heroldi* (Arcangeli), is known only from caves and epigean localities in California (U.S.A.). Two species, *B. cavernarum* Ulrich and *B. reddelli* (Vandel), are known only from caves in Texas.

Brackenridgia bridgesi (Van Name)

Protrichoniscus bridgesi Van Name, 1942:299, 302-304, fig. 4-5; Bolívar, 1950:211; Rioja, 1950: 127-137, 138, 140, 141, 143, fig. 1-20; Vandel, 1950:206, 207; Rioja, 1951b:183, 184, 187, 188; Villalobos, 1951:215; Bonet, 1953a:27, 30; Rioja, 1953a:287, 289, 291, 295; Vandel, 1953: 371, 372; Rioja, 1955b:39-44, 46, 53, 61, fig. 1-10; Mulaik, 1960:100, 101-102, 103, 104, 105, 106, 107, 108, 109, 110, fig. 27-38; Nicholas, 1962:172; Reddell, 1965a:19; Vandel, 1965c: 353, 354, 360-364, 366, fig. 1, 5-6; Reddell, 1967b:82; Schultz, 1968:256-257, fig. 3, 6, 9, 12, 15, 18, 21, 26-27; Schultz, 1970a:412.

Protrichoniscus (part): Rioja, 1953e:11, fig. 7.

Protrichoniscus potosinus Mulaik, 1960:100-101, fig. 21-26; Nicholas, 1962:172; Bowman, 1965: 212; McKenzie, 1965a:38; Vandel, 1965c:353, 354, 360.

Brackenridgia bridgesi: Mitchell and Reddell, 1971: 59; Reddell, 1971b:23; Reddell and Mitchell, 1971a:143, fig. 9; Reddell and Mitchell, 1971b: 183, fig. 1, 15; Mitchell and Kawakatsu, 1973a: 671, 673, 675; Reddell and Elliott, 1973a:171; Reddell and Elliott, 1973b:181; Fernández Ruiz, 1976:716, 717; Johnson and Heath, 1977:131-135.

Type-locality.—Of *Protrichoniscus bridgesi:* Cave at El Pujal (=Cueva Chica), San Luis Potosí, México; of *Protrichoniscus potosinus:* Cueva Chica, El Pujal, San Luis Potosí, México.

Distribution.—Known from caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas; and the Sierra de Guatemala, Tamaulipas. See Fig. 10.

Records.—*San Luis Potosí:* Boca del Abra, Sótano del Arroyo, Cueva Chica, Ventana Jabalí, Cueva de Los Sabinos, Sótano del Tigre, and Sótano de la Tinaja; *Tamaulipas:* ?Cueva de la Capilla, Cueva de la Mina, Cueva de El Pachón, and Grutas de Quintero.

Discussion.—Boca del Abra is an unidentified locality but may be the same cave as Cueva de Valdosa. This widespread species may also be found in a variety of habitats, both terrestrial and aquatic. Individuals have been seen to walk though pools several inches deep and even to be seen remaining under water for long periods of time. It is usually collected on small pieces of rotten wood, among bits of organic debris washed into caves, or about small pools. Johnson and Heath (1977) estimated the population size in Cueva Chica to be about 533 individuals. This species shows strong affinities with *B. reddelli* of Central Texas (Vandel, 1965c).

Brackenridgia palmitensis (Mulaik)

Protrichoniscus palmitensis Mulaik, 1960:100, 102, fig. 39-48; Nicholas, 1962:172; Bowman, 1965: 212; Vandel, 1965c:353, 354; Reddell, 1967a:24.

Protrichoniscus: Reddell, 1967a:24.
Brackenridgia palmitensis: Reddell, 1971b:23.

Type-locality.—Cueva (=Grutas) del Palmito, Bustamante, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 10.

Discussion.—The description of this species is inadequate to allow speculation on its relationship to other members of the genus. A single small isopod, probably of this species, has been collected from organic debris in a small side passage near the entrance to Grutas del Palmito.

Brackenridgia villalobosi (Rioja)

Protrichoniscus villalobosi Rioja, 1950:127, 128, 129, 132, 137-145, fig. 21-49; Rioja, 1951b:183, 184, 187, 188; Rioja, 1953a:289, 291, 295; Rioja, 1953c:227; Rioja, 1955b:44-49, 52, 53, 61, fig. 11-18; Mulaik, 1960:82, 100, 103, 104, 105-110, fig. 527-551; Nicholas, 1962:172; Vandel, 1965b: 502; Vandel, 1965c:354, 362, 367-368, fig. 1, 8; Argano, 1972b:31.
Protrichoniscus (part): Rioja, 1953e:11, fig. 7.
Brackenridgia villalobosi: Reddell, 1971b:23.

Fig. 10.—Distribution of troglobitic trichoniscid isopods of the genera *Brackenridgia, Mexiconiscus,* and *Typhlotricholigioides:* 1, *Brackenridgia palmitensis;* 2, *B. bridgesi;* 3, *Mexiconiscus laevis;* 4, *B. villalobosi;* 5, *B. villalobosi* and *Typhlotricholigioides aquaticus;* 6, *B. acostai.*

Type-locality.—Cueva del Ojo de Agua Grande, Córdoba, Veracruz, México.

Distribution.—Known only from caves near Córdoba and Orizaba, Veracruz. See Fig. 10.

Records.—*Veracruz:* ?Grutas de Atoyac, Cueva del Carbón, and Cueva del Ojo de Agua Grande.

Discussion.—This species was collected from organic debris and from the vicinity of and in small pools. It is most closely related to *B. acostai.* The record of *B. villalobosi* from Grutas de Atoyac is tentative. Mulaik (1960) originally reported the population from Grutas de Atoyac as *Protrichoniscus bridgesi;* this is certainly a misidentification.

Cylindroniscus cavicolus (Mulaik)

Antroniscus cavicola Mulaik, 1960:82, 117, 118-119, fig. 50-64; Nicholas, 1962:171; Schultz, 1970a: 407-408.

Cylindroniscus cavicolus: Schultz, 1970a:409, 411-412; Reddell, 1971b:23.

Type-locality.—Gruta del Palmito, Bustamente (=Bustamante), Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 11.

Discussion.—The genus *Cylindroniscus* is a member of the First Division of the subfamily Trichoniscinae.

Fig. 11.—Distribution of troglobitic trichoniscid isopods of the genus *Cylindroniscus:* 1, *Cylindroniscus cavicolus;* 2, *C. vallesensis;* 3, *C. maya.*

It includes five species, of which three are troglobites. *Cylindroniscus seurati* Arcangeli is an endogean species from Cuba; *C. yucatanensis* (Mulaik) is known only from Santa María, Yucatán, and is probably also an endogean. *Cylindroniscus cavicolus* is apparently very closely related to *C. vallesensis* Schultz (Schultz, 1970a).

Cylindroniscus maya Rioja

Cylindronischus: Rioja, 1955b:61 (erroneous spelling).

Cylindroniscus maya Rioja, 1958:269-277, fig. 1-28; Mulaik, 1960:82, 112-116, 118, fig. 571-598; Nicholas, 1962:172; Schultz, 1970a:407, 408-409; Reddell, 1971b:23; Reddell, 1977b:229, 240, 268, 285.

Antroniscus balamensis Mulaik, 1960:82, 117, 118, fig. 56-58; Nicholas, 1962:171; Schultz, 1970a: 407-408.

Type-locality.—Of *Cylindroniscus maya:* Cenote de Sambulha (=Sambulá), situada a 1 kilómetro al sur de Motul, Yucatán, México; of *Antroniscus balamensis:* Cueva Balam-Canche (=Grutas de Balankanche), Chichén-Itzá, Yucatán, México.

Distribution.—Known only from two caves in northern Yucatán. See Fig. 11.

Records.—*Yucatán:* Grutas de Balankanche and Cenote de Sambulá (Motul).

Discussion.—Whether this and the other two cave inhabiting species are troglobites must await further intensive collecting on the surface in the vicinity of the caves from which isopods have been collected. Numerous isopods apparently belonging to the genus *Cylindroniscus* have been collected from both cave and surface localities in Yucatán. This material is presently under study by Dr. George A. Schultz.

Cylindroniscus vallesensis Schultz

Cylindroniscus vallesensis Schultz, 1970a:409-412, fig. 1-19; Reddell, 1971b:23; Reddell and Mitchell, 1971a:143; Reddell, 1973a:32, 37; Reddell and Elliott, 1973a:171, 172.

Cylindroniscus sp. nr. *vallesensis:* Reddell and Elliott, 1973a:172.

Type-locality.—Cueva Pinta, 8 mi NE of Valles, San Luis Potosí, México.

Distribution.—Known only from caves in the vicinity of Valles, San Luis Potosí. See Fig. 11.

Records.—*San Luis Potosí:* Cueva Pinta and ?Sótano de Yerbaniz.

Discussion.—Specimens from Sótano de Yerbaniz are immature, so this record must remain tentative. This is the most elongate species of the genus with a length-width ratio of 8:1. The other two cave species have ratios of 3.1:1 and 3.3:1, and the two epigean species have ratios of 5.3:1 and 6:1.

Mexiconiscus laevis (Rioja)

Protrichoniscus sp.: Bonet, 1953a:24, 27, 30, 33, 85, 86.

Cordioniscus laevis Rioja, 1956:447-451, fig. 1-14; Mulaik, 1960:82, 98-99, fig. 513-526; Nicholas, 1962:172; Bowman, 1965:209; Schultz, 1968: 255; Vandel, 1968a:628; Vandel, 1968b:48.

Mexiconiscus tlamayaensis Schultz, 1964:376-380, fig. 1-19; Schultz, 1965:102, 104, 108; Reddell, 1967d:106; Schultz, 1968:255; Moller, 1970:5.

Mexiconiscus tlamayensis: Reddell, 1965c:7; Schultz, 1968:255 (erroneous spelling).

Xilitloniscus laevis: Bowman, 1965:210, 212, 215, fig. 1-30; Reddell, 1967d:106.

Mexiconiscus laevis: Schultz, 1968:255, fig. 2, 5, 8, 11, 14, 17, 20, 24-25; Schultz, 1970a:412; Vandel, 1970:161-178, fig. 1-5; Reddell, 1971b:23.

Mexiconiscus: Reddell, 1973a:32, 37.

Type-locality.—Of *Cordioniscus laevis:* Cueva de la Hoya, en Ahuacatlán, en el Municipio de Xilitla, San Luis Potosí, México; of *Mexiconiscus tlamayaensis:* El Sontano (=Sótano) de Huitzmolotitla about two K. west of the small town of Tlamaya, near Xilitla, San Luis Potosí, México.

Distribution.—Caves in the vicinity of Xilitla, Ahuacatlán, and Aquismón, San Luis Potosí. See Fig. 10.

Records.—*San Luis Potosí:* Cueva de la Hoya, Sótano de Huitzmolotitla, Cueva de la Luz, Sótano de la Navidad, Cueva de la Porra, Cueva de los Potrerillos, and Cueva de la Selva.

Discussion.—This species can be found both in water and on land in caves. Vandel (1970) has discussed the possibility that this species is a true amphibian, with part of its life spent on land and part in water, but proof requires careful observations. The species is related to a species from a cave in Spain.

Typhlotricholigioides aquaticus Rioja

Typhlotricholigioides aquaticus Rioja, 1953c:228-240, fig. 1-26; Rioja, 1955b:54-60, 61, fig. 27-34; Mulaik, 1960:83, 121-127, fig. 599-617; Nicholas, 1962:172; Vandel, 1965b:497-504, 506-507, 509-511, 513-515, fig. 7-10; Vandel, 1970:161; Argano, 1971:304; Reddell, 1971a:217; Reddell, 1971b:24; Reddell and Mitchell, 1971c:2; Argano, 1972b:31-32; Sbordoni and Argano, 1972:19; Magniez, 1975:116, 120.

Trichoniscidae, muy curiosa: Rioja, 1953e:11.

Typhlotricholigidioides aquaticus: Vandel, 1964:332; Vandel, 1965a:283 (erroneous spelling).
Typhlotricholigioides: Vandel, 1958:34, fig. 1; Vandel, 1960:138; Vandel, 1965c:351.
Typhlotricholigiodes aquaticus: Argano, 1972b:23 (erroneous spelling).

Type-locality.—Cueva del Ojo de Agua Grande, Paraje Nuevo, Córdoba, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 10.

Discussion.—This species was found in travertine pools filled with water left from flooding from deep within the cave. Vandel (1965b) does not believe that it ever had terrestrial ancestors. He contends that it is one of the more primitive living Oniscoidea and that it is most closely related to the troglobitic isopod from Spain, *Cantabroniscus primitivus* Vandel. He cites the similarity of the two species to show the effects of continental drift.

Order Amphipoda

Although more than 100 species of amphipod have been found in the caves of the United States, the order is poorly represented in México and Central America. Only 16 species of amphipod have been collected in the caves of this region. With two exceptions all are troglobitic (see Table 10).

Family Bogidiellidae

The family Bogidiellidae is represented in the caves of México and Guatemala by nine described species in the genus *Bogidiella.* This genus is known from Europe, Israel, Central Asia, Japan, Africa, Brazil, Barbuda, Saint Martin, México, and Guatemala. Although most species are inhabitants of fresh water and several are troglobites, some inhabit brackish water and a few are known from the marine interstitial zone; all, however, are of a subterranean facies. The genus is apparently of marine origin, and its distribution corresponds to a certain extent with that of the Cirolanidae, Stenasellidae, and Hadziidae. In addition to the species listed here, the troglobitic *B. bredini* Shoemaker has been described from Barbuda, and *B. martini* Stock from Saint Martin. A single incomplete specimen from a well in Campeche, Campeche, may belong to an undescribed species (Ruffo and Vigna Taglianti, 1977).

Bogidiella arganoi Ruffo and Vigna Taglianti

Bogidiella arganoi Ruffo and Vigna Taglianti, 1974: 115-116, 119-121, 127, 129, 130-131, 132, fig. 8-9, 14; Argano, 1977:119; Holsinger, 1977:15; Ruffo and Vigna Taglianti, 1977:126, 141, 153, 155, 166, 168, 169, 170.
Bogidiella new species: Argano, 1974:101.
Bogidiella cfr. *arganoi:* Ruffo and Vigna Taglianti, 1977:153-155, 166, 168, fig. 13, 21.

Type-locality.—Well no. 1, Paraje Nuevo, Córdoba, Veracruz, México.

Distribution.—Known from the type-locality and possibly a well in Oaxaca. See Fig. 12.

Records.—*Oaxaca:* Well (Etla); *Veracruz:* Well no. 1 (Paraje Nuevo).

Discussion.—This species is apparently an inhabitant of phreatic waters. Its small size and presence in a well may indicate that it is not a regular inhabitant of caves. The specimens from a well at Etla, Oaxaca, were tentatively referred to *B. arganoi* by Ruffo and Vigna Taglianti (1977) but demonstrate some differences from the typical population. A single incomplete specimen from a well at Lambityeco, Oaxaca, may also belong to this species.

Bogidiella holsingeri Ruffo and Vigna Taglianti

Bogidiella holsingeri Ruffo and Vigna Taglianti, 1974:120, 121-122, 124, 126-127, 129, 130-132, fig. 10-14; Ruffo and Vigna Taglianti, 1977:126, 133, 134-135, 141, 143, 144, 146, 148, 149, 150, 151, 162, 168, 169, 170, fig. 2m-n, 21.
Bogidiella: Peck, 1974b:33.

Type-locality.—Cueva Seamay, Finca Seamay, Senahú, Alta Verapaz, Guatemala.

Distribution.—Known only from two caves near Senahú, Alta Verapaz. See Fig. 12.

Records.—GUATEMALA: *Alta Verapaz:* Cueva Seamay and Cueva Sepacuite n. 2.

Discussion.—This species is closely related to *B. orchestipes* and *B. pasquinii.*

Bogidiella michaelae Ruffo and Vigna Taglianti

Bogidiella michaelae Ruffo and Vigna Taglianti, 1977:161-166, 168, 170, fig. 18-21; Argano, 1977:119.

Type-locality.—Pozzo, Etla, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 12.

Discussion.—This phreatic species is without close relatives in the described bogidiellid fauna of Central America.

Bogidiella niphargoides Ruffo and Vigna Taglianti

Bogidiella niphargoides Ruffo and Vigna Taglianti, 1977:155-161, 166, 168, 169, 170, fig. 17, 21; Argano, 1977:119.

Type-locality.—Pozzo, Etla, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 12.

Discussion.—This is a phreatic species without clear affinities to other described bogidiellids. It was taken in association with *Bogidiella* sp. cf. *arganoi*, *B. michaelae*, and the stenasellid isopod *Etlastenasellus mixtecus* Argano. A single, incomplete specimen from a well in Tehuacán, Puebla, may also prove to belong to this species (Ruffo and Vigna Taglianti, 1977).

Bogidiella orchestipes Ruffo and Vigna Taglianti

Bogidiella orchestipes Ruffo and Vigna Taglianti, 1977:135-141, 148, 149, 150, 151, 168, 169, 170, fig. 3-6, 21.

Bogidiella sbordonii s. l.: Argano, 1977:105.

Type-locality.—Pozzo in casa bell, S. Cristóbal de las Casas, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 12.

Fig. 12.—Distribution of troglobitic amphipods of the families Bogidiellidae and Hadziidae: 1, *Mexiweckelia mitchelli;* 2, *Mexiweckelia colei* and *Mexiweckelia particeps;* 3, *Mayaweckelia yucatanensis;* 4, *Mayaweckelia cenoticola;* 5, *Bogidiella arganoi;* 6, *B. arganoi, B. michaelae,* and *B. niphargoides;* 7, *B. tabascensis;* 8, *B. sbordonii;* 9, *B. orchestipes;* 10, *B. vomeroi;* 11, *B. pasquinii;* 12. *B. holsingeri;* 13, *Bogidiella* sp.

Discussion.—This is a phreatic species most closely related to *B. holsingeri*.

Bogidiella pasquinii Ruffo and Vigna Taglianti

Bogidiella pasquinii Ruffo and Vigna Taglianti, 1977: 141-146, 148, 149, 150, 151, 168, 169, 170, fig. 7-9, 21; Argano, 1977:116.

Type-locality.—Cueva de los Resadores, S. Eulalia, Huehuetenango, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 12.

Discussion.—This species was taken in association with *Caecidotea mitchelli* and planaria. It is related to *B. holsingeri*.

Bogidiella sbordonii Ruffo and Vigna Taglianti

Bogidiella sbordonii Ruffo and Vigna Taglianti, 1974: 107-111, 113-115, 121, 129, 130-131, 132, fig. 2-7, 14; Sbordoni et al., 1974:29; Holsinger, 1977: 15; Ruffo and Vigna Taglianti, 1977:126, 131-134, 141, 167, 168, 170, 171, fig. 2a-l, 21.

Bogidiella: Sbordoni et al., 1977:57; Vigna Taglianti, 1977:332.

Bogidiella cfr. *sbordonii:* Sbordoni et al., 1977:74, pl. IIc.

Type-locality.—Cueva de Cerro Brujo, Rancho del Cielito, Ocozocoautla, Chiapas, México.

Distribution.—Known from three caves in Chiapas. See Fig. 12.

Records.—*Chiapas:* Cueva de Cerro Brujo, Cueva de los Chivos, and Cueva de la Planta n. 3.

Discussion.—This is a typical cavernicole species apparently most closely related to *B. tabascensis*. It was found in rimstone pools at the type-locality.

Bogidiella tabascensis Villalobos

Bogidiella tabascensis Villalobos, 1960:317-334, fig. 1-36; Nicholas, 1962:172; Dancau and Serban, 1965:341; Holsinger and Peck, 1968:250; Holsinger and Minckley, 1971:425; Reddell, 1971b: 24; Mitchell and Kawakatsu, 1972:14; Holsinger, 1973:1; Mitchell and Kawakatsu, 1973a:640; Benazzi and Giannini, 1974:52; Ruffo and Vigna Taglianti, 1974:106-107, 115, 121, 129, 130-131, 132, fig. 1, 14; Sbordoni, 1974:366; Sbordoni et al., 1974:14, 15, 34; Argano, 1977:112; Holsinger, 1977a:15; Ruffo and Vigna Taglianti, 1977:126, 127-131, 134, 141, 168, 170, 171, fig. 1, 21.

Type-locality.—Grutas del Coconá, 3 km. N.NE. de Teapa, Tabasco, México.

Distribution.—Known from one cave in Tabasco and two in Chiapas. See Fig. 12.

Records.—*Chiapas:* Cueva de Chital n. 2 and Grutas del Rancho Nuevo; *Tabasco:* Grutas del Coconá.

Discussion.—This distinctive troglobite is apparently most closely related to *B. sbordonii*. It has been taken in association with the troglobitic planarian *Opisthobursa mexicana* at the type-locality. *Bogidiella tabascensis* has been collected from rimstone pools in Grutas del Rancho Nuevo and from guano-rich pools in Grutas del Coconá.

Bogidiella vomeroi Ruffo and Vigna Taglianti

Bogidiella vomeroi Ruffo and Vigna Taglianti, 1977: 141, 146-151, 152, 153, 168, 169, 170, fig. 10-11, 21.

Bogidiella cfr. *vomeroi:* Ruffo and Vigna Taglianti, 1977:151-153, 168, fig. 12, 21.

Type-locality.—Cueva de Chanchaniptic, Rancho S. Antonio, Sitala, Chiapas, México.

Distribution.—Known only from the type-locality and possibly one other cave in Chiapas. See Fig. 12.

Records.—*Chiapas:* ?Sumidero de Canada and Cueva de Chanchaniptic.

Discussion.—This species is similar to *B. holsingeri*. The specimens from Sumidero de Canada are only tentatively referred to this species by Ruffo and Vigna Taglianti (1977). Typical specimens were taken from a stream also inhabited by planaria and the asellid isopod *Caecidotea zullinii*.

Family Hadziidae

The family Hadziidae illustrates very well the distributional pattern characterized by a concentration of species in the peri-Mediterranean and Caribbean regions. The Mexican troglobitic species all belong to a relatively closely related group of genera known only from Texas, México, and the Antilles. Two additional genera occur in Europe, while three related genera are known only from Reunion Island, and from marine waters off California and in the Caroline Islands. Holsinger and Peck (1968), Holsinger and Minckley (1971), Holsinger (1973), and Stock (1977) have discussed the evolution and zoogeography of the family. A complex of new species and genera from the artesian well in San Marcos, Hays County, Texas, is under study by Dr. John R. Holsinger and should help to elucidate the relationships of the Mexican species.

Mayaweckelia cenoticola Holsinger

Mayaweckelia cenoticola Holsinger, 1977a:19, 21-24, 25, fig. 4-7; Reddell, 1977b:230, 240, 244, 251, 252, 253, 277, 281, 290, 293.

New genus (part): Holsinger, 1977b:268.

Type-locality.—Cenote Xtacabihá, Yucatán, México.

Distribution.—Known from nine caves in the Yucatán Peninsula. See Fig. 12.

Records.—*Campeche:* Volcán de los Murciélagos; *Quintana Roo:* Cenote de Las Ruinas, Cenote de San Martín, Cenote de Santo Domingo, and Cueva de Tancah; *Yucatán:* Cenote Nohchén, Cueva de Orizaba, Grutas de Tzab-Nah, and Cenote Xtacabihá.

Discussion.—This species is closely related to *M. yucatanensis,* the only other species in the genus. *Mayaweckelia* is related to *Mexiweckelia* and *Hadzia* (or *Metaniphargus,* see Stock, 1977; Holsinger, 1977a), but probably more closely to *Mexiweckelia* than *Hadzia* (J. R. Holsinger, pers. comm.). This species is somewhat larger than *M. yucatanensis.* It was collected from the bottom of shallow pools in all of the caves and in association with mysids *(Antromysis cenotensis)* and shrimps *(Typhlatya mitchelli, T. pearsei,* and *Creaseria morleyi).* Holsinger (1977a) speculates that colonization of caves occurred toward the end of the Tertiary.

Mayaweckelia yucatanensis Holsinger

Mayaweckelia yucatanensis Holsinger, 1977a:16-19, 20, 24, fig. 1-3, 7; Bousfield, 1977:297; Reddell, 1977b:230, 239, 240, 241, 249.

New genus (part): Holsinger, 1977b:268.

Type-locality.—Grutas de Xtacumbilxunam at Bolonchenticul, Campeche, México.

Distribution.—Known only from the type-locality. See Fig. 12.

Discussion.—This species was found on the bottom of a pool containing ostracods and shrimp *(Typhlatya campecheae)* in large numbers. The pool contained heavy deposits of bat guano.

Mexiweckelia colei Holsinger and Minckley

Eyeless, depigmented amphipod (part): Minckley, 1969:24.

Gammarid amphipod: Cole and Minckley, 1970:80.

Mexiweckelia colei Holsinger and Minckley, 1971: 427, 430-435, 436, 438, 439, 440, fig. 1-4; Reddell, 1971b:24; Holsinger, 1973:1, 5, 10, 11, fig. 7; Bousfield, 1977:297; Holsinger, 1977a:15; Stock, 1977:22.

Mexiweckelia (part): Reddell, 1973a:32; Holsinger, 1974a:317; Holsinger, 1974b:64; Holsinger, 1977a:16; Holsinger, 1977b:268.

Mexiweckelia (part): Reddell, 1973a:32; Holsinger, 1974a:317; Holsinger, 1974b:64; Holsinger, 1977a:16; Holsinger, 1977b:268.

Type-locality.—Unnamed spring-pool, 8.84 km south and 3.96 km west, *ca.* 150 meters west of *bajada* (talus slope) from Sierra de San Marcos, of Cuatro Ciénegas, Coahuila, México.

Distribution.—Known from springs and spring-fed pools southwest of Cuatro Ciénegas, Coahuila. See Fig. 12.

Records.—*Coahuila:* Unnamed spring-pool (8.84 km S and 3.96 km W Cuatro Ciénegas), Posos Bonitos, Unnamed small spring-fed laguna (7.92 km W and 9.42 km S Cuatro Ciénegas), Unnamed spring (8.15 km S and 2.29 km W Cuatro Ciénegas), Unnamed seep in raised marsh (7.45 km S and 5.50 km W Cuatro Ciénegas), and Unnaned small spring in raised marsh (7.45 km S and 5.42 km W Cuatro Ciénegas).

Discussion.—In addition to the three Mexican species listed here, *Mexiweckelia* presently includes *M. texensis* Holsinger from an artesian well at San Marcos, Hays County, Texas (U.S.A.). Subsequent study, however, indicates that *M. texensis* belongs to a separate, but closely related genus being described by J. R. Holsinger and G. Longley (in prep.).

Mexiweckelia mitchelli Holsinger

Mexiweckelia: Reddell, 1973a:32 (Cueva de la Siquita record only); Reddell, 1973c:53.

Mexiweckelia mitchelli Holsinger, 1973:1, 5, 10, 11, fig. 1-3, 7; Holsinger, 1977a:15; Reddell, 1977a:91; Stock, 1977:22.

Mexiweckelia (part): Holsinger, 1977a:16; Holsinger, 1977b:268.

Type-locality.—Cueva de la Siquita, 45 km NW Mapimí, Durango, México.

Distribution.—Known only from the type-locality. See Fig. 12.

Discussion.—This is the only true cavernicole species in the genus and is most closely related to *M. colei.* It was taken from deep pools at the lowest level of the cave and was present in large numbers. It was observed swimming freely in the water of the pools in direct association with an unidentified aquatic oligochaete.

Mexiweckelia particeps Holsinger

Eyeless, depigmented amphipod (part): Minckley, 1969:24.

Mexiweckelia particeps Holsinger (in Holsinger and Minckley, 1971):435-439, 440, fig. 4-6; Reddell, 1971b:24; Holsinger, 1973:1, 10, 11, fig. 7; Holsinger, 1977a:15; Stock, 1977:22.

Mexiweckelia (part): Reddell, 1973a:32; Holsinger, 1974a:317; Holsinger, 1974b:64; Holsinger, 1977a:16; Holsinger, 1977b:268.

"Mexiweckelia" particeps: Bousfield, 1977:297.

Type-locality.—Unnamed, small spring in raised marsh at north tip of Sierra de San Marcos, 7.45 km south and 5.42 km west of Cuatro Ciénegas, Coahuila, México.

Distribution.—Known only from the type-locality. See Fig. 12.

Discussion.—This species was taken in direct association with *M. colei*. Holsinger (in press) now considers this species to belong to a separate, distinct genus, more primitive in a number of characters than *Mexiweckelia*.

Family Hyalellidae

The only species in the family Hyalellidae known to inhabit caves in México is *Hyalella azteca* (Saussure). This ubiquitous species ranges through much of the United States south to Perú. It has been collected in cenotes and caves in Yucatán (Creaser, 1936) and from caves in Campeche, Chiapas, Michoacán, San Luis Potosí, and Tamaulipas.

Family Melitidae

Quadravisio lutzi (Shoemaker) is the only species in the family Melitidae known from Mexican caves. It was collected from brackish water in Cenote de Tulum and Cueva de Tancah, Quintana Roo. Otherwise, it is known only from brackish and freshwater localities along the northwest coastal area of Venezuela, Guayana, and Brazil.

Order Mysidacea

The order Mysidacea is represented in subterranean waters by at least 17 species. Two of these are known only from crab burrows, but the remaining species are probable troglobites. They are known from Zanzibar, Italy, India, the Canary Islands, Herzegovina, the Antilles, Costa Rica, Colombia, Perú, and México. All are apparently of marine origin (Vandel, 1964). Four species in two families have been collected from caves in México and are all troglobites.

Family Lepidomysidae

Spelaeomysis olivae Bowman

Spelaeomysis olivae Bowman, 1973:14, 17, fig. 1-11, 13-19; Hobbs, 1973b:73; Bowman, 1977a:149-150; Hobbs et al., 1977:52, 67.

Type-locality.—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 13.

Discussion.—The genus *Spelaeomysis* includes seven species, all of which are known from subterranean habitats. These have been reviewed by Bowman (1973). *Spelaeomysis olivae* is most closely related to *S. quinterensis*. It was collected from clear, silt-floored pools in association with blind shrimps *(Alpheopsis stygicola* and *Macrobrachium villalobosi)*.

Spelaeomysis quinterensis (Villalobos)

Typhlolepidomysis quinterensis Villalobos, 1951: 191-218, fig. 1-14; Rioja, 1953a:290, 291, 293, 294; Rioja, 1953e:11, fig. 1; Gordan, 1957:337; Delamare Deboutteville, 1960:644; Gordon, 1960: 299; Rioja et al., 1961:315; Nicholas, 1962:168; Rioja, 1962:40; Vandel, 1964:147; Reddell, 1965a:19; Vandel, 1965a:118; Straskraba, 1969: 24; Nath and Pillai, 1971:285; Paclt, 1971:424; Sbordoni and Argano, 1972:9; Bowman, 1973:13.

Typhlolepidomysis: Martin and Martin, 1954:584; Gordon, 1960:297, 301, 304, 305, 307, 308, 309; Pillai and Mariamma, 1964:113; Nath and Pillai, 1971:285, 286, 287.

Spelaeomysis quinterensis: Gordon, 1960:308; Pillai and Mariamma, 1964:113, 122, 123; Bacescu and Orghidan, 1971:225, 229, 230; Rioja, 1971:503; Bowman, 1973:14, 17, fig. 12, 20; Reddell and Elliott, 1973a:171, 173; Reddell and Elliott, 1973b:181, 183; Bowman, 1977a:149-150.

Speleomysis quinterensis: Reddell, 1967b:82; Elliott, 1971:10; Reddell, 1971b:24; Reddell and Mitchell, 1971a:143, fig. 11; Reddell and Mitchell, 1971b:184 (erroneous spelling).

Lepidomysis quinterensis: Nath and Pillai, 1971:286, 287; Nath et al., 1972:53.

Blind mysidaceans: Reddell, 1973b:77.

Type-locality.—Grutas de Quintero, Tamaulipas, México.

Distribution.—Caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas. and the Sierra de Guatemala, Tamaulipas. See Fig. 13.

Records.—*San Luis Potosí:* Sótano de la Tinaja; *Tamaulipas:* Bee Cave and Grutas de Quintero.

New record.—*San Luis Potosí:* Sótano del Toro (det. T. E. Bowman).

Discussion.—In addition to the two troglobitic species of the genus listed here, a related species, *S. nuniezi* Bacescu and Orghidan, is known from caves in Cuba. This species is certainly more abundant in the caves of the Sierra de El Abra and Sierra de Guatemala than the four above records indicate. In Grutas de Quintero hundreds of individuals have been seen to cluster about small pieces of rotten wood in large travertine pools fed by a seasonal spring. Only one individual has been collected from each of the other caves.

Family Mysidae

Antromysis (Antromysis) cenotensis Creaser

Schizopods: Pearse, 1933:110.

Antromysis cenotensis Creaser, 1936:121-123, 131, fig. 13-24; Pearse, 1936c:24; Creaser, 1938:159, 164; Pearse, 1945:167, 168, fig. 13-24; Anonymous, 1947:128; Cárdenas Figueroa, 1950:156; Carreño, 1950:24; Tattersall, 1951:4, 229, 230, 232, 233, 234, 265; Villalobos, 1951:213, 215; Banner, 1953:3; Rioja, 1953a:286, 290, 293; Gordan, 1957:340; Delamare Deboutteville, 1960: 644, 648; Gordon, 1960:299; Nicholas, 1962:168; Rioja, 1962:38, 40; Vandel, 1964:147; Vandel, 1965a:118; Straskraba, 1969:24; Bacescu and Orghidan, 1971:225, 227; Reddell, 1971b:24; Rioja, 1971:503; Bowman, 1973:19; Bowman, 1977b:26, 34; Reddell, 1977b:230, 239, 240, 251, 252, 253, 255, 256, 257, 258, 260, 261, 262, 263, 266, 267, 268, 269, 273, 277, 279, 281, 283, 285, 288, 289, 290, 291, 293.

Antromysis: Creaser, 1938:159; Pearse, 1938a:13, 15; Pearse, 1945:111, 167; Cárdenas Figueroa, 1950:157; Tattersall, 1951:229-230; Argano, 1972b:33.

Antromysis coenotensis: Bacescu and Orghidan, 1971:228 (erroneous spelling).

Antromysis (Antromysis) cenotensis: Bowman, 1977b: 27-31, 34, 36, 37, fig. 1-4, 8.

Anthromysis: Holthuis, 1977:180, 181 (erroneous spelling).

Fig. 13.–Distribution of troglobitic species of the order Mysidacea: 1, *Spelaeomysis quinterensis;* 2, *S. olivae* and *Antromysis reddelli;* 3, *A. cenotensis.*

Type-locality.—Balaam Canche Cave (=Grutas de Balankanche), three miles east, half mile south of Chichén Itzá, Yucatán, México.

Distribution.—Known from many caves and wells in Quintana Roo and Yucatán. See Fig. 13.

Records.—*Quintana Roo:* Actún Ha, Cenote de Juan Coh, Cenote de Las Ruinas, Cenote de San Martín, and Cenote de Santo Domingo; *Yucatán:* Well (Hacienda Calcehtok), Well (iron mill at Oxkutzcab), Cenote de las Abejas, Cenote Aká Chen, Grutas de Balankanche, Cenote Calchuhuim, Cenote Calchum, Actún Chac, Cueva Chac Mol, Cenote Chen Mul, Cenote de la Culebra, Cenote G, Cenote de Hoctún, Cenote de Kankirixché, Actún Kaua, Cueva Luchil, Cenote Nohchén, Cenote de Orizaba, Cueva de Orizaba, Cueva Oxolodt, Cenote del Pochote, Cenote de Sambulá (Motul), Cenote de San Diego, Cueva de San Isidro, Cenote de San José, Pozo de Santa Elena, Cenote de Sihunchén, Cenote de Sodzil, Grutas de Tzab-Nah, Cueva Xconsacab, Cenote Xkekén, Cenot Xtacabihá, Cenote Yunchén, and Cenote Zaci.

Discussion.—This species is most closely related to the troglobitic *A. cubanica* Bacescu and Orghidan from Cuba and *A. peckorum* Bowman from Jamaica. *Antromysis cenotensis* is extremely abundant in almost every cave containing groundwater in the coastal plain of Yucatán.

Antromysis (Antromysis) reddelli Bowman

Antromysis (Antromysis) reddelli Bowman, 1977b: 34, 35, 36, 37, fig. 7-8.

Type-locality.—Cueva de las Maravillas, 6 km S Acatlán, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 13.

Discussion.—This species was taken from a rock and silt-floored stream passage in which also were found the blind shrimp *Alpheopsis stygicola*, the blind crayfish *Procambarus oaxacae reddelli*, and undescribed troglobitic catfish of the genus *Rhamdia.* This species is most closely related to *A. peckorum*, *A. cubanica*, and *A. cenotensis.*

Order Decapoda

The order Decapoda is well represented in the caves of México by both troglophiles and troglobites. A total of 33 species of shrimp, crayfish, and crab have been found in Mexican and Guatemalan caves (see Table 12). Many more species probably await discovery, especially in the caves of Belize and Guatemala.

Table 12.—Summary of cave inhabiting Decapoda.

	Troglobites	Other Species
Natantia		
Alpheidae	1	0
Atyidae	3	0
Palaemonidae	6	3
Reptantia		
Cambaridae	3	9
Grapsidae	0	1
Pseudothelphusidae	3	4
Trichodactylidae	1	1
Total	17	18

Suborder Natantia

The caves of México are particularly rich in troglobitic shrimps with ten described species. This is in sharp contrast with the United States where only four troglobitic shrimps have been described.

Family Alpheidae

Alpheopsis stygicola Hobbs

Alpheopsis stygicola Hobbs, 1973b:73, 76-77, fig. 1-2; Hobbs et al., 1977:6, 8, 11, 12, 16, 24, 52, 67, 68, 69, fig. 31-32; Holthuis, 1977:174.
Alpheopsis: Hobbs et al., 1977:5, 66-67.

Type-locality.—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México.

Distribution.—Known only from three caves near Acatlán, Oaxaca, See Fig. 14.

New records.—*Oaxaca:* Cueva de la Finca and Cueva de Las Maravillas.

Discussion.—This species is of special interest in being the only known subterranean member of the family and only the third species of the family to be reported from fresh water. The other freshwater species are known from a lake in the Ogooué Basin in Gabon and from a stream in the vicinity of Manoka, Cameroon. The genus *Alpheopsis* is known from marine habitats throughout much of the world, including Antigua Island and Puerto Rico. The relationships of this species to other members of the genus are obscure and probably cannot be clarified until a comparative study of many poorly described species is made (Hobbs, 1973b). The species is unquestionably a marine relict. It is an inhabitant of lakes and pools in the caves in which it has been collected. One specimen was disgorged by an undescribed blind catfish of the genus *Rhamdia* when the fish was preserved.

Family Atyidae

The family Atyidae is entirely freshwater with the exception of two species of *Typhlatya* which inhabit marine or brackish water on Ascension Island and Isla de Santa Cruz, Galapagos Islands (Chace and Manning, 1972). Troglobitic species of atyid are known from Europe, Japan, Africa, Madagascar, Australia, Fiji, the United States, Cuba, Puerto Rico, and México.

Typhlatya campecheae Hobbs and Hobbs

Typhlatya campecheae Hobbs and Hobbs, 1976:6-10, 14, 15, 16, 20, 21, fig. 3-4; Hobbs et al., 1977:6, 8, 11, 12, 24, 32, 33, fig. 7-8; Holthuis, 1977: 174; Reddell, 1977b:230, 240, 241, 243, 249; Hobbs, 1979:618, 619-620, 621, 624, 625, 626, 629, fig. 1.

Typhlatya (part): Hobbs et al., 1977:5, 13, 32.

Type-locality.—Grutas de Xtacumbilxunam, Bolonchenticul, Campeche, México.

Distribution.—Known only from two caves in Campeche. See Fig. 14.

Records.—*Campeche:* Cenote de Cantemo and Grutas de Xtacumbilxunam.

Discussion.—This species was found to be extremely abundant in guano-floored pools at the type-

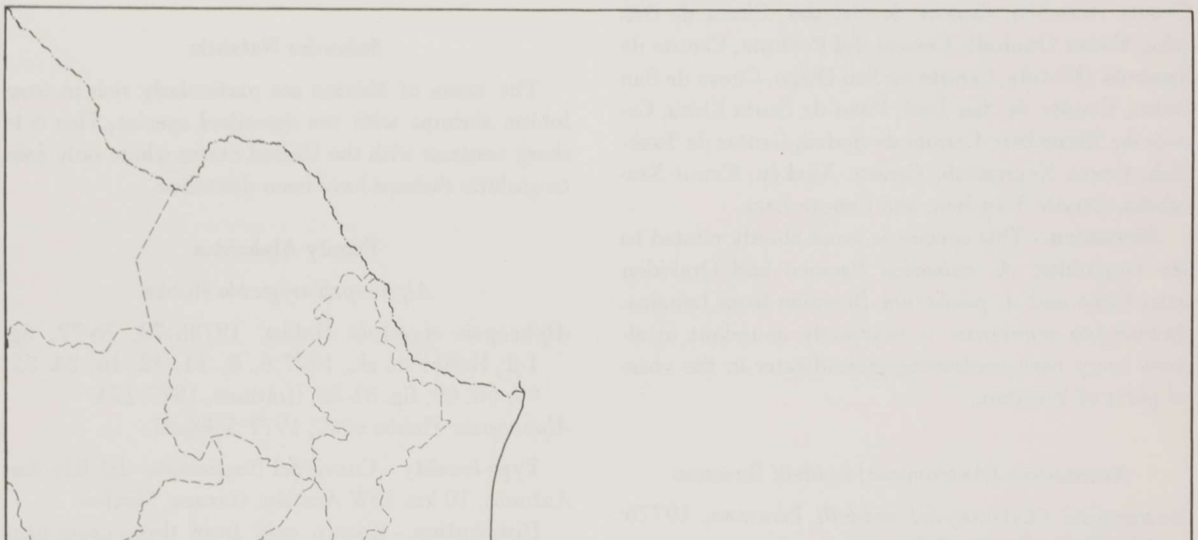

Fig. 14.—Distribution of troglobitic shrimps of the families Alphaeidae and Atyidae: 1, *Alpheopsis stygicola;* 2, *Typhlatya campecheae;* 3, *T. pearsei;* 4, *T. mitchelli;* 5, *T. pearsei* and *T. mitchelli.*

locality and in association with ostracods and amphipods *(Mayaweckelia yucatanensis)*. They were observed to rest on the floor of the pool and when disturbed would swim straight up or away at an angle. In Cenote de Cantemo they inhabited a small pool containing much organic debris and polluted by oil. *Typhlatya campecheae* is most closely related to *T. pearsei*.

Typhlatya mitchelli Hobbs and Hobbs

Typhlatya mitchelli Hobbs and Hobbs, 1976:2-6, 10, 14, 15, 16, 20, 21, fig. 1-2; Hobbs et al., 1977:6, 8, 11, 12, 25, 32, 39, 40, 41, 45, fig. 12-13; Holthuis, 1977:174, 175-181, fig. 1a-i, 2; Reddell, 1977b:230, 239, 240, 251, 255, 256, 260, 262, 263, 268, 279, 281, 289, 291, 292, 293; Hobbs, 1979:618, 620-625, 626, 629, fig. 1-2.

Typhlatya (part): Hobbs et al., 1977:5, 13, 32.

Type-locality.—Cenote Kabahchén, Maní, Yucatán, México.

Distribution.—Known from caves in Quintana Roo and Yucatán. See Fig. 14.

Records.—*Quintana Roo:* Cueva del Fermín and Actún Ha; *Yucatán:* Cenote Aká Chen, Cenote Calchuhuim, Cenote Chen Mul, Cenote Chun Kapoc, Cenote de la Culebra, Cenote Kabahchén, Actún Kaua, Cenote de Orizaba, Cenote de la Paca, Cenote del Pochote, Cenote de Sodzil, Grutas de Tzab-Nah, Cenote Xkekén, Cenote Xtacabihá, and Cenote Zaci.

Discussion.—This species is sympatric with *T. pearsei* in several caves. It possesses some characters which make it intermediate between the Cuban *T. garciai* Chace and the Puerto Rican *T. monae* Chace and the Galapagos Islands *T. galapagensis* Monod and Cals. In most of the above caves it was taken from small pools.

Typhlatya pearsei Creaser

Blind shrimps (part): Pearse, 1933:110.

Typhlatya pearsei Creaser, 1936:128-130, 131, fig. 31-41; Pearse, 1936c:24; Creaser, 1938:162-163, 164; Chace, 1942:100; Chace, 1943:30, 32; Pearse, 1945:169, 170, fig. 31-41; Cárdenas Figueroa, 1950:156; Villalobos, 1951:215; Rioja, 1953a:286, 292; Chace, 1954:319, 323; Balss, 1955:1310; Holthuis, 1955:26; Holthuis, 1956:52; Nicholas, 1962:173; Chace and Hobbs, 1969:20-21; Straskraba, 1969:25; Botosaneanu and Holthuis, 1970:122, 123, 127; Monod and Cals, 1970:69, 73, 78, 82, 84, 85, 93, 94, 100, fig. 67; Reddell, 1971b:25; Rioja, 1971:524; Chace, 1972:15; Chace and Manning, 1972:17; Croizat et al., 1974:275, fig. 2; Holthuis, 1974:141; Silva Taboada, 1974:54; Monod, 1975:99, fig. 1; Hobbs and Hobbs, 1976:1, 10-14, 15, 16, 20, 21, fig. 5-6; Hobbs et al., 1977:6, 7, 9, 12, 15, 24, 32, 39, 43-45, fig. 3, 15-16; Holthuis, 1977:174-175, 176, 180, 181, fig. 1j; Reddell, 1977b:230, 239, 240, 241, 243, 247, 251, 252, 253, 258, 260, 262, 266, 277, 278, 281, 283, 285, 293; Hobbs, 1979:618, 621, 624, 625-627, 628, 629, 630, 631, fig. 1, 3A, 3D.

Typhlatya: Hubbs, 1936:168; Creaser, 1938:159; Pearse, 1938a:13, 15; Pearse, 1945:111, 167; Argano, 1972b:33.

Typhlata: Cárdenas Figueroa, 1950:157 (erroneous spelling).

Typhlatya pearsi: Rioja, 1953a:293; Delamare Deboutteville, 1960:648; Vandel, 1964:178; Vandel, 1965a:139; Peck, 1974a:21; Juberthie-Jupeau, 1977:108 (erroneous spelling).

Typhlatya pearsii: Rioja, 1971:1150 (erroneous spelling).

Typhlatya (part): Croizat et al., 1974:276; Juberthie, 1974:81; Monod and Cals, 1970:69,72,73,85,87, 91, 97, 99, 101, 102; Rosen, 1976:441, fig. 5E.

Type-locality.—Balam Canche Cave (=Grutas de Balankanche), 4.8 kilometers east, 0.8 kilometers south Chichén Itzá, Yucatán, México.

Distribution.—Known from caves in Campeche, Quintana Roo, and Yucatán. See Fig. 14.

Records.—*Campeche:* Grutas de Monte Bravo and Grutas de San Antonio; *Quintana Roo:* Cueva Coop, Cueva del Fermín, Cenote de Juan Coh, Pozo de San Martín, Cenote de Santo Domingo, and Cenote de Tos Virlol; *Yucatán:* Cenote de las Abejas, Grutas de Balankanche, Cenote Calchum, Actún Chac, Cenote de Hoctún, Cenote Kabahchén, Actún Kaua, Actún Okobichén, Cenote del Pochote, Cueva de San Isidro, Cueva de Santa Elena, Grutas de Tzab-Nah, and Cenote Xtacabihá.

Discussion.—The genus *Typhlatya* is known from Ascension Island, the Galapagos Islands, Cuba, Dominican Republic, Puerto Rico, and the Yucatán Peninsula of México. This species is most closely related to *T. mitchelli*. The record by Nicholas (1962) of this species in "Cueva del Ponte" is probably an error for Cenote del Pochote.

Family Palaemonidae

Six species of palaemonid shrimp are troglobites in the caves of México. An additional three species have been found in caves as either troglophiles or trogloxenes. Other troglobitic palaemonids are known from Assam, the Mediterranean region, the southern United States, and Cuba.

Bithynops luscus Holthuis

Bithynops luscus Holthuis, 1974:135, 136-142, fig. 1-2; Hobbs et al., 1977:6, 8, 11, 12, 25, 46, 47, fig. 17; Holthuis, 1977:181-182, 186.
Bythinops luscus: Sbordoni et al., 1974:24 (nomen nudum); Hobbs, 1977:200.
Bithynops: Hobbs et al., 1977:5, 14, 16, 46.
Bithynops (part): Holthuis, 1977:181.

Type-locality.—Grutas de l'Arco (=Grutas del Arco), near San Rafael de l'Arco (=del Arco), la Trinitaria, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 15.

Discussion.—The genus *Bithynops* appears to be most closely related to *Macrobrachium* and *Cryphiops*. The cornea is greatly reduced in *B. luscus*, and this shrimp is probably a troglobite. A second species of the genus, *B. perspicax* Holthuis, possesses normal eyes and was observed swimming in daylight within the entrance of Cenote La Cueva, Chiapas. This information, despite a statement by Holthuis (1977) that it is a true troglobiont, indicates that this species is a facultative troglophile.

Fig. 15.—Distribution of troglobitic and troglophilic shrimps of the family Palaemonidae: 1, *Troglocubanus perezfarfanteae;* 2, *Macrobrachium villalobosi;* 3, *Neopalaemon nahuatlus;* 4, *M. acherontium;* 5, *Bithynops luscus;* 6, *B. perspicax;* 7, *Creaseria morleyi.*

Creaseria morleyi (Creaser)

Blind shrimps (part): Pearse, 1933:110.

Palaemon morleyi Creaser, 1936:126-128, 131, fig. 25-30; Pearse, 1936c:24; Creaser, 1938:163-164; Chace, 1943:31, 33; Pearse, 1945:169, fig. 25-30; Anonymous, 1947:128; Cárdenas Figueroa, 1950: 156; Carreño, 1950:24; Villalobos, 1951:215; Rioja, 1953a:293, 294; Balss, 1955:1311; Holthuis, 1955:44; Hobbs and Hobbs, 1976:1; Hobbs et al., 1977:7, 9; Hobbs, 1979:618.

Palaemon: Pearse, 1938a:13, 15; Pearse, 1945:111, 167; Cárdenas Figueroa, 1950:157.

Creaseria morleyi: Holthuis, 1950:6 (by implication); Holthuis, 1952:153-154, 356-357, pl. 40; Chace, 1954:323; Holthuis, 1955:44 (by implication), fig. 22a; Holthuis, 1956:56-57; Maccagno and Cucchiari, 1957:207 (by implication); Nicholas, 1962: 174; Rioja, 1962:38, 40; Vandel, 1965:179; Rodríguez de la Cruz, 1965:76, 97-98, pl. 4(fig. A); Vandel, 1965a:140; Andrews, 1970:4; Reddell, 1971b:25; Rioja, 1971:522; Parzefall and Wilkens, 1972:66; Wilkens, 1973a:327, 328, 330, fig. 3; Wilkens, 1973b:205; Wilkens, 1973c:50-54, 56, 58, 59, fig. 1-3; Burukovskii, 1974:fig. 96a; Holthuis, 1974:141; Hobbs and Hobbs, 1976:1, 16-19, 20, 21, fig. 7-8; Strenth, 1976:13; Hobbs et al., 1977:6, 9, 12, 25, 46-50, fig. 18-19; Holthuis, 1977:186-187, fig. 5; Reddell, 1977b:230, 240, 241, 243, 247, 251, 252, 253, 255, 258, 262, 263, 264, 266, 267-268, 273, 274, 277, 281, 283, 285, 291, 292, 293; Hobbs, 1979:618, 619, 621, 624, 625, 627-632, fig. 1, 4B-C.

Creaseria: Holthuis, 1952:2, 152-153; Holthuis, 1956:69; Balss, 1957:1549; Delamare Deboutteville, 1960:646; Argano, 1972b:33; Chace, 1972: 17; Hobbs et al., 1977:5, 14, 16, 46.

Palaemon morley: Rioja, 1953a:286 (erroneous spelling).

Creaseria morlayi: Delamare Deboutteville, 1960:648 (erroneous spelling).

?Shrimp: Lee, 1966:88.

Creaseria morelyi: Hobbs and Hobbs, 1976:1 (erroneous spelling).

Type-locality.—San Isidro Cave (=Cueva de San Isidro), Salar Colony, Yucatán, México.

Distribution.—Known from many caves in Campeche, Quintana Roo, and Yucatán. See Fig. 15.

Records.—*Campeche:* Cenote Bolchén, Grutas de Monte Bravo, and Grutas de San Antonio; *Quintana Roo:* Cueva Coop, Cueva del Fermín, Cenote de Juan Coh, Cenote de Las Ruinas, Pozo de San Martín, Cenote de Santo Domingo, and Cenote de Tos Virlol; *Yucatán:* Cenote de las Abejas, Cueva Amil, Grutas de Balankanche, Cenote Calchuhuim, Actún Chac, Cueva Chac Mol, Cenote de la Culebra, Actún Góngora, Cenote de Hoctún, Cenote Kabahchén, Cenote de la Paca, Cenote del Pochote, Cenote de Sambulá (Motul), Cueva de San Isidro, Pozo de Santa Elena, Cueva de Sodzil, Grutas de Tzab-Nah, ?Cueva Xconsacab, Cenote X-ebiz, Actún Xpukil, and Cenote Yunchén.

Discussion.—This large, distinctive species is an ever-present element of the fauna of pools and lakes in caves in the Yucatán Peninsula. It is frequently found in large numbers, especially crawling about the floors of pools over which bats roost. Many individuals are seen which have lost one cheliped, presumably in fights with other members of the same species. Wilkens (1973c) in a study of the structure of the eye remnants in this species reports that the eye stalk consists only of *medulla interna* and *medulla terminalis.* The record for Cueva Xconsacab was a sight record only and should be verified by specimens.

Macrobrachium acherontium Holthuis

Macrobrachium acherontium Holthuis, 1977:174, 188-193, 194, fig. 6-7.

Macrobrachium new species: Hobbs et al., 1977:5.

Type-locality.—Grutas del Coconá, 3 km NE of Teapa, Tabasco, México.

Distribution.—Known only from two caves near Teapa, Tabasco. See Fig. 15.

Records.—*Tabasco:* Grutas del Coconá and Resumidero del Coconá.

Discussion.—This species is most closely related to *M. villalobosi.* The cornea is very reduced and the animals are transparent brownish. This species is presumably a rather recent troglobite. In Grutas del Coconá it primarily inhabits a large, shallow pond. The animals usually rest quietly or walk slowly about on the silt floor. In addition to the two troglobites discussed here, two other species are known from caves in México and Guatemala. The river prawn, *M. carcinus* (Linnaeus), has been collected in Cueva Chica, San Luis Potosí, and Cueva del Salto de Agua, Chiapas. In both instances this species has entered from rivers directly associated with the caves. *Macrobrachium acanthurus* (Wiegmann) has been collected in Cueva de la Coche, Izabal, Guatemala, and in Cueva de Abispa, Quintana Roo, México.

Macrobrachium villalobosi Hobbs

Macrobrachium villalobosi Hobbs, 1973b:77, 79-80, fig. 3; Strenth, 1976:13; Hobbs et al., 1977:6, 8, 11, 12, 16, 22, 23, 25, 50-52, 67, 118, fig. 20; Holthuis, 1977:188, 192-193.

Shrimp: Reddell, 1973d:89.
Macrobrachium (part): Hobbs et al., 1977:5, 13, 15, 16, 50.

Type-locality.—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México.

Distribution.—Known only from two caves near Acatlán, Oaxaca. See Fig. 15.

New record.—*Oaxaca:* Cueva de la Finca (det. H. H. Hobbs, Jr.).

Discussion.—This species is most closely related to *M. acherontium*. It was taken from pools in association with *Spelaeomysis olivae*, *Alpheopsis stygicola*, *Procambarus (Austrocambarus) oaxacae reddelli*, and an undescribed blind catfish of the genus *Rhamdia*.

Neopalaemon nahuatlus Hobbs

Neopalaemon nahuatlus Hobbs, 1973a:25, 26-27, 29, fig. 1-2; Holthuis, 1974:142; Hobbs et al., 1977:6, 8, 11, 12, 25, 52, 53, 118, fig. 21; Holthuis, 1977: 181.
Large blind shrimp: Reddell, 1973d:90.
Neopalaemon: Hobbs et al., 1977:5, 14, 16, 52.

Type-locality.—Cueva del Guano, 10 km NE Valle Nacional, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 15.

Discussion.—This remarkable troglobite is the only known species in the genus *Neopalaemon*. *Neopalaemon* is possibly most closely related to *Macrobrachium*. The eye pigment and cornea are absent in this species. These large shrimps were found in abundance in a deep permanent stream which runs beneath a large bat colony. They have been found in association with *Procambarus (Austrocambarus) oaxacae oaxacae*.

Troglocubanus perezfarfanteae Villalobos

Troglocubanus sp.: Reddell, 1967d:82; Reddell, 1971b:26; Reddell and Mitchell, 1971a:143-144; Reddell and Elliott, 1973a:171.
Troglocubanus: Reddell, 1973a:32.
Troglocubanus, undescribed species: Holthuis, 1974: 142.
Troglocubanus perezfarfanteae Villalobos, 1974:1-5, fig. 1-23; Strenth, 1976:13; Hobbs et al., 1977:6, 8, 11, 25, 64-66, fig. 30; Holthuis, 1977:181; Mitchell et al., 1977:49.
Troglocubanus (part): Hobbs et al., 1977:5, 14, 58.

Type-locality.—Sótano de Tinaja, 11.7 km E.NE. Valles, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 15.

Discussion.—This remarkably delicate species has extremely elongate appendages. The only known specimen was obtained from near the surface of a deep lake in the deepest part of Sótano de la Tinaja. Its extreme transparency has probably aided it in escaping notice during the extensive explorations of caves in the Sierra de El Abra. The genus *Troglocubanus* is otherwise known only from caves in Cuba. This species, therefore, is another of a series of groups of marine relicts shared both by the Mexican mainland and the greater Antilles.

Suborder Reptantia

Section Macrura

Family Cambaridae

Although crayfishes are frequently found in Mexican caves and a total of 12 species are recorded, only three closely related forms have become troglobitic (see Fig. 16). This is a surprisingly low figure when it is compared with the crayfish fauna of the eastern United States where more than 20 species and subspecies have been described as troglobites (Hobbs and Barr, 1972). In addition to the three troglobites listed and discussed below, the following crayfish species, all presumably troglophiles, are known from caves in México. *Procambarus (Austrocambarus) mirandai* Villalobos inhabits a long, meandering stream passage in Cueva Cerro Hueco, Chiapas (Villalobos, 1954); it has also been found in Cueva del Arco and Cueva de Paso Burro, Chiapas (Hobbs, 1977). *Procambarus (A.) pilosimanus* (Ortmann) is a widely distributed species in southern México; it is known from a pool in Grutas de Zapaluta, Chiapas, which connects directly with a surface pool (Villalobos, 1955), and from two caves in Alta Verapaz, Guatemala (Delamare Deboutteville and Juberthie, 1976). *Procambarus (A.) sbordonii* Hobbs was described from Cueva del Nacimiento del Río Santo Domingo, Chiapas (Hobbs, 1977). *Procambarus (Ortmannicus) acutus cuevachicae* (Hobbs) is found in abundance in Cueva Chica, San Luis Potosí (Hobbs, 1941); it is a widely distributed form throughout east-central México, but it is not definitely known from other caves in the Sierra de El Abra. *Procambarus (O.) toltecae* Hobbs is seldom collected on the surface but has been taken from caves in the Xilitla and Aquismón regions of San Luis Potosí and from Cueva de El Tenango, Hidalgo. In Cueva de El Tenango it was abundant in the long stream passage which runs through the cave. *Procambarus (O.) villalobosi* Hobbs is known only from Cueva del Agua, near Rayón, San Luis Potosí (Hobbs, 1969b), and from Pozita de Ojo de Agua, San Luis Potosí. This species inhabits both the cave stream and the pond which is fed by the cave stream in Cueva del Agua. *Procambarus (Villalobosus) xochitlanae* Hobbs is known from Cueva de los Camarones, Puebla (Hobbs, 1975). A new species of *Procambarus (Villalobosus)* from caves in the Cuetzalan region of Puebla awaits description. *Procambarus (Paracambarus) ortmanni* (Villalobos) was recently collected from a stream in Grutas de Olivares, Puebla.

Procambarus (Austrocambarus) oaxacae oaxacae Hobbs

Procambarus (Austrocambarus) oaxacae oaxacae Hobbs, 1973a:29, 32-33, 38, fig. 3-5; Hobbs et al., 1977:6, 8, 11, 12, 17, 26, 52, 116-118, 152, fig. 52.

Blind crayfish: Reddell, 1973d:90.

Fig. 16.–Distribution of troglobitic and troglophilic decapods of the families Cambaridae, Grapsidae, Pseudothelphusidae, and Trichodactylidae: 1, *Procambarus (Ortmannicus) villalobosi;* 2, *Procambarus (O.) acutus cuevachicae;* 3, *Procambarus (O.) toltecae;* 4, *Procambarus (Villalobosus) xochitlanae;* 5, *Procambarus (V.) xochitlanae* and *Procambarus (Paracambarus) ortmanni;* 6, *Procambarus (Austrocambarus) rodriguezi* and *Pseudothelphusa (Tehuana) cordobensis;* 7, *Procambarus (A.) oaxacae reddelli;* 8, *Procambarus (A.) oaxacae oaxacae;* 9, *Trichodactylus (Rodriguezia) bidens;* 10, *Trichodactylus (R.) mensabak;* 11, *Procambarus (A.) sbordonii;* 12, *Procambarus (A.) mirandai;* 13, *Procambarus (A.) pilosimanus;* 14, *Typhlopseudothelphusa mocinoi;* 15, *Typhlopseudothelphusa mitchelli;* 16, *Typhlopseudothelphusa juberthiei;* 17, *Isabellagordonia (Phrygiopilus) longipes;* 18, *I. (P.) acanthophallus;* 19, *Sesarma (Holometopus) roberti.*

Type-locality.—Cueva del Guano, 10 km NE Valle Nacional, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 16.

Discussion.—This attractive crayfish has the eyes greatly reduced. It was found in association with *Neopalaemon nahuatlus*. *Procambarus oaxacae* is considered to be most closely related to *P. rodriguezi* Hobbs and may even prove to be only subspecifically distinct when collections from intermediate areas are made. The crayfish from this cave are used frequently by local inhabitants of the area for food. It is extremely easy to catch, but fortunately much of the stream it inhabits is quite deep and other parts of the stream are very difficult of access because of low clearance between the cave ceiling and the water. The stream contains much guano, an important factor in explaining the large population of both species of decapod in this cave.

Procambarus (Austrocambarus) oaxacae reddelli Hobbs

Procambarus (Austrocambarus) oaxacae reddelli Hobbs, 1973a:33, 35, 37-38, fig. 6-8; Hobbs et al., 1977:6, 8, 11, 12, 17, 26, 52, 67, 118, 119, 152, fig. 53.

Troglobitic crayfish: Reddell, 1973d:90.

Procambarus oaxacae reddelli: Hobbs, 1973b:73.

Type-locality.—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México.

Distribution.—Known from four caves in Oaxaca and one in Veracruz. See Fig. 16.

Records.—*Oaxaca:* ?Cueva del Guayabo and Cueva del Nacimiento del Río San Antonio.

New records.—*Oaxaca:* Cueva de la Finca and Cueva de Las Maravillas; *Veracruz:* Cueva de Corral de Piedra (det. H. H. Hobbs, Jr.).

Discussion.—Specimens from Cueva del Guayabo are only tentatively assigned to this subspecies. They show some intermediate characters between *P. o. oaxacae* and *P. o. reddelli*. The crayfish in Cueva del Guayabo were collected from small pools apparently left from a rise in a postulated lower stream. In Cueva del Nacimiento del Río San Antonio crayfish were extremely abundant throughout the length of this large cave. They tended to congregate especially about small areas of guano left by bats which roosted in small groups on the ceiling. The crayfish in this cave are also used for food by local inhabitants. In Cueva de Corral de Piedra crayfish were found only in a side passage which led to an apparent sealed entrance into which organic debris had washed.

Procambarus (Austrocambarus) rodriguezi Hobbs

Procambarus rodriguezi Hobbs, 1943:198, 203-206, fig. 15-26; Villalobos, 1948:182; Rioja, 1953a: 288, 289, 292; Villalobos, 1953:346, 356, 364, 365, 372; Villalobos, 1954:303, 306, 321-323, 363; Villalobos, 1955:2, 20, 160, 161, 176-178, 218; Nicholas, 1962:173; Hobbs and Villalobos, 1964:313; Hobbs, 1966:71; Hobbs, 1969a:161; Hobbs, 1971:3, 12, 30-31; Reddell, 1971a:217, 219; Reddell, 1971b:25; Rioja, 1971:530; Hobbs and Barr, 1972:1, 4; Hart and Hart, 1974:22; Hobbs et al., 1977:7, 9.

Paracambarus rodriguezi: Rioja, 1953a:293 (erroneous combination).

Procambarus (Austrocambarus) rodriguezi: Hobbs, 1972a:40, 152, fig. 22c; Hobbs, 1973a:25, 38; Hobbs, 1974:45, 123, fig. 174; Hobbs, 1975:276; Hobbs et al., 1977:6, 12, 17, 26, 118, 120-121, 152, fig. 54.

Procambarus (Austrocambarus) rodiguezi: Hobbs, 1972b:6 (erroneous spelling).

Troglobitic procambarid: Caine, 1974:488.

Type-locality.—Cave, 4 kilometers west northwest of the hacienda at Potrero Viejo, Paraje Nuevo, Veracruz, México.

Distribution.—Known definitely only from the type-locality. See Fig. 16.

Records.—*Veracruz:* Cave 4 km WNW of Potrero Viejo and ?Cueva del Ojo de Agua Grande.

Discussion.—The type-locality of this species has been stated to be "Cueva del Agua" and "Cueva del Ojo de Agua Grande," but the brief description of the type-locality as given by Hobbs (1943) does not fit Cueva del Ojo de Agua Grande. Furthermore, Cueva del Ojo de Agua Grande has no habitat suitable for crayfish. It contains only a single passage and this contains a rapid rock-floored stream. A single juvenile crayfish was seen trapped in a tiny drip pool in the latter cave where flood water apparently isolated it. It must be assumed that the type-locality has not been rediscovered.

Section Brachyura

Family Grapsidae

The only species of grapsid crab known from the caves of Central America is *Sesarma (Holometopus) roberti* H. Milne Edwards. It was recently collected in Cueva de la Coche, Izabal, Guatemala.

Family Pseudothelphusidae

In addition to the three remarkable troglobitic crabs of the genus *Typhlopseudothelphusa*, four pseudothelphusid crabs are known as apparent troglophiles. *Pseudothelphusa (Pseudothelphusa) sonorae* Rodríguez and Smalley was described from a stream in Mina La Aduana, Sonora (Rodríguez and Smalley, 1972); *P. (Tehuana) cordobensis* Rodríguez and Smalley is known only from Cueva de Ojo de Agua Grande, Veracruz (Rodríguez and Smalley, 1972); *Isabellagordonia (Phrygiopilus) acanthophallus* (Smalley) is known from Cueva Seamay, Alta Verapaz, Guatemala (Smalley, 1970); and *I. (P.) longipes* Pretzmann is known only from Grutas de Lanquín, Alta Verapaz, Guatemala (Pretzmann, 1972).

Typhlopseudothelphusa juberthiei Delamare Deboutteville

Typhlopseudothelphusa juberthiei Delamare Deboutteville, 1976:837, 838, 839, fig. G-J; Delamare Deboutteville and Juberthie, 1976:19; Delamare Deboutteville, 1977:115, 119, 122, 123, 125-126, 127, 128, fig. 6-7, 14-15.

Typhlopseudotelphusa juberthiei: Cottarelli and Argano, 1977:212 (erroneous spelling).

Type-locality.—Grotte de Chicam, Sierra de Chama, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 16.

Discussion.—Delamare Deboutteville (1977) has discussed at length the habitat and relationships of this and the following species.

Typhlopseudothelphusa mitchelli Delamare Deboutteville

Typhlopseudothelphusa mitchelli Delamare Deboutteville, 1976:837, 838, 839, fig. D-F; Delamare Deboutteville and Juberthie, 1976:23; Delamare Deboutteville, 1977:115, 119, 121, 124, 125, 126, 127, 128, 129, fig. 5, 9-13.

Typhlopseudotelphusa mitchelli: Cottarelli and Argano, 1977:212 (erroneous spelling).

Type-locality.—Grottes C3 et G3, sierra de Pampur au Guatemala, Alta Verapaz, Guatemala.

Distribution.—Known only from the two caves listed as the type-locality. See Fig. 16.

Discussion.—It is not known which of the two caves listed above is that from which the holotype was taken. Delamare Deboutteville (1977) reported that a specimen of *T. mitchelli* collected on 29 April 1976 carried 48 eggs.

Typhlopseudothelphusa mocinoi Rioja

Typhlopseudothelphusa n. g., n. sp.: Rioja, 1953a: 291, 292, 293 (nomen nudum).

Typhlopseudothelphusa mociñoi Rioja, 1953b:218-225, fig. 1-12; Rioja, 1971:548; Hobbs et al., 1977:7, 10.

Cangrejo ciego: Rioja, 1953e:11, fig. 2.

Typhloseudothelphusa mociñoi: Rioja et al., 1961: 313; Hartnoll, 1964b:78 (erroneous spelling).

Typhlopseudothelphusa mocinoi: Nicholas, 1962: 174; Hartnoll, 1964a:164; Hartnoll, 1964b:79; Holthuis, 1964:65; Thinès and Tercafs, 1972:68; Delamare Deboutteville, 1976:837, 838, 839, fig. A-C; Delamare Deboutteville and Juberthie, 1976: 23, fig. 3; Delamare Deboutteville, 1977:115, 116, 119, 120, 124, 126, fig. 1, 4.

Typhlopseudotelphusa mocinoi: Vandel, 1964:183; Vandel, 1965a:142; Delamare Deboutteville, 1971:60; Cottarelli and Argano, 1977:212 (erroneous spelling).

Potamocarcinus (Typhlopseudothelphusa) mocinoi: Pretzmann, 1965:2 (by implication); Smalley, 1970:102; Reddell, 1971a:217, 219; Reddell, 1971b:26; Reddell and Mitchell, 1971c:2; Pretzmann, 1972:7, 64 (by implication), 81, fig. 19, 730-732; Sbordoni et al., 1974:9; Hobbs et al., 1977:6, 12, 28, 144-145, fig. 67.

?Cave crab: Barr, 1968a:82.

Potamocarcinus (Typhlopseudothelphusa): Smalley, 1970:103, 105.

Potamocarcinus (Typhlopseudothelphusa) mociñoi: Rodríguez and Smalley, 1972:72, 92, fig. 3, 25, 26.

Potamocarcinus (Typhlopseudotelphusa) mociñoi: Rodríguez and Smalley, 1972:92 (erroneous spelling).

Potamocarcinus (Typhlopseudotehlphusa) mociñoi: Rodríguez and Smalley, 1972:92 (erroneous spelling).

Potamocarcinus mocinoi: Sbordoni et al., 1974:26.

Typhlopseudothelphusa: Hobbs et al., 1977:143-144.

Potamocarcinus (part): Hobbs et al., 1977:5, 142-143.

Type-locality.—Cueva del Tío Ticho, Comitán, Chiapas, México.

Distribution.—Known only from three caves in Chiapas. See Fig. 16.

Records.—*Chiapas:* Cueva de Los Llanos, Cueva de los Murciélagos, and Cueva del Tío Ticho.

Discussion.—In Cueva del Tío Ticho this species inhabits the lowest level of the cave. A female with 75 eggs and another with 57 young were collected on 21 August 1967 on a mud slope above the cave stream. In Cueva de Los Llanos and Cueva de los Murciélagos the crabs inhabited a small stream passage over which bats roosted, and in association with blind asellid isopods *(Caecidotea chiapas)* and planarians *(Dugesia mckenziei)*.

Family Trichodactylidae

Two species of the family Trichodactylidae have been reported from Mexican caves. Bott (1969) described *Trichodactylus (Rodriguezia) bidens* from Cueva del Azufre, Tabasco. This is an eyed species and presumably a troglophile. The other species is a troglobite and is discussed below.

Trichodactylus (Rodriguezia) mensabak Cottarelli and Argano

Trichodactylus (Rodriguezia) mensabak Cottarelli and Argano, 1977:207-212, fig. 1-2; Sbordoni et al., 1977:74, pl. IIB (nomen nudum).
Trichodactylus mensabak: Sbordoni et al., 1977:37 (nomen nudum).

Type-locality.—Cueva de Nicolas Bravo, Tila, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 16.

Discussion.—This is the only known troglobitic crab in the family Trichodactylidae. It is most closely related to *T. (R.) villalobosi* Rodríguez and Manrique, an epigean species from Chiapas.

Class Arachnida

The class Arachnida has been the most successful of all groups which have invaded the cave habitat in México and Central America. A total of 122 species of troglobite is known from México, Guatemala, and Belize, and another 420 species have been identified as troglophiles, trogloxenes, or accidentals. México is unique in that all 11 orders of arachnid have been collected in caves (see Table 13). The orders Scorpiones, Pseudoscorpionida, Schizomida, Amblypygida, Araneae, Ricinulei, Opilionida, and Acarina contain troglobites.

Order Scorpiones

The order Scorpiones is generally poorly represented in the fauna of caves. The European *Belisaurus xambeui* Simon is frequently found in caves but also inhabits deep soil and litter. *Uroctonus sequoia* Gertsch and Soleglad and *Vaejovis iviei* Gertsch and Soleglad, both from California, and *V. reddelli* Gertsch and Soleglad from Texas are troglophiles which show little or no adaptation to a cavernicole existence. Only eight described species are considered to be significantly cave adapted, of which seven occur in México. *Uroctonus grahami* Gertsch and Soleglad from Samwell Cave, California, is probably a troglobite although it retains vestiges of eyes (Gertsch and Soleglad, 1972). The troglobitic scorpion fauna of México includes three described and two undescribed chactids, three diplocentrids, one vaejovid, and a remarkable eyeless species from Oaxaca of unknown familial relationship.

Table 13.—Summary of cave inhabiting Arachnida.

	Troglobites	Other Species
Scorpiones		
Unknown family	1	0
Buthidae	0	2
Chactidae	5	1
Diplocentridae	3	2
Vaejovidae	1	2
*Pseudoscorpionida	24	17
Uropygida		
Thelyphonidae	0	1
Schizomidae		
Protoschizomidae	3	0
Schizomidae	12	12
Amblypygida		
Charontidae	1	0
Phrynidae	5	7
*Araneae	47	252
Ricinulei		
Ricinoididae	3	6
*Opilionida	15	35
Palpigradida		
Eukoeniniidae	0	1
Solpugida	0	1
*Acarina	2	81
Total	122	420

*For summary by families see Tables 14-17.

Family Buthidae

Centruroides yucatanus (Chamberlin and Ivie) was described from Actún Loltún, Yucatán (Chamberlin and Ivie, 1938a), but is a junior synonym of *C. ochraceous* Pocock, which has been collected from under rocks in the entrance area of two caves and from darkness in two other caves in Yucatán (Wagner, 1977). *Centruroides gracilis* (Latreille) has been found in Cueva del Salitre, San Luis Potosí, and Cueva de los Cuarteles, Tamaulipas. In the latter cave a single large specimen was collected from the ceiling of the cave in total darkness.

Family Chactidae

The family Chactidae is represented in Mexican caves by the three troglobites of the genus *Typhlochactas* discussed below, by an undescribed genus with two new troglobitic species from caves in San Luis Potosí and Tamaulipas, and by a single species of possible troglophile. The last species, *Megacormus gertschi* Díaz Nájera, has been found in two caves in Querétaro.

Typhlochactas elliotti Mitchell

Typhlochactas elliotti Mitchell, 1971b:135-148, fig. 1-17, 26-27; Reddell and Mitchell, 1971a:144, fig. 1; Reddell, 1973a:33, 37; Reddell and Elliott, 1973a:171; González Sponga, 1974:56; Soleglad, 1976:253, 254; Mitchell and Peck, 1978:159, 164, 167, 168.

Troglobitic scorpion: Elliott, 1972:130.

Typhlochactas: Vomero, 1974:353 [Sótano de Jerbaniz (=Yerbaniz) record only]; Mitchell et al., 1977: 56.

Typlochactas (part): Díaz Nájera, 1975:3, 35 (erroneous spelling).

Typlochactas elliotti: Díaz Nájera, 1975:4, 30 (erroneous spelling).

Type-locality.—Sótano de Yerbaniz, located approximately 21 km north of Ciudad Valles, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 17.

Discussion.—This is the most highly cave adapted of the three known troglobitic scorpions in the genus. It appears to have its closest affinities with *T. rhodesi* Mitchell, the geographically nearest species (Mitchell, 1971b). Mitchell expresses surprise at the discovery of a highly evolved troglobite in the Sierra de El Abra, but this is perhaps a logical development in the evolution of the troglobitic *Typhlochactas*. The recent discovery of the eyeless *T. sylvestris* Mitchell and Peck from forest litter at 1220 meters in Oaxaca gives us an important clue to the evolution of this group. It may be assumed that the ancestral blind scorpions originally inhabited much of México as inhabitants of deep forest litter. With the rise of temperature in the lowland tropics following the colder climate of the glacials, they survived in caves at low elevations and the surface populations were eliminated. The surface populations still existed in the cooler forested highlands for longer periods of time, but eventually they, too, became extinct, isolating the ancestors of *T. rhodesi* and *T. reddelli* in caves. The comparatively robust endogean populations continue to live in Oaxaca and probably elsewhere in México in moist, heavily forested highland situations. The distribution pattern of *Typhlochactas* is very similar to that of the millipeds of the *Cleidogona crucis* group in Oaxaca and Veracruz, and is probably duplicated by the distribution of the millipeds of the genus *Mexiterpes* in San Luis Potosí and Querétaro. *Typhlochactas elliotti* has been collected from the pants leg of the original collector and from bare rock on the cave ceiling and walls.

Typhlochactas reddelli Mitchell

Typhlochactas reddelli Mitchell, 1968:762-776, fig. 22-41; Reddell, 1971a:217; Reddell, 1971b:26; Mitchell, 1971b:135, 138, 143, 145-146, fig. 21-23, 25, 27; Muchmore, 1972a:275; Kawakatsu, 1973b:255; Reddell, 1973a:32, 37; Vachon, 1974:930, 931, 934, fig. 167, 183, 199-201; Soleglad, 1976:253-254; Mitchell and Peck, 1978:159, 162, 164, 167, 168.

Typhlochactas reddeli: González Sponga, 1974:56 (erroneous spelling).

Typhlochactas: Vomero, 1974:353 (Cueva del Ojo de Agua de Tlilapan record only).

Typlochactas (part): Díaz Nájera, 1975:3, 35 (erroneous spelling).

Typlochactas redelli: Díaz Nájera, 1975:4, 33 (erroneous spelling).

Type-locality.—Cueva del Ojo de Agua de Tlilapan, in the village of Tlilapan, Municipio de Tlilapan, approximately five km south of Orizaba, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 17.

Discussion.—The single known specimen of this species was collected from beneath a rock in the first bat room of the cave.

Typhlochactas rhodesi Mitchell

Typhlochactas rhodesi Mitchell, 1968:756-765, 768-776, fig. 1-21, 41, pl.; Delamare Deboutteville, 1971:49; Reddell, 1971b:3, 27, cover; Mitchell, 1971b:135, 138, 143, 145-146, fig. 18-20, 24, 27; Reddell and Mitchell, 1971b:181, 184, fig. 9; Reddell and Mitchell, 1971d:foll. table of contents; Sbordoni and Argano, 1972:8; Mitchell and Kawakatsu, 1973a:671; Reddell, 1973a:32, 37; Reddell and Elliott, 1973b:181; González Sponga, 1974: 56; Kawakatsu, 1976:35; Soleglad, 1976:253, 254; Mitchell and Peck, 1978:159, 164, 165, 167, 168.

Typhlochactas: Vomero, 1974:353 [Cueva Chica (=Cueva de la Mina) record only].

Typlochactas (part): Díaz Nájera, 1975:3, 35 (erroneous spelling).

Typlochactas rhodesi: Díaz Nájera, 1975:4, 32 (erroneous spelling).

Type-locality.—La Cueva de la Mina, Sierra de Guatemala, Municipio de Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 17.

Discussion.—This species is known only by a few specimens taken from a single small upper level room in this cave.

Family Diplocentridae

Diplocentrus anophthalmus Francke

Diplocentrus anophthalmus Francke, 1977:56, 58-61, fig. 40-52, 54; Reddell, 1977b:230, 231, 240, 241, 263, fig. 6; Francke, 1978:44-45.

Eyeless diplocentrid scorpion: Mitchell and Peck, 1978:167.

Type-locality.—Actún Chukum, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 17.

Discussion.—This is the most highly cave-adapted species known in the family Diplocentridae. The median eyes are absent and the lateral eyes are reduced to vestiges. It was found under rocks in the inner room of Actún Chukum. In addition to the two other species of troglobite listed below, the family Diplocentridae is represented in caves by *D. reddelli* Francke, known only from Actún Xpukil, Yucatán; and by an undescribed species of *Cazierius* from Actún Loltún, Yucatán.

Diplocentrus cueva Francke

Diplocentrus cueva Francke, 1978:39-45, fig. 1-12.

Type-locality.—Cueva Desapareciendo, 2 km W. Acatlán, Oaxaca, México.

Fig. 17.—Distribution of troglobitic scorpions: 1, Chactidae gen. et sp. 1; 2, Chactidae gen. et sp. 2; 3, *Typhlochactas rhodesi;* 4, *T. elliotti;* 5, *T. reddelli;* 6, *Vaejovis gracilis;* 7, Family incertae sedis; 8, *Diplocentrus cueva;* 9, *D. mitchelli;* 10, *D. anophthalmus.*

Distribution.—Known only from the type-locality. See Fig. 17.

Discussion.—This species, known only from the holotype male, is an attenuate form with reduced medial eyes, pigmentation, and carinae. It is the least cave adapted of the three troglobitic species of the genus.

Diplocentrus mitchelli Francke

Diplocentrus mitchelli Francke, 1977:56-58, 60, fig. 29-39, 53; Reddell, 1977b:230, 231, 240, 241, 245, fig. 5; Francke, 1978:44-45.

Type-locality.—Actún Halmensura, Campeche, México.

Distribution.—Known only from the type-locality. See Fig. 17.

Discussion.—This species is known only from the immature holotype. It is an attenuate form with vestigial medial and reduced lateral eyes and with reduced carinae. The holotype was collected from under a small rock in the inner chamber of Actún Halmensura.

Family Vaejovidae

Three species of the family Vaejovidae have been identified from Mexican caves. *Vaejovis gracilis* Gertsch and Soleglad is a probable troglobite and is discussed below. Williams (1968) described *V. minckleyi* from a cave near Cuatro Ciénegas, Coahuila. *Vaejovis nigrescens* Pocock was found in the entrance area of Cueva de las Rusias, San Luis Potosí. Many undescribed or immature specimens of *Vaejovis* have been collected from caves in Durango, Nuevo León, San Luis Potosí, and Tamaulipas.

Vaejovis gracilis Gertsch and Soleglad

Vejovis gracilis Gertsch and Soleglad, 1972:556, 557, 563, 593, 602, 603-604, 606, fig. 24-25, 80-83, 147-149; Reddell, 1973a:37; Soleglad, 1975:107-120, fig. 1-32.

Type-locality.—Cueva de Atoyac, Atoyac, Veracruz, México.

Distribution.—Known from two caves in Veracruz. See Fig. 17.

New record.—*Veracruz:* Sótano de las Golondrinas (det. O. F. Francke).

Discussion.—The holotype of this species is a very immature form. Soleglad (1975) reported *V. gracilis* from Cueva del Lencho Virgen, Oaxaca; Cueva de la Barranca and Grutas de Jonotla, Puebla; and Cueva del Volcancillo, Veracruz. He discussed the variation in the species and, based on the new specimens, concluded that the species was not a troglobite. A large adult was collected from Sótano de las Golondrinas in the same mountain range that contains Grutas de Atoyac. The specimen corresponds well with the holotype of *V. gracilis* and is almost certainly the adult of that species. Furthermore, it is not conspecific with the specimens reported by Soleglad (Francke, pers. comm.). The Sótano de las Golondrinas adult is highly depigmented and attenuate and is a probable cave-adapted form.

Table 14.—Summary of cave-inhabiting Pseudoscorpionida.

	Troglobites	Other Species
Heterosphyronida		
Chthoniidae	7	3
Tridenchthoniidae	0	1
Diplosphyronida		
Hyidae	8	0
Ideoroncidae	1	1
Syarinidae	1	2
Vachoniidae	7	0
Monosphyronida		
Cheiridiidae	0	1
Cheliferidae	0	1
Chernetidae	0	8
Total	24	17

Order Pseudoscorpionida

The order Pseudoscorpionida is well represented in the caves of México, Guatemala, and Belize, with 24 troglobitic and 17 troglophilic species having been identified to date (see Table 14). Many species, especially among the troglophilic forms, await study.

Suborder Heterosphyronida

Family Chthoniidae

In addition to the troglobitic species of *Aphrastochthonius*, *Paraliochthonius*, and *Tyrannochthonius*, the family Chthoniidae includes two troglophiles which are known from caves (see Fig. 18). *Lechytia cavicola* Muchmore is known only from bat guano in the terminal room of Grutas de Cacahuamilpa, Guerrero. *Mundochthonius mexicanus* Muchmore was described from leaf litter on Cuesta de Chipinque, Nuevo León; it is also known from leaf litter near Teopisca, Chiapas, and from rat droppings in Crystal Cave, Tamaulipas. The genus *Tyrannochthonius* also includes at least one and probably several undescribed species of troglophile from caves in San Luis Potosí and Tamaulipas.

Aphrastochthonius major Muchmore

Aphrastochthonius new species: Reddell, 1973a:33.
Aphrastochthonius major Muchmore, 1973a:47-48, fig. 1; Reddell and Elliott, 1973b:181, 183; Muchmore, 1976:364.

Type-locality.—Cueva de la Capilla, 13.5 km NW Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 18.

Discussion.—This large species is known only from a single female. The genus *Aphrastochthonius* appears to be largely restricted to caves. *Aphrastochthonius tenax* Chamberlin and *A. pecki* Muchmore are known only from caves in Alabama (Muchmore, 1972c); *A. pachysetus* Muchmore is known only from Doc Brito Cave, Eddy County, New Mexico (Muchmore, 1976); *A. alteriae* Muchmore is known only from litter on the surface at Ruinas de Palenque, Chiapas (Muchmore, 1977); *A cubanus* Dumitresco and Orghidan was described from fissures on Isla de Pinos, Cuba

Fig. 18.—Distribution of troglobitic pseudoscorpions of the family Chthoniidae: 1, *Aphrastochthonius* n. sp.; 2, *A. major;* 3, *Tyrannochthonius troglobius;* 4, *A. parvus;* 5, *A. russelli;* 6, *T. pallidus;* 7, *Tyrannochthonius* n. sp.; 8, *Paraliochthonius strinatii;* 9, *A. verapazanus.*

(Dumitresco and Orghidan, 1977); the remaining four species are troglobites from México and Guatemala and are listed below. An undescribed troglobite has been recently collected in Sumidero de Oyamel, Tamaulipas.

Aphrastochthonius parvus Muchmore

Aphrastochthonius sp.: Reddell and Mitchell, 1971a: 144.

Aphrastochthonius parvus Muchmore, 1972c:437-438, 440, 441, 442, fig. 4-7; Reddell, 1973a:33, 37; Reddell and Elliott, 1973a:171, 173; Muchmore, 1976:364; Dumitresco and Orghidan, 1977: 100, 101.

Type-locality.—La Cueva de la Florida, 15 kilometers S.S.W. of Mante, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 18.

Discussion.—This is the smallest species in the genus and is known only from a single female collected from the cave wall.

Aphrastochthonius russelli Muchmore

Aphrastochthonius russelli Muchmore, 1972c:440-441, 442, fig. 10-12; Reddell, 1973a:33, 37; Reddell and Elliott, 1973a:171, 173; Muchmore, 1976:364.

Type-locality.—La Cueva Pinta, about 12 kilometers N.E. of Valles, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 18.

Discussion.—This species is known only from a single tritonymph. The species is probably most closely related to *A. parvus*, a species occurring in the northern Sierra de El Abra. Until adults of *A. russelli* are available, the relationships of this species must remain uncertain.

Aphrastochthonius verapazanus Muchmore

Aphrastochthonius verapazanus Muchmore, 1972c: 438, 440, 442, fig. 8-9; Muchmore, 1973a:48; Muchmore, 1976:364; Dumitresco and Orghidan, 1977:101; Muchmore, 1977:63.

Type-locality.—La Cueva Sepacuite No. 2, Senahú, Finca Sepacuite, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 18.

Discussion.—This very attenuate species is known only from a single female.

Paraliochthonius strinatii Beier

Paraliochthonius strinatii Beier, 1974:101-102, fig. 1; Strinati, 1977:388.

Type-locality.—Cueva Chirrepeck, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 18.

Discussion.—In addition to this troglobite, the genus *Paraliochthonius* is known by species from the eastern Mediterranean, Madeira, the Canary Islands, Jamaica, Puerto Rico, and Baja California and Jalisco, México (Muchmore, 1972b). Muchmore (pers. comm.) indicates that this species is probably misplaced and may belong in *Tyrannochthonius*.

Tyrannochthonius pallidus Muchmore

Tyrannochthonius pallidus Muchmore, 1973c:81-82, fig. 1-2.

Type-locality.—Cueva de El Jobo, 5 km NE Xilitla, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 18.

Discussion.—This species is known only from a single male collected from under a rock. It is most closely related to *T. troglobius*, but it is smaller with less attenuate appendages. Troglobitic members of this genus are also known from caves in Alabama. An undescribed troglobitic species has recently been collected in Cueva de Las Maravillas, Oaxaca.

Tyrannochthonius troglobius Muchmore

Tyrannochthonius troglobius Muchmore, 1969:31-32, fig. 1-3; Reddell, 1971b:27; Reddell and Mitchell, 1971b:184; Mitchell and Kawakatsu, 1973a:671; Muchmore, 1973c:81-82; Reddell, 1973a:33, 37; Reddell and Elliott, 1973b:181.

Type-locality.—Mine Cave (=Cueva de la Mina), Rancho del Cielo, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 18.

Discussion.—This species is most closely related to *T. pallidus*. Both troglophilic and epigean species of the genus are known from the vicinity of Cueva de la Mina, but all remain undescribed.

Family Tridenchthoniidae

A single species of the family Tridenchthoniidae has been reported from Mexican caves. *Tridenchthonius juxtlahuaca* was described from bat guano in Grutas de Juxtlahuaca, Guerrero, and is presumably a troglophile (Chamberlin and Chamberlin, 1945) (see Fig. 18).

Suborder Diplosphyronida

Family Hyidae

Leucohya heteropoda Chamberlin

Pseudoscorpión troglobio: Anonymous, 1942b:265.

Pseudoscorpiones nueva subfamilia: Bolívar, 1944: 26.

Leucohya heteropoda Chamberlin, 1946:7, 8-10, pl. 1; Chamberlin and Malcolm, 1960:114; Muchmore, 1969:32; Reddell, 1971b:27; Muchmore, 1972a:261, 269, 272, 273; Muchmore, 1973a:51, 53, fig. 15-17.

Leucohya heterodonta: Reddell, 1967a:24 (erroneous spelling).

Type-locality.—Gruta del Palmito, Bustamante, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This species is closely related to *L. magnifica* Muchmore, but the relationships of this genus to other neobisioid genera remain uncertain. It is apparently related to *Mexobisium*, *Apohya*, and more distantly to *Paravachonium*. An editorial addendum to Muchmore (1969) reports this species as being known from caves in Yucatán; this is an obvious error. Topotypic specimens collected recently were found under rocks in the entrance room of the cave.

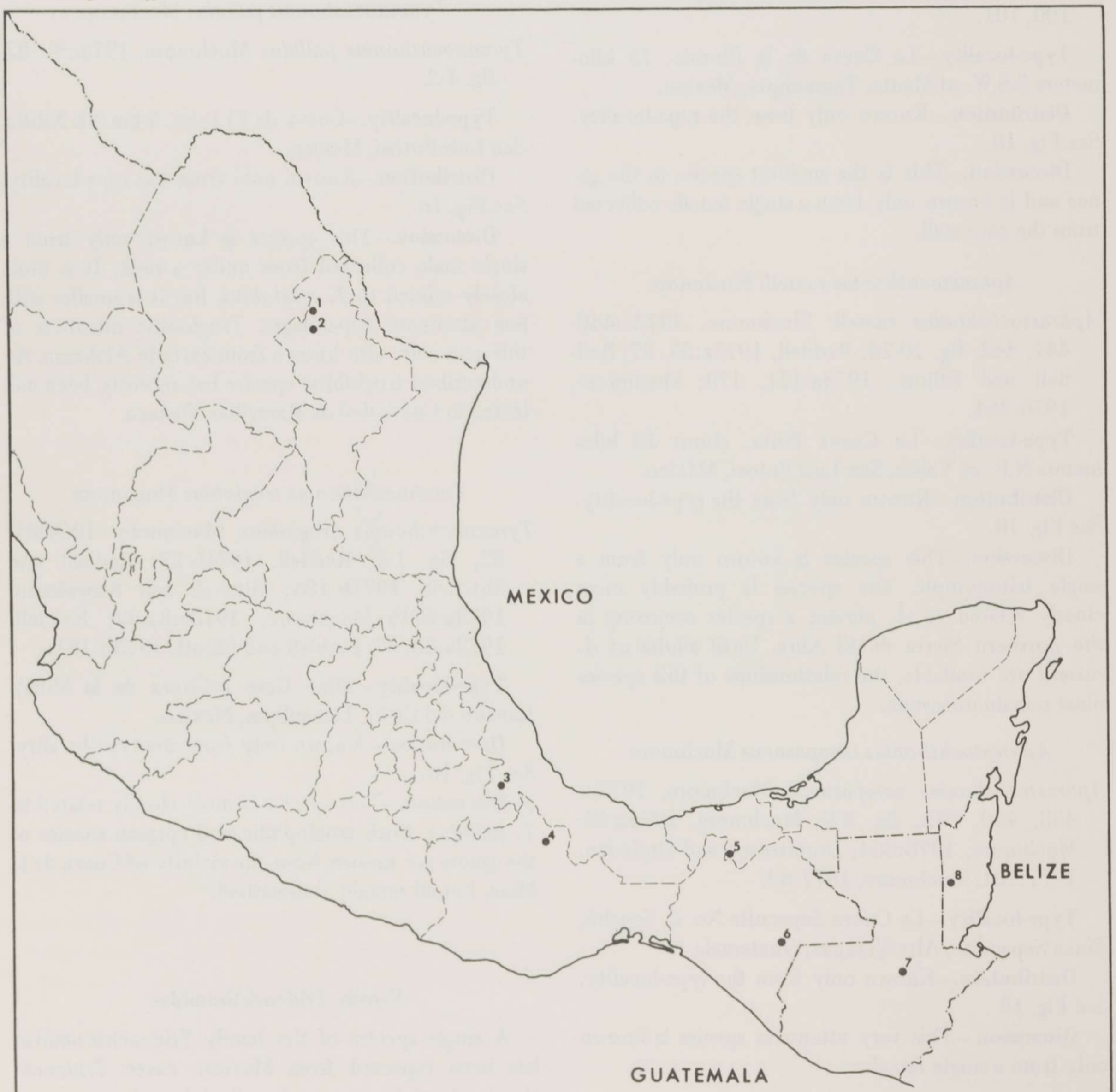

Fig. 19.—Distribution of troglobitic pseudoscorpions of the family Hyidae: 1, *Leucohya magnifica;* 2, *L. heteropoda;* 3, *Mexobisium paradoxum;* 4, *Troglohya carranzai;* 5, *M. maya;* 6, *T. mitchelli;* 7, *M. guatemalense;* 8, *M. goodnighti.*

Leucohya magnifica Muchmore

Undescribed genus and species of pseudoscorpion: Reddell, 1967a:24.

Hyidae, undescribed genus and species: Reddell, 1971b:27.

Leucohya magnifica Muchmore, 1972a:271-272, fig. 12-13; Muchmore, 1973a:51; Reddell, 1973a: 33, 37.

Type-locality.—Grutas del Carrizal, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This species is known only from a single female. Both species of *Leucohya* are known from single caves in isolated limestone ranges separated by desert terrain.

Mexobisium goodnighti Muchmore

Mexobisium goodnighti Muchmore, 1973b:69-71, fig. 22-25; Muchmore, 1977:71.

Type-locality.—Cave near Augustine, Belize.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This large species with attenuated appendages is the only species of the genus known from Belize. It is very distinct and may eventually prove generically distinct from other species of *Mexobisium*. The genus *Mexobisium* includes seven species of fairly disparate morphology. Epigean species are known from Cuba and from Chiapas and Oaxaca, México. Troglobites occur in Guatemala, Belize, and Tabasco and Veracruz, México.

Mexobisium guatemalense Muchmore

Mexobisium guatemalense Muchmore, 1973b:67, 69, 71, fig. 18-21; Muchmore, 1977:71.

Type-locality.—Cueva Lanquín, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This is the only species of the genus known to occur in Guatemala.

Mexobisium maya Muchmore

Mexobisium maya Muchmore, 1973b:67, 69, 71, fig. 12-17; Muchmore, 1977:71.

Type-locality.—Grutas de Coconá, 3 km NE Teapa, Tabasco, México.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This species is known from a single male, two females, and two tritonymphs. Its relationship to other members of the genus is not clear although it is similar to *M. pecki* Muchmore, an epigean species, in its general conformation.

Mexobisium paradoxum Muchmore

Mexobisium paradoxum Muchmore, 1972a:273-275, fig. 14-19; Reddell, 1973a:37; Muchmore, 1973b: 63, 71-72.

Mexobisium garadoxum: Reddell, 1973a:33 (erroneous spelling).

Type-locality.—Cueva del Ojo del Agua de Tlilapan, Tlilapan, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This species is known only from the holotype female collected from a flowstone slope in the Formation Room at the type-locality. *M. paradoxum* is unique in many respects, and its affinities to other members of the genus are obscure.

Troglohya carranzai Beier

Troglohya carranzai Beier, 1956:83, 84-85, fig. 2; Chamberlin and Malcolm, 1960:114; Barrera, 1968:313; Muchmore, 1969:32; Reddell, 1971b: 27; Muchmore, 1972a:261, 272; Muchmore, 1973a:54, 55.

Type-locality.—Cueva de Monteflor, cerca de Valle Nacional, N. Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This species is known only from a single tritonymph. It is related to *M. mitchelli* Muchmore, but until further material is available, the degree of relationship is unknown. The genus *Troglohya* may prove to be more closely related to *Vachonium* than to *Leucohya*.

Troglohya mitchelli Muchmore

Troglohya mitchelli Muchmore, 1973a:55-56, fig. 24-31; Muchmore, 1977:71.

Type-locality.—Grutas de Zapaluta, 6.5 km SE La Trinitaria, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 19.

Discussion.—This species, known from a single female, is larger and more attenuate than *T. carranzai*.

Family Ideoroncidae

Albiorix bolivari Beier

Albiorix bolivari Beier, 1963:133-134, fig. 1; Barrera, 1968:313; Muchmore, 1969:32; Reddell, 1971b: 27; Muchmore, 1972a:261.

Type-locality.—Gruta de Acuitlapán, Guerrero, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This species is most closely related to *A. magnus* Hoff. Undescribed troglobites belonging to the genus *Albiorix* are known from Cueva del Diablo, Veracruz, and Grutas de Atepolihuit, Puebla. An undescribed troglophile is known from Cueva de Las Maravillas, Oaxaca.

Family Syarinidae

Pachychitra grandis Muchmore

Pachychitra sp.: Reddell, 1971a:219.
Pachychitra grandis Muchmore, 1972a:266, 267, fig. 6-7; Reddell, 1973a:33, 37; Muchmore, 1977:70.

Type-locality.—Cueva del Tío Ticho, one mile south of Comitán, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Fig. 20.—Distribution of troglobitic and troglophilic pseudoscorpions of the families Ideoroncidae, Syarinidae, and Vachoniidae: 1, *Paravachonium* n. sp.; 2, *Paravachonium superbum;* 3, *Paravachonium bolivari;* 4, *Pachychitra similis;* 5, *Albiorix* n. sp. 1; 6, *Albiorix* n. sp. 2; 7, *A. bolivari;* 8, *Albiorix* n. sp. 3; 9, *Pachychitra grandis;* 10, *Vachonium cryptum;* 11, *Vachonium* sp. 1; 12, *Pachychitra maya;* 13, *Vachonium* sp. 2; 14, *V. boneti;* 15, *V. maya;* 16, *V. kauae;* 17, *V. belizense.*

Discussion.—This is the largest species of the genus. The greater size and more slender appendages suggest that it is restricted to the cave habitat. The genus is known from Florida (U.S.A.), Jamaica, Puerto Rico, Curaçao, Tamaulipas, Chiapas, and Yucatán. Two additional species are known only from caves *(P. maya* Chamberlin from Yucatán and *P. similis* Muchmore from Tamaulipas), but are smaller and less attenuate than *P. grandis.* Nicholas (1962) lists *P. maya* as a troglobite, but it is probably best considered to be a troglophile.

Family Vachoniidae

Paravachonium bolivari Beier

Paravachonium bolivari Beier, 1956:81, 82-83, 85, fig. 1; Chamberlin and Malcolm, 1960:114; Reddell, 1965a:19; Barrera, 1968:313; Muchmore, 1969:32; Reddell, 1971b:27; Reddell and Mitchell, 1971a:144; Muchmore, 1972a:261, 267, 268, 269; Muchmore, 1973a:57, fig. 32; Reddell and Elliott, 1973a:171, 173.
Paravachonium: Reddell, 1967c:55.

Type-locality.—Cueva (=Grutas) de Quintero, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This species is known only from the holotype female and a deutonymph. Although Beier considered this species as belonging to the family Vachoniidae, Muchmore (1973a) considers the affinities of the genus to be obscure. *Paravachonium* is known only from these two species and an undescribed troglobite from Sumidero de Oyamel, Tamaulipas.

Paravachonium superbum Muchmore

Paravachonium sp.: Reddell, 1967c:55; Reddell, 1971b:27; Reddell and Mitchell, 1971b:184-185; Vomero, 1974:350.
Paravachonium superbum Muchmore, 1972a:268, 269, 271, fig. 8-11; Reddell, 1973a:33, 37; Reddell and Elliott, 1973b:181, 183.

Type-locality.—Sótano de Gómez Farías, just south of the village of Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This species is known from a single female collected beneath a rock at the 25-meter level of the cave. This large, attenuate species is closely related to *P. bolivari.*

Vachonium belizense Muchmore

Vachonium belizense Muchmore, 1973a:58, fig. 36-38; Muchmore, 1977:72.

Type-locality.—Mountain Cow Cave, Caves Branch, Belize.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This is the largest species of the genus and the only one known outside of the Mexican state of Yucatán. It is known only from a single tritonymph.

Vachonium boneti Chamberlin

Vachonium boneti Chamberlin, 1947:4, 5, 6-7, 8, 9, fig. 1-23; Chamberlin and Malcolm, 1960:114; Muchmore, 1969:32; Reddell, 1971b:27; Muchmore, 1972a:261, 267; Muchmore, 1973a:57; Muchmore, 1977:72; Reddell, 1977b:230, 240, 282.

Type-locality.—Cueva de Sabacá (=Actún Sabacá), Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This species is known only from a single female. The genus *Vachonium* is possibly closely related to *Troglohya. Vachonium* contains only the five troglobites listed here. An editorial addendum to Muchmore (1969) lists this species as occurring in "la Cueva de Palmito, Nuevo León"; this is an obvious error. A single tritonymph from Actún Xpukil, Yucatán, is this or a closely related species (Muchmore, 1977).

Vachonium cryptum Muchmore

Vachonium cryptum Muchmore, 1977:72, 73, fig. 20-21; Reddell, 1977b:230, 240, 271.

Type-locality.—Actún Xkyc, 1 km S Calcehtok, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This species, known only from a single female, is closely related to *V. kauae* and V. *maya.* The only specimen was collected from the underside of a Mayan stone water dish.

Vachonium kauae Muchmore

Vachonium kauae Muchmore, 1973a:57-58, fig. 33-35; Muchmore, 1977:72; Reddell, 1977b:230, 239, 240, 260.

Type-locality.—Cueva de Kaua (=Actún Kaua), 1 km S Kaua, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This species is known only from a single female. It appears to be most closely related to *V. maya* but is less attenuate.

Vachonium maya Chamberlin

Vachonium maya Chamberlin, 1947:5, 8-9, fig. 24-36; Chamberlin and Malcolm, 1960:114; Muchmore, 1969:32; Reddell, 1971b:28; Muchmore, 1972a:261, 267; Muchmore, 1973a:57; Muchmore, 1977:72; Reddell, 1977b:230, 239, 240, 285.

Type-locality.—Cueva de Balaam Canche (=Grutas de Balankanche), Chichén Itzá, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 20.

Discussion.—This species appears to be most closely related to the geographically near species *V. kauae*. It has recently been collected from beneath rocks at the type-locality.

Suborder Monosphyronida

Family Cheiridiidae

The family Cheiridiidae is known from undetermined specimens recently collected from two caves in the Sierra de Ticul, Yucatán.

Family Cheliferidae

A single species of the family Cheliferidae, *Mexichelifer reddelli* Muchmore, has been collected from a cave in México. It was found in the entrance area of Cueva de las Carnicerias, San Luis Potosí. Although its ecological status is uncertain, it is probably a troglophile.

Family Chernetidae

The family Chernetidae is the best represented of all families of pseudoscorpions in Mexican caves, although apparently contributing no troglobites to the fauna. J. C. Chamberlin (1938) described two species of this family from caves in Yucatán: *Lustrochernes minor* and *Parazaona cavicola.* Nicholas (1962) listed these as troglobites, but they should be considered as troglophiles. Specimens from caves in all parts of México, Guatemala, and Belize that have been visited are now under study by Dr. W. B. Muchmore. He has tentatively identified the genera *Dinocheirus, Hesperochernes, Lustrochernes, Neoallochernes,* and *Semeiochernes* from caves in this area. Chernetids are commonly found in bat guano, where they may be present in vast numbers.

Order Uropygida

Family Thelyphonidae

The order Uropygida is primarily tropical in distribution, although one species ranges north into subtropical regions. A single species of whipscorpion, *Mastigoproctus giganteus* Lucas, is known from the caves of México. It has been found on walls near the entrance of eleven caves in the states of Coahuila, Hidalgo, San Luis Potosí, and Tamaulipas.

Order Schizomida

The order Schizomida is an important and, until recently, a neglected element of the soil and litter fauna of México and Central America. It is worldwide in distribution but rare in temperate regions. In North America schizomids are known from Panama into the southern United States. The order in México appears to be limited to southern México and along the easttern slopes of the Sierra Madre Oriental to Monterrey. Relict populations have been found in caves and other mesic habitats north and east into south Texas.

Epigean schizomids are commonly found beneath rocks along hillsides, but they also may be collected in leaf litter. Cavernicole schizomids are usually found on the underside of rotting wood, in organic debris, and beneath rocks. Some are found running over silt banks and in bat guano.

All North American schizomids lack true eyes, although some retain small "eyespots." Epigean species tend to be fairly robust, orange-brown to green, and most have distinct eyespots. The cavernicole species range from very dark, robust forms to elongate, pale forms. Ten of the described species appear to be sufficiently pale, delicate, and poorly sclerotized to warrant inclusion in this list as cave-adapted forms.

Family Protoschizomidae

The family Protoschizomidae contains two genera, each with two described species. *Protoschizomus pachypalpus* (Rowland) is known only from epigean localities in Tamaulipas, while *P. occidentalis* Rowland is known only from a single epigean site in Colima. The genus *Agastoschizomus* contains two described and one undescribed species of troglobite.

Agastoschizomus huitzmolotitlensis Rowland

Schizomus sp.: Reddell, 1967d:106; Reddell, 1971b: 28 (Sótano de Huitzmolotitla record only).

Agastoschizomus huitzmolotitlensis Rowland, 1975b: 6, 8-10, fig. 3; Rowland, 1975a:28, 44, 45, 46-47, 48-49, 50, 167-168, fig. 17; Rowland and Reddell, 1977:80, 81-82, fig. 1; Rowland and Reddell, 1979a:162, 167, 169, 170, fig. 4, 7.

Type-locality.—Sótano de Huitzmolotitla, 2 km SW Tlamaya, and approximately 10 km N Xilitla, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 21.

Discussion.—This species is smaller and has relatively longer appendages than does *A. lucifer.* Known only by a single male, it is unique in being the only described Mexican schizomid from high elevations (about 700 meters). An undescribed species of *Agastoschizomus* has been found at about this same elevation in caves in Hidalgo.

Agastoschizomus lucifer Rowland

Agastoschizomus lucifer Rowland, 1971a:15, 17, fig. 1-8; Reddell and Mitchell, 1971a:145, fig. 3-4; Dumitresco, 1973:282; Reddell, 1973a:33, 38; Reddell and Elliott, 1973a:171; Rowland, 1973a: 10; Rowland, 1973b:197, 202, fig. 2, 4; Rowland, 1973c:136; Brignoli, 1974a:150; Rowland, 1975a: 8-9, 14-15, 27, 28, 43-45, 46-47, 48-49, 50, 167-168, 181, 211, fig. 1, 8, 13, 16; Rowland, 1975b: 8, 9, 10, fig. 4; Rowland and Reddell, 1977:80, 81, 82, 85, 96, fig. 1; Rowland and Reddell, 1979a:162, 167, 168, 169-170, fig. 4, 7.

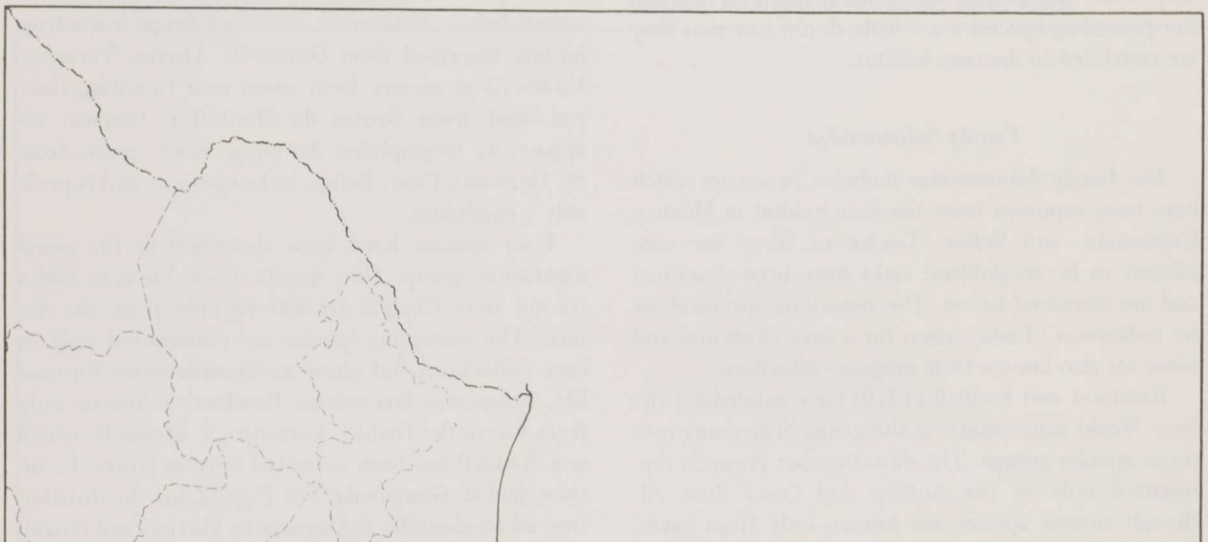

Fig. 21.—Distribution of troglobitic schizomids of the family Protoschizomidae: 1, *Agastoschizomus lucifer;* 2, *A. huitzmolotitlensis;* 3, *Agastoschizomus* n. sp.

Agastochizomus lucifer: Rowland, 1971a:13 (erroneous spelling).

Type-locality.—Sótano de la Tinaja, 10 km NE Ciudad Valles, San Luis Potosí, México.

Distribution.—Known only from three caves in the Sierra de El Abra, near Valles, San Luis Potosí. See Fig. 21.

Records.—*San Luis Potosí:* Sótano de Matapalma, Sótano de la Tinaja, and Sótano de Yerbaniz.

Discussion.—This is the largest species in the order Schizomida. It is abundant on silt and along walls in Sótano de la Tinaja. Although Brignoli (1974a) has reservations about considering any schizomid to be a troglobite, the habitat and general facies of this and the preceding species leave little doubt but that they are restricted to the cave habitat.

Family Schizomidae

The family Schizomidae includes 24 species which have been reported from the cave habitat in México, Guatemala, and Belize. Twelve of these are considered to be troglobites; eight have been described and are discussed below. The remaining species show no indication of adaptation for a cave existence, and some are also known from epigean collections.

Rowland and Reddell (1979) have subdivided the New World schizomids of the genus *Schizomus* into seven species groups. The *dumitrescoae* group is represented only in the Antilles and Costa Rica. Although several species are known only from caves, their ecological status is uncertain. The *simonis* group ranges from northern South America to Costa Rica; none are known from caves. The *briggsi* group is known only from Arizona and California in the United States, with one species, *S. shoshonensis* (Briggs and Hom), being an apparent troglobite in Upper Shoshone Cave, Inyo County, California.

The *brasiliensis* group ranges from Brazil to southern México. Two species of this group have invaded caves. *Schizomus stewarti* Rowland is known only from Cueva del Guayabo, Oaxaca. *Schizomus trilobatus* Rowland is a dark species with distinct eyespots and is known only from Grutas del Coconá, Tabasco. The only other *brasiliensis* group species known from México is *S. lacandonus* Rowland from Las Ruinas de Palenque, Chiapas.

With the exception of one species, the *mexicanus* group is restricted to México, Belize, and Guatemala, where it is abundantly represented in caves. *Schizomus portoricensis* (Chamberlin) has been collected from Ecuador, the Galapagos Islands, southeastern México, the Antilles, and southern Florida. Peripheral populations are all parthenogenetic; parthenogenetic populations also occur in caves in the Yucatán Peninsula (Rowland and Reddell, 1977). Six species of the *mexicanus* group are probably cave-adapted forms and are discussed below. *Schizomus mexicanus* Rowland is known both from caves and the surface in the Sierra de El Abra and in the lowland Sierra de Guatemala. *Schizomus moisii* Rowland is a dark species with distinct eyespots; it is known only from Grutas de Monteflor, Oaxaca. An undescribed species from Grutas de Cacahuamilpa, Guerrero, lacks eyespots and may be a troglobite.

The *pecki* group is known only from southern México, Guatemala, and Belize. *Schizomus firstmani* and *S. pecki* are apparently troglobites and are discussed below. *Schizomus sbordonii* Brignoli is a troglophile described from Grutas de Atoyac, Veracruz. Undescribed species from caves near Comitán, Chiapas, and from Grutas de Monteflor, Oaxaca, are apparently troglophiles. An undescribed species from St. Herman's Cave, Belize, lacks eyespots and is probably a troglobite.

Four species have been described in the *goodnightorum* group. One species from Yucatán and a second from Chiapas are known only from the surface. The remaining species are represented only in cave collections but show no modifications for cave life. *Schizomus lanceolatus* Rowland is known only from Cueva del Diablo, Veracruz; *S. silvino* Rowland and Reddell has been collected only in Gruta de Silvino, Izabal, Guatemala. See Fig. 22 for the distribution of troglophilic *Schizomus* in México and Guatemala.

Schizomus bartolo Rowland

Schizomus sp.: Reddell, 1967a:25; Reddell, 1971b: 28 (Grutas de San Bartolo record only).

Schizomus bartolo Rowland, 1973a:13-16, 18, fig. 11-13; Rowland, 1973c:135, 137; Rowland, 1975a:34, 166, 169, 173-174, 176, 177, 214-215, 218-219, 222-223, 228-229, 366-367, 368-369, 394, fig. 158, 174, 193, 292; Dumitresco, 1977: 157; Rowland and Reddell, 1977:80, 83, 84, fig. 2; Rowland and Reddell, 1979a:163.

Type-locality.—Gruta de San Bartolo, 16 km SSW Monterrey, Nuevo León, México.

Distribution.—Known only from Grutas de San Bartolo. See Fig. 23.

Records.—*Nuevo León:* Grutas de San Bartolo and Gruta Sur de San Bartolo.

Discussion.—Grutas de San Bartolo is located in a desert region, and *S. bartolo* is apparently an isolated population now restricted to the cave habitat. It is most closely related to *S. firstmani.* Grutas de San

Bartolo is a name applied to two nearby caves (designated as Sur and Norte); it is not known from which cave the type series was collected.

Schizomus cookei Rowland

Schizomus cookei Rowland, 1971b:122-123, fig. 10-12, 19; Reddell and Mitchell, 1971a:145; Dumitresco, 1973:291; Reddell, 1973a:38; Rowland, 1973c:135; Brignoli, 1974a:146; Rowland, 1975a: 34, 166, 167-168, 169, 181, 182, 210-211, 212, 213, 216-217, 218-219, 220-221, 228, 231, 366-367, 368-369, 395, fig. 165, 180, 183-184, 292; Rowland and Reddell, 1977:80, 84, 85, fig. 2; Rowland and Reddell, 1979a:163.

Type-locality.—Sótano de la Tinaja, 10.5 km NE of Ciudad Valles, San Luis Potosí, México.

Distribution.—Known only from two caves north of Valles in the Sierra de El Abra, San Luis Potosí. See Fig. 23.

Records.—*San Luis Potosí:* Sótano de la Tinaja and Sótano de Yerbaniz.

Discussion.—This elongate species is sympatric in both of these caves with *Agastoschizomus lucifer;* it also occurs with *S. mexicanus* in Sótano de la Tinaja. Extensive epigean collections have failed to include *S. cookei*, although *S. mexicanus* is abundant on the surface throughout the Sierra de El Abra.

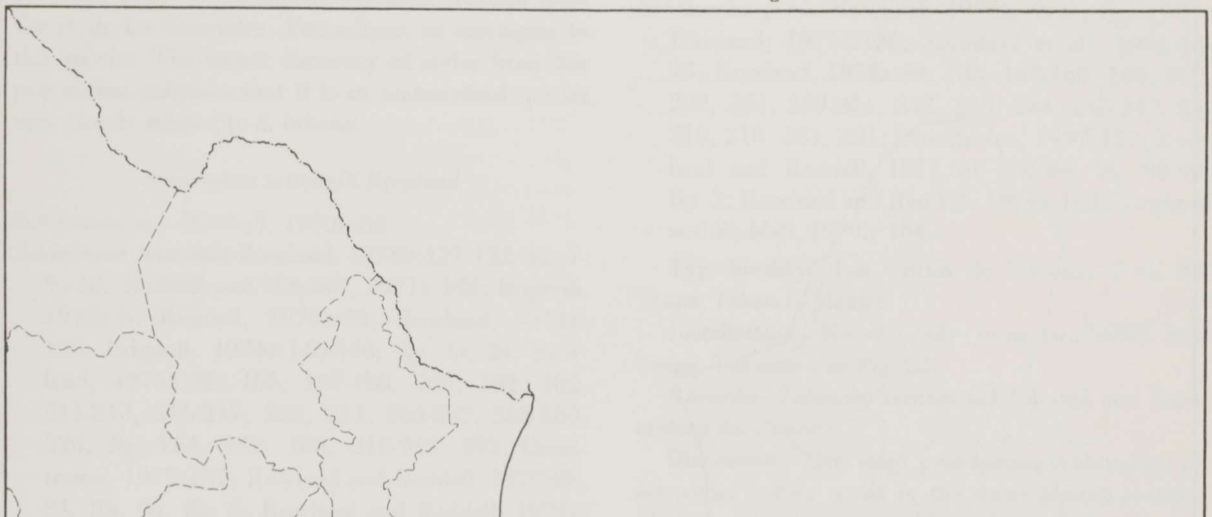

Fig. 22.—Distribution of troglophilic schizomids of the family Schizomidae: 1, *Schizomus mexicanus;* 2, *S. lanceolatus;* 3, *S. sbordonii;* 4, *S. moisii;* 5, *S. stewarti;* 6, *S. trilobatus;* 7, *S. arganoi;* 8, *S. portoricensis.*

Schizomus firstmani Rowland

Schizomus sp.: Reddell, 1971a:219 (Grutas de Atoyac record only).

Schizomus firstmani Rowland, 1973a:16-19, fig. 14-16; Rowland, 1973c:136; Rowland, 1975a:34, 167-168, 232, 234, 235-237, 238, 239-240, 243, 246-247, 248-249, 252-253, fig. 217, 219-220, 226-227; Rowland and Reddell, 1977:80, 84, 98, 99, fig. 2; Rowland and Reddell, 1979a:163.

Type-locality.—Grutas de Atoyac, 2 km E Atoyac, Veracruz, México.

Distribution.—Known only from the type-locality and possibly caves near Acatlán, Oaxaca. See Fig. 23.

Records.—*Oaxaca:* ?Cueva Desapareciendo, ?Cueva de la Finca, and ?Cueva del Nacimiento del Río San Antonio; *Veracruz:* Grutas de Atoyac.

Discussion.—This species is most closely related to *S. bartolo,* and is sufficiently delicate and elongate to be considered a probable troglobite. The Oaxacan records for this species are based on females and should be verified by collection of males.

Schizomus lukensi Rowland

Schizomus lukensi Rowland, 1973c:136-137, fig. 1, 4; Rowland, 1975a:34, 166, 169, 174, 175-176, 177, 214-215, 218-219, 222-223, 228-229, 366-367, 368-369, 394, fig. 160, 173, 191-192, 292;

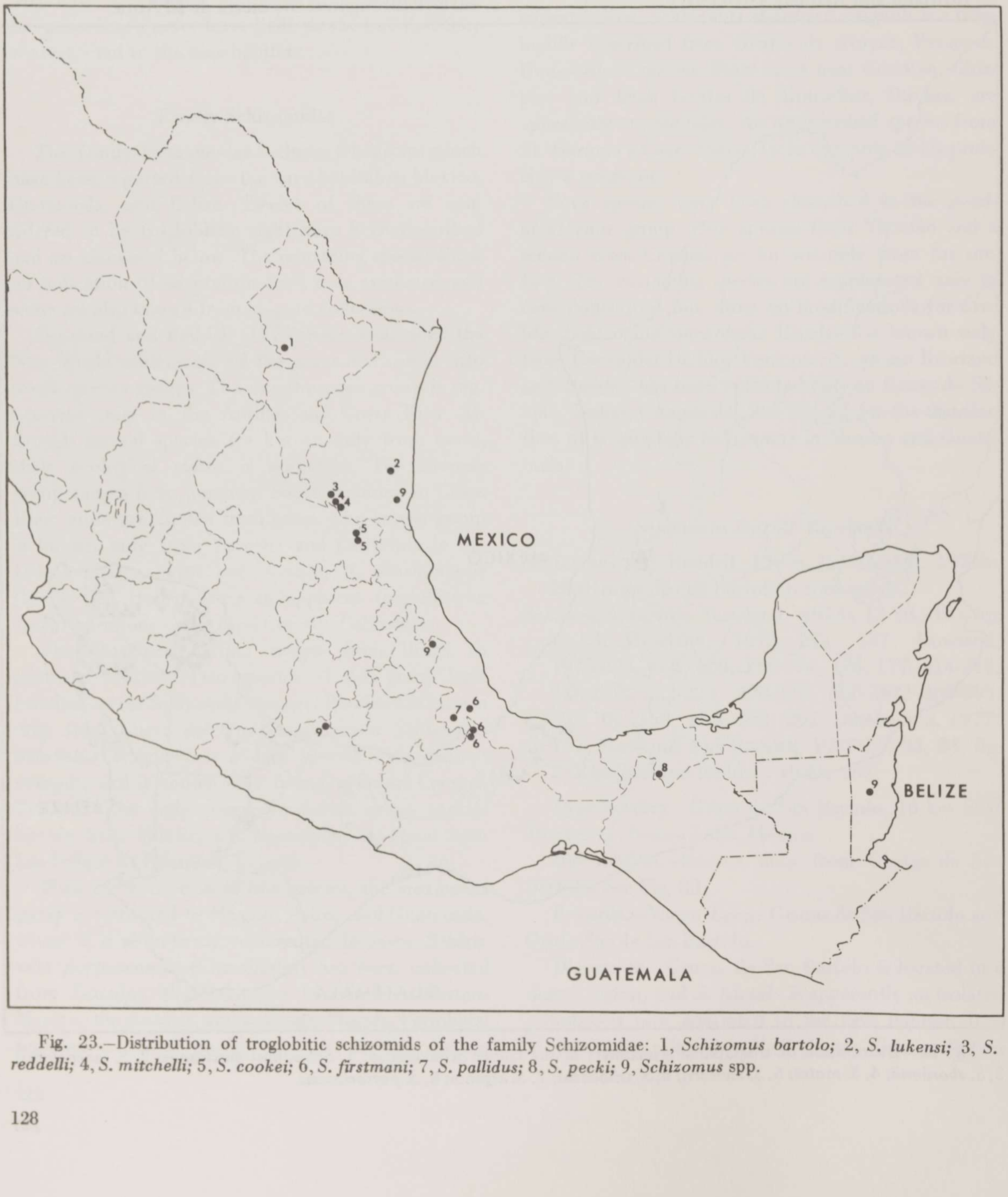

Fig. 23.—Distribution of troglobitic schizomids of the family Schizomidae: 1, *Schizomus bartolo;* 2, *S. lukensi;* 3, *S. reddelli;* 4, *S. mitchelli;* 5, *S. cookei;* 6, *S. firstmani;* 7, *S. pallidus;* 8, *S. pecki;* 9, *Schizomus* spp.

Rowland, 1975b:19, 20; Dumitresco, 1977:157; Rowland and Reddell, 1977:80, 83-85, 98, fig. 2; Rowland and Reddell, 1979a:163.

Type-locality.—Cueva del Agua (de Simón Salinas), 50 km SW Soto la Marina, Tamaulipas, México.

Distribution.—Known only from two caves in the Sierra de Tamaulipas, Tamaulipas. See Fig. 23.

Records.—*Tamaulipas:* Cueva del Agua de Simón Salinas and Cueva de la Virgen de Guadalupe.

Discussion.—This pale species with long first legs is apparently isolated in its moist cave habitat by the semi-arid environment of the Sierra de Tamaulipas. It appears to be most closely related to *S. mexicanus.* Rowland (1975a) tentatively reported females from Cueva de los Cuarteles, Tamaulipas, as belonging to this species. The recent discovery of males from this population indicates that it is an undescribed species very closely related to *S. lukensi.*

Schizomus mitchelli Rowland

Schizomus sp.: Mitchell, 1970b:65.

Schizomus mitchelli Rowland, 1971b:121-122, fig. 7-9, 18; Reddell and Mitchell, 1971a:145; Brignoli, 1973a:6; Reddell, 1973a:38; Rowland, 1973c: 135; Brignoli, 1974a:145-146, fig. 1a, 2e; Rowland, 1975a:34, 166, 167-168, 169, 181, 182, 211-213, 216-217, 228, 231, 366-367, 368-369, 395, fig. 164, 182, 188, 212-215, 292; Dumitresco, 1977:157; Rowland and Reddell, 1977:80, 84, 85, 96, fig. 2; Rowland and Reddell, 1979a: 163.

Schizomids: Rowland, 1972a:73.

Type-locality.—Cueva de El Pachón, 7.5 km NE of Antiguo Morelos, Tamaulipas, México.

Distribution.—Known only from three caves in the northern Sierra de El Abra, Tamaulipas. See Fig. 23.

Records.—*Tamaulipas:* Cueva de la Florida, Cueva de El Pachón, and Grutas de Quintero.

Discussion.—This species possesses slender elongate appendages and is almost certainly a troglobite. Collections outside of the entrance of Cueva de la Florida have included only *S. mexicanus.* A female of this species was observed carrying eggs. This is unusual behavior since previous accounts of schizomids indicated that they built cocoons and the female remained in the cocoon until the eggs hatched. This may be an adaptation to the cavernicole existence and its comparatively low number of predators.

Schizomus pallidus Rowland

Schizomus pallidus Rowland, 1975b:7, 13-15, fig. 6; Rowland, 1975a:34, 166, 167-168, 169, 184-186, 188, 216-217, 218-219, 222-223, 228, 230, 280, 366-367, 368-369, 396, fig. 166, 179, 196, 292; Rowland and Reddell, 1977:80, 84, 87, 88, fig. 2; Rowland and Reddell, 1979a:163.

Type-locality.—Cueva Macinga, Tlilapan, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 23.

Discussion.—This pale species with elongate appendages appears to be related to *S. mexicanus* but is quite distinct in some respects. It was found on silt beneath rocks in a dry side passage of the cave.

Schizomus pecki Rowland

Schizomus pecki Rowland, 1973a:19-23, fig. 17-19; Rowland, 1973c:136; Sbordoni et al., 1974:14-15; Rowland, 1975a:34, 135, 167-168, 188, 209, 232, 234, 239-241, 242, 243, 244, 246-247, fig. 216, 218, 221, 231; Dumitresco, 1977:157; Rowland and Reddell, 1977:80, 83, 84, 96, 98-99, fig. 2; Rowland and Reddell, 1979a:163; Rowland and Reddell, 1979b:104.

Type-locality.—Las Grutas de Coconá, 2 mi NE Teapa, Tabasco, México.

Distribution.—Known only from two caves near Teapa, Tabasco. See Fig. 23.

Records.—*Tabasco:* Grutas del Coconá and Resumidero del Coconá.

Discussion.—This large, pale species is abundant on silt under rotten wood in the more remote sections of Grutas del Coconá. A dark robust species, *S. trilobatus,* inhabits litter near the cave entrance.

Schizomus reddelli Rowland

Schizomus reddelli Rowland, 1971b:123, 124, 126, fig. 13-15; Reddell and Mitchell, 1971b:185; Reddell, 1973a:38; Rowland, 1973a:21; Rowland, 1973c:135; Brignoli, 1974a:147, 149; Rowland, 1975a:34, 166, 169, 177, 178-179, 181, 214-215, 218-219, 220-221, 228-230, 366-367, 368-369, 394, fig. 159, 175, 189-190; Rowland and Reddell, 1977:80, 84, 85, fig. 2; Rowland and Reddell, 1979a:163.

Schizomus mexicanus Rowland: Reddell and Mitchell, 1971b:185 (misidentification); Vomero, 1974: 341 (misidentification).

Schizomus reddeli: Dumitresco, 1977:157 (erroneous spelling).

Type-locality.—Cueva de Tres Manatiales (=Cueva del Ojo de Agua de Manantiales), 23 km NW Limón, Tamaulipas, México.

Distribution.—Known from two caves in the Sierra de Guatemala, Tamaulipas. See Fig. 23.

Records.—*Tamaulipas:* Cueva del Ojo de Agua de Manantiales and Cueva de los Vampiros.

Discussion.—This species is very closely related to *S. mexicanus.* Rowland (1975a) speculates that this may represent a high altitude relict of a species ancestral to it and *S. mexicanus.*

Order Amblypygida

The order Amblypygida is world-wide in distribution but, like the Schizomida, barely reaches north into temperate regions. In North America it ranges throughout Central America into the southern United States. Epigean amblypygids are found under rocks, on cliff-faces at night, on the walls of buildings, and in culverts and beneath bridges. Cavernicole amblypygids are seen, frequently in large numbers, along cave walls, on flowstone mounds, and beneath rocks.

Family Charontidae

The family Charontidae is known from caves only by an undescribed troglobite of uncertain generic affinities. It has recently been collected in Footprint Cave, Belize.

Family Phrynidae

The described species of amblypygid known from México and Central America include five troglobitic and six troglophilic species belonging to the family Phrynidae. Several undescribed species, including at least one troglobite, are known from caves in this region.

The large, distinctive species *Acanthophrynus coronatus* Koch is known from an unidentified limestone cave at Ixtlahután, Colima. Its ecological status is unknown.

The genus *Phrynus* is represented in Mexican caves by a probably undescribed species from Grutas del Coconá, Tabasco, and by undetermined specimens from several other caves. This genus is much rarer in caves than is *Paraphrynus.*

Mullinex (1975) has revised the genus *Paraphrynus* for North America. In addition to the four troglobites listed below, she included six species as probable troglophiles. A fifth species of troglobite has since been described from México (Mullinex, 1979). *Paraphrynus raptator* (Pocock) is an extremely abundant species in the caves of the Yucatán Peninsula. It is known from many caves in Campeche, Quintana Roo, and Yucatán, México; and in caves in El Petén, Guatemala, and Belize. See Fig. 24 for the distribution of troglophilic *Paraphrynus* in México, Guatemala, and Belize.

Paraphrynus williamsi Mullinex and *P. emaciatus* Mullinex are rare species known only from Grutas de Zapaluta, Chiapas, and Cemetery Cave, Alta Verapaz, Guatemala, respectively. The latter species has elongate appendages but is otherwise not adapted for cave life.

Paraphrynus mexicanus (Bilimek) is a highly variable species with three distinct morphological forms separated by considerable distributional gaps. These three forms may be eventually given specific recognition. The so-called Cacahuamilpan form has been found in caves in Guerrero, México, Oaxaca, and Puebla, México. The other two forms (Arizonan and Cuban) have not been found in caves and occur respectively in northern México and the southwestern United States and in Cuba.

Paraphrynus pococki Mullinex is a somewhat variable species known only from cave and epigean habitats in San Luis Potosí and Tamaulipas. This is the commonly occurring species in the caves of the Sierra de El Abra.

Paraphrynus azteca (Pocock) is represented by two distinct forms. The Isthmus form is known from Chiapas, Tabasco, Oaxaca, and southern Veracruz, México. The Atoyac form occurs in more northern Veracruz in the vicinity of Córdoba and Orizaba. Both forms are known from caves. This or a related species is known from caves in the Cuetzalan area of Puebla.

Paraphrynus baeops Mullinex

Paraphrynus baeops Mullinex, 1975:1, 9, 26, 28-29, 43, fig. 27-28, 39.

Type-locality.—Sótano de Vasquez, 10 km SE Ocampo, Tamaulipas, México.

Distribution.—Known from four caves in the Sierra de Guatemala and Sierra de El Abra, Tamaulipas. See Fig. 25.

Records.—*Tamaulipas:* Cueva de la Florida, Grutas del Puente, and Sótano de Vasquez.

New record.—*Tamaulipas:* Sótano de Santa Elena (det. C. Mullinex).

Discussion.—This species possesses median eyes which are greatly reduced in size and lacking in pigment; furthermore, the median ocular tubercle is absent.

Paraphrynus chacmool (Rowland)

Tarantula chacmool Rowland, 1973d:123, 125-126, 128, fig. 1, 3, 5, 7, 9, 11, 13, 15, 17.

Paraphrynus chacmool: Mullinex, 1975:43; Reddell, 1977b:230, 239, 240, 256, 258, 260, 263, 267, 273, 276, 279, 281, 282, 285, 289, 293.

Type-locality.—Actún Kaua, Yucatán, México.

Distribution.—Known from caves in Quintana Roo and Yucatán. See Fig. 25.

Records.—*Yucatán:* Cenote de Aká Chen, Grutas de Balankanche, Cenote Calchum, Cenote Chen Mul, Actún Chukum, Cenote de Hoctún, Actún Kaua, Actún Sabacá, Cenote de Sihunchén, Cueva de Tecoh, Grutas de Tzab-Nah, Actún Xpukil, Cenote Xtacabihá, and Actún Ziz.

New records.—*Quintana Roo:* Cenote de Las Ruinas; *Yucatán:* Cenote de Catzín and Cueva Escondida (det. C. Mullinex).

Discussion.—Most of these caves are also inhabited by *P. raptator*. The eyes of this species are greatly reduced in size and are depigmented; the ocular tubercle is nearly obsolete; the body is generally depigmented; and the appendages are elongated.

Paraphrynus chiztun (Rowland)

Tarantula chiztun Rowland, 1973d:125, 126, 128, fig. 4, 6, 8, 10, 12, 14, 16, 18.
Paraphrynus chiztun: Mullinex, 1975:43.

Type-locality.—Las Grutas de Coconá, Teapa, Tabasco, México.

Distribution.—Known only from the type-locality. See Fig. 25.

Discussion.—This species is apparently most closely related to *P. chacmool*, but its relationship to

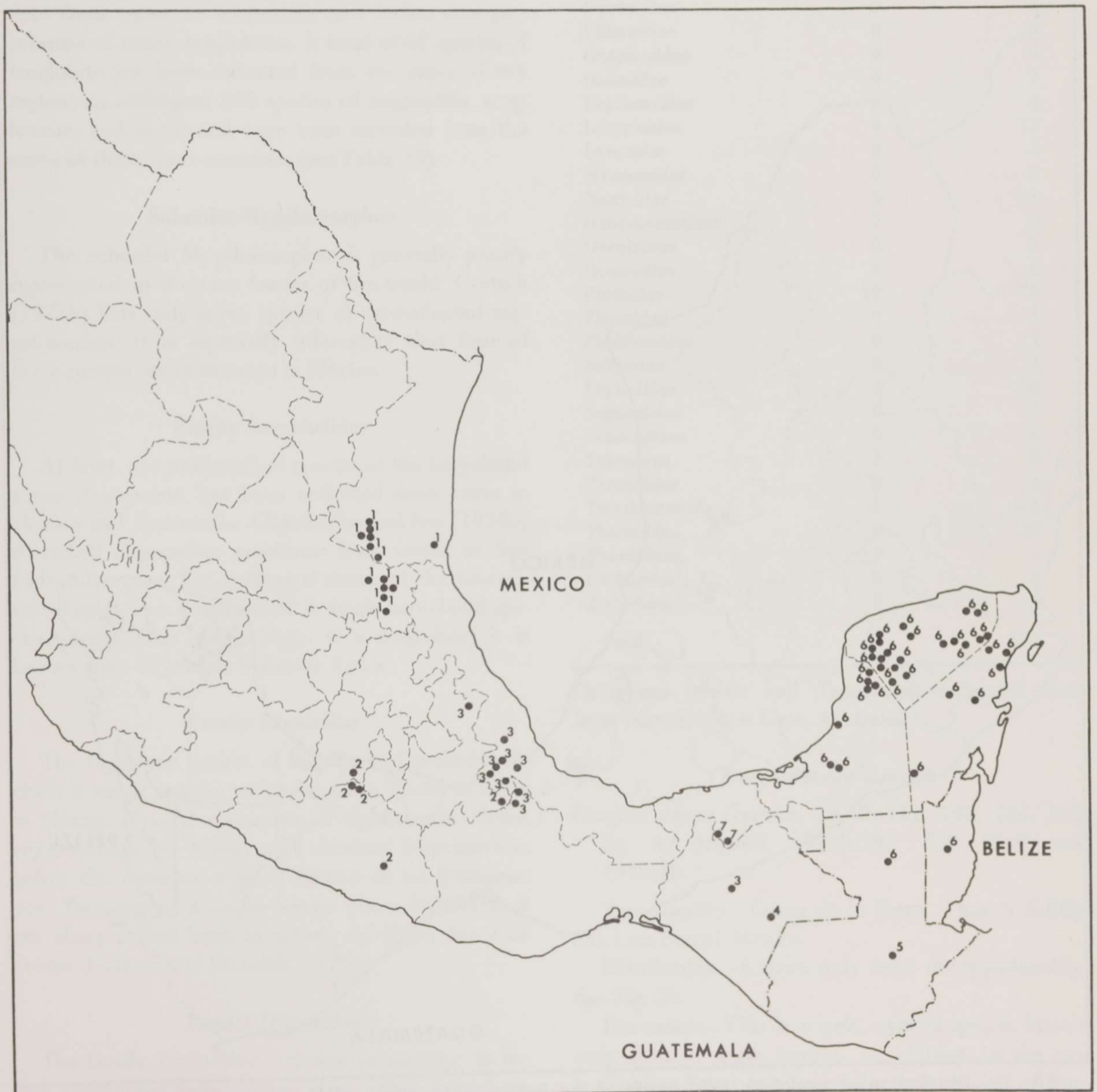

Fig. 24.—Distribution of troglophilic amblypygids of the family Phrynidae: 1, *Paraphrynus pococki;* 2, *Paraphrynus mexicanus;* 3, *Paraphrynus azteca;* 4, *Paraphrynus williamsi;* 5, *Paraphrynus emaciatus;* 6, *Paraphrynus raptator;* 7. *Phrynus* sp.

other members of the genus are unclear. Grutas del Coconá is also inhabited by a probably undescribed species of the genus *Phrynus*. *Paraphrynus chiztun* has been observed running across the walls of Grutas del Coconá near the end of the cave. *Phrynus* sp. was taken from flowstone and walls and beneath rocks much closer to the cave entrance. *Paraphrynus chiztun* has reduced and depigmented eyes, reduced ocular tubercle, depigmented body, and elongated appendages.

Paraphrynus reddelli Mullinex

Paraphrynus reddelli Mullinex, 1979:267-269, fig. 1-7.

Type-locality.—Actún Loltún, 7 km SSW Oxkutzcab, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 25.

Discussion.—This is a completely eyeless species; it is very different in many respects from other described species of *Paraphrynus* and its relationships are uncertain.

Paraphrynus velmae Mullinex

Paraphrynus velmae Mullinex, 1975:1, 9, 26-28, 40, 65, 66, 67, 78, fig. 25-26, 38.

Type-locality.—Sótano de Tlamaya, San Luis Potosí, México.

Fig. 25.—Distribution of troglobitic amblypygids of the families Charontidae and Phrynidae: 1, *Paraphrynus baeops;* 2, *P. velmae;* 3, *P. chiztun;* 4, *P. chacmool;* 5, *P. reddelli;* 6, *Paraphrynus* sp.; 7, Charontidae gen. et sp.

Distribution.—Known only from caves in the Xilitla and Aquismón regions, San Luis Potosí. See Fig. 25.

Records.—*San Luis Potosí:* Sótano de Huitzmolotitla and Sótano de Tlamaya.

New record.—*San Luis Potosí:* Cueva de San Rafael (det. C. Mullinex).

Discussion.—This species has the median ocular tubercle and median eyes completely missing.

Order Araneae

The spider fauna of the caves of México is one of the richer in the world, both in number of species and in number of troglobites. The few collections of spiders from caves in Guatemala and Belize also give promise of many troglobites. A total of 47 species of troglobite has been collected from the caves of this region; an additional 252 species of troglophile, trogloxene, and accidental have been recorded from the caves of these three countries (see Table 15).

Suborder Mygalomorphae

The suborder Mygalomorphae is generally poorly represented in the cave faunas of the world. Gertsch (1973b) lists only seven species of cave-adapted mygalomorph. It is especially interesting that four of these species are from caves in México.

Family Barychelidae

At least one unidentified species of the barychelid genus *Zygopelma* has been collected from caves in México and Guatemala. Chamberlin and Ivie (1938b) described *Zygopelma meridana* from Cueva de San Isidro, Yucatán. The ecological status of the cavernicole *Zygopelma* is unknown. A single barychelid species, *Troglothele coeca* Fage, is a troglobite; it is known from Grutas de Bellamar, Cuba.

Family Ctenizidae

The trap-door spiders of the family Ctenizidae include a single species which has been found in caves in México. Several specimens of *Cyclosomia (Chorizops) loricata* (C. Koch) were obtained from burrows below the entrance drop of Sótano de los Guacamayos, Tamaulipas; a single female was collected as it ran along a mud bank in Sótano del Tigre, San Luis Potosí (Gertsch and Platnick, 1975).

Family Dipluridae

The family Dipluridae includes, in addition to the two troglobites listed below, two other troglobitic diplurids: *Accola caeca* Simon from caves in the

Table 15.—Summary of cave inhabiting Araneae.

	Troglobites	Other Species
Mygalomorphae		
Barychelidae	0	1
Ctenizidae	0	1
Dipluridae	3	2
Theraphosidae	5	2
Araneomorphae		
Agelenidae	5	12
Amaurobiidae	0	2
Anyphaenidae	0	1
Araneidae	0	15
Caponiidae	0	1
Clubionidae	0	12
Ctenidae	0	2
Dictynidae	0	1
Dysderidae	0	1
Filistatidae	0	4
Gnaphosidae	0	4
Hahniidae	0	1
Leptonetidae	6	5
Linyphiidae	0	11
Lycosidae	0	3
Mysmenidae	0	8
Nesticidae	4	10
Ochyroceratidae	2	4
Oecobiidae	0	1
Oonopidae	1	6
Pholcidae	19	75
Pisauridae	0	1
Plectreuridae	0	2
Salticidae	0	4
Scytodidae	0	20
Segestriidae	0	1
Selenopidae	0	1
Telemidae	1	0
Tengellidae	0	1
Tetrablemmidae	1	1
Theridiidae	0	28
Thomisidae	0	3
Uloboridae	0	4
Zodariidae	0	1
Total	47	252

Philippine Islands and *Troglodiplura lowryi* Main from Roaches Rest Cave, Australia.

Euagrus anops Gertsch

Euagrus anops Gertsch, 1973b:141, 142, 144, 145, fig. 4; Brignoli, 1974b:199, 200; Hoffmann, 1976:16.

Type-locality.—Cueva de la Porra, 5 km N Xilitla, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 26.

Discussion.—This is a pale, eyeless species known only from a single female. In addition to the two troglobites listed here, several other species of *Euagrus* are known from caves in México, only one of which has been described. *Euagrus luteus* Gertsch is abundant in caves in the vicinity of Jalpan and Pinal de Amoles, Querétaro. It has small eyes and slightly attenuate appendages and is probably a troglophile. Brignoli (1974b) described *E. lynceus* from Cueva del Diablo, Huehuetenango, Guatemala; it is also a troglophile. A species of troglobite remains to be described from a cave in San Luis Potosí.

Euagrus cavernicola Gertsch

Euagrus cavernicola Gertsch, 1971a:47, 48-49; Reddell and Mitchell, 1971b:186, fig. 11; Brignoli, 1973b:327; Gertsch, 1973b:142, 145; Mitchell and Kawakatsu, 1973a:671, 673; Reddell, 1973a: 33, 38; Reddell and Elliott, 1973b:181; Brignoli, 1974b:199; Hoffmann, 1976:16.

Type-locality.—Cueva de la Capilla, El Porvenir, 13.5 km NW of Gómez Farías, Tamaulipas, México.

Distribution.—Known from three caves in the Sierra de Guatemala, Tamaulipas. See Fig. 26.

Records.—*Tamaulipas:* Cueva de la Capilla, Harrison Sinkhole, and Cueva de la Mina.

Discussion.—This pale, eyeless species is comparatively common in the caves of the Sierra de Guatemala, although no fully mature specimens have yet

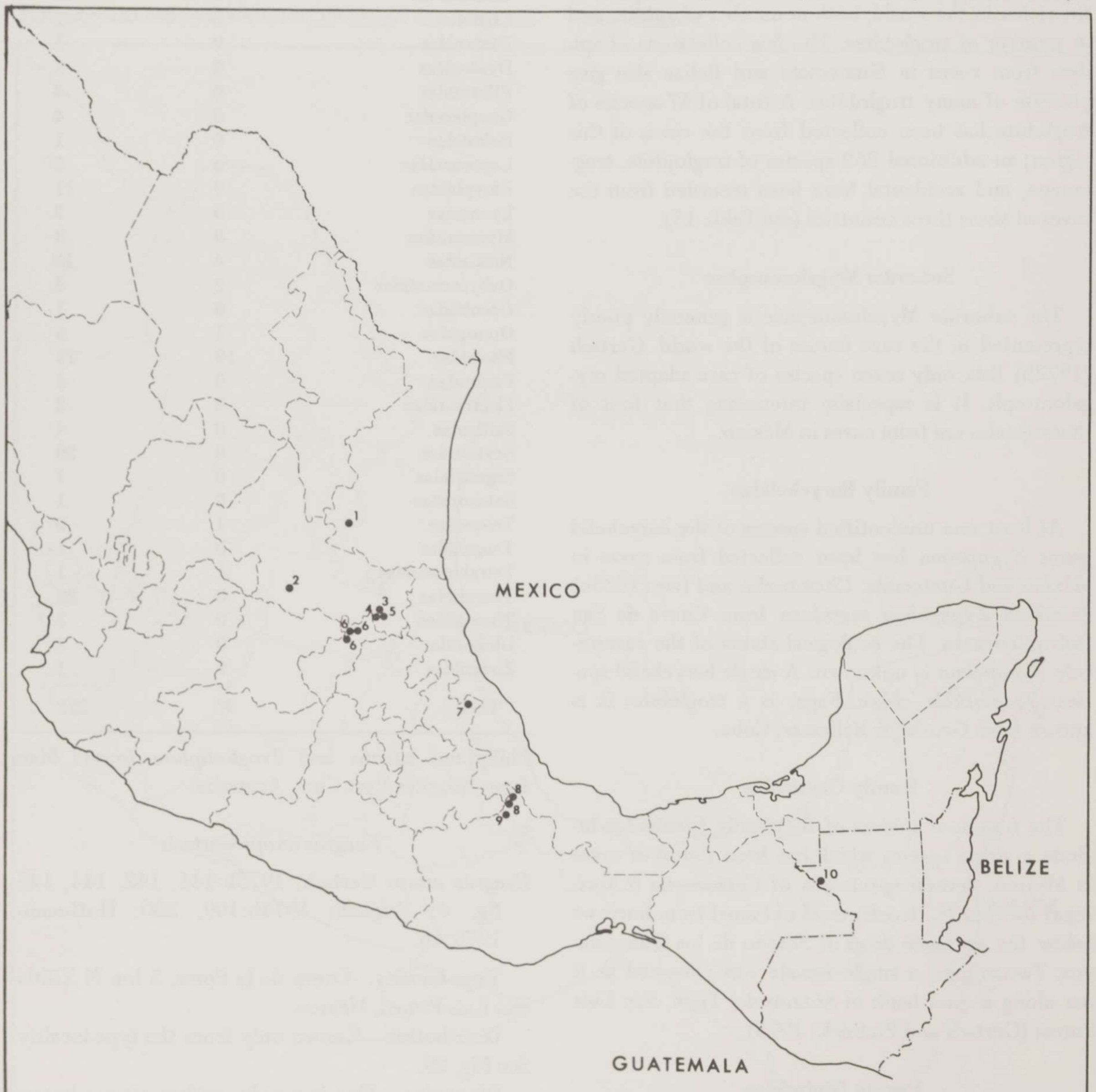

Fig. 26.—Distribution of troglobitic and troglophilic spiders of the suborder Mygalomorphae: 1, *Euagrus cavernicola;* 2, *Schizopelma elliotti;* 3, *Euagrus* n. sp.; 4, *S. stygia;* 5, *E. anops;* 6, *E. luteus;* 7, *Schizopelma* n. sp. 1; 8, *S. reddelli;* 9, *Schizopelma* n. sp. 2; 10, *E. lynceus.*

been collected. It is frequently found walking across moist flowstone.

Family Theraphosidae

Two species of blind *Schizopelma* have been described from Mexican caves and are discussed below. Large dark tarantulas are frequently found near cave entrances, but are probably only accidentals or trogloxenes. Until the taxonomy of this difficult group is better understood they await study.

Schizopelma reddelli Gertsch

Schizopelma reddelli Gertsch, 1973b:141, 142, 143-144, 146, fig. 1, 2b; Hoffmann, 1976:19.

Type-locality.—Cueva del Nacimiento del Río San Antonio, Oaxaca, México.

Distribution.—Known only from two caves near Acatlán, Oaxaca. See Fig. 26.

New record.—*Oaxaca:* Cueva de la Culebra (det. W. J. Gertsch).

Discussion.—This species is closely related to *S. stygia*. It is pale with greatly reduced eyes. It is known from three adult females. At the type-locality this species was collected from clay banks more than 2 km from the cave entrance. It was observed to roam over the clay, probably in search of a large undescribed species of troglobitic nicoletiid thysanuran which is abundant on the clay. A third species of *Schizopelma (S. elliotti* Gertsch) is a troglophile known only from Cueva de la Laguna, San Luis Potosí. Additional troglobitic species of theraphosid from Puebla and Oaxaca await description.

Schizopelma stygia (Gertsch)

Aphonopelma stygia Gertsch, 1971a:47-48, 49-50; Brignoli, 1973b:327; Reddell, 1973a:33, 38; Hoffmann, 1976:91.

Schizopelma stygia: Gertsch, 1973b:142-143, 144, fig. 1, 2a; Hoffmann, 1976:19, 91.

Type-locality.—Cueva de los Potrerillos, 1.5 km W of Ahuacatlán, San Luis Potosí, México.

Distribution.—Known only from two caves near Ahuacatlán, San Luis Potosí. See Fig. 26.

New record.—*San Luis Potosí:* Sótano del Pozo (det. W. J. Gertsch).

Discussion.—This pale species possesses reduced eyes. Although its legs are somewhat elongate, they are less so than in *S. reddelli*. Both species lack urticating hairs on the dorsum of the abdomen, an unusual feature and possibly one related to adaptation to the cave environment and its fewer large predators.

Suborder Araneomorphae

A total of 34 families of this suborder have been collected from caves in México, Guatemala, and Belize. Many of these are represented only by one or a few species of accidentals or trogloxenes and are not discussed here. Several families, however, have made significant contributions to the troglobitic and troglophilic fauna of caves in this area. Despite the fact that the spider fauna of this region already includes a large number of species, it should be emphasized that numerous species await description and that each visit to a new or poorly studied region results in the discovery of an entirely new complex of cave inhabiting species.

Family Agelenidae

The family Agelenidae includes 17 identified species from the area under consideration. The only two genera of interest, however, are *Cicurina* and *Tegenaria* (see Figs. 27-28). Each includes both troglobitic and troglophilic species. All described species of Mexican *Cicurina* are cavernicoles and are discussed below. *Tegenaria* includes two troglobitic and seven troglophilic species in Mexican caves. In addition to the two troglobites, the following species have been reported from Mexican caves: *T. decora* Gertsch (caves near Xilitla, San Luis Potosí), *T. florea* Brignoli (caves in Chiapas), *T. gertschi* Roth (caves in Coahuila and Nuevo León), *T. mexicana* Roth (caves in Morelos, Michoacán, and Guerrero), *T. rothi* Gertsch (Cueva de El Ocote, Hidalgo), *T. selva* (caves in San Luis Potosí and Tamaulipas), and *T. tlaxcala* Roth (underground water conduits in Tlaxcala and possibly lava caves near Jalapa, Veracruz). The genus in the Western Hemisphere has been reviewed by Roth (1968).

Cicurina (Cicurella) coahuila Gertsch

Cicurina coahuila Gertsch, 1971a:48, 110-111; Brignoli, 1972:151; Reddell, 1973a:33, 38; Hoffmann, 1976:46.

Type-locality.—Cueva de los Lagos, 24 km W of Ciudad Acuña, Coahuila, México.

Distribution.—Known only from the type-locality. See Fig. 27.

Discussion.—This species is closely related to *C. buwata* Chamberlin and Ivie, a blind species living in caves in Central Texas. It is clearly a member of a complex of troglobitic species ranging throughout Central Texas, most of which await description. Cueva de los Lagos has unfortunately been covered by the waters of the Amistad Reservoir.

Cicurina (Cicurella) maya Gertsch

Cicurina maya Gertsch, 1977b:127-128, 129, fig. 86; Reddell, 1977b:230, 239, 240, 241, 269.
Cicurina, eyeless species: Gertsch, 1977b:103.

Type-locality.—Actún Tucil, 2 km S Muna, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 27.

Discussion.—This small eyeless species is related to *C. buwata* of Texas. It is the only species of the genus known south of Tamaulipas.

Cicurina (Cicurusta) mina Gertsch

Cicurina mina Gertsch, 1971a:48, 108, 110, fig. 166-167; Reddell and Mitchell, 1971b:185; Mitchell and Kawakatsu, 1973a:673; Reddell, 1973a:33, 38; Hoffmann, 1976:46.
Cicurina (Cicurusta) mina: Brignoli, 1972:149-150, 151-152, fig. 5(43); Reddell and Elliott, 1973b: 181, 184.
Circurina mina: Mitchell and Kawakatsu, 1973a:671 (erroneous spelling).

Type-locality.—Cueva de la Capilla, 13.5 km NW of Gómez Farías, Tamaulipas, México.

Fig. 27.—Distribution of troglobitic and troglophilic spiders of the genus *Cicurina:* 1, *Cicurina coahuila;* 2, *C. mina;* 3, *C. iviei;* 4, *C. maya;* 5, *Cicurina* spp.

Distribution.—Known from two caves in the Sierra de Guatemala, Tamaulipas. See Fig. 27.

Records.—*Tamaulipas:* Cueva de la Capilla and Cueva de la Mina.

Discussion.—This species is very closely related to *C. iviei* Gertsch, a troglophile known from Cueva de la Mina and Harrison Sinkhole, Tamaulipas. Brignoli (1972) found few differences, other than eyelessness, between the two species and is apparently not convinced that they are specifically distinct.

Tegenaria blanda Gertsch

Tegenaria blanda Gertsch, 1971a:105-106; Reddell and Mitchell, 1971b:185; Reddell, 1973a:38; Brignoli, 1974b:230; Hoffmann, 1976:47.

Type-locality.—Cueva de la Capilla, 13.5 km NW of Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 28.

Discussion.—This is a pale orange, long-legged species with reduced eyes.

Tegenaria caverna Gertsch

Tegenaria caverna Gertsch, 1971a:105, 106-107, fig. 158-161; Roth and Brame, 1972:3; Reddell, 1973a:38; Brignoli, 1974b:230; Hoffmann, 1976: 47.

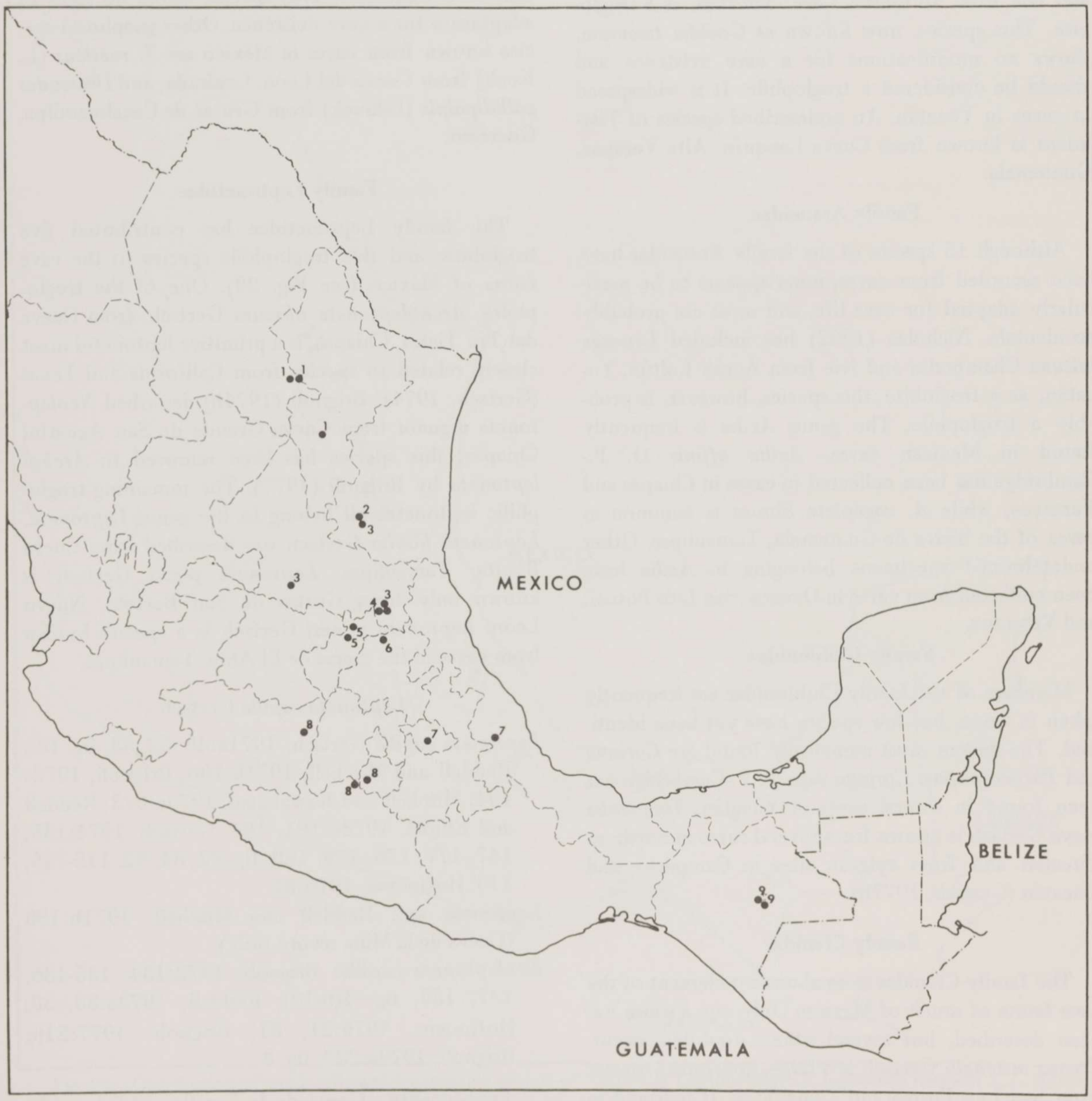

Fig. 28.—Distribution of troglobitic and troglophilic spiders of the genus *Tegenaria:* 1, *Tegenaria gertschi;* 2, *T. blanda;* 3, *T. selva;* 4, *T. decora;* 5, *T. caverna;* 6, *T. rothi;* 7, *T. tlaxcala;* 8, *T. mexicana;* 9, *T. florea.*

Type-locality.—Cueva del Puerto del León, 6.5 km SE of Río Blanco, Querétaro, México.

Distribution.—Known only from three caves in Querétaro. See Fig. 28.

New records.—*Querétaro:* Cueva de los Otates and Cueva de Penalta (det. W. J. Gertsch).

Discussion.—This pale, orange-brown species has the eyes greatly reduced in size. It is apparently closely related to *T. blanda*.

Family Amaurobiidae

The family Amaurobiidae includes one species which has been identified from a cave in México. Nicholas (1962) lists *Titanoeca tizamina* Chamberlin and Ivie from Muruztún Cave, Yucatán, as a troglobite. This species, now known as *Goeldia tizamina*, shows no modifications for a cave existence and should be considered a troglophile. It is widespread in caves in Yucatán. An undescribed species of *Titanoeca* is known from Cueva Lanquín, Alta Verapaz, Guatemala.

Family Araneidae

Although 15 species of the family Araneidae have been recorded from caves, none appears to be particularly adapted for cave life, and most are probably accidentals. Nicholas (1962) has included *Leucage loltuna* Chamberlin and Ivie from Actún Loltún, Yucatán, as a troglobite; this species, however, is probably a troglophile. The genus *Azilia* is frequently found in Mexican caves. *Azilia affinis* O. P.-Cambridge has been collected in caves in Chiapas and Veracruz, while *A. vagepicta* Simon is common in caves of the Sierra de Guatemala, Tamaulipas. Other undetermined specimens belonging to *Azilia* have been collected from caves in Oaxaca, San Luis Potosí, and Veracruz.

Family Clubionidae

Members of the family Clubionidae are frequently taken in caves, but few species have yet been identified. The genera most commonly found are *Corinna* and *Phrurotimpus. Corinna saga* F. P.-Cambridge has been found in several caves in Yucatán. *Tixcocoba maya* Gertsch is known from several caves in northern Yucatán and from epigean sites in Campeche and Yucatán (Gertsch, 1977b).

Family Ctenidae

The family Ctenidae is an abundant element of the cave fauna of much of México. Only one species has been described, but several others doubtless occur. *Ctenus mitchelli* Gertsch is a large, interesting species from San Luis Potosí and Tamaulipas. It is found in all parts of caves but may be seen most often on the walls of dark rooms near the cave entrance. It probably should be classified as a troglophile.

Family Filistatidae

Five species of the family Filistatidae are known to occur in Mexican caves, but only one is of particular interest. An undescribed species of *Filistatoides* has been found in numerous caves in Nuevo León and Coahuila. It is probably a troglophile.

Family Gnaphosidae

Nicholas (1962) listed the gnaphosid *Zelotes mayanus* Chamberlin and Ivie from Actún Sabacá, Yucatán, as a troglobite. This species shows no signs of adaptation for a cave existence. Other gnaphosid species known from caves in México are *Z. rusticus* (L. Koch) from Cueva del León, Coahuila, and *Drassodes pallidipalpis* (Bilimek) from Grutas de Cacahuamilpa, Guerrero.

Family Leptonetidae

The family Leptonetidae has contributed five troglobitic and five troglophilic species to the cave fauna of México (see Fig. 29). One of the troglophiles, *Archoleptoneta obscura* Gertsch, from Cueva del Tío Ticho, Chiapas, is a primitive leptonetid most closely related to species from California and Texas (Gertsch, 1974). Brignoli (1974b) described *Neoleptoneta arganoi* from Cueva Grande de San Agustín, Chiapas; this species has been removed to *Archoleptoneta* by Brignoli (1977). The remaining troglophilic leptonetds all belong in the genus *Leptoneta. Leptoneta bonita* Gertsch was described from Cueva Bonita, Tamaulipas. *Leptoneta pecki* Gertsch is known only from Grutas de San Bartolo, Nuevo León. *Leptoneta rainesi* Gertsch is a species known from caves in the Sierra de El Abra, Tamaulipas.

Leptoneta capilla Gertsch

Leptoneta capilla Gertsch, 1971a:48, 52, 53, fig. 1-2; Reddell and Mitchell, 1971b:186; Brignoli, 1972: 134; Mitchell and Kawakatsu, 1973a:673; Reddell and Elliott, 1973b:181, 184; Gertsch, 1974:145, 147, 177, 178, 179, 180, fig. 82, 84, 92, 115-116, 119; Hoffmann, 1976:81.

Leptoneta sp.: Reddell and Mitchell, 1971b:186 (Cueva de la Mina record only).

Neoleptoneta capilla: Brignoli, 1972:134, 135-136, 137, 139, fig. 1(6-10); Reddell, 1973a:33, 38; Hoffmann, 1976:21, 81; Brignoli, 1977:216; Brignoli, 1979a:233, fig. 4.

Type-locality.—Cueva de la Capilla, 13.5 km NW of Gómez Farías, Tamaulipas, México.

Distribution.—Known from three caves in the Sierra de Guatemala, Tamaulipas. See Fig. 29.

Records.—*Tamaulipas:* Cueva de la Capilla and Cueva de la Mina.

New record.—*Tamaulipas:* Cueva de las Perlas (det. W. J. Gertsch).

Discussion.—This is a pale, eyeless species with long legs, although a single, eyed male from Cueva de la Mina indicates that the eyed condition has not been "completely erased from the genes" (Gertsch, 1974). An undescribed blind *Leptoneta* has recently been collected from caves in the Cuetzalan area of Puebla.

Leptoneta delicata Gertsch

Leptoneta delicata Gertsch, 1971a:52-53, fig. 3-4; Gertsch, 1974:178, 179, 182, fig. 91, 113-114, 124; Hoffmann, 1976:81.

Neoleptoneta delicata: Brignoli, 1972:136-137; Reddell, 1973a:38; Hoffmann, 1976:21, 81; Brignoli, 1977:216.

Type-locality.—Iron mine at road, 2 km E of Pinal de Amoles, Querétaro, México.

Distribution.—Known only from the type-locality. See Fig. 29.

Discussion.—This pale species with reduced eyes is most closely related to *L. capilla.* The "iron mine" is

Fig. 29.—Distribution of troglobitic and troglophilic spiders of the family Leptonetidae: 1, *Leptoneta limpida;* 2, *L. isolata;* 3, *L. pecki;* 4, *L. reclusa;* 5, *L. bonita;* 6, *L. capilla;* 7, *L. rainesi;* 8, *L. delicata;* 9, *Leptoneta* n. sp.; 10, *Archoleptoneta arganoi;* 11, *A. obscura.*

actually a natural cave artificially enlarged by mercury (not iron) miners.

Leptoneta isolata Gertsch

Leptoneta: Reddell, 1967c:55.

Leptoneta isolata Gertsch, 1971a:48, 51, 52, 53, fig. 9-11; Gertsch, 1974:145, 178, 179, 180-181, fig. 94, 107-108, 123; Hoffmann, 1976:81.

Neoleptoneta isolata: Brignoli, 1972:137; Reddell, 1973a:33, 38; Hoffmann, 1976:21, 81; Brignoli, 1977:216.

Type-locality.—Grutas de García (=Grutas de Villa de García), Nuevo León, México.

Distribution.—Known only from caves in Nuevo León and Tamaulipas. See Fig. 29.

New record.—*Tamaulipas:* Cueva de California (det. W. J. Gertsch).

Discussion.—This is a pale, essentially eyeless species related to the troglophile *L. pecki.*

Leptoneta limpida Gertsch

Leptoneta limpida Gertsch, 1974:166, 174-175, fig. 60, 79; Hoffmann, 1976:113; Reddell, 1977a:90.

Neoleptoneta limpida: Brignoli, 1977:216; Brignoli, 1979:437.

Type-locality.—Cueva de los Riscos, 4 km S Mapimí, Durango, Mexico.

Distribution.—Known only from the type-locality. See Fig. 29.

Discussion.—This pale, long-legged cavernicole has reduced eyes. It is more closely related to the cave inhabiting species of the genus from Central Texas than to the Mexican cave species. It was found in small webs at the junction of wall and floor in a small side room near the end of the cave.

Leptoneta reclusa Gertsch

Leptoneta reclusa Gertsch, 1971a:53-54, fig. 12-13; Gertsch, 1974:178, 179, 184, fig. 86, 95, 111-112, 117; Hoffmann, 1976:82.

Neoleptoneta reclusa: Brignoli, 1972:137; Reddell, 1973a:38; Hoffmann, 1976:21, 82; Brignoli, 1977:215.

Type-locality.—Cueva de Chorros de Agua, 20 km W of Montemorelos, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 29.

Discussion.—This pale species with reduced eyes is most closely related to *L. capilla.*

Family Linyphiidae

Although nine species of linyphiid have been collected from caves in this area, none show any signs of adaptation for a cave existence. *Erigone tamazunchalensis* Gertsch and Davis has been found in several caves in San Luis Potosí and Puebla; *Jalapyphantes* is represented by at least two species from caves in México and Guatemala; and the genus *Meioneta* includes several species in caves throughout México.

Family Mysmenidae

The family Mysmenidae is represented in Mexican caves by seven species of the genus *Maymena* (Gertsch, 1960, 1971a, 1973a; Brignoli, 1974) (see Fig. 30). One of these, *M. mayana* (Chamberlin and Ivie), ranges south from Oaxaca into Belize and Guatemala, where it also inhabits caves. Some specimens from caves have reduced eyes. The remaining six species are known only from caves in México: *M. cascada* Gertsch from Oaxaca and Veracruz; *M. chica* Gertsch from Nuevo León, San Luis Potosí, and Tamaulipas; *M. delicata* Gertsch from Oaxaca and Veracruz; *M. grisea* Gertsch from Tamaulipas; *M. misteca* Gertsch from Guerrero and Oaxaca; and *M. sbordonii* Brignoli from Chiapas. Undescribed species are known from caves in Campeche, Oaxaca, Puebla, and Veracruz. Although Nicholas (1962) lists *M. misteca* and *M. mayana* as troglobites, no species of the genus shows extreme adaptations for a cave existence and all should probably be considered troglophiles.

Family Nesticidae

Among the more important elements in the cave fauna of México are the spiders of the family Nesticidae. Species of the genera *Nesticus*, *Eidmannella*, and *Gaucelmus* are frequently found in caves in this region. Gertsch (in press) has revised the family in North America, Central America, and the West Indies. Two species of described *Nesticus* are considered here to be troglobites, and an additional two species are troglophiles: *Nesticus hoffmanni* Gertsch from caves in Hidalgo and *N. vazquezi* Gertsch from caves in Querétaro (see Fig. 31). Five troglophilic species from caves in Querétaro, Oaxaca, and Tamaulipas remain undescribed. *Eidmannella pallida* (Emerton) ranges south from the United States into Guatemala and has been recorded from essentially every state in México for which we have cave collections (see Fig. 32). An undescribed troglophile of the genus is known only from Cueva de El Pachón, Tamaulipas. The genus *Gaucelmus* is represented by three species: *G. calidus* Gertsch ranges north from Huehuetenango, Guatemala, into Hidalgo, México; *G. augustinus* Keyserling is a troglophile in caves from Guatemala into the United States; *G. strinatii* Brignoli was recently described from Cueva Chirrepeck, Alta Verapaz, Guatemala (Brignoli, 1979b).

Nesticus arganoi Brignoli

Nesticus arganoi Brignoli, 1972:148-149, fig. 5(40-42); Hoffmann, 1976:39.

Type-locality.—Cueva de Ojo de Agua de Tlilapan no. 2 (=Cueva Macinga), Orizaba, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 31.

Discussion.—This is the only described eyeless *Nesticus* from México. It appears to be most closely related to *N. nahuanus*. A second eyeless species of *Nesticus* has been collected recently in a cave near Zoquitlán, Puebla.

Nesticus nahuanus Gertsch

Nesticus nahuanus Gertsch, 1971a:99-100, fig. 151, 156; Brignoli, 1972:149; Reddell, 1973a:38; Hoffmann, 1976:39.

Nesticus nahnanus: Guéorguiev, 1974:682 (erroneous spelling).

Type-locality.—Cueva de la Boca, 6 km SE of Santiago, Nuevo León, México.

Distribution.—Known from caves in Nuevo León. See Fig. 31.

Records.—*Nuevo León:* Small caves (Cuesta de Chipinque), Cueva de la Boca, and Resumidero del Pablillo.

Fig. 30.—Distribution of troglophilic spiders of the family Mysmenidae: 1, *Maymena chica;* 2, *M. grisea;* 3, *M. misteca;* 4, *M. delicata;* 5, *M. mayana;* 6, *M. cascada;* 7, *M. sbordonii.*

Discussion.—This large species has the eyes reduced to small, evanescent spots in most individuals. Although not as highly cave adapted as *N. arganoi*, this species is almost certainly committed to a cave existence.

Family Ochyroceratidae

The tropical family Ochyroceratidae includes two apparent troglobitic and three troglophilic species (see Fig. 34). *Ochyrocera fagei* Brignoli is known from Cueva del Panteón, Chiapas; *O. formosa* Gertsch was described from Gruta del Silvino, Izabal, Guatemala; and an undescribed species of *Ochyrocera* has recently been collected in Grutas de Balankanche, Yucatán. In addition to the two troglobites discussed below, cave-adapted species of this family are known from Jamaica and the Hawaiian Islands.

Theotima martha Gertsch

Theotima martha Gertsch, 1977b:126; Reddell, 1977b:232, 239, 240, 291. Brignoli, 1979c:597.

Type-locality.—Cueva Sodzil, 3 km W Sucopo, Yucatán, México.

Distribution.—Known only from the type-locality and possibly one cave in Quintana Roo. See Fig. 34.

Fig. 31.—Distribution of troglobitic and troglophilic spiders of the genera *Eidmannella* and *Nesticus*: 1, *Nesticus nahuanus*; 2, *Nesticus* n. sp. 1; 3, *Eidmannella* n. sp.; 4, *Nesticus* n. sp. 2-3; 5, *N. hoffmanni*; 6, *N. vasquezi*; 7, *Nesticus* n. sp. 4; 8, *N. arganoi*; 9, *Nesticus* n. sp. 5; 10, *Nesticus* n. sp. 6.

New record.—*Quintana Roo:* ?Cueva de la Abispa (det. W. J. Gertsch).

Discussion.—This is a pale yellow species with long legs and reduced eyes. It is closely related to *T. ruina* Gertsch from Las Ruinas de Palenque, Chiapas.

Theotima pura Gertsch

Theotima pura Gertsch, 1973b:141, 155; Reddell and Elliott, 1973b:181, 184; Hoffmann, 1976:24; Shear, 1976:249; Gertsch, 1977b:125; Brignoli, 1978:15, 16. Brignoli, 1979c:597.

Type-locality.—Cueva de los Vampiros, 20 km NW El Limón, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 34.

Discussion.—This species is known only by a single eyeless female. It is the first, and only eyeless, species of the family known from Mexican caves.

Family Oonopidae

One troglobitic oonopid, *Oonops coecus* (Chamberlin and Ivie), is known from México. Other cave-dwelling oonopids of interest include *O. chickeringi* Brignoli from Cueva del Panteón, Chiapas; *O. mitchelli* Gertsch from Actún Xpukil, Yucatán; *O. reddelli* Gertsch from Actún Tucil, Yucatán; *Triaeris lacandona* Brignoli from Cueva de Yaxchilán, Guatemala:

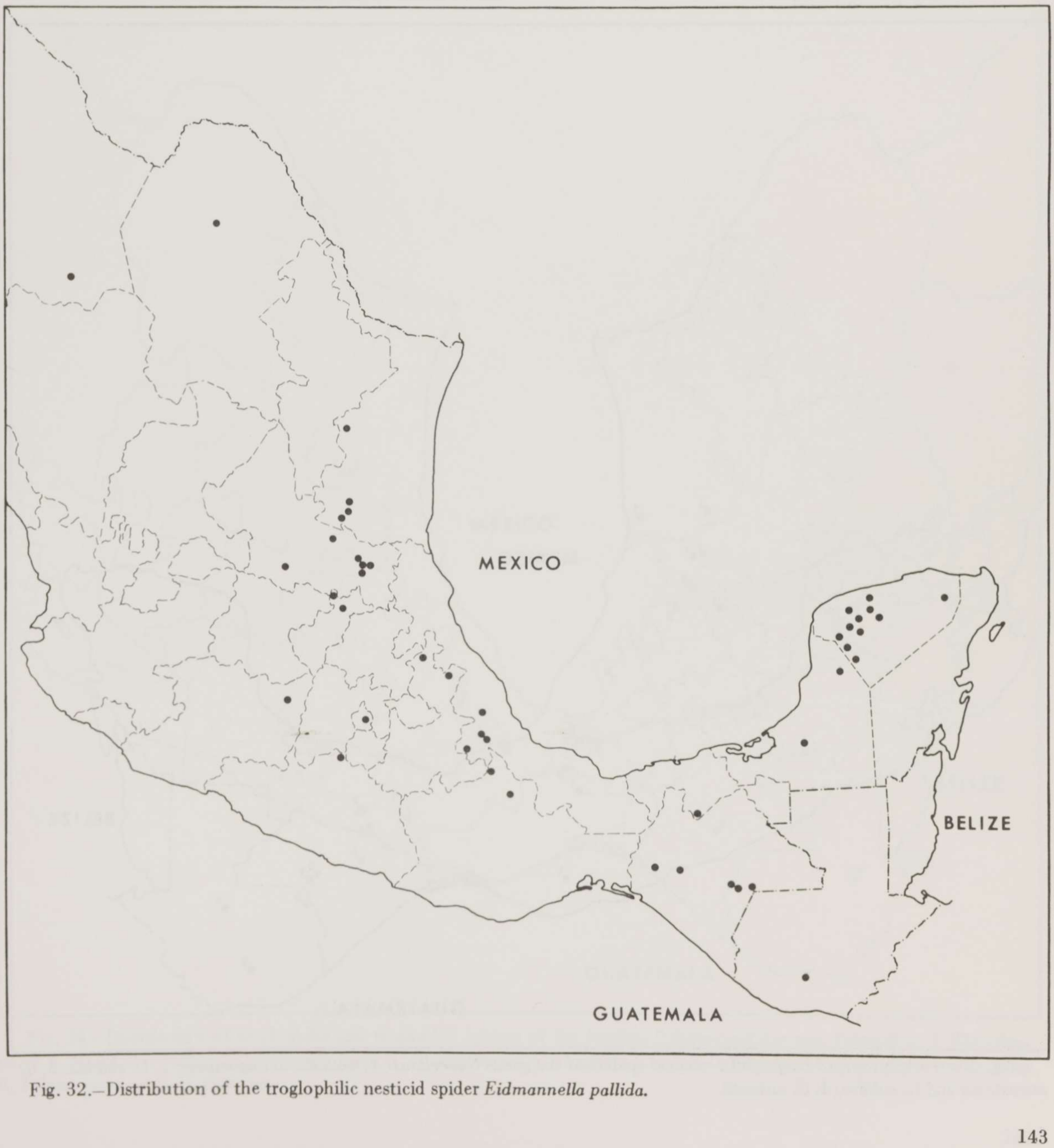

Fig. 32.—Distribution of the troglophilic nesticid spider *Eidmannella pallida*.

and *T. patellaris* Bryant from caves in Campeche, Oaxaca, Quintana Roo, Tabasco, San Luis Potosí, and Veracruz, México, and Alta Verapaz, Guatemala.

Oonops coecus (Chamberlin and Ivie)

Wanops coecus Chamberlin and Ivie, 1938b:123, 125, fig. 1-2; Pearse, 1945:155; Nicholas, 1962:181; Gertsch, 1971a:47, 48, 56; Reddell, 1971b:31; Brignoli, 1972:153; Brignoli, 1973b:328; Gertsch, 1973a:164; Hoffmann, 1976:21; Gertsch, 1977b: 103, 120; Reddell, 1977b:232.

Oonops coecus: Gertsch, 1977b:120, 121, fig. 64-66; Reddell, 1977b:232, 240, 241, 245, 246, 253, 259, 260, 279, 281, 285.

Type-locality.—Balaam Canche Cave (=Grutas de Balankanche), Chichén Itzá, Yucatán, México.

Distribution.—Known from caves in the Yucatán Peninsula, México. See Fig. 35.

Records.—*Campeche:* Actún Huachap and Grutas de Xkalumkín; *Quintana Roo:* Cenote de Santo Domingo; *Yucatán:* Grutas de Balankanche and Cueva Escondida.

New record.—*Quintana Roo:* Cenote de Tos Virlol (det. W. J. Gertsch).

Discussion.—This eyeless species is closely related to *O. mitchelli* and *O. reddelli.* It is usually found beneath small rocks on silt.

Fig. 33.—Distribution of troglophilic nesticid spiders of the genus *Gaucelmus:* 1, *Gaucelmus augustinus;* 2, *G. calidus;* 3, *G. augustinus* and *G. calidus;* 4, *G. strinatii.*

Family Pholcidae

Without doubt, the most important family that has invaded caves in México and Central America is the Pholcidae. A total of 94 species of pholcid is already known to inhabit caves in this region; 19 of these are troglobites.

Seven described species of the genus *Coryssocnemis* have been identified from caves in México (Gertsch, 1971a, 1973b; Brignoli, 1974b): *C. abernathyi* Gertsch from San Luis Potosí, Tamaulipas, Oaxaca, and Puebla; *C. clarus* Gertsch from Tamaulipas; *C. facetus* Gertsch and *C. pecki* Gertsch from Chiapas; *C. iviei* Gertsch from Hidalgo, Querétaro, and San Luis Potosí; *C. placidus* Gertsch from Veracruz; and *C. simoni* O. P.-Cambridge from Coahuila, Hidalgo, Nuevo León, Oaxaca, and Querétaro. Several undescribed species have been collected recently. These spiders are usually found hanging in webs, usually in the vicinity of the cave entrance. See Fig. 36 for the distribution of the species of this genus in Mexican caves.

The genus *Physocyclus* is known from caves throughout much of México (Gertsch, 1971a, 1973b; Brignoli, 1974b), although many species appear to be

Fig. 34.—Distribution of troglophilic and troglobitic spiders of the families Ochyroceratidae and Telemidae: 1, *Theotima pura;* 2, *Matta sbordonii;* 3, *Ochyrocera fagei;* 4, *M. mckenziei;* 5, *Theotima* n. sp.; 6, *Ochyrocera* n. sp.; 7, *Theotima martha;* 8, *Telema mayana;* 9, *O. formosa.*

restricted to the Mexican Plateau (see Fig. 37). Nicholas (1962) lists *P. hoogstraali* Gertsch and Davis as a troglobite, but it like all species of the genus is presumably a troglophile. *Physocyclus* is also usually found hanging in webs in the vicinity of the cave entrance. Although its distribution overlaps that of *Coryssocnemis*, the genus seems to be more commonly found in caves in the arid regions of México. Eleven species have been reported from Mexican caves: *P. bicornis* Gertsch and *P. modestus* Gertsch from Guerrero; *P. enaulus* Crosby from Chihuahua and Coahuila; *P. globosus* (Taczanowski) from Chiapas, San Luis Potosí, Veracruz, and Yucatán; *P. hoogstraali* Gertsch and Davis from Coahuila and Nuevo León; *P. lautus* Gertsch and *P. validus* Gertsch from Colima; *P. merus* Gertsch from San Luis Potosí; *P. pedregosus* Gertsch from Coahuila; *P. reddelli* Gertsch from Hidalgo, Querétaro, and San Luis Potosí; and *P. tanneri* Gertsch from Sonora.

The genus *Modisimus* includes 12 described species which have been identified from caves in México and Guatemala (Gertsch, 1971a, 1973b; Brignoli, 1974b): *M. beneficus* Gertsch from Veracruz; *M. boneti* Gertsch and *M. texanus* Banks from San Luis Potosí and Tamaulipas; *M. iviei* Gertsch from Quintana Roo, Tabasco, and Yucatán; *M. mckenziei* Gertsch, *M. mitchelli* Gertsch, and *M. reddelli* Gertsch from Tamaulipas; *M. propinquus* O. P.-Cambridge and *M.*

Fig. 35.—Distribution of troglophilic and troglobitic spiders of the family Oonopidae: 1, *Triaeris patellaris;* 2, *Oonops chickeringi;* 3, *O. coecus;* 4, *O. mitchelli;* 5, *O. reddelli;* 6, *T. lacandonus.*

tzotzile Brignoli from Chiapas; *M. pusillus* Gertsch from Nuevo León; *M. rainesi* Gertsch from Nuevo León and Tamaulipas; and *M. gracilipes* Gertsch from Alta Verapaz, Guatemala. Three undescribed species are known from caves in Veracruz. All of the cavernicole species of the genus are presumably troglophiles. These spiders are found in all parts of the caves, where they hang in delicate webs along the walls or among speleothems. See Fig. 38 for the distribution of this genus in the caves of the region.

The best-represented genus of spider in the caves of México, Guatemala, and Belize is *Metagonia* (see Figs. 39-41). Eight species are considered to be troglobites and are discussed below. The remaining 17 species are troglophiles (Chamberlin and Ivie, 1938b; Gertsch, 1971a, 1973b, 1977b; Brignoli, 1972, 1974b): *M. amica* Gertsch, *M. pasquinii* Brignoli, and *M. punctata* Gertsch from San Luis Potosí; *M. candela* Gertsch and *M. serena* Gertsch from Nuevo León; *M. capilla* Gertsch, *M. secreta* Gertsch, and *M. suzanne* Gertsch from Tamaulipas; M. *coahuila* Gertsch from Coahuila; *M. iviei* Gertsch from Quintana Roo and Yucatán; *M. mcnatti* Gertsch from Chiapas; *M. maximiliani* Brignoli from Querétaro; *M.*

Fig. 36.–Distribution of troglophilic pholcid spiders of the genus *Coryssocnemis:* 1, *Coryssocnemis simoni;* 2, *C. abernathyi;* 3, *C. clarus;* 4, *C. iviei;* 5, *C. iviei* and *C. simoni;* 6, *Coryssocnemis* n. sp. 1; 7, *Coryssocnemis* n. sp. 2; 8, *Coryssocnemis* n. sp. 3; 9, *C. placidus;* 10, *Coryssocnemis* n. sp. 4; 11, *C. facetus;* 12, *C. pecki.*

maya Chamberlin and Ivie from Campeche, Quintana Roo, and Yucatán; *M. placida* Gertsch from Nuevo León and Tamaulipas; *M. tinaja* Gertsch from San Luis Potosí and Tamaulipas; *M. yucatana* Chamberlin and Ivie from Campeche and Yucatán; and *M. blanda* Gertsch from Izabal and Alta Verapaz, Guatemala. Undescribed troglobites and troglophiles are known from caves in Puebla and Veracruz.

The genus *Pholcophora* is also well represented in the caves of México and Guatemala (Chamberlin and Ivie, 1938b; Gertsch, 1971a, 1977b) (see Fig. 42). Three species are considered to be troglobites and are discussed below. The remaining nine species are troglophiles: *P. bispinosa* Gertsch and *P. evansi* Gertsch from Chiapas; *P. bolivari* Gertsch and *P. mitchelli* Gertsch from Tamaulipas; *P. elliotti* Gertsch from San Luis Potosí; *P. maria* Gertsch from Yucatán; *P. speophila* (Chamberlin and Ivie) from Campeche and Yucatán; *P. troglodyta* Gertsch from Veracruz; and *P. quieta* Gertsch from Izabal, Guatemala. Undescribed species of the genus, including four troglobites, are known from caves in Oaxaca, Puebla, Veracruz, and Campeche.

The genus *Psilochorus* is known from caves in México from near the border of the United States to Guerrero and Oaxaca (see Fig. 43). Two species are tentatively considered to be troglobites and are discussed below. The remaining six species are probable

Fig. 37.—Distribution of troglophilic pholcid spiders of the genus *Physocyclus:* 1, *Physocyclus enaulus;* 2, *P. hoogstraali;* 3, *P. pedregosus;* 4, *P. merus;* 5, *P. reddelli;* 6, *P. globosus;* 7, *P. lautus* and *P. validus;* 8, *P. modestus;* 9, *P. bicornis.*

troglophiles: *P. concinnus* Gertsch from San Luis Potosí; *P. cordatus* (Bilimek) and *P. tellezi* Gertsch from Guerrero; *P. fishi* Gertsch from Hidalgo; *P. murphyi* Gertsch from Oaxaca; and *P. russelli* Gertsch from Coahuila. An undescribed species is a probable troglophile in the caves of Veracruz.

Metagonia atoyacae Gertsch

Metagonia atoyacae Gertsch, 1971a:48, 87-88, fig. 123, 129; Gertsch, 1973b:152; Reddell, 1973a:33, 38; Hoffmann, 1976:25.

Type-locality.—Grutas de Atoyac, Atoyac, Veracruz, México.

Distribution.—Known only from two caves in Veracruz. See Fig. 39.

New record.—*Veracruz:* Grutas de Abejas (det. W. J. Gertsch).

Discussion.—This pale, eyeless species is related to *M. tlamaya* Gertsch, *M. pura* Gertsch, and other members of the *tinaja* group. All of the troglobitic species of *Metagonia* form a single close-knit group of species. It is interesting to note that six of the troglobites are from lowland tropical caves.

Fig. 38.—Distribution of troglophilic pholcid spiders of the genus *Modisimus:* 1, *Modisimus pusillus;* 2, *M. rainesi;* 3, *M. mckenziei, M. mitchelli,* and *M. reddelli;* 4, *M. reddelli;* 5, *M. mitchelli;* 6, *M. mckenziei;* 7, *M. boneti;* 8, *M. texanus;* 9, *M. texanus* and *M. boneti;* 10, *Modisimus* n. sp. 1; 11, *Modisimus* n. sp. 2; 12, *Modisimus* n. sp. 3; 13, *M. beneficus;* 14, *M. tzotzile;* 15, *M. propinquus;* 16, *M. iviei;* 17, *M. gracilipes.*

Metagonia chiquita Gertsch

Metagonia chiquita Gertsch, 1977b:103, 105, fig. 31-32; Reddell, 1977b:232, 239, 240, 279.

Type-locality.—Cenote Chen Mul, Ruinas de Mayapán, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 39.

Discussion.—This small, eyeless species was taken from beneath a rock on bat guano in an inner chamber of Cenote Chen Mul.

Metagonia jarmila Gertsch

Metagonia jarmila Gertsch, 1973b:141, 147, 154, fig. 24-26.

Type-locality.—Bucks Bypass Cave, Caves Branch, Belize.

Distribution.—Known only from two caves near Caves Branch, Belize. See Fig. 39.

Records.—BELIZE: *Cayo District:* Bucks Bypass Cave and St. Hermans Cave.

Discussion.—This is a pale, essentially eyeless species related to *M. tinaja*. It is the only troglobitic spider known from Belize.

Metagonia martha Gertsch

Metagonia martha Gertsch, 1973b:141, 147, 153-154, fig. 27; Hoffmann, 1976:25.

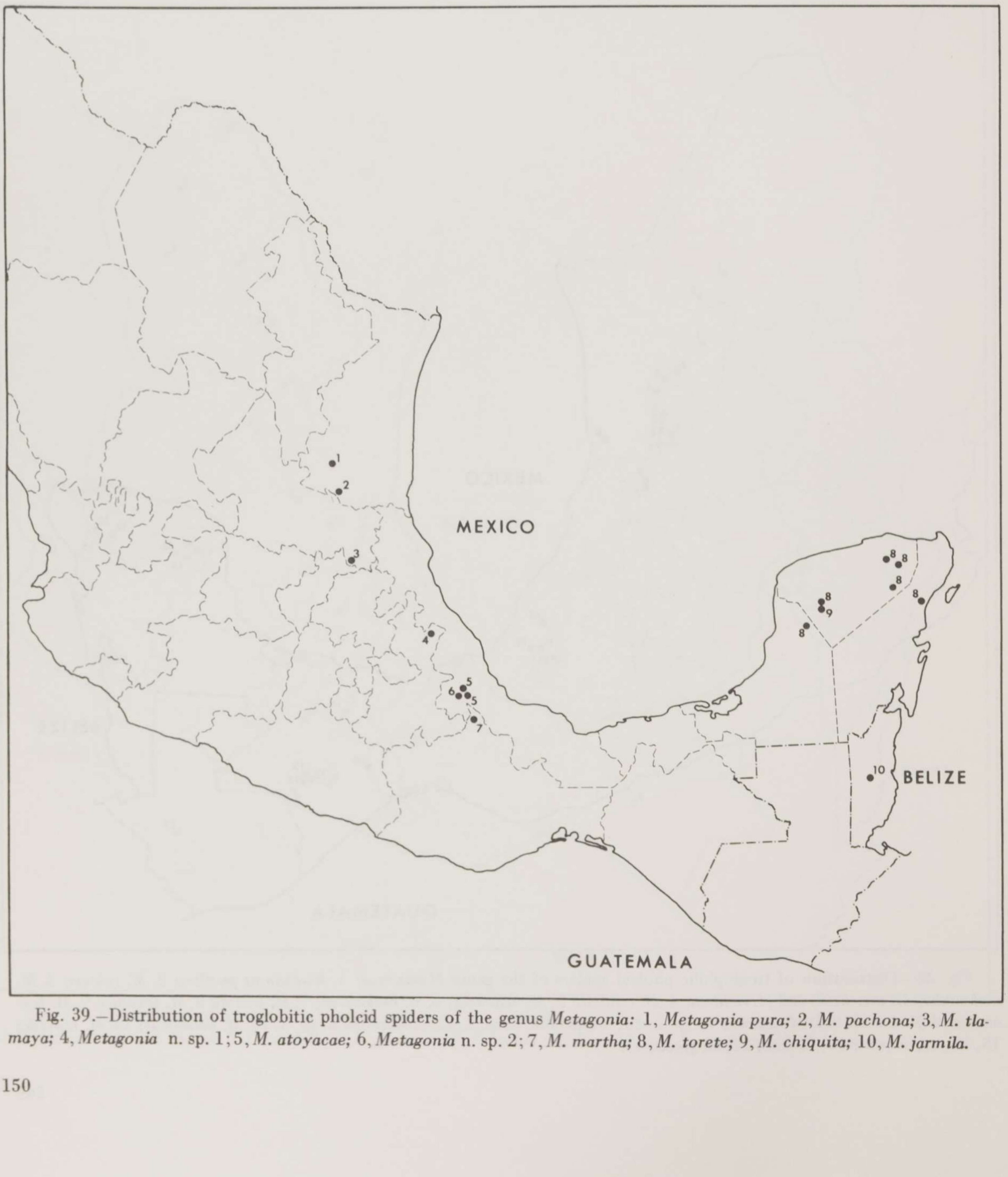

Fig. 39.—Distribution of troglobitic pholcid spiders of the genus *Metagonia:* 1, *Metagonia pura;* 2, *M. pachona;* 3, *M. tlamaya;* 4, *Metagonia* n. sp. 1; 5, *M. atoyacae;* 6, *Metagonia* n. sp. 2; 7, *M. martha;* 8, *M. torete;* 9, *M. chiquita;* 10, *M. jarmila.*

Type-locality.—Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 39.

Discussion.—This pale species with rudimentary eyes is related to *M. tinaja.*

Metagonia pachona Gertsch

Metagonia pachona Gertsch, 1971a:88, fig. 117, 124; Reddell and Mitchell, 1971a:147; Reddell, 1973a: 38; Hoffmann, 1976:25.

Type-locality.—Cueva de El Pachón, 7.5 km NE of Antiguo Morelos, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 39.

Discussion.—This pale, small-eyed species is tentatively considered to be a troglobite. It is related to *M. tinaja.*

Metagonia pura Gertsch

Metagonia pura Gertsch, 1971a:48, 87, fig. 108-109, 122; Reddell and Mitchell, 1971b:187; Brignoli, 1972:137, 138-139, fig. 2(16-18); Reddell, 1973a: 33, 39; Reddell and Elliott, 1973b:184; Hoffmann, 1976:25.

Fig. 40.—Distribution of 10 species of troglophilic pholcid spider of the genus *Metagonia:* 1, *Metagonia candela;* 2, *M. serena;* 3, *M. placida;* 4, *M. capilla;* 5, *M. secreta;* 6, *M. tinaja;* 7, *M. punctata;* 8, *M. maximiliani;* 9, *M. amica;* 10, *M. iviei.*

Metagonia capilla: Mitchell and Kawakatsu, 1973a: 673 (error for *M. pura);* Reddell and Elliott, 1973b:181 (error for *M. pura).*

Type-locality.—Cueva de la Capilla, 13.5 km NW of Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 39.

Discussion.—This pale, eyeless species is related to *M. tlamaya.*

Metagonia tlamaya Gertsch

Metagonia sp.: Reddell, 1967d:106; Reddell, 1971b: 31 (Sótano de Tlamaya record only).

Metagonia tlamaya Gertsch, 1971a:48, 83-84, 87, fig. 110-111, 125; Reddell, 1973a:33, 39; Hoffmann, 1976:25.

Type-locality.—Sótano de Tlamaya, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 39.

Discussion.—This pale, eyeless species is related to *M. tinaja.*

Metagonia torete Gertsch

Metagonia torete Gertsch, 1977b:105, 107, 108-109, fig. 9, 25-26, 29-30; Reddell, 1977b:232, 240, 241, 281, 292, 293.

Fig. 41.—Distribution of eight species of troglophilic pholcid spider of the genus *Metagonia:* 1, *Metagonia coahuila;* 2, *M. suzanne;* 3, *M. pasquinii;* 4, *M. mcnatti;* 5, *M. maya;* 6, *M. yucatana;* 7, *Metagonia* n. sp. 3; 8, *M. blanda.*

Type-locality.—Cueva Sodzil, 5 km W Sucopo, Yucatán, México.

Distribution.—Known from caves in Campeche, Quintana Roo, and Yucatán. See Fig. 39.

Records.—*Yucatán:* Cenote de Orizaba, Cueva de Sodzil, Grutas de Tzab-Nah, and Cenote Xtacabihá.

New records.—*Campeche:* Grutas de San Antonio; *Quintana Roo:* Cueva de Tancah (det. W. J. Gertsch).

Discussion.—This is a small species with evanescent eyes and elongated legs.

Pholcophora exigua Gertsch

Pholcophora exigua Gertsch, 1971a:80, 82, fig. 99-100; Reddell, 1973a:39; Hoffmann, 1976:26; Reddell, 1977a:90.

Type-locality.—Cueva de los Riscos, Sierra de la India, 6.5 km S of Mapimí, Durango, México.

Distribution.—Known only from the type-locality. See Fig. 42.

Discussion.—This small, white species has the anterior median eyes obsolete and the lateral eyes reduced. It was collected from the remotest parts of

Fig. 42.—Distribution of troglobitic and troglophilic pholcid spiders of the genus *Pholcophora:* 1, *Pholcophora exigua;* 2, *P. mitchelli;* 3, *P. bolivari;* 4, *P. elliotti;* 5, *Pholcophora* n. sp. 1; 6, *Pholcophora* n. sp. 2 and *P. troglodyta;* 7, *Pholcophora* n. spp. 3-4; 8, *Pholcophora* n. spp. 5-6; 9, *Pholcophora* n. sp. 7; 10, *P. gruta;* 11, *P. bispinosa;* 12, *P. evansi;* 13, *Pholcophora* n. sp. 8; 14, *P. speophila;* 15, *P. pearsei;* 16, *P. quieta.*

the cave and in general association with *Leptoneta limpida*, *Psilochorus delicatus*, and *Cryptocellus reddelli*. Nicholas (1962) listed *Spermophila* (sic) *speophila* Chamberlin and Ivie from caves in Yucatán as a troglobite. This species, now placed in *Pholcophora*, should be considered a troglophile.

Pholcophora gruta Gertsch

Pholcophora gruta Gertsch, 1971a:48, 78, fig. 95-96, 137-138; Reddell, 1973a:33, 39; Brignoli, 1974b: 223; Hoffmann, 1976:26.

Type-locality.—Grutas de Juxtlahuaca, 6.5 km N of Colotlipa, Guerrero, México.

Distribution.—Known only from the type-locality. See Fig. 42.

Discussion.—This is a pale, eyeless species.

Pholcophora pearsei (Chamberlin and Ivie)

Anopsicus pearsei Chamberlin and Ivie, 1938b:123, 130, 132, fig. 17-18; Pearse, 1945:156; Nicholas, 1962:181; Gertsch, 1971a:47, 76; Reddell, 1971b:31; Hoffmann, 1976:84; Gertsch, 1977b: 103, 112.

Anopsicus: Pearse, 1945:155; Brignoli, 1972:137, 138, 139; Brignoli, 1974b:219, 223.

Pholcophora (Anopsicus) pearsei: Gertsch, 1971a: 48.

Pholcophora pearsei: Gertsch, 1971a:77; Brignoli, 1974b:223; Hoffmann, 1976:26, 84; Gertsch, 1977b:115, 116, fig. 47-49; Reddell, 1977b:232, 239, 240, 253, 259, 260, 261.

Type-locality.—Oxolodt Cave (=Cueva Oxolodt), Kaua, Yucatán, México.

Distribution.—Known from caves in Quintana Roo and Yucatán. See Fig. 42.

Records.—*Quintana Roo:* Cenote de Las Ruinas and Cenote de Santo Domingo; *Yucatán:* Cueva Escondida, Actún Kaua, and Cueva Oxolodt.

Discussion.—This small, eyeless species is usually found beneath rocks in moist areas.

Psilochorus delicatus Gertsch

Psilochorus delicatus Gertsch, 1971a:76, fig. 90-91; Hoffmann, 1976:27; Reddell, 1977a:90.

Type-locality.—Cueva de los Riscos, Sierra de India, 6.5 km S of Mapimí, Durango, México.

Distribution.—Known only from the type-locality. See Fig. 43.

Discussion.—This small pale species with reduced eyes is known only from a single female and two immature specimens. It was collected from a small side room near the end of the cave. Nicholas (1962) listed *Pholcus cordatus* Bilimek from Grutas de Cacahuamilpa, Guerrero, as a troglobite. This species, now placed in *Psilochorus*, is a troglophile.

Psilochorus diablo Gertsch

Psilochorus new species: Spieth, 1950:31.

Psilochorus sp.: Reddell, 1971b:32 (Cueva del Diablo record only).

Psilochorus diablo Gertsch, 1971a:72, 73, fig. 77-81; Reddell, 1973a:39; Hoffmann, 1976:27; Reddell, 1977a:85.

Type-locality.—Cueva del Diablo, 1 km W of Salaices, 35 km N of Parral, Chihuahua, México.

Distribution.—Known only from the type-locality. See Fig. 43.

Discussion.—This small, pale species has reduced eyes and is probably a troglobite restricted to the cave habitat by the surrounding desert.

Family Scytodidae

The spiders of the scytodid genus *Loxosceles* abound in the caves of México, Guatemala, and Belize (Chamberlin and Ivie, 1938b; Gertsch, 1958, 1973b) (see Fig. 44). A total of 13 species of this genus is known from caves: *L. aranea* Gertsch from Querétaro; *L. aurea* Gertsch from Durango; *L. belli* Gertsch from Coahuila; *L. bolivari* Gertsch and *L. luteola* Gertsch from Nuevo León; *L. colima* Gertsch from Colima; *L. devia* Gertsch and Mulaik from Tamaulipas; *L. misteca* Gertsch from Guerrero; *L. tehuana* Gertsch from Chiapas; *L. tenango* Gertsch from Hidalgo; *L. valdosa* Gertsch from San Luis Potosí and Tamaulipas; *L. yucatana* Chamberlin and Ivie from Campeche, Quintana Roo, and Yucatán, México; Cayo District, Belize; and El Petén, Guatemala; and *L. guatemala* Gertsch from Alta Verapaz, Guatemala. These spiders are usually found in drier areas of the cave. They live in small tangled webs among loose dry breakdown and are frequently present in large numbers. Although several species of the genus *Scytodes* are known from Mexican caves, none show signs of cave adaptation. Nicholas (1962) lists two Yucatán cave species, *Scytodes itzana* Chamberlin and Ivie and *S. meridana* Chamberlin and Ivie as troglobites; these species are probably troglophiles. *Scytodes fusca* Walckenaer is also frequently found in caves in Yucatán. Brignoli (1976) has reviewed the world scytodid fauna.

Family Telemidae

The family Telemidae is known from southern Europe, Africa, the western United States, and Guatemala. A single species, *Telema mayana* Gertsch, is a troglobite in Guatemalan caves (see Fig. 34). *Telema gracilis* (Keyserling) from Alabaster Cave, California, is a troglophile.

Telema mayana Gertsch

Telema mayana Gertsch, 1973b:141, 154-155; Shear, 1976:249.

Type-locality.—Cueva Sepacuite n. 2, Finca Sepacuite, Senahú, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 34.

Discussion.—The eyes in this species are reduced to vestiges.

Family Tetrablemmidae

Matta mckenziei Shear

Tetrablemma n. sp.: Reddell, 1977b:232, 240, 241, 245, 247.

Matta mckenziei Shear, 1978:14, 16, 18, 19, 20, fig. 37-39.

Type-locality.—Grutas de San Ignacio, Chencedro, 15 km. N of Bolonchenticul, Campeche, México.

Distribution.—Known only from two caves in northwestern Campeche. See Fig. 35.

Records.—*Campeche:* Actún Halmensura and Grutas de San Ignacio.

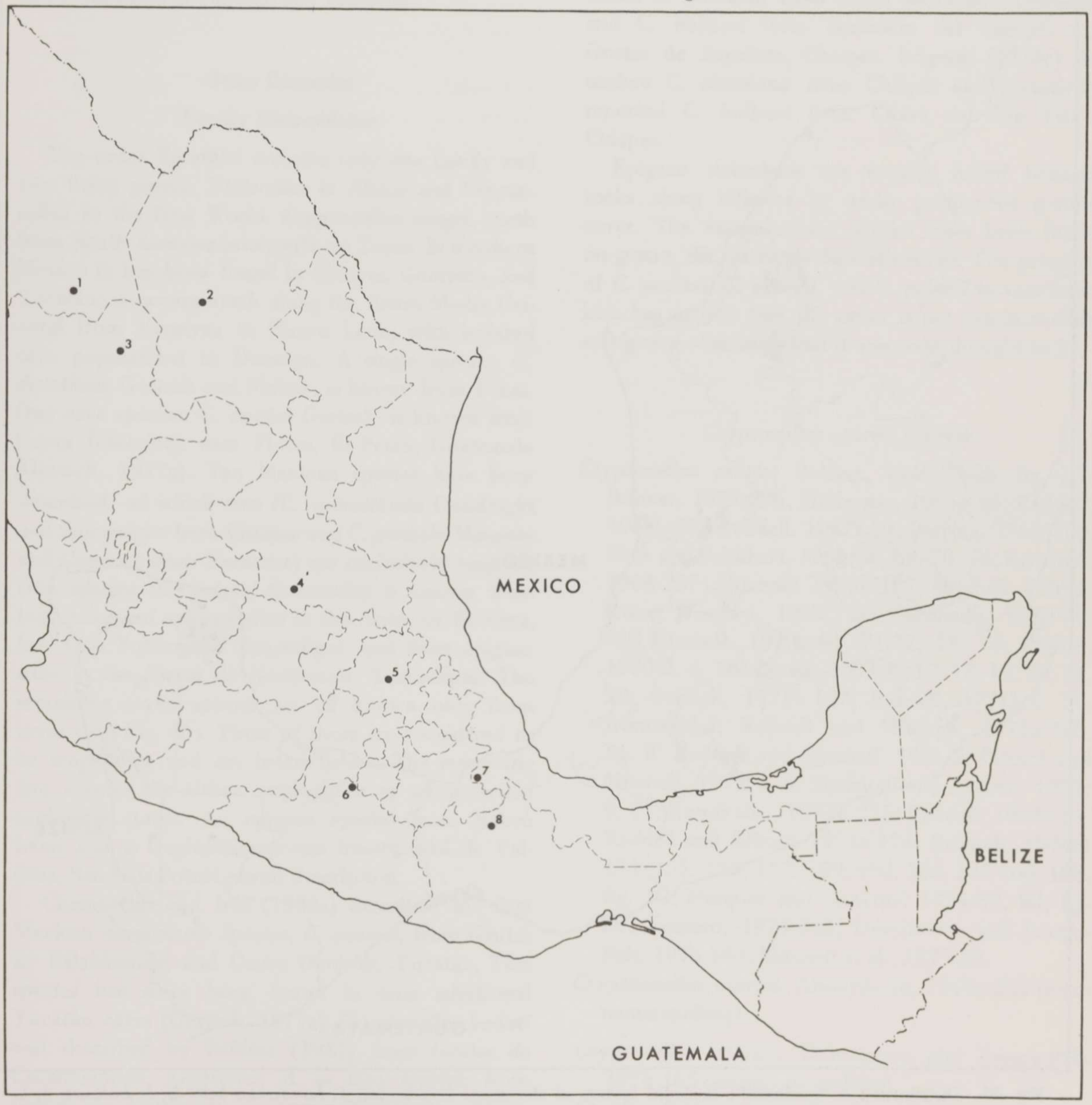

Fig. 43.—Distribution of troglobitic and troglophilic pholcid spiders of the genus *Psilochorus:* 1, *Psilochorus diablo;* 2, *P. russelli;* 3, *P. delicatus;* 4, *P. concinnus;* 5, *P. fishi;* 6, *P. cordatus* and *P. tellezi;* 7, *Psilochorus* n. sp.; 8, *P. murphyi.*

Discussion.—This is a delicate, eyeless species with long legs. The genus *Matta* ranges from San Luis Potosí, México, into Brazil. The only other species of *Matta* known from caves is *M. sbordonii*, which was described from an eyeless population in Cueva del Ojo de Agua de Tlilapan, Veracruz. In a revision of the genus, Shear (1978) studied numerous specimens of *M. sbordonii* from epigean and cave collections and found no significant differences in the genitalia between cave and surface populations. Some epigean specimens possess reduced lateral eyes. *Matta sbordonii* is much darker and more robust than is *M. mckenziei*. In addition to the type-locality *M. sbordonii* is known from caves in Oaxaca, Tamaulipas, and Yucatán.

Family Theridiidae

Although at least 24 species of theridiid spiders have been reported from caves in México, most have been recorded only once and are probably accidentals. Nicholas (1962) lists *Spelobion spukilum* Chamberlin and Ivie as a troglobite. This species, now placed in the genus *Thymoites*, is probably a troglophile. The genus *Achaearanea* includes five species which are frequently found in caves and which may be troglophiles. They are found hanging in webs in

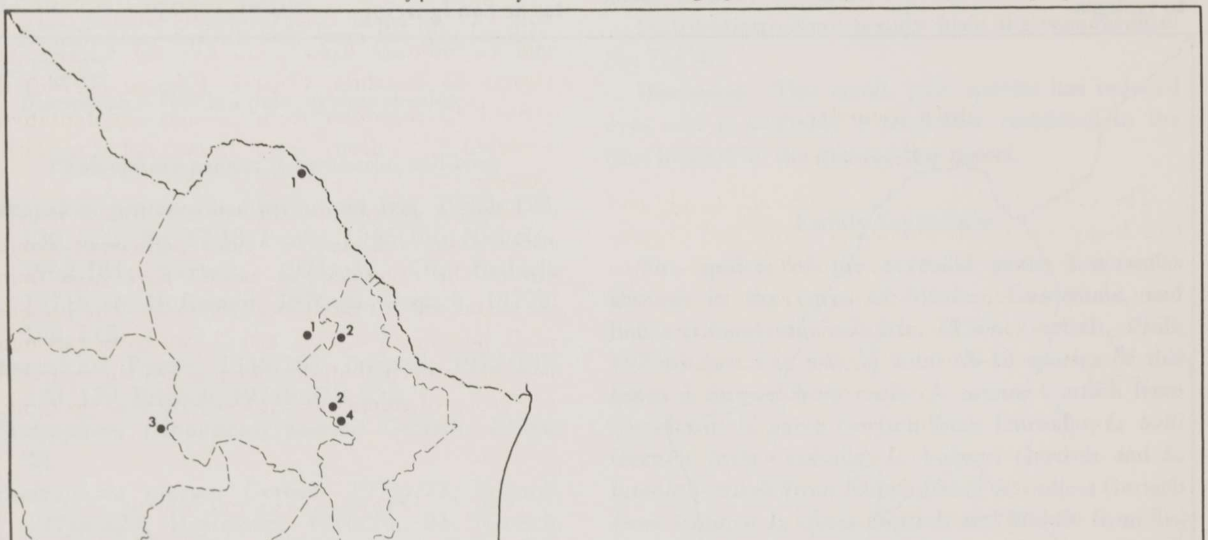

Fig. 44.—Distribution of troglophilic scytodid spiders of the genus *Loxosceles*: 1, *Loxosceles belli*; 2, *L. bolivari*; 3, *L. aurea*; 4, *L. luteola*; 5, *L. valdosa*; 6, *L. devia*; 7, *L. aranea*; 8, *L. tenango*; 9, *L. colima*; 10, *L. misteca*; 11, *L. tehuana*; 12, *L. guatemala*; unnumbered circles, *L. yucatana*.

darkness along the cave wall. One of these is *A. porteri* Banks, a common troglophile in the caves of Central Texas. Several species of *Theridion*, *Thymoites*, and *Tidarren* have been occasionally collected, but their ecological status is not known.

Family Uloboridae

The genus *Philoponella* is known from many caves throughout México. *Philoponella signatella* (Roewer) is an apparent troglophile in caves in Oaxaca, Puebla, and Yucatán. *Philoponella semiplumosa* (Simon) is known from caves in Tamaulipas and Veracruz. *Philoponella vicina* (O. P.-Cambridge) has been taken in several caves in Tabasco and Veracruz.

Order Ricinulei

Family Ricinoididae

The order Ricinulei includes only one family and two living genera, *Ricinoides* in Africa and *Cryptocellus* in the New World. *Cryptocellus* ranges north from South America into southern Texas. In southern México it has been found in Chiapas, Guerrero, and Yucatán; it occurs north along the Sierra Madre Oriental from Veracruz to Nuevo León, with isolated cave populations in Durango. A single species, *C. dorotheae* Gertsch and Mulaik, is known from Texas. One cave species, *C. cookei* Gertsch, is known from Cueva Jobitzinaj, near Flores, El Petén, Guatemala (Gertsch, 1977a). Ten Mexican species have been described, of which two *(C. spinotibialis* Goodnight and Goodnight from Chiapas and *C. gertschi* Márquez and Conconi from Veracruz) are exclusively epigean. One species *(C. pelaezi* Coronado) is known from both cave and epigean sites in the Sierra de El Abra, San Luis Potosí and Tamaulipas, and from epigean sites in the Sierra de Guatemala, Tamaulipas. The remaining seven species are all known only from caves (see Fig. 45). Three of these are considered to be troglobites and are listed below. The remaining five species are either troglophiles or of uncertain ecological status. An epigean species from Nuevo León and a troglobitic species from Cueva de Valdosa, San Luis Potosí, await description.

Chamberlin and Ivie (1938a) described the first Mexican cavernicole species, *C. pearsei*, from Grutas de Balankanche and Cueva Oxolodt, Yucatán. This species has since been found in nine additional Yucatán caves (Gertsch, 1977a). *Cryptocellus boneti* was described by Bolívar (1941) from Grutas de Cacahuamilpa, Guerrero; it is also known from Grutas de Acuitlapán, Guerrero (Coronado, 1970). *Cryptocellus pelaezi* was described by Coronado (1970) from Cueva de Taninul n. 1, San Luis Potosí. This species has become the best known of all ricinuleids, due to the outstanding work of Dr. Robert W. Mitchell and his students at Texas Tech University. Pittard and Mitchell (1972) studied the external morphology of all life stages; Cooke (1971) studied the mating behavior; and Mitchell (1970) studied various aspects of the population dynamics in Cueva de la Florida, Tamaulipas. Other studies, including the life cycle and the development of the third leg, are in preparation. Gertsch (1971b) described three additional species of cavernicole ricinuleid. In addition to the troglobite, *C. reddelli*, he added *C. mitchelli* from Cueva del Guano, Durango, and *C. bolivari* from Sumidero del Camino and Grutas de Zapaluta, Chiapas. Brignoli (1974c) described *C. sbordonii* from Chiapas and tentatively reported *C. bolivari* from Cueva del Tío Ticho, Chiapas.

Epigean ricinuleids are usually found beneath rocks along hillsides or under permanent ground cover. The cavernicolous species have been found on guano, silt, or rarely beneath rocks. The presence of *C. pearsei*, *C. osorioi*, and *C. pelaezi* in vast numbers has proven that the order is not the incredibly rare group of animals that it was once thought to be.

Cryptocellus osorioi Bolívar

Cryptocellus osorioi Bolívar, 1946:24-28, fig. 1-7; Bolívar, 1952:296; McKenzie, 1965a:36; Reddell, 1967b:82; Reddell, 1967f:99; Barrera, 1968:309; Beck and Schubart, 1968:68, 69, 70, 74; Kaestner, 1968:207; Mitchell, 1969b:137; Mitchell, 1969d: letter; Woolley, 1969:151; Coronado, 1970:48, 61; Mitchell, 1970b:64, 71-72, 73, 74; Pittard, 1970:3, 6, 10; Cooke, 1971:9, 17, 18, 19, 20, 21, 22; Gertsch, 1971b:127; Reddell, 1971b:3, 34, frontispiece; Reddell and Mitchell, 1971a:148, fig. 8; Reddell and Mitchell, 197c:2; Pittard and Mitchell, 1972:4, 6; Sbordoni and Argano, 1972: 9, 11; Kawakatsu, 1973b:255; Reddell, 1973a:34; Reddell and Elliott, 1973a:174; Brignoli, 1974c: 154, 155, 156, 157, 159, 160, 166, 167-168, 169, fig. 1C; Márquez and Conconi, 1974:82, 83, fig. 20; Vomero, 1974:345; Dumitresco and Juvara-Bals, 1976:163; Mitchell et al., 1977:53.

Cryptocoellus osorioi: Anonymous, 1942a:221 (erroneous spelling).

Cryptocellus osorici: Dumitresco and Juvara-Bals, 1976:163 (erroneous spelling).

Cryptocellus ossorioi: Dumitresco and Juvara-Bals, 1976:164, 178 (erroneous spelling).

Type-locality.—Cueva de Los Sabinos, Valles, San Luis Potosí, México.

Distribution.—Known only from caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas. See Fig. 45.

Records.—*San Luis Potosí:* Cueva de Los Sabinos, Cueva de Taninul n. 1, and Sótano del Tigre; *Tamaulipas:* Cueva de la Florida, Grutas de Quintero, and Sótano de El Venadito.

New record.—*Tamaulipas:* Cueva de Diamante (det. W. J. Gertsch).

Discussion.—This large species possesses attenuate appendages and is a probable troglobite. Unlike its companion species in some of these caves, *C. pelaezi*, it has never been collected from the surface despite intensive collecting throughout the Sierra de El Abra. Brignoli (1974c) places it with a group of species adapted for cave existence but refrains from designating any as troglobites. *Cryptocellus osorioi* is usually rare, but in Sótano del Tigre it is present in enormous numbers. In this cave it was found living on guano in an extremely humid, warm passage several hundred meters long. In Cueva de la Florida it inhabits parts of the cave not utilized by *C. pelaezi* and is only rarely seen.

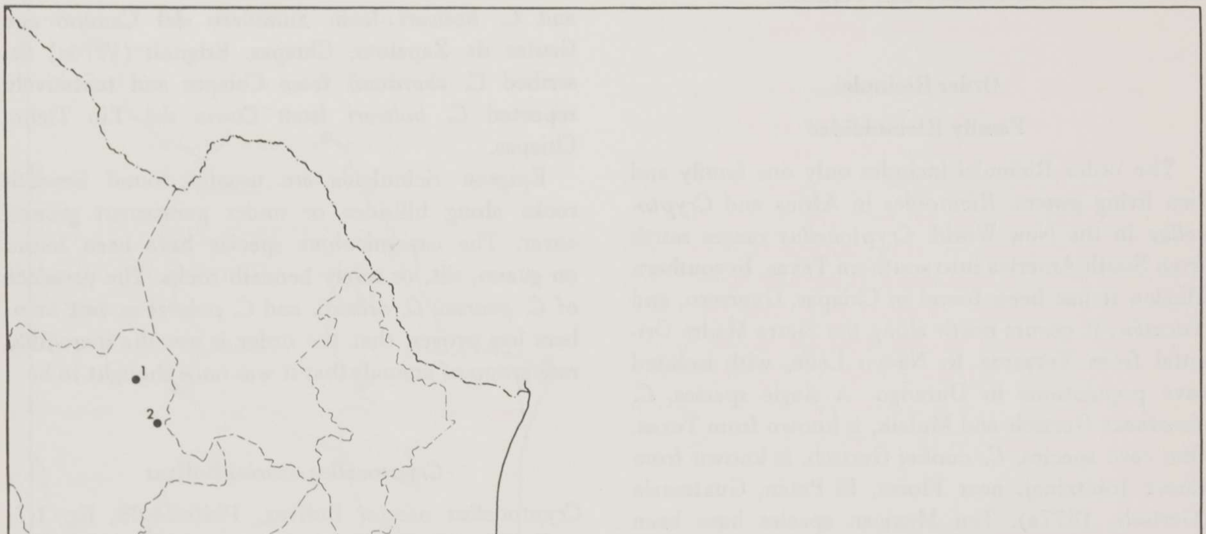

Fig. 45.—Distribution of troglobitic and troglophilic species of the order Ricinulei: 1, *Cryptocellus reddelli;* 2, *C. mitchelli;* 3, *C. osorioi* and *C. pelaezi;* 4, *C. osorioi;* 5, *C. boneti;* 6, *C. sbordonii;* 7, *C. bolivari;* 8, *C. pearsei;* 9, *C. cookei.*

Cryptocellus reddelli Gertsch

Cryptocellus new species: Reddell, 1967f:99-100.

Cryptocellus sp.: Reddell, 1971b:34 (Cueva de los Riscos record only).

Cryptocellus reddelli Gertsch, 1971b:127, 130, 132, fig. 8-12; Cooke and Shadab, 1973:6; Reddell, 1973a:34, 39; Reddell, 1973c:53; Brignoli, 1974c:160, 167, 168, 169; Márquez and Conconi, 1974:81, 82, 83, fig. 20; Dumitresco and Juvara-Bals, 1976:173; Reddell, 1977a:90.

Type-locality.—Cueva de los Riscos, Sierra de la India, four miles south of Mapimí, Durango, México.

Distribution.—Known only from the type-locality. See Fig. 45.

Discussion.—This is the only unquestionable troglobite in the order. The extreme elongation of appendages, paleness, and habitat within the cave all point to a degree of cave adaptation not found among other ricinuleids. The species has been taken only from the complex of small rooms at the limit of exploration in the cave. The few specimens which have been found were taken from clay or moist rock. The only other species of ricinuleid known from the desert regions of México is *C. mitchelli* from Cueva del Guano, Durango. It is a typical guanophile and is relatively abundant on guano in the inner rooms of this large bat cave.

Cryptocellus sbordonii Brignoli

Cryptocellus sbordonii Brignoli, 1974c:159-160, 164, 167, 169, fig. 1B, 3; Sbordoni et al., 1974:30, 45, pl. 4(10) (nomen nudum).

Cryptocellus prope *sbordonii*: Brignoli, 1974c:155, 160, 162, fig. 10; Sbordoni et al., 1974:29; Dumitresco and Juvara-Bals, 1976:163, 164, 178.

Type-locality.—Cueva de las Canícas, Rancho del Cielito, Ocozocoautla, Chiapas, México.

Distribution.—Known only from the type-locality and possibly one other cave at Rancho del Cielito, Chiapas. See Fig. 45.

Records.—*Chiapas:* Cueva de las Canícas and ?Cueva del Cerro Brujo.

Discussion.—The holotype is a male, whereas the single specimen known from Cueva de Cerro Brujo is a female; they are probably conspecific. This species has the most elongate legs in the genus and is, therefore, presumed to be a troglobite.

Order Opilionida

The order Opilionida includes a total of 50 species which have been reported from the caves of the area under consideration. Many groups of opilionids have not yet been studied, so this list will eventually be much longer. In particular, many species of the family Phalangiidae remain to be identified. See Table 16.

Table 16.—Summary of cave inhabiting Opilionida.

	Troglobites	Other Species
Cyphophthalmi		
Sironidae	1	0
Laniatores		
Cosmetidae	0	7
Phalangodidae	13	25
Palpatores		
Nemastomatidae	1	0
Phalangiidae	0	3
Total	15	35

Suborder Cyphophthalmi

Family Sironidae

Neogovea mexasca Shear

Neogovea mexasca Shear, 1977b:165, 166, 167, 168, 172-175, fig. 16-24.

Type-locality.—Cueva del Nacimiento del Río San Antonio, 10 km SSW of Acatlán, Oaxaca, México.

Distribution.—Known only from two caves near Acatlán, Oaxaca. See Fig. 46.

New record.—*Oaxaca:* Cueva de la Finca (det. W. A. Shear).

Discussion.—This species, the only troglobitic cyphophthalmid known in the Western Hemisphere, is the only species of the suborder known between Florida and Guyana. The genus *Neogovea* includes three other species, one from Brazil and two from Guyana. *Neogovea mexasca* was described from females; the study of recently discovered males may result in a new generic assignment, possibly *Siro*. Other troglobitic cyphophthalmids are known from South Africa and central Europe. The type specimens were found on bat guano deposited on red clay approximately 2 km from the entrance to the cave. Specimens collected in Cueva de la Finca were taken from a similar situation about 1 km from the cave entrance. This species has reduced sclerotization and much lengthened appendages, and is pale red.

Suborder Laniatores

The suborder Laniatores is well represented in the caves of México and Belize. Thirteen species of troglobite and 31 other species are known. The taxonomy of this group is unfortunately in a state of flux. Silhavý (1974, 1977) recognizes the family Stygnopsidae and places several species of laniatorids in this family. Clarence and Marie Goodnight, however, place all of these species in the family Phalangodidae. The latter family is used in this report, but the most recent generic allocations are used until a thorough revisionary study is made of this group.

Family Cosmetidae

The family Cosmetidae includes no troglobites, but a total of seven cave inhabiting species are known from México and Belize (see Fig. 46). Goodnight and Goodnight (1973) described *Cynorta guadalupensis* from one cave in San Luis Potosí and *C. jamesoni* from numerous caves in San Luis Potosí and Tamaulipas. Goodnight and Goodnight (1977) reported the presence of *Vonones compressus* (Cambridge) and *Erginulus roeweri* (Goodnight and Goodnight) from caves in Yucatán; *E. bimaculata* Goodnight and Goodnight from caves in Campeche and Yucatán; and *E. serratipes* (Cambridge) from Rio Frio Cave, Belize.

Family Phalangodidae

The most frequently found group of opilionids in tropical American caves are those belonging to the family Phalangodidae (including the Stygnopsidae). Thirteen species of phalangodids are believed to be

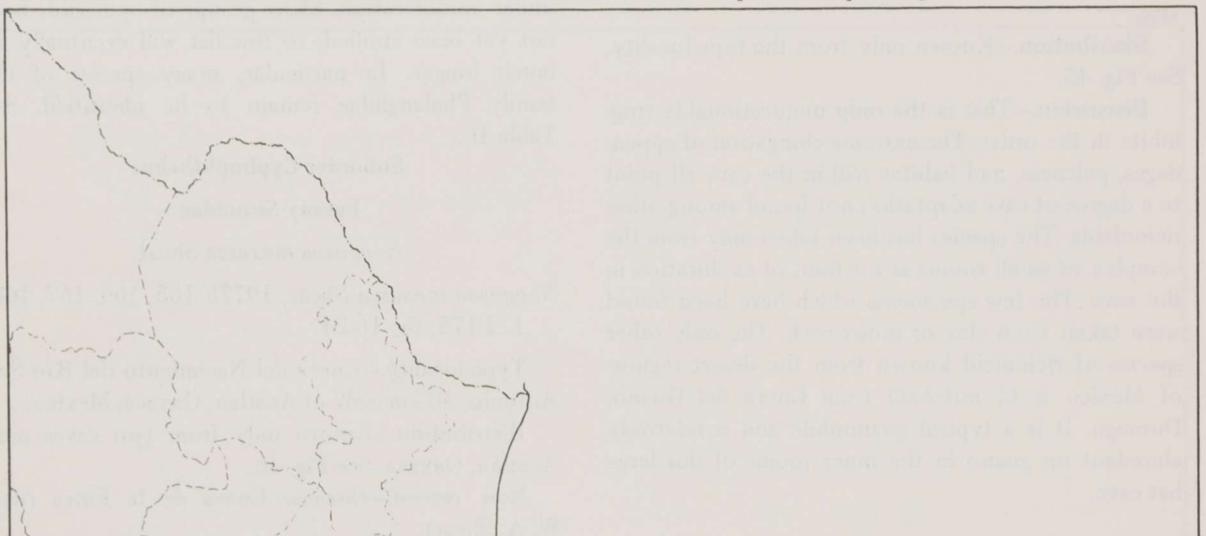

Fig. 46.–Distribution of troglobitic and troglophilic opilionids of the families Cosmetidae and Sironidae: 1, *Cynorta jamesoni;* 2, *C. guadalupensis;* 3, *Neogovea mexasca;* 4, *Erginulus bimaculata;* 5, *E. roeweri;* 6, *Vonones compressus;* 7, *E. serratipes.*

troglobites in the caves of México and Belize. These are currently placed in the genera *Caecoa, Cynortina, Hoplobunus, Mexotroglinus, Stygnomma,* and *Troglostygnopsis* and are discussed below.

Silhavý (1977) described three genera for species collected in caves in Chiapas (see Fig. 47). *Arganotus* was described to include *Phalangodinus macrochelis* Goodnight and Goodnight; this species, previously known from Ocosingo, Chiapas, was collected in Cueva del Sabín, Chiapas. *Akdalima vomeroi* was described from Cueva del Sabín, Chiapas. *Sbordonia* was described to include *Paramitraceras parvula* Goodnight and Goodnight, an epigean species from Chiapas, and *Sbordonia armigera* n. sp. from Sótano de Malpaso, Chiapas. Silhavý (1979) described *Arganotus strinatii* from Cueva Chirrepeck, Alta Verapaz, Guatemala.

Goodnight and Goodnight (1971) described five new species of the genus *Karos* from Mexican caves: *K. depressus* from Sumidero del Llano Conejo, Querétaro; *K. gratiosus* from caves in the Xilitla and Agua Buena regions of San Luis Potosí and from a cave near Huautla de Jiménez, Oaxaca; *K. parvus* from caves in the Sierra de El Abra, Tamaulipas, and the Micos and Valle de los Fantasmas regions of San Luis Potosí; *K. projectus* from Cueva del Ahuate

Fig. 47.—Distribution of troglophilic phalangodid opilionids of the genera *Pellobunus, Paramitraceras, Sbordonia, Arganotus,* and *Akdalina:* 1, *Pellobunus mexicanus;* 2, *Paramitraceras granulatus;* 3, *Paramitraceras femoralis* and *Sbordonia armigera;* 4, *Arganotus macrochelis* and *Akdalina vomeroi;* 5, *Paramitraceras hispidulus;* 6, *Arganotus strinatii.*

n. 2, San Luis Potosí; and *K. rugosus* from Cueva de Ojo de Agua de Tlilapan, Veracruz. Silhavý (1974) reported the presence of *K. rugosus* in Cueva del Ojo de Agua Grande, Veracruz, and described *K. brignolii* from Cueva Tlilapan, Veracruz. *Karos dybasi* (Goodnight and Goodnight) was reported from Cueva de El Jobo, San Luis Potosí, by Goodnight and Goodnight (1973). See Fig. 48 for the distribution of *Karos* in Mexican caves.

Three species of the genus *Paramitraceras* have been identified from Mexican caves (see Fig. 47). Goodnight and Goodnight (1973) reported *P. granulatus* Cambridge from Cueva del Guayabo, Oaxaca. Silhavý (1974) identified *P. hispidulus* Cambridge from Cueva de la Golondrina, Chiapas. *Paramitraceras femoralis* Goodnight and Goodnight was reported by Silhavý (1977) from Sótano de Malpaso, Chiapas. *Pellobunus mexicanus* Goodnight and Goodnight is known from caves in Nuevo León and Querétaro (Goodnight and Goodnight, 1971, 1973) (see Fig. 47). Goodnight and Goodnight (1971) described *Hoplobunus robustus* from caves in the Tequila region of Veracruz. This species is also known from caves in the Potrero region of Veracruz (Goodnight and Goodnight, 1973) (see Fig. 50). Silhavý (1974) removed this species to the genus *Stygnopsis*. This is a large distinctive species which is frequently abundant on cave walls and rocky floor areas.

Fig. 48.—Distribution of troglophilic phalangodid opilionids of the genus *Karos:* 1, *Karos parvus;* 2, *K. gratiosus;* 3, *K. depressus;* 4, *K. dybasi, K. gratiosus,* and *K. projectus;* 5, *K. rugosus;* 6, *K. brignolii* and *K. rugosus.*

Caecoa arganoi Silhavý

Caecoa arganoi Silhavý, 1974:176, 189, 191, fig. 6 (38-41), 7(42).

Type-locality.—Cueva de Coatepec, Coatepec Harinas, México, México.

Distribution.—Known only from the type-locality. See Fig. 49.

Discussion.—This eyeless species is the type and only known species of the genus.

Cynortina misteca Goodnight and Goodnight

Cynortina misteca Goodnight and Goodnight, 1977: 142, 143, fig. 3a-3b.

Type-locality.—Footprint Cave, 4 km southwest of Caves Branch, Cayo District, Belize.

Distribution.—Known only from the type-locality. See Fig. 49.

Discussion.—This pale, eyeless species is most closely related to *C. acanthotibialis* Goodnight and Goodnight from Chiapas, Guatemala, and Belize. *Cynortina minutus* (Goodnight and Goodnight) was described from Resumidero del Río San Gerónimo, Guerrero.

Hoplobunus apoalensis Goodnight and Goodnight

Hoplobunus apoalensis Goodnight and Goodnight, 1973:84, 85, 86-87, fig 4-5.

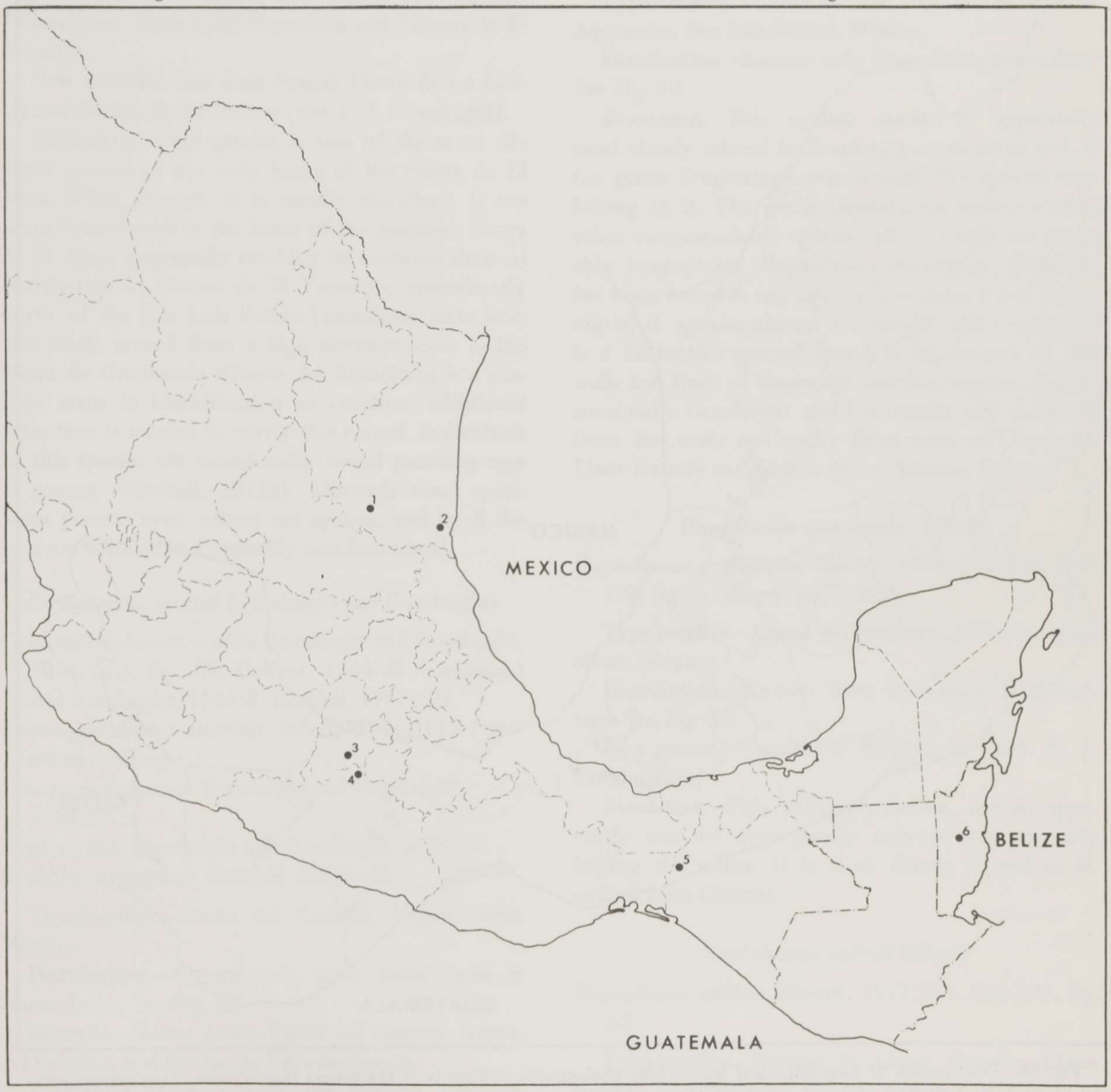

Fig. 49.—Distribution of troglobitic opilionids of the family Nemastomatidae and of troglophilic and troglobitic phalangodid opilionids of the genera *Stygnomma, Caecoa, Cynortina,* and *Mexotroglinus:* 1, *Ortholasma sbordonii;* 2, *Stygnomma tuberculata;* 3, *Caecoa arganoi;* 4, *Cynortina minutus;* 5, *Mexotroglinus sbordonii;* 6, *Cynortina misteca* and *S. pecki.*

Type-locality.—Cueva de Apoala, Santiago Apoala, 20 km N Asunción Nochixtlán, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 50.

Discussion.—This species has very small eyes which appear to have lost the retinas. It was collected from walls and silt banks in a moist room above the stream passage.

Hoplobunus boneti (Goodnight and Goodnight)

Serrobunus boneti Goodnight and Goodnight, 1942: 2-3, fig. 7-11; Goodnight and Goodnight, 1945: 3-4; Bonet, 1946a:115.

Opilion, troglobio: Anonymous, 1942a:221.

Serrobunus: Goodnight and Goodnight, 1953:20.

Hoplobunus: Goodnight and Goodnight, 1953:20.

Hoplobunus boneti: Goodnight and Goodnight, 1971:38, 40, fig. 18-19; Mitchell, 1971a:392-394; Reddell, 1971b:35; Reddell and Mitchell, 1971a: 149, fig. 21-22; Goodnight and Goodnight, 1973: 87; Reddell and Elliott, 1973a:171, 174; Reddell and Elliott, 1973b:181, 184; Silhavý, 1974:176, 178, 182, fig. 1(5-8); Vomero, 1974:345; Fernández Ruiz, 1976:716, 717; Goodnight and Goodnight, 1976:662.

Fig. 50.—Distribution of troglobitic and troglophilic phalangodid opilionids of the genera *Hoplobunus*, *Troglostygnopsis*, and *Stygnopsis:* 1, *Hoplobunus osorioi;* 2, *Troglostygnopsis inops;* 3, *H. mexicanus* and *T. inops;* 4, *H. boneti;* 5, *H. planus;* 6, *T. queretarius;* 7, *Stygnopsis robustus;* 8, *H. mexicanus;* 9, *H. spinooculorum;* 10, *H. apoalensis;* 11, *H. oaxacensis;* 12, *T. anophthalma;* 13, *H. zullinii.*

Hoplobonus boneti: Sbordoni et al., 1974:37 (erroneous spelling).

Type-locality.—Cueva de Los Sabinos, San Luis Potosí, México.

Distribution.—Known from many caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas; and possibly from one cave in the Sierra de Guatemala, Tamaulipas. See Fig. 50.

Records.—*San Luis Potosí:* Sótano de Coatimundi, Cueva de la Curva, Sótano de Matapalma, Cueva de los Monos, Sótano de Pichijumo, Cueva Pinta, Sótano de la Pipa, Cueva de Los Sabinos, Sótano de Soyate, Cueva de Tanchipa, Sótano del Tigre, Sótano de la Tinaja, Cueva de Valdosa, and Sótano de Yerbaniz; *Tamaulipas:* ?Cueva del Remolino and Sótano de El Venadito.

New records.—*San Luis Potosí:* Cueva de los Cuates and Sótano de las Piedras (det. C. J. Goodnight).

Discussion.—This species is one of the more obvious species in the cave fauna of the Sierra de El Abra. When present, it is usually abundant. It has never been found in the caves of the northern Sierra de El Abra, apparently reaching its northern limit of distribution in Sótano de El Venadito, immediately north of the San Luis Potosí-Tamaulipas state line. The single record from a high elevation cave in the Sierra de Guatemala (Cueva del Remolino) is a possible error in identification or curation; additional collection is needed to verify this record. Individuals of this species are occasionally found guarding eggs or young (Mitchell, 1971a). Although some specimens possess eyes, others are eyeless, and in all the eyes are reduced and probably non-functional.

Hoplobunus osorioi (Goodnight and Goodnight)

Chinquipellobunus osorioi Goodnight and Goodnight, 1944:1, 3, fig. 4-9; Bolívar, 1944:26; Goodnight and Goodnight, 1945:3; Reddell, 1967a:24.

Chipinquelobunus osorioi: Bonet, 1946a:115 (erroneous spelling).

Chinquepellobunus: Goodnight and Goodnight, 1953:20.

Hoplobunus: Goodnight and Goodnight, 1953:20.

Hoplobunus osorioi: Reddell, 1971b:35.

Type-locality.—Gruta del Carrizal, Nuevo León, México.

Distribution.—Known only from three caves in Nuevo León. See Fig. 50.

Records.—*Nuevo León:* Cueva del Carrizal, Grutas del Palmito, and Grutas de Villa de García.

Discussion.—This species has greatly reduced, probably non-functional eyes. Each of the three caves from which it is recorded is located in an isolated limestone range in the Northern Basin and Range Province. The lack of divergence and the retention of eye remnants imply that this is a comparatively recent troglobite. This species was found in large numbers along the stream passage in Cueva del Carrizal. Geographically close members of the genus are *H. russelli* Goodnight and Goodnight and *H. madlae* Goodnight and Goodnight, both of which are troglobites from Central Texas.

Hoplobunus planus Goodnight and Goodnight

Hoplobunus planus Goodnight and Goodnight, 1973: 88, 90, fig. 9.

Type-locality.—Cueva de San Nicolás, 10 km SW Aquismón, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 50.

Discussion.—This eyeless species is apparently most closely related to *Troglostygnopsis inops* and, if the genus *Troglostygnopsis* is valid, this species may belong to it. The genus *Hoplobunus* includes three other cave-associated species, all of which are probably troglophiles. *Hoplobunus mexicanus* (Roewer) has been found in one cave each in Oaxaca and Tamaulipas; *H. spinooculorum* Goodnight and Goodnight is a distinctive species found in abundance on the walls and floor of Cueva del Guyabo, Oaxaca; and *H. oaxacensis* Goodnight and Goodnight was collected from the walls and rocky floor areas of Cueva del Llano Grande and Sótano de los Arboles, Oaxaca.

Hoplobunus queretarius Silhavý

Hoplobunus queretarius Silhavý, 1974:176, 179, 180, 182, fig. 2; Silhavý, 1977:223.

Type-locality.—Cueva del Madroño, El Lobo, Querétaro, México.

Distribution.—Known from two caves in Querétaro. See Fig. 50.

New record.—*Querétaro:* El Socavón (det. C. J. Goodnight).

Discussion.—This yellowish brown species apparently has the eyes greatly reduced and probably lacking the retina. It is most closely related to *H. zullinii* from Chiapas.

Hoplobunus zullinii Silhavý

Hoplobunus zullinii Silhavý, 1977:219, 220-223, fig. 1-9.

Type-locality.—Grutas de Llano Grande, Llano Grande, La Grandezza, Huixtla, Chiapas, México.

Distribution.—Known from two caves in Chiapas. See Fig. 50.

Records.—*Chiapas:* Sumidero de Canada and Grutas de Llano Grande.

Discussion.—This small-eyed presumed troglobite is most closely related to *H. queretarius.*

Mexotroglinus sbordonii Silhavý

Mexotroglinus sbordonii Silhavý, 1977:220, 231-233, fig. 24-28.

Type-locality.—Cueva del Perro de Agua, Río Negro, Lago de Malpaso, Ocozocoautla, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 49.

Discussion.—The monotypic genus *Mexotroglinus* is most closely related to *Monterella.* This species is eyeless and depigmented with a reduced eyemound.

Stygnomma pecki Goodnight and Goodnight

Stygnomma pecki Goodnight and Goodnight, 1977: 148, 150, fig. 11.

Type-locality.—St. Herman's Cave, Caves Branch, Belize.

Distribution.—Known only from two caves at Caves Branch, Belize. See Fig. 49.

Records.—BELIZE: *Cayo District:* Mountain Cow Cave and St. Herman's Cave.

Discussion.—This is the only troglobitic species of the genus *Stygnomma* known from mainland North America. Rambla (1969) described *S. fiskei* from a cave in Jamaica; it is also eyeless. *Stygnomma pecki* is eyeless and light yellow. *Stygnomma tuberculata* Goodnight and Goodnight is a troglophile in Cueva de los Cuarteles, Tamaulipas.

Troglostygnopsis anophthalma Silhavý

Troglostygnopsis anophthalma Silhavý, 1974:176, 182, 184, fig. 3(14-20); Sbordoni et al., 1974:32, 34, 45, pl. 5(fig. 13) (nomen nudum).

Type-locality.—Grutas de Rancho Nuevo, S. Cristóbal de las Casas, Chiapas, México.

Distribution.—Known from three caves in central Chiapas. See Fig. 50.

Records.—*Chiapas:* Cueva de la Golondrina, Cueva del Nacimiento del Río Santo Domingo, and Grutas de Rancho Nuevo.

Discussion.—This species is most closely related to *T. inops.* Eyes are absent. Like *T. inops* and *H. planus*, *T. anophthalma* is known only from high elevation caves.

Troglostygnopsis inops (Goodnight and Goodnight)

Hoplobunus inops Goodnight and Goodnight, 1971: 40-41, fig. 17; Reddell and Mitchell, 1971b:188, fig. 13; Goodnight and Goodnight, 1973:87, 90, fig. 7; Mitchell and Kawakatsu, 1973a:671; Mitchell and Reddell, 1973b:cover; Reddell, 1973a:34, 39; Reddell and Elliott, 1973b:181, 184.

Troglostygnopsis inops: Silhavý, 1974:176, 184, 185, fig. 4(21).

Type-locality.—Sótano de la Joya de Salas, 21 km NW of Gómez Farías, Tamaulipas, México.

Distribution.—Known only from caves in the Sierra de Guatemala, Tamaulipas. See Fig. 50.

Records.—*Tamaulipas:* Cueva de la Capilla, Sumidero de El Jineo, Sótano de la Joya de Salas, Cueva de la Mina, Cueva del Ojo de Agua de Manantiales, and Sótano de Vasquez.

Discussion.—This eyeless species is considered by Silhavý (1974) to be most closely related to *T. anophthalma.* A record of *T. inops* from Cueva del Nacimiento del Río San Antonio, Oaxaca (Goodnight and Goodnight, 1973), is doubtless in error. The two regions share no other cave species in common, and any resemblance is probably due to convergence. The Oaxacan species is presumably an undescribed troglobite.

Suborder Palpatores

Family Nemastomatidae

Ortholasma sbordonii Silhavý

Ortholasma sbordonii Silhavý, 1974:176, 191, 193, fig. 7(43-49).

Type-locality.—Cueva de la Perra (=Cueva de la Capilla), Sierra de Guatemala (Gómez Farías), Tamaulipas, México.

Distribution.—Known only from two caves in the Sierra de Guatemala, Tamaulipas. See Fig. 49.

Records.—*Tamaulipas:* Cueva de la Capilla and Cueva de la Mina.

Discussion.—*Ortholasma* has been erroneously placed in the Trogulidae in the past; it clearly belongs in the Nemastomatidae, though probably in a new subfamily also including *Dendrolasma* of Oregon and Washington and *Cladolasma* of Japan. Epigean species of *Ortholasma* are known from Oregon south to southern California, and from central México, where the genus has been described under the synonym *Trilasma* (W. A. Shear, pers. comm.). The function of the peculiar cuticular sculpture of *Ortholasma* species appears to be the accumulation of dirt for purposes of camoflage. In *O. sbordonii* the dirt also covers the depigmented eyes.

Family Phalangiidae

The family Phalangiidae is well represented in caves throughout México, but only three species have yet been identified. *Geaya yucatana* Goodnight and Goodnight is known from caves in Campeche and Quintana Roo and will probably be eventually recorded from many caves in the Yucatán Peninsula. *Leiobunum metallicum* Roewer has been found in caves in Querétaro and San Luis Potosí. *Leiobunum viridorsum* Goodnight and Goodnight is known from a single cave in San Luis Potosí. *Leiobunum townsendi* Weed is the common trogloxenic harvestmen in the caves of Central Texas and doubtless will be identified from many caves in northern México.

Order Palpigradida

The order Palpigradida is widespread in North America, but it is seldom collected because of its minute size and secretive habits. It is known to range north from southern México into California and Texas. The only known Mexican species, *Koenenia hanseni* Silvestri, has been reported by Remy (1948) from surface localities in Guerrero, Jalisco, Nuevo León, Puebla, Quintana Roo, San Luis Potosí, Tabasco, Tamaulipas, Veracruz, and Yucatán. It has been taken in abundance in detritus in darkness in Sótano de la Tinaja, San Luis Potosí. Remy (1948) reported *Koenenia* sp. from Cuevas de Bellamar, Cuba.

Order Solpugida

A single unidentified specimen of solpugid has been collected from below the upper entrance to Cueva del Abra, Tamaulipas. It doubtless fell into the entrance and should not be considered a part of the true cave fauna. No species of solpugid is known to be associated with caves.

Order Acarina

The order Acarina is the most commonly encountered group of arachnids in the caves of México; it is also the least studied. The accompanying list of families (see Table 17) includes a minimum of 83 species, but many of these represent only family identifications. Other species included in this list are aquatic mites taken from open-air cenotes in Yucatán.

The only part of México which has seen any systematic study of its mite fauna is the state of Yucatán. Wharton (1938) studied several species of interest from the caves of that state.

It is impossible here to go into detail on the known mite fauna of México, but a few families of interest are discussed below.

Table 17.—Summary of cave inhabiting Acarina.

	Troglobites	Other Species
Mesostigmata		
Ascidae	0	1
Heterozerconidae	0	2
Laelapidae	0	1
Macrochelidae	0	1
Paramegistidae	0	1
Parasitidae	0	1
Polyaspidae	0	1
Prodinychidae	0	1
Spelaeorhynchidae	0	1
Spinturnicidae	0	3
Trachytidae	0	1
Trematurellidae	0	1
Uropodidae	0	1
Metastigmata		
Argasidae	0	12
Ixodidae	0	3
Prostigmata		
Arrenuridae	0	1
Cheyletidae	0	2
Cunaxidae	0	1
Ereynetidae	0	1
Erythraeidae	0	1
Hydrachnidae	0	1
Hydrodromidae	0	1
Limnesiidae	0	1
Mideopsidae	0	1
Myobiidae	0	1
Pionidae	0	1
Pterygosomidae	0	1
Rhagidiidae	2	1
Smarididae	0	1
Trombiculidae	0	14
Trombidiidae	0	3
Unionicolidae	0	1
Astigmata		
Acaridae	0	4
Anoetidae	0	1
Glycyphagidae	0	1
Rosensteiniidae	0	1
Cryptostigmata		
Achipteriidae	0	1
Belbidae	0	1
Carabodidae	0	1
Eremaeidae	0	1
Galumnidae	0	1
Hermanniidae	0	1
Hypochthoniidae	0	1
Oribatellidae	0	1
Oribatulidae	0	1
Phthiracaridae	0	1
Total	2	81

Suborder Mesostigmata

Family Ascidae

The only species of ascid mite reported from caves in México is an undetermined member of the genus *Melichares*, taken in Hoyo de Don Nicho, Chiapas. It was found in stream detritus.

Family Heterozerconidae

Specimens of *Discozercon* sp. were removed from a large centipede collected in Cueva de Taninul n. 1, San Luis Potosí. Undetermined specimens probably belonging to the genus *Heterozercon* were found in the sediment of jars from Cueva de la Mina, Tamaulipas, and Cueva de El Ocote, Hidalgo. The hosts were probably rhachodesmid millipeds.

Family Laelapidae

Bonet (1953a) reported the presence of undetermined laelapids of the subfamily Laelapinae in six caves of the Xilitla region, San Luis Potosí. *Haemolaelaps glasgowi* (Ewing) was reported by Wharton (1938) from the carcass of a paca in Grutas de Balankanche, Yucatán; it has recently been collected from swallow guano in Actún Xpukil, Yucatán.

Family Macrochelidae

Macrocheles coprophila Womersley is a guano inhabiting species known from Cueva de la Hoya, San Luis Potosí (Bonet, 1953a). Undetermined specimens of the same genus were reported from Cueva del Jobo, San Luis Potosí (Bonet, 1953a).

Family Polyaspidae

A single species of polyaspid mite, *Dipolyaspis* sp., was reported from three caves in the Xilitla region, San Luis Potosí, by Bonet (1953a).

Family Spelaeorhynchidae

The unusual bat parasite, *Spelaeorhynchus praecursor* Neumann, was reported from caves in San Luis Potosí and Tabasco by Hoffmann and de Barrera (1970).

Family Spinturnicidae

The spinturnicid mites are important parasites of bats and are frequently present on the animals in large numbers. In areas of large bat deposits this group of mites may be extremely abundant on the guano. Rudnick (1960) has revised the family. Three species have been found on bats in caves: *Periglischrus iheringi* Oudemans in Yucatán; *P. vargasi* Hoffmann in Chiapas and Tabasco; and *Spinturnix carloshoffmanni* Hoffmann in Tamaulipas.

Family Trachytidae

This little-known family is represented in Mexican caves only by specimens of the genus *Uroseius* from Cueva de Los Sabinos, San Luis Potosí.

Family Trematurellidae

Bonet (1953a) reported the presence of *Trematurella* sp. in one cave in Querétaro and three in San Luis Potosí.

Family Uropodidae

The family Uropodidae is a frequently collected family in Mexican caves. *Uropoda pearsei* Wharton was described from Cenote de Sambulá (Motul), Yucatán (Wharton, 1938). Although Nicholas (1962) lists this species as a troglobite, it is certainly a troglophilic guanophile. It has been recently collected at the type-locality from guano in a small crawlway at the end of the cave.

Suborder Metastigmata

Family Argasidae

Twelve species of argasid tick have been found in the caves of México, but many are only accidental visitors. Species of the genera *Antricola*, *Ornithodoros*, and *Nothoaspis* are frequently found and are of some importance to the cave ecosystem. *Antricola coprophilus* (McIntosh), *A. marginatus* (Banks), and *A. mexicanus* Hoffmann have all been found to be abundant in guano in bat caves in several parts of México. The immature stages are parasites of bats, but the adults appear to be free-living in the guano. At times *A. mexicanus* is present in vast numbers. At least five species of the genus *Ornithodoros* occur in Mexican caves, but these are usually not found in large numbers and probably have merely dropped off the bats or other host mammal. A unique new genus and species of argasid tick, *Nothoaspis reddelli*, was recently described from Grutas de Xtacumbilxunam, Campeche, by Keirans and Clifford (1975). It has also been found in Actún Xpukil, Yucatán, and Cueva del Azufre, Tabasco (Keirans et al., 1977). It is probably a parasite of the old man bat, *Mormoops megalophylla*.

Family Ixodidae

Three species of ixodid tick of the genus *Amblyomma* have been reported from caves in several states of México. All probably were parasites of small mammals using the cave entrance area for shelter.

Suborder Prostigmata

The suborder Prostigmata is represented in Mexican caves by 17 families and includes the most interesting species in the order with respect to the cave fauna. Marshall (1936) reported specimens of the families Arrenuridae, Hydrachnidae, Hydrodromidae, Limnesiidae, Mideopsidae, Pionidae, and Unionicolidae from caves and cenotes in Yucatán. With the exception of two species reported from caves these families will not be further discussed.

Family Cheyletidae

Two species of cheyletid mite have been collected from caves in México. *Cheyletus cacahuamilpensis* Baker, described from Grutas de Cacahuamilpa, Guerrero (Baker, 1949), is also known from caves in Yucatán. *Cheyletus malaccensis* Oudemans has been collected recently from caves in Tamaulipas and Veracruz.

Family Ereynetidae

Baker (1945) described *Ereynetes sabinensis* from Cueva de Los Sabinos, San Luis Potosí. This predaceous mite probably inhabits washed-in organic debris in caves.

Family Erythraeidae

One species of this family, *Erythraeus bisetosa* Wharton, was described from Cueva de San Isidro, Yucatán. Nicholas (1962) lists it as a troglobite, but it is at best a troglophile. The larvae of erythraeids are parasitic on insects.

Family Hydrodromidae

Hydrodroma despiciens (Müller) is a troglophile inhabiting pools in Grutas de Balankanche, Yucatán (Marshall, 1936).

Family Limnesiidae

Marshall (1936) reported *Limnesia paucispina* Wolcott from five open-air cenotes and two caves in Yucatán. It is presumably a troglophile in Grutas de Balankanche and Cueva de Santa Elena.

Family Myobiidae

The only species of myobiid mite reported from Mexican caves is *Jamesonia arganoi* Vomero. This species was described from the vampire bat *Desmodus rotundus murinus* Wagner in Cueva de Los Sabinos, San Luis Potosí (Vomero, 1972).

Family Pterygosomidae

Cunliffe (1952) reported *Hirstiella trombidiformes* (Berlese) from Cueva del Carrizal, Nuevo León. This is a frequent parasite of lizards; the host in this cave is unknown.

Family Rhagidiidae

The family Rhagidiidae is frequently collected in caves, and many species in Europe and the eastern United States have been tentatively considered to be troglobites. Two described species are possible troglobites and discussed below. An undescribed species of probable troglophile is known from Cueva del Diablo, Veracruz. Undetermined material is also known from Grutas del Palmito and Grutas de Villa de García, Nuevo León.

Rhagidia trisetata Elliott and Strandtmann

Rhagidia sp.: Reddell and Mitchell, 1971a:149.
Rhagidia trisetatus Elliott and Strandtmann, 1971: 473-474, fig. 1-3, 8-16; Reddell, 1973a:34, 39; Reddell and Elliott, 1973a:174.
Rhagidia trisetata: Elliott, 1976:14.

Type-locality.—El Sótano de la Tinaja, San Luis Potosí, México.

Distribution.—Known only from the type-locality.

Discussion.—This species is known only from one female. It was found in association with *R. weyerensis*. These two species are the only members of the family which have been described from México.

Rhagidia weyerensis (Packard)

Bryiobia? (or *Penthaleus?*) *weyerensis* Packard, 1888: 42, pl. II(fig. 1, 1a, 1b).
Bryiobia weyerensis: Banks, 1907:598.
Rhagidia cavicola (part): Banta, 1907:68.
Rhagidia weyerensis: Holsinger, 1965:654, 655-658, 661, fig. 1-6; Elliott and Strandtmann, 1971:469-473, fig. 4-7, 17-24; Reddell and Mitchell, 1971a: 149; Reddell and Elliott, 1973a:174.

Type-locality.—Weyer's Cave (=Grand Caverns), 17 miles north of Staunton, Augusta County, Virginia.

Distribution.—Known from Grand Caverns, Virginia; Old Spanish Cave, Stone County, Missouri; Carlsbad Caverns, Eddy County, New Mexico; and Sótano de la Tinaja, San Luis Potosí, México.

México record.—*San Luis Potosí:* Sótano de la Tinaja.

Discussion.—The distribution of this mite defies explanation at this time. No known species of troglobite is known to have so great and disjunct a distribution; yet no collections of this species are known from the surface, and much of the intervening terrain is hardly suitable for these humus inhabiting animals. Elliott and Strandtmann (1971) found no differences between specimens from Virginia and México and were confident that they dealt with only one species. All known epigean rhagidiids possess eyespots and are either red, orange, or yellow. This species lacks eyespots and pigment and gives every indication of being a troglobite. It is, therefore, listed here with reservations.

Family Smarididae

Specimens of *Fessonia* sp. were collected from cave swallow guano in Cueva del Salitre, Chihuahua. This group of mites is parasitic on insects as larvae, but predaceous as adults.

Family Trombiculidae

The family Trombiculidae is a significant element of the cave fauna of México. The larvae of this family are parasites of vertebrates, and many are known only from bats. The adults of many trombiculids have been collected from caves in México, but the present systematics of the family is based on larval characters so that identification of the free-living adults is practically impossible. Wharton (1938) described one adult species, *Trombicula camilla*, from caves in Yucatán, but it cannot now be identified with any of the described larval species. Either this species or others are frequently present as adults on guano in many caves in Yucatán and are certainly important to the ecology of the caves. Nicholas (1962) lists *T. camilla* and *Hannemania (=Whartonia) nudosetosa* Wharton as troglobites, but these are obviously not cave adapted. Hoffmann (1970) has begun a revision of the trombiculids of México.

Family Trombidiidae

The trombidiid mites are parasites of arthropods in the larval stages. Nicholas (1962) lists two Yucatán species, *Platyseta yucatanicus* Wharton and *Monunguis streblida* Wharton, as troglobites; neither species is cave adapted. Robaux et al. (1977) described an interesting trombidiid, *Ceuthothrombium cavaticum*, from camel crickets (Rhaphidophoridae) from caves in Texas, New Mexico, and México (Cueva del Ojo de Agua, Dulces Nombres, Nuevo León).

Suborder Astigmata

Family Acaridae

Bonet (1953a) reported the presence of *Acarus* sp. in Cueva de la Hoya, San Luis Potosí. Nesbitt (1949) described three species of the genus *Caloglyphus* from Mexican caves: *C. armipes longisetosus* from Cueva de la Calera, Michoacán; *C. longipilus* from Grutas de Juxtlahuaca, Guerrero, and Cueva del Carrizal, Nuevo León; and *C. paranomalus* from Grutas de Atoyac, Veracruz, Cueva de la Calera, and Cueva del Carrizal. Species of *Caloglyphus* have been reported to feed on decaying insects.

Family Anoetidae

Histiostoma sp. has been recently collected in Sótano de Yerbaniz, San Luis Potosí. The anoetids are usually found on decaying organic matter.

Family Glycyphagidae

Bonet (1953a) reported the presence of undetermined specimens of this family in caves in Querétaro and San Luis Potosí. *Glycyphagus domesticus* (DeGeer) has been collected in Cueva del Tempisque, Chiapas, and Cueva del Pedregoso, Coahuila. This is a cosmopolitan species usually found on organic matter; when present in large numbers it can cause dermatitis.

Family Rosensteiniidae

Nycteriglyphus sp. was found in Cueva de Los Sabinos, San Luis Potosí, and Cueva de la Mina, Tamaulipas. This genus of mite is commonly associated with caves and is present at times on bat guano in enormous numbers.

Suborder Cryptostigmata

The oribatid mites certainly abound in the caves of México, but few have been identified. None show any signs of adaptation to the cave environment, but they are doubtless of considerable importance to the cave ecosystem.

Family Belbidae

Bonet (1953a) reported undetermined species of the family to be present in six caves of the Xilitla region, San Luis Potosí. *Belba* sp. has been identified from Cueva de La Lagunita, San Luis Potosí.

Family Galumnidae

Pearse (1936c) reported *Galumna* sp. from two cenotes in Yucatán. *Galumna jacoti* Wharton was described from Cenote de Sambulá (Motul), Yucatán (Wharton, 1938).

Family Oribatellidae

Bonet (1953a) reported the presence of this family in caves in Querétaro and San Luis Potosí. *Oribatella monospicus* Wharton was described from Cenote de Sambulá (Motul), Yucatán (Wharton, 1938).

Family Oribatulidae

Scheloribates luchili was described by Wharton (1938) from Cueva Luchil, Yucatán. Bonet (1953a) reported the presence of this family in Cueva del Jobo, San Luis Potosí.

Class Chilopoda

The cavernicole fauna of México is rich in numbers and diversity of centipedes, but this group remains essentially unstudied. Only 13 species of centipede have been identified from caves in México and only five of these have been reported from more than one cave (see Table 18).

Order Geophilomorpha

Family Geophilidae

The order Geophilomorpha is frequently found in caves in México, but only the geophilid *Pachymerium ferrugineum* (C. L. Koch) has been identified. It is known only from Cueva del Ojo de Agua Grande and Cueva del Ojo de Agua de Tlilapan, Veracruz.

Order Lithobiomorpha

Family Lithobiidae

Garcibius osorioi Chamberlin

Garcibius osorioi Chamberlin, 1942:5-6; Chamberlin, 1943a:27; Bonet, 1946a:111; Nicholas, 1962:175; Reddell, 1967a:24; Reddell, 1971b:42.

Type-locality.—Grutas de García (=Grutas de Villa de García), Nueva (=Nuevo) León, México.

Distribution.—Known only from the type-locality. See Fig. 51.

Discussion.—In this species the ocelli are rudimentary, the antennae are very long, and the animal is pale. In the present state of North American chilopod taxonomy it is impossible to say anything about the affinities of this species.

Nuevobius cavicolens Chamberlin

Nuevobius cavicolens Chamberlin, 1941:188; Crabill, 1960:121-123, 127; Reddell, 1971b:42.

Type-locality.—Bat Cave (=?Cueva de la Boca), Villa Santiago, Hacienda Vista Hermosa—Horsetail Falls, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 51.

Discussion.—*Nuevobius cavicolens* is a pale species with long, slender legs and antennae. The only other member of the genus is *N. cottus* Crabill, known only from Tuckaleechee Caverns, Blount County, Tennessee. This remarkable distributional discontinuity is similar in some respects to that of the milliped family Trichopetalidae. The identity of the type-locality is somewhat uncertain, but it is probably Cueva de la Boca.

Table 18.—Summary of cave inhabiting Chilopoda.

	Troglobites	Other Species
Geophilomorpha		
Geophilidae	0	1
Lithobiomorpha		
Lithobiidae	2	0
Watobiidae	0	1
Scolopendromorpha		
Cryptopidae	2	2
Scolopendridae	0	1
Scutigeromorpha		
Pselliodidae	0	1
Scutigeridae	0	3
Total	4	9

Family Watobiidae

One species of troglophile, *Cruzobius atoyacus* Chamberlin, has been described in this family. It is known only from Grutas de Atoyac, Veracruz, but does not appear to be cave adapted (see Fig. 51).

Order Scolopendromorpha

Family Cryptopidae

Newportia (Scolopendrides) sabina Chamberlin

Newportia sabina Chamberlin, 1942:4; Chamberlin, 1943a:5, 7, 9; Bonet, 1946a:111; Bücherl, 1959: 230, 231; Nicholas, 1962:175; Reddell, 1971b: 43; Reddell and Mitchell, 1971a:150.

Newportia (Scolopendrides) sabina: Bücherl, 1959: 234, 235.

Type-locality.—Cueva de los Sabinos, San Luis Potosí, México.

Distribution.—Known from three caves in the Sierra de El Abra, San Luis Potosí, and possibly one cave in the Sierra de Guatemala, Tamaulipas. See Fig. 51.

New records.—*San Luis Potosí:* Sótano de la Tinaja and Sótano de Yerbaniz; *Tamaulipas:* ?Bee Cave (det. A. Weaver).

Discussion.—A single specimen from Bee Cave lacks the ultimate legs, but in other characters appears to be identical to typical *N. sabina.* Three other species of the genus *Newportia* are known from Mexican caves. *Newportia (Scolopendrides) pelaezi* Chamberlin is a small species described from Grutas del Palmito, Nuevo León, and known only from the holotype (Chamberlin, 1942). Its correct ecological designation must await study, but it is probably a troglophile. An undescribed species from two caves in the Sierra de El Abra, San Luis Potosí, and from Sótano de Nogal, Querétaro, is an apparent troglophile. A very distinctive new species from Cueva del Brinco, Tamaulipas, is unquestionably a highly adapted troglobite.

Family Scolopendridae

Scolopendra sumichrasti Saussure is a large species frequently found in the entrance area of caves. It is known from several caves in the Sierra de El Abra, San Luis Potosí, and the Sierra de Guatemala, Tamaulipas. A large specimen was collected in a remote inner room of Actún Loltún, Yucatán.

Order Scutigeromorpha

Family Pselliodidae

Pselliodes sabinorum, described by Chamberlin (1942) from Cueva de Los Sabinos, San Luis Potosí, was listed by Nicholas (1962) as a troglobite. This species is now considered to be a synonym of the widespread *P. guildingii* (Newport) and is presumably a troglophile.

Fig. 51.–Distribution of troglophilic and troglobitic centipedes of the families Lithobiidae and Cryptopidae: 1, *Newportia pelaezi;* 2, *Garcibius osorioi;* 3, *Nuevobius cavicolens;* 4, *Newportia* n. sp. 1; 5, *Newportia sabina;* 6, *Newportia* n. sp. 2; 7, *Cruzobius atoyacus.*

Family Scutigeridae

Scutigera carrizala Chamberlin from Cueva del Carrizal, Nuevo León, was listed by Nicholas (1962) as a troglobite; this species shows no signs of cave adaptation and should be considered a troglophile. *Scutigera cacahuamilpensis* Herrera was described from Grutas de Cacahuamilpa, Guerrero. It is probably a synonym of *S. linceci* (Wood) which has been reported from that cave as well as from Grutas de Juxtlahuaca, Guerrero, and Grutas de Atoyac, Veracruz; this species is also a troglophile.

Class Pauropoda

The only record of pauropods in Mexican caves is that of a single undetermined specimen collected in Cueva del Jobo, San Luis Potosí (Bonet, 1953a).

Class Diplopoda

The millipeds, better than any other group, characterize the cave fauna of the region under consideration. Every cave with any appreciable moisture can be expected to contain at least one and usually several species of milliped. Although 46 troglobitic and 90 other species have been reported (see Table 19), the class is still poorly known. Many genera and species of both troglobite and troglophile remain undescribed or belong to such poorly known groups that specific identifications are not presently possible.

Table 19.—Summary of cave inhabiting Diplopoda.

	Troglobites	Other Species
Polyxenida		
Lophoproctidae	0	1
Glomeridesmida		
Glomeridesmidae	1	0
Glomerida		
Glomeridae	4	0
Chordeumida		
Cleidogonidae	5	3
Trichopetalidae	4	0
Julida		
Julidae	0	1
Paraiulidae	0	1
*Polydesmida	23	64
Polyzoniida		
Polyzoniidae	0	2
Siphonophoridae	0	1
Spirobolida		
Atopetholidae	0	1
Messicobolidae	0	2
Rhinocricidae	0	4
Spirobolellidae	1	0
Spirobolidae	0	2
Spirostreptida		
Cambalidae	6	0
Spirostreptidae	2	6
Stemmiulida		
Stemmiulidae	0	1
Platydesmida		
Platydesmidae	0	1
Total	46	90

*For summary by families see Table 20.

Order Polyxenidae

Family Lophoproctidae

The minute millipeds of the order Polyxenida have been found in several caves throughout southern México, but only one species, *Lophoproctinus diversunguis* Silvestri, from Grutas de Atoyac, Veracruz, has been identified. The taxonomy of this complex group is very different from that of other millipeds, and no systematists are presently working with the North American fauna. The polyxenids are usually found in soil and deep litter, and the cavernicole species are presumably all troglophiles.

Order Glomeridesmida

Family Glomeridesmidae

The order Glomeridesmida in North America is represented by six species from Panama, one from Guatemala, and this Mexican troglobite. Shear (1974) reports five undescribed epigean species from México. All of the described forms have been placed in the genus *Glomeridesmus*, but Shear believes that at least three genera are represented.

Glomeridesmus sbordonii Shear

Glomeridesmus sbordonii Shear, 1974:241, 245, 246, 248, fig. 1-4; Sbordoni et al., 1974:15, 30 (nomen nudum); Sbordoni, 1974:366.

Type-locality.—Grutas de Coconá, Teapa, Tabasco, México.

Distribution.—Known from the type-locality and possibly one cave in Chiapas. See Fig. 52.

Records.—*Chiapas:* ?Cueva de la Golondrina; *Tabasco:* Grutas del Coconá.

Discussion.—Specimens from Grutas del Coconá have been taken in large numbers from rotten wood near the end of the cave.

Order Glomerida

Family Glomeridae

The family Glomeridae is represented in the New World only by two genera: *Onomeris* contains several epigean species in the southeastern United States; *Glomeroides* contains the four troglobitic species included here, two described epigean species from

México and Guatemala, and several undescribed epigean species from México and Belize. One isolated species of the genus occurs in California.

Glomeroides additiius Causey

Glomeroides additiius Causey, 1973:107, fig. 1-2.

Type-locality.—Cueva de Ungurria, about 20 km WSW Tezonapa, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 52.

Discussion.—This is an eyeless species and in this respect most closely resembles *G. caecus* Causey. It was found on mud in a lower-level room of the cave.

Glomeroides caecus Causey

Glomeroides caecus Causey, 1964b:63, 65, 66, fig. 1-5; Reddell, 1967d:106; Loomis, 1968:7; Causey, 1971b:30; Reddell, 1971b:43; Causey, 1973:107; Reddell, 1973a:34, 40; Shear, 1974:248, 249.

Type-locality.—Sótano de Huitzmolotitla, about 2 km southwest of Tlamaya, which is 10 km northeast of Xilitla, San Luis Potosí, México.

Distribution.—Known only from two caves in the Xilitla region, San Luis Potosí. See Fig. 52.

Records.—*San Luis Potosí:* Sótano de Huitzmolotitla and Sótano de Tlamaya.

Fig. 52.—Distribution of troglobitic millipeds of the families Glomeridae and Glomeridesmidae: 1, *Glomeroides promiscus;* 2, *Glomeroides caecus;* 3, *Glomeroides* n. sp. 1; 4, *Glomeroides pellucidus;* 5, *Glomeroides addititius;* 6, *Glomeroides* n. sp. 2; 7, *Glomeridesmus sbordonii.*

Discussion.—This eyeless species is apparently restricted in its distribution to caves near Xilitla. Both of the caves from which it is recorded are deep wet systems.

Glomeroides pellucidus Shear

Glomeroides pellucidus Shear, 1974:248-249, fig. 5-8.

Type-locality.—Cueva del Ojo de Agua Grande, Paraje Nueva (=Nuevo), Córdoba, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 52.

Discussion.—This species possesses cuticular remnants of ocelli. A single specimen was collected recently from silt in an upper level.

Glomeroides promiscus Causey

Glomeroides promiscus Causey, 1964b:63, 65-66, fig. 6-8; Reddell, 1966a:13; Reddell, 1967c:55; Loomis, 1968:7; Reddell, 1971b:43; Reddell and Mitchell, 1971b:189; Reddell, 1973a:34, 40; Reddell and Elliott, 1973b:181, 185; Shear, 1974: 248, 249; Vomero, 1974:350.

Type-locality.—Sótano de Gómez Farías, 5 km east of Gómez Farías, Tamaulipas, México.

Distribution.—Known only from caves in the Sierra de Guatemala, Tamaulipas. See Fig. 52.

Records.—*Tamaulipas:* Sótano de Gómez Farías, ?Cueva de la Mina, Sótano del Naranjo, Cueva del Ojo de Agua de Manantiales, ?Cueva del Rancho del Cielo n. 3, and ?Cueva del Rancho del Cielo n. 7.

Discussion.—This species possesses a few ocelli but is doubtless a troglobite. The records indicated by a question mark are represented only by females and are thus tentative. Immature specimens taken in Cueva del Nacimiento del Río Frío, Tamaulipas, probably also belong to this species. This milliped is usually found on moist silt and frequently in direct association with other species of milliped.

Order Chordeumida

The order Chordeumida is the dominant group in the milliped fauna of the caves of the eastern United States. It has not been nearly so successful in the caves of México and Central America; few species have invaded caves and fewer yet have become troglobites. Only two families in this order are represented in the cave fauna of México.

Family Cleidogonidae

Shear (1972) has monographed the family Cleidogonidae and reviewed the order Chordeumida in North America. He reported six species of *Cleidogona* from caves in México; two additional species have been added since (Shear, 1974, 1977a). None of these species shows the high degree of adaptation to the cave environment which is present in some other milliped families in México, but five appear to be adapted to cave life and are included here (see Fig. 53). Of the remaining three, one *(C. crystallina* Shear) is known only from caves and may now be isolated in the cave environment. The two other species are also known from epigean localities. *Cleidogona mayapec* Shear has been identified from Cueva del Judío, Querétaro, and *C. totonaca* Shear has been found in Sótano del Gobernador, Querétaro. Other collections of this family from caves in Tamaulipas and Veracruz await study.

Cleidogona baroqua Shear

Cleidogona baroqua Shear, 1972:198, 207, 209-210, fig. 197-200.

Type-locality.—Sótano de San Augustín (=Agustín), Huautla de Jiménez, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 53.

Discussion.—This depigmented species possesses ocelli and is only tentatively considered to be a troglobite. It is a member of the *crucis* group. This species group includes the troglobitic *C. crucis* (Chamberlin) from Veracruz and three epigean species from Oaxaca. Shear (1972) considers this to be the most primitive group in the genus. Because of the presence of ocelli, this species would have to be considered a very recent troglobite. The epigean species of the *crucis* group are known from comparatively high elevations (1700 to 2500 meters), whereas *C. baroqua* is found at about 1400 meters. The more highly evolved troglobite *C. crucis* is found at 500 meters. Although only much additional collecting on the surface and in caves can clarify the situation, it is possible that the epigean ancestor of *C. crucis* became extinct in the Veracruz lowlands much earlier than in the Huautla area and that it or its closest relatives still exist at high elevations in Oaxaca. This may be a similar situation to that in the scorpion genus *Typhlochactas* and the milliped genus *Mexiterpes.*

Cleidogona crucis (Chamberlin)

Cavota crucis Chamberlin, 1942:8-9, fig. 3-7; Chamberlin, 1943b:5, 36; Bonet, 1946a:112; Nicholas, 1962:177; Loomis, 1968:66; Reddell, 1971a:222; Reddell, 1971b:44.

Cleidogona crucis: Shear, 1972:207, 209, fig. 193-196; Shear, 1974:245, 259.

Type-locality.—Gruta de Atoyac, Veracruz, México.

Distribution.—Known only from two caves near Córdoba, Veracruz. See Fig. 53.

Records.—*Veracruz:* Grutas de Atoyac and Cueva del Ojo de Agua Grande.

Discussion.—This species lacks pigment, and the ocelli are reduced to 10. It is the most highly cave-adapted member of the genus in México.

Cleidogona felipiana Shear

Cleidogona felipiana Shear, 1974:254-255, fig. 9-13.

Type-locality.—Cueva del Rayo de San Felipe, San Cristóbal de las Casas, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 53.

Discussion.—This probable troglobite is lacking in pigment and has fewer ocelli than most epigean species. This species is most closely related to *C. decurva* Shear, an epigean species from Chiapas. It is a member of the *stolli* group which, in addition to the two Chiapas species, includes species from El Salvador and Guatemala.

Fig. 53.—Distribution of troglobitic and troglophilic millipeds of the families Cleidogonidae and Trichopetalidae: 1, *Cleidogona crystallina* and *C. pecki;* 2, *Mexiterpes sabinus;* 3, *M. egeo;* 4, *M. fishi;* 5, *C. mayapec, C. totonaca,* and *M. metallicus;* 6, *C. crucis;* 7, *C. baroqua;* 8, *C. hunapu;* 9, *C. felipiana.*

Cleidogona hunapu Shear

Cleidogona hunapu Shear, 1977a:236-238, fig. 1-8.

Type-locality.—Cueva del Burro, Lago de Malpaso, Río Encajonado, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 53.

Discussion.—This depigmented species with only 14 ocelli is closely related to *C. forficula* Shear, an epigean species from San Cristóbal de las Casas, Chiapas. These are the only species known in the *forficula* group.

Cleidogona pecki Shear

Cleidogona sp.: Reddell and Mitchell, 1971b:188 (Cueva de la Capilla and Cueva de la Mina records only).

Cleidogona pecki Shear, 1972:207, 213, fig. 221-225; Reddell and Elliott, 1973b:185; Shear, 1974:254.

Type-locality.—Cueva de la Mina, 6 mi northwest of Gómez Farías, Tamaulipas, México.

Distribution.—Known from two caves in the Sierra de Guatemala, Tamaulipas. See Fig. 53.

Records.—*Tamaulipas:* Cueva de la Capilla and Cueva de la Mina.

Discussion.—This probable troglobite is unpigmented and has the ocelli reduced to 16-20. It is a member of the *crystallina* group. The only other species in this group is *C. crystallina* Shear, which is known only from four caves in the Sierra de Guatemala, including Cueva de la Capilla. *Cleidogona crystallina* also has a slightly reduced number of ocelli, and some individuals have reduced pigmentation. The *crystallina* group is intermediate in structure between the *crucis* group and the large, apparently actively speciating *maculata* group to the north and southwest. The *crystallina* group may represent a pair of relict species now limited to caves.

Family Trichopetalidae

Mexiterpes egeo (Causey)

Poterpes egeo Causey, 1969:46-47, 49, fig. 5, 7-10; Reddell, 1971b:44; Shear, 1972:247; Elliott and Reddell, 1973:196; Reddell, 1973a:34, 40.

Mexiterpes egeo: Shear, 1974:255, 256.

Type-locality.—Cueva de El (=la) Puente, 13 miles south of San Francisco, San Luis Potosí, México.

Distribution.—Known from caves in the vicinity of San Francisco, San Luis Potosí. See Fig. 53.

Records.—*San Luis Potosí:* ?Sótano del Puerto de los Lobos and Cueva de la Puente.

Discussion.—Only a single female is known from Sótano del Puerto de los Lobos so this record must be considered tentative. Although eyes are present, they are reduced. The family Trichopetalidae is represented in México only by the four troglobitic species listed here. Although Shear (1974) considers *Poterpes* to be a synonym of *Mexiterpes*, Causey (pers. comm.) does not feel this position to be justified. The discovery of additional species should help to clarify the generic status of the species of *Poterpes.*

Mexiterpes fishi (Causey)

Poterpes fishi Causey, 1969:46, 47-49, fig. 6, 11-16; Reddell, 1971b:44; Shear, 1972:247; Reddell, 1973a:34, 40.

Mexiterpes fishi: Shear, 1974:256.

Type-locality.—Cueva de la Luz, 20 miles west of Aquismón, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 53.

Discussion.—This species is most closely related to *M. egeo.* The ocelli are reduced in number and the species is certainly a troglobite.

Mexiterpes metallicus Shear

Mexiterpes metallicus Shear, 1972:247, 275, 280, 281, fig. 532-538; Shear, 1974:256; Peck, 1977c: 67.

Type-locality.—1.2 miles east of Pinal de Amoles, Querétaro, México, in an iron mine at roadside.

Distribution.—Known only from the type-locality. See Fig. 53.

Discussion.—This species possesses four small ocelli. It is most closely related to *M. fishi* and *M. egeo.* The "iron mine" is apparently a natural cave enlarged during the mining of mercury rather than iron.

Mexiterpes sabinus Causey

Mexiterpes sabinus Causey, 1963:235-237, fig. 1-3; Reddell, 1965c:7; Reddell, 1967b:82; Causey, 1968:124; Loomis, 1968:69; Causey, 1969:45-46, 49; Reddell, 1971b:44; Reddell and Mitchell, 1971a:151; Shear, 1972:280, 281, fig. 529-531; Reddell, 1973a:34, 40; Reddell and Elliott, 1973a:172; Shear, 1974:255, 256.

Type-locality.—Sótano del Arroyo, near village of Los Sabinos and 8 miles north of Valles, San Luis Potosí, México.

Distribution.—Known from four caves in the Sierra de El Abra near Valles, San Luis Potosí. See Fig. 53.

Records.—*San Luis Potosí:* Sótano del Arroyo, ?Cueva Pinta, Cueva de Los Sabinos, and ?Sótano de la Tinaja.

Discussion.—The localities marked with a question mark are not known by adult males but almost certainly belong to this species. Shear (1974) stated that specimens from Cueva de Los Sabinos are "topotypes," but this is in error since the type-locality is Sótano del Arroyo. Specimens from Cueva de los Monos, San Luis Potosí, are very immature, but will probably prove to belong to this species. *Mexiterpes sabinus* is the most highly evolved troglobite in the genus. This is of special interest since it is a lowland troglobite. Since the Trichopetalidae is a group of temperate relicts in México, it is not surprising that the epigean ancestors survived longer at more temperate higher elevations. The existence of species with ocelli in caves at high elevations suggests that they have become more recently restricted to caves. It is important to make intensive surface collections in the Sierra Madre Oriental to determine whether fully eyed species still survive in the epigean environment. The situation with these millipeds is probably analogous to that already discussed for *Typhlochactas* and for the *Cleidogona crucis* group.

Order Julida

Family Julidae

A single introduced species in the family Julidae, *Diploiulus latistriatus* (Curtis), has been taken in Mexican caves. This species was collected in Cueva de las Cuatas, San Luis Potosí, and is probably an accidental.

Family Paraiulidae

An apparently undescribed species of the genus *Paraiulus* has been collected from three caves at Valle de los Fantasmas, San Luis Potosí. All were taken near the entrance or in areas where flood debris had accumulated, indicating that this is an accidental.

Order Polydesmida

The order Polydesmida has been a remarkably successful group in colonizing the caves of México and Central America. Although 23 troglobites and 64 other species are known from caves in this area (see Table 20), probably as many more species await description or identification. Each visit to a new cave region produces additional new species of polydesmoids, including at least one or two troglobites, while the most carefully studied regions continue to produce new species with almost every investigation.

Table 20.—Summary of cave-inhabiting Polydesmida.

	Troglobites	Other Species
Chelodesmidae	0	1
Euryuridae	1	1
Oniscodesmidae	2	0
Paradoxosomatidae	0	2
Peridontodesmidae	1	2
Pyrgodesmidae	0	34
Rhachodesmidae	10	14
Sphaeriodesmidae	0	8
Trichopolydesmidae	8	0
Tridontomidae	1	0
Xystodesmidae	0	2
Total	23	64

Family Chelodesmidae

Only one species of the family Chelodesmidae has been identified from caves in México. *Chondrodesmus sabachanus* Chamberlin was described from Actún Sabacá, Yucatán. It or a closely related species has since been collected from several cave and surface localities in northern Yucatán and eastern Campeche. Although Nicholas (1962) lists it as a troglobite, it is probably a troglophile or trogloxene.

Family Euryuridae

Undetermined species of the genus *Pseudamplinus* are known from caves in Chiapas, Oaxaca, San Luis Potosí, and Veracruz. The ecological status of the members of this genus is unknown, but some may be troglophiles. The only troglobite in the family is *Polylepiscus vomeroi* Shear, which is discussed below.

Polylepiscus vomeroi Shear

Polylepiscus vomeroi Shear, 1977a:242, 244, 245, fig. 19-23.

Type-locality.—Gruta II Finca Santa Anita, Simoyovel de Allende, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—This depigmented and weakly sclerotized species is the only troglobite in the family. Species of *Polylepiscus* are known only from Chiapas and Guatemala.

Family Oniscodesmidae

Bonetesmus ojo Shear

Bonetesmus ojo Shear, 1974:260, fig. 29-31; Shear, 1977a:260, fig. 44.
Bonetesmus: Shear, 1977a:253.

Type-locality.—Cueva del Ojo de Agua de Tlilapan, Tlilapan, near Orizaba, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—The Oniscodesmidae reaches its northern distributional limit in Veracruz where it is represented by the two troglobitic species listed here. The only other Mexican species is an epigean species, *Ligiodesmus pusillus* Pocock, from Tabasco.

Bonetesmus verus Chamberlin

Bonetesmus verus Chamberlin, 1942:11-12, fig. 18-20; Chamberlin, 1943b:6, 62; Bonet, 1946a:113; Loomis, 1968:111; Causey, 1971b:30; Reddell, 1971b:44; Shear, 1974:256, 257, 259-260, 274, fig. 20-28.

Bonestmus verus: Nicholas, 1962:177 (erroneous spelling).

Bonetesmus novenus Causey, 1971b:30; Reddell, 1973a:40; Shear, 1974:257, 259.

Type-locality.—Of *Bonetesmus verus:* Grutas de Atoyac, Veracruz, México; of *Bonetesmus novenus:* Cueva del Ojo de Agua Grande, 12 km NE Córdoba, Veracruz, México.

Distribution.—Known from three caves in the vicinity of Córdoba, Veracruz. See Fig. 54.

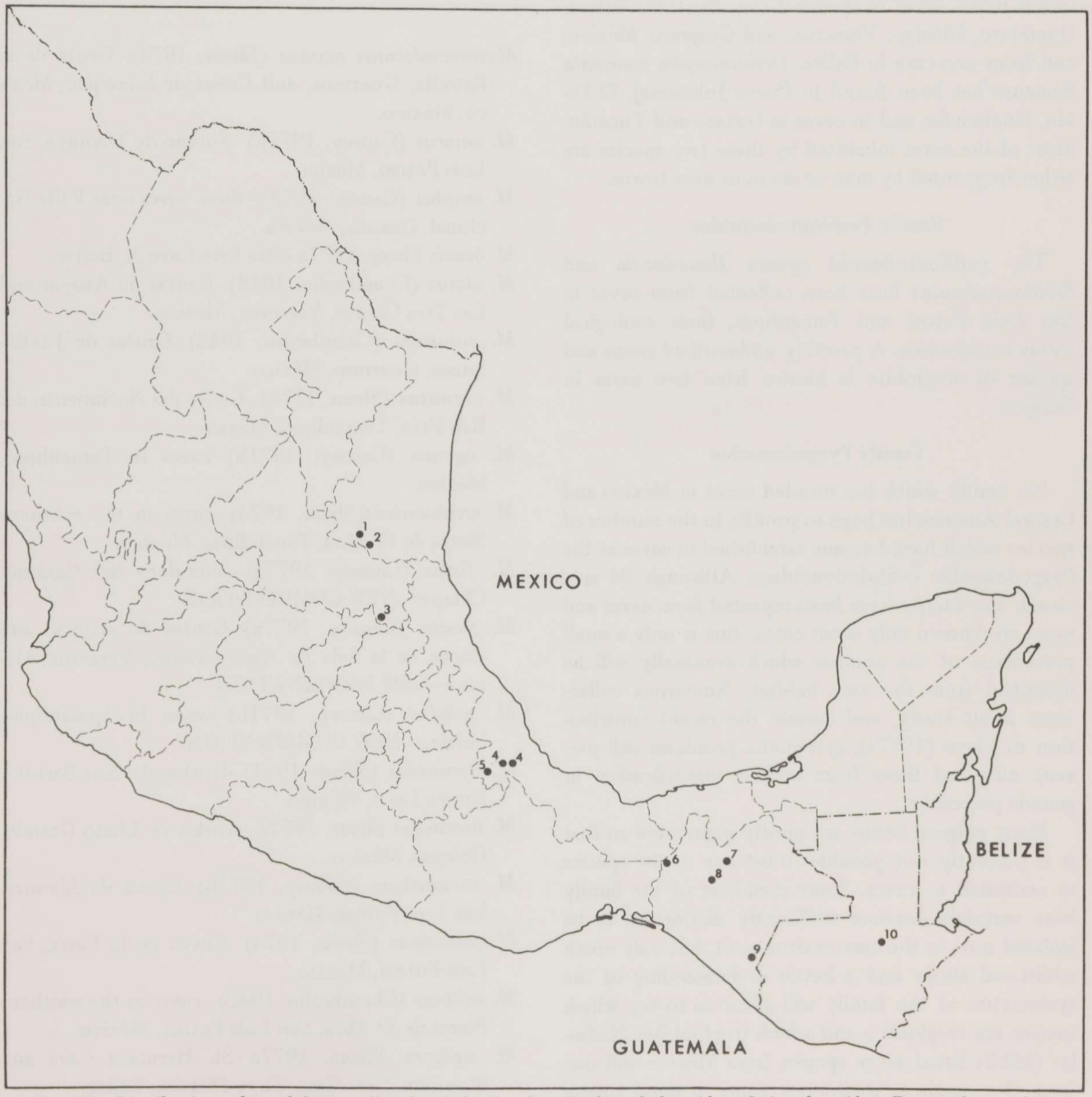

Fig. 54.—Distribution of troglobitic millipeds of the families Trichopolydesmidae, Oniscodesmidae, Euryuridae, and Tridontomidae: 1, *Tylogoneus minus;* 2, *Speodesmus pecki;* 3, *Tylogoneus rainesi;* 4, *Bonetesmus verus;* 5, *B. ojo;* 6, *Caramba delburro;* 7, *Polylepiscus vomeroi;* 8, *C. delnegro;* 9, *C. grandeza;* 10, *Tridontomus loomisi.*

Records.—*Veracruz:* Grutas de Atoyac, Cueva del Ojo de Agua Grande, and Cueva de Sala de Agua Grande.

Discussion.—This species was abundant on and near rotting wood in the wetter areas of each of the three above caves.

Family Paradoxosomatidae

Two species of the family Paradoxosomatidae have been found in caves in México, Guatemala, and Belize. Both are tropicopolitan in distribution and now appear almost everywhere man is found. *Oxidus gracilis* (Koch), the hothouse milliped, has been collected in 14 caves in Nuevo León, San Luis Potosí, Querétaro, Hidalgo, Veracruz, and Guerrero, México; and from one cave in Belize. *Orthomorpha coarctata* Saussure has been found in Cueva Jobitzinaj, El Petén, Guatemala; and in caves in Oaxaca and Yucatán. Most of the caves inhabited by these two species are either frequented by man or are in or near towns.

Family Peridontodesmidae

The peridontodesmid genera *Hexodontia* and *Peridontodesmus* have been collected from caves in San Luis Potosí and Tamaulipas; their ecological status is unknown. A possibly undescribed genus and species of troglobite is known from two caves in Chiapas.

Family Pyrgodesmidae

No family which has invaded caves in México and Central America has been so prolific in the number of species which have become established in caves as the Pyrgodesmidae (=Stylodesmidae). Although 34 species in this family have been reported from caves and most are known only from caves, this is only a small percentage of the number which eventually will be described from the cave habitat. Numerous collections await study, and despite the recent contribution of Shear (1977a), systematic problems still prevent many of these from correct identification or generic placement.

Many epigean forms are poorly pigmented so that it is presently not possible to list any of the species as restricted to caves. Some members of the family have certainly become sufficently distinct as to be isolated now in the cave environment, but only much additional study and a better understanding of the systematics of the family will allow us to say which species are troglobites and which troglophiles. Nicholas (1962) listed seven species from México and one from Guatemala as troglobites; none of these appear to possess unusual modifications restricting them to caves.

These small millipeds are usually black, gray, or cream colored, and many species are covered with a fine layer of dirt adhering to the numerous small knobs and projections on the body. They are found in a variety of habitats in caves, ranging from moist flowstone, guano, and silt to the underside of small rocks and rotting wood.

The genus *Myrmecodesmus* has recently been expanded by Shear (1977a) to include species previously placed in the genera *Bolivaresmus*, *Ceratesmus*, *Gibberdesmus*, and *Stenotodesmus*. The following is a list of the 18 species of cavernicole *Myrmecodesmus* known from this area (see Figs. 55-56).

Myrmecodesmus aconus (Shear, 1974)—Gruta de la Estrella, Guerrero, and Cueva de Coatepec, México, México.

M. amarus (Causey, 1971b)—Sótano de Tlamaya, San Luis Potosí, México.

M. amplus (Causey, 1973)—three caves near Valle Nacional, Oaxaca, México.

M. brevis Shear, 1977a—Rio Frio Cave A, Belize.

M. clarus (Chamberlin, 1942)—Grutas de Atoyac and Las Tres Cuevas, Veracruz, México.

M. colotlipa (Chamberlin, 1942)—Grutas de Juxtlahuaca, Guerrero, México.

M. cornutus (Shear, 1974)—Cueva del Nacimiento del Río Frío, Tamaulipas, México.

M. egenus (Causey, 1971b)—caves in Tamaulipas, México.

M. errabundus (Shear, 1974)—caves in the northern Sierra de El Abra, Tamaulipas, México.

M. fissus (Causey, 1977a)—Sumidero del Camino, Chiapas—NEW COMBINATION.

M. fuscus (Causey, 1977a)—Grutas de Atoyac and Cueva de la Sala de Agua Grande, Veracruz, México—NEW COMBINATION.

M. gelidus (Causey, 1971b)—caves in Tamaulipas, México—NEW COMBINATION.

M. ilymoides (Shear, 1974)—Grutas de San Bartolo, Nuevo León, México.

M. inornatus Shear, 1977a—Grutas de Llano Grande, Chiapas, México.

M. monasticus (Causey, 1971b)—Cueva de Llanura, San Luis Potosí, México.

M. potosinus (Shear, 1974)—Cueva de la Porra, San Luis Potosí, México.

M. sabinus (Chamberlin, 1942)—caves in the southern Sierra de El Abra, San Luis Potosí, México.

M. unicorn Shear, 1977a—St. Hermans Cave and Mountain Cow Cave, Cayo District, Belize.

The genus *Calymmodesmus* includes one species from Guatemala and five from Yucatán (see Fig. 57).

Calymmodesmus inquinatus Causey was described from Gruta del Silvino, Izabal, Guatemala (Causey, 1960); it is also known from Cueva de Yaxchilán, El Petén, Guatemala. *Calymmodesmus alienus* (Chamberlin), *C. isidricus* (Chamberlin), *C. muruztunicus* (Chamberlin), *C. viabilis* (Chamberlin), and *C. hoctunanus* (Causey) are all known only from caves in Yucatán (Chamberlin, 1938; Causey, 1971b).

Shear (1974) described two species of *Cryptyma* from caves in México and Guatemala (see Fig. 57). *Cryptyma cocona* is known only from Grutas del Coconá, Tabasco; and *C. guatemala* has been found in three caves in Alta Verapaz, Guatemala.

The genus *Rettenmeyeria* is represented in caves only by *R. cryptymoides* Shear. It was described by Shear (1977a) from Rio Frio Cave A, Belize (see Fig. 57). Other species of this genus are myrmecophiles.

Lophodesmus includes six species known from caves in Chiapas and Guatemala (see Fig. 57). Shear (1974) described *L. italolegatus* from Cueva de la Golondrina, Chiapas; it is now known from two additional caves in Chiapas and from four in Yucatán. *Lophodesmus tioticho* Shear is known from three caves in Chiapas (Shear, 1974). Causey (1977) considered the American "*Lophodesmus*" to belong to

Fig. 55.—Distribution of eight species of troglophilic pyrgodesmid milliped of the genus *Myrmecodesmus*: 1, *Myrmecodesmus ilymoides*; 2, *M. egenus*; 3, *M. cornutus* and *M. errabundus*; 4, *M. errabundus*; 5, *M. monasticus*; 6, *M. amarus*; 7, *M. aconus*; 8, *M. clarus*.

the genus *Synoptura* and removed the above species to that genus. Hoffman (1976) described *L. petrinus* from Cueva Chirripeck, Alta Verapaz, Guatemala. Shear (1977a) added *L. rodriguezi* from Sima I del Tempisque (=Hoyo de Don Nicho), Chiapas; *L. shawcrossi* from Cueva de Agua Escondida, Huehuetenango, Guatemala; and *L. zullinii* from Grutas de Llano Grande, Chiapas.

Two species apparently spread by commerce have been found in caves in the Yucatán Peninsula. *Poratioides disparatus* Loomis, known from Florida to El Salvador, has been found in Cueva Luchil, Yucatán. *Prosopodesmus jacobsoni* Silvestri, a species described from Java and ranging from Florida into Central America, is known from seven caves in Campeche and Yucatán.

Family Rhachodesmidae

The family Rhachodesmidae is among the more important elements in the milliped fauna of caves in this area. Ten species of troglobite and 14 other species have been identified from caves; many other species, especially of troglobite, await description. Nicholas (1962) lists five species of this family as

Fig. 56.–Distribution of nine species of troglophilic pyrgodesmid milliped of the genus *Myrmecodesmus:* 1, *Myrmecodesmus gelidus;* 2, *M. sabinus;* 3, *M. potosinus;* 4, *M. fuscus;* 5, *M. amplus;* 6, *M. colotlipa;* 7, *M. fissus;* 8, *M. inornatus;* 9, *M. unicorn.*

troglobites, only two of which are unquestionably such. The remaining three, *Aceratophallus calcehtokanus*, *A. hoctunanus*, and *A. oxkutzcabus* were described by Chamberlin (1938) from caves in Yucatán (see Fig. 58). These three species are of uncertain ecological status. The only unquestioned troglobite in this genus, *A. scutigeroides* Shear, is listed below.

The genus *Rhachodesmus* is represented in Mexican caves by two species (Causey, 1973): *R. digitatus* Causey is an apparent troglophile from caves near Huautla de Jiménez, Oaxaca; *R. viridis* (Saussure) is presumably an accidental in Cueva del Ojo de Agua Grande, Veracruz (see Fig. 58).

Two other genera of rhachodesmid are represented in Mexican caves by species which have probably been accidentally introduced into the caves. *Rhachidomorpha adunca* (Saussure and Humbert) is known only from Sótano del Relicario, Veracruz; and *Tiphallus frivolus* Causey has been collected only in Cuevacita de Nopales, San Luis Potosí (Causey, 1973).

The remaining four genera of rhachodesmids

Fig. 57.—Distribution of troglophilic pyrgodesmid millipeds of the genera *Cryptyma*, *Lophodesmus*, *Calymmodesmus*, and *Rettenmeyeria*: 1, *Cryptyma cocona*; 2, *Lophodesmus italolegatus*; 3, *L. italolegatus* and *L. rodriguezi*; 4, *L. tioticho*; 5, *L. zullinii*; 6, *Calymmodesmus isidricus* and *Calymmodesmus viabilis*; 7, *Calymmodesmus viabilis*; 8, *Calymmodesmus hoctunanus*; 9, *Calymmodesmus alienus*; 10, *Calymmodesmus muruztunicus*; 11, *Calymmodesmus inquinatus*; 12, *Cryptyma guatemala*; 13, *Rettenmeyeria cryptymoides*.

known from caves all contain troglobites and are discussed below.

Aceratophallus scutigeroides Shear

Aceratophallus scutigeroides Shear, 1974:263, 269, 271, fig. 50-54.

Type-locality.—Cueva Sepacuite n. 1 and Cueva Sepacuite n. 2, Finca Sepacuite, Senahú, Alta Verapaz, Guatemala.

Distribution.—Known from two caves in Alta Verapaz, Guatemala, and possibly one in Chiapas, México. See Fig. 58.

Records.—**GUATEMALA:** *Alta Verapaz:* Cueva Sepacuite n. 1 and Cueva Sepacuite n. 2; **MEXICO:** *Chiapas:* ?Cueva del Arco.

Discussion.—The genus *Aceratophallus* ranges north into Chiapas and Yucatán. Several cave species have been described from Yucatán, but none are obvious troglobites. The single female from Chiapas is either *A. scutigeroides* or a closely related undescribed species. This species is in some ways similar to *Unculabes arganoi* Shear, and it may eventually be necessary to rearrange the species in several genera of the Rhachodesmidae.

Fig. 58.—Distribution of troglobitic and troglophilic rhachodesmid millipeds of the genera *Ceuthauxus, Pararhachistes, Acutangulus, Rhachodesmus,* and *Aceratophallus:* 1, *Ceuthauxus palmitonus;* 2, *C. mediator;* 3, *C. galeanae;* 4, *C. constans;* 5, *Pararhachistes amblus;* 6, *Acutangulus alius;* 7, *Acutangulus pictus;* 8, *Rhachodesmus viridis;* 9, *R. digitatus;* 10, *Aceratophallus scutigeroides;* 11, *Aceratophallus calcehtokanus;* 12, *Aceratophallus oxkutzcabus;* 13, *Aceratophallus hoctunanus.*

Acutangulus alius Causey

Acutangulus alius Causey, 1973:108, 109, fig. 3-6.

Type-locality.—Cueva del Ojo de Agua de Tlilapan, Tlilapan, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 58.

Discussion.—This is the only troglobite in the genus *Acutangulus*. There are presently five described species in this genus from Veracruz and two undescribed species from Oaxaca (Causey, 1973). *Acutangulus pictus* Causey has been collected in Sótano de Botella Chica, Veracruz, but is probably an accidental. *Acutangulus alius* was found on silt and breakdown along the edges of the first bat room in the type-locality. It appeared to avoid the main guano deposits.

Ceuthauxus constans Causey

Ceuthauxus constans Causey, 1973:111-112, fig. 9-10.

Type-locality.—Grutas del Mogote, El Mogote, 15 km NNE Taxco, Guerrero, México.

Distribution.—Known only from two caves in the Dolina de El Mogote, Guerrero. See Fig. 58.

Records.—*Guerrero:* Cueva Chica del Mogote and Grutas del Mogote.

Discussion.—This abundant troglobite is the southernmost species of the genus, which ranges north to Nuevo León. Other species are known from Morelos, Veracruz, Oaxaca, Tamaulipas, and Coahuila. This species is apparently closely related to *C. palmitonus* Chamberlin. In Grutas del Mogote it was present in large numbers on silt banks. *Ceuthauxus galeanae* (Chamberlin) has been taken from caves near Galeana, Nuevo León, while *C. mediator* Chamberlin has been found in small caves on Cuesta de Chipinque near Monterrey, Nuevo León. Both species are probably accidentals.

Ceuthauxus palmitonus Chamberlin

Ceuthauxus palmitonus Chamberlin, 1942:12; Chamberlin, 1943b:5, 52; Bonet, 1946a:112; Chamberlin, 1947:32; Nicholas, 1962:176; Causey, 1973: 111.

Ceuthauxius palmitonus: Bolívar, 1944:26 (erroneous spelling).

Ceuthauxus palmitensis: Reddell, 1967a:24 (erroneous spelling).

Strongylodesmus palmitonus: Loomis, 1968:41; Reddell, 1971b:45.

Type-locality.—Gruta del Palmito, Bustamente (=Bustamante), Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 58.

Discussion.—This is the northernmost described species of the family Rhachodesmidae. It is apparently a relict species now restricted to its cave habitat by the surrounding desert. Other relict species include *C. nuevus* Chamberlin which is known only from the vicinity of the spring, Ojo de Agua, at Sabinas Hidalgo, Nuevo León; and an undescribed epigean species taken in the entrance area of Cueva del Carrizal, Nuevo León. Specimens have been collected from Grutas del Palmito in the main entrance room in moist, silted areas, from rotting wood, and from an oatmeal trail.

Pararhachistes amblus Chamberlin

Pararachistes amblus Chamberlin, 1942:13, fig. 21-22; Chamberlin, 1943b:5, 53; Bonet, 1946a:112; Nicholas, 1962:176.

Pararhachistes amblus: Loomis, 1968:39; Reddell, 1971b:45.

Type-locality.—Cueva de Jutxlahuaca (=Grutas de Juxtlahuaca), Colotlipa, Guerrero, México.

Distribution.—Known only from the type-locality. See Fig. 58.

Discussion.—The genus *Pararhachistes,* in addition to this troglobite, includes two epigean species from Guerrero. *Pararhachistes amblus* has been collected recently from silt banks and rotten wood.

Strongylodesmus harrisoni Causey

Milliped, new genus and species: Reddell, 1966a:13; Reddell, 1967c:55.

Rhachodesmidae, undescribed genus and species: Reddell, 1971b:44 (Tamaulipas records only).

Strongylodesmus harrisoni Causey, 1971b:31; Reddell and Mitchell, 1971b:189, fig. 14; Causey, 1973:113, 114, 116, fig. 17-18; Mitchell and Kawakatsu, 1973a:671, 673; Reddell, 1973a:34, 40; Reddell and Elliott, 1973b:181, 185; Shear, 1974:261, 263, fig. 32-34; Fernández Ruiz, 1976: 717.

Type-locality.—Cueva del Rancho del Cielo No. 7, 5 km NW of Gómez Farías, Tamaulipas, México.

Distribution.—Known from caves in the Sierra de Guatemala, Tamaulipas. See Fig. 59.

Records.—*Tamaulipas:* ?"Sinkhole" at Rancho del Cielo, Cueva de la Capilla, Crystal Cave, ?Sótano de Gómez Farías, Harrison Sinkhole, Cueva del Infiernillo, Sumidero de El Jineo, ?Sótano de la Joya de Salas, Sótano del León, Resumidero de los Mangos, Cueva de la Mina, Sótano del Molino, Cueva de las Perlas, Cueva Chica de la Perra, ?Cueva del Rancho del Cielo n. 3, Cueva del Rancho del Cielo n. 7, Cueva del Remolino, Sótano de Tres Cerritos, Cueva del Ojo de Agua de Manantiales, 2,000 Meter Cave, Sótano de Vasquez, and ?Wet Cave.

Discussion.—This large, delicate species ranges in color from a pale blue-green to pure white. It is a major element of the cave fauna of the Sierra de Guatemala. Retention of pigment in some individuals indicates that it is a fairly recent troglobite. It is frequently abundant on silt and moist flowstone. A large, epigean species, *S. conspicuus* Causey, is abundant on the surface and is occasionally collected in the entrance areas of caves in the Sierra de Guatemala and Sierra de El Abra. A second epigean species, *S. potosianus* (Chamberlin), is known from Sumidero de Fantasmas, San Luis Potosí. The genus *Strongylodesmus* ranges from Veracruz to Tamaulipas and contains eight species.

Unculabes arganoi Shear

Unculabes arganoi Shear, 1974:264, 265, 267, 268, 269, fig. 39-44.

Type-locality.—Cueva del Madroño, El Lolo (=El Lobo), Querétaro, México.

Fig. 59.—Distribution of troglobitic and troglophilic rhachodesmid millipeds of the genus *Strongylodesmus:* 1, *Strongylodesmus harrisoni;* 2, *S. harrisoni* and *S. conspicuus;* 3, *S. conspicuus;* 4, *S. potosianus.*

Distribution.—Known only from the type-locality. See Fig. 60.

Discussion.—This species is apparently most closely related to *U. crispus* Causey, its geographically closest relative. The genus *Unculabes* includes five species, all known from caves. Four of these are certainly troglobites. A fifth species, *U. columbinus* Causey, from Sótano de las Golondrinas, San Luis Potosí (Causey, 1973), is red and probably should be classified as a troglophile. *Unculabes* includes several rather divergent species, and some may eventually be removed to other genera.

Unculabes causeyae Shear

Unculabes sp.: Causey, 1973:118; Reddell and Elliott, 1973b:181, 185.

Unculabes causeyae Shear, 1974:263, 264-265, 267, fig. 35-38.

Type-locality.—Cueva Chica de la Perra, 8 mi northwest of Gómez Farías, Tamaulipas, México.

Distribution.—Known only from two caves in the Sierra de Guatemala, Tamaulipas. See Fig. 60.

Records.—*Tamaulipas:* ?Cueva de la Mina and Cueva Chica de la Perra.

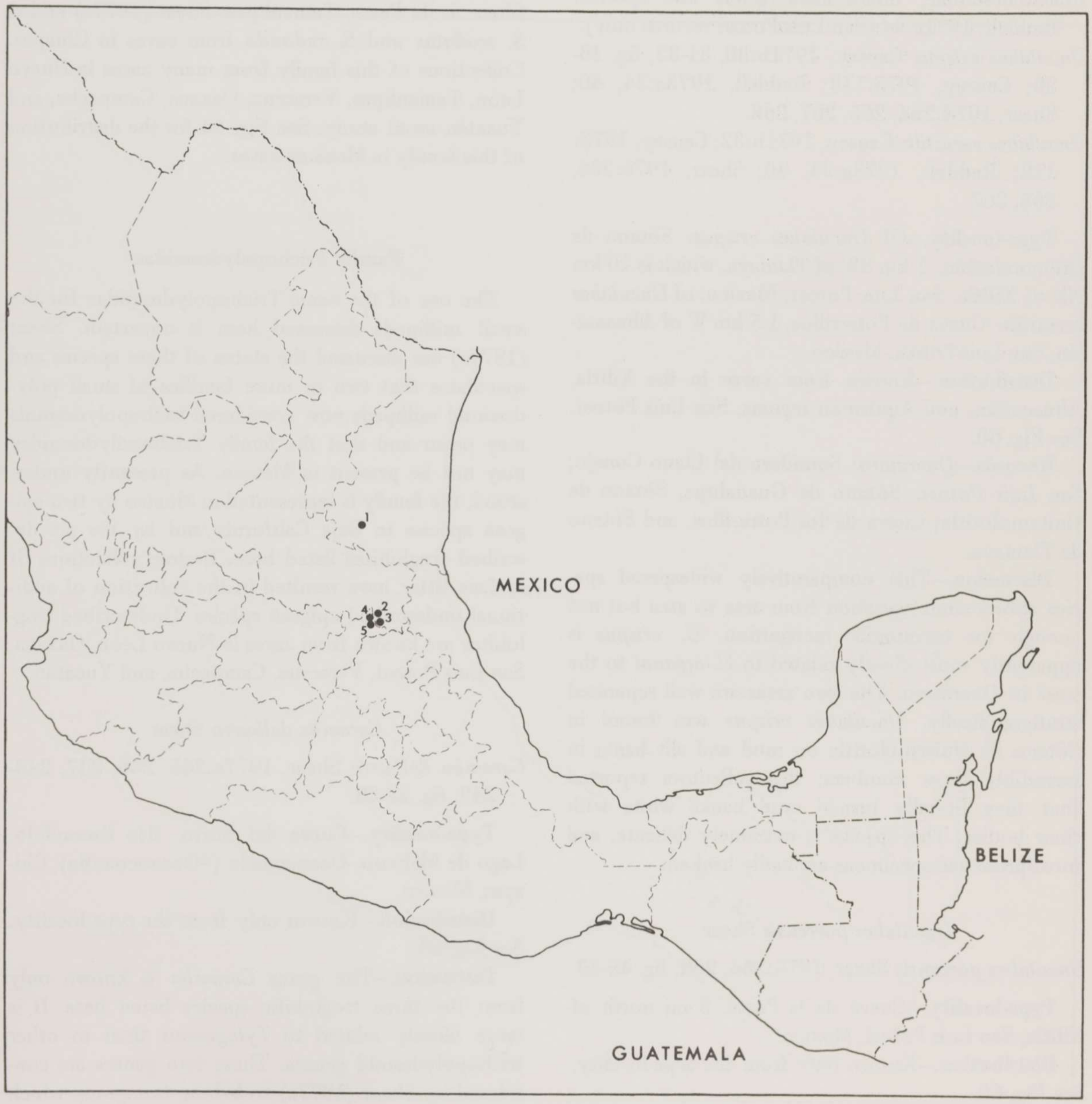

Fig. 60.—Distribution of troglobitic and troglophilic rhachodesmid millipeds of the genus *Unculabes:* 1, *Unculabes causeyae;* 2, *U. columbinus* and *U. crispus;* 3, *U. crispus* and *U. porrensis;* 4, *U. crispus;* 5, *U. arganoi.*

Discussion.—This species is distinct from other members of the genus *Unculabes* and in many respects resembles *Aceratophallus.* It is interesting that this troglobite inhabits the same caves as does the less highly evolved *Strongylodesmus harrisoni.* It is very uncommon in the area, whereas *S. harrisoni* is abundant. It is possible that *S. harrisoni* is a more successful recent invader.

Unculabes crispus Causey

Polydesmoid, undescribed genus and species: Reddell, 1967d:106.

Rhachodesmidae, undescribed genus and species: Reddell, 1971a:44 (San Luis Potosí records only).

Unculabes crispus Causey, 1971b:30, 31-32, fig. 18-20; Causey, 1973:118; Reddell, 1973a:34, 40; Shear, 1974:264, 265, 267, 268.

Unculabes versatilis Causey, 1971b:32; Causey, 1973:118; Reddell, 1973a:34, 40; Shear, 1974:264, 265, 267.

Type-locality.—Of *Unculabes crispus:* Sótano de Huitzmolotitla, 2 km SW of Tlamaya, which is 10 km NE of Xilitla, San Luis Potosí, México; of *Unculabes versatilis:* Cueva de Potrerillos, 1.5 km W of Ahuacatlán, San Luis Potosí, México.

Distribution.—Known from caves in the Xilitla, Ahuacatlán, and Aquismón regions, San Luis Potosí. See Fig. 60.

Records.—*Querétaro:* Sumidero del Llano Conejo; *San Luis Potosí:* Sótano de Guadalupe, Sótano de Huitzmolotitla; Cueva de los Potrerillos, and Sótano de Tlamaya.

Discussion.—This comparatively widespread species shows some variation from area to area but not enough for taxonomic recognition. *U. crispus* is apparently most closely related to *U. arganoi* to the west in Querétaro. The two areas are well separated stratigraphically. *Unculabes crispus* was found in Sótano de Huitzmolotitla on mud and silt banks in incredibly large numbers; the collectors reported that they literally turned mud banks white with their bodies. This species is extremely delicate, and most preserved specimens are badly broken.

Unculabes porrensis Shear

Unculabes porrensis Shear, 1974:264, 268, fig. 45-49.

Type-locality.—Cueva de la Porra, 3 mi north of Xilitla, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 60.

Discussion.—This species is closely related to *U. arganoi* and *U. crispus.*

Family Sphaeriodesmidae

The family Sphaeriodesmidae is well represented in caves, and seven species are known only from caves with many specimens still unstudied. Nicholas (1962) listed *Cylionus kauanus* Chamberlin from Actún Kaua, Yucatán, as a troglobite, but it is doubtful if any sphaeriodesmids can be reliably listed as troglobites. The cave inhabiting species show no significant differences from species which inhabit endogean habitats. Shear (1974) described four species from Mexican caves: *Sphaeriodesmus cruzbelem*, *S. golondrinensis*, and *S. zontehuitz* are known only from caves in Chiapas; *S. nortoni* has been identified from Cueva Chica de la Perra, Tamaulipas. Shear (1977a) added *S. trullatus* and *S. redondo* from caves in Chiapas. Collections of this family from many caves in Nuevo León, Tamaulipas, Veracruz, Oaxaca, Campeche, and Yucatán await study. See Fig. 61 for the distribution of this family in Mexican caves.

Family Trichopolydesmidae

The use of the name Trichopolydesmidae for the small millipeds discussed here is uncertain. Shear (1977a) has discussed the status of these species and speculates that two or more families of small polydesmoid millipeds now considered trichopolydesmids may occur and that the family Trichopolydesmidae may not be present in México. As presently understood, the family is represented in México by two epigean species in Baja California and by the six described troglobites listed here. Berlese collections of surface litter have resulted in the collection of additional undescribed epigean species. Undescribed troglobites are known from caves in Nuevo León, Oaxaca, San Luis Potosí, Veracruz, Campeche, and Yucatán.

Caramba delburro Shear

Caramba delburro Shear, 1977a:245, 246, 247, 248-249, fig. 24-28.

Type-locality.—Cueva del Burro, Río Escondido, Lago de Malpaso, Ocozocuatla (=Ocozocoautla), Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—The genus *Caramba* is known only from the three troglobitic species listed here. It is more closely related to *Tylogoneus* than to other trichopolydesmid genera. These two genera are considered by Shear (1977a) to belong to a group which includes the genera *Chaetaspis* and *Antriadesmus* of the United States.

Caramba delnegro Shear

Caramba delnegro Shear, 1977a:246, 247, 248, 250, 251, fig. 30.

Type-locality.—Cueva del Negro, Bochil, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—The shape of the gonopods of this species is similar in some respects to that of the species of *Tylogoneus*, but other characters clearly place it in *Caramba*.

Caramba grandeza Shear

Caramba grandeza Shear, 1977a:247, 248, 249, 250, fig. 29.

Type-locality.—Grutas de Llano Grande, Llano Grande, La Grandeza, Huiztla, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—This species, known only from males, is closely related to *C. delburro.*

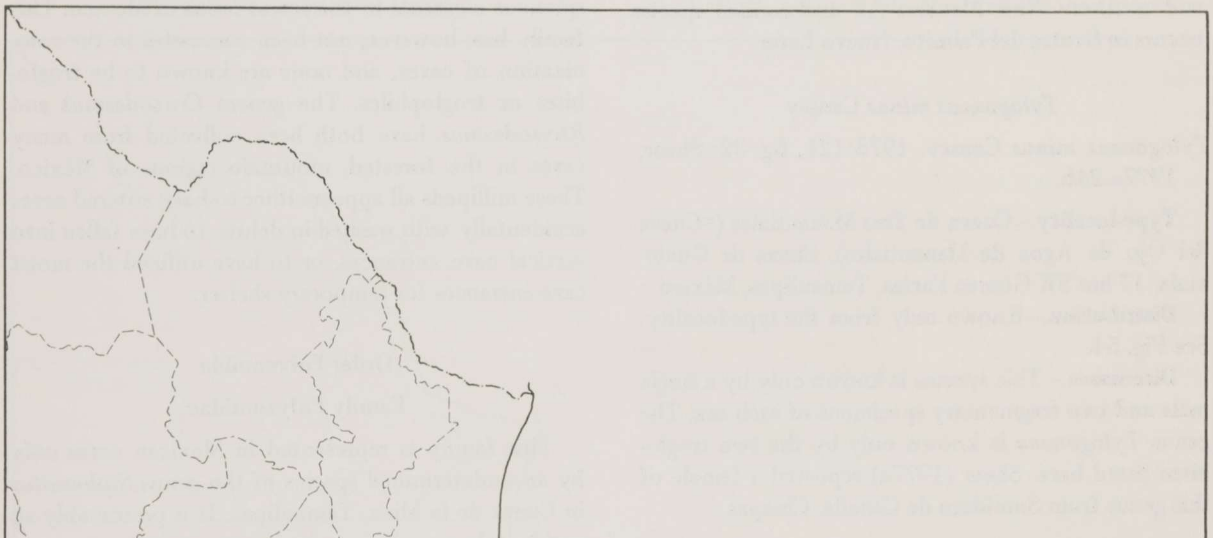

Fig. 61.—Distribution of troglophilic millipeds of the family Sphaeriodesmidae: 1, *Sphaeriodesmus nortoni;* 2, *S. redondo;* 3, *S. golondrinensis;* 4, *S. zontehuitz;* 5, *S. cruzbelem;* 6, *S. trullatus;* 7, *Cylionus kauanus.*

Speodesmus pecki Shear

Polydesmidae, undescribed genus and species: Reddell and Mitchell, 1971a:150.

Speodesmus pecki Shear, 1974:241, 272, 273-274, fig. 55-58; Shear, 1977a:246, 247.

Type-locality.—Cueva del Pachón, 12 mi south of Ciudad Mante, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—Shear (1974) placed this species in *Speodesmus* with the admission that it may be representative of an undescribed genus. *Speodesmus* is known only by troglobitic species in Central Texas and southern New Mexico. An undescribed species occurs in Grutas del Palmito, Nuevo León.

Tylogoneus minus Causey

Tylogoneus minus Causey, 1973:121, fig. 32; Shear, 1977a:246.

Type-locality.—Cueva de Tres Manantiales (=Cueva del Ojo de Agua de Manantiales), Sierra de Guatemala, 17 km SW Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—This species is known only by a single male and two fragmentary specimens of each sex. The genus *Tylogoneus* is known only by the two troglobites listed here. Shear (1977a) reported a female of this genus from Sumidero de Cañada, Chiapas.

Tylogoneus rainesi Causey

Tylogoneus rainesi Causey, 1973:121, fig. 27-31; Shear, 1977a:246, 247.

Type-locality.—Cueva de Poca Ventana (=Cueva del Ahuate n. 2), Xilitla, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—This species is known only from the male holotype.

Family Tridontomidae

Tridontomus loomisi Shear

Tridontomus loomisi Shear, 1977a:241-243, fig. 14-18.

Type-locality.—Cueva Seamay, near Senahú, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 54.

Discussion.—This species is known only from the male holotype. The family Tridontomidae includes only two species in addition to this troglobite. The other two species, *Tridontomus procerus* Loomis and Hoffman and *Aenigmopus alatus* Loomis and Hoffman are known from Sepacuite and Seamay, Alta Verapaz, Guatemala, respectively. All three species have very long legs and antennae and weakly sclerotized cuticles. Shear (1977a) speculates that the two species described by Loomis and Hoffman (1962) are also from caves since well known caves occur at both Sepacuite (Cueva Sepacuite) and Seamay (Cueva Seamay).

Family Xystodesmidae

The family Xystodesmidae is among the more conspicuous elements in the forest fauna of México. This family has, however, not been successful in the colonization of caves, and none are known to be troglobites or troglophiles. The genera *Cruzodesmus* and *Rhysodesmus* have both been collected from many caves in the forested, mountain regions of México. These millipeds all appear either to have entered caves accidentally with washed-in debris, to have fallen into vertical cave entrances, or to have utilized the moist cave entrances for temporary shelter.

Order Polyzoniida

Family Polyzoniidae

This family is represented in Mexican caves only by an undetermined species of the genus *Siphonotus* in Cueva de la Mina, Tamaulipas. It is presumably an accidental.

Family Siphonophoridae

One species of siphonophorid, *Siphonophora sabachana* Chamberlin, has been described from Mexican caves. It was found in Actún Sabacá, Yucatán, and is listed by Nicholas (1962) as a troglobite, but is clearly an accidental or trogloxene. It has recently been collected in Cueva Luchil, Yucatán. This or a related species has also been taken from three other Yucatán caves.

Order Spirobolida

Family Atopetholidae

The only species of atopetholid identified from caves in México is *Aztecolus nigrior* (Chamberlin). This species was found below the entrance drop into Chevy Sink, Nuevo León.

Family Messicobolidae

This family is represented only by undetermined species of the genera *Anelus* and *Messicobolus* from several caves in México. Their ecological status is unknown, but none are troglobites.

Family Rhinocricidae

Two species of this family were described from caves in Yucatán by Chamberlin (1938) and are listed by Nicholas (1962) as troglobites. *Rhinocricus motulensis* is known only from Cenote de Sambulá, at Motul, and *Yucatobolus spukilensis* was described from Actún Xpukil. Both are apparently accidentals.

Family Spirobollelidae

Reddellobus troglobius Causey

Reddellobus troglobius Causey, 1975b:333, 334-336, 337, 338, fig. 3-5.

Type-locality.—Grutas de Jonotla, 3700 ft el, 7 km SW of Cuetzalan, Puebla, México.

Distribution.—Known from four caves near Cuetzalan, Puebla. See Fig. 62.

Records.—*Puebla:* Cueva de la Barranca, Grutas de Jonotla, Cueva Octimaxal Sur n. 2, and Cueva Xochitl.

Discussion.—This remarkable species is a member of the subfamily Typhlobolellinae, which is represented only by four or possibly five described species, all of which occur in México. *Reddellobus troglobius*

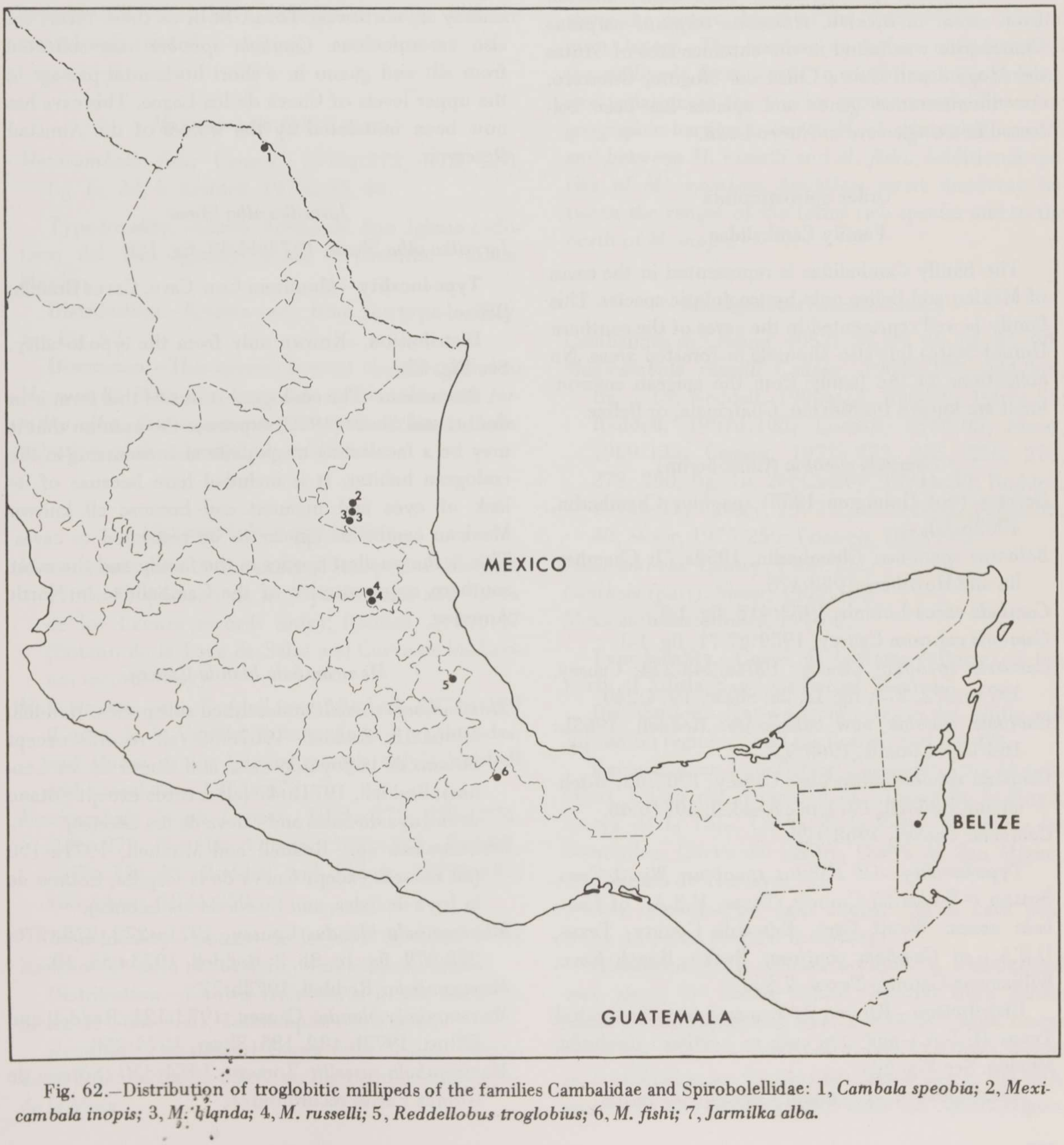

Fig. 62.—Distribution of troglobitic millipeds of the families Cambalidae and Spirobolellidae: 1, *Cambala speobia;* 2, *Mexicambala inopis;* 3, *M. blanda;* 4, *M. russelli;* 5, *Reddellobus troglobius;* 6, *M. fishi;* 7, *Jarmilka alba.*

appears to be most closely related to *Ergene setosus* Chamberlin, an epigean species known from San Luis Potosí and Tamaulipas. Other typhlobollelids include two species of *Typhlobolellus* from Veracruz and possibly *Morelene* from Morelos. *Reddellobus troglobius* was found in areas of organic debris and bat guano in each of the recorded caves. Although all typhlobollelids lack eyes, this species has reduced pigmentation, slender body, and attenuate appendages, indicating that it should be considered to be a troglobite.

Family Spirobolidae

Two species of this family have been collected from caves in México. *Hiltonius carpinus carpinus* Chamberlin was found in the entrance area of Grutas del Mogote and Cueva Chica del Mogote, Guerrero. An undetermined genus and species has been collected in a single cave in Nuevo León.

Order Spirostreptida

Family Cambalidae

The family Cambalidae is represented in the caves of México and Belize only by troglobitic species. This family is well represented in the caves of the southern United States but also abounds in forested areas. No collections of the family from the epigean environment are known for México, Guatemala, or Belize.

Cambala speobia (Chamberlin)

Eclytus (not Holmgren 1855) *speobius* Chamberlin, 1952b:10.

Eclomus speobius: Chamberlin, 1952a:71; Chamberlin and Hoffman, 1958:175.

Cambala caeca Loomis, 1953:417, fig. 1-3.

Cambala captiosa Causey, 1959:67-71, fig. 1-3.

Cambala speobia: Causey, 1964a:243-244; Causey, 1971a:272, 273, fig. 1a, 2a; Shear, 1974:249.

Cambala speobia new subspecies: Reddell, 1965b: 164-165; Loomis, 1968:95.

Cambala speobia subspecies: Causey, 1965:63; Mitchell and Reddell, 1971:64; Reddell, 1971b:46.

Cambala: Causey, 1968:124.

Type-locality.—Of *Eclytus speobius:* Wyatt Cave, Sutton (=Edwards) County, Texas, U.S.A.; of *Cambala caeca:* Wyatt Cave, Edwards County, Texas, U.S.A.; of *Cambala captiosa:* Beck's Ranch Cave, Williamson County, Texas, U.S.A.

Distribution.—Known from many caves in Central Texas (U.S.A.) and one cave in northern Coahuila, México. See Fig. 62.

México record.—*Coahuila:* Cueva de los Lagos.

Discussion.—This is the common cave milliped of Central Texas. Its occurrence in a cave 2 km south of the Rio Grande in Coahuila is not surprising. The limestones of Val Verde County, Texas, are identical to those in adjacent Coahuila. Specimens from Coahuila appear to exhibit slight differences from those across the Rio Grande, and, at first, these appeared to be sufficient to justify subspecific recognition for the Mexican population. Careful study of all material from Central Texas has shown that these differences fall within the range of variation within the species in Texas. The species is closely related to *Cambala reddelli reddelli* Causey in northwestern Texas and adjacent New Mexico and *C. reddelli inornatus* Causey in northwest Texas. Both of these forms are also cavernicolous. *Cambala speobia* was collected from silt and guano in a short horizontal passage in the upper levels of Cueva de los Lagos. This cave has now been inundated by the waters of the Amistad Reservoir.

Jarmilka alba Shear

Jarmilka alba Shear, 1973:44-45, fig. 1-3.

Type-locality.—Mountain Cow Cave, Caves Branch, Belize.

Distribution.—Known only from the type-locality. See Fig. 62.

Discussion.—The ecological status of this form is in doubt, and Shear (1973) expresses the opinion that it may be a facultative troglophile also occurring in the endogean habitat. It is included here because of its lack of eyes and pigment and because all known Mexican cambalids appear to be restricted to caves. This is the smallest species in the family and the most southern representative of the Cambalidae in North America.

Mexicambala blanda Causey

Mexicambala russelli undescribed subspecies: Reddell, 1966a:13; Reddell, 1967c:55 (all records except Sótano de la Joya de Salas and Cueva de los Leones); Reddell, 1971b:47 (all records except Sótano de la Joya de Salas and Cueva de los Leones).

Mexicambala sp.: Reddell and Mitchell, 1971b:190 (all records except Cueva de la Capilla, Sótano de la Joya de Salas, and Cueva de los Leones).

Mexicambala blandus Causey, 1971a:272, 275, 276, 278-279, fig. 1c, 2b, 3; Reddell, 1973a:35, 40.

Mexicambala: Reddell, 1973b:77.

Mexicambala blanda: Causey, 1973:121; Reddell and Elliott, 1973b:182, 185; Shear, 1974:250.

Mexicambala russelli: Vomero, 1974:350 (Sótano de Gómez Farías record only).

Type-locality.—Harrison's Sinkhole, Rancho del Cielo, Tamaulipas, México.

Distribution.—Caves in the southern Sierra de Guatemala, Tamaulipas. See Fig. 62.

Records.—*Tamaulipas:* Bee Cave, Crystal Cave, Sótano de Gómez Farías, Harrison Sinkhole, Sumidero de El Jineo, Sótano del León, Sótano del Molino, Cueva del Nacimiento del Río Frío, Cueva de la Paloma, Grutas de El Puente, Cueva del Remolino, Sótano de Tres Cerritos, and Sótano de Vasquez.

Discussion.—The genus *Mexicambala* is composed only of the four troglobitic species listed here. Causey (1971a) considers this species, together with *M. inopis* and *M. russelli*, to comprise the *russelli* superspecies. They have contiguous ranges and are very closely related.

Mexicambala fishi Causey

Mexicambala fishi Causey, 1971a:272, 275, 280, fig. 1e, 2d, 4; Reddell, 1973a:35, 40.

Type-locality.—Cueva Arriba de Río Iglesia (=Sótano del Río Iglesia), 4 mi. E Huautla, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 62.

Discussion.—This species is most closely related to *M. russelli*. With the exception of the aberrant *Jarmilka alba*, this represents the southern limit of distribution of the Cambalidae in México.

Mexicambala inopis Causey

Mexicambala russelli undescribed subspecies: Reddell, 1967c:55 (Sótano de la Joya de Salas and Cueva de los Leones records only); Reddell, 1971b:47 (Sótano de la Joya de Salas and Cueva de los Leones records only).

Mexicambala sp.: Reddell and Mitchell, 1971b:190 (Cueva de la Capilla, Sótano de la Joya de Salas, and Cueva de los Leones records only); Mitchell and Kawakatsu, 1973a:673.

Mexicambala inopis Causey, 1971a:272, 275, 276, 278, 279, fig. 1b; Causey, 1973:122; Reddell, 1973a:35, 40; Reddell and Elliott, 1973b:182, 185; Shear, 1974:250.

Type-locality.—Sótano de la Joya de Salas, W of Rancho del Cielo about 6 mi., Tamaulipas, México.

Distribution.—Known from caves in the northern Sierra de Guatemala, Tamaulipas. See Fig. 62.

Records.—*Tamaulipas:* Cueva de la Capilla, Sótano de la Joya de Salas, Cueva de los Leones, and Cueva de la Mina.

Discussion.—This species occurs to the north of and at higher elevations than *M. blanda*. The evolution in the same area of two species as closely related as are *M. blanda* and *M. inopis* is somewhat difficult to explain. The epigean ancestor may have become extinct in the higher, more northern part of the Sierra de Guatemala before it did so in the lower, southern area. The higher areas are generally pine forest and are drier than the cloud forest at the lower elevations of the range of *M. blanda*. In the United States the Cambalidae generally prefer wet litter habitats, and we would assume the epigean ancestor of *Mexicambala* to have had a similar preference. Causey (1971a) speculates that *Mexicambala* moved south along the eastern slopes of the Sierra Madre Oriental into Oaxaca. The increase in surface sculpturing of the millipeds from north to south implies a progressive isolation as the species moved south. There are geographic barriers between *M. blanda* and *M. russelli* and between *M. russelli* and *M. fishi*. Additional species of *Mexicambala* doubtless await discovery between the ranges of the latter two species and to the north of *M. inopis*.

Mexicambala russelli Causey

Cambalidae sp.: Bonet, 1953a:24, 29, 66, 81, 85, 90.

Mexicambala russelli Causey, 1964a:237, 244-246, fig. 7-13; Reddell, 1966a:13; Reddell, 1967c:55; Reddell, 1967d:106; Loomis, 1968:95; Shear, 1969:135; Causey, 1971a:272, 275, 276, 278, 279, 280, fig. 1d, 2c; Causey, 1971b:30; Reddell, 1971b:47; Causey, 1973:121; Reddell, 1973a:35, 40; Shear, 1975:250; Vomero, 1974:350.

Mexicambala: Causey, 1968:124.

Cambala (part): Shear, 1969:135.

Mexicambalas: Moller, 1970:5.

Type-locality.—Cueva de la Parra (=Porra), 5 km north of Xilitla, San Luis Potosí, México.

Distribution.—Known from caves in the Xilitla and Aquismón regions, San Luis Potosí. See Fig. 62.

Records.—*San Luis Potosí:* Cueva del Agua (Aquismón), Cueva del Ahuate n. 2, ?Cueva de la Hoya, Cueva de la Laja, Cueva de la Porra, Cueva de los Potrerillos, Cueva del Salitre, Cueva de San Miguel, and Sótano de Tlamaya.

New record.—*San Luis Potosí:* Small cave near Hoya de Quital (det. N. B. Causey).

Discussion.—This species occupies a well-defined area along the Sierra Madre Oriental from Xilitla north to the Aquismón area. The record from Cueva de la Hoya is based only on Bonet's (1953a) record of Cambalidae sp. in this cave. Since this is the only species of this family known from the Xilitla region, this is almost certainly *M. russelli.* Specimens have been taken from moist cave walls with a fine layer of washed-in silt, from wet flowstone with small amounts of bat guano on it, and from silt floors.

Family Spirostreptidae

The only genus of spirostreptid known from caves in this area is *Orthoporus.* In addition to the two troglobites discussed below, this genus is represented in caves in México by five species (see Fig. 63). *Orthoporus fraternus* (Saussure) is a guanophile in Grutas de Zapaluta and Sumidero del Camino, Chiapas; *O. guerreronus* (Chamberlin) has been collected in Grutas de Juxtlahuaca, Guerrero; *O. solicolens* Chamberlin is an abundant troglophile in the caves of Campeche and Yucatán; *O. yucatanensis* Causey is rarely collected in caves in Campeche and Yucatán and is probably an accidental; and *O. mimus* Chamberlin is a troglophile in caves in San Luis Potosí and Tamaulipas (Causey, 1975a). *Orthoporus discriminans* Chamberlin has been collected in Grutas de Lanquín, Alta Verapaz, Guatemala (Causey, 1960). Nicholas (1962) lists *O. guerreronus* as a troglobite, but this species is probably a guanophile. Numerous collections of this genus from many caves throughout México await study.

Orthoporus spelaeus Causey

Orthoporus spelaeus Causey, 1977:167, 176, 178, 180, fig. 16-19; Reddell, 1977b:233, 239, 240, 256.

Type-locality.—Cenote de Catzín, Catzín, nr. Valladolid, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 63.

Discussion.—This species possesses ocelli that are depigmented, as is the body. It is a small species, closely related to *O. solicolens,* which also occurs in Cenote de Catzín. *Orthoporus spelaeus* was found in areas where small accumulations of bat guano had formed. The species demonstrates to a lesser degree the same response to light as is described below for *O. zizicolens.*

Orthoporus zizicolens (Chamberlin)

Gymnostreptus zizicolens Chamberlin, 1938:167, 168, fig. 6-10; Pearse, 1945:173.

Orthoporus zizicolens: Loomis, 1968:105; Reddell, 1971b:48; Causey, 1977:167, 176, 177, 180, 181-182, fig. 20-22; Reddell, 1977b:233, 240, 241, 264, 271, 273, 275, 276, 282.

Orthoporus kiemi Loomis, 1962:47-50, fig. 1-3; Nicholas, 1962:178; Loomis, 1968:100; Reddell, 1971b:47; Causey, 1977:181-182; Shear, 1977a: 238, 239.

Type-locality.—Of *Gymnostreptus zizicolens:* Ziz Cave (=Actún Ziz), Oxkutzcab, Yucatán, México; of *Orthoporus kiemi:* Cave on Hacienda San Bernardo, five miles from station of same name on railroad between Mérida and Maxcanú (=Actún Xpukil), Yucatán, México.

Distribution.—Known only from six caves in the Sierra de Ticul, Yucatán, México. See Fig. 63.

Records.—*Yucatán:* Actún Chukum, Grutas de Loltún, Cueva de Sabré (=Actún Sabacá), Actún Xkyc, Actún Xpukil, and Actún Ziz.

Discussion.—This is a remarkable species in many respects. The ocelli are unpigmented and few in number, the body wall is weakly sclerotized, and the legs and antennae are elongated. It is found on mud and guano slopes and on moist flowstone. When light strikes it, it reacts by twisting wildly. Causey (1977) reports a record of this species in "Cueva de Sabré," collected by B. F. Osorio Tafall. This is certainly Actún Sabacá, a cave known to have been visited by Osorio Tafall. The identity of the type-locality of *O. kiemi* has recently been determined to be Actún Xpukil (=Caves of Calcehtok). These two species of troglobite are, so far as I know, the only cave-adapted spirostreptids.

Order Stemmiulida

Family Stemmiulidae

The only species of stemmiulid known to occur in Mexican caves is an undescribed species of *Prostemmiulus.* This is an abundant troglophile in Grutas de Xtacumbilxunam, Campeche, where it is usually found on bat guano.

Order Platydesmida

Family Platydesmidae

The order Platydesmida is represented in caves in this area only by a single undetermined genus and species from Waterfall Cave, Belize. It is presumably an accidental.

Class Symphyla

Symphylans are frequently found in the soil and leaf litter of caves in México, but they remain unstudied. Specimens have been taken from several caves in Campeche, Oaxaca, Puebla, Tamaulipas, Veracruz, and Yucatán. Their ecological status is unknown.

Class Insecta

The class Insecta is, of course, a dominant element in the cavernicole fauna of the world, just as it is in the epigean fauna. Troglobites are, however, surprisingly sparse in all tropical areas, and only the Apterygota have been very successful in adapting to a cave environment. Twenty-five orders of insect have been collected from caves in México, Guatemala, and Belize. Of these only seven—Collembola, Diplura, Thysanura, Blattodea, Saltatoria, Homoptera, and Coleoptera—are represented by troglobites (see Table 21).

Order Collembola

Collembolans are present in essentially every cave in México and Central America. A total of 16 troglobites and 21 other species have been identified (see Table 22), but large collections from numerous caves in all parts of this area remain unstudied. Although collembolans are most commonly found on organic debris, animal droppings, and bat guano, they are occasionally taken from moist flowstone, the surface of pools, and on cave walls.

Fig. 63.—Distribution of troglobitic and troglophilic millipeds of the family Spirostreptidae: 1, *Orthoporus mimus;* 2, *O. guerreronus;* 3, *O. fraternus;* 4, *O. zizicolens;* 5, *O. spelaeus* and *O. solicolens;* 6, *O. discriminans;* unnumbered circles, *O. solicolens.*

Table 21.—Summary of cave inhabiting Insecta.

	Troglobites	Other Species
*Collembola	16	21
Diplura		
Campodeidae	5	1
Japygidae	0	4
Parajapygidae	0	1
Archaeognatha		
Machilidae	0	1
Thysanura		
Lepismatidae	0	2
Nicoletiidae	1	2
Odonata		
Aeschnidae	0	1
Coenagrionidae	0	6
Cordulegastridae	0	1
Libellulidae	0	13
Ephemeroptera		
Baetidae	0	1
Leptophlebiidae	0	2
Blattodea		
Blaberidae	0	6
Blattellidae	1	6
Blattidae	0	1
Polyphagidae	0	4
Isoptera		
Termitidae	0	1
Mantodea		
Mantidae	0	1
Dermaptera		
Forficulidae	0	2
Labiduridae	0	1
Labiidae	0	1
Plecoptera		
Perlidae	0	1
*Saltatoria	4	37
Embioptera	0	1
Psocoptera		
Caeciliidae	0	1
Epipsocidae	0	1
Liposcelidae	0	1
Pachytroctidae	0	1
Psocidae	0	1
Psyllipsocidae	0	2
Troctopsocidae	0	1
Mallophaga		
Menoponidae	0	1
Philopteridae	0	1
*Hemiptera	0	63
*Homoptera	2	10
Megaloptera		
Corydalidae	0	1
Neuroptera		
Myrmeleontidae	0	1
*Coleoptera	25	246
Siphonaptera		
Hystrichopsyllidae	0	1
Ischnopsyllidae	0	3
Pulicidae	0	3
*Diptera	0	97
Trichoptera		
Calamoceratidae	0	1
Hydropsychidae	0	1
Philopotamidae	0	1
Polycentropidae	0	1
*Lepidoptera	0	15
*Hymenoptera	0	81
Total	54	653

*For summary by families see Tables 22-29.

Family Entomobryidae

The best-represented family in this area is the Entomobryidae. Nine species of troglobite have been identified, but others doubtless await determination. Cave-adapted forms have been described in the genera *Cyphoderus*, *Metasinella*, *Pseudosinella*, and *Troglopodetes*. These troglobites and related troglophiles are discussed below. At least two species of troglobitic *Dicranocentruga* from caves in Oaxaca and Veracruz are presently under study. Mills (1938) reported *Isotomus* sp., *Lepidocyrtus pearsei* Mills, and *Proisotoma centralis* Denis from caves in Yucatán. These are all troglophiles. Bonet (1953a) reported *Lepidocyrtus* sp. from caves in the Xilitla region of San Luis Potosí and Querétaro.

Cyphoderus innominatus Mills

Cyphoderus innominatus Mills, 1938:183, 186, 188, fig. 17-19; Pearse, 1945:174; Delamare Deboutteville, 1948a:349, 350, 412; Nicholas, 1962:178; Salmon, 1964:537; Reddell, 1971b:49; Reddell, 1977b:234, 239, 240, 268, 274, 276, 289.

Type-locality.—San Bulha Cenote (=Cenote de Sambulá), Motul, Yucatán, México.

Distribution.—Known from four caves in Yucatán. See Fig. 64.

Records.—*Yucatán:* Actún Góngora, Cueva Muruztún, Cenote de Sambulá (Motul), and Cueva Segunda del Camino a San Roque.

Discussion.—This is a white, eyeless species most closely related to the African termitophile *C. limboxiphius* Borner.

Table 22.—Summary of cave inhabiting Collembola.

	Troglobites	Other Species
Entomobryidae	9	5
Hypogastruridae	2	3
Isotomidae	0	3
Neelidae	0	3
Oncopoduridae	2	0
Onychiuridae	0	3
Poduridae	1	3
Sminthuridae	2	1
Total	16	21

Metasinella falcifera (Mills)

Sulcuncus falciferus Mills, 1938:183, 188, 190, fig. 25-27; Absolon and Kseneman, 1942:22, fig. 20; Pearse, 1945:175; Salmon, 1964:483; Reddell, 1971b:49; Massoud and Gruia, 1973:335.

Metasinella falcifera: Bonet, 1944a:20, 22, 23; Delamare Deboutteville, 1949:119; Vandel, 1964: 200-201; Vandel, 1965a:168; Massoud and Gruia, 1973:338, 339; Reddell, 1977b:234, 239, 240, 241, 270.

Sulcuncus: Pearse, 1945:174; Salmon, 1964:131, 483.

Sulcunus falciferus: Nicholas, 1962:179 (erroneous spelling).

Type-locality.—Sazich Cave (=Actun Sazich), Calcehtok, Yucatán, México.

Distribution.—Known only from the type-locality. See Fig. 64.

Discussion.—This is a white, eyeless species. *Metasinella* also includes four cavernicole species from Cuba.

Pseudosinella bonita Christiansen

Pseudosinella bonita Christiansen, 1973:129-130, 131, fig. 1.

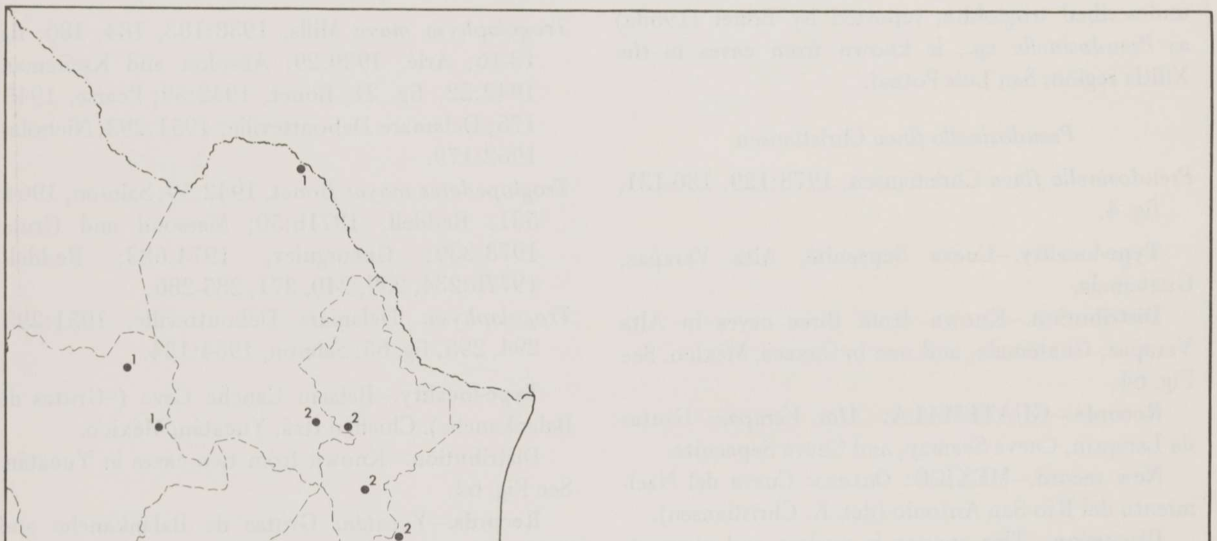

Fig. 64.—Distribution of troglobitic and troglophilic collembolans of the families Entomobryidae and Isotomidae: 1, *Pseudosinella violenta;* 2, *P. reddelli;* 3, *P. reddelli* and *P. petrustrinatii;* 4, *P. petrustrinatii;* 5, *P. finca;* 6, *P. bonita;* 7, *Cyphoderus innominatus* and *Troglopedetes maya;* 8, *Metasinella falcifera;* 9, *Proisotoma centralis.*

Type-locality.—Cueva Bonita del Presidente, 2 km N Huautla, Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 64.

Discussion.—*Pseudosinella bonita* is white and eyeless. It is the most highly evolved troglobite in the genus in México. Five species of *Pseudosinella* are known from Mexican caves. Of the two troglophiles, one, *P. violenta* (Folsom), is abundant in caves in Central Texas; it is also known from caves in Coahuila and Durango. The other troglophile, *P. reddelli* Christiansen, is a widespread, variable species ranging from Coahuila south to southern San Luis Potosí. An undescribed troglobite, reported by Bonet (1953a) as *Pseudosinella* sp., is known from caves in the Xilitla region, San Luis Potosí.

Pseudosinella finca Christiansen

Pseudosinella finca Christiansen, 1973:129, 130-131, fig. 4.

Type-locality.—Cueva Sepacuite, Alta Verapaz, Guatemala.

Distribution.—Known from three caves in Alta Verapaz, Guatemala, and one in Oaxaca, México. See Fig. 64.

Records.—**GUATEMALA:** *Alta Verapaz:* Grutas de Lanquín, Cueva Seamay, and Cueva Sepacuite.

New record.—**MEXICO:** *Oaxaca:* Cueva del Nacimiento del Río San Antonio (det. K. Christiansen).

Discussion.—This species is eyeless and pigmentless. It appears to be most closely related to *P. petrustrinatii*.

Pseudosinella petrustrinatii Christiansen—**New Name**

Pseudosinella strinatii Christiansen, 1973:130, 131-132, fig. 2 (not *P. strinatii* Gisin, 1951); Reddell and Elliott, 1973a:175; Reddell and Elliott, 1973b:182, 185.

Type-locality.—Crystal Cave, Rancho del Cielo, 5 km NW Gómez Farías, Tamaulipas, México.

Distribution.—Known from caves in the Sierra de Guatemala, Tamaulipas; Sierra de El Abra, San Luis Potosí and Tamaulipas; and one cave in the Sierra el Pino, San Luis Potosí. See Fig. 64.

Records.—*San Luis Potosí:* Cueva Chica, Cueva de La Lagunita, Cueva de los Monos, Cueva Pinta, Cueva de Taninul n. 1; Sótano del Tigre, and Sótano de Yerbaniz; *Tamaulipas:* Crystal Cave, Cueva de la Florida, Cueva de El Pachón, Cueva de la Paloma, and Cueva de San Rafael de los Castros.

Discussion.—Dr. Kenneth Christiansen has suggested that the new name, *Pseudosinella petrustrinatii*, be used for *P. strinatii*. "Due to an oversight, *P. strinatii* Christiansen (1973) is a junior homonym of *P. strinatii* Gisin (1951). I propose the new name *Pseudosinella petrustrinatii* to replace *P. strinatii* Christiansen" (Christiansen, in litt.). *Pseudosinella petrustrinatii* is pigmentless and eyeless, and has been divided by Christiansen into three forms, which may eventually prove to be distinct species. The type-locality, Crystal Cave, is the only locality for Type C. Type A occurs only in the Sierra de El Abra; Type B is known from the Sierra de El Abra and from Cueva de La Lagunita.

Troglopedetes maya (Mills)

Trogolaphysa maya Mills, 1938:183, 184, 186, fig. 13-16; Arlé, 1939:29; Absolon and Kseneman, 1942:22, fig. 21; Bonet, 1942:59; Pearse, 1945:175; Delamare Deboutteville, 1951:293; Nicholas, 1962:179.

Troglopedetes maya: Bonet, 1942:59; Salmon, 1964:531; Reddell, 1971b:50; Massoud and Gruia, 1973:339; Guéorguiev, 1974:683; Reddell, 1977b:234, 239, 240, 271, 285-286.

Trogolaphysa: Delamare Deboutteville, 1951:293, 294, 295, fig. 65; Salmon, 1964:134.

Type-locality.—Balaam Canche Cave (=Grutas de Balankanche), Chichén Itzá, Yucatán, México.

Distribution.—Known from two caves in Yucatán. See Fig. 64.

Records.—*Yucatán:* Grutas de Balankanche and Actún Xkyc.

Discussion.—This white, eyeless species is closely related to *T. delamarei* Massoud and Gruia from a cave in Cuba. Undescribed troglobites in this genus are known from caves in Guerrero and Veracruz.

Family Hypogastruridae

Two species of the family Hypogastruridae *(Acherontides atoyacense* and *A. potosinus)* are troglobites. In addition, three species of troglophile have been identified from Mexican caves (see Fig. 65). *Acherontiella sabina* Bonet is a frequently collected species in caves in San Luis Potosí, Tamaulipas, and Nuevo León (Bonet, 1945; 1946b). *Brachystomella parvula* (Schaeffer) was identified by Bonet (1953a) from Cueva de la Hoya, San Luis Potosí. Bonet (1945) described *Willemia persimillis bulbosa* from Cueva de Los Sabinos, San Luis Potosí.

Acherontides atoyacense Bonet

Acherontides atoyacense Bonet, 1945:28-31, fig. 24-31; Bonet, 1946a:114; Bonet, 1946b:52, 55, 56, 57, 62; Bonet, 1953a:23, 30; Stach, 1959:435; Nicholas, 1962:179; Salmon, 1964:189; Gruia, 1970:197, 198, 199; Reddell, 1971b:50; Hüther, 1975:287.

Acherontides atoyacence: Delamare Deboutteville, 1948b:49, 55; Thibaud, 1963:288, 295-296, fig. 3C (erroneous spelling).

Type-locality.—Cueva (=Grutas) de Atoyac, Atoyac, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 65.

Discussion.—The genus *Acherontides* includes seven species, of which the two troglobites listed here are the only Mexican species. The other five species are known from Rumania, Japan, and Afghanistan. *Acherontides atoyacense* is eyeless and pigmentless.

Acherontides potosinus Bonet

Acherontides potosinus Bonet, 1946b:52, 53-57, 62, fig. 1-2; Delamare Deboutteville, 1948b:49, 55; Bonet, 1953a:23, 24, 30, 33, 41, 48, 54, 55, 71, 72, 85, 86; Stach, 1959:434; Nicholas, 1962:179; Thibaud, 1963:288; Salmon, 1964:189; Reddell, 1967d:106; Gruia, 1970:197, 198, 199; Moller, 1970:5; Reddell, 1971b:50; Hüther, 1975:286, 287.

Fig. 65.—Distribution of troglobitic and troglophilic collembolans of the family Hypogastruridae: 1, *Acherontiella sabina;* 2, *Acherontides potosinus;* 3, *Acherontides atoyacense.*

Type-locality.—Cueva de El Jobo, El Jobo, San Luis Potosí, México.

Distribution.—Known from caves in the Xilitla region, San Luis Potosí. See Fig. 65.

Records.—*San Luis Potosí:* Cueva del Aire, Cueva de los Cuchos, Cueva de la Hoya, Cueva del Jobo, and Cueva del Salitre.

Discussion.—This is an eyeless, pigmentless species closely related to *A. atoyacense.*

Family Isotomidae

Two troglophilic species of the family Isotomidae (*Folsomia* sp. and *Folsomina onychiurina* Denis) were identified by Bonet (1953a) from caves in the Xilitla region, San Luis Potosí. *Proisotoma* sp. has been collected in Sótano de Yerbaniz, San Luis Potosí; and *P. centralis* Denis was reported by Mills (1938) from Cenote Yunchén, Yucatán.

Family Neelidae

Bonet (1947) in his monograph on the family Neelidae reported *Neelus murinus* Folsom from Cueva de Los Sabinos, San Luis Potosí; *N. murinus bolivari* Bonet from Cueva de Santa Elena, Yucatán; and *Megalothorax minimus* Willem from caves in Nuevo León and Yucatán. All are troglophiles or trogloxenes.

Family Oncopoduridae

Oncopodura atoyacense Bonet

Oncopodura atoyacense Bonet, 1943:133, 140, 145-147, fig. 14-16; Bonet, 1946a:114; Nicholas, 1962:179; Salmon, 1964:297; Reddell, 1971b:51.

Oncopodura atoyacensis: Guéorguiev, 1974:683 (erroneous spelling).

Type-locality.—Cueva (=Grutas) de Atoyac, Atoyac, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 66.

Discussion.—The genus *Oncopodura* is represented by several species in Europe, one in Japan, one troglobite in Montana (U.S.A.), and the two Mexican troglobites listed here.

Oncopodura prietoi Bonet

Onchopodura: Anonymous, 1942b:265 (erroneous spelling).

Oncopodura prietoi Bonet, 1943:133, 141, 147-150, fig. 17-22; Bolívar, 1944:26; Bonet, 1946a:114; Nicholas, 1962:179; Salmon, 1964:298; Reddell, 1971b:51; Reddell and Elliott, 1973b:182-186.

Oncopodura sp.: Reddell and Mitchell, 1971b:191.

Oncopodura prietori: Guéorguiev, 1974:683 (erroneous spelling).

Type-locality.—Gruta del Palmito, Bustamante, Nuevo León, México.

Distribution.—Known from the type-locality and possibly one cave in the Sierra de Guatemala, Tamaulipas. See Fig. 66.

Records.—*Nuevo León:* Grutas del Palmito; *Tamaulipas:* ?Bee Cave.

Discussion.—This eyeless species is closely related to several European species. The record of this species from Bee Cave is based on a single specimen. Additional material is needed to verify this identification.

Family Onychiuridae

At least three species of the family Onychiuridae have been identified from Mexican caves. *Mesaphorura krausbaueri* Borner and *Onychiurus* sp. were reported by Bonet (1953a) from caves in the Xilitla region, San Luis Potosí. *Onychiurus fimetarius* (Linnaeus) has been collected in Resumidero de Pablillo, Nuevo León. *Mesaphorura foveata* Bonet was reported from Cueva Chica, San Luis Potosí (Bonet, 1944b).

Family Poduridae

In addition to the troglobitic *Spelaeogastrura guerrerense* Bonet, three other podurids have been identified from Mexican caves (see Fig. 66). Mills (1938) described the troglophile *Xenylla yucatana* from Cenote de Sambulá (Motul), Yucatán. Recent collections have included *Paranura caeca* Folsom from Grutas del Mogote, Guerrero, and *Tafallia* sp. from Cueva del Huisache, San Luis Potosí.

Spelaeogastrura guerrerense Bonet

Spelaeogastrura guerrerense Bonet, 1945:22-27, fig. 1-10, 17-23; Bonet, 1946a:114; Nicholas, 1962:179; Salmon, 1964:239; Reddell, 1971b:51.

Speleogastrura: Delamare Deboutteville, 1951:272 (erroneous spelling).

Spelaeogastrura: Salmon, 1964:108, 239.

Type-locality.—Gruta de Cacahuamilpa, Cacahuamilpa, Guerrero, México.

Distribution.—Known only from the type-locality. See Fig. 66.

Discussion.—This eyeless, pigmentless species is the only member of the genus. *Spelaeogastrura* is possibly most closely related to the genus *Schafferia.*

Family Sminthuridae

The family Sminthuridae includes one described troglobite, *Pararrhopalites anops*, in México. A species of the genus *Sminthurus* was reported by Bonet (1953a) as a troglobite in the caves of the Xilitla region, San Luis Potosí. *Temeritas* sp. has been recently collected in Sótano de la Tinaja, San Luis Potosí; its ecological status is unknown.

Pararrhopalites anops Bonet and Tellez

Pararrhopalites anops Bonet and Tellez, 1947:194-198, 202, fig. 1-16; Cassagnau and Delamare Deboutteville, 1953:143; Stach, 1956:62; Nicholas, 1962:179; Salmon, 1964:576; Reddell, 1967a:24; Reddell, 1971b:51.

Type-locality.—Cueva (=Grutas) del Palmito, Bustamante, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 66.

Discussion.—*Pararrhopalites* includes only the troglobite listed here and *P. oculatus* Bonet from Isla de la Roqueta, Acapulco, Guerrero, México.

Fig. 66.—Distribution of troglobitic and troglophilic collembolans of the families Oncopoduridae, Poduridae, and Sminthuridae: 1, *Oncopodura prietoi* and *Pararrhopalites anops;* 2, *O. prietoi;* 3, *Spelaeogastrura guerrerense;* 4, *O. atoyacense;* 5, *Xenylla yucatana.*

Order Diplura

Family Campodeidae

Although campodeids may be found in almost every moist cave in México and Central America, very few species have been described. In addition to the five troglobites discussed below, Wygodzinsky (1944) described *Campodea (Campodea) chica* from Cueva Chica, San Luis Potosí (see Fig. 67). This is presumably a troglophile. Large collections of campodeids remain unstudied. Campodeids are usually found in soil, under rocks, and in debris; troglobites may be found on cave walls or running among rocks on the cave floor.

Juxtlacampa hauseri Condé

Juxtlacampa hauseri Condé, 1975:421-424, fig. 1-2; Strinati, 1977:388.

Type-locality.—Cueva Chirrepeck, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 67.

Discussion.—This species is closely related to *J. juxtlahuacensis.*

Juxtlacampa juxtlahuacensis Wygodzinsky

Juxtlacampa juxtlahuacensis Wygodzinsky, 1944: 368, 374-377, fig. 4; Bonet, 1946a:113; Condé,

Fig. 67.—Distribution of troglobitic and troglophilic diplurans of the family Campodeidae: 1, *Podocampa cavernicola* and *Paratachycampa boneti;* 2, *Campodea (Campodea) chica;* 3, *Litocampa atoyacensis;* 4, *Juxtlacampa juxtlahuacensis;* 5, *J. hauseri.*

1955:40, 60, 62, 64, 170, 187; Paclt, 1957:33; Nicholas, 1962:180; Reddell, 1971b:48; Condé, 1975:421, 424.

Juxtlacampa: Condé, 1955:31, 48, 51, 94, 166, 178; Paclt, 1957:4; Vandel, 1964:203; Vandel, 1965a:170; Delamare Deboutteville, 1971:62.

Type-locality.—Cueva (=Grutas) de Juxtlahuaca, Colotlipa, Guerrero, México.

Distribution.—Known only from the type-locality. See Fig. 67.

Discussion.—The genus *Juxtlacampa* includes only the two species listed here, although Paclt (1957) considered *Jeannelicampa stygia* Condé from Algeria to properly belong in *Juxtlacampa.* This is clearly incorrect.

Litocampa atoyacensis (Wygodzinsky)

Plusiocampa (Litocampa) atoyacensis Wygodzinsky, 1944:368-370, fig. 1; Condé, 1949:137; Condé, 1955:124; Nicholas, 1962:180; Reddell, 1971b: 49.

Plusiocampa atoyacensis: Condé, 1955:130, 170, 187.

Litocampa (Cocytocampa) atoyacensis: Paclt, 1957: 27.

Litocampa atoyacensis: Condé, 1975:421.

Type-locality.—Cueva (=Grutas) de Atoyac, Atoyac, Veracruz, México.

Distribution.—Known only from the type-locality. See Fig. 67.

Discussion.—This troglobite has been placed by Paclt (1957) in the subgenus *Cocytocampa.* This subgenus is a heterogeneous assemblage of species from Europe, South America, and México. It is certainly not a natural grouping of species. I am, therefore, following the usage of Condé (1975).

Paratachycampa boneti Wygodzinsky

Paratachycampa boneti Wygodzinsky, 1944:368, 371-374, fig. 2-3; Condé, 1955:42, 45, 72-73, 77, 170, 187; Nicholas, 1962:180; Reddell, 1967a:24; Reddell, 1971b:49; Condé, 1975:421.

Plusiocampa boneti: Bonet, 1946a:113; Paclt, 1957: 4.

Plusiocampa (Stygiocampa) boneti: Paclt, 1957:45.

Paratachycampa: Condé, 1955:31, 42, 50, 94, 166, 173; Vandel, 1964:203; Vandel, 1965a:170; Delamare Deboutteville, 1971:62.

Type-locality.—Grutas de García (=Grutas de Villa de García), García, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 67.

Discussion.—*Paratachycampa* is a monotypic genus. Paclt (1957) synonymized the genus with *Plusiocampa* and placed *P. boneti* in the subgenus *Stygiocampa* along with species from Bulgaria, Yugoslavia, and Australia. This is certainly not a natural assemblage of species and does not reflect the true relationships of this distinctive troglobite; therefore, at the suggestion of Dr. Pedro Wygodzinsky (pers. comm.), I am retaining the original classification.

Podocampa cavernicola (Wygodzinsky)

Parallocampa (Parallocampa) cavernicola Wygodzinsky, 1944:368, 380-382, fig. 7; Condé, 1955:166, 170, 187; Nicholas, 1962:180; Reddell, 1971b:48.

Parallocampa cavernicola: Bonet, 1946a:113; Reddell, 1967a:24.

Meiocampa (Remycampa) cavernicola: Paclt, 1957: 31.

Parallocampa: Vandel, 1964:203; Vandel, 1965a: 170; Delamare Deboutteville, 1971:62.

Podocampa cavernicola: Condé, 1975:421.

Type-locality.—Grutas de García (=Grutas de Villa de García), García, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 67.

Discussion.—This species was originally placed in *Parallocampa*, a complex of North American species. Paclt (1957) has removed some of these species, including *P. cavernicola*, and placed them in the Moroccan subgenus *Remycampa.* This is certainly an artificial grouping. I am here following the usage of Condé (1975) in placing this species in the genus *Podocampa.*

Family Japygidae

Our knowledge of the japygids of México is extremely limited. Only one species has been positively identified. *Allojapyx allodontus* Silvestri, an epigean species described from southern México, has been reported from Sótano de la Tinaja, San Luis Potosí. Careful study of the holotype of this poorly known species may reveal that the San Luis Potosí specimens belong to an undescribed species. Other genera known from México include *Metajapyx* and *Mixojapyx.* Several undescribed species of troglophile are known. Japygids are usually found under rocks, in leaf litter, and in rotting wood. In some Mexican caves, however, large specimens have been collected from moist silt and clay banks.

Family Parajapygidae

Silvestri (1948) reported *Parajapyx mexicanus* Silvestri from Cueva de Carroza, Yucatán. This family of small soil inhabiting japygoids has been found in several caves in México and Guatemala, but the specimens all remain unstudied.

Order Archaeognatha

Family Machilidae

Machilids are seldom collected in caves, and only one species has been found in a Mexican cave. An unidentified species was collected below the entrance drop of Sótano de Gómez Farías, Tamaulipas. Careful study of the litter in the vicinity of entrances should reveal additional machilids.

Order Thysanura

Family Lepismatidae

Two species of the family Lepismatidae have been identified from caves in México. *Allacrotelsa spinulata* (Packard) was collected from cave swallow guano in the entrance of Cueva del Salitre, Chihuahua. Wygodzinsky (1972) reported *Ctenolepisma ciliata* (Dufour) from the entrance area of Cueva del Diablo, Chihuahua. Both species are probably trogloxenes or accidentals.

Family Nicoletiidae

The family Nicoletiidae is a frequently encountered group in the caves of México and Central America. Numerous species of troglobite and troglophile have been collected from all parts of this area, but with one exception they await description. Troglobitic thysanurans are usually found running along clay or silt banks or on the cave walls. The troglophilic species are more commonly found on the cave floor under and among debrisand rocks. A record of the troglobitic species, *Texoreddellia texensis* (Ulrich), from Grutas de Quintero, Tamaulipas (Paclt, 1971) is in error. *Texoreddellia* is a genus described by Wygodzinsky (1973) for a highly evolved troglobite from Central Texas. Although known from numerous caves in Texas, it has not been reliably reported from México. Wygodzinsky (1973) reports that he has considerable material from Grutas de Quintero, none of which is *Texoreddellia.* The species probably occurs in northern Coahuila. A single individual, which could not be captured, was seen in Cueva de los Lagos, Coahuila, immediately across the Rio Grande from caves inhabited by *T. texensis.* Unfortunately, this cave is now inundated by the waters of the Amistad Reservoir.

Anelpistina anophthalma (Bilimek)

Lepisma anophthalma Bilimek, 1867:905; Packard, 1894:732; Silvestri, 1912:204; Wolf, 1934-1938: vol. 2:484, vol. 3:143; Jeannel, 1943:144; Vandel, 1964:205; Vandel, 1965a:171.

Lepisma anophthalmum: Packard, 1888:88 (erroneous spelling).

Lepisma cacahuamilpensis: Herrera, 1891:219, pl. II (fig. 1b); Packard, 1894:732.

Lepisma anopthalma: MacGillivray, 1891:270 (erroneous spelling).

Lepisma (?) anophtlalma: Silvestri, 1912:221 (erroneous spelling).

Nicoletia anophthalma: Escherich, 1904:133, 140, 155.

Nicoletia: Bolívar, 1940:126.

Nicoletia (Anelpistina) anophtalma: Wygodzinsky, 1946:15-17, 19, 20, 21, fig. 1-2 (erroneous spelling).

Nicoletia (Anelpistina) anophthalma: Paclt, 1963:47.

Anelpistina: Wygodzinsky, 1967:519, 523.

Anelpistina anophthalma: Reddell, 1971b:48.

Type-locality.—Of *Lepisma anophthalma:* Höhle (=Grutas de) Cacahuamilpa in Mexiko; of *Lepisma cacahuamilpensis:* Caverna (=Grutas) de Cacahuamilpa, Guerrero, México.

Distribution.—Known only from the type-locality. See Fig. 68.

Discussion.—This species is a member of a genus ranging from southern México into the southern United States, with one species in Perú (Wygodzinsky, 1967). A closely related species, *A. boneti* (Wygodzinsky), is a troglophile in Grutas de Juxtlahuaca, Guerrero. *Anelpistina* is a frequent inhabitant of caves in México, as both troglophiles and troglobites, but most of the species remain undescribed.

Order Ephemeroptera

Family Baetidae

This family is represented in Mexican caves only by an unidentified genus and species collected in Grutas de Olivares, Puebla.

Family Leptophlebiidae

Two species of this family have been collected in Mexican caves. *Choroterpes (Neochoroterpes) mexicanus* Allen was taken in Cueva de la Puente, San Luis Potosí (Allen, 1974). Nymphs of *Thraulodes litotes* Allen were found in a stream in total darkness in Cueva del Brinco, Tamaulipas. Both of these species are certainly troglophiles.

Order Odonata

Eighteen species of dragonflies and damselflies were reported from cenotes in Yucatán (Williamson, 1936). Although these doubtless utilize the cenotes as places in which to deposit their eggs, they are certainly not part of the true cave fauna. Nymphs of a few additional species have been collected from caves which receive floodwaters, but none should be considered more than accidentals.

Order Blattodea

Roaches are frequently found in caves, both in the entrance area and in total darkness, and are certainly important aspects of the cavernicole fauna. Large collections from all parts of México await study, and the brief summary of the families recorded from caves will doubtless be considerably expanded when this material is studied.

Family Blaberidae

The most conspicuous roaches which inhabit caves are the larger species of the family Blaberidae. *Blaberus atropos* (Stoll) and *B. craniifer* Burmeister have been reported from caves in Yucatán (Pearse, 1938b). The latter species is also extraordinarily abundant in Grutas de Juxtlahuaca, Guerrero, where it nearly covers the walls and floor of the principal bat room. Fisk (1977) also reported this species from Cueva del Rancho San Miguel, Chiapas. *Blaberus giganteus*

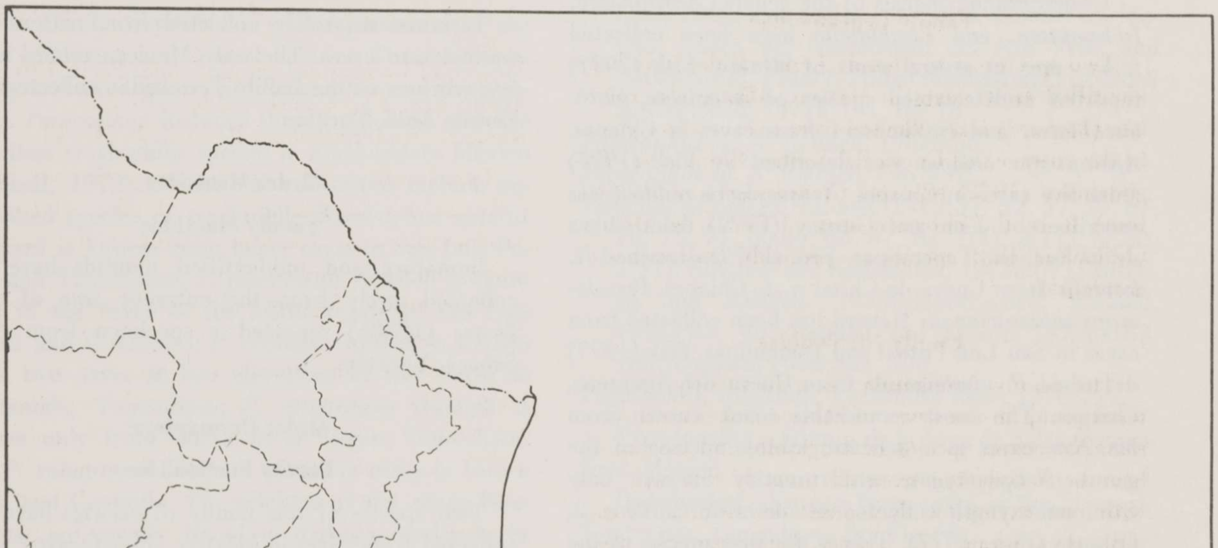

Fig. 68.–Distribution of troglobitic and troglophilic thysanurans of the family Nicoletiidae: 1, Undescribed troglobitic Nicoletiidae; 2, *Anelpistina anophthalma;* 3, *A. boneti.*

(Linnaeus) has been collected from Cueva de San Rafael de los Castros, Tamaulipas. *Pycnoscelus surinamensis* (Linnaeus) was found in the entrance room of Bee Cave, Tamaulipas; it has also been reported by Fisk (1977) from caves in Chiapas, México, and Huehuetenango, Guatemala; and by Fisk (pers. comm.) from Cueva de Taninul n. 1, San Luis Potosí, and Cueva de El Pachón, Tamaulipas. An undescribed species of *Panchlora* was reported from Las Tres Cuevas (=Cueva de Sala de Agua Grande), Veracruz (Fisk, 1977).

Family Blattellidae

Undetermined species of the genera *Chorisoneura*, *Ischnoptera*, and *Latiblatella* have been collected from caves in several parts of México. Fisk (1977) reported undetermined species of *Anaplecta*, *Euthlastoblatta*, and *Ischnoptera* from caves in Chiapas. *Agalopteryx chiapas* was described by Fisk (1977) from five caves in Chiapas. *Nesomylacris reddelli* was described by Fisk and Gurney (1972) from Cueva de El Pachón, Tamaulipas. Fisk (1977) described *N. lateralis* from Cueva de Chital n. 1, Chiapas. *Pseudomops septentrionalis* Hebard has been collected from caves in San Luis Potosí and Tamaulipas. Fisk (1977) described *P. nigrimaculis* from Cueva del Aguacero, Chiapas. The most remarkable roach known from Mexican caves is a delicate, eyeless species of the genus *Nelipophygus*, unfortunately known only from one nymph collected in Cueva de Chital n. 2, Chiapas (Fisk, 1977). This is the first species of the genus known from mainland North America. An undescribed troglobite of the genus is known from caves on Jamaica. Other troglobitic roaches are known from Hawaiian caves.

Family Blattidae

This family is known from Mexican caves only by an undetermined species of *Periplaneta* from San Luis Potosí and Tamaulipas.

Family Polyphagidae

The family Polyphagidae is well represented in Mexican caves. The genus *Arenivaga* is frequently collected from the dry entrance areas of caves in Coahuila and Durango. *Holocompsa azteca* Saussure was reported from Cueva del Venado, Chiapas (Fisk, 1977). *Holocompsa zapoteca* Saussure was found in many caves in Yucatán (Pearse, 1938b) and in Cueva del Sabín, Chiapas (Fisk, 1977). *Homoeogamia mexicana* Burmeister has been found in caves in Guerrero, Hidalgo, México, Michoacán, and San Luis Potosí.

Table 23.—Summary of cave inhabiting Saltatoria.

	Troglobites	Other Species
Acrididae	0	1
Gryllidae	4	14
Rhaphidophoridae	0	21
Stenopelmatidae	0	3
Tettigoniidae	0	1
Total	4	40

Order Isoptera

Family Termitidae

Termites are rarely collected from rotten wood washed into caves. The only Mexican record is of a few workers of the family Termitidae collected from Cenote Amil, Yucatán.

Order Mantodea

Family Mantidae

Immature and unidentified mantids have been collected rarely from the entrance area of caves. Pearse (1938b) reported a specimen from Actún Sabacá, Yucatán.

Order Dermaptera

Family Forficulidae

Two species of this family of earwigs have been collected from caves in México: *Ancistogaster* sp. cf. *toltecus* (Scudder) from Cueva de la Puente, San Luis Potosí; and *A. impennis* Bormas from Cueva de Carnicerías, San Luis Potosí. Both species are probably trogloxenes.

Family Labiduridae

The only species of this family recorded from Mexican caves is *Euborellia annulipes* (Lucas) from Grutas de Juxtlahuaca, Guerrero. Its ecological status is unknown.

Family Labiidae

This family is represented in Mexican caves only by *Labia rotundata* Scudder from Pozo Melendez, Guerrero. It is probably an accidental.

Order Plecoptera

Family Perlidae

The only stone fly recorded from Mexican caves is *Anacroneuria* sp., collected from the entrance area of Sima Esteban, Puebla. It is probably an accidental.

Order Saltatoria

The cricket fauna of México and Central America is poorly known, and the 41 species identified to date represent only a small percentage of the actual number of species which inhabit caves in this region (see Table 23). Extensive collections await study.

Family Acrididae

A single species of the family Acrididae, *Necaxacris* sp. cf. *micans* (Hebard), has been collected in Sótano del Profesor, Veracruz. It is certainly an accidental.

Family Gryllidae

The family Gryllidae is well represented in the caves of México and Central America. The most commonly collected genera are *Paracophus* and *Amphiacusta*. *Paracophus* includes three troglobitic and five described troglophilic species in northeastern México (Hubbell, 1972). Additional collections include undescribed species of troglophile. *Paracophus apterus* Chopard is known from many caves in San Luis Potosí and Tamaulipas; *P. placonotus* Hubbell is abundant in the caves of the Xilitla region in San Luis Potosí and Querétaro; *P. reddelli* Hubbell is known from two caves at low elevations in the Sierra de Guatemala, Tamaulipas; *P. sanctorum* Hubbell is known only from Cueva de la Virgen, Tamaulipas; and *P. subapterus* Chopard occurs in caves in Nuevo León and Coahuila. The crickets of the genus *Paracophus* are usually found in darkness under rocks and on silt banks. Troglobitic species are more frequently seen on the walls and on speleothems. *Paracophus apterus* and *P. placonotus* are the only species which have been collected from epigean forest habitats. The only other troglobitic gryllid in México is *Tohila atelomma* from Yucatán. See Figs. 69-70 for localities of *Paracophus* and *Tohila* in México.

The genus *Amphiacusta* ranges from Belize and Guatemala north into southern Tamaulipas, México. It is frequently found near cave entrances where it may be heard stridulating. Four species have been identified from caves in México; many other species from Belize, Guatemala, and México remain to be described. Chopard (1947) reported *A. azteca* Saussure from a cave at Tepoztlán, Morelos; *A. bolivari* Chopard from Grutas de Atoyac, Veracruz; and *A. maya* Hubbell from Cueva de Berriozabal, Chiapas. Hubbell (1938) described *A. yucatana* from numerous caves in Yucatán; it is also now known from caves in Campeche. *Amphiacusta bolivari* has been reported by Hubbell (1972) from several additional caves near Orizaba and Córdoba, Veracruz. Saussure (1897) described *Arachnomimus cavicola* from Grutas de Lanquín, Alta Verapaz, Guatemala. The correct generic assignment of this species is still in doubt. See Fig. 71 for the localities of *Amphiacusta* and *Arachnomimus* in the caves of México and Guatemala. Undetermined species of *Cycloptilum*, *Gryllus*, *Miogryllus*, and *Nemobius* have been collected from various caves in México; all are probably accidentals.

Paracophus caecus Hubbell

Paracophus undescribed species: Reddell, 1966a:14.

Paracophus sp.: Reddell, 1971b:55 [Harrison Sinkhole, Sótano de la Joya de Salas, Sótano del Molino, Cueva del Nacimiento del Río Frío, and Sótano de las Piñas (=Pinos) records only]; Reddell and Mitchell, 1971b:191, fig. 16.

Paracophus sp. A: Reddell, 1967c:55.

Paracophus sp. B: Reddell, 1967c:55.

Paracophus caecus Hubbell, 1972:51, 52, 57, 58, 67, 70, 76, 77, 80-84, 86, 87, fig. 1(4), 2(17), 3(28), 5(37); Mitchell and Kawakatsu, 1973a:671; Mitchell and Reddell, 1973b:frontispiece; Reddell, 1973a:35, 40; Reddell and Elliott, 1973b:182, 186; Vomero, 1974:341, 350.

Paracophus, troglobio: Fernández Ruiz, 1976:717.

Type-locality.—Sótano de la Joya de Salas, Tamaulipas, México.

Distribution.—Known from caves in the Sierra de Guatemala, Tamaulipas. See Fig. 69.

Records.—*Tamaulipas:* Cave at Rancho del Cielo, Bee Cave, Cueva de la Capilla, Crystal Cave, Sótano de Gómez Farías, Harrison Sinkhole, Cueva del Infiernillo, Sótano de la Joya de Salas, Cueva de la Mina, Sótano del Molino, Cueva del Nacimiento del Río Frío, Sótano de los Pinos, Cueva del Ojo de Agua de Manantiales, Cueva de los Vampiros, and Wet Cave.

Discussion.—This is the only eyeless gryllid in the New World. It is also wingless and very pale with elongate appendages. The genus *Paracophus* is most closely related to the Yucatán cave genus *Tohila*. All of the troglobitic species apparently evolved in the higher mountains and, with the exception of six populations of *P. caecus*, are known only from high elevations. It is interesting that some of the lowland populations of *P. caecus* are also somewhat less pale and delicate, indicating that they have maintained contact with the parent species longer. *Paracophus caecus* has been taken in association with *P. apterus* in Sótano de Gómez Farías, Cueva del Nacimiento del Río Frío, Cueva del Ojo de Agua de Manantiales, and Cueva de los Vampiros; and with *P. reddelli* in Bee

Cave. *Paracophus caecus* appears to have descended from a common ancestor from which *P. apterus* and *P. placonotus* and their allies also later developed (Hubbell, 1972). *Paracophus caecus* is found under rocks, but it is also often collected from cave walls and from among stalactites. It has been observed copulating in several caves while sitting on stalagmites or stalactites.

Paracophus cladonotus Hubbell

Paracophus sp.: Reddell, 1967d:106; Reddell, 1971b: 55 (Sótano del Pozo and Sótano de Tlamaya records only).

Paracophus cladonotus Hubbell, 1972:51, 52, 57, 58, 74, 76, 77, 80, 84-87, fig. 1(8), 2(9-10, 16), 3(18, 22, 26-27), 5(36); Reddell, 1973a:35, 40.

Type-locality.—Sótano de Tlamaya, San Luis Potosí, México.

Distribution.—Known from caves in southern San Luis Potosí and adjacent Hidalgo. See Fig. 69.

Records.—*Hidalgo:* Cueva de Piedra Ancha and Cueva de El Tenango; *San Luis Potosí:* Sótano de Guadalupe, Cueva de la Luz, Cueva de los Potrerillos, Sótano del Pozo, Cueva de San Nicolas, and Sótano de Tlamaya.

Fig. 69.—Distribution of troglobitic crickets of the family Gryllidae: 1, *Paracophus caecus;* 2, *P. lippus;* 3, *P. cladonotus;* 4, *Tohila atelomma.*

Discussion.—This species is known from caves in the Xilitla and Aquismón regions, San Luis Potosí, and from the geologically contiguous parts of Hidalgo. The eyes of *P. cladonotus* are very small and the appendages elongate, but not to the extent that they are in *P. caecus.* This species probably also evolved from the ancestral stock which gave rise to *P. caecus. Paracophus cladonotus* has been taken with *P. placonotus* in Cueva de El Tenango, Hidalgo, and Cueva de los Potrerillos and Sótano de Tlamaya, San Luis Potosí.

Paracophus lippus Hubbell

Paracophus lippus Hubbell, 1972:51, 52, 57, 58, 74, 77-78, 80, 82, fig. 1(3), 2(15), 3(25), 4(34); Reddell, 1973a:35, 40.

Type-locality.—Cueva de La Lagunita, Blagg Ranch, 15 mi. NE of Ciudad del Maíz, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 69.

Discussion.—This species also has very small eyes, reduced pigmentation, and elongate appendages. It is

Fig. 70.—Distribution of troglophilic gryllid crickets of the genus *Paracophus:* 1, *Paracophus subapterus;* 2, *P. sanctorum;* 3, *P. apterus;* 4, *P. apterus, P. reddelli,* and *P. placonotus;* 5, *P. apterus* and *P. placonotus;* 6, *P. placonotus.*

the most poorly known species in the genus, and a discussion of its affinities must await careful description of the male genitalia. It has been taken in association with a possibly undescribed species of troglophilic *Paracophus*.

Tohila atelomma Hubbell

Tohila atelomma Hubbell, 1938:191-192, 194-200, 204, fig. 1-10, 77; Jeannel, 1943:156; Pearse, 1945:175; Chopard, 1947:67; Nicholas, 1962: 180; Vandel, 1964:217; Vandel, 1965a:181; Leroy, 1967:665, 684, 685, 686, 709; Chopard, 1968:262; Delamare-Deboutteville and Botosanéau, 1970:70; Reddell, 1971b:55; Hubbell, 1972:53; Reddell, 1977b:234, 239, 240, 258, 261, 266, 286, 288.

Tohila: Hubbell, 1938:191, 201, 202; Hubbell, 1972: 54-56.

Type-locality.—Chac Mol Cave (=Cueva Chac Mol), Tohil, Yucatán, México.

Distribution.—Known from caves in the state of Yucatán. See Fig. 69.

Records.—*Yucatán:* Grutas de Balankanche, Cueva Chac Mol, Cueva Luchil, Cueva Oxolodt, Cueva de San Isidro, and Cueva del Cenote Xtolok.

New records.—*Yucatán:* Cenote Aká Chen, Cenote Calchum, Cenote de Sambulá (Motul), Grutas de Tzab-Nah, and Actún Xpukil (det. T. H. Hubbell).

Fig. 71.—Distribution of troglophilic gryllid crickets of the genera *Amphiacusta* and *Arachnomimus:* 1, *Amphiacusta azteca;* 2, *Amphiacusta bolivari;* 3, *Amphiacusta maya;* 4, *Amphiacusta yucatana;* 5, *Arachnomimus cavicola.*

Discussion.—The genus *Tohila* was originally assigned to the subfamily Pentacentrinae and considered to be most closely related to the genus *Trigonidomimus* of the Old World (Hubbell, 1938). Hubbell (1972) has reexamined these genera and feels now that *Tohila* is most closely related to *Paracophus* and that they are probably both members of the subfamily Phalangopsinae. *Tohila* is a monotypic genus and is small and pale with degenerate eyes. It is usually found beneath rocks, but it is also occasionally taken from moist flowstone or cave walls. It has been collected from several caves which are also inhabited by the troglophilic *Amphiacusta yucatana*. Numerous collections of crickets from caves in the Yucatán Peninsula await study, and some will certainly prove to contain this species.

Family Rhaphidophoridae

The camel crickets of the family Rhaphidophoridae are frequently found in the caves of México and Guatemala. The 12 described species, however, represent a small percentage of the fauna to be reported eventually from caves. The described species belong to the genera *Ceuthophilus*, *Anargyrtes*, *Leptargyrtes*, *Exochodrilus*, *Hypsobadistes*, and *Phoberopus*. Several other genera await description. The Rhaphidophoridae appear to be absent from low elevations along the eastern flanks of the Sierra Madre Oriental south into the Yucatán Peninsula. The caves in this region are instead populated by species of the gryllid genus *Amphiacusta*. *Amphiacusta* in this area inhabits the entrance zone usually occupied by rhaphidophorids in other regions.

Hubbell (1972) erected the genus *Anargyrtes* for two species from the states of México and Guerrero. *Anargyrtes annulata* (Bilimek) was described from Grutas de Cacahuamilpa, Guerrero; it is now known also from many caves in Guerrero and México. *Anargyrtes bolivari* Hubbell is known primarily from epigean localities, but it has been found in a lava cave near San Gerónimo, México (see Fig. 72).

The genus *Ceuthophilus* is the principal cave cricket genus inhabiting caves in the southwestern United States and northern México. Only two species, *Ceuthophilus (Geotettix) cunicularis* Hubbell and *C. (Ceuthophilus) variegatus* Scudder, have been identified from Mexican caves. The first species is known only from Cueva de los Lagos, Coahuila, and the latter has been collected in several caves in Coahuila and Chihuahua (see Fig. 72). Many undescribed species of *Ceuthophilus* have been collected in caves in northern México.

Hubbell (1972) described a new genus and two new species for the camel crickets inhabiting the higher elevations of the Sierra de Guatemala, Tamaulipas. *Exochodrilus caelestis* occurs in two caves at Rancho del Cielo, and *E. forcipatus* is known from caves at higher elevations (see Fig. 72).

The genus *Leptargyrtes* was erected by Hubbell (1972) to include two new species from Querétaro: *L. boneti* from caves near El Lobo in eastern Querétaro, and *L. tejamanilae* from caves to the west near Pinal de Amoles and Tejamanil (see Fig. 72).

Hubbell (1977) described the Phoberopes group to include several species of camel cricket from Guatemala and Chiapas, México. *Phoberopus minor* Hubbell is known from Cueva de Chemal n. 1 and Cueva de Santa Eulalia (=Cueva de los Resadores), Huehuetenango, Guatemala. Three species of long-legged, delicate crickets were placed in the new genus *Hypsobadistes*: *H. gracilior* Hubbell from two caves in Huehuetenango, Guatemala; *H. stuarti* Hubbell from Cueva del Rayo de San Felipe, Chiapas; and *H. tenuis* Hubbell from three caves at San Agustín, Chiapas (see Fig. 72).

Apparently undescribed species of the genera *Pristoceuthophilus* and *Argyrtes* have been collected from caves in Coahuila and Hidalgo respectively.

Family Stenopelmatidae

Unidentified species of the stenopelmatid genera *Anabropsis*, *Glaphyrosoma*, and *Stenopelmatus* have been collected from Mexican caves, but they are all probably accidentals.

Family Tettigoniidae

A single unidentified tettigoniid of the genus *Dichopetala* was collected below the entrance drop into Cueva de Taninul n. 4, San Luis Potosí; it is certainly an accidental.

Order Embioptera

An undetermined genus and species of the seldom collected order Embioptera was found in Sótano de El Triunfo, San Luis Potosí. It is presumably an accidental.

Order Psocoptera

The order Psocoptera is occasionally taken from caves in México and is doubtless far more abundant than the few records would indicate. This group includes troglobites in other parts of the world, but all of the species known from Mexican caves are probably troglophiles or trogloxenes.

Family Caeciliidae

An undetermined species of the genus *Caecilius* was collected in Sótano de El Triunfo, San Luis Potosí. Its ecological status is unknown.

Family Epipsocidae

The family Epipsocidae is represented in Mexican caves only by undetermined species of the genus *Epipsocus* collected in caves in Chiapas, Puebla, and Veracruz.

Family Liposcelidae

Undetermined species of the genus *Liposcelis* have been taken in Grutas de San Bartolo, Nuevo León, and in Grutas de Atoyac, Veracruz.

Family Pachytroctidae

The family Pachytroctidae is represented in Mexican caves only by an undetermined species of *Pachytroctes* taken from cave swallow guano in Actún Tucil, Yucatán.

Family Psocidae

This family is represented in Mexican caves by *Cerastipsocus* sp. prob. *trifasciatus* (Prov.) from Gruta de Cuevacillas, Coahuila. It is probably a trogloxene.

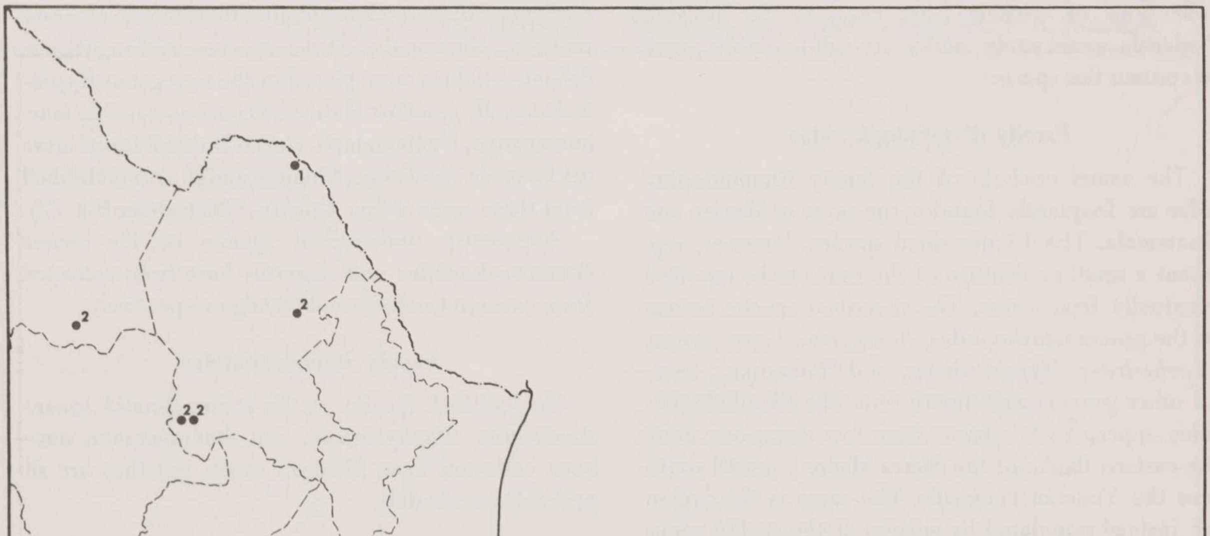

Fig. 72.—Distribution of cavernicole crickets of the family Rhaphidophoridae: 1, *Ceuthophilus (Geotettix) cunicularis;* 2, *C. (Ceuthophilus) variegatus;* 3, *Exochodrilus forcipatus;* 4, *E. caelestis;* 5, *Leptargyrtes boneti;* 6, *L. tejamanilae;* 7, *Anargyrtyes bolivari;* 8, *A. annulata;* 9, *Hypsobadistes stuarti;* 10, *H. tenuis;* 11, *Phoberopus minor;* 12, *H. gracilior.*

Family Psyllipsocidae

Two species of the family Psyllipsocidae are known from Mexican caves (see Fig. 73). *Psyllipsocus ramburii* Selys is a species found in caves in many parts of the world. In México it is known from caves in Coahuila, Durango, Chihuahua, Nuevo León, San Luis Potosí, Tamaulipas, Puebla, Veracruz, and Chiapas. This species is usually found in dry areas, both in total darkness and the twilight zone. It is frequently found on rotting wood or bits of paper. *Psyllipsocus yucatan* Gurney was described from Cueva del Cenote Xtolok, Yucatán (Gurney, 1943).

Family Troctopsocidae

Mockford (1967) has described the remarkable psocid *Protroctopsocus enigmaticus* from leaf litter in the entrances of caves on Cuesta de Chipinque, Nuevo León. This species is also known from leaf litter in Durango (E. L. Mockford, pers. comm.).

Order Mallophaga

Family Menoponidae

The only record of this family from Mexican caves is of *Myrsidea* sp., taken from *Petrochelidon fulva*

Fig. 73.—Distribution of troglophilic psocopterans of the family Psyllipsocidae: 1, *Psyllipsocus ramburii;* 2, *P. yucatan.*

citata Van Tyne in Cenote de Pisté, Yucatán (Klaas, 1968).

Family Philopteridae

This family of lice is represented in Mexican caves only by *Philopterus excisus* Nitzch from *Petrochelidon fulva citata* in Cenote de Pisté, Yucatán (Klaas, 1968).

Order Hemiptera

The order Hemiptera is represented in Mexican caves by 63 species in 25 families. Many of these species are known only from open-air cenotes in Yucatán or from entrance areas and will not be discussed here. Although troglobitic hemipterans are known from caves in Hawaii, no troglobitic species have been found in North or Central America. Several, however, are troglophiles, and at least one emesine reduviid shows some signs of becoming adapted to cave existence.

Table 24.—Summary of cave inhabiting Hemiptera.

	Troglobites	Other Species
Hydrocorizae		
Belostomatidae	0	6
Corixidae	0	1
Gelastocoridae	0	1
Naucoridae	0	2
Nepidae	0	2
Notonectidae	0	3
Ochteridae	0	1
Amphibicorizae		
Gerridae	0	5
Hebridae	0	1
Hydrometridae	0	1
Mesoveliidae	0	1
Veliidae	0	5
Geocorizae		
Ceratocombidae	0	1
Cimicidae	0	4
Cydnidae	0	7
Dipsocoridae	0	1
Enicocephalidae	0	1
Lygaeidae	0	5
Miridae	0	2
Pyrrhocoridae	0	3
Reduviidae	0	6
Rhopalidae	0	1
Schizopteridae	0	1
Thyreocoridae	0	1
Tingidae	0	1
Total	0	63

Suborder Hydrocorizae

Family Belostomatidae

Hungerford (1936) reported two species of the genus *Belostoma* and one of *Lethocerus* from open-air cenotes in Yucatán. *Abedus immensus* Menke is a troglophile in Cueva de la Puente and Cueva de la Laguna, San Luis Potosí. *Abedus signoreti* Mayr is known from Sótano del Molino, Tamaulipas; its ecological status is unknown. An undetermined species of the genus *Belostoma* is extremely abundant in Cueva del Azufre, Tabasco; numerous individuals carrying eggs were observed and it is certainly a troglophile. *Belostoma subspinosum* Beauvois is probably a troglophile in Sótano del Lienzo, San Luis Potosí.

Suborder Amphibicorizae

Family Gerridae

Hungerford (1936) reported four species of gerrids from open-air cenotes in Yucatán. Two species have been collected from Mexican caves and are apparently troglophiles: *Gerris remigis* Say from Sótano de San Francisco n. 2, San Luis Potosí; and *Trepobates pictus* (Herrich-Schaeffer) from Cenote Poxil, Yucatán. An undetermined species of *Trepobates* was found in Cenote Aká Chen, Quintana Roo.

Family Veliidae

Hungerford (1936) reported two species of *Microvelia* from open-air cenotes in Yucatán. Numerous undetermined species of this genus have been recently collected from many caves in México. *Rhagovelia varipes* Champion is a troglophile in caves in Hidalgo and San Luis Potosí. *Velia* sp. is an apparent troglophile in Grutas del Mogote, Guerrero.

Suborder Geocorizae

Family Cimicidae

Four species of bedbug of the family Cimicidae have been collected from Mexican caves. *Cimex hemipterus* Fabricius was reported by Pearse (1938b) from caves in Yucatán. Hoffmann (1972) reported *Cimex pilosellus* (Horvath) from Cuevas del Cerro de Xictle, Distrito Federal. The rare bat bedbug *Primicimex cavernis* Barber, has been taken from Cueva de Janitzio, Michoacán, and Cueva de Valladolid, Yucatán (Ueshima, 1968). *Primicimex cavernis* and *Cimex incrassatus* Usinger and Ueshima are known from a bat cave at Chocoyos, Chimaltenango, Guatemala (Sailer, 1950; Usinger, 1966). *Primicimex cavernis* is otherwise known only from Ney Cave and Fern Cave, Texas (U.S.A.). This species lives in crevices in the walls of the chambers inhabited by bats and during the day emerges to feed on the resting bats.

Family Cydnidae

Seven species of the family Cydnidae have been found in Mexican caves (see Fig. 74). All are probably troglophiles usually found in guano. *Amnestus pusio* (Stal) was taken in caves in Oaxaca and Yucatán; *A. subferrugineus* (Westwood) has been found in caves in Oaxaca and San Luis Potosí, and in "cave earth at Cacao, Trece Aguas, Guatemala" (Froeschner, 1960). The most frequently encountered genus of cydnid in Mexican caves is *Pangaeus*. *Pangaeus (Pangaeus) aethiops* (Fabricius) was found in caves in San Luis Potosí and Veracruz; *P. (P.) docilis* (Walker) has been found in caves in Campeche, Oaxaca, Quintana Roo, San Luis Potosí, Tamaulipas, Veracruz, and Yucatán; *P. (P.) moestus* (Stal) has been found only in Actún Huachap, Campeche; *P. (P.) piceatus* Stal is known from caves in Chiapas, Oaxaca, San Luis Potosí, and Yucatán. *Tominotus unisetosus* Froeschner has been found in caves in Guerrero and Yucatán.

Family Reduviidae

The family Reduviidae is frequently found in the vicinity of cave entrances. This family is of special interest since many members of it are capable of transmitting Chagas disease. Several specimens of the subfamily Reduviinae have been collected from the dry entrance area of caves in Coahuila, Nuevo León, and Durango. *Opisthacidius mexicanus* (Pelaez) has

Fig. 74.–Distribution of troglophilic hemipterans of the family Cydnidae: 1, *Pangaeus (Pangaeus) docilis;* 2, *P. (P.) docilis, P. (P.) piceatus,* and *P. (P.) aethiops;* 3, *P. (P.) docilis* and *P. (P.) piceatus;* 4, *P. (P.) docilis;* 5, *P. (P.) piceatus;* 6, *P. (P.) docilis* and *P. (P.) aethiops;* 7, *Tominotus unisetosus;* 8, *P. (P.) moestus.*

been found in caves and mines in Yucatán. Two species of reduviids in Yucatán and Quintana Roo have been found to be vectors of *Trypanosoma cruzi* Chagas, the protozoan which is responsible for Chagas disease (Gonzalez-Angulo and Ryckmen, 1967). *Triatoma dimidiata* (Latreille) is known from caves in Alta Verapaz, Guatemala; Cayo District, Belize; and Yucatán, México. *T. hegneri* Mazzotti was collected from a cave on El Rancho Santa Rita, Quintana Roo. Lent and Wygodzinsky (1979) reported *T. longipennis* Usinger from a bat cave in Sinaloa. The most interesting group of reduviids inhabiting Mexican caves are the thread-legged bugs of the subfamily Emesinae. Wygodzinsky (1966) described *Ploiaria maya* from an unidentified cave in Yucatán. This small-eyed species has been taken from cave walls in total darkness in several additional caves in Yucatán. Immature emesines, some belonging to the genus *Ploiaria*, have been found in caves in San Luis Potosí and Veracruz.

Order Homoptera

Twelve species of the order Homoptera have been identified from caves in México. Although most homopterans are accidentals or trogloxenes, at least two are troglobites (see Table 25).

Family Cicadellidae

Leafhoppers of the family Cicadellidae are occasionally collected in the entrance area of caves. *Balclutha* sp., *Empoasca* sp., *Hortensia similis* (Walker), *Planicephalus flavicosta* (Stal), and *Xestocephalus* sp. have all been found in the heavily vegetated entrance areas of caves in Yucatán. *Gyponana germari* (Stal) was taken at the bottom of the drop into Sótano de las Golondrinas, San Luis Potosí.

Family Cixiidae

Cixiid fulgoroids are not infrequently collected from caves, and one described species is a troglobite in México. Pearse (1938b) reported *Cixius* sp. from Actún Góngora, Yucatán. An undetermined species of this genus has recently been collected from Cueva de los Camarones, Puebla. Undetermined cixiids, including two probable troglobites, have been found in caves in Oaxaca, Puebla, Veracruz, and Quintana Roo. The only other troglobitic cixiids are in the genus *Oliarus* and are known from lava caves in Hawaii.

Cixius orcus Fennah

Cixius orcus Fennah, 1973:439, 440-442, fig. 1-10.

Table 25.—Summary of cave inhabiting Homoptera.

	Troglobites	Other Species
Auchenorrhyncha		
Cicadellidae	0	6
Cixiidae	1	1
Fulgoridae	0	1
Kinnaridae	1	0
Membracidae	0	1
Sternorrhyncha		
Ortheziidae	0	1
Total	2	10

Type-locality.—Cueva de Emilia, 14 km. NNW Ahuacatlán, Querétaro, México.

Distribution.—Known only from the type-locality. See Fig. 75.

Discussion.—This species has the eyes and ocelli absent, has the tegmina and wings reduced, and is pale and poorly sclerotized.

Family Kinnaridae

Oeclidius hades Fennah

Oeclidius hades Fennah, 1973:439, 442-444, fig. 11-17.

Type-locality.—Cueva de Valdosa, 8 mi. E Valles, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 75.

Discussion.—This is the only described troglobite in the family Kinnaridae. An apparent new species of troglobite is known from Cueva de la Mina, Tamaulipas, and a possible troglobite is known from Cueva Macinga, Veracruz. The eyes and ocelli in *O. hades* are absent, the body is pale yellowish brown, and the wings are reduced to scales.

Order Megaloptera

Family Corydalidae

The large aquatic larvae of the dobsonfly *Corydalus* sp. have been found in Guerrero (Sbordoni and Argano, 1972) and Veracruz. They are presumably accidentals.

Order Neuroptera

Family Myrmeleontidae

An antlion, *Eremeleon longior* Banks, was described from caves in Yucatán (Banks, 1938). Adults and larvae of this species have been collected recently in many caves in Campeche, Quintana Roo, and Yucatán. This is apparently a troglophile. The adults are usually seen resting on the cave walls near entrances, while the larvae inhabit silty areas in dry parts of the caves.

Order Coleoptera

The order Coleoptera is well represented in the caves of México and Central America. Although about 270 species have been identified from caves in this region, only 25 are known to be troglobites (see Table 26). This is an amazingly low number of troglobites for so vast and diverse an area, but it has already been noted many times that the beetle fauna of tropical regions is very poorly represented by troglobites (Vandel, 1964). The reasons for this are not clear, and only additional collecting and a better understanding of tropical faunas in general will help to explain the paucity of troglobitic beetles in the tropics. The following discussion of the beetle fauna of this region can, of course, only emphasize those families which have made a significant contribution to the cavernicole fauna. Because of their frequent

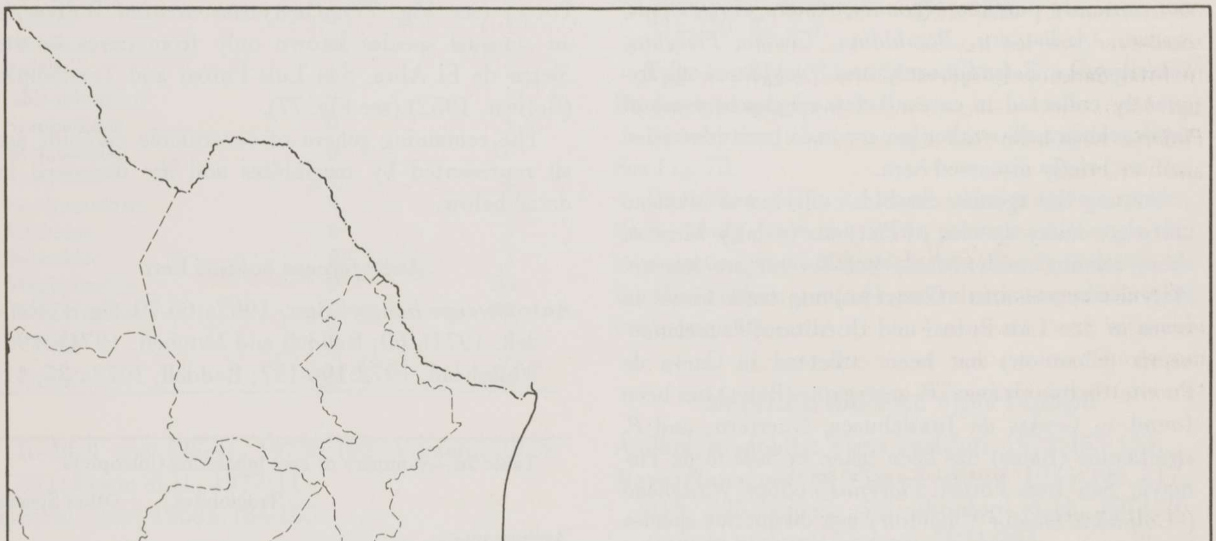

Fig. 75.–Distribution of troglobitic and troglophilic homopterans of the families Cixiidae and Kinnaridae: 1, Kinnaridae gen. et sp.; 2, *Oeclidius hades;* 3, *Cixius orcus;* 4, Cixiidae gen. et sp.

ground dwelling habit, many beetles are washed into caves with organic debris; most of these constitute in no way a part of the true cave fauna.

Suborder Adephaga

Family Carabidae

The family Carabidae is naturally the largest contributor to the beetle fauna of Mexican caves, as it is in most of the world. More than 70 species have been identified from the caves in this region, of which 17 are troglobites and discussed below. Many of the carabid genera of significance to the cavernicole ecology are in serious need of revision, and identifications are not presently possible. *Agonum*, *Amara*, *Anisotarsus*, *Apenes*, *Ardistomis*, *Bembidion*, *Clivina*, *Platynus*, *Schizogenius*, *Selenophorus*, and *Tachys* are all frequently collected in caves. A few species in some of these and in a few other genera have been identified and are briefly discussed here.

Among the agonine carabids collected in Mexican caves are many species of *Platynus* (s. lat.). Most of these remain unidentified, but several are known. *Platynus acuminatus* (Chevrolat) has been found in caves in San Luis Potosí and Querétaro; *P. melanocnemis* (Chaudoir) has been collected in Cueva de Puente Fierro, Oaxaca; *P. segregatus* (Bates) has been found in Grutas de Juxtlahuaca, Guerrero; and *P. stricticollis* (Bates) has been taken in Sótano de Tlamaya, San Luis Potosí. *Platynus colibor* Whitehead (=*Colpodes bicolor* Chaudoir) is a distinctive species known from several caves in Chiapas and Guerrero. *Platynus (Stenoplatynus) umbripennis* (Casey) is a troglophile in caves in the states of Guerrero and México (Bolívar and Hendrichs, 1965; Barr et al., 1968).

Many species of the genus *Rhadine* are known as troglobites in the caves of Central Texas (Barr, 1974), but all of the known Mexican cavernicole species are troglophiles. *Rhadine araizai araizai* (Bolívar) was described from Grutas del Palmito, Nuevo León (Bolívar, 1944). It has since been found in Cueva del Pedregoso, Coahuila. A possible new subspecies of *R. araizai* has been collected from Cueva de los Lagos, Coahuila. Bolívar and Hendrichs (1964) described four species of *Rhadine* from Mexican caves. *Rhadine medellini* is known only from Cueva de Carnicero, San Luis Potosí. *Rhadine rotgeri* was described from Gruta de Cuevacillas, Coahuila; it has recently been collected in Cueva Abaja de Carreterra, Tamaulipas, and Sumidero de Matehuala, San Luis Potosí. Two species assigned to *Rhadine* by Bolívar and Hendrichs (1964) were placed by Whitehead (1973) in the genus *Platynus*. One of these, *Platynus boneti*, is known only from Cueva de la Boca, Nuevo León; the other, *P. pelaezi*, is known only from Grutas de Villa de García, Nuevo León. An undescribed species of *Rhadine* is known only from Sumidero 552, San Luis Potosí. See Fig. 76 for localities from which Mexican cavernicole *Rhadine* are known.

Among other carabids identified from Mexican caves are *Apenes obscura* Chaudoir from Bee Cave, Tamaulipas; *Masoreus* sp. from Grutas de Xtacumbilxunam, Campeche; *Tachys (Tachys) proximus* Say from Cueva de los Lagos, Coahuila; *T. (Tachyura) unistriatus* (Bilimek) from Grutas de Cacahuamilpa, Guerrero, and Grutas de la Estrella, México; and an undescribed species of *Pterostichus (Ithytolus)* from caves in the Sierra de El Abra, San Luis Potosí (see Fig. 77). *Pachyteles urrutiai* Bolívar is an unusual species known only from caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas (Bolívar, 1952) (see Fig. 77).

The remaining genera of cavernicole carabids are all represented by troglobites and are discussed in detail below.

Antroforceps bolivari Barr

Antroforceps bolivari Barr, 1967a:66-70, fig. 1; Reddell, 1971b:60; Reddell and Mitchell, 1971b:193; Whitehead, 1972:196-197; Reddell, 1973a:35, 41;

Table 26.—Summary of cave inhabiting Coleoptera.

	Troglobites	Other Species
Archostomata		
Micromalthidae	0	1
Adephaga		
Carabidae	17	56
Dytiscidae	0	7
Gyrinidae	0	1
Polyphaga		
Aderidae	0	1
Alleculidae	0	3
Anthicidae	0	1
Bruchidae	0	2
Cantharidae	0	2
Chrysomelidae	0	6
Cleridae	0	1
Coccinellidae	0	3
Colydiidae	0	1
Curculionidae	0	2
Dascyllidae	0	1
Dermestidae	0	3
Dryopidae	0	1
Elateridae	0	4
Elmidae	0	1
Endomychidae	0	2
Euglenidae	0	1
Helodidae	0	1
Histeridae	4	14
Hydrobiidae	0	1
Hydrophilidae	0	5

Table 26.—(Continued)

	Troglobites	Other Species
Lampyridae	0	1
Leiodidae	3	14
Limnichidae	0	1
Lycidae	0	1
Meloidae	0	1
Melyridae	0	1
Mordellidae	0	2
Mycetophagidae	0	1
Nitidulidae	0	4
Oedomeridae	0	1
Passalidae	0	2
Platypodidae	0	1
Pselaphidae	0	4
Ptilidae	0	1
Ptilodactylidae	0	1
Ptinidae	1	1
Rhizophagidae	0	1
Scaphidiidae	0	1
Scarabaeidae	0	18
Scolytidae	0	1
Scydmaenidae	0	7
Silphidae	0	2
Silvanidae	0	1
Staphylinidae	0	34
Tenebrionidae	0	22
Trogidae	0	1
Total	25	246

Reddell and Elliott, 1973b:182; Vomero, 1974: 351; Erwin et al., 1977:11.
Scaritini: Barr, 1968b:184-185.

Type-locality.—Sótano de la Joya de Salas, 25 kilometers west of Encino, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 77.

Discussion.—*Antroforceps* is a monotypic genus belonging to the tribe Scaritini. Only two other species of this tribe (both from Europe) are known to be troglobites. These are very different from *Antroforceps*, however, and apparently not closely related. *Antroforceps bolivari* is eyeless, rufotestaceous, and has very elongate appendages. Unfortunately, it is known from a single female. Vomero (1974) has suggested that it is an endogean, but its occurrence in the lower levels of the cave indicates that it is a troglobite.

Chiapadytes bolivari Vigna Taglianti

Trecchino troglobio: Sbordoni et al., 1977:56.
Chiapadytes bolivari Vigna Taglianti, 1977:327, 328-333, fig. 1-2.

Type-locality.—Cueva de la Planta n. 2, Las Piedrecitas, S. Cristóbal de las Casas, Chiapas, México.

Distribution.—Known only from two caves at Las Piedrecitas, Chiapas. See Fig. 78.

Records.—*Chiapas:* Cueva de la Planta n. 1 and Cueva de la Planta n. 2.

Discussion.—The record for Cueva de la Planta n. 1 is based only on a pair of elytra. This large species has elongated appendages and the eyes reduced to small, pale areolae. This monotypic genus appears to be closely related to *Paratrechus (Hygroduvalius).*

Mayaphaenops sbordonii Vigna Taglianti

Trechino troglobio: Sbordoni et al., 1977:70.
Mayaphaenops sbordonii Vigna Taglianti, 1977:333, 334-339, fig. 3-4.

Type-locality.—Resumidero Chico, La Capellania, Huehuetenango, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 78.

Discussion.—This is a small, slender eyeless species known only from the holotype male. Although the monotypic genus *Mayaphaenops* clearly belongs to the *Paratrechus* group of genera, it is very distinct in many respects.

Mexanillus sbordonii Vigna Taglianti

Anillini, troglobite: Vigna Taglianti, 1973:153-154.
Mexanillus sbordonii Vigna Taglianti, 1974:309, 317, 318, 320-323, fig. 5-6; Sbordoni et al., 1974:26 (nomen nudum); Vomero, 1974:353.

Type-locality.—Cueva de Tío Ticho, Comitan, Chiapas, México.

Distribution.—Known only from the type-locality. See Fig. 77.

Discussion.—This troglobite is one of only two species of the tribe Anillini described from México. The other species, *Geocharidius zullinii* Vigna Taglianti, is an endogean from Comitán, Chiapas. *Mexanillus* is a monotypic genus and appears to be related most closely to *Geocharidius.*

Mexaphaenops elegans Barr

Trechine (part): Barr, 1967a:66.
Mexaphaenops elegans Barr, 1967d:162, 164, 165, fig. 2, 5; Barr, 1971:113, 115, 116; Laneyrie, 1971:192-193; Reddell, 1971b:60; Vigna Taglianti, 1972:118, 126, 127, fig. 5; Reddell, 1973a:35, 41; Erwin et al., 1977:24; Vigna Taglianti, 1977: 326, 333.
Trechini: Reddell, 1967d:106.
Mexaphaenops new species: Barr, 1968b:183.

Type-locality.—Sótano de Tejamanil, 4.5 Km west of Pinal de Amoles, Querétaro, México.

Distribution.—Known from three caves in Querétaro. See Fig. 78.

New records.—*Querétaro:* Sótano de la Escuela and Cueva del Judío (det. T. C. Barr, Jr.).

Discussion.—The genus *Mexaphaenops* is known only from caves at comparatively high elevations. In addition to the four species listed here, three species from Tamaulipas and Nuevo León await description. Barr (1967c) postulates that the genus has evolved from a *Paratrechus*-like ancestor. *Mexaphaenops elegans* has been taken from flowstone and from rotten wood. It was rather abundant among the debris left from a campfire built in Cueva del Judío.

Mexaphaenops fishi Barr

Trechine (part): Barr, 1967a:66.

Mexaphaenops fishi Barr, 1967d:162-164, 165, fig. 3, 6; Barr, 1971:115-116; Laneyrie, 1971:192; Reddell, 1971b:61; Vigna Taglianti, 1972:118, 126, 127, fig. 5; Elliott and Reddell, 1973:192, 197;

Fig. 76.—Distribution of troglobitic and troglophilic carabid beetles of the genera *Rhadine, Platynus,* and *Speocolpodes:* 1, *Rhadine araizai;* 2, *R. pelaezi;* 3, *Platynus boneti;* 4, *R. rotgeri;* 5, *P. medellini;* 6, *Platynus (Mexisphodrus)* n. sp. 1; 7, *P. (M.) profundus;* 8, *Platynus (Mexisphodrus)* n. sp. 2; 9, *P. tlamayaensis* and *Platynus (Mexisphodrus)* n. sp. 3; 10, *Platynus (Mexisphodrus)* n. sp. 3; 11, *P. (M.) gertschi;* 12, *Platynus (Mexisphodrus)* n. spp. 4-5; 13, *P. (M.) veraecrucis;* 14, *P. (M.) urquijoi;* 15, *P. (Stenoplatynus) umbripennis;* 16, *Speocolpodes franiai.*

Reddell, 1973a:35, 41; Vigna Taglianti, 1977:326, 333, 338.
Mexaphaenops new species: Barr, 1968b:183.
Mexaphaenops fiski: Erwin et al., 1977:24 (erroneous spelling).

Type-locality.—Small cave in Valle de los Fantasmas, 45 Km east of San Luis Potosí on the highway to Valles, San Luis Potosí, México.

Distribution.—Known only from two caves at Valle de los Fantasmas, San Luis Potosí. See Fig. 78.

Records.—*San Luis Potosí*: Cave (Valle de los Fantasmas) and Sótano de la Golondrina.

Discussion.—*Mexaphaenops fishi* is probably most closely related to *M. prietoi.* It is known from two caves at 2,800 meters in elevation. It is interesting that only two troglobites are known from the Valle de los Fantasmas region and that both are quite rare. It is possible that this area has been too cold and dry at times to support large numbers of species of the litter-associated fauna which appears to have supplied most of the troglobites known from Mexican caves.

Mexaphaenops intermedius Barr

Mexaphaenops intermedius Barr, 1971:113, 115, fig. 1-2; Reddell and Mitchell, 1971b:193, fig. 19;

Fig. 77.—Distribution of troglobitic and troglophilic carabid beetles of the genera *Tachys, Antroforceps, Mexanillus, Pachyteles,* and *Pterostichus:* 1, *Tachys (Tachys) proximus;* 2, *Antroforceps bolivari;* 3, *Pachyteles urrutiai;* 4, *Pachyteles urrutiai* and *Pterostichus (Ithytolus)* n.sp.; 5, *Pterostichus (Ithytolus)* n. sp.; 6, *Tachys (Tachyura) unistriatus;* 7. *Mexanillus sbordonii.*

Vigna Taglianti, 1972:118, 121-127, fig. 3-5; Reddell, 1973a:35, 41; Reddell and Elliott, 1973b:182, 186; Vomero, 1974:351, 353; Erwin et al., 1977:24; Vigna Taglianti, 1977:326, 333, 338; Rossi and Cesari Rossi, 1977:374, 376.

Mexaphaenops: Sbordoni and Argano, 1972:8.

Mexaphenops intermedius: Mitchell and Kawakatsu, 1973a:673 (erroneous spelling).

Paratrechus: Peck, 1973c:129 (misidentification).

Type-locality.—Cueva de la Capilla, 13.5 km NW of Gómez Farías, Tamaulipas, México.

Distribution.—Known from two caves in the Sierra de Guatemala, Tamaulipas. See Fig. 78.

Records.—*Tamaulipas:* Cueva de la Capilla and Cueva de la Mina.

Discussion.—This species has been taken from moist flowstone and among rotten wood. Barr (1971) considers this species to be intermediate in several respects between the more generalized *M. elegans* and the highly specialized *M. prietoi.* It has been taken in general association with *Platynus (Mexisphodrus) profundus* and *Ptomaphagus (Adelops) troglomexicanus.*

Fig. 78.—Distribution of troglobitic and troglophilic carabid beetles of the tribe Trechini: 1, *Mexaphaenops prietoi;* 2, *Mexaphaenops* n. sp. 1; 3, *Mexaphaenops* n. spp. 1-3; 4, *Mexaphaenops intermedius;* 5, *Mexaphaenops fishi;* 6, *Mexaphaenops elegans* and *Paratrechus (Hygroduvalius) pallescens;* 7, *P. (Paratrechus) tepoztlanensis;* 8, *Paratrechus (Paratrechus)* n. sp.; 9, *P. (P.) mexicanus;* 10, *Mexitrechus coarctatus;* 11, *Chiapadytes bolivari;* 12, *Mayaphaenops sbordonii.*

Rossi and Cesari Rossi (1977) described the ascomycete fungus *Laboulbenia sbordonii* as a parasite of *M. intermedius*.

Mexaphaenops prietoi Bolívar

Mexaphaenops prietoi Bolívar, 1942:351, 352, 353-354, fig. 1-6; Bolívar, 1944:26; Barr, 1967a:65-66; Barr, 1967d:161, 162, 164, 165; Reddell, 1967a: 24; Barr, 1968b:182-183; Barrera, 1968:309; Barr, 1971:113, 116; Laneyrie, 1971:192; Reddell, 1971b:61; Vigna Taglianti, 1972:118, 124, 125, 126, 127, fig. 5; Erwin et al., 1977:24; Vigna Taglianti, 1977:326, 333.

Mexicaphaenops prietoi: Anonymous, 1942b:265 (erroneous spelling).

Mexaphaenops: Barr, 1966b:97; Vandel, 1964:237; Vandel, 1965a:199.

Type-locality.—Grutas del Palmito, Bustamante, Nuevo León, México.

Distribution.—Known only from the type-locality. See Fig. 78.

Discussion.—This is the rarest species of the genus and is known only from a few specimens. Barr (1967d) considers this to be the most highly apomorphic species in the genus.

Paratrechus (Hygroduvalius) pallescens Barr

Trechine (part): Barr, 1967a:66.

Paratrechus (Hygroduvalius) pallescens Barr, 1967d: 161-162, 165, fig. 1, 4; Reddell, 1971b:61; Vigna Taglianti, 1972:118; Reddell, 1973a:41; Mateu, 1977:192, 194; Vigna Taglianti, 1977:326, 332

Trechini: Reddell, 1967d:106.

Paratrechus new species: Barr, 1968b:183.

Paratrechus (Hygroduvalius) pallescans: Reddell, 1973a:35 (erroneous spelling).

Paratrechus pallescens: Erwin et al., 1977:24.

Paratrechus (Hygroduvalius) pallens: Mateu, 1977: 200, 206 (erroneous spelling).

Type-locality.—Sótano de Tejamanil, 4.5 km west of Pinal de Amoles, Querétaro, México.

Distribution.—Known from four caves in Querétaro. See Fig. 78.

New records.—*Querétaro:* Sótano del Buque, Sótano de la Escuela, and Cueva del Judío (det. T. C. Barr, Jr.).

Discussion.—This species is most closely related to *Paratrechus (Hygroduvalius) sylvaticus* Bolívar, an eyed species from Morelos and the Distrito Federal. *Paratrechus (H.) pallescens* may represent a further link in the series running from the robust, large-eyed species of *Paratrechus* (s. str.) to the elongate, anophthalmic species of *Mexaphaenops* (Barr, 1967d). This species has been taken from moist flowstone and from under rotten wood. An apparently troglobitic species of *Paratrechus* (s. str.) has recently been collected from Cueva del Volcancillo, Veracruz, but remains undescribed. Two other species of *Paratrechus* (s. str.) have been taken from caves in México (see Fig. 78): *P. mexicanus* Putzeys from Cueva de la Cascada, Veracruz and *P. tepoztlanensis* Bolívar from Grutas del Mogote, Guerrero, and Cueva de Coatepec, México. Rossi and Cesari Rossi (1977) reported that *P. tepoztlanensis* was parasitized by the ascomycete fungus *Rhachomyces quetzalcoatl* Balazuc in Cueva de Coatepec. They also report this same fungus as a parasite of an undetermined species of *Paratrechus* in Resumidero Grande and Resumidero de Chemal, Huehuetenango, Guatemala. Mateu (1977) described the genus *Mexitrechus* to include *P. coarctatus* Bates. This species has been recently found in Sótano de las Bellotas and Comedor del Diablo, Oaxaca (see Fig. 78).

Platynus (Mexisphodrus) profundus (Barr)

Mexisphodrus profundus Barr, 1966a:113-114, 115; Barr, 1967a:66; Reddell, 1967c:55; Barr, 1968b: 184; Reddell, 1971b:61; Reddell and Mitchell, 1971b:193, fig. 18; Vigna Taglinati, 1972:125; Hendrichs and Bolívar, 1973:38, 41; Mitchell and Kawakatsu, 1973a:671; Reddell, 1973a:36, 41; Reddell and Elliott, 1973b:182; Vomero, 1974: 353.

Mexisphodrus sp.: Hendrichs and Bolívar, 1966:7 (Tamaulipas record only).

Mexisphodrus new species: Reddell, 1966a:13.

Mexisphodrus: Sbordoni and Argano, 1972:8 [Cueva de la Perra (=Capilla) record only]; Peck, 1973c: 129.

Platynus profundus: Whitehead, 1973:185, 207; Erwin et al., 1977:31.

Type-locality.—Sótano de la Joya de Salas, 25 km west of Encino, Tamaulipas, México.

Distribution.—Known from caves in the Sierra de Guatemala, Tamaulipas. See Fig. 76.

Records.—*Tamaulipas:* Sinkhole at Rancho del Cielo, Cueva de la Capilla, Crystal Cave, Harrison Sinkhole, Sótano de la Joya de Salas, and Cueva de la Mina.

Discussion.—Five species have been described in *Mexisphodrus*, all known only from caves. Of these, three are presumably troglobites and are included here. Of the remaining species, one *(M. tlamayaensis* Barr from caves in Querétaro, San Luis Potosí, and

Veracruz) belongs in another subgenus (Barr, pers. comm.), and the other (*M. gertschi* Hendrichs and Bolívar) is a dark, eyed troglophile from Cueva de El Ocote, Hidalgo. Barr (1965) originally considered *Mexisphodrus* to be a member of the tribe Sphodrini, but with recent collections and further study he feels it to be more closely related to *Platynus* and its allies in the Agonini (Barr, pers. comm.). Whitehead (1973) considers *Mexisphodrus* to be no more than a subgenus of *Platynus*. *Platynus (M.) profundus* is frequently taken from guano and from organically rich areas. Undescribed species of the subgenus are known from caves in Nuevo León, Puebla, Querétaro, San Luis Potosí, and Tamaulipas.

Platynus (Mexisphodrus) urquijoi (Hendrichs and Bolívar)—NEW COMBINATION

Mexisphodrus, undescribed species: Barr, 1967a:66 (Oaxaca record only); Barr, 1968b:184.
Mexisphodrus sp.: Reddell, 1971b:61 (Sótano de San Agustín record only).
Mexisphodrus urquijoi Hendrichs and Bolívar, 1973: 38-41, fig. 1-2.

Type-locality.—Sótano de San Agustín, cerca de Huautla de Jiménez, norte del estado de Oaxaca, México.

Distribution.—Known only from the type-locality. See Fig. 76.

Discussion.—This is the most highly cave-adapted species in the subgenus; it is the only *Mexisphodrus* completely lacking eyes. Although known only from the type-locality, this species may be represented by specimens from other caves in the Huautla region. This species is placed in the genus *Platynus* in accordance with the evidence offered by Whitehead (1973).

Platynus (Mexisphodrus) veraecrucis (Barr)

Mexisphodrus veraecrucis Barr, 1965:66-71, fig. 1; Barr, 1966a:112, 113, 114, 115; Barr, 1967a:66; Barr, 1968b:184; Reddell, 1971a:226; Reddell, 1971b:61; Hendrichs and Bolívar, 1973:38, 41; Reddell, 1973a:36, 41.
Mexisphodrus veracrucis: Hendrichs and Bolívar, 1966:7, 8, 10 (erroneous spelling).
Platynus (Mexisphodrus) veraecrucis: Whitehead, 1973:182, 214.
Platynus veraecrucis: Erwin et al., 1977:31.

Type-locality.—Sótano del Profesor, near Tequila, Veracruz, México.

Distribution.—Known from caves in the vicinities of Tequila and Soledad Atzompa, Veracruz. See Fig. 76.

Records.—*Veracruz:* Sótano del Profesor and Sótano de Sphodrini.

New record.—*Veracruz:* Sótano Itamo (det. T. C. Barr, Jr.).

Discussion.—This species, like *P. (M.) profundus*, has an elongate body, small eyes, and vestigial metathoracic wings. In Sótano del Profesor it was taken from under rocks near the body of a murdered schoolteacher who had been thrown into the pit. In Sótano de Sphodrini specimens were taken from the cave walls.

Speocolpodes franiai Barr

Speocolpodes franiai Barr, 1973:273, 275-276, fig. 1; Mateu, 1978:22.
Eyeless carabid beetle: Syme and Peck, 1974:146.
Platynus franiai: Erwin et al., 1977:30.
Speocolpodes: Mateu, 1978:22, 26, 27.

Type-locality.—Seamay Cave near Senahú, Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality. See Fig. 76.

Discussion.—This monotypic genus is most closely related to *Platynus*. Erwin et al. (1977) place it in *Platynus*, but without offering any evidence for this combination. With the exception of the Venezuelan troglobite *Speleodesmoides raveloi* Mateu, *S. franiai* is the most southern troglobitic beetle in the New World. The species is known only from two females collected on flowstone and from under a rock near pools.

Family Dytiscidae

Darlington (1936) reported several species of dytiscid beetle from open-air cenotes in Yucatán. *Thermonectes* sp. was reported by Pearse (1938b) from Cenote de Sambulá (Motul), Yucatán. It may be a troglophile. Two additional species of possible troglophile are known from Mexican caves: *Agabus americanus* Aubé from Cueva de la Cascada, Veracruz, and *Hydroporus belfragei* Sharp from Cueva de la Capilla, Tamaulipas. The latter species is abundant in silt-floored drip pools.

Suborder Polyphaga

Family Alleculidae

Several species of the family Alleculidae are probably troglophiles in Mexican caves. Species of the genera *Hymenorus* and *Lystronychus* have been found in caves in Coahuila, San Luis Potosí, and Tamaulipas. *Lobopoda subcuneata* Casey has been identified from Sótano del Pozo, San Luis Potosí.

Family Cantharidae

The cantharids of caves are of uncertain ecological status, but the presence of larvae in many caves indicates that they may be troglophiles. Undetermined larvae have been found in caves in Hidalgo, Querétaro, Tamaulipas, and Veracruz, México; and in Huehuetenango, Guatemala. *Cantharis* sp. was found in Sumidero de Matehuala, San Luis Potosí, and *Discodon* sp. was taken in Cueva de la Puente, San Luis Potosí.

Family Dermestidae

Dermestid beetles are frequently found in caves inhabited by bats. Three species of this family have been identified from caves in México. The most common is *Dermestes carnivorus* Fabricius; it was collected from caves in Coahuila, Durango, Guerrero, and San Luis Potosí. In the larger bat caves it may be present in vast numbers. The other two species found in Mexican caves are *Apsectus araneorum* Beal from Cueva de la Boca, Nuevo León, and *Dermestes maculatus* De Geer from Pozo Melendez, Guerrero.

Family Histeridae

Hister beetles are present in large numbers in many caves throughout México and Central America, but few have yet been determined. Pearse (1938b) reported the presence of *Gnathoncus* sp., *Oxarthrius* n. sp. nr. *hematicallis* Sharp, *Phelister* sp., *Platysoma* sp., *Plegaderus* sp., and *Saprinus* spp. 1 and 2 from caves in Yucatán. Recent collections have included undetermined species of *Epierus* and *Euspilotus* from caves in San Luis Potosí and Tamaulipas, of *Euspilotus (Hesperosaprinus)* from Cueva de la Boca, Nuevo León, and of *Euspilotus (Neosaprinus)* from caves in Oaxaca and Yucatán. *Paromalus luderti* Marseul has been identified from Cueva del Ojo de Agua de Tlilapan, Veracruz. Vomero (1977) described the troglophile *Anapleus wenzeli* from Cueva de la Cañada n. 1, Chiapas (see Fig. 79). The four troglobitic species known from the family in North America all belong to the distinctive genus *Troglobacanius* and are discussed below.

Troglobacanius bolivari Vomero

Troglobacanius bolivari Vomero, 1974:328, 340, 341-345, 349, 350, 353-355, 356-358, fig. 6; Vomero, 1973:364 (nomen nudum); Decou and Thérond, 1977:404.

Type-locality.—Sótano del Tigre, 10 miles NE of Valles, San Luis Potosí, México.

Distribution.—Known only from the type-locality. See Fig. 79.

Discussion.—Although ten blind species of hister beetle are known, only *Speleacritus anophthalmus* Jeannel and the four Mexican species included here are troglobites (Vomero, 1973). The genus *Troglobacanius* includes only the troglobites listed here. It is most closely related to the genus *Bacanius*. *Troglobacanius bolivari* is closely allied to *T. maya* and *T. reddelli*.

Troglobacanius maya Vomero

Troglobacanius maya Vomero, 1974:328, 329, 331-333, 335-336, 338, 340, 342, 343, 344, 350, 353-355, 356-358, fig. 1-3; Vomero, 1973:364 (nomen nudum); Sbordoni, 1974:366; Sbordoni et al., 1974:15 (nomen nudum); Decou and Thérond, 1977:404.

Type-locality.—Grutas del Coconá, Teapa, Tabasco, México.

Distribution.—Known only from the type-locality. See Fig. 79.

Discussion.—This species is very closely allied to *T. reddelli*. It is the most highly evolved troglobite in the genus and is from the most tropical region.

Troglobacanius reddelli Vomero

Troglobacanius reddelli Vomero, 1974:328, 336, 338-341, 342, 343, 344, 350, 353-355, 356-358, fig. 4-5; Vomero, 1973:364 (nomen nudum); Decou and Thérond, 1977:404.

Type-locality.—Grutas de El Puente, 5 miles SE of Ocampo, Tamaulipas, México.

Distribution.—Known from two caves in the Sierra de Guatemala, Tamaulipas. See Fig. 79.

Records.—*Tamaulipas:* Grutas de El Puente and Cueva de los Vampiros.

Discussion.—This species is very closely allied to *T. maya* and somewhat more distantly to *T. bolivari*. Together these three species form the *maya* species group. It is probably significant that no species of troglobitic histerid has been found at high elevations in the Sierra de Guatemala. All of the species which have become cave adapted are known from lowland tropical caves. Although some of the species which have been found in lowland caves of the Sierra de Guatemala are also known from higher elevation caves and presumably evolved there and moved downward through subterranean routes to the lower elevations, it must be assumed that this is not the case with *Troglobacanius* but that all of the species of this genus have evolved in the lowlands.

Troglobacanius sbordonii Vomero

Troglobacanius sbordonii Vomero, 1974:328, 345, 347, 349-350, 353-355, 356-358, fig. 7-8; Vomero, 1973:364 (nomen nudum); Decou and Thérond, 1977:404.

Type-locality.—Sótano de Gómez Farías, Tamaulipas, México.

Distribution.—Known only from the type-locality. See Fig. 79.

Discussion.—This species is unique in many respects and has been placed by Vomero (1974) in the monotypic *sbordonii* species group.

Family Hydrophilidae

Darlington (1936) reported three species of hydrophilid beetle from open-air cenotes in Yucatán. *Tropisternus apicipalpis* Chevrolat was recorded by Pearse (1938b) from Cueva Yunchén, Yucatán. The only other record of this family from the cave habitat in México is of *T. (Cyphostethus) chalybeus* Laporte from Sótano del Arroyo, San Luis Potosí.

Family Leiodidae

The family Leiodidae is represented in Mexican caves by many species, including two troglobites. A recent collection of the leiodine *Aglyptinus* sp. from Harrison Sinkhole, Tamaulipas, is the first record of

Fig. 79.—Distribution of troglobitic and troglophilic beetles of the family Histeridae: 1, *Troglobacanius sbordonii;* 2, *T. reddelli;* 3, *T. bolivari;* 4, *T. maya;* 5, *Anapleus wenzeli.*

this genus in caves in mainland North America, although it is common in Antillean caves. Peck (1973a, 1977a) has summarized the catopine beetle fauna of the caves of México, Belize, and Guatemala. Three species of *Dissochaetus* have been identified from caves in southern and eastern México and from Belize. *Dissochaetus aztecus* Szymcakowski has been reported from caves in Nuevo León, San Luis Potosí, and Tamaulipas; *D. curtus* Portevin has been collected in Cueva Cerro Hueco, Chiapas; *D. hetschkoi* Reitter, a widespread species ranging north from Brazil into Nuevo León, México, has been reported from caves in Campeche, Oaxaca, San Luis Potosí, Veracruz, and Yucatán, México, and from Rio Frio Cave B, Belize. A species with reduced eyes, *Proptomaphaginus microps* Peck, is known from caves in the Xilitla and Aquismón regions of San Luis Potosí; Peck (1973a) considers this to be an endogean form. An undescribed species of *Proptomaphaginus* has recently been collected in Cueva de la Finca, Oaxaca. See Fig. 80 for the distribution of cavernicole *Dissochaetus* and *Proptomaphaginus* in México and Belize.

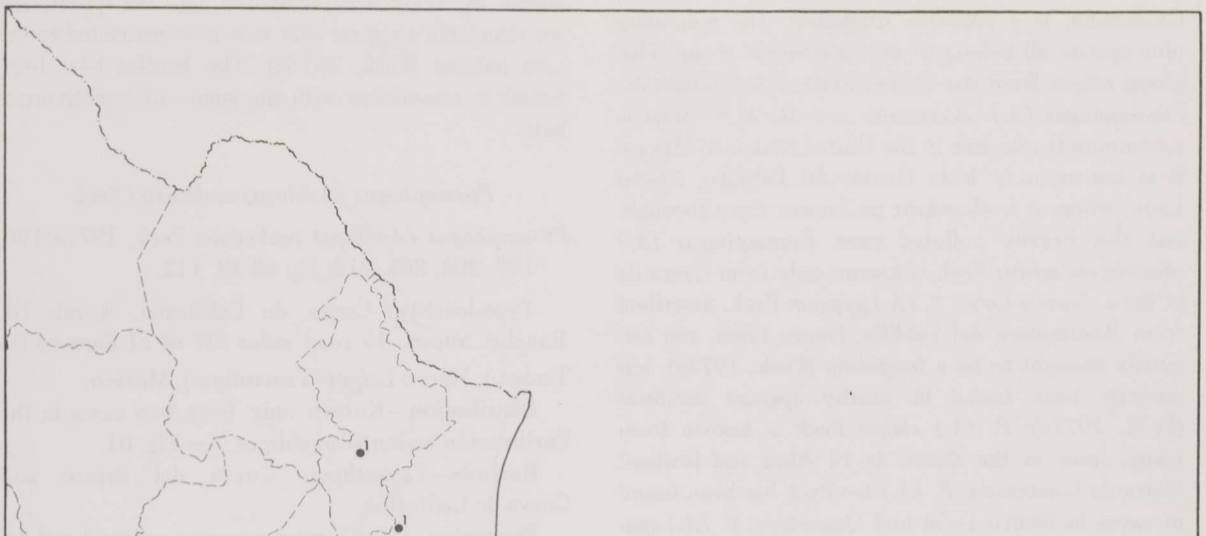

Fig. 80.—Distribution of troglophilic leiodid beetles of the genera *Dissochaetus* and *Proptomaphaginus*: 1, *Dissochaetus aztecus*; 2, *D. aztecus* and *D. hetschkoi*; 3, *Proptomaphaginus microps*; 4, *P. microps* and *D. aztecus*; 5, *D. hetschkoi*; 6, *Proptomaphaginus* n. sp.; 7, *D. curtus*.

Ptomaphagus (Adelops) is a group of beetles represented in this region by eight troglophilic and three troglobitic species. Peck (1973a, 1977a) has placed the Mexican and Central American cavernicoles into two species groups. The *consobrinus* group ranges from the southern United States into Central America. Three cave inhabiting species from southern México, Belize, and Guatemala belong to this group: *P. (A.) reddelli* Peck from caves in the Valle Nacional and Acatlán regions of Oaxaca; and *P. (A.) barbarae* Peck from caves in Belize and possibly in El Petén, Guatemala, are troglophiles. *Ptomaphagus (A.) giaquintoi* Jeannel from three caves in Alta Verapaz, Guatemala, is a probable troglobite. The remaining nine species all belong to the *cavernicola* group. This group ranges from the United States into Guatemala. *Ptomaphagus (A.) cavernicola cavernicola* Schwarz is a common troglophile in the United States; in México it is known only from Grutas del Palmito, Nuevo León, where it is abundant on human feces throughout this heavily polluted cave. *Ptomaphagus (A.) cavernicola aditus* Peck is known only from Cueva de la Boca, Nuevo León; *P. (A.) gypsum* Peck, described from Resumidero del Pablillo, Nuevo León, and originally thought to be a troglobite (Peck, 1973a), has recently been found in nearby epigean localities (Peck, 1977a); *P. (A.) elabra* Peck is known from many caves in the Sierra de El Abra and lowland Sierra de Guatemala; *P. (A.) leo* Peck has been found in caves in Nuevo León and Querétaro; *P. (A.) spelaeus* (Bilimek) is known from caves in Guerrero and México, as well as nearby epigean localities; *P. (A.) tabascensis*, described by Sbordoni (1974) from Grutas del Coconá, Tabasco, has been collected also in caves in Campeche, Quintana Roo, and Yucatán, and from forested habitats in Campeche. The remaining two species of the *cavernicola* group, *P. (A.) mckenziei* and *P. (A.) troglomexicanus*, are troglobites and discussed below. Sbordoni et al. (1977) reported undetermined troglophilic and troglobitic species of *Ptomaphagus* from several caves in Chiapas. See Fig. 81 for localities from which cavernicole *Ptomaphagus (Adelops)* are known.

Ptomaphagus (Adelops) giaquintoi Jeannel

Ptomaphagus (Adelops) giaquintoi Jeannel, 1936:93; Jeannel, 1949:98-99; Nicholas, 1962:180; Nicholas, 1968:168.

Ptomaphagus giaquintoi: Barr, 1973:276; Peck, 1973a:100, 101; Peck, 1973c:38, 40, 42, 43, 44, 45, 61, 85, 86, 92, 93, 94, 95, 98, 99, 102, 103, 104, 105, 111-112, 146, 147, 154, fig. 49, 93, 123, 175, 204; Strinati, 1977:387.

Ptomaphagus: Peck and Peck, 1973:70.

Type-locality.—Cueva Sepacuite (=Cueva Sepacuite n. 2), near Panzos, Alta Verapaz, Guatemala.

Distribution.—Known from three caves in Alta Verapaz, Guatemala. See Fig. 81.

Records.—**GUATEMALA:** *Alta Verapaz:* Grutas de Lanquín, Cueva de Seamay, and Cueva Sepacuite n. 2.

Discussion.—This species is the only troglobitic leiodid known from Guatemala. Its ecological status is uncertain since it still retains functional flight wings and pigmented eyes. The fact that the eyes are reduced, the body is depigmented, and the appendages are elongated suggests that it is now restricted to the cave habitat (Peck, 1973a). The beetles have been found in association with the guano of insectivorous bats.

Ptomaphagus (Adelops) mckenziei Peck

Ptomaphagus (Adelops) mckenziei Peck, 1977a:196, 199, 200, 205, 212, fig. 48-59, 112.

Type-locality.—Cueva de California, 4 mi. NE Rancho Nuevo, 46 road miles SW of El Barretal (in Tamps.), Nuevo León (=Tamaulipas), México.

Distribution.—Known only from two caves in the Purificación region, Tamaulipas. See Fig. 81.

Records.—*Tamaulipas:* Cueva del Brinco and Cueva de California.

Discussion.—This species possesses reduced and depigmented eyes, elongated antennae, and reduced flight wings. It is very closely related to *P. (A.) cavernicola*, from which it may be directly descended (Peck, 1977a). The *cavernicola* group includes, in addition to the two troglobites listed here, a third form which shows some adaptations to the cave environment: *P. (A.) cavernicola aditus* from Cueva de la Boca, Nuevo León.

Ptomaphagus (Adelops) troglomexicanus Peck

Ptomaphagus (Adelops) troglomexicanus Peck, 1968: 92-97, fig. 1-5; Reddell, 1971b:63; Reddell and Mitchell, 1971b:194, fig. 21; Reddell, 1973a:41; Reddell and Elliott, 1973b:182, 187; Peck, 1977a: 193, 199, 206, 207, 212, fig. 19, 58, 130.

Ptomaphagus troglomexicanus: Peck, 1971b:12; Sbordoni and Argano, 1972:8; Vigna Taglianti, 1972:125; Mitchell and Kawakatsu, 1973a:671, 673; Peck, 1973a:103, fig. 1, 12; Peck, 1973c:38, 40, 42, 44, 45, 60, 111, 128, 129-130, 154, fig. 60, 131, 190; Reddell, 1973a:36; Sbordoni and Cobolli-Sbordoni, 1973a:340-346, fig. 1; Sbordoni and Cobolli-Sbordoni, 1973b:150; Sbordoni, 1974:366; Vomero, 1974:353; Peck, 1977b:81, 82.

Type-locality.—Cueva de la Perra (=Capilla), La Perra (=El Porvenir), 15 miles northwest of Gómez Farías, Tamaulipas, México.

Distribution.—Known from four caves in the Sierra de Guatemala, Tamaulipas. See Fig. 81.

Records.—*Tamaulipas:* Cueva de la Capilla, Cueva de la Mina, Cueva de las Perlas, and Cueva Chica de la Perra.

Discussion.—This species has greatly reduced eyes and very elongated antennal segments. It is a member of the *cavernicola* group and is the most highly cave-adapted member of the group. It was found on flowstone and silt in association with *Mexaphaenops intermedius* in Cueva de la Capilla. Peck (1968) has discussed the evolution of this species. Sbordoni and Cobolli-Sbordoni (1973a) have considered the morphological differences between this "temperate" species and a typical "tropical" troglophilic species, *P.*

Fig. 81.—Distribution of troglobitic and troglophilic leiodid beetles of the genus *Ptomaphagus:* 1, *Ptomaphagus (Adelops) cavernicola cavernicola;* 2, *P. (A.) leo;* 3, *P. (A.) cavernicola aditus;* 4, *P. (A.) gypsum;* 5, *P. (A.) mckenziei;* 6, *P. (A.) troglomexicanus;* 7, *P. (A.) elabra;* 8, *P. (A.) spelaeus;* 9, *P. (A.) reddelli;* 10, *P. (A.) tabascensis;* 11, *P. (A.) barbarae;* 12, *P. (A.) giaquintoi.*

(A.) spelaeus, from Grutas de Cacahuamilpa, Guerrero. They concluded that these differences are a result of the degree of energy input into the respective caves. Peck (1977a) has discussed alternatives to their conclusions.

Family Limnichidae

Specimens of this family have been collected from several caves in San Luis Potosí and Tabasco and apparently belong to at least two species of troglophile. They remain unstudied.

Family Pselaphidae

The family Pselaphidae is among the principal groups contributing to the troglobitic and troglophilic fauna of the United States, but it is rarely collected in Mexican caves. A few species, including members of the genera *Cerocerus* and *Reichenbachia,* have been collected, but all await study.

Family Ptilodactylidae

The family Ptilodactylidae is represented in caves in México by at least one probable new species of the genus *Ptilodactyla.* This troglophile has been found in caves in Guerrero, Nuevo León, Oaxaca, San Luis Potosí, Tamaulipas, and Veracruz.

Family Ptinidae

Two species of spider beetle have been found in the caves of México, one of which is a possible troglobite (see Fig. 82). The other species, *Niptus abstrusus* Spilman, is known only from caves in Texas (U.S.A.) and Coahuila and Durango, México (Ashworth, 1973). The eyes in this species are somewhat reduced but less so than in *N. absconditus.* In addition to the two cavernicole species from México and Texas, the genus *Niptus* includes three species in North America. One of these is a nearly cosmopolitan stored product pest, one is an inhabitant of mammal nests in the southwestern United States, and the third *(N. abditus* Brown) is a cavernicole known only from Spider Cave, Utah.

Niptus absconditus Spilman

Niptus absconditus Spilman, 1968:194, 196, 197-198, fig. 1-3; Reddell, 1971b:65; Reddell, 1973a: 36, 41.

Type-locality.—Grutas de Xoxafí, Hidalgo, México.

Distribution.—Known only from the type-locality. See Fig. 82.

Discussion.—This species possesses the smallest eyes in the genus and is known only from the most remote sections of Grutas de Xoxafí. Whether it is a troglobite or not is speculative, but it is included here because the species is doubtless in the process of becoming adapted to the cave environment.

Family Scarabaeidae

Several species of scarab beetle have been collected from caves, but most are probably accidentals. The genus *Onthophagus,* however, is a frequent contributor to the cave fauna of México. These beetles are usually found in bat guano and are probably troglophiles. *Onthophagus incensus* Say was found in Sótano de Tlamaya, San Luis Potosí; *O. cuevensis* was recently described from caves in San Luis Potosí and Tamaulipas (Howden, 1973); *O. landolti* Harold has been found in Cueva del Ojo de Agua Grande, Veracruz; and *O. vespertilio* was described by Howden, Cartwright, and Halffter (1956) from Gruta de Acuitlapán, Guerrero, and has also been found in Grutas del Mogote, Guerrero. See Fig. 82 for the distribution of *Onthophagus* in Mexican caves.

Family Scydmaenidae

The family Scydmaenidae is well represented in the caves of México and Guatemala where it apparently replaces the Pselaphidae as a major element of the small beetle fauna. Franz (1977) described two cavernicole species of scydmaenid from Mexican caves: *Scydmaenus teapanus* from Grutas del Coconá, Tabasco; and *Euconnus (Madagassoconnus) arganoi* from Cueva del Muju, Chiapas (see Fig. 83). Both appear to be troglophiles. Species of the genus *Scydmaenus* (s. str.) have been collected in caves in Izabal and Alta Verapaz, Guatemala, and in Veracruz and Oaxaca, México. *Euconnus (?Drastophus)* n. sp. has been collected from bat guano in Cueva del Ojo de Agua de Tlilapan, Veracruz. Several species of *Euconnus (Napochus)* have been collected in caves in Alta Verapaz, Guatemala, and in Campeche, Oaxaca, Tamaulipas, San Luis Potosí, and Veracruz, México. Their ecological status is uncertain, but at least some species are presumed troglophiles. An undescribed species of *Euconnus,* possibly belonging to a new subgenus, has been collected in Sótano del León, Tamaulipas. It is a highly attenuate form and may be a troglobite.

Family Staphylinidae

The family Staphylinidae has made a major contribution to the Mexican cave fauna, and at least 34 species have been found. Many of these are known only by generic identifications. The subfamily Aleocharinae is frequently collected, but the taxonomy of this group is too poorly understood to allow even generic identifications. The genera *Anotylus*, *Belonuchus*, *Carpelimus*, *Erchomus*, *Homaeotarsus*, *Medon*, *Philonthus*, *Scopaeus*, *Stamnoderus*, and *Stenus* are frequently collected in almost every part of México and Central America; species identifications in these genera must await revisionary studies. *Stilicolina condei* Jarrige is a species described from a cave in Central Texas (U.S.A.) and reported by Herman (1970) from many caves in Texas and northern México. Recent study, however, indicates that the Mexican populations belong to an undescribed species (H. Frania, pers. comm.). This species ranges south from near the Texas border into the Aquismón region of San Luis Potosí (See Fig. 83). *Stenopholea reddelli* Herman was originally described as a troglobite from Cueva de la Mina, Tamaulipas (Herman, 1969), but it has recently been found to be abundant in the endogean fauna of the high mountain regions of the Sierra Madre Oriental (Herman, pers. comm.) (see Fig. 83).

Family Tenebrionidae

The family Tenebrionidae is widely distributed in caves in the western United States and México and is

Fig. 82.—Distribution of troglobitic and troglophilic beetles of the families Ptinidae and Scarabaeidae: 1, *Niptus absconditus;* 2, *Onthophagus cuevensis;* 3, *O. incensus;* 4, *N. abstrusus;* 5, *O. vespertilio;* 6, *O. landolti.*

represented by many species. Tenebrionids are usually found in the drier parts of caves, frequently as guanophiles. Many species have been identified and some await description. Large collections remain undetermined, and the number of identified tenebrionid species will doubtless increase with further study. *Alphitobius laevigatus* (Fabricius) is a common guanophile in caves in Coahuila, San Luis Potosí, and Tamaulipas. *Cryptoglossa mexicana mexicana* Champion is abundant in the caves of northern and western México. It is known from dry, dusty caves in Chihuahua, Coahuila, Durango, and Nuevo León. The genus *Eleodes* is the most commonly collected genus of tenebrionid in México. Although usually found as guanophiles, they are also taken in dry dusty areas of many caves not inhabited by bats. Most collections of this genus await study, but a few species have been identified. *Eleodes glabricollis* Champion has been found in gypsum caves south of Galeana, Nuevo León. *Eleodes rugosa* Perbosc is frequently found in the drier area of caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas. *Eleodes sallei* Champion has been found in many caves at higher elevations in the Sierra Madre Oriental in San Luis Potosí and Querétaro and in Oaxaca. *Eleodes hispilabris* (Say), a common guanophile in Texas caves, has been collected from Cueva de los Lagos, Coahuila. *Eleodes spinolai* Solier has been collected in

Fig. 83.–Distribution of troglophilic beetles of the families Staphylinidae and Scydmaenidae: 1, *Stilicolina* n. sp.; 2, *Stilicolina* n. sp. and *Stenopholea reddelli;* 3, *Scydmaenus teapanus;* 4, *Euconnus (Madagassoconnus) arganoi.*

Grutas de Cacahuamilpa and Grutas del Mogote, Guerrero. *Liodema* sp. nr. *kirschi* Bates is a frequently collected species in the caves of the Sierra de El Abra, San Luis Potosí and Tamaulipas. *Rhinandrus ?elongatus* Horn was reported by Pearse (1938b) from several caves in Yucatán. *Zophobas atratus* (Fabricius), known from caves in the Sierra de El Abra, San Luis Potosí, is otherwise known only from a cave in Venezuela. For the cave localities of several species of tenebrionid in México see Fig. 84.

Family Trogidae

This family of beetles is frequently collected as guanophiles in Central Texas. The only record for Mexican caves is of *Omorgus carinatus* (Loomis) from Cueva de la Siquita, Durango. It is probably a guanophile in this large bat cave.

Order Siphonaptera

Family Hystrichopsyllidae

The only species of this family reported from Mexican caves is the bat flea *Anomiopsyllus traubi* Barrera from Cueva de Belén, Hidalgo (Barrera, 1951).

Family Ischnopsyllidae

Three species of bat flea of the family Ischnopsyllidae have been taken from guano in Mexican caves.

Fig. 84.—Distribution of cavernicole beetles of the family Tenebrionidae: 1, *Eleodes hispilabris;* 2, *Cryptoglossa mexicana mexicana;* 3, *E. glabricollis;* 4, *E. rugosa;* 5, *E. sallei;* 6, *E. spinolai.*

Myodopsylla gentilis Jordan and Rothschild was found in Cueva del Cochino, San Luis Potosí. A single specimen of *M. globata* Holland was collected from Grutas del Coconá, Tabasco; this is only the second specimen of this species, previously known from San Cristóbal de las Casas, Chiapas. *Sternopsyllus distincta texana* (C. Fox) was extremely abundant in guano in Grutas de San Bartolo and Cueva de la Boca, Nuevo León.

Family Pulicidae

The family Pulicidae is represented in Mexican caves by three species. *Pulex irritans* Linnaeus is known from Cenote Sabacah (Sucopo), Yucatán, and Cueva del Cochino, San Luis Potosí; it is usually associated with man and large carnivores. The specimens from Cueva del Cochino were taken from the dry entrance area of the cave. *Pulex porcinus* Jordan and Rothschild is known from Grutas de Monte Bravo and Grutas de Xtacumbilxunam, Campeche, and from Cenote Amil, Yucatán. This species is usually associated with peccaries; its host in the above caves is unknown. Pearse (1938b) reported the plague flea, *Xenopsylla cheopis* (Rothschild) from Grutas de Balankanche, Yucatán.

Order Diptera

Almost 100 species of fly have been collected in Mexican caves (see Table 27). In addition, numerous collections await study. Many flies utilize the entrance areas as daytime retreats; others are attracted by water or carrion. Some species apparently are troglophiles and complete their life cycle underground. No species from México or Central America is troglobitic. The following is a brief summary of some of the more significant species with respect to the cave habitat.

Suborder Nematocera

Family Ceratopogonidae

Two genera of this family have been identified from caves. The presence of larvae in caves indicates that they may possibly be troglophiles. Pearse (1938b) reported *Dasyhelea* sp. from Actún Góngora, Yucatán. *Forcipomyia* sp. has been reported from Cueva Chac Mol, Yucatán (Pearse, 1938b); it has also been collected in Actún Xpukil, Yucatán.

Family Chironomidae

Several species of midge of the family Chironomidae have been collected from caves and cenotes in Yucatán (Pearse, 1936b, 1938b). The larvae of this family are usually aquatic, and presumably, the adults' presence in this habitat is a result of the absence of surface water in most of northern Yucatán. *Tendipes fulvipilus* Rempel is an apparent troglophile in Cueva del Azufre, Tabasco (Gordon and Rosen, 1962). It has been taken from guano deposits in large numbers.

Table 27.—Summary of cave inhabiting Diptera.

	Troglobites	Other Species
Nematocera		
Cecidomyiidae	0	2
Ceratopogonidae	0	2
Chironomidae	0	5
Culicidae	0	8
Mycetophilidae	0	3
Psychodidae	0	16
Sciaridae	0	2
Tipulidae	0	5
Brachycera		
Asilidae	0	1
Dolichopodidae	0	2
Empidiidae	0	1
Rhagionidae	0	1
Scenopinidae	0	1
Stratiomyidae	0	2
Tabanidae	0	1
Therevidae	0	2
Cyclorrhapha		
Agriomyzidae	0	1
Calliphoridae	0	2
Chloropidae	0	2
Drosophilidae	0	1
Lonchaeidae	0	1
Metopiidae	0	1
Milichiidae	0	5
Muscidae	0	4
Phoridae	0	4
Sciomyzidae	0	1
Sphaeroceridae	0	2
Streblidae	0	17
Tachinidae	0	2
Total	0	97

Family Culicidae

Eight species of mosquito of the family Culicidae have been collected from caves and cenotes in Yucatán (Pearse, 1938b). Mosquitoes frequently utilize the entrance of caves for shelter, but in Yucatán where surface water is almost nonexistent, many species are dependent upon caves and cenotes as places in which to deposit their eggs. Pearse (1938b) reported *Aedes angustivittatus* Dyar and Knab, *A. euplocamus* Dyar, *A. taeniorhynchus* (Wiedemann), *Culex* sp., *Haemagogus* sp., *Isostomyia* sp., *Mochlonyx* sp., and *Psorophora* sp. from caves in northern Yucatán.

Family Mycetophilidae

Mycetophilid flies are occasionally found in the cavernicole habitat, and three genera are known from Mexican caves: *Keraplatus* sp. from Sótano Encantado, Querétaro; *Mycetophila* sp. from Cueva de las Perlas, Tamaulipas; and *Rhymosia* sp. from caves in the Valle de los Fantasmas region, San Luis Potosí.

Family Psychodidae

Three genera of psychodid flies have been found in Mexican caves. *Nemopalpus* sp. was reported from Cueva Segunda del Camino a San Roque, Yucatán (Pearse, 1938b). Breder (1942) reported *Psychoda* sp. from Cueva Chica, San Luis Potosí. *Telmatoscopus albipunctatus* (Williston) was reported to be very abundant in Grutas del Coconá, Tabasco (Ryckman, 1956). The last species, at least, is a troglophile.

Williams (1976a, 1976b, 1976c) has studied in detail the biology of the phlebotomine sandflies inhabiting caves in Belize. During the course of his studies he collected 15,041 specimens from four caves in the Cayo District (Millionario Cave, Augustine Cave 1, Augustine Cave 2, and San Antonio Cave). Thirteen species were identified, two of which belonged to the genus *Brumptomyia* and 11 to the genus *Lutzomyia*. Some of the species were quite rare and may have followed the collectors into the caves. A few, however, apparently complete their life cycle in the caves, utilizing bats as their source of blood meals. The most common species in all of the caves was *L. beltrani* (Vargas and Díaz Nájera). The second most abundant species in all but San Antonio Cave was *L. deleoni* (Fairchild and Hertig). *Lutzomyia trinidadensis* (Newstead) was the second most abundant species in the San Antonio Cave, but was comparatively rare in the other caves. The only other species present in all of the caves was *L. shannoni* (Dyar). The remaining species were all very rare and probably not of significance to a study of the cave fauna. Williams (1976a) reported the presence of trypanosomatid flagellates and filaria worms in *L. trinidadensis* from the Belize caves. The vertebrate host of the trypanosomes infecting this species is not known. An undetermined trypanosome species also infected *L. beltrani;* this species is probably a bat parasite.

Family Sciaridae

The small gnats of the family Sciaridae are frequently abundant in Mexican caves. *Sciara* sp. has been found in caves in Yucatán (Pearse, 1938b) and Tamaulipas. *Bradysia coprophila* (Lintner) is known from Sótano de Caballo Moro, Tamaulipas. Undetermined species of *Bradysia* are known from caves in Campeche, Durango, Nuevo León, Oaxaca, San Luis Potosí, and Tamaulipas. These gnats are apparently troglophiles and may be so abundant as to be extremely annoying.

Family Tipulidae

Crane flies are common inhabitants of caves, where they are frequently found resting on cave walls in the vicinity of the entrance. No species have yet been identified, but the following genera are known to occur in Mexican caves: *Epiphragma*, *Helius*, *Limnophila*, *Limonia*, and *Teucholabis.*

Suborder Brachycera

Family Dolichopodidae

Two species of this family have been found in Mexican caves: *Chrysotus* sp. from Salamander Cave, Tamaulipas, and *Peloreopeodes cornutus* Van Durzee from Cueva de la Puente, San Luis Potosí. Some species of dolichopodid fly are known to be troglophiles, but the ecologic status of the above species is unknown.

Family Therevidae

Two species of the family Therevidae have been found in Mexican caves. *Henicomyia hubbardi* Coquillett is known from Cueva de los Pájaros, Tamaulipas, and *Psilocephala* sp. is abundant in the caves of Yucatán (Pearse, 1938b).

Suborder Cyclorrhapha

Family Drosophilidae

The family Drosophilidae is frequently collected in caves in México. *Drosophila repleta* Wollaston has been identified from Cueva Xconsacab, Yucatán (Pearse, 1938b). Undetermined species of *Drosophila* have been taken from caves in Nuevo León, Puebla, San Luis Potosí, Tamaulipas, and Yucatán. In Cueva de las Perlas, Tamaulipas, enormous swarms were observed on the ceiling of the cave. Thousands of individuals were collected in dung-baited traps in Cueva de Chorros de Agua, Nuevo León.

Family Milichiidae

The small flies of the family Milichiidae are frequently found in caves. *Milichia* sp. is abundant in the caves of Yucatán (Pearse, 1938b). Pearse (1938b) also reported the presence of *Desmometopa* sp from two caves in Yucatán. Undetermined species of the genus *Pholeomyia* have been collected from caves in Chiapas, Puebla, Tamaulipas, and Veracruz. Three species of *Pholeomyia* have been reported from Mexican and Guatemalan caves: *P. dampfi* Sabrosky from Grutas del Coconá, Tabasco, México, and Cueva de Jobitzinaj, El Petén, Guatemala (Sabrosky, 1959); *P. indecora* Loew from Cueva Chica, San Luis Potosí (Breder, 1942); and *P. leucozona* Bilimek from Grutas de Cacahuamilpa, Guerrero (Bilimek, 1867), and Cueva Chirripeck, Alta Verapaz, Guatemala (Papp, 1978). These species are all presumed troglophiles.

Family Phoridae

The humpbacked flies of the family Phoridae are occasionally collected in Mexican caves. *Megaselia scalaris* Loew has been found in several caves in Yucatán (Pearse, 1938b). *Conicera dauci* Meigen was found in Sumidero del Jineo, Tamaulipas. Undetermined species of the genera *Conicera*, *Dohrniphora*, and *Puliciphora* have been taken from caves throughout México.

Family Sphaeroceridae

The small dung flies of the family Sphaeroceridae are frequently taken from bat guano in caves. *Archiborborus mexicanus* Steyskal was described from Sótano de El Porvenir, Tamaulipas (Steyskal, 1973). This is the most northern record for the genus. Undetermined species of *Leptocera* have been collected from caves in Hidalgo, Nuevo León, San Luis Potosí, Tamaulipas, and Yucatán.

Family Streblidae

Seventeen species of streblid fly have been identified from caves in México. These flies are all parasites of bats and are frequently abundant in caves, where they may be found on cave walls or on guano. Their bite is annoying, but not usually painful. This family in México has been reviewed by Hoffmann (1953). Among the more frequently collected species are *Euctenodes mirabilis* Waterhouse from caves in Guerrero, San Luis Potosí, and Yucatán; *Megistopoda araneae* (Coquillett) from caves in San Luis Potosí and Yucatán; *Nycterophilia coxata* Ferris from caves throughout México; *Trichobius adamsi* Augustson from caves in Baja California Sur, Colima, and Guerrero; *T. caecus* Edwards from caves in Guerrero, San Luis Potosí, Tamaulipas, and Yucatán; *T. intermedius* Peterson and Hurka from caves in Yucatán (Peterson and Hurka, 1974); *T. parasiticus* Gervais from caves in Chiapas, Guerrero, San Luis Potosí, Tabasco, and Yucatán; and *T. sphaeronotus* Jobling from caves in Baja California Sur, Chiapas, Nuevo León, and Sonora.

Table 28.—Summary of cave inhabiting Lepidoptera.

	Troglobites	Other Species
Acrolophidae	0	1
Arctiidae	0	1
Blastobasidae	0	1
Gelechiidae	0	1
Noctuidae	0	1
Phalaenidae	0	1
Pterophoridae	0	1
Pyralidae	0	2
Tineidae	0	6
Total	0	15

Order Trichoptera

Trichoptera larvae are occasionally taken from streams in caves, and a few species may complete their life cycle underground.

Family Calamoceratidae

Specimens of the genus *Phylloicus* have been taken in Cueva de la Puente and Sótano de Tlamaya, San Luis Potosí. These are probably troglophiles.

Family Philopotamidae

Apparently troglophilic species of the genus *Wormaldia* have been collected from the streams in Cueva de la Puente, San Luis Potosí, and Cueva del Brinco, Tamaulipas.

Family Polycentropidae

Polycentropus picana Ross was found in the stream passage in Cueva de la Puente, San Luis Potosí. An undetermined species of *Polycentropus* is an apparent troglophile in Cueva del Brinco, Tamaulipas.

Order Lepidoptera

Although nine families of moth have been collected in Mexican caves, only two are of unusual significance to the study of the cavernicole fauna (see Table 28). Most collections of moths have been in alcohol and, therefore, are unsuitable for description or specific determination.

Family Noctuidae

Numerous specimens of noctuid moth have been collected from Mexican caves, most from the entrance area. *Latebraria amphipyroides* Guenée is frequently found in caves throughout much of México. This large moth is to be seen resting during the daytime on the cave wall. It was reported from Yucatán caves by Pearse (1938b) and from caves in the Xilitla region of San Luis Potosí by Bonet (1953a).

Table 29.—Summary of cave inhabiting Hymenoptera.

	Troglobites	Other Species
Apidae	0	4
Bethylidae	0	3
Braconidae	0	1
Chalcididae	0	2
Cynipidae	0	1
Diapriidae	0	3
Figitidae	0	1
Formicidae	0	52
Halictidae	0	2
Ichneumonidae	0	3
Mutilidae	0	1
Pompilidae	0	2
Scelionidae	0	1
Sphecidae	0	4
Vespidae	0	1
Total	0	81

Family Tineidae

Several, probably undescribed, species of the family Tineidae are known from caves in México. A probable new genus and species has recently been collected from bat guano in Cueva de Tasalolpan, Puebla. *Amydria* spp. have been collected from caves in Nuevo León, Puebla, Tamaulipas, and Veracruz. *Decardarchis* sp. is known from Cenote de Sambulá (Motul), Yucatán, and Grutas de Xtacumbilxunam, Campeche. *Episcardia* sp. has been taken from caves in Nuevo León and Tamaulipas. *Tinea* sp. is known from caves in San Luis Potosí and Yucatán. *Monopis impresipenella* (Bilimek) is a poorly known species recorded from Grutas de Cacahuamilpa, Guerrero (Bilimek, 1867).

Order Hymenoptera

The order Hymenoptera is well represented in caves, and 81 species have been identified from this habitat in México (see Table 29). Many species are accidentals, but others, such as bees and wasps, build their hives and nests within the shelter of the cave entrance. Some of the species are very aggressive and may inflict severe stings to the cave explorer. Bees also are found occasionally around moist flowstone in the entrance rooms of caves.

Family Apidae

Four species of the family Apidae have been collected from caves in México. *Apis mellifera* Linnaeus is known from the entrance sinks of caves in Campeche and Yucatán. This species usually builds its hives in crevices on the vertical walls of the sinkholes. Local inhabitants frequently build elaborate scaffoldings up the cave walls to reach the hives. Three additional species of apid bees have been collected from the entrance area of caves in México: *Partamona cupira orizabensis* (Str.) from Cueva de los Pájaros, Tamaulipas; *Trigona atrolutea* Moure from Actún Xpukil, Yucatán; and *T. testacea cupira* Sm. from Cenote Sucilá, Yucatán. The latter two species are much more common in caves in Yucatán than these two records indicate.

Family Bethylidae

Three genera of wasp of the family Bethylidae have been found in Yucatán caves. Pearse (1938b) reported *Apanesia* n. sp. from Actún Kaua, Yucatán. *Holepyris* sp. has been found in Actún Xkyc, Yucatán, and *Rhabdepyris* sp. has been collected in Actún Kaua.

Family Formicidae

The only group of hymenopterans which may be considered to be truly associated with the cave habitat is the family Formicidae. Ants are not uncommon in cave entrances and occasionally are found throughout the cave. Most of these species are accidentals or trogloxenes, but a few are apparently permanent inhabitants of caves.

Among species commonly taken in caves but obviously not in any way adapted for a cave existence is *Pachychondyla harpax montezumia* F. Smith. This species has been found in several caves in San Luis Potosí and Yucatán. Another species commonly taken in caves is *Acromyrmex octospinosus* (Reich), which was reported from caves in Yucatán (Wheeler, 1937). This species is frequently found building its nest in the twilight zone of caves. *Solenopsis geminata* (Fabricius) has been found in caves in Oaxaca, Puebla, San Luis Potosí, Tabasco, Veracruz, Campeche, and Yucatán. In some caves this species has been present in thousands, both in twilight and in total darkness. In Sótano de Guadalupe, San Luis Potosí, a large nest at the entrance allowed immediate access by the ants into the cave, and individuals were observed carrying out numerous animals, including some troglobites. Other ants collected frequently in Mexican caves are: *Hypoponera punctatissima* (Roger) from Campeche, San Luis Potosí, and Yucatán; *Labidus coecus* (Latreille) from Oaxaca and Yucatán; *L. praedator* (F. Smith) from San Luis Potosí and Yucatán; *Leptogenys* spp. from Oaxaca, Campeche, Yucatán, and Quintana Roo; *Pachycondyla apicalis* (Latreille) from Campeche, Quintana Roo, and Yucatán; and *P. villosa* (F. Smith) from caves in Quintana Roo, Tamaulipas, and Yucatán.

Wheeler (1938) has reported the presence in caves in Yucatán of three species that at various times have been reported as troglobites. *Erebomyrma urichi* (Wheeler) was originally described from a cave on Trinidad and is known also from Cenote de Sambulá (Motul), Yucatán. It is a pale species now known also from endogean localities. Two other species are known only from caves in the Yucatán Peninsula: *Brachymyrmex cavernicola* Wheeler from Grutas de Balankanche, Yucatán; and *Paratrechina pearsei* (Wheeler) from caves in Campeche, Quintana Roo, and Yucatán. Both of these species are pale yellow with minute eyes. The latter species has been found to occur only in darkness and is frequently taken from moist flowstone in the most remote parts of the caves. Wilson (1962) has discussed the ecologic status of these species and has convincingly argued the case against the existence of troglobitic ants.

Family Pompilidae

Two genera of the spider wasps of the family Pompilidae have been collected from caves in Yucatán. *Auplopus* sp. was collected from Actún Chukum. *Pepsis* sp. was taken from total darkness in Cueva de Aguacate while it was in battle with a theraphosid tarantula. The same genus was found in total darkness in Actún Kaua, where the wasps flew at the collectors, apparently attracted by their lights.

Family Vespidae

The vespid wasp *Polybia diguetana* Buysson was collected from nests in the entrance areas of Cenote de Ek Bis, Campeche, and Actún Kaua, Yucatán.

Phylum Chordata

Class Teleostei

The blind fish of the caves of México have excited greater interest than any other group of animals to be found in the caves of North America. The genus *Astyanax* is certainly the best studied of all cavernicoles. In addition to the five species of troglobitic fish discussed in detail below, 16 other species of fish have been recorded from Mexican caves (see Table 31). Some of these are troglophiles, while others are probably accidentals or trogloxenes.

Order Cypriniformes

Family Characidae

Astyanax jordani (Hubbs and Innes)

Anoptichthys jordani Hubbs and Innes, 1936:5-7, pl. 1; Hykes, 1937:108-109; Innes, 1937:200-202; Jordan, 1937:203-204; Greenberg, 1938:80; Hubbs, 1938:261, 264, 271, 275; Bridges, 1940: 74-97, map; De Buen, 1940:8; Gresser and Breder, 1940:113-116, pl. 1-3; Breder and Gresser, 1941b: 123-130, fig. 1-2, pl. 1-4; Anonymous, 1942a:221; Breder, 1942:7, 11-14, fig. 2, 5; Osorio Tafall, 1942:206; Walls, 1942:210, 387; Breder, 1943a:26-30; Breder, 1943b:82; Breder, 1943c:168-176; Breder and Rasquin, 1943:169-200, fig. 1-9, pl. 1-3; Bridges, 1943:82-90; Hubbs, 1943:121; Osorio Tafall, 1943:44, 55, 57-67, 68, 69; Anonymous, 1945:70; Barbour, 1945a:77; Barbour, 1945b:189; Benn, 1945:12; Breder, 1945:95-100, fig. 1-2, pl. 1; Alvarez, 1946:263, 264, 265, 267, 268, 270, 271, 272, 273, 274-275, 276, 280, 281, fig. 2-8; De Buen, 1946:127; Jordan, 1946:198; Pavan, 1946:358; Rasquin, 1946:578-579; Alvarez, 1947:219; Breder and Rasquin, 1947a:323-351, fig. 1-9; Breder and Rasquin, 1947b:29-33; Nigrelli, 1947:105, 108, pl. |11(fig. 38); Rasquin, 1945:35-42, fig. 1, pl. 1; Schlagel and Breder, 1947:17-27, fig. 2; Allee et al., 1949:612, 674, 675, fig. 247B-C; Rasquin, 1949a:499-531, fig. 4-5, 7, pl. 20-21, 23; Rasquin, 1949b:131, 133; Alvarez, 1950:

Table 30.—Summary of cave inhabiting Chordata.

	Troglobites	Other Species
*Teleostei	5	16
Amphibia		
Urodela		
Ambystomatidae	0	1
Plethodontidae	0	9
Anura		
Bufonidae	0	4
Hylidae	0	6
Leptodactylidae	0	17
Ranidae	0	1
Rhynophrynidae	0	1
Reptilia		
Chelonia		
Kinosternidae	0	3
Squamata		
Boidae	0	1
Colubridae	0	5
Crotalidae	0	2
Gekkonidae	0	2
Iguanidae	0	5
Teiidae	0	1
Xanthusiidae	0	3
Aves		
Falconiformes		
Cathartidae	0	1
Psittaciformes		
Psittacidae	0	2
Podicipitiformes		
Podicipitidae	0	1

Table 30.—(Continued)

	Troglobites	Other Species
Strigiformes		
Strigidae	0	1
Tytonidae	0	1
Apodiformes		
Apodidae	0	2
Trochilidae	0	2
Coraciiformes		
Momitidae	0	2
Passeriformes		
Hirundinidae	0	2
Troglodytidae	0	1
Turdidae	0	2
Mammalia		
Marsupialia		
Didelphidae	0	2
Chiroptera		
Emballonuridae	0	5
Molossidae	0	7
Mormoopidae	0	6
Natalidae	0	2
Phyllostomatidae	0	33
Vespertilionidae	0	19
Rodentia		
Cricetidae	0	8
Dasyproctidae	0	1
Erithizontidae	0	1
Carnivora		
Canidae	0	1
Felidae	0	1
Mustelidae	0	1
Procyonidae	0	1
Total	5	182

*For summary by family see Table 31.

27-28; Atz, 1950:87, 89-90; Heuts, 1951:223; Ladiges, 1951a:258-260; Ladiges, 1951b:169; Rasquin and Hafter, 1951a:398; Rasquin and Hafter, 1951b:163; Meder, 1952:171-174; Bonet, 1953b:241; Breder, 1953:180; Lüling, 1953a: 314-318; Lüling, 1953b:62-65; Lüling, 1953c: 289-299; Rioja, 1953e:10; Angel, 1954:85-86, foll. 96; Breder, 1954:13-16, pl. 1; Kauffeld, 1954:140-141; Kuhn and Kähling, 1954:385-398, fig. 1-2; Lüling, 1954a:197-203; Lüling, 1954b:9-42; Olivereau and Herlant, 1954:52; Rasquin and Rosenbloom, 1954:406; Stefanelli, 1954b:277-282, fig. 1-2; Thinès, 1954:35-58; Axelrod and Vorderwinkler, 1955:61; Bridges, 1955:256-268; Lüling, 1955a:138-143, fig. 1-6; Lüling, 1955b: 401-477; Lüling, 1955c:138-143; Quaghebeur, 1955:?, Thinès, 1955:9, 41, 68-70, 108-109, 115, 123; Olivereau and Francotte-Henry, 1955-1956: 143; Bonet, 1956b:96; Bonet, 1956c:238; Dearolf, 1956:202, 210; Pfisterer, 1956:11-12; Sadoglu, 1956:113-114; Thinès, 1956:79; Gordon, 1957:466; Hahn, 1957:1-81; John, 1957:129, 130; Kähling, 1957:?; Lüling, 1957:145-150;

Table 31.—Summary of cave inhabiting Teleostei.

	Troglobites	Other Species
Cypriniformes		
Characidae	1	1
Ictaluridae	1	0
Pimelodidae	1	4
Cyprinodontiformes		
Poeciliidae	1	4
Perciformes		
Brotulidae	1	0
Cichlidae	0	6
Synbranchiformes		
Synbranchidae	1	0
Total	5	16

Pickford and Atz, 1957:77, 159, 324-325, 327; Quaghebeur, 1957:?; Thinès and Kähling, 1957: 150-160; Bertin, 1958b:2661-2662; Cahn, 1958: 76-107, pl. 14-15, 22-24, 26-27; Grobbel and Hahn, 1958:249-266; Marshall and Thînes, 1958: 441, 446, 447, 449, 450, 453; Pelz, 1958:172-175; Stolk, 1958:382-394; Alvarez, 1959:79; Breder, 1959:423, 424, 425, 426, 436, 437, 446, 447, fig. 4-6; Frank, 1960:39-41; Hahn, 1960: 611-612; Humbach, 1960a:1-88; Humbach, 1960b:551-552; Kosswig, 1960a:24; Kuhn, 1960: 481-483; Strotkoetter, 1960:611-612; Thinès, 1960:44, 45, 46; Frank, 1961:347-365; Heuts, 1961:196; Kähling, 1961:439-451; Poulson, 1961: 143, 171-174; Axelrod et al., 1962:C-35.00, F-38.00, F-141.00; Bath, 1962:242, 281-285, 287, fig. 35-36; Franck, 1962:?; Franck-Krahé, 1962:?; Goettert, 1962:56-58; Goodrick, 1962:10; Gordon and Rosen, 1962:365-366; Lüling, 1962: 139-145; Nicholas, 1962:165, 184; Tamayo, 1962:vol. III:260; Bonet, 1963b:95; Burgers et al., 1963:189-195; Durand, 1963:183; Pfeiffer, 1963: 112, 116, 117, 123, 125, 128, 131, 132, 139, 141; Poulson, 1963:286, 287, 288; Sterba, 1963:144, 145, 146-147, fig. 173; Steven, 1963:219, 221, 230; Berra, 1964:12-19; Franck, 1964:96; Kosswig, 1964:73-74; Moore and Nicholas, 1965:94-95; Vandel, 1964:52, 262-264, 361, 404, 405, 414, 458-459, 462, 463, 466, 472, 473, 476, 483, 509, 570, 571, fig. 59; Boucquey et al., 1965:88, 91, 92; Brittan and Böhlke, 1965:2; Glaser, 1965:?; Kosswig, 1965:246-250, fig. 9; McKenzie, 1965a: 38, 39; Post, 1965:56, 57, 64, 89; Thinès et al., 1965:65, 77, 92, 101, 102; Vandel, 1965a:39, 222, 223, 344, 351, 387, 392, 395, 401, 403, 404, 409, 429, 483, fig. 59; Breder and Rosen, 1966: 155-156; Innes, 1966:161; Peters and Peters, 1966: 393-414; Pfeiffer, 1966:97-105; Reed, 1966:79-80, 83, 85; Barr, 1967c:486; Greenwood, 1967:

263-264, 265, 267, 270, 273, fig. 58, pl. 40A; Johnson, 1967:6-7, 9-11, 25, 27, 28, 30, 32, 34, 36, 37, 38, 39, 40, 44, 46, 48, 49, fig. 7, 9; Kosswig, 1967:441-450; Kuhn and Strotkoetter, 1967: 1-57; Mattheij and van Oordt, 1967:472; Pfeiffer, 1967b:218, 224, 225; Popper and Tavolga, 1967: 791; Reddell, 1967b:82; Russell and Raines, 1967:79, 84; Schemmel, 1967:255-316; Thinès et al., 1967:438, 442; Barr, 1968a:77, 89, 90, 91; Frank, 1968:299-391; Glaser, 1968:648-658; Mattheij, 1968a:588-595; Mattheij, 1968b:542-553; Wilkens, 1968:454-464; Campos, 1969:255, 256, 259, 263, 265, 266, 277-281, 292, 298, fig. 1, 4, 6, 9; Frank, 1969:11-13; Fujii, 1969:324; Kleerekoper, 1969:123; Mattheij, 1969:588-597; Mattheij and Sprangers, 1969:411-419; Mattheij et al., 1969:519-520; Sadoglu and McKee, 1969:10-14; Thinès, 1969:frontispiece, 10, 20, 24-25, 27, 55, 57-62, 235, 247, 304, 305, 335, 336, 344, 347-349, 352-354, 356-357, 360, fig. 13-14, 97, 113; Alvarez, 1970:44; Delamare-Deboutteville and Botosanéau, 1970:75; Gertychowa, 1970:9-69; Love, 1970:186, fig. 74; Mattheij, 1970a:lxix; Mattheij, 1970b:91-106; Walker, 1970:6-7, 44-50; Weiss and Martini, 1970:34-37, fig. 1; Whitt and Maeda, 1970:728-731, 739-740, fig. 3, 9a; Wilkens, 1970a:1-47; Wilkens, 1970b:173; Wilkens, 1970c: 56, 59; Bauer, 1971:56, 121; Gertychowa, 1971: 66-69; Glydenholm and Scheel, 1971:480; Hara, 1971:93, 94, 108; Heuts and Thinès, 1971:147; Reddell, 1971b:1; Avise and Selander, 1972:2; De Buen, 1972:119, 121; Durand, 1972:621, 622, 690, 693; Herald, 1972:87, 103; Schmatolla, 1972:556; Thinès and Tercafs, 1972:46, 55, fig. 11; Thinès and Wissocq, 1972:140, 143-153, 167, fig. 2-5; Wilkens, 1972a:1; Wilkens, 1972b:411-431; Wilkens and Burns, 1972:263, 264, 266, 268; Zaccone, 1972:106-115; Denton, 1973:99; Thinès and Durand, 1973:275, 276, 277, 278, fig. 5, pl. I(fig. a, e, f), pl. II(fig. a); Thinès and Legrain, 1973:291-297; Zeitlin, 1973:461-462; Zeitlin and McDevitt, 1973:357a; Pfeiffer, 1975:708; Thinès and Capon, 1975:209, 216; Vives, 1975:119-123; Migdalski and Fichter, 1976:138, 139; Durand, 1977:150; Kirby et al., 1977:578; Mitchell et al., 1977:4, 5; Miyashita et al., 1977:?; Wilkens, 1977a:143, 146; Zaccone, 1977:31-38, fig. 1-2; Thinès and Piquemal, 1978:197; Thinès and Weyers, 1978:36, 39; Coss, 1979:341; Coss and Globus, 1979:348.

Anoptichthys: Anonymous, 1940:221; Breder and Gresser, 1941a:112; Breder and Gresser, 1941c: 289-296, pl. 1; Anonymous, 1942a:221; Osorio Tafall, 1943:45, 46, 49, 52, 55, 57-67, 68, 69; Walls, 1942:387; Osorio Tafall, 1946:153; Pavan, 1946:343; Alvarez, 1950:13, 26; Bonet, 1953b: 238, 241, 242; Rioja, 1953a:287; Thinès, 1955:27, 119, 121, 123; Olivereau and Francotte-Henry, 1955-1956:144; John, 1957:123-132; Sadoglu, 1957a:394; Bertin, 1958a:1918, 1919, 1920, 1921, 1922, 1923; Bertin, 1958b:2661; Alvarez, 1959:78; Breder, 1959:420, 422, 426, 429, 431, fig. 7; Kosswig, 1959:50, 55-56; Kosswig, 1960b: 495, 496, 500, 504, 505-506, 507, 508-510; Kuhn, 1960:418-483; Thinès, 1960:46, 47, 48, 49; Frank, 1961:360; Poulson, 1961:14, 171, 175, 177; Kosswig, 1963:205-239; Pfeiffer, 1963:123, 127, 128, 129, 142, 144, 145, 146; Poulson, 1963:285, 286; Steven, 1963:212, 227, 228, 229, 230, 231; Kosswig, 1964:72-74, fig. 11-13; Vandel, 1964:19, 52, 382, 412, 413, 420, 459, 462, 474, 495, 505, 506, pl. 10; Fingerman, 1965:323; Kosswig, 1965:233-234, 246-256, fig. 11-12; McKenzie, 1965a:34; McKenzie and Russell, 1965:30; Reddell, 1965c:6; Vandel, 1965a:11, 39, 222, 350, 356, 387, 402, 418, 428, 430, 434, 483, pl. 10; Greenwood, 1967:266, 269, 271; Husmann, 1967: 417; Johnson, 1967:6-9, 23, 26, 45, 47, 48; Kosswig, 1967:441-450; Kosswig and Peters, 1967: 828-835; Pfeiffer, 1967a:365-378; Pfeiffer, 1967b: 218-245; Reddell, 1967c:55; Thinès et al., 1967: 437-448, pl. 73-76; Barr, 1968a:77, 78, 88-89; Durand, 1968:352; Peck, 1968:96; Peters and Peters, 1968:212, 220, 231, 233, 234, 238; Campos, 1969:259, 265, 284, 286, 287, 288, 289, 293, 294, 295, 296, 297; Fujii, 1969:335, 343; Kleerekoper, 1969:127; Thinès, 1969:5, 15, 55-57, 69, 214, 223-225, 233-235, 239-241, 273, 276, 300, 301, 304-307, 317, 322, 327, 329, 332-336, 338-344, fig. 100, 114-115; Alvarez, 1970:43, 44, 45, fig. 47; Fenwick, 1970:98; Strinati, 1970:2; Vandel and Durand, 1970:2699; Culver and Poulson, 1971:83; Delamare-Deboutteville, 1971:69; Gertychowa, 1971:67; Heuts and Thinès, 1971: 113, 117, 140, 141, 158, 159, 160, 161; Rouch, 1971:108; Durand, 1972:693, 760; Thinès and Tercafs, 1972:55, 64, 135, 136, 137, 143-144, 147; Thinès and Wissocq, 1972:139, 140, 142, 154, 156, 157, 158, 159, 160, 161, 162, 163-167, 168; Wilkens and Burns, 1972:263-269; Peters and Peters, 1973a:187-201; Peters and Peters, 1973b:301-313; Thinès and Durand, 1973:275, 277, 280; Juberthie, 1974:81, 82; Peters et al., 1975:110, 116, 123; Pfeiffer, 1975:706-711; Thinès and Capon, 1975:209, 221, 225, 227; Durand, 1976:181, 219, fig. 1; Durand, 1977: 149-161, pl. 1-4; Mitchell et al., 1977:5; Yew and Yoshihara, 1977:175; Thinès and Piquemal, 1978:

196, 197, 198, 202-203; Thinès and Weyers, 1978: 36, 39; Durand, 1979:270-274, pl.(fig. 3-5).

Anoptichthys n. subsp.: Osorio Tafall, 1942:210.

Anoptichthys n. sp.: Breder, 1943c:169, 175.

Blind characins: Bridges, 1943:90; Heuts, 1953b:300.

Anoptichthys sp.: Breder and Rasquin, 1943:169-200, pl. 1-3; Alvarez, 1946:265, 267, 268, 270, 271, 272, 274, 275-278, 280, 281, fig. 9-15; Bolívar, 1946:27; De Buen, 1946:127; Rasquin, 1946: 578-579; Breder and Rasquin, 1947a:323-351; Cahn, 1958:76-107, pl. 16-20, 22-24, 26-27; Tamayo, 1962:vol. III:260; Walters and Walters, 1965:22; Reddell, 1967c:55; Schemmel, 1967: 255-316. Rance and Baker, 1979:65, 66.

Blind fish: Breder, 1944:131-143, pl. 1; Mannix, 1947:59; Mohr, 1950:5; Heuts, 1953a:391-392; Warner and Beer, 1957:17; Longsworth, 1959: 117, 119; Lanham, 1962:93, pl. 23; McKenzie and Russell, 1965:31, 32; Mohr and Poulson, 1966:181, 182; Reddell, 1967b:82; Russell and Raines, 1967:53, 69; Bauer, 1971:120; Elliott, 1972:129, 130, 131; Walsh, 1972:15, 23; Kawakatsu, 1973a:?; Oguri and Omura, 1973:419, 421, 424, 434, fig. XV-10; Reddell, 1973b:77-78.

Anoptichthys antrobius Alvarez, 1946:265, 267, 268, 270, 271, 272, 274, 276, 278-281, fig. 16-23; Alvarez, 1947:219; Breder and Rasquin, 1947a: 323-351; Alvarez, 1950:28; Breder and Atz, 1952: 262; Bonet, 1953b:241; Thinès, 1954:36; Bridges, 1955:268; Thinès, 1955:9, 41, 70-71, 108-109; Bonet, 1956a:83; Bonet, 1956d:250; Dearolf, 1956:202; Sadoglu, 1956:113-114; Hahn, 1960: 611; Thinès, 1960:44; Heuts, 1961:196, 197; Poulson, 1961:172, 174; Nicholas, 1962:184; Bonet, 1963a:99; Kosswig, 1963:220, fig. 2; Poulson, 1963:286, 287, 288; Franck, 1964:95-107; Kosswig, 1964:73; Vandel, 1964:262, 474; Boucquey et al., 1965:79-103; Kosswig, 1965: 251, fig. 10; Reddell, 1965a:20; Thinès and Wolff-Van Ermengem, 1965:585; Thinès et al., 1965:61-115; Vandel, 1965a:222, 402; Vandenbussche et al., 1965:586; Peters and Peters, 1966:393-414; Pfeiffer, 1966:97-105; Johnson, 1967:6-7, 12-13, 27, 28, 30, 32, 34, 36, 37, 38, 39, 40, 41, 44, 46, 48, 49, fig. 7, 9; Pfeiffer, 1967a:366, 376, 377; Pfeiffer, 1967b:218, 219, 224, 225, 226, 232, 242, 243; Reddell, 1967b:82; Russell and Raines, 1967:58; Sadoglu, 1967:541-549; Schemmel, 1967:255-316; Thinès et al., 1967:438; Wilkens, 1968:454-464; Sadoglu and McKee, 1969: 10-14; Thinès, 1969:10, 25, 27, 64-66, 344-345, 348, 352, 356, 360-363, fig. 100, 123; Alvarez, 1970:45; Gertychowa, 1970:9, 10; Strinati, 1970: 3, fig. 1; Wilkens, 1970a:1-47; Wilkens, 1970b: 173; Wilkens, 1970c:54-75; Gertychowa, 1971:66, 67; Wilkens, 1971:530-543; Avise and Selander, 1972:3; Thinès and Tercafs, 1972:55; Wilkens, 1972a:1; Wilkens, 1972b:412, 414, 417, 421; Wilkens and Burns, 1972:263, 266; Schemmel, 1973:215; Mitchell et al., 1977:4, 5, 57; Wilkens, 1977a:139.

Anoptichthys hubbsi Alvarez, 1947:215-219, fig. 1; Rasquin, 1949a:499-531; Rasquin, 1949b:131, 133; Alvarez, 1950:28; Bolívar, 1950:216; Heuts, 1951:223; Bolívar, 1952:295, 296; Bonet, 1953b: 241; Olivereau and Herlant, 1954:52; Thinès, 1954:36; Bridges, 1955:268; Thinès, 1955:9, 41, 70, 108-109; Olivereau and Francotte-Henry, 1955-1956:143; Bonet, 1956a:86; Bonet, 1956d: 247; Dearolf, 1956:202; Sadoglu, 1956:113-114; Gordon, 1957:467; John, 1957:123-132; Pickford and Atz, 1957:159; Alvarez, 1959:79; Breder, 1959:423, 424, 425, 436, 437, 446, 447, fig. 4-6; Hahn, 1960:611; Humbach, 1960a:1-88; Humbach, 1960b:551-552; Thinès, 1960:44; Heuts, 1961:196; Poulson, 1961:172, 173, 174; Nicholas, 1962:184; Bonet, 1963a:98; Poulson, 1963:286, 287, 288; Moore and Nicholas, 1964:94; Vandel, 1964:262, 414, 466, 474, 482; Boucquey et al., 1965:88; Thinès et al., 1965:65; Vandel, 1965a: 222, 351, 395, 402, 407; Peters and Peters, 1966: 393-414; Johnson, 1967:6-7, 11-12, 28, 30, 32, 34, 36, 37, 38, 39, 40, 41, 44, 46, 50, fig. 7, 9; Pfeiffer, 1967b:218, 225; Reddell, 1967b:82; Schemmel, 1967:255-316; Thinès et al., 1967:438; Wilkens, 1968:454-464; Sadoglu and McKee, 1969:10-14; Thinès, 1969:10, 20, 25, 27, 62-68, 335, 348, 356, fig. 97; Alvarez, 1970:45; Gertychowa, 1970:9, 65; Wilkens, 1970a:1-47; Wilkens, 1970b:173; Wilkens, 1970c:54-75; Gertychowa, 1971:67; Wilkens, 1971:530-543; Avise and Selander, 1972:2; Thinès and Tercafs, 1972:55; Wilkens, 1972a:1; Wilkens, 1972b:412, 414, 416, 421; Wilkens and Burns, 1972:263, 266; Mitchell et al., 1977:4, 5, 51; Wilkens, 1977a:139.

Anopitchthys hubbsi: Alvarez, 1947:215 (erroneous spelling).

Characinidae of Mexican caves: Allee et al., 1949: 643.

Anoptichthys undescribed species: Rasquin, 1947:35-42, pl. 1.

Anopthychtys: Rioja, 1953a:294 (erroneous spelling).

Anopichthys antrobius: Martin and Martin, 1954: 584 (erroneous spelling).

Anophthyctys jordani: Stefanelli, 1954a:436-438 (erroneous spelling).

Cave tetra: Woods, 1954:4.

Astyanax jordani: Barr, 1956:12-13; Bull, 1969:37; Mitchell, 1969a:80; Morris, 1969:26, 27; Popper, 1970:552-562; Hubbs, 1971:93; Reddell, 1971b: 82-83; Reddell and Mitchell, 1971a:159; Reddell and Elliott, 1973a:172; Johnson and Heath, 1977: 132; Moore and Nicholas, 1978:116-117; Thinès and Weyers, 1978:35-55, fig. 1-2.

Anoptichtys jordani: Sadoglu, 1957b:432-439; Berra, 1963:44-45 (erroneous spelling).

Anoptichtys hubbsi: Sadoglu, 1957b:432-439 (erroneous spelling).

Anoptichtys antrobius: Sadoglu, 1957b:432-439 (erroneous spelling).

Anoptichtys: Sadoglu, 1957b:433; Parzefall and Wilkens, 1972:69 (erroneous spelling).

Anopichthys: Woods and Inger, 1957:232 (erroneous spelling).

Anaptichthys jordani: Tamayo, 1962:vol. III:328 (erroneous spelling).

Astyanax (Anoptichthys) jordani: Poulson, 1964: 751, 754, 755, 756, 758, 760, 761, 762, 763, 764, 767.

Astyanax (Anoptichthys) jordani hubbsi: Poulson, 1964:757.

Astyanax (Anoptichthys) jordani jordani: Poulson, 1964:757.

Astyanax (Anoptichthys) spp.: Poulson, 1964:767.

Anoptichthys jordan: Vandel, 1964:477 (erroneous spelling).

Astyanax ("Anoptichthys"): Greenwood, 1967:268.

Astyanax mexicanus jordani: Walters and Liu, 1967: 437, 441, 442.

Astyanax mexicanus, cave derivatives of: Peters and Peters, 1968:213, 219, 230, 231, 235, 236; Mitchell, 1973:146; Schemmel, 1974a:196-215, fig. 1-7; Besharse and Brandon, 1976:538; Mitchell et al., 1977:1-89, fig. 1-21.

Astyanax hubbsi: Bull, 1969:37; Reddell, 1971b:82; Reddell and Mitchell, 1971a:159; Schmatolla, 1972:555, 556, 558, 559-564, 571, fig. 1B, 2-3, 4B, 5B; Reddell and Elliott, 1973a:172; Schmatolla and Erdmann, 1973:705, 708; Voneida, 1973:462-463; Egar, 1974:350; Sligar, 1974:467; Fernández Ruiz, 1976:712, 716; Sligar and Voneida, 1976:107-124, pl. 1(fig. 1-4), pl. 2(fig. 5-8), pl. 3(fig. 9-10), pl. 4(fig. 11-12), pl. 5(fig. 13), pl. 6(fig. 14), pl. 7(fig. 15), pl. 8(fig. 16), pl. 9(fig. 17); Voneida and Sligar, 1976:89-106, pl. 1(fig. 4), pl. 2(fig. 8-9), pl. 7(fig. 18-19), pl. 8(fig. 20-21); Yew and Yoshihara, 1977:175-180, fig. 1-9.

Astyanax antrobius: Bull, 1969:37; Mitchell, 1970b: 64; Reddell, 1971b:82; Reddell and Mitchell, 1971a:159, fig. 14-15; Reddell and Elliott, 1973a: 172; Kawakatsu, 1974:27, fig. 15; Kawakatsu, 1976:36, fig. 3.

Astyanax mexicanus: Copp, 1969:381; Wilkens, 1970b:173-199; Parzefall and Wilkens, 1972:64, 71, 77-78; Wilkens, 1972a:1-11; Wilkens and Burns, 1972:263, 266, 267; Avise and Kitto, 1973:113-132.

Anoptichthys antobius: Kleerekoper, 1969:127 (erroneous spelling).

Astyanax, blind: Mitchell, 1969a:76; Elliott, 1971: 3-5, 42; Elliott and Mitchell, 1973:172; Vomero, 1974:345; Fernández Ruiz, 1976:712.

Astyanax: Mitchell, 1969d:map, letter; Reddell and Mitchell, 1971c:2; Kawakatsu, 1973b:255; Reddell, 1973a:36.

Characins: Thinès, 1969:3-4, 12.

Anophtichtys hubbsi: de Lachica B., 1970:62 (erroneous spelling).

Anophthycthys hubbsi: de Lachica B., 1970:122 (erroneous spelling).

Anoptychtys: Pasquini, 1970:470 (erroneous spelling).

Astyanax fasciatus, cave forms of: Wilkens, 1970c: 54-75.

Astyanax sp.: Mitchell, 1971b:136; Reddell, 1971b: 82; Reddell and Mitchell, 1971a:143, 158; Reddell and Mitchell, 1971b:196; Reddell and Elliott, 1973a:178; Reddell and Elliott, 1973b:182, 188, 190.

Anotichthys jordani: Reddell and Mitchell, 1971a: 137 (erroneous spelling).

Astyanax mexicanus, blind characin: Tavolga, 1971: 171.

Astyanax, eyeless: Wiley and Mitchell, 1971:231-239; Mitchell, 1977:171-173; Mitchell and Cooke, 1977:175-178; Mitchell and Elliott, 1977:179-184; Mitchell and Russell, 1973:261; Mitchell and Russell, 1976a:169-172; Mitchell and Russell, 1976b:163-167.

Astyanax mexicanus, troglobitic populations of: Avise and Selander, 1972:1-16.

Astyanax (=Anoptichthys): Sbordoni and Argano, 1972:10-11; Mitchell, 1975:360-361.

Astyanax (=Anoptichthys) jordani: Sbordoni and Argano, 1972:12.

Astyanax, Mexican cavefish: Alley et al., 1973:263.

Astyanax, cave relatives of: Kirpichnikov, 1973:224.

Astyanax mexicanus, cave populations of: Kosswig, 1973:4-5, 9, 10, 13; Parzefall, 1973b:284; Scholl, 1973:291, 292, 296; Chakraborty and Nei, 1974: 460-461, 467-469; Schemmel, 1974b:193-201, fig.

1-3; Peters et al., 1975:110-124, fig. 1-4; Li and Nei, 1977:913; Wilkens, 1977a:137-148, fig. 1-8; Wilkens, 1977b:604; Giuseffi et al., 1978:679.

Astyanax mexicanus, cavernicole form: Kosswig, 1973:13; Schemmel, 1973:209-219; Wilkens, 1973c:55, 57-58; Durand, 1976:18; Parzefall, 1976:29; Thinès and Piquemal, 1978:197.

Mexican eyeless characin fishes: Mitchell and Cooke, 1973:147; Mitchell and Elliott, 1973:147.

Astyanax mexicanus (blind cave fish): Oguri and Omura, 1973:414.

Astyanax mexicanus (=Anoptichthys): Peters and Peters, 1973a:187-201, fig. 1-5; Peters et al., 1973:428-430.

Astianax: Sbordoni and Cobolli-Sbordoni, 1973b: 150 (erroneous spelling).

Astyanax, hypogean form: Schemmel, 1973:209-219.

Astyanax complex, blind and depigmented derivatives of: Schröder, 1973:vi.

Astyanax mexicanus, blind cave varieties: Sadoglu, 1975:419-426, fig. 1-9.

Blind tetras: Kirby et al., 1977:578-579, fig. 1C.

Anopthichthys: Thinès and Piquemal, 1978:197 (erroneous spelling).

Astyanax mexicanus or *Anoptichthys*, blind form of: Durand, 1979:269.

Type-locality.—Of *Anoptichthys jordani:* Subterranean stream southwest of Valles (=Cueva Chica), San Luis Potosí, México; of *Anoptichthys antrobius:* Cueva de El Pachón, Antiguo Morelos, Tamaulipas, México; of *Anoptichthys hubbsi:* Cueva de Los Sabinos, Ciudad Valles, San Luis Potosí, México.

Distribution.—Known from caves in the Sierra de El Abra, Tamaulipas and San Luis Potosí; the Sierra de Guatemala, Tamaulipas; and the Micos region, San Luis Potosí. See Fig. 85.

Records.—*San Luis Potosí:* Sótano del Arroyo, El Cuate Este, El Cuate Oeste, Cueva Chica, Cueva de la Curva, Sótano de Japones, Sótano de Jos, Cueva del Lienzo, Sótano de Matapalma, Sistema de Montecillos, Cueva del Otate, Sótano de Palma Seca, Sótano de las Piedras, Cueva del Río Subterráneo, Sótano de la Roca, Cueva de Los Sabinos, Sótano de Soyate, Sótano del Tigre, Sótano de la Tinaja, Sótano del Toro, and Sótano de Yerbaniz; *Tamaulipas:* Bee Cave, Sótano del Caballo Moro, Sótano Escondido, Sumidero del Jineo, Sótano del Molino, Cueva de El Pachón, Sótano de Vasquez, and Sótano de El Venadito.

Discussion.—*Astyanax jordani* has been more intensively studied than any other species of cavernicole in the world. Essentially every aspect of its morphology, behavior, and genetics has been examined at least once. Despite this intense examination considerable confusion remains about the origin of the species and its relationships to its parent species, *Astyanax mexicanus* (Filippi). The species is presently under continuing study by several European zoologists, including H. Wilkens, J. Parzefall, G. and N. Peters, G. Thinès, and C. Schemmel. The habitats, evolution, and various aspects of morphology have been recently studied in considerable detail by Mitchell et al. (1977). It is hoped that their clear enunciation of the relationship of this fish to the geology and physiography of the region in which it occurs and of its evolution will allow others to appraise more intelligently the results of their own studies. Three species were originally described from rather isolated parts of the range of the species as we know it now. With the discovery of populations in 30 caves, a far better understanding of the hydrology of this part of México, and the genetic studies of Breder, Sadoglu, Wilkens, and their colleagues, there is no justification for recognizing more than one species of eyeless characin in México. Breder and his colleagues, in particular, have studied the genetics and habitat of this species in the type-locality of *A. jordani*, Cueva Chica, San Luis Potosí. They discovered that the fish was hybridizing with *A. mexicanus* to a certain extent in the cave. Furthermore, it has been demonstrated that the species will readily hybridize with *A. mexicanus* under laboratory conditions. It is significant, however, that the continual introduction of eyed *Astyanax* into Cueva Chica has not led to an exclusively hybrid population even there, and, furthermore, it has been demonstrated that the eyed fish when raised in darkness frequently exhibit both morphological and physiological abnormalities. Based solely on the physical barriers presented by the cave environment for *A. mexicanus* and by the epigean environment for *A. jordani*, I feel that it is justified and useful to treat the two as distinct species. It is almost certain that *A. mexicanus* can never successfully compete with the cave-adapted *A. jordani* in the cave, nor that the blind *A. jordani* could hope to survive in the epigean environment. Although the two species have not diverged enough to lead to complete genetic isolation, they have diverged enough to prevent the significant survival of one species in the environment of the other.

Family Ictaluridae

Prietella phreatophila Carranza

Ameiuridae, ciego y depigmentado: Bolívar and Carranza, 1954:115.

Prietella phreatophila Carranza, 1954:129-136, fig. 1, pl. I; Smith, 1956:15-16, 41, 42, 43, 44, pl. 27; Suttkus, 1961:55, fig. 5; Nicholas, 1962:184; Vandel, 1965a:224; Husmann, 1967:421; Contreras-Balderas, 1969:294; Taylor, 1969:1, 14, 17, 18, 220, fig. 5; Thinès, 1969:28, 90-95, 215, fig. 29; Alvarez, 1970:72; Benjamin, 1970:18322; Hubbs, 1971:91; Reddell, 1971b:83; Reddell and Mitchell, 1971c:2; Thinès and Tercafs, 1972:56; Thinés and Durand, 1973:276; United States Office of Endangered Species and International Activities, 1974:5; Longley and Karnei, 1979a:7, fig. 3; Longley and Karnei, 1979b:8, fig. 4; Moore and Nicholas, 1978:114.

Prietella: Smith, 1956:33-34, fig. 1; Suttkus, 1961: 57, 63, 64; Taylor, 1969:5, 10, 12, 13, 15, 16, 18, 24, 217, 310; Thinès, 1969:263, 267, 322; Alvarez, 1970:71, 72; Juberthie, 1974:81.

Prietella phreaticola: Vandel, 1964:264 (erroneous spelling).

Priatella phreatophila: Cole and Minckley, 1966:22 (erroneous spelling).

Type-locality.—Pozo El Potrero de Doña Mariana, Municipio de Músquiz, Coahuila, México.

Distribution.—Known only from the type-locality. See Fig. 85.

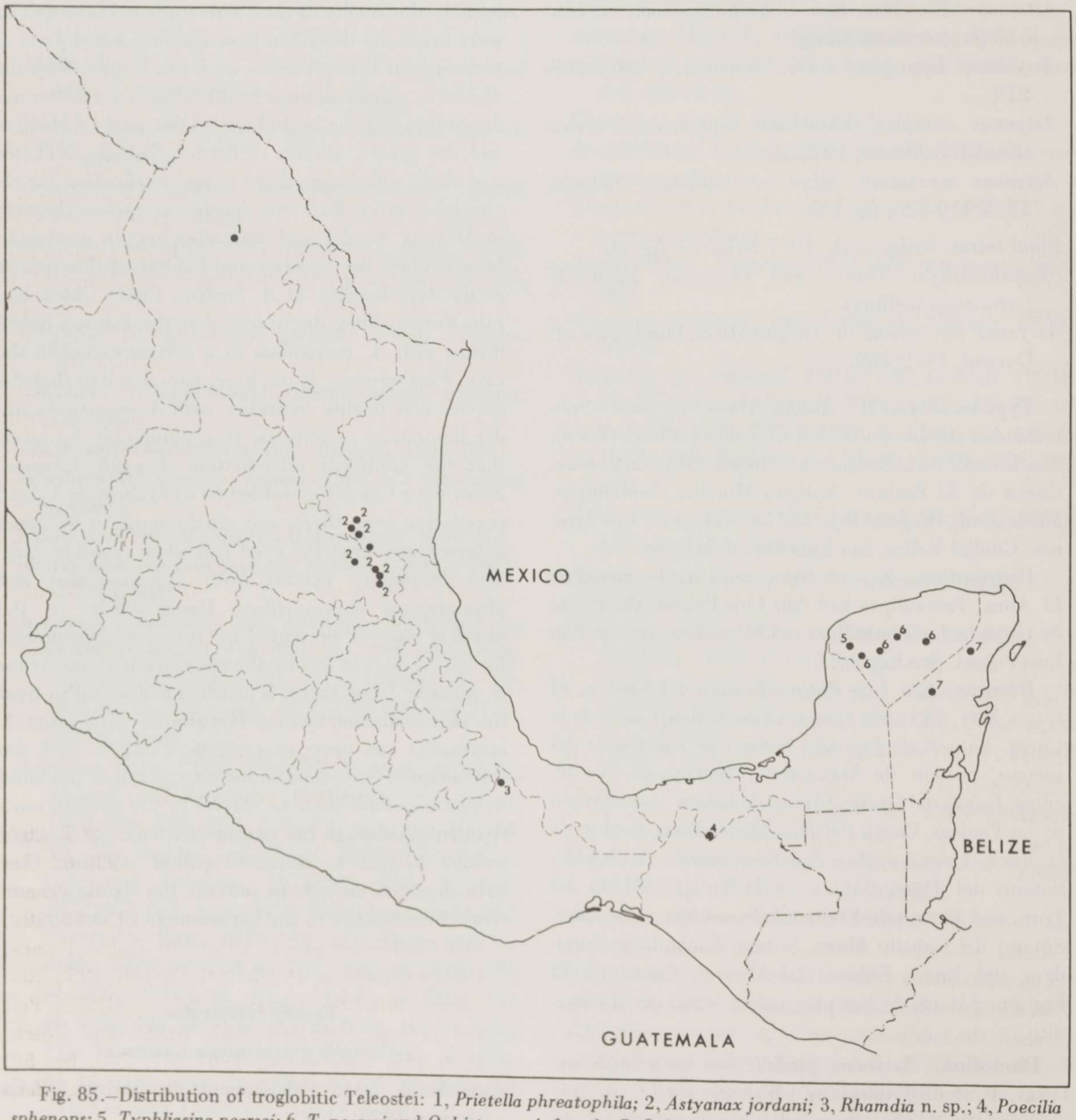

Fig. 85.—Distribution of troglobitic Teleostei: 1, *Prietella phreatophila;* 2, *Astyanax jordani;* 3, *Rhamdia* n. sp.; 4, *Poecilia sphenops;* 5, *Typhliasina pearsei;* 6, *T. pearsei* and *Ophisternon infernale;* 7, *Ophisternon infernale.*

Discussion.—*Prietella phreatophila* is one of only three troglobitic catfishes described from North America. The other two species are *Satan eurystomus* Hubbs and Bailey and *Trogloglanis pattersoni* Eigenmann, both known only from deep artesian wells in and near San Antonio, Bexar County, Texas (U.S.A.). It is notable that all three species of blind ictalurids are found only in phreatic waters. *Prietella* is most closely related to the genus *Noturus*, which ranges northeast from Texas into Canada. *Prietella phreatophila* has been collected only in an artificially enlarged natural well fed by a deep crevice. Following heavy rains, water gushes from the well, and many fish are reported to be washed out at that time. The well is frequently cleaned with algaecides, and fish may be found only sporadically in the wells. This species has been placed on the list of endangered foreign species.

Family Pimelodidae

The pimelodid catfishes of the genus *Rhamdia* from the caves and cenotes of Yucatán have been studied by Hubbs (1936, 1938). His revision of this group includes four subspecies associated with subterranean waters: *R. guatemalensis decolor* Hubbs, *R. g. depressa* Barbour and Cole, *R. g. sacrificii* Barbour and Cole, and *R. g. stygaea* Hubbs. *Rhamdia g. decolor* is somewhat depigmented, and *R. g. stygaea* has somewhat smaller eyes than the remaining subspecies. Both of these subspecies are known only from caves. A troglobitic species of *Rhamdia* from caves in the Acatlán region of Oaxaca is presently being described.

Order Cyprinodontiformes

Family Poeciliidae

The family Poeciliidae is represented in Mexican caves by the troglobitic population of *Poecilia sphenops* discussed below and by two other species. Hubbs (1936) reported the presence of *P. sphenops altissima* (Hubbs), *P. velifera* (Regan), and *Gambusia yucatana* Regan in the cenotes of Yucatán. These should not be considered a part of the true cave fauna.

Poecilia sphenops Valenciennes

Poecilia sphenops Valenciennes (in Cuvier and Valenciennes, 1846):130.

Poecilia sphenops, cave population: Gordon and Rosen, 1962:360-368, fig. 1-8; Rosen and Bailey, 1963:49-53; Kosswig, 1964:74; Moore and Nicholas, 1964:95; Walters and Walters, 1965:214-223; Barr, 1968a:89; Peters and Peters, 1968:211-244; Reddell, 1971b:84; Zeiske, 1971:387-393; Parzefall and Wilkens, 1972:64-65, 76; Wilkens and Burns, 1972:269; Kosswig, 1973:5, 10; Parzefall, 1973a:177-183, fig. 1-3; Parzefall, 1973b:283-290; Peters, 1973:315-326; Peters et al., 1973: 417-436, fig. 2-5; Juberthie, 1974:82; Peters et al., 1975:111; Thinès and Capon, 1975:226; Besharse and Brandon, 1976:538; Parzefall, 1979:399-422, fig. 1-10.

Mollienesia sphenops, cave population: Poulson, 1964:756; Zeiske, 1968:190-222, fig. 1-13; Parzefall, 1969:1-37; Parzefall, 1970:323-342; Wilkens, 1970c:65.

Mollienesia: Poulson, 1964:755.

Discussion.—*Poecilia sphenops* has been reported as a cave-adapted form only in Cueva del Azufre, Tabasco. The troglobitic population has never been given taxonomic recognition. The situation of *P. sphenops* in Cueva del Azufre is remarkably similar to that of *Astyanax jordani* and *A. mexicanus* in Cueva Chica, San Luis Potosí. The stream emerging from Cueva del Azufre has permitted epigean fish to re-invade the cave habitat, and a limited amount of hybridization with the derivative troglobitic fish is now occurring. It is not possible to traverse a great distance into Cueva del Azufre and, therefore, the eyeless fish population remains unstudied. It is of great importance to explore this region extensively in an attempt to locate the source of the eyeless fish now hybridizing with the eyed *P. sphenops*. Walters and Walters (1965) have made some laboratory observations on this species, and the European workers N. and G. Peters, J. Parzefall, H. Wilkens, and E. Zeiske have studied the morphology and genetics of the cave-adapted form of this species. Normal-eyed *P. sphenops* have been collected in Cueva del Río Subterráneo and in a well near Cueva Chica, San Luis Potosí.

Order Perciformes

Family Brotulidae

Typhliasina pearsei (Hubbs)

Typhlias pearsei Hubbs, 1938:261, 263, 265, 267, 269, 290, 291, pl. 3; Chitwood, 1938:62; De Buen, 1940:66; Anonymous, 1947:128; Pearse, 1945:112, 113, 151, 214; Alvarez, 1950:15, 109, 110; Cárdenas Figueroa, 1950:156; Robles Ramos, 1950:64; Ladiges, 1951b:168; Dearolf, 1956:203; Barrera, 1962:84; Tamayo, 1962:vol. III:326; Poll and Leleup, 1965:466, 467; Breder and Rosen, 1966:385; Greenwood, 1967:267, 270, fig. 58; De Buen, 1972:269; Bravo-Hollis and Caballero Deloya, 1973:74, 99.

Typhlias: Pearse, 1938a:13, 15; Hubbs, 1938:261, 287-290; Walls, 1942:388; Osorio Tafall, 1946:156; Pearse, 1945:135, 214; Alvarez, 1950:109; Bolívar, 1950:216; Cárdenas Figueroa, 1950:157; Whitley, 1950:67; Poll and Leleup, 1965:466.

Typhlias pearsi: Osorio Tafall, 1943:68-69; Thinès, 1955:42, 82, 108-109; Thinès, 1960:45, 50, 52, pl. 2; Tamayo, 1962:vol. III:261; Vandel, 1964: 271, 300; Vandel, 1965a:230, 252; Greenwood, 1967:264, fig. 56B; Delamare Deboutteville, 1971:68 (erroneous spelling).

Tiphlias pearsei: Carreño, 1950:24 (erroneous spelling).

Typhliasina pearsei: Whitley, 1950:67; Solorzano, 1953:286; Nicholas, 1962:185; Rioja, 1962:38; Alvarez, 1970:150; Andrews, 1970:4; Reddell, 1971b:84; Wilkens, 1973a:329-330, fig. 1; Wilkens, 1973b:204, 205; Wilkens, 1973c:50, 54-55, 56, 57, 58, fig. 4; Reddell, 1977b:236, 239, 240, 258, 263, 268, 281, 285.

Typhliasina: Whitley, 1950:67; Rioja, 1962:39; Cohen and Robins, 1970:134, 135; Juberthie, 1974: 81.

Blind brotula: Woods, 1954:4.

Typhlia: Bertin, 1958a:1919 (erroneous spelling).

Blind Höhlenfische: Wilkens, 1960b:499.

Blind brotulid of Mexico: Norman, 1963:194.

Yucatan Brotulidae: Norman, 1963:196.

Typhliasina pearsi: Vandel, 1964:271; Vandel, 1965a:230; Thinès, 1969:29, 135, 172-174, 250, fig. 73-74; Delamare Deboutteville and Botosanéau, 1970:75; Thinès and Tercafs, 1972:63, 138, fig. 23 (erroneous spelling).

Typhlyasina: Argano, 1972b:33 (erroneous spelling).

Typhliasina pearcei: Wilkens, 1973b:204 (erroneous spelling).

Type-locality.—Balaam Canche Cave (=Grutas de Balankanche), near Chichén Itzá, Yucatán, México.

Distribution.—Known only from five caves in Yucatán. See Fig. 85.

Records.—*Yucatán:* Grutas de Balankanche, Cenote de Calchuhuim, Cenote de Hoctún, Cenote del Pochote, and Grutas de Tzab-Nah.

Discussion.—*Typhliasina pearsei* is eyeless and depigmented. It was collected from a deep lake in the inner passage in Grutas de Tzab-Nah and from shallow pools connected to the groundwater in the other caves. Wilkens (1973a, 1973b) contends that this species is a very old troglobite, based at least in part on the degree of reduction of the eyes. Chitwood (1938) has reported the presence of the nematode *Rhabdochona kidderi* Pearse in the intestine of this species. Four other freshwater brotulids, all troglobites, are known: *Caecogilbia galapagosensis* Poll and Leleup from deep crevices on Isla de Santa Cruz, Galapagos Islands; *Lucifuga (Stygicola) dentatus* (Poey) and *L. (Lucifuga) subterraneus* Poey from Cuba; and *L. (S.) spelaeotes* Cohen and Robins from New Providence, Bahamas. Cohen and Robins (1970) believe that *Typhliasina* is more closely related to the marine genera *Dinematichthys* and *Ogilbia* than to *Lucifuga.* Vandel (1964) speculates that the troglobitic brotulids have been derived from marine littoral species which inhabited cavities in coral reefs.

Family Cichlidae

Two species of cichlids, *Cichlasoma meeki* (Brind) and *C. urophthalmus* (Günther), have been reported from the subterranean waters of Yucatán (Hubbs, 1936, 1938). *Cichlasoma meeki* is known only from an artificial cenote and is probably a species introduced by man. *Cichlasoma urophthalmus* contains four subspecies associated with caves and cenotes: *C. u. conchitae* Hubbs, *C. u. ericymba* Hubbs, *C. u. mayorum* Hubbs, and *C. u. zebra* Hubbs. The only one of these which seems to be closely associated with the cave habitat is *C. u. ericymba,* which is known only from Cenote de Sambulá (Mérida). *Cichlasoma cyanoguttatum* (Baird and Girard) has been collected in Cueva del Carrizal, Nuevo León.

Order Synbranchiformes

Family Synbranchidae

Ophisternon infernale (Hubbs)

Pluto infernalis Hubbs, 1938:261, 263, 265, 269, 270, 292-293, pl. 4; De Buen, 1940:6; Osorio Tafall, 1943:68-69; Anonymous, 1947:128; Pearse, 1945:112, 114, 208; Alvarez, 1950:15, 23; Cárdenas Figueroa, 1950:156, fig. 4; Carreño, 1950:24; Robles Ramos, 1950:64; Ladiges, 1951b:168; Thinès, 1955:41, 71, 108-109; Dearolf, 1956:203; Barrera, 1962:84; Mees, 1962:27, 28, 31, 32; Tamayo, 1962:vol. III:261, 320; Vandel, 1964:266; Vandel, 1965a:226; Andrews, 1970:4; Delamare Deboutteville and Botosanéau, 1970:75.

Pluto: Hubbs, 1938:261, 291-292; Osorio Tafall, 1946:156; Pearse, 1945:111, 135, 207; Alvarez, 1950:23; Bolívar, 1950:216; Whitley, 1950:67; Bertin, 1958b:2661; Vandel, 1964:272; Vandel, 1965a:231.

Furmastix infernalis: Whitley, 1950:67; Nicholas, 1962:184; Vandel, 1964:266; Vandel, 1965a:226; Alvarez, 1970:130; de Lachica B., 1970:65, 122; Herald, 1972:139; Parzefall and Wilkens, 1972:63-79, fig. 2-3, 4b, 5b; Rosen and Rumney, 1972:1, 4, 11, 27, 28, 29, 40, 41, 42, 43, 44, fig. 13-14, 28, 31; Wilkens, 1973a:329, fig. 2; Wilkens, 1973b:204, 205; Wilkens, 1973c:55, 56, 57; Rosen and Greenwood, 1976:6; Durand, 1977:17.

Furmastix: Whitley, 1950:67; Mees, 1962:32.

Synbranchus infernalis: Mees, 1962:27, 28, 31, 32; Thinès, 1969:18, 23-24, 29, 182-183, 261, 271-272, fig. 77; Thinès and Tercafs, 1972:63.

Symbranchus infernalis: Reddell, 1971b:85; Thinès and Durand, 1973:275.

Furmastik infernalis: De Buen, 1972:197 (erroneous spelling).

Ophisternon infernale: Rosen and Greenwood, 1976: 8, 10, 13, 18, 22, 23, 25, 28, 34, 36, 37, 42, 43, 45, 47, 52, 60, 61, 62, 63, 64, fig. 7, 8, 31, 45, 66, 67; Reddell, 1977b:236, 237, 239, 240, 258, 268, 281, 285, fig. 7-8; Reddell, 1977c:cover, inside title page.

Ophisternon: Rosen, 1976:434, 435, 436, 442, 457, 458, fig. 1, 2, 21.

Type-locality.—Hoctun Cave (=Cenote de Hoctún), at Hoctún, between Mérida and Chichén Itzá, Yucatán, México.

Distribution.—Known only from four caves in Yucatán and possibly two caves in Quintana Roo. See Fig. 85.

Records.—*Quintana Roo:* ?Actún Ha and ?Cenote de Santo Domingo; *Yucatán:* Grutas de Balankanche, Cenote de Hoctún, Cenote del Pochote, and Grutas de Tzab-Nah.

Discussion.—The genus *Ophisternon*, as revised by Rosen and Greenwood (1976), includes a diverse group of species from both the Old and New Worlds. The only New World species, other than *O. infernale*, is *O. enigmaticum* Rosen and Greenwood, which ranges from northern South America into southern México. One other species, *O. candidum* (Mees) from Western Australia, is a troglobite. The zoogeography of the genus has been discussed by Rosen (1976). *Ophisternon infernale* has been found resting on the guano-covered floor of a large pool near the end of Cenote de Hoctún, buried partially in mud in a small pool below the inner skylight entrance to Grutas de Tzab-Nah, and swimming along the silt floor of a pool in Grutas de Balankanche. The two questionable records from Quintana Roo are based on sightings of single individuals partially buried in silt and rocks in small shallow pools in each cave.

Class Amphibia

Order Urodela

Although several species of salamander in the United States and one in Europe have become sufficiently adapted to cave life to be classified as troglobites, no Mexican salamander is known to exhibit such adaptations.

Family Ambystomatidae

The family Ambystomatidae is represented only by the widespread North American species, *Ambystoma tigrinum* (Green). It has been found in three caves at Valle de los Fantasmas, San Luis Potosí.

Family Plethodontidae

Nine species of plethodontid salamander have been collected in Mexican caves and two are known only from caves (see Fig. 86). *Bolitoglossa yucatana* (Peters) has been found in Cenote Sagrado (Dunn, 1926) and Cenote Seco, Yucatán (Duellman, 1965). It was recently collected in leaf litter at the base of a cliff in the entrance sink of Actún Sabacá, Yucatán. An undetermined species of the genus *Thorius* has been collected in Sótano de El Triunfo, Tamaulipas.

The genus *Chiropterotriton* is well represented in caves in northeastern México. *Chiropterotriton arborea* (Taylor) has been found in caves in Hidalgo, Querétaro, and San Luis Potosí. *Chiropterotriton chondrostega* Taylor has been reported from open sinkholes at Rancho del Cielo, Tamaulipas (Martin, 1958). *Chiropterotriton multidentata* (Taylor) is frequently found in caves in the Sierra de Guatemala, Tamaulipas, the Xilitla region of San Luis Potosí, and near Pinal de Amoles, Querétaro. Two species of *Chiropterotriton* are known only from caves, although they are certainly only trogloxenes. *Chiropterotriton magnipes* Rabb is a distinctive species with large feet used for clinging to cave walls and ceilings (Rabb, 1965). It has been found in many caves in the Xilitla region of San Luis Potosí and Querétaro. *Chiropterotriton mosaueri* (Woodall) was described from an unidentified cave at Durango, Hidalgo (Woodall, 1941); it has been found recently in Cueva del Puerto de la Zorra, Hidalgo.

Two species of the genus *Pseudoeurycea* are frequently found in caves in the Sierra de Guatemala, Tamaulipas. Martin (1958) reported *P. scandens* Walker from several caves in this area. The large, attractive species, *P. belli* (Gray), has also been found in the entrance area of caves in the Sierra de Guatemala.

Order Anura

Twenty-nine species of frog have been identified from caves in México, but many of these are known only by single specimens found below the entrance drop and are not regular cave inhabitants.

Family Bufonidae

Four species of toad of the genus *Bufo* have been found in Mexican caves: *Bufo debilis* Girard was taken in Cueva de Dos Cuartos, San Luis Potosí; *B. occidentalis* Camerano was found in Sótano del Gobernador, Querétaro; *B. valliceps* Wiegemann was found in caves and cenotes in Yucatán (Gaige, 1936); and *B. marinus* (Linnaeus), reported from cenotes in Yucatán by Barbour and Cole (1906) and Gaige (1936), has been collected in Hoyo de Don Nicho, Chiapas, and Cueva de la Virgen de Guadalupe, Tamaulipas.

Family Hylidae

Six species of hylid frog have been found in caves and cenotes. *Agalychnis callidryas* (Cope) was reported from Cenote de Thompson, Yucatán (Gaige, 1936). *Triprion petasatus* (Cope), described from Cenote Taamanché, Yucatán (Cope, 1865), has been found in Cenote de Santa Elena, Yucatán (Kellogg, 1932). Four other species have been taken from Mexican caves: *Hyla staufferi staufferi* Cope from Hoyo de Don Nicho, Chiapas; *H. taeniopus* Günther from Sima Esteban, Puebla; *Plectrohyla* sp. cf. *sagorum* Hartweg from the streams in Chen Sibilmut

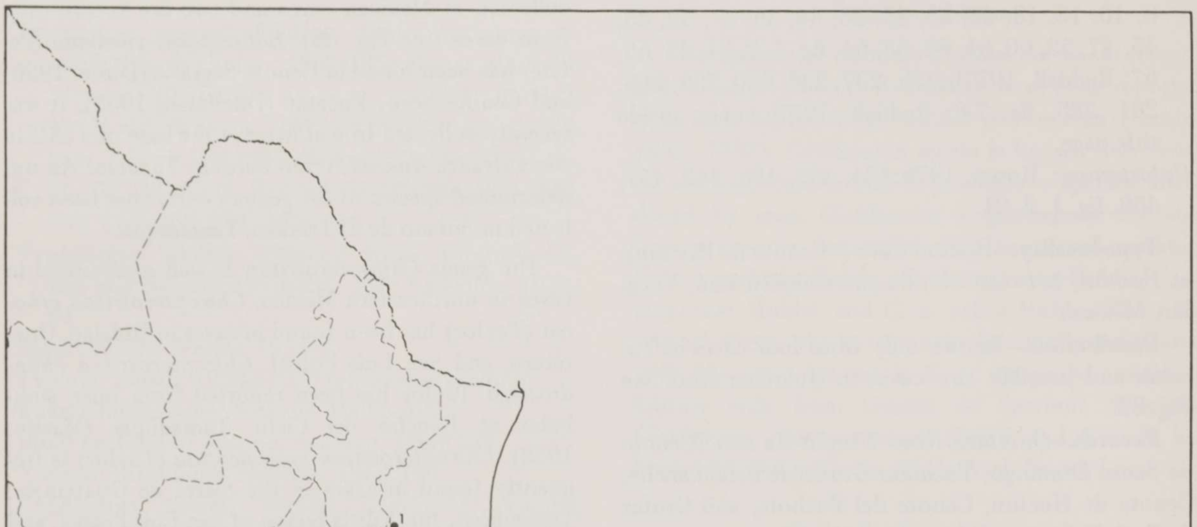

Fig. 86.–Distribution of cavernicole salamanders of the family Plethodontidae: 1, *Chiropterotriton multidentata;* 2, *C. multidentata* and *Psudoeurycea scandens;* 3, *C. chondrostega, C. multidentata, P. belli,* and *P. scandens;* 4, *C. multidentata* and *Thorius* sp.; 5, *C. arborea* and *C. magnipes;* 6, *C. magnipes;* 7, *C. arborea;* 8, *C. mosaueri;* 9, *Bolitoglossa yucatana.*

and Cueva de Mapachero, Chiapas; and *Smilisca baudinii* (Dumeril and Bibron) from three caves in the Sierra de El Abra, San Luis Potosí.

Family Leptodactylidae

The family Leptodactylidae is closely associated with caves in Central America, the Antilles, and Texas (U.S.A.). Five genera have been found in Mexican caves, the most important of which are *Eleutherodactylus* and *Syrrhophus* (see Fig. 87).

Six species of *Eleutherodactylus* have been found in Mexican caves: *E. alfredi* (Boulenger) from Sótano de los Perros, Veracruz; *E. guerreroensis* Lynch from Cueva del Nacimiento del Río San Antonio, Oaxaca; *E. decoratus decoratus* Taylor from caves in Hidalgo, Querétaro, San Luis Potosí, Tamaulipas, and Veracruz; *E. decoratus purpurus* Lynch from caves in Oaxaca and Tamaulipas (Lynch, 1967); *E. rhodopis* (Cope) from Grutas de Atepolihuit, Puebla; *E. spatulatus* Smith from caves near Huautla de Jiménez,

Fig. 87.—Distribution of cavernicole leptodactylid frogs of the genera *Eleutherodactylus* and *Syrrhophus:* 1, *Syrrhophus cystignathoides* and *S. longipes;* 2, *S. dennisi;* 3, *S. longipes;* 4, *Eleutherodactylus decoratus decoratus, E. decoratus purpurus,* and *S. longipes;* 5, *E. decoratus purpurus* and *S. longipes;* 6, *S. dennisi* and *S. longipes;* 7, *S. cystignathoides;* 8, *S. guttilatus;* 9, *E. decoratus decoratus* and *S. cystignathoides;* 10, *E. decoratus decoratus* and *S. longipes;* 11, *E. decoratus decoratus;* 12, *S. verrucipes;* 13, *E. rhodopis;* 14, *E. alfredi;* 15, *E. decoratus purpurus* and *E. guerreroensis;* 16, *E. spatulatus;* 17, *E. yucatanensis.*

Oaxaca; and *E. yucatanensis* Lynch from a cave at Pueblo Nuevo X-Can, Quintana Roo (Lynch, 1965).

Five species of the genus *Syrrhophus* have been found in Mexican caves (Lynch, 1970): *S. cystignathoides* (Cope) from caves in Nuevo León, San Luis Potosí, and Tamaulipas; *S. dennisi* Lynch from caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas; *S. guttilatus* (Cope) from Cueva de Dos Cuartos, San Luis Potosí; *S. longipes* (Baird) from caves in Nuevo León, Querétaro, San Luis Potosí, and Tamaulipas; and *S. verrucipes* Cope from Cueva Grillo de la Mona, Puebla.

Four other species of leptodactylid have been taken from Mexican caves: *Hylactophryne augusti augusti* (Dugès) from caves in San Luis Potosí and Tamaulipas; *H. a. cactorum* Taylor from caves in Puebla; *Leptodactylus labialis* (Cope) from Actún Chen, Campeche; *L. melanonotus* (Hallowell) from Cueva de Sala de Agua Grande, Veracruz; and *Tomodactylus nitidus nitidus* (Peters) from Grutas del Mogote, Guerrero.

Family Ranidae

The leopard frog, *Rana pipiens* (Schreber), is known from caves in Hidalgo, Quintana Roo, San Luis Potosí, Tamaulipas, and Yucatán.

Class Reptilia

Order Chelonia

Family Kinosternidae

Two species of turtle, *Kinosternon creaseri* Hartweg and *K. cruentatum* Dumeril and Bibron, have been reported from large open-aired cenotes in Yucatán (Duellman, 1965). A third species, *K. integrum* Le Conte, was reported from a cave at Raboso, Puebla, by Smith and Van Gelder (1955).

Order Squamata

Family Boidae

A boa, *Constrictor constrictor imperator* (Daudin), was collected from Cueva de Tezoapa, Guerrero, where it presumably was preying on bats (Villa R. and López-Forment, 1966).

Family Colubridae

Villa R. and López-Forment (1966) reported the presence of *Elaphe flavirufa flavirufa* (Cope) in Cueva de la Sepultura, Tamaulipas; it was probably preying on bats. Three other species of colubrid snake have been found in Mexican caves: *Rhadinaea crassa* Smith from caves in the Sierra de Guatemala, Tamaulipas; *Storeria dekayi* (Holbrook) from Sótano de Tlamaya, San Luis Potosí; and *Tropidodipsas sartorii sartorii* Cope from a cave at Pueblo Nuevo X-Can, Quintana Roo (Duellman, 1965), and Actún Loltún, Yucatán (Gaige, 1938).

Family Crotalidae

The fer-de-lance, *Bothrops atrox asper* (Garman), is frequently found in the entrance area of caves in the Sierra de El Abra, San Luis Potosí. It is also known from caves in Veracruz and Yucatán. A rattlesnake, *Crotalus durissus tzabcan* Klauber, has been found in the entrance area of caves in Campeche and Yucatán.

Family Gekkonidae

Two gekkos, *Coleonyx elegans elegans* Gray and *Thecadactylus rapicaudus* (Houttuyn), have been found in many caves in Yucatán (Gaige, 1938). They are frequently seen on the walls near the cave entrances.

Family Iguanidae

Three species of iguanid lizard have been found in caves and cenotes in Yucatán: *Anolis lemurinus bougeaei* Bocourt, *Basiliscus vittatus* Wiegmann, and *Ctenosaura similis* (Gray). All three species probably only utilize the cave entrance area for shelter.

Family Xantusiidae

The lizards of the family Xantusiidae are closely associated with the cave habitat, and three Mexican species have been found in caves. *Lepidophyma micropholis* Walker inhabits caves in the Sierra de El Abra, San Luis Potosí and Tamaulipas (Walker, 1955b). It has been taken both from the twilight zone and in total darkness. Smith and del Toro (1977) described *L. lipetzi* from a cave north of Cintalapa, Chiapas. Mautz and López-Forment (1978) discussed the cavernicolous habits of *L. smithii* Bocourt in caves near Puerto Márquez, Guerrero.

Class Aves

Sixteen species of bird have been recorded from cavernicolous habitats in México (see Table 30). Many of these utilize the cave entrances for temporary shelter, but others build their nests in the protected entrance rooms of caves. A few of the more significant species are briefly discussed below.

Order Falconiformes

Family Cathartidae

The vulture *Coragyps atratus* (Bechstein) has been observed nesting in three caves at the ruins of Aké, Yucatán.

Order Psittaciformes

Family Psittacidae

Many species of parrot inhabit caves in México, but very few records are available. The green parakeet, *Aratinga holochlora* (Sclater), has been reported nesting in the entrance of Hoya de las Guaguas and other deep pits in the Xilitla region of San Luis Potosí (Ukrain, 1979; Whitacre, 1979); they also have been observed nesting in the entrance passage at Cueva de los Pájaros, Tamaulipas. The beautiful military macaw, *Ara militaris* Linnaeus, has been observed nesting in Sótano de los Guayacamos, Tamaulipas.

Order Strigiformes

Family Strigidae

The mottled wood-owl, *Ciccaba virgata tamaulipensis* (Phillips), has been reported from caves in the Sierra de Guatemala (Harrell, 1951) and Sierra de Tamaulipas (Martin et al., 1954), Tamaulipas.

Family Tytonidae

The barn owl, *Tyto alba* (Scopoli), nests in many caves. This species has been reported from caves in Oaxaca (Monés, 1968), Puebla (Flannery, 1967), Sonora (Bradshaw and Hayward, 1960), Tamaulipas (Holman, 1970); and Alta Verapaz, Guatemala (Land, 1968); it is also known from caves in San Luis Potosí and Yucatán, México. This species is doubtless far more frequent a cave inhabitant than the few records indicate.

Order Apodiformes

Family Apodidae

Vaux swift, *Chaetura vauxi tamaulipensis* Sutton, has been reported from several caves at Rancho del Cielo in the Sierra de Guatemala, Tamaulipas (Harrell, 1951). The white-collared swift, *Streptoprocne zonaris* (Shaw), has been reported to nest in large numbers in pits in Chiapas (Sbordoni et al., 1977) and San Luis Potosí (Ukrain, 1979).

Family Trochilidae

Two species of hummingbird have been reported by Harrell (1951) from caves at Rancho del Cielo, Tamaulipas: the wedge-tailed sabrewing, *Campylopterus curvipennis curvipennis* (Lichtenstein), and the amethyst-throated hummingbird, *Lampornis amethestinus amethestinus* Swainson.

Order Coraciiformes

Family Momotidae

The turquoise-browed motmot, *Eumomota superciliosa superciliosa* (Swainson), is an almost ever-present sight in the caves and cenotes of Yucatán. Their haunting cry is heard in the entrance to almost every cave, and many caves were found by following their call. Harrell (1951) reported the blue-crowned motmot, *Momotus momota coeruliceps* (Gould), from caves at Rancho del Cielo, Tamaulipas.

Order Passeriformes

Family Hirundinidae

Two species of swallow are common inhabitants of caves in the Yucatán Peninsula. The cave swallow, *Petrochelidon fulva citata* Van Tyne, builds its distinctive nests in the large entrance rooms of many caves. Ridgway's swallow, *Stelgidopteryx ruficollis ridgwayi* Nelson, is also seen in almost every cave which possesses a large entrance. The latter species was reported by Land (1968) from Cueva Seamay, Alta Verapaz, Guatemala.

Family Troglodytidae

Harrell (1951) has reported the presence of the canyon wren, *Catherpes mexicanus* (Swainson), in the caves of Rancho del Cielo, Tamaulipas.

Family Turdidae

Two species of thrush have been reported from caves at Rancho del Cielo, Tamaulipas (Harrell, 1951): the black-headed nightingale thrush, *Catharus mexicanus mexicanus* (Bonaparte), and the brown-backed solitaire, *Myadestes obscurus obscurus* Lafresnaye.

Class Mammalia

Order Marsupialia

Family Didelphidae

Two species of opossom have been reported from caves in México. Villa R. (1967) reported *Didelphis marsupialis* Linnaeus from Cueva Cerro Hueco, Chiapas, and Pearse and Kellogg (1938) reported *D. virginiana yucatanensis* J. A. Allen from Actún Ebizt, Yucatán.

Order Chiroptera

The importance of bats to the cave ecosystem cannot be overemphasized. The amount and type of energy input provided, to a certain extent, determine the population size and composition of the invertebrate fauna. One reason for the greater diversity of the cave fauna in tropical regions is the greater diversity of bats in the tropics. In addition to the insectivorous bats, which are also common in temperate regions, the tropics contain nectarivous, frugivorous, carnivorous, and sanguivorous species. Observations in tropical caves have revealed that the guano of each type of bat is inhabited by its own distinctive faunal assemblage. Few detailed studies have been made of the fauna of caves in the New World tropics with respect to their population size and the relationship of this to bat guano. R. W. Mitchell (1970a) has studied the fauna inhabiting a passage in Cueva de la Florida, Tamaulipas, which is inhabited by insectivorous bats. H. A. Mitchell (1965) studied the atmosphere of Cueva del Tigre, Sonora, a large cave containing several species of bats. In addition to the significance of bats to the study of the cave ecosystem, bats are also of importance to human health. Many species of cave-associated bat in México have been found to carry rabies. Furthermore, many caves which are inhabited by bats harbor *Histoplasma capsulatum* Darling, the causative agent of the dangerous lung disease, histoplasmosis. Constantine (1970) has published a detailed review of the significance of bats to human health.

Although there are numerous records of bats in Mexican caves, these records are few when the number of known caves is considered. The difficulty of obtaining collecting permits and of collecting and properly preserving bats has left their study largely to mammalogists working in the field. Many of the papers published on bats include references to their occurrence in caves, but in many instances only general localities are given without reference to whether or not the bats were obtained from caves. The bat fauna of the caves of Guatemala and Belize is even less well known, and there are very few cave records for these two countries. A total of 72 species and subspecies of bat have been recorded from the caves of México; only 20 species from Guatemala and 8 species from Belize are known from caves.

It is outside the scope of this review to do more than briefly summarize the bat fauna associated with caves in México, Guatemala, and Belize. Villa R. (1967) has published the most comprehensive report on the bats of México; this study includes many cave records. The only general review of the bats of Guatemala is that of Jones (1966). No comprehensive study appears to have been published on the bat fauna of Belize, but a few records were found in a paper on histoplasmosis in Belize (Quinones et al., 1978) and in general taxonomic studies. Records of bats in the caves of various Mexican states and regions have been included in the following surveys: Baja California (Jones et al., 1965), Chihuahua (Anderson, 1972), Coahuila (Baker, 1956), Durango (Baker and Greer, 1962), Guerrero (Lukens and Davis, 1957), Hidalgo (Carter and Jones, 1978), Jalisco (Watkins et al., 1972), Michoacán (Hall and Villa R., 1949), Morelos (Davis and Russell, 1952), Nuevo León (Jiménez Guzmán, 1968), Oaxaca (Goodwin, 1969), San Luis Potosí (Dalquest, 1953a), the Sierra de El Abra, San Luis Potosí and Tamaulipas, and the Sierra de Guatemala, Tamaulipas (Mollhagen, 1971), Sinaloa (Jones et al., 1972), Sonora (Burt, 1938; Cockrum and Bradshaw, 1963), Tamaulipas (Alvarez, 1963), Valley of México (Villa R., 1952), Veracruz (Hall and Dalquest, 1963), Yucatán (Pearse and Kellogg, 1938), Yucatán and Quintana Roo (Hatt and Villa R., 1950; Birney et al., 1974), and the Yucatán Peninsula (Jones et al., 1973).

Family Emballonuridae

Five species of emballonurid bat have been reported from caves in México and Gutemala. Thomas's sac-winged bat, *Balantiopteryx io* Thomas, has been reported from caves in Chiapas, Oaxaca, Tabasco, and Veracruz, México; and Alta Verapaz and Izabal, Guatemala. This species seems to prefer to hang from the tops of pits and crevices, and may be present within the twilight zone as well as in total darkness. Colonies as large as 1000 have been reported from caves (Hall and Dalquest, 1963). Peters' bat, *B. plicata plicata* Peters, is among the more frequently collected bats in the caves of southern México. It is known from caves from San Luis Potosí south into Guatemala and from Colima east to Tabasco. They may inhabit both large, dark caves and smaller, well-lit shelter-like openings. The greater doglike bat, *Peropteryx kappleri kappleri* Peters, is known from caves in Tabasco and Veracruz, México; and Izabal, Guatemala. Most of the records are from small caves and few bats were present. The lesser doglike bat, *P. macrotis macrotis* (Wagner), is known from caves in Tabasco, Quintana Roo, Veracruz, and Yucatán, México. This species has been found in both large caves and small shallow cliff-face recesses. The greater white-lined bat, *Saccopteryx bilineata centralis* Thomas, is known from caves in Campeche, Jalisco, and Oaxaca, but this bat probably prefers to roost in hollow trees.

Family Molossidae

Seven species of molossid bat have been recorded from caves in México and one species in Guatemala. Of these, only species of the genus *Tadarida* are frequently encountered in caves. *Tadarida aurispinosa*

(Peale) is known only from a small cave at El Salto, San Luis Potosí, and from Cueva del Abra, Tamaulipas. Two subspecies of the Brazilian free-tailed bat have been found in Mexican caves, and one from a cave in Guatemala. *Tadarida brasiliensis intermedia* Shamel is known only from Grutas de Zapaluta, Chiapas, México, and a cave near Cobán, Alta Verapaz, Guatemala. The Mexican free-tailed bat, *T. b. mexicana* (Saussure), is known from caves throughout much of México. This insectivorous species is frequently present in caves in colonies ranging into the millions. The invertebrate fauna associated with the enormous guano deposits of this species is a distinctive assemblage of species (Mitchell, 1970b). Cockrum (1969) and Villa R. and Cockrum (1962) have studied the migratory habits and patterns of this species, while Constantine (1967) has studied its activity patterns. The broad-tailed bat, *T. laticaudata ferruginea* Goodwin, is known only from two caves in Tamaulipas.

Family Mormoopidae

Six species of mormoopid bat have been recorded from caves in México, Guatemala, and Belize. Smith (1972) has revised the family, and his names are used in the discussion here. Peters' ghost-faced bat (also known as the old man bat), *Mormoops megalophylla megalophylla* (Peters), has been found in caves from Texas south into Guatemala. This species is insectivorous and may occur in colonies of up to several thousand individuals. Mass die-offs, possibly as a result of disease, have been recorded for this species in Cueva del Diablo, Nuevo León (Villa R., 1956), and in Sótano de Sauz, Chihuahua (Sprouse, 1977). They commonly occur in caves with very high temperatures and humidities. Davy's naked-backed bat, *Pteronotus davyi fulvus* (Thomas), has been found in caves from Sonora and Nuevo León, México, south into Alta Verapaz, Guatemala. This species is insectivorous. Parnell's mustached bat, *P. parnellii* (Gray), is represented in the caves of this region by two subspecies. *Pteronotus parnellii mesoamericanus* Smith has been taken in caves in Chiapas, Tabasco, Veracruz, and Yucatán, México; the Maya Mountains of Belize; and El Petén and Alta Verapaz, Guatemala. *Pteronotus p. mexicanus* (Miller) is known from caves from Tamaulipas and southern Chihuahua into Guerrero. This species is frequently taken with other bats, and one individual may occur in a cluster of another species. Wagner's mustached bat, *P. personatus psilotis* (Dobson), is known from caves south from San Luis Potosí, México, into Alta Verapaz, Guatemala. This insectivorous species is frequently found in large humid caves in large numbers. The big naked-backed bat, *Pteronotus suapurensis* (J. A. Allen), is known only from Cueva Laguna Encantada, Veracruz, and Grutas de Lanquín, Alta Verapaz.

Family Natalidae

The family Natalidae is represented in Mexican caves only by the two subspecies of the Mexican funnel-eared bat, *Natalus stramineus* Gray, discussed below. *Natalus stramineus mexicanus* Miller is known from caves in Baja California Sur and Sonora. *Natalus s. saturatus* Dalquest and Hall occurs in caves from Nuevo León south into Guatemala. This insectivorous species may be present in colonies of several hundred individuals.

Family Phyllostomatidae

The family Phyllostomatidae is the largest and most diverse family of bats occurring in the New World tropics. Thirty-three species and subspecies of this family have been reported from the caves of México, Guatemala, and Belize. The nomenclature used below follows that of Jones and Carter (1976).

Geoffroy's tailless bat, *Anoura geoffroyi lasiopyga* (Peters), has been found in caves in Chiapas, Guerrero, México, Morelos, and Tamaulipas. Ten species and subspecies of the fruit-eating bats of the genus *Artibeus* have been recorded from caves in this region. Davis (1969, 1970a, 1970b) has reviewed the systematics of the genus *Artibeus* in Middle America. *Artibeus aztecus aztecus* Andersen is known from caves in Guerrero, México, San Luis Potosí, and Tamaulipas; *A. a. minor* Davis occurs in caves in Chiapas. *Artibeus hirsutus* Anderson is known from caves in Guerrero, Morelos, and Nayarit. The Jamaican fruit-eating bat, *Artibeus jamaicensis* Leach, is represented in the caves of this region by four subspecies: *A. j. paulus* Davis from Chiapas; *A. j. richardsoni* J. A. Allen from Tabasco, México, and Escuintla and Alta Verapaz, Guatemala; *A. j. triomylus* Handley from Guerrero, Jalisco, Morelos, Michoacán, and Oaxaca; and *A. j. yucatanicus* Allen from Quintana Roo, San Luis Potosí, Tamaulipas, Veracruz, and Yucatán. This large species may form colonies containing thousands of individuals. The areas under their roosts frequently contain thousands of sprouted seeds, and the invertebrate fauna in these areas may be unlike that in other parts of the cave. The big fruit-eating bat, *A. lituratus intermedius* J. A. Allen, is known from caves in Guerrero, Morelos, San Luis Potosí, and Tamaulipas. *Artibeus phaeotis phaeotis* Miller has been recorded from caves in Quintana Roo and Tabasco. *Artibeus toltecus toltecus* (Saussure) is known from caves in Chiapas, Morelos, Nuevo León, and Veracruz, México; and Alta Verapaz, Guatemala.

Three species of short-tailed bats of the genus *Carollia* have been recorded from the caves of this region. The nomenclature for this genus follows the revision of Pine (1972). *Carollia brevicauda* (Schinz) is known from caves in Chiapas, Puebla, Quintana Roo, San Luis Potosí, Tabasco, Tamaulipas, and Veracruz, México; and the Maya Mountains of Belize. *Carollia perspicillata azteca* Saussure has been found in caves in Chiapas, Veracruz, and Yucatán, México; the Maya Mountains of Belize; and El Petén and Alta Verapaz, Guatemala. *Carollia subrufa* (Hahn) is known only from caves in Tabasco, México; and Alta Verapaz, Guatemala.

The nectar-feeding Mexican long-tongued bat, *Choeronycteris mexicana* Tschudi, has been found in caves in México from Coahuila and Sonora south to Michoacán. Peters' false vampire bat, *Chrotopterus auritus auritus* (Peters), has been found in caves in Chiapas, Oaxaca, Veracruz, Yucatán, and Quintana Roo. This is apparently a carnivorous species.

Three species of vampire bat occur in México and Central America, and all are known from caves. Villa R. (1953a) has discussed the systematics of the subfamily Desmodontinae. *Diaemus youngi* (Jentink) is a rare species known only from caves by specimens collected in Grutas del Coconá, Tabasco. The hairy-legged vampire bat, *Diphylla ecaudata centralis* Thomas, has been reported from caves in Chiapas, Oaxaca, Quintana Roo, San Luis Potosí, Tamaulipas, Veracruz, and Yucatán. This species is reported to leave only dry, brown stains beneath its roosts (Hall and Dalquest, 1963). The most common vampire bat, and probably the most studied of all Mexican bats, is *Desmodus rotundus murinus* Wagner. Various aspects of the behavior of a colony of this species inhabiting Cueva de Don Luis, Tabasco, has been studied by Wimsatt (1969). Intensive investigations of this species were conducted in southern México by the United States Bureau of Sport Fisheries and Wildlife (1970, 1971). This species is known from caves from Nuevo León into Belize and Guatemala. It usually roosts in small domes or crevices in the ceiling of the cave in clusters ranging from a few individuals to more than 100. The presence of this species in a cave can be immediately determined by pools of black, tarry guano beneath their roosts. These pools harbor a distinctive invertebrate fauna, including several families of fly, and histerid and leiodid beetles.

Pallas' long-tongued bat, *Glossophaga soricina leachii* (Gray), is among the more frequently encountered bats in the caves of México, Guatemala, and Belize. This species feeds on nectar and fruit, and roosts deep in caves. It is known from caves from Tamaulipas and Durango south into Guatemala and Belize.

Underwood's long-tongued bat, *Hylonycteris underwoodi* Thomas, is a rare species known from caves in Tabasco and Veracruz. In one cave pits of jobo plums were found beneath their roost, indicating they had taken the fruit into the caves to eat (Hall and Dalquest, 1963). Another species which is seldom collected from caves is Tomes' long-eared bat, *Lonchorhina aurita aurita* Tomes, known only from caves in Oaxaca, Quintana Roo, and Tabasco. In Quintana Roo this species was found to roost in clusters of about 10 individuals in depressions in the ceiling (Jones et al., 1973).

Two species of long-nosed bat of the genus *Leptonycteris* are known from caves in México. This genus is known from caves from Texas south into Guerrero. The ranges of the two species are broadly sympatric throughout most, if not all, of México, and there has been much confusion as to their correct identity. Hoffmeister (1957) and Ramírez-Pulido and Alvarez (1972) have discussed the taxonomy of the genus. *Leptonycteris nivalis* (Saussure) is known from caves from Tamaulipas into Guerrero. *Leptonycteris sanborni* Hoffmeister has been taken in caves from Sonora and Chihuahua south into Chiapas and Guerrero. Both species have been taken from the same caves on several occasions. These species are nectar-feeders and may occur in colonies containing several hundred individuals.

The only cave record for the long-legged bat, *Macrophyllum macrophyllum* Schinz, is that of a cave near Teapa, Tabasco. This is the northern limit of the range for this species.

Two species of the leaf-nosed bats of the genus *Macrotus* are known from caves in México. The systematics of these insectivorous bats have been studied by Anderson and Nelson (1965). *Macrotus californicus* Baird is known from caves in Baja California Sur and Sonora. *Macrotus waterhousii* Gray is represented in the caves of México by two subspecies: *M. w. bulleri* H. Allen from Hidalgo, Jalisco, and Nuevo León; and *M. w. mexicanus* Saussure from Colima, Guerrero, México, and Morelos.

Three species of small-eared bats of the genus *Micronycteris* have been recorded from caves in México and Belize. *Micronycteris megalotis mexicana* Miller has been found in caves in Guerrero, Morelos, San Luis Potosí, Tabasco, Tamaulipas, and Yucatán. This is apparently an insectivorous species and is usually present in small numbers. *Micronycteris sylvestris* (Thomas) has been recorded only from caves in Jalisco and Veracruz. *Micronycteris brachyotis* (Dobson) has been recorded from caves only from the Maya Mountains of Belize.

The spear-nosed bat, *Mimon cozumelae* Goldman, has been taken from caves in Oaxaca, Tabasco, Veracruz, and Yucatán. These large bats have been reported to feed on very ripe fruit or else on insects feeding on the fruit (Hall and Dalquest, 1963). They usually occur in caves only in small numbers.

The yellow-shouldered bat, *Sturnira lilium parvidens* Goldman, has been recorded from caves in Puebla, Quintana Roo, and Tabasco, México, and in Alta Verapaz, Guatemala. The fringe-lipped bat, *Trachops cirrhosus coffini* Goldman, is known from caves in Oaxaca and Veracruz, México; and El Petén, Guatemala. This species may occur in caves in colonies of up to 50 or more individuals; it is carnivorous and its droppings are white and resemble the feces of birds more than those of bats (Hall and Dalquest, 1963).

Family Vespertilionidae

Nineteen species of vespertilionid bat have been recorded from the caves of México, Guatemala, and Belize. Some of the records are of species which do not usually inhabit caves and so are not discussed here.

The pallid bat, *Antrozous pallidus pallidus* (LeConte), is known from caves in Chihuahua and Durango. This species is primarily insectivorous but may occasionally eat small lizards.

Two species of the genus *Eptesicus* have been recorded from caves in México and Guatemala. The Central American species of this genus have been studied by Davis (1965). The tropical brown bat, *Eptesicus furinalis gaumeri* (J. A. Allen), is known from caves in Morelos and Yucatán. The big brown bat, *E. fuscus* (Palisot de Beauvois), is represented in caves by two subspecies: *E. fuscus miradorensis* H. Allen from Puebla, Tamaulipas, and Veracruz, México, and Alta Verapaz, Guatemala; and *E. f. pallidus* Young from one cave in Coahuila. These bats are insectivorous.

Five species of the genus *Myotis* are known from caves in México, Guatemala, and Belize. The Central American species of the genus have been studied by LaVal (1973). The California myotis, *M. californicus mexicanus* (Saussure), is known only from a cave in Tlaxcala. Keays' myotis, *M. keaysi pilosatibialis* LaVal, is known from caves in Quintana Roo, Tabasco, Tamaulipas, Veracruz, and Yucatán, México; the Maya Mountains of Belize; and El Petén, Guatemala. This insectivorous species is frequently present in caves in large numbers. The black myotis, *M. nigricans nigricans* (Schinz), is known from caves in Oaxaca, Tamaulipas, and Veracruz, México, and Escuintla, Guatemala. The fringed myotis, *Myotis thysanodes* Miller, is represented in Mexican caves by two subspecies: *M. t. aztecus* Miller from the state of México; and *M. t. thysanodes* Miller from Chihuahua and Durango. Three subspecies of the cave myotis, *M. velifer* J. A. Allen, have been reported from Mexican caves. *Myotis velifer incautus* J. A. Allen is known from caves in Coahuila and Durango; this is the common subspecies inhabiting caves in Texas. It is frequently present in colonies containing several thousand individuals. *Myotis velifer velifer* J. A. Allen occurs in caves from Sonora and Durango south through the Sierra Madre Occidental and into southern México. *Myotis velifer peninsularis* Miller is known only from caves in Baja California Sur (Jones et al., 1965). All species of *Myotis* are insectivorous.

The only pipistrelle known from Mexican caves is *Pipistrellus subflavus veraecrucis* (Ward). It has only been reported from caves on Cofre de Perote, Veracruz.

Two species of the genus *Plecotus* are known from Mexican caves. The systematics of this genus have been studied by Handley (1959). The Mexican big-eared bat, *P. mexicanus* (G. M. Allen), is known from caves from southern Chihuahua south to Michoacán and east to Yucatán. Townsend's big-eared bat, *P. townsendii australis* Handley, occurs in caves from Chihuahua and Coahuila south to Michoacán.

Order Rodentia

Ten species of rodent have been reported from Mexican caves, but other species utilize caves at least occasionally. A few of the species are more closely associated with caves than others, and these are briefly discussed below.

Family Cricetidae

The Tamaulipan wood rat, *Neotoma angustapalata* Baker, has been reported from caves in the Sierra de Guatemala and Sierra de El Abra, Tamaulipas (Hooper, 1953). This species builds its nests in the caves. Signs of the Mexican wood rat, *Neotoma mexicana torquata* Ward, were found in caves in Veracruz (Hall and Dalquest, 1963). The big-eared climbing rat, *Ototylomys phyllotis phyllotis* Merriam, is known from caves and cenotes in Yucatán (Pearse and Kellogg, 1938; Hatt, 1938), and Alta Verapaz, Guatemala (Lawlor, 1969). Two species of *Peromyscus* have been reported from Mexican caves. Hall and Dalquest (1963) reported *P. mexicanus* (Saussure) from "the gloom of caves" in Veracruz. Dalquest and Roth (1970) reported that the white-ankled mouse, *P. pectoralis* Osgood, was abundant in the entrance area of Cueva del Abra, Tamaulipas. Peters' climbing rat, *Tylomys nudicaudus gymnurus* Villa R., has been reported from caves in Guerrero and Puebla (Ramírez-Pulido and Sánchez-Hernández, 1971).

Family Dasyproctidae

Remains of the paca, *Agouti paca nelsoni* Goldman, have been found in caves in Yucatán (Pearse and Kellogg, 1938; Jones et al., 1974). Local inhabitants report that pacas frequently are shot in the large entrance sinks of the caves of Yucatán; they doubtless venture into darkness in some caves in search of water.

Family Erithizontidae

The Mexican porcupine, *Coendou mexicanus yucataniae* Thomas, has been reported from caves in Yucatán (Pearse and Kellogg, 1938; Jones et al., 1974).

Order Carnivora

Family Canidae

The gray fox, *Urocyon cinereoargenteus nigrirostris* (Lichtenstein), was reported from Cueva de Tía Juana, Guerrero, by Villa R. (1967). It was presumably preying on bats.

Family Felidae

The jaguar, *Felis onca veraecrucis* Nelson and Goldman, has been reported from Cueva de Los Sabinos (Hall and Kelson, 1959) and Sótano del Tigre, San Luis Potosí (Harris, 1971). Local hunters in the Sierra de El Abra of San Luis Potosí and Tamaulipas report that jaguars are frequently seen in caves.

Family Mustelidae

The western spotted skunk, *Spilogale gracilis* Merriam, was reported from Cueva del Tigre, Sonora (Villa R., 1958), where it was presumably preying on bats.

Family Procyonidae

The coati, *Nasua narica* (Linnaeus), was reported by Villa R. (1967) from a cave near Huajintlán, Morelos. This species is probably a frequent predator of bats in the entrance area of caves.

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Appendix 1

LIST OF COLLECTING LOCALITIES

The following is a list of all caves, wells, springs, and other localities in México, Belize, and Guatemala from which cave-associated species have been recorded. The localities are listed by state or district and then by physiographic region within each state. The name of the locality is followed whenever possible by an approximate location with respect to a nearby town, the municipio, elevation, bibliographic reference, and the topographic map on which the locality occurs. The references cited may include a description of the locality or, if no description is available, the source of the information for the locality. If a map of the cave has been published an "m" is attached to the page number on which the map is printed. Where no reference is given, the information is from the files of the Association for Mexican Cave Studies (AMCS). An asterisk (*) preceding the locality name indicates that cave-adapted species are known from it. A plus sign (+) preceding the locality name indicates that the locality has not been visited by members of the AMCS. The names used are those accepted by the AMCS. Alternate names are included with a cross-reference to the accepted name. The approximate locations of all collecting localities may be found on Fig. 2. The topographic maps used for México are those of the 1:50,000 series issued by the Dirección General de Estudios del Territorio Nacional; the maps used for Belize are those of the 1:50,000 series issued by the British Government's Ministry of Overseas Development. Unfortunately, Guatemalan and many Mexican maps were unavailable.

BAJA CALIFORNIA SUR

+Cave 0.8 km S Las Cuevas, Mpo. de Santiago (Jones et al., 1965:54, 56)
+Cave 1 km S Las Cuevas, Mpo. de Santiago (Jones et al., 1965:56)
+Cuevas de Santiago, Mpo. de Santiago (Hoffmann, 1944: 41, 108, 110, 117)

CAMPECHE

Coastal Plain

+*Well, Calle Victoria 49a, Campeche, Mpo. de Campeche (Ruffo and Vigna Taglianti, 1977:167)
Cenote de Bocchén—see Cenote de Bolchén
*Cenote de Bolchén, 3 km S San Antonio Sacabchén, Mpo. de Calkini (Reddell, 1977b:241)
Cueva de la Iglesia, 2 km NW Becabchén, Mpo. de Calkini

Central Hill District

Artificial cave, Cumpich, Mpo. de Hecelchakan
Quarried cave, 20 km N Champotón, Mpo. de Champotón (Reddell, 1977b:241-243)
*Cenote de Cantemo, 1 km N Cantemo, Mpo. de Champotón (Reddell, 1977b:243)
Actún Chen, Cumpich, Mpo. de Hecelchakan (Reddell, 1977b:244-245)
Cueva de Chuiná, Chuiná, Mpo. de Champotón (Reddell, 1977b:243)
Cenote Ek Bis, 4 km E Cumpich, Mpo. de Hecelchakan
Cenote Espiritú, 10 km NNW Bolonchenticul, Mpo. de Hopelchen (Reddell, 1977b:245-246)
*Actún Halmensura, 5 km E Cumpich, Mpo. de Hecelchakan (Reddell, 1977b:245)
*Actún Huachap, 14 km NNW Bolonchenticul, Mpo. de Hopelchen (Reddell, 1977b:246)
Grutas de Ixtacumbilxunam—see Grutas de Xtacumbilxunam
*Grutas de Monte Bravo, 10 km NW Cantemo, Mpo. de Champotón (Reddell, 1977b:243-244)
*Volcán de los Murciélagos, 11 km E Conhuas, Mpo. de Champotón (Reddell, 1977b:244)
*Grutas de San Antonio, 10 km NNE Bolonchenticul, Mpo. de Hopelchen (Reddell, 1977b:246-247)
*Grutas de San Ignacio, 15 km N Bolonchenticul, Mpo. de Hopelchen (Reddell, 1977b:247)
Grutas de San José, 15 km NE Bolonchenticul, Mpo. de Hopelchen (Reddell, 1977b:247)
Cueva Sascabá, Ruinas de Chicanná, Mpo. de Champotón (Reddell, 1977b:244)
*Grutas de Xkalumkín, 5 km W Cumpich, Mpo. de Hecelchakan (Reddell, 1977b:245)
*Grutas de Xtacumbilxunam, 2 km SW Bolonchenticul, Mpo. de Hopelchen (Stephens, 1843:97-104; Reddell, 1977b:247-249)
Cueva del Yeso, 4 km W Ruinas de Chicanná, Mpo. de Champotón (Reddell, 1977b:244)

CHIAPAS

Altamirano Region

+Small cave near the Pyramid Tzajalalchib, Ocosingo, 1130 m, Mpo. de Ocosingo (Goodnight and Goodnight, 1953:10)
+Cueva de Chital n. 1, Rancho Chital, Ocosingo, 1390 m, Mpo. de Ocosingo (Sbordoni et al., 1977: 46)
+*Cueva de Chital n. 2, Rancho Chital, Ocosingo, 1390 m, Mpo. de Ocosingo (Sbordoni et al., 1977: 43m, 45)

+*Cueva de los Chivos, 5 km E Altamirano, Nuevo Santa Ana, 1400 m, Mpo. de Altamirano (Sbordoni et al., 1977:49-50)

+Cueva presso Cuxulja n. 1, Cuxulja, Ocosingo, 1435 m, Mpo. de Ocosingo (Sbordoni et al., 1977: 47)

+Cueva presso Cuxulja n. 2, Cuxulja, Ocosingo, 1435 m, Mpo. de Ocosingo (Sbordoni et al., 1977: 47, 48m)

+Cueva de Monte Vidal n. 1, Monte Vidal, Altamirano, 1400 m, Mpo. de Altamirano (Sbordoni et al., 1977:50)

+Sumidero del Panteón, Altamirano, 1350 m, Mpo. de Altamirano (Sbordoni et al., 1977:47)

Bochil and Soyalo Region

+Cave near Bochil, Mpo. de Bochil (Villa R., 1967: 224, 226)

+*Cueva de la Golondrina, 4 km E Bochil, 1440 m, Mpo. de Bochil (Sbordoni et al., 1974:30, 32)

+*Cueva del Nacimiento del Río Santo Domingo, Finca Santo Domingo, near Bochil, 1250 m, Mpo. de Bochil (Sbordoni et al., 1974:32)

+Sumidero del Naranjo, El Naranjo, Soyalo, 1540 m, Mpo. de Soyalo (Sbordoni et al., 1977:43-44, 43m)

+*Cueva del Negro, El Naranjo, Soyalo, 1590 m, Mpo. de Soyalo (Sbordoni et al., 1977:44m, 45)

+Cueva del Puente Redondo, Puente Redondo, Jitotol, 1600 m, Mpo. de Jitolol (Sbordoni et al., 1977:41, 42m, 43)

Comitán de Domínguez Region

Cueva Chica de Hun Chabín, 1.5 km N Comitán de Domínguez, 1700 m, Mpo. de Comitán de Domínguez

Cueva Chica de Hunchenbien—see Cueva Chica de Hun Chabín

*Cueva del Tío Ticho, 3 km S Comitán de Domínguez, 1700 m, Mpo. de Comitán de Domínguez (Sbordoni et al., 1974:26)

Cueva de la Toma de Agua—see Cueva del Tío Ticho

Ixtacomitán Region

+Cave 3 km W Ixhuatán, Mpo. de Ixhuatán (Tuttle, 1968:787)

Cueva de la Frontera—see TABASCO

"La Gruta," Ejido Ignacio Allende—see TABASCO

+Piccola Grotta in Loc. Malpaso, Malpaso, Ixtacomitán, 180 m, Mpo. de Ixtacomitán (Sbordoni et al., 1977:21-22)

+Sótano de Malpaso, Malpaso, 2.5 km NE Ixtacomitán, 280 m, Mpo. de Ixtacomitán (Sbordoni et al., 1977:22, 22m)

Malpaso Region

+Cave in canyon of Río de la Venta, Lago de Malpaso, 600 m, Mpo. de Ocozocoautla (Smith and Alvarez del Toro, 1977:37)

+Cueva del Agua Purificada, Río Negro, Ocozocoautla, 130 m and 115 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:26m, 27)

+*Cueva del Burro, Lago de Malpaso, Ocozocoautla, 125 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:23-24, 24m)

+La Cueva, Lago de Malpaso, Ocozocoautla, 120 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:23)

+Cueva de las Dos Bocas, at the confluence of the Río de la Venta with the Río Negro, Ocozocoautla, 120 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:25)

+Grutas de los Indios, Río Negro, Ocozocoautla, 130 m, Mpo. de Cintalapa (Sbordoni et al., 1977: 27)

+Cueva de la Mariposa, Río Negro, Ocozocoautla, 125 m, Mpo. de Cintalapa (Sbordoni et al., 1977: 28)

+Cueva del Perro de Agua, Río Negro, near its confluence with the Río de la Venta, Ocozocoautla, 115 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:25-26)

+Piccola grotta sul Río Venta, at the confluence of the Río de la Venta with the Río Negro, Ocozocoautla, 145 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:25)

+Cueva del Venado, Río Negro, Ocozocoautla, 130 m, Mpo. de Cintalapa (Sbordoni et al., 1977:27-28)

Montebello Region

+*Cueva del Arco, San Rafael del Arco, La Trinitaria, 1470 m, Mpo. de La Trinitaria (Sbordoni et al., 1974:23-24, 25m)

+Cueva de Chinkultic n. 1, near Chinkultic, 30 km SE Comitán de Domínguez, 1500 m, Mpo. de La Trinitaria (Sbordoni et al., 1974:24)

+Cueva de Chinkultic n. 2, near Chinkultic, 30 km SE Comitán de Domínguez, 1500 m, Mpo. de La Trinitaria (Sbordoni et al., 1974:24)

+Cenote La Cueva, Tziscao, La Trinitaria, 1480 m, Mpo. de La Trinitaria (Sbordoni et al., 1977:52)

+Cenote de las Golondrinas, Tziscao, La Trinitaria, 1490 m, Mpo. de La Trinitaria (Sbordoni et al., 1977:51-52)

+Cueva León, 4 km ENE San Lucas, Mpo. de Frontera Comalapa (Smith, 1972:117)

Grutas de San Francisco—see Grutas de Zapaluta

Cueva del San José del Arco, Lagunas de Montebello, Comitán de Domínguez, Mpo. de La Trinitaria (Peck and Peck, 1973:69)

Cueva de La Trinitaria—see Grutas de Zapaluta

*Grutas de Zapaluta, 7 km SE La Trinitaria, 1600 m, Mpo. de La Trinitaria (Thompson, 1972:9, 18m; Sbordoni et al., 1977:51)

Motozintla Region

+*Sumidero de Canada, Canada, El Porvenir, 2560 m, Mpo. de El Porvenir (Sbordoni et al., 1977:64)

+*Grutas de Llano Grande, Llano Grande, La Grandeza, 2140 m, Mpo. de La Grandeza (Sbordoni et al., 1977:63-64)

Palenque Region

Cueva del Salto de Agua, 15 km SE Palenque, Mpo. de La Libertad (Coons, 1974:17)

Rancho del Cielito Region

+Cave 3.5 km NNW Galeana, 43.5 km E Altamirano, 900 m, Mpo. de Las Margaritas (Pine, 1972:42)

+*Cueva de las Canicas, Rancho del Cielito, 12 km from Colonia Galeana, Ocozocoautla, 1350 m, Mpo. de Ocozocoautla (Sbordoni et al., 1974:22m, 29-30)

+*Cueva del Cerro Brujo, Rancho del Cielito, 12 km from Colonia Galeana, Ocozocoautla, 1320 m, Mpo. de Ocozocoautla (Sbordoni et al., 1974:28-29)

San Cristóbal de las Casas Region

+Cave 2 km W Teopisca, 2120 m, Mpo. de Teopisca (Davis et al., 1964:385)

+Cave 5 km from Teopisca, Mpo. de Teopisca (Rudnick, 1960:200)

+*Well in Casa Bell, San Cristóbal de las Casas, Mpo. de San Cristóbal de las Casas (Ruffo and Vigna Taglianti, 1977:135)

Cueva del Arcotete, 6 km S San Cristóbal de las Casas, Mpo. de San Cristóbal de las Casas (Peck and Peck, 1973:68-69)

+Piccole cavita dell'Arcotete, La Quinta, San Cristóbal de las Casas, 2250 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:61)

+Cueva de las Calaveras, San Cristóbal de las Casas, 2265 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:48m, 55)

Sumidero del Camino, 16 km NE Comitán de Domínguez, Mpo. de Comitán de Domínguez

+Cueva de la Cañada n. 1, La Quinta, San Cristóbal de las Casas, 2270 m, Mpo. de San Cristóbal de las Casas (Gascoyne and Pratt, 1975:34; Sbordoni et al., 1977:57-58)

+Cueva de la Cañada n. 2, La Quinta, San Cristóbal de las Casas, 2270 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:58)

*Sótano de Cancuc, Cancuc, 11 km NE Tenejapa, Mpo. de Sitala

+Sumidero de Casa Clark, San Cristóbal de las Casas, 2240 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:53-54)

+Cueva Clara, Finca San Nicolas, San Cristóbal de las Casas, 2330 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:59-61, 60m)

+Cueva del Coyote, Rancho Nuevo, San Cristóbal de las Casas, 2520 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:61-62, 62m)

+Cueva de la Cruz Belen, Finca San Antonio de Padua, Comitán de Domínguez, 2210 m, Mpo. de Comitán de Domínguez (Sbordoni et al., 1974:39m, 40-41)

Salida de Cruz Pilal, Cruz Pilal, 14 km NNE Tenejapa, Mpo. de Tenejapa (Boon, 1974:11, 12m; Pace, 1977:7-8, 9m, 10)

Entrance D, Río Quinta Valley—see Cueva de la Cañada n. 1

+Cueva Encantada, San Cristóbal de las Casas, 2300 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:54m, 55)

+*Cueva de las Florecillas, Colonia San Francisco, Comitán de Domínguez, 2265 m, Mpo. de Comitán de Domínguez (Sbordoni et al., 1974:36m, 40)

Huistán Resurgence—see Cueva Mapachero

*Cueva de Los Llanos, 15 km ESE San Cristóbal de las Casas, 2295 m, Mpo. de San Cristóbal de las Casas

Cueva Mapachero, 3 km N Huistán, Mpo. de Huistán (Larson, 1975:28, 29m, 30)

*Cueva de los Murciélagos, 15 km ESE San Cristóbal de las Casas, 2295 m, Mpo. de San Cristóbal de las Casas

+Cueva Obscura, Finca San Nicolas, San Cristóbal de las Casas, 2300 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:58-59, 59m)

+Cueva del Panteón, 2 km WNW Teopisca, 1820 m, Mpo. de Teopisca (Sbordoni et al., 1974:26-28, 27m)

+*Cueva de la Planta n. 1, Las Piedrecitas, 6.5 km N San Cristóbal de las Casas, 2180 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:55-56)

+*Cueva de la Planta n. 2, Las Piedrecitas, 6.5 km N San Cristóbal de las Casas, 2180 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:56)

+*Cueva de la Planta n. 3, Las Piedrecitas, 6.5 km N San Cristóbal de las Casas, 2180 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1977:57)

Risorgenza de la Planta n. 3—see Cueva de la Planta n. 3

*Grutas de Rancho Nuevo, 10 km SE San Cristóbal de las Casas, 2275 m, Mpo. de San Cristóbal de las Casas (Thompson, 1972:10, 17m; Sbordoni et al., 1974:33-35, map; Shawcross, 1978:3-4)

+Cueva del Rayo de San Felipe, 3.8 km W San Cristóbal de las Casas, 2190 m, Mpo. de San Cristóbal de las Casas (Sbordoni et al., 1974:35)

+Cueva del Rayo de San Francisco, 4 km from Colonia San Francisco, Comitán de Domínguez, 2250 m, Mpo. de Comitan de Domínguez (Sbordoni et al., 1974:38, 39m, 40)

+Cueva de Saclamanton n. 1, Saclamanton, 4 km at 100° from San Juan Chamula, 2430 m, Mpo. de San Juan Chamula (Sbordoni et al., 1977:48m, 52-53)

+Cueva de Saclamanton n. 2, Saclamanton, 4 km at 100° from San Juan Chamula, 2430 m, Mpo. de San Juan Chamula (Sbordoni et al., 1977:53)

+Cueva de Saclamanton n. 3, Saclamanton, 4 km at 100° from San Juan Chamula, 2430 m, Mpo. de San Juan Chamula (Sbordoni et al., 1977:48m, 53)

+Cueva Chica de San Agostín, Rancho de San Agostín, 52 km from San Cristóbal de las Casas on road to Comitán de Domínguez, 2380 m, Mpo. de Comitán de Domínguez (Sbordoni et al., 1974:31m, 37)

+Cueva Grande de San Agostín, Rancho de San Agostín, 51.7 km from San Cristóbal de las Casas on road to Comitán de Domínguez, 2320 m, Mpo. de Comitán de Domínguez (Sbordoni et al., 1974: 31m, 38)

+Sótano de San Agostín, Rancho de San Agostín, 51.7 km from San Cristóbal de las Casas on road to Comitán de Domínguez, 2320 m (Comitán de Domínguez) (Sbordoni et al., 1974:31m, 38)

Pozzo San Agostino—Sótano de San Agostín

Gruta de San Cristóbal—see Grutas de Rancho Nuevo

Chen Sibilmut, 4 km N Huistán, Mpo. de Huistán (Donavan, 1975: 21-22, 23 m, 25-27)

Chen Senvilmut—see Chen Sibilmut

Chen Ven Sil Mut—see Chen Sibilmut

+Cueva de Teopisca, 4.5 km SSW Teopisca, 1700 m, Mpo. de Teopisca (Villa R., 1967:242)

+Cueva de Tulanca n. 1, 2 km W Rancho de Tulanca, 44 km SE San Cristóbal de las Casas, 2200 m, Mpo. de Amatenango (Sbordoni et al., 1974: 35-36, 36m)

Sumidero Yochib, Yochib, 8 km NE Tenejapa, Mpo. de Tenejapa (Lord, 1974:14-15, 17m; Boon, 1975: 6-9, 10-11m, 15-16; Steele, 1977a:3-9; Steele, 1977b:11-14; Van Note, 1977:3-4, 5m)

Simojovel and Tila Region

+Cueva del Barrio Francisco Madero n. 1, Tila, 1160 m, Mpo. de Tila (Sbordoni et al., 1977:37)

+Cueva del Barrio Francisco Madero n. 2, Tila, 1160 m, Mpo. de Tila (Sbordoni et al., 1977:37-38)

+*Cueva de Chanchaniptic, Sitala, 1200 m, Mpo. de Sitala (Sbordoni et al., 1977:39, 40m, 41)

Cueva de Colonia Rincón, near Rincón Chamula, 1790 m, Mpo. de Pueblo Nuevo Solistahuacan

+Gruta de Finca Santa Anita n. 1, Finca Santa Anita, Simojovel de Allende, 830 m, Mpo. de Simojovel de Allende (Sbordoni et al., 1977:38-39, 38m)

+*Gruta de Finca Santa Anita n. 2, Finca Santa Anita, Simojovel de Allende, 810 m, Mpo. de Simojovel de Allende (Sbordoni et al., 1977:39)

+Cueva de Nicolas Bravo, Tila, 1160 m, Mpo. de Tila (Sbordoni et al., 1977:36-37, 36m)

+Cueva Tchabo öet-öet, Tila, 1050 m, Mpo. de Tila, (Sbordoni et al., 1977:35-36)

Tuxtla Gutiérrez Region

Cave 2.5 km NE Balneario Chorreadero, 16 km E Tuxtla Gutiérrez, Mpo. de Chiapa de Corzo

Cave 2 km SW Las Pilitas, Mpo. de Ocozocoautla

Cueva del Aguacero—see Cueva del Encanto

+Cueva de Berriozabal, Berriozabal, Mpo. de Berriozabal (Chopard, 1947:68)

Cueva Chica del Camino, 21 km E Tuxtla Gutiérrez, Mpo. de Ixtapa

+Cueva del Camino del Aguacero, Aguacero, Ocozocoautla, 630 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:30)

+Cueva de la Cepona, Tuxtla Gutiérrez, 800 m, Mpo. de Tuxtla Gutiérrez (Sbordoni et al., 1974:20-21)

Cueva Cerro Hueco, 4 km SE Tuxtla Gutiérrez, 730 m, Mpo. de Tuxtla Gutiérrez, (Sbordoni et al., 1974:18-19, fig. 5m)

+Cueva de la Chepa, 2 km N, 4 km N, or 4 km NE Tuxtla Gutiérrez, 760 m, Mpo. de Tuxtla Gutiérrez (Mazzotti, 1940:405)

Cueva del Chorreadero, Balneario Chorreadero, 12 km E Tuxtla Gutiérrez, 650 m, Mpo. de Chiapa de Corzo (Thompson, 1972:11-12, 13m, 15-16; Sbordoni et al., 1974:16-18, 17m; Shawcross et al., 1974:60, 62m)

+Cueva de la Cotorra, Piedra Parada, Ocozocoautla, 700 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:29)

Hoyo de Don Nicho, Rancho del Tempisque, 13 km W Ocozocoautla, 710 m, Mpo. de Ocozocoautla (Sbordoni et al., 1974:21; Sbordoni et al., 1977: 31)

+Cueva del Encanto, Aguacero, Ocozocoautla, 590 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:30; Gascoyne and Pratt, 1975:36m, 37)

+Cueva del Muju, Rancho de las Pilitas, Ocozocoautla, 680 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:32)

+Sima del Ojito, Colonia Galeana, 30 km S Ocozocoautla, 950 m, Mpo. de Ocozocoautla (Sbordoni et al., 1974:21-22, 22m)

+Cueva de Paso Burro, Berriozabal, 900 m, Mpo. de Berriozabal (Sbordoni et al., 1977:33)

Cueva de las Piñas Ramas—see Cueva de los Pinos Ramas

Cueva de los Pinos Ramas, 21 km E Tuxtla Gutiérrez, Mpo. de Ixtapa

+Cueva de la Ramillette, 7 km from the outskirts of Tuxtla Gutiérrez in the direction 340°, 815 m, Mpo. de Tuxtla Gutiérrez (Sbordoni et al., 1974: 19-20)

+Cueva del Rancho San Miguel n. 1, Rancho San Miguel, Chiapa de Corzo, 460 m, Mpo. de Chiapa de Corzo (Sbordoni et al., 1977:34-35)

+Cueva del Rancho San Miguel n. 2, Rancho San Miguel, Chiapa de Corzo, 460 m, Mpo. de Chiapa de Corzo (Sbordoni et al., 1977:34-35)

+Gruta de Roberto, Strada Tuxtla Gutiérrez-San Cristóbal de las Casas, Chiapa de Corzo, 810 m, Mpo. de Chiapa de Corzo (Sbordoni et al., 1977:33-34, 34m)

+Cueva del Sabín, Rancho del Sabín, Ocozocoautla, 890 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:28-29, 29m)

Cueva del Tempisque, Rancho del Tempisque, 13 km W Ocozocoautla, 690 m, Mpo. de Ocozocoautla (Sbordoni et al., 1977:31-32)

Sima del Tempisque n. 1—see Hoyo de Don Nicho

Sima del Tempisque n. 2—see Cueva del Tempisque

CHIHUAHUA

Carimechi Region

+Cave near Carimechi, Mpo. de ?Uruachic (Anderson, 1972:236)

+Cavern in a canyon near Carimechi, Mpo. de ?Uruachic (Anderson, 1972:239)

Magurichic Region

+Cave at Magurichic, Mpo. de Magurichic (Knobloch, 1942:297)

Cave at Mojarachic—see Cave at Magurichic

Salaices Region

*Cueva del Diablo, 4 km W Salaices, Mpo. de Villa López (Reddell, 1977a:85, pl. Im)

Cueva de los Muchachos, 2 km S Salaices, Mpo. de Villa López (Reddell, 1977a:85)

Santa Elena Region

+Cave in Fern Canyon, 21 km NW Santa Elena, Mpo. de Ojinaga (Judd, 1967:192)

+Cave on south side of Cañon de Santa Elena, Mpo. de Ojinaga (Villa R., 1967:383)

Sótano de Sauz, 15 km N Manuel Benavides, 1000 m, Mpo. de Ojinaga (Sprouse, 1977:79-80, pl. Vm) Manuel Benavides, H13D44)

Santo Tomas Region

Socavón de Santo Tomas, 8 km NNW Santo Tomas, Mpo. de ?Cd. Guerrero (Reddell, 1977a:87)

Sótano Segundo de Santo Tomas, 8 km NNW Santo Tomas, Mpo. de ?Cd. Guerrero

Sótano Suciedad de Santo Tomas, 8 km NNW Santo Tomas, Mpo. de ?Cd. Guerrero

Villa Matamoros Region

Cueva del Salitre, 13 km W Villa Matamoros, Mpo. de Villa Matamoros (Reddell, 1977a:85, 87)

COAHUILA

Allende Region

+Cueva de Allende, Mpo. de ?Allende (Malaga Alba and Villa R., 1957:548, 559)

El Chiflón Region

+Cave at El Chiflón, 35 km W Saltillo, Mpo. de Saltillo (Baker, 1956:173)

Ciudad Acuña Region

*Cueva de los Lagos, 24 km W Ciudad Acuña, Mpo. de Ciudad Acuña

Cuatro Ciénegas de Carranza Region

+Cave 5.3 km NW Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Williams, 1968: 24)

+*Small laguna 7.92 km W, 9.42 km S Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971:430) (Cuatro Ciénegas, G13B59)

+*Pozo 8.2 km S, 4.7 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1970:74 (Cuatro Ciénegas, G13B59)

+*Pozo 20.3 km S, 5.5 km E Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1970:76 (Cuatro Ciénegas, G13B59)

+*Pozo 12 km SW Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Minckley and Cole, 1968:2) (Cuatro Ciénegas, G13B59)

+*Small seep near Pozo Barbado, 9.4 km S, 7.9 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1972: 315) (Cuatro Ciénegas, G13B59)

+*Seep 7.45 km S, 5.50 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971:430) (Cuatro Ciénegas, G13B59)

+*Small spring 7.45 km S, 5.42 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971:430) (Cuatro Ciénegas, G13B59)

+*Small spring 8.2 km S, 8.4 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1972:315) (Cuatro Ciénegas, G13B59)

+*Small spring 8.8 km S, 4.0 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1972:315) (Cuatro Ciénegas, G13B59)

+*Spring 8.15 km S, 2.29 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971:430) (Cuatro Ciénegas, G13B59)

+*Spring-pool, 8.84 km S, 3.96 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971:430) (Cuatro Ciénegas, G13B59)

Sumidero de Alicantre, 16 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza

+*Pozo Barbado, 9.4 km S, 7.9 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1972:320) (Cuatro Ciénegas, G13B59)

+*Poza de la Becerra, 13.7 km SSW Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Taylor, 1966:162-163) (Cuatro Ciénegas, G13B59)

+*Pozos Bonitos, Laguna Churince, Churince, 14.73 km S, 7.05 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Holsinger and Minckley, 1971:430) (Cuatro Ciénegas, G13B59)

+*Laguna Escobeda, 9.8 km S, 2.3 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Taylor, 1966:163) (Cuatro Ciénegas, G13B59)

+Frightful Cave, Site 68 of Taylor's survey, Cuatro Ciénegas basin, Mpo. de Cuatro Ciénegas de Carranza (Taylor, 1956:215-234)

+*Laguna Juan Santos, 8.5 km S, 8.0 km W Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1972:319) (Cuatro Ciénegas, G13B59)

+*West Laguna of Mojarral, 11 km SW Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Cole and Minckley, 1972:319) (Cuatro Ciénegas, G13B59)

Cueva del Pedregoso, 32 km SE Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (Anonymous, 1968:11-12)

Pedregoso Circle Cave, 30 km SE Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza

Pedregoso Hidden Cave, 30 km SE Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza

Pedregoso Pipe Cave, 30 km SE Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza

Cueva de San Vicente, 6.5 km S Boquilla, 16 km SE Cuatro Ciénegas de Carranza, Mpo. de Cuatro Ciénegas de Carranza (García Lozano, 1939b:10-13, 12m; Rodríguez Cabo, 1953:354-355; Fish, 1965:66)

Hermanas Region

+Cave 10 km E Hermanas, 360 m, Mpo. de Escobedo (Baker, 1956:171)

Cueva de la Herradura, 8 km E Hermanas, Mpo. de Escobedo (Fish, 1965:66)

Monclova Region

Bocas del Carmen, 40 km W Monclova, Mpo. de ?Sacramento

Ojo Caliente Region

+Cueva del Socavón del Volcán de Ojo Caliente, 2 km ESE Ojo Caliente, 16 km ENE Ramos Arizpe, 1455 m, Mpo. de Ramos Arizpe (García Lozano, 1939b:9; Rodríguez Cabo, 1953:350-351) (Ramos Arizpe, G14C24)

Rancho Guadalupe Region

+Cueva de Don Jesús, Rancho Guadalupe, 92 km N, 43.5 km W Saltillo, Mpo. de Ramos Arizpe (Baker, 1956:173-174)

Cueva de San Jesús—see Cueva de Don Jesús

San Buenaventura Region

+Cave below summit of south face of Cañón del Río Salado, 14.5 km W, 6.5 km S San Buenaventura, 550 m, Mpo. de San Buenaventura (Baker, 1956: 173, 183, 187)

Serrania del Burro Region

Cave, Hacienda Las Pilas, 100 km SE Boquillas del Carmen, Mpo. de Zaragoza (Mollhagen, 1977:80)
+Spring Cave, C96 of Taylor's survey, in Media Luna Canyon, 26 km S Boquillas del Carmen, Mpo. de Ocampo (Drake, 1951:94)

Sierra Arteaga Region

Gruta de Cuevecillas, 1 km N Cuevecillas, 9 km ENE Arteaga, Mpo. de Arteaga (Fish, 1965:68) (Arteaga, G14C34)

Sierra de las Animas Region

Cueva de las Animas, 21 km WNW Candela, 760 m, Mpo. de Monclova (García Lozano, 1939b:10m; Rodríguez Cabo, 1953:352-354, 366m; Reddell, 1966c:5-6) (Candela, F14A54)

Sierra de Mayrán Region

Cueva de Empalme, 1.5 km E Entronque la Cuchilla, Mpo. de Viesca (Mayrán, G13D27)
Cueva de los Escarabajos, 1.5 km E Entronque la Cuchilla, Mpo. de Viesca (Mayrán, G13D27)
Cueva de los Grillos, 1.5 km E Entronque la Cuchilla, Mpo. de Viesca (Mayrán, G13D27)
Cueva de Yeso, 1.5 km E Entronque la Cuchilla, Mpo. de Viesca (Mayrán, G13D27)

Sierra de Santa Rosa Region

+Cave, north side of Puerto de Santa Ana, 7 km S Nacimiento de los Indios, 850 m, Mpo. de Melchor Músquiz (Baker, 1956:171)
Cueva del León, Cañón de la Alameda, 52 km WNW Melchor Músquiz, Mpo. de Melchor de Músquiz (García Lozano, 1939b:17-18; Rodríguez Cabo, 1953:356-358)
*Pozo de El Potrero, 8.5 km SSE Melchor Músquiz, 600 m, Mpo. de Melchor Músquiz (Melchor Músquiz, G14A12)

Sierra San Lorenzo Region

+Cueva del Buen Abrigo, Buen Abrigo, 19 km N Matamoros, Mpo. de Matamoros (Barlow, 1946:266-267) (Matamoros, G13D26)
+Cueva de San Lorenzo, 2 km from Hacienda de San Lorenzo de la Legua, 23 km NNE Matamoros, Mpo. de Matamoros (Martínez del Río, 1956:20) (Matamoros, G13D26)

Sierra El Tarillal Region

Cueva de las Vigas—see NUEVO LEON

Sierra Zapaliname Region

+Caves 2 km S and 8 km W Bella Unión, 2100 m, Mpo. de Saltillo (Baker, 1956:187) (Arteaga, G14C34)

Torreón Region

+Cave 51 km SW San Pedro de las Colonias, 1100 m, Mpo. de Matamoros (Baker, 1956:173)
+Cave SE of Torreón (Baker, 1956:190)
+Cueva de Laguna Seca, 8 km NW Nazareno, Mpo. de Torreón (Constantine, 1967:19)

Unplaced Cave

+Cueva de la Bandurria, 1.5 km N K612 Saltillo-Torreón Highway, 1200 m (Villa R., 1967:370)

COLIMA

+Cave, Ixtlahuacán, Mpo. de Ixtlahuacán
+Cave, Manzanillo, Mpo. de Manzanillo (Ingles, 1959:381)
+Cueva de la Fábrica, 5 km W Coquimatlán, Mpo. de Coquitmatlán (Mazzotti, 1941:313)
+Cueva de la Finca, Coquitmatlán, Mpo. de Coquimatlán (Hoffmann, 1953:185, 187)

DISTRITO FEDERAL

+Caves near Ixtapalapa (Goldman, 1951:137)
+Lava "blow hole" near San Gerónimo (Hubbell, 1972:105)
Cueva del Cerro de la Estrella, 2 km S Ixtapalapa (Reddell, 1973f:92-93)
Cave El Feuhtle—see Cuevas de Teutli
+Cuevas de Teutli (Hoffmeister, 1957:459)
+Cueva de Xictli, Tlalpan (Caballero y C., 1942:652)

DURANGO

Campaña Balcones Region

+Cueva de los Indios, 11 km N Campaña Balcones, 1140 m, Mpo. de Tlahualilo (Baker and Greer, 1962:75)

Ciudad Lerdo Region

+Cave 16 km S Ciudad Lerdo, 1500 m, Mpo. de Ciudad Lerdo (Villa R., 1967:435)
+Cueva de España, 2 km S, 11 km W Nazareno, Mpo. de Ciudad Lerdo (Villa R., 1967:59, 67, 442)
Cueva del Guano, 20 km S Ciudad Lerdo, Mpo. de Ciudad Lerdo (Reddell, 1977a:89-90, pl. IIm)
Cueva del Indio—see Cueva de España
+Cueva de la Joya de Lerdo, Ciudad Lerdo, Mpo. de Ciudad Lerdo (Bustamante, 1964:509, 513-515)

La Pila Region

+Fissures 7 km SW La Pila, Mpo. de ?Durango (Baker, 1960:309)

Rancho Descubridora Region

*Cueva de la Siquita, 40 km WNW Mapimí, Mpo. de Mapimí (Reddell, 1977a:90-91, pl. IVm)

Santa Ana Region

+Cave at Santa Ana, 395 m, Mpo. de Coloma (Jones, 1964:751)

Sierra de la India Region

Cueva de la Cucaracha, 7 km S Mapimí, Mpo. de Mapimí (Reddell, 1977a:89)
*Cueva de los Riscos, 7 km S Mapimí, Mpo. de Mapimí (Reddell, 1977a:90, pl. IIIm)

Vicente Guerrero Region

+Cave on Rancho Las Margaritas, SW Vicente Guerrero, 2270 m, Mpo. de Vicente Guerrero (Baker and Greer, 1962:73)

GUERRERO

+Small caves near Acahuizotla, 850 m, Mpo. de Chilpancingo de los Bravos (Lukens and Davis, 1957:3, 4, 11)
+Cave 8 km NW Acapulco de Juárez, Mpo. de Acapulco de Juárez (de la Torre, 1955:696)

+Large crevice, 4 km S Almolonga, 1700 m, Mpo. de Tixtla de Guerrero (Lukens and Davis, 1957:3)
+Small cave 2 km SSE Almolonga, Mpo. de Tixtla de Guerrero (Fish, 1968:117)
+Cave at Atlala, 2 km NE Mexicapan, Mpo. de Teloloapan (Martínez and Villa R., 1940:303)
+Large cave 5 km W Mezcala, 600 m, Mpo. de Zumpango del Río (Lukens and Davis, 1957:2, 4, 5, 11)
+Cave 19 km S Mezcala, Mpo. de Zumpango del Río (de la Torre, 1955:696)
+Sinkhole 3 km W Omiltemi, 2390 m, Mpo. de Chilpancingo de los Bravos (Lukens and Davis, 1957:10-11)
+Cave, Papayo, 8 m, Mpo. de Coyuca de Benítez (Lukens and Davis, 1957:10)
+Cave system 2 km W Puerto Márquez, Mpo. de Acapulco de Juárez (Mautz and López-Forment, 1978:311)
+Cave on outskirts of Taxco, Mpo. de Taxco (Roth, 1968:21) (Taxco, E14A68)
+Cave near Cueva de la Laguna Honda, near Yerbabuena, 12 km NW Teloloapan, Mpo. de ?Icapulzaco (Martínez and Villa R., 1940:302-303) (NOTE: This is one of the Cuevas de Yerbabuena)
+Cave near Puente de Díos, 1 km NW Yerbabuena, 12 km NW Teloloapan, 1800 m, Mpo. de ?Icapulzaco (Martínez and Villa R., 1940:301) (NOTE: This is one of the Cuevas de Yerbabuena)
+Cueva de Acahuizotla, Acahuizotla, Mpo. de Chilpancingo de los Bravos (Villa R., 1967:97)
*Grutas de Acuitlapán, 2 km ENE Cupango, 12 km NE Taxco, 1470 m, Mpo. de Tetipac (Bonet, 1971:75-78, mapa 15) (Taxco, E14A68)
+Cueva de Agua Brava, Hoya Coralleyo, 12 km NE Taxco, 1180 m, Mpo. de Tetipac (Bonet, 1971:74-75, mapa 14; Sbordoni and Argano, 1972:15) (Taxco, E14A68)
+Cueva Alpixafia, 7 km NNE Teloloapan, Mpo. de Ixcateopan (Villa R., 1952:325, 327, 328)
+Cueva de los Americanos, 10 km SSW Teloloapan, Mpo. de Teloloapan (Villa R., 1967:305)
+Cueva del Borrego, E of Omiltemi on highway to Amojileca, Mpo. de Chilpancingo de los Bravos (Barrera, 1958:90, 91)
*Grutas de Cacahuamilpa, 16 km NE Taxco, 1100 m, Mpo. de Tetipac (Bonet, 1971:61-71, mapa 12; Sbordoni and Argano, 1972:16-17; Coons, 1976:35-36, 39m) (Taxco, E14A68)
+Grieta de las Cacánicuas, 6 km W San Miguel Totolapan, Mpo. de San Miguel Totolapan (Villa R., 1967:153)
+Gruta de Calicanto, 8 km SE Teloloapan, 1400 m, Mpo. de Teloloapan (Martínez and Villa R., 1940:297-298)
Gruta de Cal y Canto—see Gruta de Calicanto
+Cueva del Cañon del Zopilote, 12.5 km S Mezcala, 450 m, Mpo. de Zumpango del Río (Villa R. and Jiménez G., 1962:392)
+Cueva de Carlos Pacheco, 400 m SSE Grutas de Cacahuamilpa, 15 km NE Taxco, 1060 m, Mpo. de Tetipac (Bonet, 1971:71-74, mapa 13) (Taxco, E14A68)
+Cueva del Coyote, 21 km N Taxco, 1600 m, Mpo. de Pilcaya (Bonet, 1971:47)
Gruta de Cuetzala—see Grutas de Cuetzala del Progreso
+Grutas de Cuetzala del Progreso, 6 km N Cuetzala del Progreso, 904 m, Mpo. de Cuetzala del Progreso (Martínez and Villa R., 1940:298-300)
+Cueva del Diablo, 0.5 km SE San Miguel Acuitlapán, 9 km NE Taxco, 460 m, Mpo. de Taxco (Bonet, 1971:79-80, mapa 16)
*Grutas de la Estrella, 21 km N Taxco, 1580 m, Mpo. de Pilcaya (Sbordoni and Argano, 1972:14-15; Bonet, 1971:52-57, mapa 8) (Taxco, E14A68)
+Cueva el Fraile, Teloloapan, Mpo. de Teloloapan (Horst and Langworthy, 1972:903)
Grutas de las Granadas, 4.5 km SE San Miguel Acuitlapán, 10 km ENE Taxco, 1300 m, Mpo. de Taxco (Harmon, 1979:102-103m) (Taxco, E14A68)
+Cueva del Huarache, 14 km S Chilpancingo de los Bravos, Mpo. de Chilpancingo de los Bravos (Villa R., 1967:202-203)
+Cueva de las Juntas, 2 km E Acahuizotla, Mpo. de Chilpancingo de los Bravos (Villa R., 1967:90, 91, 191)
*Grutas de Juxtlahuaca, 6 km NNW Colotlipa, 765 m, Mpo. de Cuautotitlan (Roy, 1974:39-42, map)
+Cueva de la Laguna Honda, Yerbabuena, 12 km NW Teloloapan, 1800 m, Mpo. de ?Ixcapuzalco (Ramírez-Pulido and Alvarez, 1972:251, 258) (NOTE: This is one of the Cuevas de Yerbabuena)
Cueva de la Mariposa—see Grutas de El Mogote
Pozo Melendez, Puente Campuzano, 12 km S Taxco, Mpo. de ?Taxco (Thompson, 1970:58-62, 59m) (Iguala, E14A78)
+Cueva de la Mesa de las Choas, 5.3 km E San Miguel Totolapan, 280 m (Villa R., 1967:178, 202, 205)
*Cueva Chica de El Mogote, 0.5 km E El Mogote, 10 km NNE Taxco, 1480 m , Mpo. de Tetipac (Fish and Reddell, 1965:76) (Taxco, E14A68)
*Grutas de El Mogote, 0.5 km E El Mogote, 10 km NNE Taxco, 1480 m, Mpo. de Tetipac (Bonet, 1971:59-61, mapa 10) (Taxco, E14A68)
+Cueva Ojo de Agua de Chapa, 7 km SSE Teloloapan, 1400 m, Mpo. de Teloloapan (Villa R., 1967:333)
+Cueva de Ostotilan, Mpo. de Teloloapan (Villa R., 1967:63)
Grutas de Pacheco—see Gruta de Carlos Pacheco
Cueva del Palo Blanco—see Cueva del Huarache
+Cueva de la Pedrera de Cajeles, near Acahuizotla, 30 km S Chilpancingo de los Bravos, Mpo. de Chilpancingo de los Bravos (Ramírez-Pulido and Sánchez-Hernández, 1971:481)
+Cueva de la Peñita, 1.6 km S Palo Blanco, Mpo. de Chilpancingo de los Bravos (Fish, 1968:123)
+Cueva del Puente de Díos, 1 km NW Yerbabuena, 12 km NW Teloloapan, 1700 m, Mpo. de ?Ixcapuzalco (Martínez and Villa R., 1940:301) (NOTE: This is one of the Cuevas de Yerbabuena)
Gruta "El Resuello"—see Grutas del Río Chontalcoatlán
+Cueva del Rincón, near Rincón, 790 m, Mpo. de Teloloapan (Lukens and Davis, 1957:5)
+Grutas del Río Chontalcoatlán, 12 km NE Taxco, 1180 m, Mpo. de Tetipac (Sbordoni and Argano, 1972:16; Coons, 1976:37-38, 39m) (Taxco, E14A68)
+Grutas del Río San Jerónimo, 16 km NNE Taxco, 1200 m, Mpo. de Tetipac (Coons, 1976:37-38, 39m) (Taxco, E14A68)
+Cueva de El Salitre, 12 km N Zacatula, Mpo. de La Unión (Alvarez, 1968:24)
+Cueva de San Ignacio, near Acahuizotla, Mpo. de Chilpancingo de los Bravos (López-Forment et al., 1971:227)
+Cueva de Suanche, Piedreas Negras, 17 km N Taxco, 1280 m, Mpo. de Pilcaya (Bonet, 1971:57-59, mapa 9) (Taxco, E14A68)
+Cueva Tecabra, Ahuacatitlan, 1400 m (Villa R., 1967:430, 431)

+Cueva de Tezoapa, 1.5 km E Acahuizotla, 650 m, Mpo. de Chilpancingo de los Bravos (Villa R. and López-Forment, 1966:192)

+Cueva de Tía Juana, 1.5 km SSW Yerbabuena, 12 km NW Teloloapan, 1840 m, Mpo. de ?Ixcapuzalco (Villa R., 1963:390)

+Cueva de Tlachalitla, 1.5 km SE Apetlanca, 50 m, Mpo. de Cuetzala del Progreso (Malaga Alba and Villa R., 1957:538)

+Cueva de la Tranca de Ixcapaneca, 1 km NW Yerbabuena, 12 km NW Teloloapan, Mpo. de ?Ixcapuzalco (Martínez and Villa R., 1940:302) (NOTE: This is one of the Cuevas de Yerbabuena)

+Cuevas de Yerbabuena, near Yerbabuena, 12 km NW Teloloapan, 1800 m, Mpo. de ?Ixcapuzalco (Martínez and Villa R., 1940:301-303) (INCLUDES: Cueva de Puente de Díos, Cueva de la Laguna Honda, Cueva de la Tranca de Ixcapaneca, and three unnamed caves)

HIDALGO

Jacala Region

+Cave, Durango, Mpo. de Zimapán (Woodall, 1941:1)

+Cave W of Pinalito, Colonia Santa María, Mpo. de Jacala (Villa R., 1967:208)

+Cueva de Belén, 500 m N Encarnación, 2000 m, Mpo. de Zimapán (Barrera, 1951:200)

*Sótano del Hondo de Pinalito, near Pinalito, Mpo. de Jacala (Bittinger, 1975:13, 14m)

+Cueva de la Mariposa, Jacala, 1415 m, Mpo. de Jacala (Villa R., 1967:327)

Cueva de El Ocote, 1.5 km N Palomas, 1600 m, Mpo. de Chapulhuacán (Hendrichs and Bolívar, 1966:9)

*Cueva Piedra Ancha, Puerto Obscuro, 19 km by road SW Chapulhuacán, Mpo. de Chapulhuacán (Fish and Reddell, 1965:74)

Cueva del Puerto de la Zorra, Puerto de la Zorra, 10 km NE Jacala, Mpo. de Jacala

Cueva de Santa Ana, Santa Ana, Mpo. de Chapulhuacán

Cueva de El Tenango, Rancho de El Tenango, 3 km NW Chapulhuacán, Mpo. de Chapulhuacán (Fish and Reddell, 1965:73)

Lagunillas Region

*Grutas de Xoxafí, 5.6 km N Lagunillas, 1833 m, Mpo. de Santiago de Anaya (Fish and Reddell, 1965:74)

Tonoltongo Region

Grutas de Tonoltongo, 16 km NE Cardonal, Mpo. de Cardonal (Villada, 1910:31-33, pl. VIII-X)

Zacualtipán Region

+Cave 3 km S Zacualtipán, Mpo. de Zacualtipán (Carter and Jones, 1978:8)

JALISCO

+Small cave 2 km NNW Barra de Navidad, Mpo. de Cihuatlán (Watkins et al., 1972:7, 19)

+Large cave 3 km E Bolaños, Mpo. de Bolaños (Watkins et al., 1972:8, 12)

+Cave, Cuetzmalá, Mpo. de La Huerta (Watkins et al., 1972:8)

+Cave, Rancho del Preciado, near El Grullo, Mpo. de El Grullo (Johnson, 1948:191)

+Limestone sink 9.5 km SW and 10.5 km E Pihuamo, Mpo. de Pihuamo (Thompson, 1968:160)

+Cave 3 km ESE Plan de Barrancas, Mpo. de Hostotipaquillo (Watkins et al., 1972:8)

+Cueva "El Chico," 5 km NW Tuxcacuesco, Mpo. de Tuxcacuesco (Hoffmann, 1962:222)

+Cueva D. C. B., 7.5 km W Jamay, Mpo. de Jamay (Villa R. et al., 1967:10)

+Cueva de las Garrochas (three caves), 17 km NNW Soyatlán del Oro, Mpo. de Atengo (Watkins et al., 1972:30, 32)

+Cueva de Ginés, Etzatlán, Mpo. de Etzatlán (Watkins et al., 1972:23)

+Cueva Hedionda, 10 km S Huascato, Mpo. de Degollado La Rivera (Watkins et al., 1972:14)

MEXICO

+Cave in Paso Oyamecalco, 25 km N Coatepec Harínas, Mpo. de Coatepec Harínas (Villa R., 1967:428-429)

+Cave near Zacazonapán, Mpo. de Zacazonapán (Burns, 1970:391)

+Cueva de la Barranca de los Idolos, west face of Barranca de los Idolos, 32 km SW or 35 km W Ciudad de México (Villa R., 1967:309, 367)

+Cueva de Coatepec Harínas, 1 km SE Coatepec Harínas, Mpo. de Coatepec Harínas (Bonet, 1971:50-52, mapa 7; Sbordoni and Argano, 1972:14)

+Cueva del Diablo, La Peña, Valle de Bravo, 1800 m, Mpo. de Valle de Bravo (Villa R., 1967:430, 433)

Grutas de la Estrella—see GUERRERO

+Cueva de la Peña Blanca, Valle de Bravo, Mpo. de Valle de Bravo (Hoffmann et al., 1978:41)

MICHOACAN

+Caves on ranches near arroyo of Aguililla River, NE Aguililla, Mpo. de Aguililla (Johnson, 1948:191)

+Cave at Apatzingan, 315 m, Mpo. de Apatzingan (Hall and Villa R., 1949:440)

+Cave on limestone hill at eastern edge of Coalcomán de Matamoros, Mpo. de Coalcomán de Matamoros (Hooper, 1961:121)

+Cave at El Guyabo, 34 km S Uruapan, Mpo. de ?Uruapan (Hall and Villa R., 1949:441)

+Cave 3 km W Patzcuaro, 2330 m, Mpo. de Patzcuaro (Hall and Villa R., 1949:441)

+Cave 3 km N Patzcuaro, 2150 m, Mpo. de Patzcuaro (Handley, 1959:149)

Cave 30 km W Zamora, 1900 m, Mpo. de Villa Mar

Las Grutas, 8 km W Ciudad Hidalgo, Mpo. de Ciudad Hidalgo

+Cueva de la Arena, 5 km SW Jacona, 1550 m, Mpo. de Jacona (Villa R., 1967:327, 430, 433)

+Cueva de las Caleras, Ciudad Hidalgo, Mpo. de Ciudad Hidalgo (Nesbitt, 1949:64, 66)

+Cueva del Cerro del Borrego, 10 km from Hacienda San José de Chila, Mpo. de Apatzingan (Tellez Girón, 1944:37-38)

+Cueva de la Colmena, Cerro La Beata, 3 km NW Tangancícuaro, Mpo. de Tangancícuaro (Villa R., 1967:327)

+Cueva de la Estancia, near Los Bancos, Mpo. de ?Paracuaro (Tellez Girón, 1944:37)

Cueva de la Isla Janitzio—see Cueva de Janitzio

+Cueva de Janitzio, Lago de Patzcuaro, 2200 m, Mpo. de Patzcuaro (Ueshima, 1968:145, 146)
+Cueva de los Monos, 10 km NW Aguililla, Mpo. de Aguililla (Tellez Girón, 1944:38)
+Cueva Prieta, Rancho Agua Fría, SE of Aguililla, Mpo. de Aguililla (Tellez Girón, 1944:38)
Grutas de Pujido, Mpo. de Chincuila

MORELOS

+Small cave 8 km NE Alpuyeca, 18 km SE Cuernavaca, Mpo. de Xochitepec (Davis and Russell, 1954:69) (Cuernavaca, E14A59)
+Cave at Amacuzac, 20 km ENE Taxco, 900 m, Mpo. de Amacuzac (Davis and Russell, 1954:67 (Taxco, E14A68)
+Cave on Cerro Frío, 21 km SW Jojutla de Juárez, Mpo. de Puente de Ixtla (Ward, 1904:654 (Tilzapotla, E14A79) (NOTE: May be in Guerrero)
+Cave near Cuautla, Mpo. de Cuautla (U. S. Bureau of Sport Fisheries and Wildlife, 1970:15)
+Cave at southern edge of Cuernavaca, Mpo. de Cuernavaca (Flores Crespo et al., 1970:627) (Cuernavaca, E14A59)
+Shallow cave, Cuernavaca, Mpo. de Cuernavaca (Roth, 1968:20) (Cuernavaca, E14A59)
+Cave, Las Fuentes de Chapultepec, 8 km SE Cuernavaca, Mpo. de Cuernavaca (Herrera, 1911:4) (Cuernavaca, E14A59)
+Large deep cave 3 km S Jonacatepec, Mpo. de Jonacatepec (Davis and Russell, 1954:68)
+Cave near Temixco, 6 km S Cuernavaca, Mpo. de Temixco (Barbour, 1945b:80) (Cuernavaca, E14A59)
+Small cave at Tepoztlán, 15 km NE Cuernavaca, Mpo. de Tepoztlán (Chopard, 1947:67) (?Cuernavaca, E14A59)
+Cave near Laguna Tequesquitengo, 8 km W Jojutla de Juárez, Mpo. de Jojutla de Juárez (Grummon and Novick, 1963:363) (Jojutla de Juárez, E14A69)
+Small cavern near Zacoalpán de Amilpas, Mpo. de Zacoalpán de Amilpas (Ward, 1904:645)
+Cueva del Amate, near Cuernavaca, Mpo. de ?Cuernavaca (U. S. Bureau of Sport Fisheries and Wildlife, 1970: 19) (Cuernavaca, E14A59)
+Cueva de la Barranca de Apatlaco, near Xochitepec, 16 km S Cuernavaca, Mpo. de Xochitepec (Malaga Alba and Villa R., 1957:536)
+Cueva del Cerro, 1 or 3.4 km S Laguna Tequesquitengo, 11 km SW Jojutla de Juárez, 840 m, Mpo. de Jojutla de Juárez (Malaga Alba and Villa R., 1957:335) (Jojutla de Juárez, E14A69)
+Cueva 18 de Julio, 9 km SSW Temixco, 15 km SSW Cuernavaca, Mpo. de Temixco (Villa R., 1967:327, 333) (Cuernavaca, E14A59)
+Cueva del Gallo, Ticumán, 21 km SW Cuernavaca, Mpo. de Tlaltizapán (Villa R., 1967:153) (Cuernavaca, E14A59)
+Cuevas de Huajintlán, 0.5 km NW Huajintlán, 19 km ENE Taxco, Mpo. de Amacuzac (Davis and Russell, 1954:67, 68) (Taxco, E14A68)
+Cueva del Idolo, 1 km S Tequesquitengo, 9 km WSW Jojutla de Juárez, 950 m, Mpo. de Jojutla de Juárez (Villa R., 1963:384, 387, 390 (Jojutla de Juárez, E14A69)
+Cueva de Leona, District of Juárez, Mpo. de ?Jojutla de Juárez (Ward, 1904:653)
+Cueva de Michapa, in Cañada de Michapa, Mpo. de Cocoyotla (Bonet, 1971:48) (?Tenancingo, E14A58)
+Cueva de los Muñecos, near Cuernavaca, Mpo. de ?Cuernavaca (U. S. Bureau of Sport Fisheries and Wildlife, 1970:19) (Cuernavaca, E14A59)
+Cueva del Murciélago, 6.5 km NW Tres Cumbres, 3400 m, Mpo. de Huitzilac (Villa R., 1967:367, 368, 369, 428, 430)
Cueva Ocho de Julio—see Cueva 18 de Julio
+Cueva de Oxtoyahualolco, 6 km NNE Tepoztlán, 2000 m, Mpo. de Tepoztlán (Malaga Alba and Villa R., 1957:542)
+Cueva Palmira III, 6 km S Cuernavaca, Mpo. de Cuernavaca (U. S. Bureau of Sport Fisheries and Wildlife, 1971:16) (Cuernavaca, E14A59)
+Cueva de Palo Bolero, Palo Bolero, 17 km S Cuernavaca, Mpo. de Xochitepec (Villa R., 1967:49)
+Cueva Poza de Moctezuma, 1 km E, 2 km E, or 2 km W Oaxtepec, Mpo. de ?Yautepec (Villa R., 1967:67, 69, 176, 177, 178, 180, 203, 457)
Cueva de la Presa de Moctezuma—see Cueva Poza de Moctezuma
+Cueva del Río Palmira, S of Cuernavaca, Mpo. de Cuernavaca (U. S. Bureau of Sport Fisheries and Wildlife, 1971:16) (Cuernavaca, E14A59)
+Cueva del Río Tetlama, 12 km NNW Cuernavaca, Mpo. de Temixco (Villa R., 1967:156) (Cuernavaca, E14A59)
+Cueva del Salitre, Tequesquitengo, 8 km W Jojutla de Juárez, Mpo. de Jojutla de Juárez (Handley, 1966: 300) (Jojutla de Juárez, E14A69)
+Cueva del Salitre, 3 or 5 km S Tetacalita, 15 km N Jojutla de Juárez, 1152 m, Mpo. de Emiliano Zapata (Malaga Alba and Villa R., 1957:536, 537, 542) (?Jojutla de Juárez, E14A69)
+Cueva del Salitre, 10 km NNW Ticumán, 14 km SE Cuernavaca, Mpo. de Ticumán (Villa R. and Jiménez G., 1961:504) (Cuernavaca, E14A59)
+Cueva del Salitre, 4 km W Xochimanca, 17 km SE Cuernavaca, 1600 m, Mpo. de Ticumán (Villa R., 1967: 245)
Cueva de Xochitepec—see Cueva de la Barranca de Apatlaco

NAYARIT

+Caves on Isla María Madre (Nelson, 1899:18)
+Cueva del Fuerte de San Blas, on cliff facing San Blas, Mpo. de San Blas (Villa R., 1967:231)
+Cueva del Tesoro, 50 km SSE Tepic, Mpo. de Santa María del Oro (Villa R., 1967:305)
+Cueva de Ventanas, 2 km S Manzanillo (Villa R., 1967: 152)

NUEVO LEON

Cañón Huasteco Region

Gruta Aguila del Oro, 2 km S Santa Catarina, 1740 m, Mpo. de Santa Catarina (Fish and Reddell, 1967: 82; Sumbera, 1972:118-119 (Garza García, G14C25)
Grutas de San Bartolo—see Gruta Sur de San Bartolo and Gruta Norte de San Bartolo
Gruta Norte de San Bartolo, 9 km S Santa Catarina, 900 m, Mpo. de Santa Catarina (Russell and Raines, 1967:21, 22m) (Garza García, G14C25)

*Gruta Sur de San Bartolo, 9 km S Santa Catarina, 900 m, Mpo. de Santa Catarina (Raines, 1968b: 140-141, 143) (Garza García, G14C25)
Cueva de Tío Bartolo—see Gruta Norte de San Bartolo and Gruta Sur de San Bartolo

Cañón de Iturbide Region

+*Cueva La Chorrera, 27.3 km SW Linares, Mpo. de Linares
Cueva del Ebanito—see Cueva del Nacimiento de El Ebanito
+Cueva de Guadalupe, Cañón de Itiurbide, 25 km SW Linares, Mpo. de Linares (Malaga Alba and Villa R., 1957:539)
*Cueva del Nacimiento de El Ebanito, El Ebanito, 10 km ENE Iturbide, Mpo. de Linares (Russell, 1973b:280) (Iturbide, G14C67)

Cerro de la Boca Region

*Cueva de Chorros de Agua, 23 km SW Montemorelos, 700 m, Mpo. de Montemorelos (Russell and Raines, 1967:29, 38) (Montemorelos, G14C47)

Cerro Potosí Region

+Cave, Loma La Cueva, 1.5 km SW San José La Hoya, 27 km WNW Galeana, 2720 m, Mpo. de Galeana (Radovsky et al., 1971:738) (Galeana, G14C56)

Cuesta de Chipinque Region

Small caves on Cuesta de Chipinque—see Caves 1-3
*Cave No. 1, Cuesta de Chipinque, Monterrey, 1500 m, Mpo. de Monterrey (Peck and Peck, 1973:64) (Garza García, G14C25)
Cave No. 2, Cuesta de Chipinque, Monterrey, 1500 m, Mpo. de Monterrey (Peck and Peck, 1973:64) (Garza García, G14C25)
Cave No. 3, Cuesta de Chipinque, Monterrey, 1500 m, Mpo. de Monterrey (Peck and Peck, 1973:64) (Garza García, G14C25)

Galeana Region

Chevy Sink, 7 km SW Galeana, 1780 m, Mpo. de Galeana (Galeana, G14C56)
Pozo de Gavilán, 7 km SW Galeana, 1780 m, Mpo. de Galeana (Russell and Raines, 1967:31, 38, 40m) (Galeana, G14C56)
Cueva del Limón, 1.2 km E San Marcos, 15 km S Galeana, Mpo. de Galeana (San José de Raices, G14C66)
*Resumidero de Pablillo, 4 km NNE Pablillo, 26 km SE Galeana, 2000 m, Mpo. de Galeana (Russell and Raines, 1967:31, 38, 41m) (Iturbide, G14C67)
Sótano de la Piña—see Sótano del Pino
Sótano del Pino, 6 km SSW Galeana, 1700 m, Mpo. de Galeana (San José de Raices, G14C66)
Cueva Sur del Sótano de Dos Cuevas, 1.5 km S Santa Fe, 15.5 km ESE Galeana, 1800 m, Mpo. de Galeana (Reddell, 1966d:49) (San José de Raices, G14C66)
Cueva de Yeso Blanco, 6 km SW Galeana, 1740 m, Mpo. de Galeana (Galeana, G14C56)

Monterrey Region

+Well, Monterrey, Mpo. de Monterrey (Packard, 1894: 732)

Pico de Carrizal Region

*Gruta de Carrizal, 10 km SW El Candela, Mpo. de Lampazos de Naranjo (Russell and Raines, 1967: 13, 14m)

Potrero Redondo Region

Sótano de la Anticlina, 9 km SSW Villa de Santiago, Mpo. de Villa de Santiago (Raines, 1972b:96) (Allende, G14C36)
Sótano de Potrero Redondo, 17 km S Villa de Santiago, Mpo. de Villa de Santiago (Allende, G14C36)
Redondo Pit Cave—see Sótano de Potrero Redondo

Purificación Region

Cueva del Borrego—see TAMAULIPAS
Cueva del Brinco--see Sistema Purificación, TAMAULIPAS
Cueva de California—see TAMAULIPAS
Cueva del Camino—see TAMAULIPAS
Cueva de Chuparosa—see TAMAULIPAS
Sótano de Jesús—see TAMAULIPAS
Cueva del Ojo de Agua, 4 km WSW Dulces Nombres, Mpo. de Aramberri (Casas Reales, F14A18)
*Cueva Chica del Ojo de Agua, 4 km WSW Dulces Nombres, Mpo. de Aramberri (Casas Reales, F14A18)
Cueva de los Parajitos, 2 km N Tinajas (=Los Tanques), 7 km SE Dulces Nombres, Mpo. de Aramberri (Casas Reales, F14A18)
Pozo de los Peñuelos—see Sótano de las Peñuelas
*Sótano de las Peñuelas, 3 km SW Dulces Nombres, 2010 m, Mpo. de Aramberri (Casas Reales, F14A18)
Sótano de Rancho Nuevo n. 1—see TAMAULIPAS
Sótano de Rancho Nuevo n. 2—see TAMAULIPAS
Sótano de Rancho Nuevo n. 3—see TAMAULIPAS
Sótano de Rancho Nuevo n. 4—see TAMAULIPAS
Cueva de Rancho Revilla—see Cueva de Revilla, TAMAULIPAS
Cueva del Tecolote—see Cueva de Desmontes, TAMAULIPAS
Cueva Vrincón—see Sistema Purificación, TAMAULIPAS

Sierra Las Animas Region

+Puente de Díos, 7 km NNW Galeana, 1460 m, Mpo. de Galeana (Russell and Raines, 1967:38) (Galeana, G14C56)

Sierra del Fraile Region

Grutas de García—see Grutas de Villa de García
+Cueva del Rincón de la Virgen, 6.8 km N Villa de García, 1200 m, Mpo. de Villa de García (Malaga Alba and Villa R., 1957:559, 564, 566) (Hidalgo, G14C15)
*Grutas de Villa de García, 7 km NW Villa de García, 1060 m, Mpo. de Villa de García (Russell and Raines, 1967:19, 20m) (Hidalgo, G14C15)

Sierra de Garia Region

Cueva de Constantín, 8 km S Espinazo, Mpo. de Mina (Bittinger, 1972:56, 57m) (Reata, G14A83)

Sierra de Gomas Region

Cave 7 km SSW Bustamante, Mpo. de Bustamante

Pit 7 km SSW Bustamante, Mpo. de Bustamante (Fromén, 1965:44-45)

*Grutas del Palmito, 7 km SSW Bustamante, Mpo. de Bustamante (Russell and Raines, 1967:16, 17-18m; Ediger, 1970:3-7, 5m)

Cueva del Precipicio, 9 km SW Bustamante, Mpo. de Bustamante (Russell, 1973a:363-365; Walsh, 1973: 100-101)

Sierra de Iguana Region

+Cueva del Diablo, 7 km by road W Sabinas Hidalgo, Mpo. de Sabinas Hidalgo (Hershberger, 1967:88-89, 90m)

+Cueva Envenenada, 7 km by road W Sabinas Hidalgo, Mpo. de Sabinas Hidalgo (Aguirre Pequeño, 1959: 245, 246)

Sierra de Santa Clara Region

Cueva del Camino—see Cueva de las Fisuras

Cueva de las Fisuras, 16 km by road W Sabinas Hidalgo, Mpo. de ?Sabinas Hidalgo (Russell and Raines, 1967:21)

Sierra de la Silla Region

*Flooded mine below Cueva de la Boca, 3 km E Villa de Santiago, 500 m, Mpo. de Villa de Santiago (Peck and Peck, 1973:63) (Allende, G14C36)

*Cueva de la Boca, 3 km E Villa de Santiago, 540 m, Mpo. de Villa de Santiago (Russell and Raines, 1967:26, 35, 36m, 37) (Allende, G14C36)

Cueva de la Villa de Santiago—see Cueva de la Boca

Sierra El Tarillal Region

Cueva de las Vigas, El Carmen (=Las Vigas), 22 km E Arteaga, 2300 m, Mpo. de Santa Catarina (Reddell, 1966d:53) (San Antonio de las Alazanas, G14C35)

Zaragoza Region

Cueva de Cuesta Blanca, 3 km W Zaragoza, Mpo. de Zaragoza (Russell and Raines, 1967:31, 38) (Zaragoza, F14A17)

Sótano de Cuesta Blanca, 3 km W Zaragoza, Mpo. de Zaragoza (Russell and Raines, 1967:38) (Zaragoza, F14A17)

Dolina Cave, 4 km N Zaragoza, Mpo. de Zaragoza (Zaragoza, F14A17)

OAXACA

Acatlán Region

+Cave on Cerro Piñón, 12 km S Acatlán, Mpo. de Acatlán (Constantine, 1966:126)

Cave near Los Corrales, 11 km SSW Acatlán, Mpo. de Acatlán

+Cave 1.5 km NW Los Limones, 18 km S Acatlán, Mpo. de Acatlán (Constantine, 1966:125)

+Cave 5 km W Los Limones, 18 km S Acatlán, Mpo. de Acatlán (Constantine, 1966:125)

Cueva de Campo Chico, 9 km SSW Acatlán, Mpo. de Acatlán

*Cueva de Cayetano, 10 km SW Acatlán, Mpo. de Acatlán

*Cueva de Los Corrales, 2 km W Los Corrales, 11 km SSW Acatlán, Mpo. de Acatlán

*Cueva de la Culebra, 10 km SW Acatlán, Mpo. de Acatlán

*Cueva Desapareciendo, 2 km SW Acatlán, Mpo. de Acatlán

Sótano Desapareciendo, 2 km SW Acatlán, Mpo. de Acatlán

*Cueva de la Finca, 10 km SW Acatlán, Mpo. de Acatlán

*Cueva de Juan Sánchez, 10 km NW Acatlán, Mpo. de Acatlán (Byrd, 1976:23, 24m)

*Cueva Chica de Juan Sánchez, 12 km NW Acatlán, Mpo. de Acatlán

Cueva de la Junta, 5 km SW Acatlán, Mpo. de Acatlán (Reddell, 1973e:88-89)

*Cueva de la Laguna Verde, 10 km SW Acatlán, Mpo. de Acatlán (Coons, 1977:18-20, 21m)

*Cueva del Lencho Virgen, 9 km SSW Acatlán, Mpo. de Acatlán (Reddell and Elliott, 1974:9)

*Cueva de las Maravillas, 6 km SSW Acatlán, Mpo. de Acatlán (Reddell, 1973f:95)

+Cueva del Nacimiento, above Vista Hermosa, Acatlán, Mpo. de Acatlán (Villa R., 1967:224)

*Cueva del Nacimiento del Río San Antonio, 10 km SSW Acatlán, Mpo. de Acatlán (Reddell, 1973e: 89; Reddell, 1973f:95; Reddell and Elliott, 1974:9)

Cueva Sin Fin, 2 km SW Acatlán, Mpo. de Acatlán

Sótano Sin Hondo, 5 km SSW Acatlán, Mpo. de Acatlán

Huautla de Jiménez Region

*Cave near Puente de Fierro, 1.5 km N Huautla de Jiménez, Mpo. de Huautla de Jiménez

Sink near Huautla de Jiménez, Mpo. de Huautla de Jiménez

Cave No. 3, near Huautla de Jiménez, Mpo. de Huautla de Jiménez

Pit No. 2, near Huautla de Jiménez, Mpo. de Huautla de Jiménez

*Sótano de Agua de Carrizo, 5 km ESE Huautla de Jiménez, Mpo. de Huautla de Jiménez (Stone, 1979a:33-52, 2 maps)

Cueva del Arroyo Mazateca, San Miguel Dolina, San Miguel, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez

Cueva del Camino, Puente de Fierro, 1.5 km N Huautla de Jiménez, Mpo. de Huautla de Jiménez

*Cueva del Escorpión, San Miguel Dolina, San Miguel, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez

The Fissure—see La Grieta

*La Grieta, 2 km E San Andres, 5 km E Huautla de Jiménez, Mpo. de Huautla de Jiménez (Stone, 1977:7-17, map; Steele, 1978:26-29, map)

*Milliped Cave, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez (Fish and Russell, 1966:63, 66m)

*Milliped Cave, 1.5 km N Huautla de Jiménez, Mpo. de Huautla de Jiménez (Russell, 1965:62)

*Cueva del Molino de Carne, 5 km ESE Huautla de Jiménez, Mpo. de Huautla de Jiménez

*Cueva de los Pájaros, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez

Cueva Arriba del Presidente, 1 km N Huautla de Jiménez, Mpo. de Huautla de Jiménez

*Cueva Bonita del Presidente, 1 km N Huautla de Jiménez, Mpo. de Huautla de Jiménez

*Cueva del Puente de Fierro, 1.5 km N Huautla de Jiménez, Mpo. de Huautla de Jiménez (Russell, 1965:62)

Cueva de Puente Fierrón—see Cueva del Puente de Fierro

*Gruta de Regadura, 2 km N Huautla de Jiménez, Mpo. de ?Huautla de Jiménez (Russell, 1965:62)

Cueva Arriba del Río Iglesia—see Sótano del Río Iglesia

*Sótano del Río Iglesia, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez (Boon, 1969:32, 35m, 39)

*Cueva de San Agustín, San Agustín, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez (Boon, 1969:33m, 39-40; Finn, 1971:46, 47m, 49)

*Sótano de San Agustín, San Agustín, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez (Fish, 1970:3-7, map; Steele, 1978:map; Stone, 1979b:33-58, 3 maps)

Water-Trough Cave, 5 km SE Huautla de Jiménez, Mpo. de Huautla de Jiménez (Fish and Russell, 1966:62, 66m)

Isthmo de Tehuantepec Region

+Cave 2 km S Tollosa, 100 m (Baker and Greer, 1960:414, 415)

+Cave near Montebello, 24 km N Matías Romero, Mpo. de San Juan Guichicovi (Villa R., 1967: 157)

+Cave 29 km N Matías Romero, Mpo. de ?San Juan Guichicovi (Schaldach, 1965:133)

+Cave 38.4 km N Matías Romero, Mpo. de Matías Romero (Schaldach, 1965:131)

+Cave at Santo Domingo Tehuantepec, Mpo. de Santo Domingo Tehuantepec (de la Torre, 1955:696)

+Las Cuevas, "bat caves" in the bed of the Río Tehuantepec, 16 km NW Santo Domingo Tehuantepec, Mpo. de Jalapa del Márques (Goodwin, 1969: 260)

+Cueva del Convento, 6 km NE Magdalena Tequisistlán, Mpo. de Jalapa del Márques (Monés, 1971: 169)

Cueva Diana Liesa—see Cueva Lisa

+Cueva Lisa, 1 km W Santo Domingo Tehuantepec, 50 m, Mpo. de Santo Domingo Tehuantepec (Villa R., 1967:153)

+Cueva Piña del Colorado, 1 km S Magdalena Tequisistlán, Mpo. de Magdalena Tequisistlán (Villa R., 1967:153)

+Cuevas de Santo Domingo, in the center of Istmo de Tehuantepec (Sumichrast, 1882:203)

Mitla Region

+Cave 8 km NW Mitla, Mpo. de ?San Luis Quiavini (Ingles, 1959:384)

Oaxaca Region

+*Well, Etla, Oaxaca (Argano, 1977:117)

San Gabriel Mixtepec Region

+Cave at Km 183, 36.5 km N San Gabriel Mixtepec, 1700 m, Mpo. de Juquila (Schaldach, 1966:292)

San Juan Bautista Cuicatlán Region

+Fissure at San Juan Bautista Cuicatlán, Mpo. de San Juan Bautista Cuicatlán (Villa R., 1967:423)

+Cave 4.5 km N San Juan Bautista Cuicatlán, Mpo. de San Juan Bautista Cuicatlán (Villa R., 1967:205)

San Sebastián de las Grutas Region

Sótano de los Arboles, 1 km S San Vicente Lachixio, Mpo. de San Vicente Lachixio (Reddell, 1973e:91)

Cueva de Llano Grande, 1 km S San Vicente Lachixio, 2010 m, Mpo. de San Vicente Lachixio (Reddell, 1973e:90)

Sótano de los Niños, near Grutas de San Sebastián, 3 km N San Sebastián de las Grutas, Mpo. de Santa María Sola

*Grutas de San Sebastián, 3 km N San Sebastián de las Grutas, 1820 m, Mpo. de Santa María Sola (Russell, 1972d:70-71; Reddell, 1973e:90-91

Santiago Apoala Region

*Cueva de Apoala, Santiago Apoala, 2000 m, Mpo. de Santiago Apoala (Harden, 1971:36; Reddell, 1973e:91)

Sótano de las Bellotas, 5 km NW Santiago Apoala, 2240 m, Mpo. de Santiago Apoala

*Comedor del Diablo, 5 km NW Santiago Apoala, 2240 m, Mpo. de Santiago Apoala (Harden, 1971: 36; Reddell, 1973e:91)

Cueva de la Laguna—see Cueva de Apoala

Sótano de la Milpa Agua, near Santiago Apoala, Mpo. de Santiago Apoala

Cueva de Santa Catarina, 12 km NW Apoala, Mpo. de Santa Catarina Ocotlán (Reddell, 1973e:91)

Sótano de Un Grillo, 5 km NW Apoala, 2240 m, Mpo. de Santiago Apoala

Valle Nacional Region

Cueva del Brujo, 12 km N Valle Nacional, Mpo. de Valle Nacional (Reddell, 1973e:90)

*Cueva del Guano, 8 km N Valle Nacional, Mpo. de Valle Nacional (Reddell, 1973e:89-90)

*Cueva del Guayabo, 12 km N Valle Nacional, Mpo. de Valle Nacional (Reddell, 1973e:90)

Cueva de Loma del Carmen, 15 km N Valle Nacional, Mpo. de Valle Nacional (Reddell, 1973e:89)

*Grutas de Monteflor, Monteflor, 6 km N Valle Nacional, Mpo. de Valle Nacional (Reddell, 1973e:90)

Unplaced Localities

+Well, Lambityeco (Ruffo and Vigna Taglianti, 1977: 166)

+Cueva de Dominguillo, Dominguillo (Villa R. and Jiménez G., 1961:504)

PUEBLA

Cuetzalan Region

*Grutas de Ateno, 2 km NW Xochitlán, Mpo. de Xochitlán (Reddell, 1974:185-186, pl. 5m)

*Grutas de Atepolihuit, 2 km W Cuetzalan, Mpo. de Cuetzalan (Davis, 1974:179, 180m)

*Cueva de la Barranca, 7 km SW Cuetzalan, Mpo. de Cuetzalan (Reddell, 1974:188)

Sima de los Bueyes, 2 km S Cuetzalan, Mpo. de Cuetzalan (Sprouse, 1979:61, 63m)

Cueva de los Camarones, 2.5 km NW Xochitlán, Mpo. de Xochitlán (Reddell, 1974:186)

Sima de Cohuatichan—see Sima de los Bueyes

*Sumidero de Cohuatichan, 2 km S Cuetzalan, Mpo. de Cuetzalan (Davis, 1974:182-183, pl. 4m)
Sumidero de Cuetzeltemanes, 1 km W Xochitlán, Mpo. de Xochitlán (Reddell, 1974:186)
Sima Esteban, 7 km SW Cuetzalan, Mpo. de Cuetzalan (Reddell, 1974:187, pl. 6m)
*Grutas de Jonotla, 1.5 km SSW Jonotla, Mpo. de Jonotla (Davis, 1974:171)
Cueva de la Milpa, 7 km SW Cuetzalan, Mpo. de Cuetzalan (Reddell, 1974:185)
Sima Octimaxal Norte–see Sima Octimaxal Sur n. 2
Sima Octimaxal Sur n. 1, 3 km SSW Cuetzalan, Mpo. de Cuetzalan (Davis, 1974:177, 178m, 179)
Sima Octimaxal Sur n. 2, 3 km SSW Cuetzalan, Mpo. de Cuetzalan (Anonymous, 1973:12-13, 15m; Davis, 1974:179)
Grutas de Olivares, 7 km SW Cuetzalan, Mpo. de Cuetzalan (Reddell, 1974:187, 189m)
*Cueva de Tasalolpan, 2 km W Cuetzalan, Mpo. de Cuetzalan (Sprouse, 1979:62, map)
*Grutas de Tenextepec, 6 km SW Cuetzalan, Mpo. de Cuetzalan (Davis, 1974:166-167, 168m)
Cueva de la Víbora, 1 km NW Xochitlán, Mpo. de Xochitlán (Reddell, 1974:186)
*Cueva Xochitl, 1 km SE Xochitlan, Mpo. de Xochitlán (Davis, 1974:162-163)
Sima Chica de Xochitlán, Xochitlán, Mpo. de Xochitlán
Cueva de Xocoyolo, 5.5 km SW Cuetzalan, Mpo. de Cuetzalan (Davis, 1974:174-175, pl. 2m)
Cueva Murciélago de Xocoyolo, 5.5 km SW Cuetzalan, Mpo. de Cuetzalan (Davis, 1974:175)
Sumidero de Yohuatichan–see Sumidero de Cohuatichan

Hueytemalco Region

+Cave 10 km W Hueytemalco, Mpo. de Hueyapán (Ramírez-Pulido and Sánchez-Hernández, 1971: 481)

Izucar de Matamoros Region

+Cave near San Juan Raboso, Mpo. de Izucar de Matamoros (González Ochoa, 1964:983)
+Cave at spring 3 km E San Juan Raboso, Mpo. de Izucar de Matamoros (Smith and Van Gelder, 1955: 147)
Cuevas de Matamoros–see Cuevas del Río Nexapa
+Cuevas del Río Nexapa, on left side of Río Nexapa near Izucar de Matamoros, Mpo. de Izucar de Matamoros (Caballero y C., 1943:426)
+Cueva del Salto de Alcececa, 9 km S Atzalan (=?Atzala), Mpo. de ?Chietla (Villa R., 1967:367)

Mesa de San Diego Region

+Talus cave on Mesa de San Diego, Mpo. de Venustiano Carranza (Warner and Beer, 1957:17)

Tehuacán Region

+Caves in the El Riego cliffs south of Tehuacán, Mpo. de Tehuacán (Flannery, 1967:155)
+*Well, Tehuacán, Mpo. de Tehuacán (Ruffo and Vigna Taglianti, 1977:166)

Tlapacoya Region

+Cave near Tlapacoyan (=Tlapacoya), Mpo. de Tlapacoya (Bhatnagar, 1978:865)

Xicotepec Region

+Cueva del Azufre, near Xicotepec, Mpo. de Xicotepec (Villa R., 1967:267)
Cueva Grillo de la Mona, 3 km W Xicotepec, Mpo. de Xicotepec (Reddell, 1973f:92)
Cueva Vampiros de la Mona, 3 km W Xicotepec, Mpo. de Xicotepec (Reddell, 1973f:92)
+Cueva de Patla, Planta Hidroelectrica de Tepexi, 8 km SW Xicotepec, Mpo. de Xicotepec (Rioja, 1954:287)

San Pablo Zoquitlán Region

Sótano of log-filled sink, 10 km E San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán
Cueva del Caballo n. 1, 10 km E San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán
Cueva del Caballo n. 2, 10 km E San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán
Cueva del Caballo n. 3, 10 km E San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán
*Sótano de Coyomeapan, 12 km ESE San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán (Atkinson, 1978:47-50, map)
*Horizontal Cave, 12 km ESE San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán
Overflow Cave–see Cueva de Xocotlat
Preston's Overflow Cave–see Cueva de Xocotlat
Cueva del Río Texocotla–see Sumidero de Xocotlat
Second River Cave–see Sótano de Coyomeapan
*Cueva del Terrible, 10 km E San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán
Cueva de Xocotlat, 2 km SSE San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán (Atkinson and Forsythe, 1979:76-81, map)
*Sumidero de Xocotlat, 10 km E San Pablo Zoquitlán, Mpo. de San Pablo Zoquitlán (Russell, 1977:20)

QUERETARO

Ahuacatlán Region

Pit 0.5 km S Agua Fría, 22 km NW Jalpan, Mpo. de Jalpan
Pit in pass, La Florida, 14 km NNW Ahuacatlán, Mpo. de Pinal de Amoles
Sótano de Aguacatilla, 14 km NNW Ahuacatlán, Mpo. de Pinal de Amoles
Sotanito de Ahuacatlán, 2 km NNW Ahuacatlán, 7 km W Jalpan, Mpo. de Pinal de Amoles (Raines, 1972a:17-20, map)
*Cueva de Emilia, 14 km NNW Ahuacatlán, Mpo. de Pinal de Amoles
Cueva de la Milpa, Agua Fría, 22 km NW Jalpan, Mpo. de Jalpan
Sótano del Potrero–see Xilitla Region, SAN LUIS POTOSI
Cueva de Puente de Díos–see Cueva de Puente de Díos del Río Jalpan
Cueva de Puente de Díos del Río Jalpan, 4 km S Puerto Animas, 7 km SW Jalpan, Mpo. de Jalpan (Fish and Reddell, 1967:85)
Cueva del Puente Natural, 4 km S Puerto Animas, 7 km SW Jalpan, Mpo. de Jalpan (Reddell, 1979: 100)

Cueva de los Riscos, 2 km S Rancho Huichale, 8 km SW Jalpan, Mpo. de Jalpan (Fish and Reddell, 1967:85-86, 87m)

Laguna Colorada Region

Sinkhole, Laguna Colorada, 23 km W Xilitla, Mpo. de Landa de Matamoros

Cueva de Camposantos—see Sótano de Camposantos

Sótano de Camposantos, 5 km W El Lobo, 22 km W Xilitla, Mpo. de Landa de Matamoros (Fish and Reddell, 1967:86)

+*Cueva del Madroño, 1.5 km S El Madroño, 19 km W Xilitla, 1810 m, Mpo. de Landa de Matamoros (Bonet, 1953a:92, 94-96, 93m; Sbordoni and Argano, 1972:12-13)

*Cueva del Niño, 5 km W El Lobo, 22 km W Xilitla, Mpo. de Landa de Matamoros (Sbordoni and Argano, 1972:13)

*Cueva de las Tablas, 5 km W El Lobo, 22 km W Xilitla, Mpo. de Landa de Matamoros

Pinal de Amoles Region

*Iron (?) mine, 2 km E Pinal de Amoles, Mpo. de Pinal de Amoles (Peck and Peck, 1973:67)

115-ft. blind pit, San Gaspar, 10 km NW Pinal de Amoles, Mpo. de Pinal de Amoles

Cave No. 1, 20 km N Pinal de Amoles, Mpo. de Pinal de Amoles (Greer, 1979:109)

Cave No. 14, 20 km N Pinal de Amoles, Mpo. de Pinal de Amoles (Greer, 1979:112-113, 112m)

Cave No. 29—see Cave No. 14

Cave No. 33—see Cave No. 1

*Sótano del Buque, 20 km N Pinal de Amoles, Mpo. de Pinal de Amoles (Jefferys, 1979:70-74, map)

Cueva de Chevrón, 3 km E Pinal de Amoles, Mpo. de Pinal de Amoles (Fish and Reddell, 1967:85)

Sótano de Dos Arañas Grandes, 1 km ENE Río Blanco, 2000 m, Mpo. de Peña Miller (Reddell, 1979:99) (Peña Miller, F14C47)

Cueva Encantada, 3 km W La Ciénega, 20 km NNE Pinal de Amoles, Mpo. de Pinal de Amoles (Greer, 1979:114, 115m)

Sótano Encantado—see Cueva Encantada

*Sótano de la Escuela, Llano de San Francisco, 10 km NW Pinal de Amoles, Mpo. de Pinal de Amoles (Bittinger, 1973:86)

Sótano del Gobernador, 2 km S Pinal de Amoles, Mpo. de Pinal de Amoles (Reddell, 1979:100)

*Cueva del Judío, 2 km S Pinal de Amoles, Mpo. de Pinal de Amoles (Reddell, 1979:100)

Sótano de La Lagunita, 2 km NE Río Blanco, 2100 m, Mpo. de Peña Miller (Reddell, 1979:99) (Peña Miller, F14C47)

Cueva del Mercurio, Tejamanil, 3 km SW Pinal de Amoles, Mpo. de Pinal de Amoles (Reddell, 1979:100)

*Cueva de los Otates, Los Pinos, 15 km NW Pinal de Amoles, Mpo. de Pinal de Amoles (Bittinger, 1973:86)

Sótano de la Paila, 20 km N Pinal de Amoles, Mpo. de Pinal de Amoles

*Cueva de Peñalta, 10 km NW Pinal de Amoles, Mpo. de Pinal de Amoles

Sótano del Pino, 20 km NNE Pinal de Amoles, Mpo. de Pinal de Amoles

*Cueva del Puerto del León, 4 km E Río Blanco, Mpo. de Pinal de Amoles (Reddell, 1979:99) (Peña Miller, F14C47)

Cueva de Tejamanil, 0.5 km NE Tejamanil, 2.5 km SW Pinal de Amoles, Mpo. de Pinal de Amoles (Fish and Reddell, 1967:85)

*Sótano de Tejamanil, 0.5 km NE Tejamanil, 2.5 km SW Pinal de Amoles, Mpo. de Pinal de Amoles (Fish and Reddell, 1967:85)

Sótano de El Tigre, 24 km by road SW Jalpan, Mpo. de Landa de Matamoros (Reddell, 1979:100)

San Joaquín Region

Sótano de Herreras—see Grutas de San Joaquín

Cueva del Rincón, La Lagunita, 11 km SSW San Joaquín, Mpo. de San Joaquín (San Joaquín, F14C58)

Sótano del Rincón, La Lagunita, 11 km SSW San Joaquín, Mpo. de San Joaquín (Mothes, 1978:63) (San Joaquín, F14C58)

Grutas de San Joaquín, 2 km SSW San Joaquín, 2440 m, Mpo. de San Joaquín (Mothes, 1978:64-65) (San Joaquín, F14C58)

San Juan Region

Cave of the Bedding, 2 km N San Juan, Mpo. de Arroyo Seco

*Hoya de las Conchas, 3 km N San Juan, Mpo. de Arroyo Seco (Stone and Jameson, 1977:28m, 29-33, map)

Sótano de Conchas—see Hoya de las Conchas

Cueva de Guayavitos, 1 km SW San Juan, Mpo. de Arroyo Seco (Stone and Jameson, 1977:42)

Cueva de la Milpa, 2 km W San Juan, Mpo. de Arroyo Seco

*Sótano de Nogal, 5 km NW San Juan, Mpo. de Arroyo Seco (Stone and Jameson, 1977:34m, 35-39, map)

Sótano de Pedregal, 1 km NE San Juan, Mpo. de Arroyo Seco (Stone and Jameson, 1977:44m)

El Sotanito, 1.5 km N San Juan, Mpo. de Arroyo Seco (Stone and Jameson, 1977:20m, 21, map)

Tancoyol Region

Cueva del Agua del Rancho Ojo de Agua, 20 km NE Jalpan, Mpo. de Jalpan

Sótano de Lagunita Seca, Tancoyol, 20 km NE Jalpan, Mpo. de Jalpan

*El Socavón, Ojo de Agua, 20 km NE Jalpan, Mpo. de Jalpan (Broussard, 1975:2m)

Xilitla Plateau Region

Cueva de Campamiento—see Sumidero del Llano Conejo

Cueva de los Grillos, 3 km N Cerro de la Luz, 13 km NW Xilitla, Mpo. de Llanda de Matamoros

Cueva de Llano de los Chiquitos—see Sumidero del Llano Chiquito

*Sumidero del Llano Chiquito, 12 km W Xilitla, Mpo. de Landa de Matamoros (Fish, 1978b:41, 42m; Fish, 1979:7)

Cueva del Llano del Conejo—see Sumidero del Llano Conejo

*Sumidero del Llano Conejo, 10 km ENE Xilitla, Mpo. de Landa de Matamoros (Fish, 1979:12, 13m)

QUINTANA ROO

Coastal Plain

+Cenote 2 km N Felipe Carrillo Puerto, Mpo. de Felipe Carrillo Puerto (Reddell, 1977b:252)
+Cenote 14 km NE Playa del Carmen, Mpo. de Cozumel (Reddell, 1977b:249)
+Cave 1.5 km S, 1 km E Pueblo Nuevo X-Can, 10 m, Mpo. de Cozumel (Reddell, 1977b:249)
+Cave 1.5 km S, 7 km E Pueblo Nuevo X-Can, Mpo. de Cozumel (Duellman, 1965:584)
+Sink 3 km NE San Miguel, Isla de Cozumel, Mpo. de Cozumel (Reddell, 1977b:249)
+Cave, Rancho Santa Rita, Isla de Cozumel, Mpo. de Cozumel (Reddell, 1977b:249)
+Cave near Cenote, Tancah, Mpo. de Cozumel (Reddell, 1977b:249)
*Cueva de Abispa, 2 km N Tancah, Mpo. de Cozumel (Reddell, 1977b:249-250)
Cenote Aká Chen, Ruinas de Cobá, Mpo. de Cozumel (Reddell, 1977b:251)
+Cenote Antón (Finch, 1965:110)
Cueva de Arena—see YUCATAN
+*Cueva Coop, near Pamul, Mpo. de Cozumel (Holthuis, 1977:175)
*Cueva del Fermín, 3 km E Pamul, Mpo. de Cozumel (Reddell, 1977b:251)
*Actún Ha, Ruinas de Cobá, Mpo. de Cozumel (Reddell, 1977b:251)
*Cenote de Juan Coh, Felipe Carrillo Puerto, Mpo. de Felipe Carrillo Puerto (Reddell, 1977b:252)
Cueva de Kopoil, 0.5 km N Kopoil, Mpo. de Felipe Carrillo Puerto (Reddell, 1977b:252)
+Cueva Rouel, Tancah, Mpo. de Cozumel (Reddell, 1977b:251)
*Cenote de Las Ruinas, 6 km ENE Polyuc, Mpo. de Felipe Carrillo Puerto (Reddell, 1977b:252-253)
*Cenote de San Martín, 2.5 km E Pamul, Mpo. de Cozumel (Reddell, 1977b:251)
*Pozo de San Martín, 2.5 km E Pamul, Mpo. de Cozumel (Reddell, 1977b:251-252)
*Cenote de Santo Domingo, 5 km ENE Kilometer 50, Mpo. de Felipe Carrillo Puerto (Reddell, 1977b: 253)
*Cueva de Tancah, 2 km NW Tancah, Mpo. de Cozumel (Reddell, 1977b:252)
*Cenote de Tos Virlol, 13 km S Señor, Mpo. de Felipe Carrillo Puerto (Reddell, 1977b:253)
Cenote de Tulum, Ruinas de Tulum, Mpo. de Cozumel (Reddell, 1977b:252)
Actún Xpujil, Ruinas de Xpujil, Mpo. de Chetumal (Reddell, 1977b:249)

SAN LUIS POTOSI

Aquismón Region

*Small cave near Hoya de Quital, 10 km S Aquismón, Mpo. de Aquismón
*Spring at La Laja, 6 km SW Aquismón, Mpo. de Aquismón
*Cueva del Agua, 3 km W Rancho de La Linja, 10 km W Aquismón, Mpo. de Aquismón (Russell, 1973a: 47)
*Cueva de Agua Vendita n. 1, 12 km W Aquismón, Mpo. de Aquismón
Sótano de el Fin, 2 km S La Parada, 17 km W Aquismón, Mpo. de Aquismón (Russell, 1973a:48-59) (NOTE: May be in Querétaro)
Sótano de En Fin—see Sótano de el Fin
Sótano de las Golondrinas, 10 km W Aquismón, Mpo. de Aquismón (Raines, 1968a:3-5, map)
*Sótano de Guadalupe, 10 km W Aquismón, Mpo. de Aquismón
*Hoya de las Guaguas, 5 km W La Pimienta, 10 km S Aquismón, Mpo. de Aquismón (Ralph, 1979:64-71, map)
Sótano de Guaguas—see Hoya de las Guaguas
Cueva de las Hormigas, 16 km WNW Aquismón, Mpo. de Aquismón (Russell, 1973a:47) (NOTE: May be in Querétaro)
Sótano de La Linja, Rancho de La Linja, 10 km W Aquismón, Mpo. de Aquismón
*Cueva de la Luz, Rancho de la Luz, 10 km W Tamapatz, 20 km W Aquismón, Mpo. de Aquismón (NOTE: May be in Querétaro)
*Cueva del Nacimiento de San Miguel, 1.5 km E La Cuchilla, 15 km NW Aquismón, Mpo. de Aquismón
*Hoya de Quital, 10 km S Aquismón, Mpo. de Aquismón (Sprouse, 1974:123-124)
Cueva de San Miguel—see Cueva del Nacimiento de San Miguel
*Cueva de San Nicolas, 1 km N Tamapatz, 10 km W Aquismón, Mpo. de Aquismón (Walsh, 1972:33)
*Cueva de San Rafael, 0.7 km N San Rafael, 10 km W Aquismón, Mpo. de Aquismón (Sprouse, 1974: 123)

Cerro de la Cochina Region

Cueva del Cochino, 11 km ENE Matehuala, 1560 m, Mpo. de Matehuala (Matehuala, F14A25)

Cerro Companario Region

+Cave on Cerro Companario, 65 km ESE San Luis Potosí, 2360 m, Mpo. de Santa María del Río (Dalquest, 1953b:65)

Guadalupe de Carnicero Region

+Cueva del Carnicero, 10 km E Apeadero de la Maroma, 21 km NW Villa de Guadalupe, 1825 m, Mpo. de Villa de Guadalupe (Bolívar y Pieltain and Hendrichs, 1964:12) (Villa de Guadalupe, F14A34)

Hacienda Capulín Region

+Cave near Hacienda Capulín, 62 km SE Río Verde, 940 m, Mpo. de Lagunillas (Dalquest, 1953a:27)

La Libertad Region

Cueva del Desierto, 2 km NE La Libertad (=El Guayalote), 22 km W Ciudad del Maíz, 1020 m, Mpo. de Ciudad del Maíz (La Libertad, F14A77)
Cueva de Dos Cuartos, 2 km NE La Libertad (=El Guayalote), 22 km W Ciudad del Maíz, 1020 m, Mpo. de Ciudad del Maíz (La Libertad, F14A77)
Cueva del Grillo, 2 km NE La Libertad (=El Guayalote), 22 km W Ciudad del Maíz, 1020 m, Mpo. de Ciudad del Maíz (La Libertad, F14A77)
Cueva Segunda, 2 km NE La Libertad (=El Guayalote), 22 km W Ciudad del Maíz, 1020 m, Mpo. de Ciudad del Maíz (La Libertad, F14A77)

Matehuala Region

Sumidero 552, at Km. 552, about 45 km SSE Matehuala, 1330 m, Mpo. de ?Villa de Guadalupe (?El Milagro de Guadalupe, F14A45)

Sumidero de Matehuala, 3 km E Matehuala, 1500 m, Mpo. de Matehuala (Fish and Reddell, 1967:82) (Matehuala, F14A25)

Micos Region

+Cave 3 km W Micos, Mpo. de Ciudad Valles (Wilson and Findley, 1971:420, 421) (Damián Carmona, F14A89)

*Cueva del Huisache, 7 km NW Micos, 26 km NW Ciudad Valles, Mpo. de Ciudad Valles (Damián Carmona, F14A89)

Cueva de la Libertad, 3.5 km WNW Micos, 23 km NW Ciudad Valles, 250 m, Mpo. de Ciudad Valles (Damián Carmona, F14A89)

*Cueva del Lienzo, 9 km S Micos, 17 km WNW Ciudad Valles, 236 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:59) (Damián Carmona, F14A89)

Sótano del Lienzo—see Cueva del Lienzo

Cueva de Llanura, 3.5 km WNW Micos, 23 km NW Ciudad Valles, 250 m, Mpo. de Ciudad Valles (Damián Carmona, F14A89)

Micos Cave—see Cueva del Río Subterráneo

*Cueva de Otates, 9 km S Micos, 17 km WNW Ciudad Valles, 239 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:59) (Damián Carmona, F14A89)

Cueva de Puente Morita, 3.5 km WNW Micos, 23 km NW Ciudad Valles, 250 m, Mpo. de Ciudad Valles (Reddell, l965d:50) (Damián Carmona, F14A89)

*Cueva del Río Subterráneo, 9 km S Micos, 17 km WNW Ciudad Valles, 230 m, Mpo. de Ciudad Valles (Wilkens and Burns, 1972:264m, 265; Mitchell et al., 1977:58) (Damián Carmona, F14A89)

Piedra Paloma Region

Cueva de Piedra Paloma n. 1, 10 km NNE Ciudad del Maíz, Mpo. de Ciudad del Maíz (Ciudad del Maíz, F14A78)

Sumidero de Piedra Paloma, 10 km NNE Ciudad del Maíz, Mpo. de Ciudad del Maíz (Reddell, 1965d: 49) (Ciudad del Maíz, F14A78)

Puente de Díos Region

Cueva de Puente de Díos, 30 km SSW Ciudad Valles, Mpo. de Ciudad Valles

Rayón Region

Cueva del Agua, 5 km NNE Rayón, 10 km SSE Cardenas, Mpo. de Rayón (Fish and Reddell, 1967: 83)

Salto del Agua Region

+Cave under El Salto, 2 km E Salto del Agua, 500 m, Mpo. de Ciudad del Maíz (Jones and Alvarez, 1964:303) (Salto del Agua, F14A68)

San Nicolás de los Montes Region

Cueva de la Abanzaba, 2.5 km S San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Cueva Arriba de Agua Buena, 2 km NW Agua Buena, Mpo. de Tamasopo (Fish and Reddell, 1967:84)

*Sótano de Berna Be B., 7 km SSE San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Sótano de Bomba, 6 km SSE San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

*Cueva de la Bonita, near San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Sótano del Camino, near San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Sótano de Chamal, near San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

*Cueva de Elías, 5.5 km S San Nicolás de los Montes, 13 km N Agua Buena, 910 m, Mpo. de Tamasopo (Alaquines, F14A88)

Sótano de Elías—see Cueva de Elías

Cueva de Laguna Grande, 8 km SSW San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

*Cueva de las Lagunitas, 3 km S San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Cueva del Nacimiento del Quince, El Quince, 21 km NW Micos, 35 km NW Ciudad Valles, Mpo. de Tamasopo (Elliott, 1974:21) (Alaquines, F14A88)

Cueva de Ojita de Agua, 3 km SSE San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Pozita del Ojo de Agua, near San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Cueva de Pizzara, 8 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Sótano de Pozita, 4 km S San Nicolás de los Montes, 13 km N Agua Buena, Mpo. de Tamasopo (Alaquines, F14A88)

Cueva de la Verranza, near San Nicolás de los Montes, Mpo. de Tamasopo (Alaquines, F14A88)

Sierra de El Abra Region

Well near Cueva Chica—see Pozo de El Pujal

+*Boca del Abra, 11 km E Ciudad Valles, Mpo. de ?Ciudad Valles (Rioja, 1955b:44) (NOTE: May be identical to Cueva de Valdosa)

Cueva del Agua—see Cueva de la Curva

*Sótano del Arroyo, 12 km NNE Ciudad Valles, 195 m, Mpo. de Ciudad Valles (Fish, 1974:3-4, 5m, 10, 13-14; Mitchell et al., 1977:49-51)

Saltano de Attoya—see Sótano del Arroyo

Cueva de Ceiba, 24 km NE Ciudad Valles, Mpo. de Tamuín (Russell, 1972c:136)

*Cueva Chica, 16 km SE Ciudad Valles, 49 m, Mpo. de Ciudad Valles (Breder, 1942:7-15, fig. 1m; Mitchell et al., 1977:37-42)

Cueva de El Choy—see Cueva del Nacimiento del Río Choy

*Sótano de Coatimundi, 36 km NNE Ciudad Valles, Mpo. de Ciudad Valles

+Cueva de Corinto, 15 km by road NNW Tamexín (=?Tamuín), Mpo. de ?Tamuín (Villa R., 1967:17, 300)

Cueva de El Coy—see Cueva del Nacimiento del Río Coy
Cueva de los Cuates—see Cueva de las Cuatas Este and Cueva de las Cuatas Oeste
*Cueva de las Cuatas Este, 16 km SE Ciudad Valles, 59.5 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:42)
*Cueva de las Cuatas Oeste, 16 km SE Ciudad Valles, 61.5 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:42)
Cueva de la Cuesta—see Sótano de la Cuesta
Sótano de la Cuesta, 36 km NNE Ciudad Valles, Mpo. de Ciudad Valles (Russell, 1974:120)
*Cueva de la Curva, 8 km E Ciudad Valles, 131.5 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:43-44)
Cueva de Diamante—see TAMAULIPAS
Cueva Escondida—see Sótano Escondido
Sótano Escondido, 12 km NE Ciudad Valles, Mpo. de Ciudad Valles (Russell, 1972c:138; Walsh, 1972:32)
Sótano de la Estrella, 36 km NNE Ciudad Valles, Mpo. de Ciudad Valles
Cueva de Fer-de-Lance—see Sótano de Fer-de-Lance
Sótano de Fer-de-Lance, 16 km SE Ciudad Valles, Mpo. de Ciudad Valles
Sótano de Ferrocarril—see Cueva de la Curva
Cueva del Fraiser—see Cueva de Ceiba
Cueva Grande, 11 km SE Ciudad Valles, Mpo. de Ciudad Valles (Russell and Raines, 1967:78, 81m)
Hoya de Higuerón, 15 km NE Ciudad Valles, Mpo. de Ciudad Valles (Greer, 1977:72, 73m)
Joya de Higuerón—see Hoya de Higuerón
Joya de Igrión—see Hoya de Higuerón
*Ventana Jabalí, 20 km NE Ciudad Valles, Mpo. de Tamuín (Russell and Raines, 1967:75, 77m)
*Sótano de Japonés, 19.5 km NNE Ciudad Valles, 243 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:53; Fish, 1978a:1-2, map)
Sótano de Jerbaniz—see Sótano de Yerbaniz
*Sótano de Jos, 8 km NE Ciudad Valles, 176 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:45)
Cueva del León, 9 km NE Ciudad Valles, Mpo. de Ciudad Valles (Russell, 1972c:139)
Sótano del Loro, 24 km NW Ciudad Valles, Mpo. de Ciudad Valles (Morris, 1971:44; Russell, 1972c:139)
Sótano de los Loros—see Sótano del Loro
*Cueva de El Mante, 16 km SE Ciudad Valles, Mpo. de Ciudad Valles (Russell, 1972c:141)
Sótano del Mante—see Cueva de El Mante
Sótano de Manuel, 16 km SE Ciudad Valles, Mpo. de Ciudad Valles (Russell and Raines, 1967:79)
*Sótano de Matapalma, 21 km NNE Ciudad Valles, 242 m, Mpo. de Ciudad Valles (Walsh, 1972:15, 16m, 17; Mitchell et al., 1977:53-55)
Cueva de los Monos—see Sótano de los Monos
*Sótano de los Monos, 20 km NW Ciudad Valles, Mpo. de Ciudad Valles (Walsh, 1972:31; Russell, 1972c:140; Greer, 1974:23, 24m)
*Sistema de Montecillos, 8 km NE Ciudad Valles, 190 m (Sotanito de Montecillos entrance) and 157.5 m (Sótano de Pichijumo entrance), Mpo. de Ciudad Valles (Russell and Raines, 1967:74-75, 76m; Mitchell et al., 1977:46-47)
Sotanito de Montecillos—see Sistema de Montecillos
Sótano de Montecillos—see Sistema de Montecillos
Cueva del Nacimiento del Río Choy, 19 km E Ciudad Valles, Mpo. de Tamuín (Bonet, 1953b:241, 248, 257; Russell, 1972c:140)
+Cueva del Nacimiento del Río Coy, 29 km S Ciudad Valles, Mpo. de ?P. Antonio Santos (Bonet, 1953b: 245, 265m; Russell, 1972c:142)
+Cueva de El Nilo, 20 km SSE Ciudad Valles, Mpo. de Ciudad Valles (Russell, 1972c:141)
*Sótano de Palma Seca, 7 km NE Ciudad Valles, 151.5 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:44)
Sótano de Pichijumo—see Sistema de Montecillos
*Sótano de las Piedras, 7.5 km NE Ciudad Valles, 145 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:44-45)
*Cueva Pinta, 13 km NE Ciudad Valles, Mpo. de Ciudad Valles (Walsh, 1972:31)
*Sótano de la Pipa, 35 km NNE Ciudad Valles, Mpo. de Ciudad Valles
Pujal Cave n. 1—see Cueva Chica
+Pozo de El Pujal, 17 km SE Ciudad Valles, Mpo. de Ciudad Valles (Breder, 1942:8; Russell, 1972c: 141)
Cueva del Rancho Viejo, 14 km E Ciudad Valles, Mpo. de Tamuín (Mitchell et al., 1977:72)
Cueva de la Ranita, 16 km SE Ciudad Valles, Mpo. de Ciudad Valles
*Sótano de la Roca, 13 km NNE Ciudad Valles, 240.5 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:51)
*Cueva de Los Sabinos, 13 km NNE Ciudad Valles, 239.5 m, Mpo. de Ciudad Valles (Fish, 1974:9-10, 15m; Mitchell et al., 1977:51-52)
Cuevacita del Sotanito, 8 km NE Ciudad Valles, Mpo. de Ciudad Valles
*Sótano de Soyate, 12.5 km NE Ciudad Valles, 293 m, Mpo. de Ciudad Valles (Elliott, 1970:63-66, 65m; Mitchell et al., 1977:47)
*Cueva de Tanchipa, 35 km NNE Ciudad Valles, Mpo. de Ciudad Valles (Russell, 1972c:136)
*Cueva de Taninul n. 1, 13 km SE Ciudad Valles, Mpo. de Tamuín (Bonet, 1953b:263m; Russell and Raines, 1967:78; Sbordoni and Argano, 1972: 11)
Cueva de Taninul n. 4, 13 km ESE Ciudad Valles, Mpo. de Tamuín (Russell and Raines, 1967:78, 80m)
Cueva de Tantobal, 21 km SSE Ciudad Valles, Mpo. de ?Tanlajas (Russell, 1972c:141)
Sótano de la Tenaja—see Sótano de la Tinaja
*Sótano del Tigre, 14.5 km NNE Ciudad Valles, 245.5 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:52-53)
Cueva de la Tinaja—see Sótano de la Tinaja
*Sótano de la Tinaja, 10.5 km NE Ciudad Valles, 165.5 m, Mpo. de Ciudad Valles (Fish, 1974:4, 8m, 9, 14, 17; Mitchell et al., 1977:47-49)
*Sótano del Toro, 11 km SE Ciudad Valles, 92 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:42-43)
Mina de Ultima Tirón—see Cueva de Valdosa
*Cueva de Valdosa, 11 km E Ciudad Valles, Mpo. de Ciudad Valles (Russell, 1972c:140-141)

*Sótano de Yerbaniz, 21.5 km NNE Ciudad Valles, 241.5 m, Mpo. de Ciudad Valles (Mitchell et al., 1977:55-56)
*Hoya de Zimapán, 22 km NE Ciudad Valles, Mpo. de Ciudad Valles (Morris, 1971:45; Russell, 1972c: 139-140)

Sierra de Alvarez Region

Cave near San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:194) (Santa Catarina, F14A85)
*Cave in Valle de los Fantasmas, 4 km NW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:194) (Santa Catarina, F14A85)
Sótano in Valle de los Fantasmas, 4 km NW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:194) (Santa Catarina, F14A85)
Sótano de Abernathy, Los Sótanos Unidos, 6 km WNW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Sótano de Araña—see Sótano de las Arañas
Sótano de las Arañas, Los Sótanos Unidos, 6 km WNW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Cueva de los Caballos, Los Sótanos Unidos, 6 km WNW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192 (Santa Catarina, F14A85)
Sótano de Carlos, 2 km N San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Cueva de Carnicerías, NW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Cueva de Cinquenta y Ocho, 1 km W Cinquenta y Ocho and 4 km S San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Cave of Dead Cow, 4 km S San Francisco, Mpo. de Zaragoza (Santa Catarina, F14A85)
Cueva de la Entrada Chica, Valle de los Fantasmas, 4 km NW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Sumidero de Fantasmas, Valle de los Fantasmas, 4 km NW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
*Sótano de la Golondrina, Valle de los Fantasmas, 4 km NW San Francisco, Mpo. de Zaragoza (Walsh, 1972:50m, 70; Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Sótano de las Golondrinas—see Sótano de la Golondrina
Cueva de la Iglesia, 1.6 km W San Francisco, Mpo. de Zaragoza (Walsh, 1972:51m, 72; Elliott and Reddell, 1973:192) (Santa Catarina, F14A85)
Cueva de la Laguna, 6.5 km NNW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:192-193) (Santa Catarina, F14A85)
Cueva de las Moscas, 1.5 km S San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:193) (Santa Catarina, F14A85)
Cuevacita de Nopales, 1 km SW Cinquenta y Ocho and 5 km S San Francisco, Mpo. de Zaragoza (Santa Catarina, F14A85)
Sótano de Nopales, 1 km SW Cinquenta y Ocho and 5 km S San Francisco, Mpo. de Zaragoza (Walsh, 1972:55m, 68; Elliott and Reddell, 1973:193) (Santa Catarina, F14A85)
Sótano de Ojo de Agua, 9 km ESE San Francisco, Mpo. de Zaragoza (Walsh, 1972:54m, 67; Elliott and Reddell, 1973:193) (Santa Catarina, F14A85)
Sótano de Pájaro, Los Sótanos Unidos, 6 km WNW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:193) (Santa Catarina, F14A85)
*Cueva de la Puente, 17 km SSE San Francisco, Mpo. de Zaragoza (Walsh, 1972:60-61, 63m; Elliott and Reddell, 1973:193) (La Salitrera, F14C15)
*Sótano de Puerto de los Lobos, 1.5 km S San Francisco, 2340 m, Mpo. de Zaragoza (Walsh, 1972: 56-57, 59m; Elliott and Reddell, 1973:193) (Santa Catarina, F14A85)
Cueva de las Rusias, Las Rusias, 5 km E San Francisco, Mpo. de Zaragoza (Fish and Reddell, 1967: 83) (Santa Catarina, F14A85)
Sótano de San Francisco, San Francisco, 2200 m, Mpo. de Zaragoza (Elliott and Reddell, 1973:194; Anonymous, 1974c:4m) (Santa Catarina, F14A85)
*Sótano de San Francisco n. 2, 0.5 km S San Francisco, 2300 m, Mpo. de Zaragoza (Elliott and Reddell, 1973:194) (Santa Catarina, F14A85)
Sótano de Super-Macho, Los Sótanos Unidos, 6 km WNW San Francisco, Mpo. de Zaragoza (Elliott and Reddell, 1973:194) (Santa Catarina, F14A85)

Sierra El Pino Region

Cueva de Los Avalos, Ejido de Los Avalos, 14 km ENE Ciudad del Maíz, 1140 m, Mpo. de Ciudad del Maíz (Reddell, 1965d:49) (Ciudad del Maíz, F14A78)
Cueva Seca de Los Avalos, Ejido de Los Avalos, 14 km ENE Ciudad del Maíz, 1180 m, Mpo. de Ciudad del Maíz (Reddell, 1965d:49) (Ciudad del Maíz, F14A78)
*Cueva de La Lagunita, La Lagunita, 16 km NE Ciudad del Maíz, 1150 m, Mpo. de Ciudad del Maíz (Reddell, 1965d:49; Reddell, 1973g:96) (Ciudad del Maíz, F14A78)
Cueva de Mosca, La Lagunita, 16 km NE Ciudad del Maíz, 1150 m, Mpo. de Ciudad del Maíz (Reddell, 1979:101) (Ciudad del Maíz, F14A78)
Cueva de los Murciélagos, 15 km NE Ciudad del Maíz, Mpo. de Ciudad del Maíz (Ciudad del Maíz, F14A78)
Cueva de los Muros, 15 km NE Ciudad del Maíz, Mpo. de Ciudad del Maíz (Ciudad del Maíz, F14A78)

Xilitla Region

Sótano near Tlamaya, 2.5 km NNW Xilitla, Mpo. de Xilitla
+Cave 4 km W on road to Xilitla, Mpo. de Xilitla (Pine, 1972:41)
+Cave near road between Pan American highway and Xilitla, Mpo. de Xilitla (Zweifel, 1956:16-17) (NOTE: This is probably Cueva de El Jobo)
+Large cave 9 km NNE Xilitla, Mpo. de Xilitla (Dalquest, 1953a:25, 30)
+Cueva del Ahuate n. 1, Puerto del Ahuate, 2 km SW Xilitla, 721 m, Mpo. de Xilitla (Bonet, 1953a:57, pl. 5m)
*Cueva del Ahuate n. 2, Puerto del Ahuate, 2 km SW Xilitla, 721 m, Mpo. de Xilitla (Bonet, 1953a:58-68, pl. 5m)

+*Cueva del Aire, 1.8 km at S85°W from church of Huichihuayán, 190 m, Mpo. de Xilitla (Bonet, 1953a:38-42, 39m)
+*Cueva de la Barranca, near La Barranca, 1 km NE Ahuacatlán, 969 m, Mpo. de Xilitla (Bonet, 1953a: 72-76, pl. 7m)
Cuevita del Camino, Xilitlilla, 5 km E Ahuacatlán, Mpo. de Xilitla
Cueva de Campamiento—see Sumidero del Llano Conejo, QUERETARO
Cueva de la Cisterna, on trail to La Silleta from Tlamaya, NW Xilitla, 1330 m, Mpo. de Xilitla
Cueva de Cristián, 4 km E Xilitla, Mpo. de Xilitla
+*Cueva de los Cuchos, near Plan de Juárez, 2 km S Xilitla, 615 m, Mpo. de Xilitla (Bonet, 1953a:68-72, 69m)
Cueva de la Gorra—see Cueva de la Porra
Cueva de los Grillos—see QUERETARO
+*Cueva de la Hoya, 1 km NE Ahuacatlán, 938 m, Mpo. de Xilitla (Bonet, 1953a:83-86, pl. 9m)
Sótano de las Hoyas, 1 km NW Ahuacatlán, Mpo. de Xilitla (Walsh, 1972:109)
Cueva de Huichihuayán—see Cueva del Nacimiento del Río Huichihuayán
*Sótano de Huitzmolotitla, 1 km ESE Tlamaya, 2 km NNW Xilitla, Mpo. de Xilitla (Russell and Raines, 1967:90)
Cueva de la Iglesia, Ahuacatlán, Mpo. de Xilitla (Fish and Reddell, 1967:84)
*Cueva de El Jobo, 5 km E Xilitla, 445 m, Mpo. de Xilitla (Bonet, 1953a:44-50, 46m)
*Cueva de la Laja, 0.75 km NE Ahuacatlán, 870 m, Mpo. de Xilitla (Bonet, 1953a:76-82, 77m)
Cueva de Llano de los Chiquitos—see Sumidero del Llano Chiquito, QUERETARO
Sumidero del Llano Chiquito—see QUERETARO
Cueva del Llano del Conejo—see Sumidero del Llano Conejo, QUERETARO
Sumidero del Llano Conejo—see QUERETARO
Cueva del Lobo—see Cueva de El Jobo
+Cueva de la Mujer del Agua, 1.8 km at S85°W from church of Huichihuayán, 245 m, Mpo. de Xilitla (Bonet, 1953a:42-44, 43m)
Cueva del Nacimiento del Río Huichihuayán, 2 km SW Huichihuayán, 110 m, Mpo. de Xilitla (Bonet, 1953a:36-38)
*Sótano de la Navidad, SW of La Silleta, NW Xilitla, 1970 m, Mpo. de Xilitla
Cueva de la Parra—see Cueva de la Porra
Cueva de Poca Ventana—see Cueva del Ahuate n. 2
*Cueva de la Porra, 1 km SW Tlamaya, 2 km NNW Xilitla, Mpo. de Xilitla (Russell and Raines, 1967: 94)
Sótano de la Porra, 1 km SW Tlamaya, 2 km NNW Xilitla, Mpo. de Xilitla (Bridgemon, 1974:141, 143m)
*Cueva de Potrerillos, Rancho de Potrerillos, 2 km WSW Ahuacatlán, 1250 m, Mpo. de Xilitla (Bonet, 1953a:86-91, pl. 10m)
Sótano de Potrerillos, Rancho de Potrerillos, 2 km W Ahuacatlán, Mpo. de Xilitla (Reddell, 1979:100)
*Sótano de Potrero, 1 km N Ahuacatlán, Mpo. de Xilitla
*Sótano del Pozo, 1 km W Ahuacatlán, Mpo. de Xilitla (Russell and Raines, 1967:99, 102m)
Sótano del Rancho de la Barranca, 5 km NNE Ahuacatlán, Mpo. de Xilitla (Reddell, 1973d:87)
*Cueva del Salitre, 0.5 km NNE Xilitla, 460 m, Mpo. de Xilitla (Bonet, 1953a:50, 52-55, 51m; Russell and Raines, 1967:95, 98m)
*Cueva de la Selva, 2 km SW Xilitla, Mpo. de Xilitla (Russell and Raines, 1967:99, 101m)
*Sótano de Tlamaya, Tlamaya, 2.5 km NNW Xilitla, Mpo. de Xilitla (Russell and Raines, 1967:90, 92m, 94)
Cueva del Xobo—see Cueva de El Jobo

Unplaced Caves

+Cave near San Luis Potosí (González-Ochoa, 1963a: 67)
+Cueva del Platanito (Villa R., 1967:5)

SINALOA

+Large cavern system 1.5 km SW Pánuco, Mpo. de Concordia (Bateman and Vaughan, 1974:45, 52)
+Small cave near La Cueva Chinacatera, 23 km W Pericos, Mpo. de Mocorito (Constantine, 1967:18)
+Shallow caves 16 km NNW Los Mochis, Mpo. de Los Mochis (Jones et al., 1972:5)
+Cave, Santa Lucía, Mpo. de Concordia (Jones et al., 1972:7)
+Cave 2.5 km NW Topolobampo, Mpo. de Los Mochis (Jones et al., 1972:5)
+Cave 1.5 km N Zaragoza, Mpo. de Los Mochis (Jones et al., 1972:13)
+Cueva de la Chinacatera, 23 km W Pericos, Mpo. de Mocorito (Constantine, 1967:18)
+Cueva de Don Cristino, 20 km E Mazatlán, Mpo. de Mazatlán (Villa R., 1967:152)
Cueva de Monte Largo—see Cueva de la Chinacatera

SONORA

+Large cave, Chinobampo, Mpo. de Navojoa (Burt, 1938: 19)
+Shallow caves, Chinobampo, Mpo. de Navojoa (Burt, 1938:20)
+Cave 24 km NW Guaymas, Mpo. de Guaymas (Burt, 1938:19)
+Cave, Guiricoba, Mpo. de Alamos (Burt, 1938:21)
+Cave 1.5 km W Mayterrena (=Mayorena), 15 km N Empalme, Mpo. de Empalme (Bradshaw and Hayward, 1960:282)
+Cave, Pilares de Nacozari, Mpo. de Nacozari (Burt, 1938:21)
+Cave near San Bernardo, Mpo. de Alamos (Burt and Hooper, 1941:2)
+Cave below Santa María Mine, near El Tigre, Mpo. de ?Naocozari (Burt, 1938:21)
+Mina La Aduana, 8 km W Alamos, Mpo. de Alamos (Horst, 1972:49-52, 51m)
Cueva de Carbo—see Cueva del Tigre
Las Minas Cucaracha—see Mina La Aduana
+Cueva de la Higuera, San Miguel de Horcasitas, Mpo. de San Miguel de Horcasitas (Roth, 1968:28)
+Cueva del Tigre, 22 km SSE Carbo, Mpo. de Carbo (Mitchell, 1965:568-577)

TABASCO

+Cave 2 km E Teapa, Mpo. de Teapa (Winkelmann, 1962:112)

+Cave 3.5 km by road NNE Teapa, Mpo. de Teapa (Villa R., 1967:210)

+Cave 4.4 km SE Teapa, Mpo. de Teapa (Lay, 1962:374, 375)

+Well 22 km SE Villahermosa, Mpo. de Villahermosa (Zullini, 1977:76)

*Cueva del Azufre, 3.5 km S Tapijulapa, 50 m, Mpo. de Tatotalpa (Gordon and Rosen, 1962:360-362, 361m; Sbordoni et al., 1974:15-16)

Cueva de El Balneario, 3.5 km NE Teapa, 40 m, Mpo. de Teapa

*Grutas del Coconá, 3 km NE Teapa, 40 m, Mpo. de Teapa (Sbordoni et al., 1974:14-15)

*Resumidero del Coconá, 3 km NE Teapa, 40 m, Mpo. de Teapa

+Cueva de Don Luis, Finca Rosarita, 3.3 km NE, 3 km E, or SE Teapa, Mpo. de Teapa (Wimsatt, 1969:234)

+Cueva del Escorpión, 5 km NNE Teapa, Mpo. de Teapa (Villa R., 1967:149)

+Cueva de la Frontera, 1 km ESE El Azufre, on boundary between Tabasco and Chiapas, 40 m, Mpo. de Teapa (Sbordoni et al., 1977:21, 22m)

+"La Gruta," Ejido Ignacio Allende, 20° NE El Azufre on boundary between Tabasco and Chiapas, Mpo. de Teapa (Villa R., 1967:157, 178)

+Cueva La Murcielaguera, 5.3 km by road NNE Teapa, Mpo. de Teapa (Handley, 1966:300)

+Cueva del Rancho El Azufre, 8 km W Teapa, Mpo. de Teapa (Villa R., 1967:327)

TAMAULIPAS

Altas Cumbres Region

Cueva Aire Mal, 15 km SSW Ciudad Victoria, 1350 m, Mpo. de Ciudad Victoria (Chabert, 1973:21, 23m, 24) (Ciudad Victoria, F14A29)

Sótano de Altas Cumbres n. 1—see Cueva Bonita

Sótano de Altas Cumbres n. 2—see Cueva Aire Mal

Cueva Bonita, 15 km SSW Ciudad Victoria, 1350 m, Mpo. de Ciudad Victoria (Chabert, 1973:21, 22m) (Ciudad Victoria, F14A29)

+Cueva La Mula, 10 km W Joya Verde, 28 km SW Ciudad Victoria, 800 m, Mpo. de Ciudad Victoria (Alvarez, 1963:339) (Ciudad Victoria, F14A29)

Cerro El Aire Region

Sótano de Abasolo, Abasolo, Mpo. de Abasolo

Cerro Gordo Region

+Cave 3 km WNW El Carrizo, 14 km SW Llera de Canales, Mpo. de Llera de Canales (Alvarez, 1963:405) (Gómez Farías, F14A49)

La Libertad Region

Cueva de "El Murciélago"—see Cueva de Los Troncones

Cueva de la Presa—see Cueva de Los Troncones

+Cueva de la Sepultura, 6 km NW Ciudad Victoria, 740 m, Mpo. de Ciudad Victoria (Malaga Alba and Villa R., 1957:539, 543, 545, 567 (Guëmez, F14A19)

+Cueva de Los Troncones, near La Libertad, 8 km NW Ciudad Victoria, Mpo. de Ciudad Victoria (Rodríguez Cabo, 1953:361-362) (Guëmez, F14A19)

Purificación Region

+Cave, El Chihue, 31 km NW Ciudad Victoria, 1800 m, Mpo. de Villa Hidalgo (Walker, 1955a:2) (Casas Reales, F14A18)

*Small spring 0.5 km W Conrado Castillo, 41 km NW Ciudad Victoria, 2100 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Small spring W of Conrado Castillo, 41 km NW Ciudad Victoria, 2100 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

Sumidero de los Abelos—see Sumidero de Oyamel

*Agua de los Allarines, 0.8 km N Conrado Castillo, 42 km NW Ciudad Victoria, 1960 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Cueva de los Allarines, 0.8 km N Conrado Castillo, 42 km NW Ciudad Victoria, 1900 m, Mpo. de Villa Hidalgo (Treacy, 1979:16) (Casas Reales, F14A18)

+Cueva de la Boca, 5 km SW Cañón de la Boca, 22 km NNW Ciudad Victoria, Mpo. de ?Guëmez (Villa R., 1967:231) (?Guëmez, F14A19)

*Cueva del Borrego, 0.5 km S Conrado Castillo, 41 km NW Ciudad Victoria, 1980 m, Mpo. de Villa Hidago (Casas Reales, F14A18)

Cueva del Brinco—see Sistema Purificación

*Sótano de las Calenturas, 0.7 km S Yerbabuena, 34 km NW Ciudad Victoria, 1460 m, Mpo. de Villa Hidalgo (Pate, 1979:86-87) (Casas Reales, F14A18)

*Cueva de la California, 2 km N Rancho Nuevo, 2560 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Cueva del Camino, 1 km W Rancho Nuevo, 34 km WNW Ciudad Victoria, 2500 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Cueva de Coral, near summit of Cerro Zapatero, 1 km N Conrado Castillo, 41 km NW Ciudad Victoria, 2100 m, Mpo. de Villa Hidalgo (Pate, 1979:86) (Casas Reales, F14A18)

Cueva de Chuparosa, Rancho Revilla, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Cueva de Desmontes, Conrado Castillo, 41 km NW Ciudad Victoria, 1920 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

+Cueva La Esperanza, 6 km SW Rancho Santa Rosa, 32 km NW Ciudad Victoria, 360 m, Mpo. de Guëmez (Alvarez, 1963:405) (?Casas Reales, F14A18)

*Grieta de las Flores, Conrado Castillo, 41 km NW Ciudad Victoria, 2000 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

Cueva de Infiernillo—see Sistema Purificación

*Sótano de Jesús, 1 km S Rancho Revilla, 38 km NW Ciudad Victoria, 2210 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

Pozo de Juan Fuentes Pérez—see Grieta de las Flores

Cueva de Musgo, 0.75 km E Rancho Revilla, 38 km NW Ciudad Victoria, 2100 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

Cueva del Oso—see Sistema Purificación

Cueva de Oyamel—see Sumidero de Oyamel

*Sumidero de Oyamel, 1 km N Conrado Castillo, 41 km NW Ciudad Victoria, 1950 m, Mpo. de Villa Hidalgo (Treacy, 1979:16) (Casas Reales, F14A18)

*Sistema Purificación, Conrado Castillo, 41 km NW Ciudad Victoria, 1980 m (Cueva del Oso entrance), 1900 m (Cueva del Brinco entrance), 1100 m (Cueva de Infiernillo entrance), Mpo. de Villa Hidalgo (Pate, 1979:82-101, map; Treacy, 1979: 8-31, 2 maps) (Casas Reales, F14A18)

*Sótano de Rancho Nuevo n. 1, Rancho Nuevo, 34 km WNW Ciudad Victoria, 2600 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Sótano de Rancho Nuevo n. 2, Rancho Nuevo, 34 km WNW Ciudad Victoria, 2600 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Sótano de Rancho Nuevo n. 3, Rancho Nuevo, 34 km WNW Ciudad Victoria, 2600 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Sótano de Rancho Nuevo n. 4, Rancho Nuevo, 34 km WNW Ciudad Victoria, 2600 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

Cueva de Rancho Revilla—see Cueva de Revilla

*Pozo de Rancho Viejo, 2 km SW Rancho Nuevo, 34 km WNW Ciudad Victoria, 2560 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

*Cueva de Revilla, Rancho Revilla, 40 km NW Ciudad Victoria, 2300 m, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

Cueva del Tecolote—see Cueva de Desmontes

*Cueva de los Tres Bobos, near Conrado Castillo, 41 km NW Ciudad Victoria, Mpo. de Villa Hidalgo (Casas Reales, F14A18)

Entrada del Viento Alta, Conrado Castillo, 41 km NW Ciudad Victoria, 2000 m, Mpo. de Villa Hidalgo (Treacy, 1979:17) (Casas Reales, F14A18)

*Entrada del Viento Baja, Conrado Castillo, 41 km NW Ciudad Victoria, 2000 m, Mpo. de Villa Hidalgo (Pate, 1979:86; Treacy, 1979:17) (Casas Reales, F14A18)

Cueva Vrincón—see Sistema Purificación

*Cueva X, Conrado Castillo, 41 km NW Ciudad Victoria, 1950 m, Mpo. de Villa Hidalgo (Treacy, 1979:16-17) (Casas Reales, F14A18)

Santander Jiménez Region

+Cueva del Guano, 11 km N and 21 km W Santander Jiménez, 380 m, Mpo. de Santander Jiménez (Aguirre Pequeño, 1959:245-256; Alvarez, 1963: 401)

Sierra de El Abra Region

Cueva del Abra, 1 km S El Abra, 9 km NE Antiguo Morelos, 300 m, Mpo. de Antiguo Morelos (Russell and Raines, 1967:65, 67m) (Quintero, F14A69)

Cueva Chica del Arroyo Seco, 15 km ESE Antiguo Morelos, Mpo. de Antiguo Morelos (Russell, 1972c:135)

Cueva Grande del Arroyo Seco, 15 km ESE Antiguo Morelos, Mpo. de Antiguo Morelos (Russell, 1972c:135)

Sótano del Arroyo Seco—see Cueva Grande del Arroyo Seco

Cueva de El Choveno, El Choveno, 9 km NNE Antiguo Morelos, Mpo. de Antiguo Morelos (Quintero, F14A69)

*Cueva de Diamante, 23 km SE Antiguo Morelos, Mpo. de Antiguo Morelos (Minton, 1978:7-15, map)

*Cueva de la Florida, 1 km NNW Praxedis Guerrero (=El Pachón), 8 km NE Antiguo Morelos, 260 m, Mpo. de Antiguo Morelos (Mitchell, 1970:64m; Russell, 1972c:134-135) (Quintero, F14A69)

Cueva de El Mante n. 1—see Cueva del Nacimiento del Río Mante

+Cueva del Nacimiento del Río Mante, 10 km SW Ciudad Mante, 100 m, Mpo. de Ciudad Mante (Russell and Raines, 1967:64) (Quintero, F14A69)

*Cueva de El Pachón, Praxedis Guerrero (=El Pachón), 7 km NE Antiguo Morelos, 210.5 m, Mpo. de Antiguo Morelos (Russell and Raines, 1967:65, 68m; Mitchell et al., 1977:57-58) (Quintero, F14A69)

Cueva de los Pájaros, 1 km NNW Praxedis Guerrero (=El Pachón), 8 km NE Antiguo Morelos, 260 m, Mpo. de Antiguo Morelos (Russell, 1972c:135) (Quintero, F14A69)

*Grutas de Quintero, 1.5 km S Quintero, 13 km SW Ciudad Mante, 200 m, Mpo. de Ciudad Mante (Russell and Raines, 1967:64, 66m; Russell, 1972c:134) (Quintero, F14A69)

Cueva de San Rafael de los Castros—see Sótano de San Rafael de los Castros

*Sótano de San Rafael de los Castros, San Rafael de los Castros, 13 km ENE Ciudad Mante, 100 m, Mpo. de Ciudad Mante (Russell, 1972c:133) (Loma Alta, F14A59)

*Cueva de Santa Elena, 14 km SE Antiguo Morelos, Mpo. de Antiguo Morelos (Russell, 1972c:135-136) (Sierra La Colmena, F14A79)

Sótano de Santa Elena—see Cueva de Santa Elena

*Sótano de El Venadito, 16 km SE Antiguo Morelos, 312 m, Mpo. de Antiguo Morelos (Walsh, 1972:12, 14m; Mitchell et al., 1977:56-57 (Sierra La Colmena, F14A79)

Sierra de Guatemala Region

+Cave at Agua Linda, 11 km WNW Gómez Farías, 1800 m, Mpo. de Gómez Farías (Martin, 1958: 43) (Gómez Farías, F14A49)

+Cave 1 km S Aserradero del Paraíso, 13 km NNW Chamal, 420 m, Mpo. de Ocampo (Koopman and Martin, 1959:2-3) (Loma Alta, F14A59)

+Cave, Casa Piedras, 8.5 km WNW Gómez Farías, 1500 m, Mpo. de Jamauve (Martin, 1958:44) (Gómez Farías, F14A49)

+Cave, Ojo de Agua, 3 km SE Gómez Farías, 100 m, Mpo. de Gómez Farías (Alvarez, 1963:398) (Gómez Farías, F14A49)

+Caves, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Hooper, 1953: 9) (Gómez Farías, F14A49)

+Bell-shaped sink, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Martin, 1958:47) (Gómez Farías, F14A49)

+Dry sinkhole, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Martin, 1958:56) (Gómez Farías, F14A49)

+Deep open sink, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Martin, 1958:43) (Gómez Farías, F14A49)

+Sinkhole, 12 m deep (No. 1), Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Martin, 1958:47) (Gómez Farías, F14A49)

+Sinkhole, 12 m deep (No. 2), Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Martin, 1958:47) (Gómez Farías, F14A49)

+Cave n. 6, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Harrell, 1951:118, 119, 123, 182) (Gómez Farías, F14A49)

+Cave n. 11, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Harrell, 1951:135) (Gómez Farías, F14A49)

+Cave n. 13, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Harrell, 1951:120, 135, 182, 186) (Gómez Farías, F14A49)

+Cave n. 14, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Harrell, 1951:119) (Gómez Farías, F14A49)

+Cave n. 17, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Harrell, 1951:135) (Gómez Farías, F14A49)

+Cave n. 19, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Harrell, 1951:118, 119) (Gómez Farías, F14A49)

+Cave n. 20, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Harrell, 1951:169, 186) (Gómez Farías, F14A49)

35 meter deep pit, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Sinkhole, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Gómez Farías, F14A49)

Small cave near El Refugio, 17 km N Ocampo, 1100 m, Mpo. de Ocampo (?Ocampo, F14A58)

*Cave near San José, 8 km W Gómez Farías, 1300 m, Mpo. de Gómez Farías (Gómez Farías, F14A49)

Cueva de las Abejas—see Bee Cave

Cueva del Agua, 3 km S Manantiales, 15 km SW Gómez Farías, Mpo. de ?Gómez Farías (Loma Alta, F14A59)

*Bee Cave, 8.5 km NE Adolfo López Mateos (=Chamal Nuevo), 19 km NE Ocampo, 248.5 m, Mpo. de Ocampo (Mitchell et al., 1977:60-61) (Loma Alta, F14A59)

Cave C-5, 13 km NW Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Sótano del Caballo Moro, 7.8 km NW Adolfo López Mateos (=Chamal Nuevo), 11 km NE Ocampo, Mpo. de Ocampo (Mitchell et al., 1977:61-62) (Loma Alta, F14A59)

*Cueva de la Capilla, near El Porvenir (=La Perra), 11 km NW Gómez Farías, 2040 m, Mpo. de Jamauve (Sbordoni and Argano, 1972:8; Elliott, 1973b:79, 82m; Mitchell and Kawakatsu, 1973a: 673-675, 674m) (Gómez Farías, F14A49)

Cueva Capilla de la Perra—see Cueva de la Capilla

*Cueva de El Charco de la Cabeza, 6 km NW El Encino, 12 km N Gómez Farías, Mpo. de Llera de Canales (Elliott, 1979:17-18) (Gómez Farías, F14A49)

*Crystal Cave, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Elliott, 1973b:79, 83m) (Gómez Farías, F14A49)

Dry Cave, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Gómez Farías, F14A49)

Cueva del Ejido de la Libertad, 10 km N Gómez Farías, Mpo. de Llera de Canales (Gómez Farías, F14A49)

Sótano del Embudo de El Mirador, El Mirador, 11 km NE Gómez Farías, Mpo. de Jamauve (Gómez Farías, F14A49)

Sotanito Escondido, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Sótano Escondido, 1 km SW Gómez Farías, 302.5 m, Mpo. de Gómez Farías (Mitchell et al., 1977:62) (Gómez Farías, F14A49)

Cuevita de la Escuela—see Cueva de la Escuela

Cueva de la Escuela, Joya de Salas, 15 km NW Gómez Farías, 1600 m, Mpo. de Jamauve (McKenzie, 1965b:27) (Gómez Farías, F14A49)

*Sótano de Gómez Farías, 3 km ESE Gómez Farías, 300 m, Mpo. de Gómez Farías (Walsh, 1972:22) (Gómez Farías, F14A49)

Sótano de los Guacamayos, El Refugio, 17 km N Ocampo, 1060 m, Mpo. de Ocampo (Deane, 1977: 55, 56m) (Ocampo, F14A58)

*Harrison Sinkhole, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Elliott, 1973b:79, 84m) (Gómez Farías, F14A49)

Sótano de Harrison, 1 km N Rancho del Cielo, 8 km NNW Gómez Farías, 1200 m, Mpo. de Gómez Farías (Gómez Farías, F14A69)

Indian Springs Cave—see Cueva del Nacimiento del Indio

*Cueva del Infiernillo, near San José, 8 km W Gómez Farías, 1300 m, Mpo. de Jamauve (Russell and Raines, 1967:52; Sustare, 1966:54, 55m) (Gómez Farías, F14A49)

Cueva de El Infierno—see Cueva del Infiernillo

*Sótano de Jineo, 1 km NW Gómez Farías, 292 m, Mpo. de Gómez Farías (Mitchell et al., 1977:63-64) (Gómez Farías, F14A49)

Sumidero de El Jineo—see Sótano de Jineo

*Sótano de la Joya de Salas, Joya de Salas, 15 km NW Gómez Farías, 1560 m, Mpo. de Jamauve (Turner, 1972:3-4, 5m, 7; Walsh, 1972:10, 21-22) (Gómez Farías, F14A49)

*Sótano del León, 2 km S Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Cueva de los Leones, Joya de Salas, 15 km NW Gómez Farías, 1600 m, Mpo. de Jamauve (Russell and Raines, 1967:51) (Gómez Farías, F14A49)

*Resumidero de los Mangos, 1.5 km W Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Cueva de la Mina, 9 km NW Gómez Farías, 1527 m, Mpo. de Gómez Farías (Elliott, 1973b:79, 81m; Mitchell and Kawakatsu, 1973a:671-673, 672m) (Gómez Farías, F14A49)

*Sótano del Molino, 1 km NW Gómez Farías, 268.5 m, Mpo. de Gómez Farías (Walsh, 1972:22-23; Mitchell et al., 1977:63) (Gómez Farías, F14A49)

*Cueva del Nacimiento del Indio, 8 km NW Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Cueva del Nacimiento del Río Frío, 7 km S Gómez Farías, 170 m, Mpo. de Gómez Farías (Russell and Raines, 1967:53, 54m) (Loma Alta, F14A59)

+Cueva del Nacimiento del Río Sabinas, 6 km NW El Encino, 12 km N Gómez Farías, 180 m, Mpo. de Llera de Canales (Alvarez, 1963:398) (Gómez Farías, F14A49)

*Sótano del Naranjo, 1.5 km W Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

Hoya de Nubas, 10 km NW Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Cueva de Ojo de Agua de Manantiales, 14 km NNE Ocampo, 450 m, Mpo. de Ocampo (Elliott, 1979: 16-20) (Loma Alta, F14A59)

*Cueva de la Paloma, 1 km NNE Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*Cueva de las Perlas, near El Porvenir (=La Perra), 11 km NW Gómez Farías, 2000 m, Mpo. de Jamauve (Elliott, 1973b:80, 86m; Mitchell and Kawakatsu, 1973a:675-676, 675m) (Gómez Farías, F14A49)

Cueva de la Perra—see Cueva de la Capilla

*Cueva Chica de la Perra, near El Porvenir (=La Perra), 11 km NW Gómez Farías, 2040 m, Mpo. de Jamauve (Elliott, 1973b:80) (Gómez Farías, F14A49)

Sótano de las Piñas—see Sótano de los Pinos

*Sótano de los Pinos, near Joya de Salas, 15 km NW Gómez Farías, Mpo. de Jamauve (Russell and Raines, 1967:51) (Gómez Farías, F14A49)

Sótano de El Porvenir, 11 km NW Gómez Farías, Mpo. de Jamauve (Anonymous, 1974b:112, 125m) (Gómez Farías, F14A49)

*Grutas de El Puente, 11 km SE Ocampo, 400 m, Mpo. de Ocampo (Reddell, 1979:100) (Loma Alta, F14A59)

Cueva del Rancho del Cielo n. 3—see Salamander Cave

*Cueva del Rancho del Cielo n. 7, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Russell and Raines, 1967:52) (Gómez Farías, F14A49)

Sótano de El Refugio—see Sótano de los Guacamayos

*Cueva del Remolino, near San José, 8 km W Gómez Farías, Mpo. de Jamauve (Gómez Farías, F14A49)

Cueva del Río Frío—see Cueva del Nacimiento del Río Frío

*Salamander Cave, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Russell and Raines, 1967:52) (Gómez Farías, F14A49)

*Sótano de Tres Cerritos, 20 km NNW Gómez Farías, Mpo. de Jamauve (Gómez Farías, F14A49)

Sótano de Tres Manantiales—see Cueva de Ojo de Agua de Manantiales

Sótano de El Triunfo, Gómez Farías, Mpo. de Gómez Farías (Gómez Farías, F14A49)

*2,000 Meter Cave, near Joya de Salas, 15 km NW Gómez Farías, Mpo. de Jamauve (McKenzie, 1965b:25) (Gómez Farías, F14A49)

*Cueva de los Vampiros, 10 km NE Adolfo López Mateos (=Chamal Nuevo), 20 km NE Ocampo, Mpo. de Ocampo (Loma Alta, F14A59)

*Sótano de Vasquez, 6 km ESE Adolfo López Mateos (=Chamal Nuevo), 20 km E Ocampo, 422 m, Mpo. de Ocampo (Mitchell et al., 1977:59-60) (Loma Alta, F14A59)

*Wet Cave, Rancho del Cielo, 7 km NNW Gómez Farías, 1160 m, Mpo. de Gómez Farías (Russell and Raines, 1967:52) (Gómez Farías, F14A49)

Sierra de Tamaulipas Region

+Cave 7 km NW Acuña, Mpo. de ?Casas (Martin et al., 1954:46)

+Cave 5 km S, 22 km W Piedra, Mpo. de Soto la Marina (Alvarez, 1963:407)

+Cave 5 km S, 26 km W Piedra, Mpo. de Soto la Marina (Alvarez, 1963:405)

+Cave 0.5 km from cave 5 km S, 26 km W Piedra, Mpo. de Soto la Marina (Alvarez, 1963:405)

*Cueva del Agua de Simón Salinas, 48 km SW Soto la Marina, Mpo. de Soto la Marina

*Cueva de los Cuarteles, 10 km SW Aldama, Mpo. de Aldama (García Lozano, 1939a:5-7, 6m; Reddell, 1973e:87-88)

*Cueva del Virgen de Guadalupe, 48 km SW Soto la Marina, Mpo. de Soto la Marina

Tula Region

Cueva Abajo de Carreterra, 35 km SW Tula, 1030 m, Mpo. de Tula (Reddell, 1979:101) (Tula, F14A57)

Villa Hidalgo Region

Cueva del Virgen, El Chorrito, 18 km W Villa Hidalgo, 745 m, Mpo. de Villa Hidalgo (Russell and Raines, 1967:28, 38) (Villa Hidalgo, G14C88)

TLAXCALA

+Cave 13 km NE Tlaxcala, 2360 m (Davis, 1944:377)

VERACRUZ

Atoyac Region

+Cave at origin of Río Atoyac (Mullinex, 1975:37)

+Well on outskirts of Paraje Nuevo, 500 m, Mpo. de Amatlán (Argano, 1972a:41)

+Cave at edge of rain forest, Potrero Viejo, 530 m, Mpo. de Amatlán (Hooper, 1947:43)

+Cave on hillside 5 km N Potrero, Mpo. de Amatlán (Hall and Dalquest, 1963:235)

+Cave 4 km WNW Hacienda at Potrero Viejo, near trail to La Caldera, Mpo. de Amatlán (Hobbs, 1943:206)

+Cave 8 km NW Potrero, Mpo. de Amatlán (Hall and Dalquest, 1963:235)

+Well, San Juan de la Punta, Mpo. de Cuitlahuac or Cuichapa (Argano, 1972a:35)

+Cave along Río Blanco, 7 km SE San Juan de la Punta, 120 m, Mpo. de Cuichapa (Hall and Dalquest, 1963:214)

*Grutas de las Abejas, ?N of Potrero

*Grutas de Atoyac, 2 km E Atoyac, 500 m, Mpo. de Atoyac (Villada, 1911:61-67, pl. 15-18)

*Cueva de la Charca I, Ejido Charca, N of Potrero, Mpo. de Atoyac

*Cueva de Corral de Piedra, 3 km SSE Corral de Piedra, Mpo. de Cuitlahuac or Atoyac

*Sótano de las Golondrinas, Manzanilla, 11 km N Potrero, Mpo. de Atoyac

Sótano de El Maguey, 5 km N Cuitlahuac, Mpo. de Cuitlahuac
*Cueva del Nacimiento del Rancho Nuevo, 14 km N Potrero, Mpo. de Atoyac
Cueva del Nacimiento Grande—see Cueva del Ojo de Agua Grande
Cueva del Ojo de Agua—see Cave 4 km WNW Hacienda at Potrero Viejo
*Cueva del Ojo de Agua Grande, 5 km N Potrero Viejo, 550 m, Mpo. de Amatlán (Fish and Reddell, 1965:75; Sbordoni and Argano, 1972:18-19)
*Sótano de la Palma, 14 km N Potrero, Mpo. de Atoyac
Sótano de la Pastura, 7 km N Potrero, Mpo. de Atoyac
Sótano de los Perros, Manzanilla, 10 km N Potrero, Mpo. de Atoyac
+Cueva de la Pesca, Potrero, 650 m (Malaga Alba and Villa R., 1957:542)
Cueva del Rancho Santa María, 6 km N Potrero, Mpo. de Atoyac
Cueva del Río Atoyac, 3 km E Atoyac, Mpo. de Atoyac
*Cueva de la Sala de Agua, Ejido Colonia, N of Potrero, Mpo. de Atoyac
Cueva de la Sala de Agua Grande, 5 km N Cuitlahuac, Mpo. de Cuitlahuac (Hall and Dalquest, 1963: 234-235)
*Cueva de la Sala Seca, 5 km N Cuitlahuac, Mpo. de Cuitlahuac
Los Tres Cuevas, Cuitlahuac—see Cueva de Sala de Agua Grande

Buena Vista Region

Cueva de Camposanto, 2 km W Buena Vista, Mpo. de Actopan
Cueva de Cantil Blanco, 1 km N Buena Vista, Mpo. de Actopan
Cueva de los Vampiros, 2 km W Buena Vista, Mpo. de Actopan

Fortín Region

+Cave with sloping entrance 4 km WNW Fortín, Mpo. de Fortín (Hall and Dalquest, 1963:231)
+Cave with vampires, 4 km WNW Fortín, Mpo. de Fortín (Hall and Dalquest, 1963:231)
+Small cave 4 km WNW Fortín, Mpo. de Fortín (Hall and Dalquest, 1963:227)
+Cave at Metlac, 3 km N Fortín, Mpo. de Fortín (Allen, 1942:97)

Jalapa Region

+Cave at Cofre de Perote, 2800 m, Mpo. de ?Perote (Long and Jones, 1966:290)
+Caves 16 km W Jalapa (Roth, 1968:25)
+Cave 9 km NNW Jalapa, Mpo. de Banderilla (Villa R., 1967:387)
+Caves 3 km W Limón, Mpo. de Perote (Hall and Dalquest, 1963:317)
+Cavern at Plan del Río, 300 m, Mpo. de Dos Ríos (Davis, 1944:378)
+Cave 5 km ESE Las Vigas, Mpo. de Las Vigas (Davis and Carter, 1962:72)
+Caves near Las Vigas, Mpo. de Las Vigas (Ward, 1891:743-744)
+Cave 5 km E Las Vigas, 2400 m, Mpo. de Las Vigas (Davis, 1944:381)
+Caves on Volcancillo, 4 km E Las Vigas, Mpo. de Las Vigas (Hall and Dalquest, 1963:245)
Cueva del Infiernillo, 1 km E Paso del Toro, Mpo. de Naolinco (Ward, 1904:634-636)
+Cueva de Tilapa, near Orizaba (Sumichrast, 1882: 202, 203)
+Cueva de Tuxpango, near Orizaba, Mpo. de Naranjal (Sumichrast, 1882:201)
*Cueva del Volcancillo, Volcancillo, 5 km SE Las Vigas, Mpo. de Las Vigas (Reddell and Elliott, 1974:12-13, pl. 1m)
+Grotte de Xilapa, near Orizaba (Villa R., 1953b:153)
+Cueva de Zatiopan, 9 km N Jalapa, 1700 m, Mpo. de Banderilla (LaVal, 1973:25)

Jesús Carranza Region

+Cave 10 m long, 35 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963:225)
+Cave 35 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963:224)
+Small cave with water 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963: 223)
+Shallow recess in cliff 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963: 213)
+Long, tubelike cave, 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Dalquest and Hall, 1949:424)
+Small cave formed by fallen rocks 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Dalquest and Hall, 1949:424)
+Small cave 10 m from above cave, 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963:213)
+Large cave 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Dalquest and Hall, 1949:425)
+Small caves and crevices, 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963: 215)
+Small roomlike cave 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963: 224)
+Long, deep cave, 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963:224-225)
+High narrow cave 38 km SE Jesús Carranza, Mpo. de Jesús Carranza (Hall and Dalquest, 1963:225)

Orizaba Region

Cueva del Agua de Tlilapan—see Cueva Macinga
Sótano de la Botella Chica, 5 km NW Tequila, Mpo. de Tequila
*Cueva del Carbón, near San Martín, W of Tequila, Mpo. de Tequila
*Cueva de la Cascada, 2 km E Tequila, Mpo. de Tequila (Louch and Fish, 1970:23)
Cueva de Cerro—see Sótano Itamo
+Cueva de Cuautlapa, near Orizaba (Sumichrast, 1882: 201)
*Cueva del Diablo, 3 km SSW Ciudad Mendoza, Mpo. de Ciudad Mendoza (Reddell, 1973f:95)
Sótano de las Espadas, Tequila, Mpo. de Tequila
Sótano del Hombre Invincible, Soledad Atzompa, Mpo. de Soledad Atzompa

Sótano de Humo, 5 km NW San Andres, Mpo. de Tenejapa
*Sótano Itamo, near Soledad Atzompa, Mpo. de Soledad Atzompa
Sótano Ituro—see Sótano Itamo
Sótano de Lomapa, near Soledad Atzompa, Mpo. de Soledad Atzompa (Reddell and Elliott, 1974:10)
*Cueva Macinga, 2 km E Tlilapan, 1150 m, Mpo. de Tlilapan (Sbordoni and Argano, 1972:18; Reddell, 1973f:93)
Cueva de Mazatopa, near Soledad Atzompa, Mpo. de Soledad Atzompa (Reddell and Elliott, 1974:11)
Sótano de Milpa, 5 km SW San Andres, Mpo. de Tenejapa (Louch and Fish, 1970:19, 21m)
*Cueva del Ojo de Agua de Tlilapan, Tlilapan, 1200 m, Mpo. de Tlilapan (Sbordoni and Argano, 1972:17-18; Reddell, 1973f:93, 94m)
Cueva del Ojo de Agua de Tlilapan n. 1—see Cueva del Ojo de Agua de Tlilapan
Cueva del Ojo de Agua de Tlilapan n. 2—see Cueva Macinga
Cueva de Opilionida, 2 km N Tequila, Mpo. de Tequila
Sótano de Oztauatlíltaloa, Tequila, Mpo. de Tequila
+Cueva de la Presa, 4 km E Orizaba, Mpo. de ?Orizaba (Villa R. and Jiménez G., 1961:504)
*Sótano del Profesor, Tequila, Mpo. de Tequila (Raines, 1964:113-114)
Sótano de las Ranas, 5 km SW San Andres, Mpo. de Tenejapa (Louch and Fish, 1970:19, 22m)
Sótano del Relicario, 3 km N Tequila, Mpo. de Tequila
Resumidero de San Martín, San Martín, W of Tequila, Mpo. de Tequila
Cueva del Soldado, Orizaba, Mpo. de Orizaba
*Sótano de Sphodrini, Tequila, Mpo. de Tequila
*Szontecomostoc, 5 km N Tequila, Mpo. de Tequila
*Sótano de Teanacan, Soledad Atzompa, Mpo. de Soledad Atzompa (Reddell and Elliott, 1974:10)
Cueva de las Trozas, near San Martín, W of Tequila, Mpo. de Tequila
Cueva de los Vampiros, 3 km SSW Ciudad Mendoza, Mpo. de Ciudad Mendoza (Reddell, 1973f:93)
Sótano la Y Griega, Tequila, Mpo. de Tequila

Presidio Region

+Deep cave 3 km N Presidio, 500 m, Mpo. de Ixhuatlán (Hall and Dalquest, 1963:223)

Puente Nacional Region

+Series of small caves downstream from Puente Nacional, Mpo. de Puente Nacional (Davis, 1944:376)

Tezonapa Region

*Cueva de Ungurria, 20 km WSW Tezonapa on island in the Río Tonto, Mpo. de Tezonapa (Reddell, 1973e:88)

Tlacotepec Region

+Cave 15 km ENE Tlacotepec, 500 m, Mpo. de Puente Nacional (Hall and Dalquest, 1963:229)

Tlapacoyan Region

+Cueva de los Murciélagos, Tlapacoyan, Mpo. de Tlapacoyan (Villa R., 1967:327)

Totula Region

+Cave 9 km E Totutla, 750 m, Mpo. de ?Tlatetela (Hall and Dalquest, 1963:222)

Tuxpán Region

+Caves (3), Tuxpilla, 6 km SE Puerto de Tuxpán, Mpo. de Villa de Cazones (Martínez, 1941:1)
+La Gruta I, near Tuxpán, 20 m, Mpo. de Tuxpán (U. S. Bureau of Sport Fisheries and Wildlife, 1970:17)
+La Gruta II, near Tuxpán, 20 m, Mpo. de Tuxpán (U. S. Bureau of Sport Fisheries and Wildlife, 1970:17)
+Cueva del Tigre, 5 km W Tuxpán, Mpo. de Tuxpán (Handley, 1966:300)

Volcán de Tuxtla Region

+Cueva El Boquerón, Laguna Encantada, 3 km E San Andres Tuxtla, 300 m, Mpo. de San Andres Tuxtla (Hall and Dalquest, 1963:216-217)
Cueva de Laguna Encantada—see Cueva El Boquerón
+Cueva Puente de Piedra, 7 km W La Palma on Volcán de Tuxtla (Vázquez-Yanes et al., 1975:73)

Zacualpilla Region

+Gave 6 km WSW Zacualpilla, 2000 m, Mpo. de Zacualpán (Hall and Dalquest, 1963:253)

YUCATAN

Coastal Plain

+*Well, Calcehtok, Mpo. de Opichén (Reddell, 1977b:269)
+Cave near Chocholá, Mpo. de Chocholá (Reddell, 1977b:257)
+Cenote, 3.5 km NW Dzityá, Mpo. de Mérida (Reddell, 1977b:264)
+Well, Finca San Pedro, Mérida, Mpo. de Mérida (Zullini, 1977:76)
+Cave 6 km S and 5 km W Kinchil, Mpo. de Kinchil (Reddell, 1977b:262)
Artificial cave, Calle 24 x 19 in Mérida, Mpo. de Mérida (Reddell, 1977b:264)
+Cenote at No. 97, Calle 24, Mérida, Mpo. de Mérida (Reddell, 1977b:264)
+Well, Calle 38, Mérida, Mpo. de Mérida (Zullini, 1977:76)
+*Well, iron mill in Oxkutzcab, Mpo. de Oxkutzcab (Reddell, 1977b:273)
+Well, Tahmek, Mpo. de Tahmek (Zullini, 1977:76)
+Well, Teyá, 13 km E Mérida, Mpo. de Kanasín (Zullini, 1977:76)
+Well, Ticopo, Mpo. de Acanceh (Zullini, 1977:76)
+Cenote 8 km NE Tixpehual, Mpo. de Tixpehual (Reddell, 1977b:288)
+Cave 6 km N Tizimín, Mpo. de Tizimín (Reddell, 1977b:288)
Mine 5 km N Valladolid, Mpo. de Valladolid (Reddell, 1977b:291)
+Cenote, Yokdzonot, Mpo. de Tunkas (Zullini, 1977:76)
*Cenote de las Abejas, 2 km N Kopomá, Mpo. de Kopomá (Reddell, 1977b:262)
Cenote Acanceh—see Cenote Chun Kapoc

*Cenote Aká Chen, 1 km E Tixcancal, Mpo. de Tizimín (Reddell, 1977b:289)
Cenote Amil, 6 km S Abalá, Mpo. de Abalá (Reddell, 1977b:253)
+*Cueva Amil, 14 km SE and 2 km E Mérida, Mpo. de Mérida (Reddell, 1977b:264)
+Cenote Anicabil, near the road to Yaxcabá, Mpo. de Yaxcabá (Finch, 1965:113-115)
+Cueva de Arena, 0.5 km SSW Santa Rosa, Mpo. de Peto (Villa R., 1953a:318)
Cueva de Balaam Canche—see Grutas de Balankanche
*Grutas de Balankanche, 4 km E Chichén Itzá, Mpo. de ?Tinum (Andrews, 1970:1-4, 2-3m; Reddell, 1977b:284-286)
Cueva de Belaam Canche—see Grutas de Balankanche
Cueva Bolonchén—see Grutas de Balankanche
Actún Caba Chen—see Cenote Kabahchén
*Cenote Calchuhuim, 2 km E Hacienda San Bernardo, Mpo. de Maxcanú (Reddell, 1977b:263)
*Cenote Calchum, 1 km E Hacienda San Bernardo, Mpo. de Maxcanú (Reddell, 1977b:263)
Cenote Calchuntunil—see Cenote Calchuhuim
Cenote de los Camarones—see Cueva de Santa Elena
Cueva de los Camarones—see Cueva de Santa Elena
+Cueva de Carroza, Hoctún, Mpo. de Hoctún (Reddell, 1977b:257)
Baños Catacumbas—see Cenote de San Isidro
*Cenote de Catzín, Catzín, Mpo. de Chemax (Reddell, 1977b:256)
Cueva de Caxcuy—see Cenote del Pochote
+*Cueva Chac Mol, Tohil, Mpo. de Kaua (Reddell, 1977b:258)
Cenote de Chac Sikiin (Norte), Ruinas de Mayapán, Mpo. de Tecoh (Reddell, 1977b:278-279)
Cenote de Chac Sikiin (Sur), Ruinas de Mayapán, Mpo. de Tecoh (Reddell, 1977b:279)
+Cenote Chapultepec, Mérida, Mpo. de Mérida (Reddell, 1977b:264)
*Cenote Chen Mul, Ruinas de Mayapán, Mpo. de Tecoh (Smith, 1954:223-225, 230m; Reddell, 1977b:279)
+Cenote Chiuoh, Hacienda Mukuyché, Mpo. de Abalá (Reddell, 1977b:253-254)
Cenote Chiuok—see Cenote Chiuoh
+Cenote Chotch, 3 km NE Pisté, Mpo. de Tinum (Reddell, 1977b:286)
*Cenote Chun Kapoc, Acanceh, Mpo. de Acanceh (Reddell, 1977b:256)
+Cenote Ciruak, 3 km N Pisté, Mpo. de Tinum (Reddell, 1977b:286)
Cenote de Cocoyol, Cocoyol, Mpo. de Chemax (Reddell, 1977b:256-257)
+Cenote Conchita, Mérida, Mpo. de Mérida (Reddell, 1977b:264-265)
+Cenote del Country Club, Mérida, Mpo. de Mérida (Reddell, 1977b:265)
*Cenote de la Culebra, 12 km N Muna, Mpo. de Abalá (Reddell, 1977b:255)
Cenote D, Ruinas de Aké, Mpo. de Tixkokob (Reddell, 1977b:288)
Cueva de las Derrumbes, 1 km S Tixcancal, Mpo. de Tizimín (Reddell, 1977b:289)
+Cenote Dhibá, near the road to Yaxcabá, Mpo. de Yaxcabá (Finch, 1965:110)
Grutas de Dzab-Nah—see Grutas de Tzab-Nah
Aguada Dzadz—see Cenote Dzadz
+Cenote Dzadz, 10 km SW Chichén Itzá, Mpo. de Kaua (Reddell, 1977b:259)
+Cenote de la Escuela Carlos Morales, Mérida, Mpo. de Mérida (Reddell, 1977b:265)
*Cueva Escondida, 3.5 km S Kaua, Mpo. de Kaua (Reddell, 1977b:259)
*Cenote G, Ruinas de Aké, Mpo. de Tixkokob (Reddell, 1977b:288)
+Cenote Geiser, Mérida, Mpo. de Mérida (Reddell, 1977b:265)
Cenote Geyser—see Cenote Geiser
Great Cenote—see Cenote Xtolok
+Cenote Halal, 14 km N and 2 km E Mérida, Mpo. de Mérida (Reddell, 1977b:265)
Cueva de Hoctum—see Cenote de Hoctún
*Cenote de Hoctún, 1 km W Hoctún, Mpo. de Hoctún (Pearse, 1938a:10, 11m; Robles Ramos, 1950:63-66, 64m; Reddell, 1977b:257-258)
Cueva de Hoctún—see Cenote de Hoctún
+Cenote Hotún, 1.5 km SW Pisté, Mpo. de Tinum (Reddell, 1977b:286)
Cenote Hunto Chac (Cueva de Mamey), 4 km S Valladolid, Mpo. de Valladolid (Reddell, 1977b:291-292)
Cenote Hunto Chac (Cueva del Pozo), 4 km S Valladolid, Mpo. de Valladolid (Reddell, 1977b:292)
+Cenote Huntún, 4.8 km W Pisté, Mpo. de Tinum (Reddell, 1977b:286)
+Cenote de Hunucmá, 2 km N Hunucmá, Mpo. de Hunucmá (Reddell, 1977b:258)
Cenote Ikil—see Cenote Ixil
+Cenote Itzmal Chen, Ruinas de Mayapán, Mpo. de Tecoh (Finch, 1965:102m)
+Cenote Ixil, 4.8 km SE Chichén Itzá, Mpo. de Kaua (Reddell, 1977b:259)
*Cenote Kabahchén, Maní, Mpo. de Maní (Mercer, 1896:140-141, 140m; Reddell, 1977b:262)
+Cenote Kachak, 16 km W Hunucmá, Mpo. de Hunucmá (Finch, 1965:99, 100m)
Cenote Kankirixché, 10 km NW Muna, Mpo. de Muna (Reddell, 1977b:268)
*Actún Kaua, 1 km S Kaua, Mpo. de Kaua (Reddell, 1977b:259-261)
+Cenote de Kaua, Kaua, Mpo. de Kaua (Reddell, 1977b:261)
+Cenote de Kikil, 8 km N Tizimín, Mpo. de Tizimín (Reddell, 1977b:289)
Cenote Luchil—see Cueva Luchil
*Cueva Luchil, 8 km SSE Mérida, Mpo. de Kanasín (Reddell, 1977b:258)
+Cenote Manzanilla, Mérida, Mpo. de Mérida (Reddell, 1977b:265)
+Cenote de Miramar, 1 km SW Telchac Puerto, Mpo. de Telchac Puerto (Reddell, 1977b:283)
Motul Cave—see Cenote de Sambulá, Motul
+Cenote Mukuyché, Yuncú, Mpo. de Abalá, Reddell, 1977b:255)
Caverna Murustún—see Cueva Muruztún
+*Cueva Muruztún, 5 km S Tizimín, Mpo. de Tizimín (Reddell, 1977b:289)
+Cenote Niagara, Mérida, Mpo. de Mérida (Reddell, 1977b:265)
Cenote Niagra—see Cenote Niagara
*Cenote Nohchén, Sacalum, Mpo. de Sacalum (Arnold

and Bohor, 1975:25-27, 26m; Reddell, 1977b: 276)
+Cenote Olivut, Mérida, Mpo. de Mérida (Reddell, 1977b:265-266)
*Cenote de Orizaba, 8 km S Buenaventura, Mpo. de Tizimín (Reddell, 1977b:289)
*Cueva de Orizaba, 8 km S Buenaventura, Mpo. de Tizimín (Reddell, 1977b:290)
Caverna Oxloth–see Cueva Oxolodt
+*Cueva Oxolodt, Kaua, Mpo. de Kaua (Reddell, 1977b:261)
Cenote de la Paca, 7 km E Tikuch, Mpo. de Valladolid (Reddell, 1977b:292)
Cenote Pamanché–see Cenote Taamanché
Cenote de los Pinos, 7 km S Buenaventura, Mpo. de Tizimín (Reddell, 1977b:290)
+Cenote de Pisté, Pisté, Mpo. de Tinum (Reddell, 1977b:286)
El Pochote Cave–see Cenote del Pochote
*Cenote del Pochote, 10 km NW Muna, Mpo. de Muna (Reddell, 1977b:268)
Cueva del Ponte–Cenote del Pochote
Cenote Poxil, 7 km SE Chemax, Mpo. de Chemax (Reddell, 1977b:257)
Cenote de El Retiro–see Cenote de San Isidro
Cenote Sabacah, Sucopo, Mpo. de Tizimín (Reddell, 1977b:290)
Sacrificial Cenote–see Cenote Sagrado
+Cenote Sagrado, Chichén Itzá, Mpo. de Tinum (Tozzer, 1957:191-192, fig. 706-707m; Reddell, 1977b:286-287)
Cenote Salud, 12 km S Valladolid, Mpo. de Tekom (Reddell, 1977b:282-283)
*Cenote de Sambulá, Kopomá, Mpo. de Kopomá (Reddell, 1977b:262)
+Cenote de Sambulá, Mérida, Mpo. de Mérida (Reddell, 1977b:266)
*Cenote de Sambulá, Motul, Mpo. de Motul (Pearse, 1938a:10, 11m; Reddell, 1977b:267-268)
Cueva Sambulá–see Cenote de Sambulá, Mérida
Cenote San Bulhá–see Cenote de Sambulá, Mérida
Cueva San Bulhá–see Cenote de Sambulá, Mérida or Cenote de Sambulá, Motul
Cenote San Cosmé–see Cenote Olivut
Cenote de San Diego, 2 km W Cocoyol, Mpo. de Chemax (Reddell, 1977b:257)
*Cenote de San Isidro, Mérida, Mérida (Pearse, 1938a: 10, 11m; Reddell, 1977b:266)
Cueva de San Isidro–see Cenote de San Isidro
*Cenote de San José, Mérida, Mpo. de Mérida (Reddell, 1977b:266)
Cenote de San Luis, 7 km S Tixcancal, Mpo. de Tizimín (Reddell, 1977b:290)
+Cenote de Santa Ana, Valladolid, Mpo. de Valladolid (Reddell, 1977b:292)
*Cueva de Santa Elena, 5 km S Telchac Puerto, Mpo. de Telchac Puerto (Robles Ramos, 1950:67m, 68-69; Reddell, 1977b:283)
*Pozo de Santa Elena, 5 km S Telchac Puerto, Mpo. de Telchac Puerto (Reddell, 1977b:283)
+Cenote Scan Yui, 3 km E Chichén Itzá, Mpo. de Tinum (Hall, 1936:9m; Reddell, 1977b:287)
+Cenote Seco, Chichén Itzá, Mpo. de Tinum (Reddell, 1977b:287)
+Cenote Shkolak, 3 km from Sitilpech, Mpo. de Izamal (Baker, 1895:23)
*Cenote de Sihunchén, Sihunchén, Mpo. de Abalá (Reddell, 1977b:255-256)
+Cenote Sisal, Valladolid, Mpo. de Valladolid (Reddell, 1977b:292)
+Cenote Skashek, 3 km from Sitilpech, Mpo. de Izamal (Baker, 1895:23)
+Cenote Sodzil, 8 km N and 1.6 km E Mérida, Mpo. de Mérida (Reddell, 1977b:266)
*Cenote Sodzil, 5 km W Sucopo, Mpo. de Tizimín (Reddell, 1977b:290-291)
*Cueva Sodzil, 5 km W Sucopo, Mpo. de Tizimín (Reddell, 1977b:291)
Cenote Sucilá, 8 km E Hunkú, Mpo. de Temozón (Reddell, 1977b:283)
Cenote Sucopo, Sucopo, Mpo. de Tizimín (Reddell, 1977b:291)
Cenote Sucuil–see Cenote Sucilá
+Cenote Taamanché, Taamanché, Mpo. de Mérida (Reddell, 1977b:267)
*Cueva de Tecoh, Mérida, Mpo. de Mérida (Reddell, 1977b:267)
Cenote Tekom, Tekom, Mpo. de Tekom (Reddell, 1977b:283)
Cenote de Telchaquillo, Telchaquillo, Mpo. de Tecoh (Reddell, 1977b:279-280)
+Cenote de Thompson, 2.5 km E Chichén Itzá, Mpo. de Tinum (Reddell, 1977b:287)
Cenote Ticimul–see Cenote Tikimul
+Cenote Tikimul, 7 km S Chichén Itzá, Mpo. de Kaua (Reddell, 1977b:261)
Cenote Tixcancal, Tixcancal, Mpo. de Tizimín (Reddell, 1977b:291)
Actún Tuc-ic–see Actún Tuz-ic
Cenote Tuxctuc–see Cenote de San Luis
+Actún Tuz-ic, 5 km ENE Calcehtok, Mpo. de Opichén (Reddell, 1977b:270)
*Grutas de Tzab-Nah, 2 km S Tecoh, Mpo. de Tecoh (Stromsvik, 1956:463-465, 469m; Reddell, 1977b: 281)
Uki Cave–see Cenote Uki
+Cenote Uki, 3 km NW Motul, Mpo. de Motul (Reddell, 1977b:268)
+Cueva Valladolid, Valladolid, Mpo. de Valladolid (Reddell, 1977b:292)
+Cenote Xal, near Chichén Itzá, Mpo. de Tinum (Reddell, 1977b:287)
Cenote Xalau–see Cenote Xtacabihá
+Cenote Chica de Xanabá, 6.5 km SW Chichén Itzá, Mpo. de Kaua (Reddell, 1977b:261)
+Cenote Grande de Xanabá, 8 km SW Chichén Itzá, Mpo. de Kaua (Reddell, 1977b:261)
Cenote Xcan Yui–see Cenote Scan Yui
+*Cueva Xconsacab, near Tizimín, Mpo. de Tizimín (Reddell, 1977b:291)
+Cenote X-ebiz, Hoctún, Mpo. de Hoctún (Reddell, 1977b:258)
+Cenote Xix, Valladolid, Mpo. de Valladolid (Reddell, 1977b:292)
*Cenote Xkekén, 3 km N Dzit-Nup, Mpo. de Valladolid (Reddell, 1977b:293)
Cenote Xlacah–see Cenote Xlaká
+Cenote Xlaká, Ruinas de Dzibilchaltun, Mpo. de Mérida (Marden, 1959:110-129, 112-113m; Reddell, 1977b:267)

*Cenote Xtacabihá, 9 km NNE Tikuch, Mpo. de Valladolid (Reddell, 1977b:293)

+Cenote X-Tojil, Libre Unión, Mpo. de Yaxcabá (Zullini, 1977:76)

Cenote Xtolok, Chichén Itzá, Mpo. de Tinum (Hall, 1936:9m; Reddell, 1977b:287)

*Cueva del Cenote Xtolok, Chichén Itzá, Mpo. de Tinum (Reddell, 1977b:287-288)

+*Cenote Yunchén, Libre Unión, Mpo. de Yaxcabá (Reddell, 1977b:293)

Cueva Yunchén—see Cenote Yunchén

+Cenote Yuncú, Yuncú, Mpo. de ?Abalá (Reddell, 1977b:256)

+*Cenote Zaci, 36 km ENE Tizimín, Mpo. de Tizimín (Holthuis, 1977:175)

Cueva de Zopilote Negro, Ruinas de Aké, Mpo. de Tixkokob (Reddell, 1977b:288)

Sierra de Ticul

Cave on the Hacienda San Bernardo—see Actún Xpukil

+Cave, Ticul, Mpo. de Ticul (Reddell, 1977b:284)

+Cave, Yocat, Mpo. de Ticul (Reddell, 1977b:284)

Cueva de Aguacate, 2 km S Maxcanú, Mpo. de Maxcanú (Reddell, 1977b:262-263)

Actún Ankah—see Actún Chacaljas

Grutas de Calcehtok—see Actún Xpukil

*Actún Chac, 15 km ESE Santa Elena, Mpo. de Santa Elena (Mercer, 1896:91-93, 92m; Reddell, 1977b:277)

Actún Chacaljas, 3 km S Calcehtok, Mpo. de Opichén (Reddell, 1977b:269)

+Cueva Chakxix, near Tekax, Mpo. de Tekax (Reddell, 1977b:282)

Actún Chen, 3 km W Kiuick, Mpo. de Oxkutzcab (Reddell, 1977b:273)

Actún Chom, 1 km S Calcehtok, Mpo. de Opichén (Reddell, 1977b:269)

*Actún Chukum, 2 km S Maxcanú, Mpo. de Maxcanú (Reddell, 1977b:263-264)

Actún Chunup, 2 km SW Maxcanú, Mpo. de Maxcanú (Reddell, 1977b:264)

Cueva del Cinco de Mayas—see Cueva del Cinco de Mayo

+Cueva del Cinco de Mayo, 1 km SW Tekax, Mpo. de Tekax (Finch, 1965:132m, 133; Reddell, 1977b:281-282)

Actún Coch Leb, 3 km S Calcehtok, Mpo. de Opichén (Reddell, 1977b:269-270)

+Actún Coyok, 6.5 km SW Oxkutzcab, Mpo. de Oxkutzcab (Hatt, 1953:15m; Reddell, 1977b:273)

+Actún Ebizt, near Oxkutzcab, Mpo. de Oxkutzcab (Pearse, 1938a:10, 11m; Reddell, 1977b:273)

+*Actún Góngora, 1.5 km S or 3 km E Oxkutzcab, Mpo. de Oxkutzcab (Pearse, 1938a:10, 11m; Reddell, 1977b:273-274)

Actún Góngurrah—see Actún Góngora

Cueva de Gorgosa—see Actún Góngora

+Actún Has, 6.5 km S Yocat, Mpo. de Ticul (Reddell, 1977b:284)

Actún Hi—see Actún Jih

Actún Ix-kix—see Actún Xkyc

Actún Jih, 3 km W Ticul, Mpo. de Ticul (Reddell, 1977b:284)

Actún Kiuick, Ruinas de Kiuick, Mpo. de Oxkutzcab (Reddell, 1977b:274)

+Actún Lara, between Yocat and Ticul, Mpo. de Ticul (Mercer, 1896:83m, 84; Hatt, 1953:17-18, 17m; Reddell, 1977b:284)

*Actún Loltún, 7 km SSW Oxkutzcab, Mpo. de Oxkutzcab (Mercer, 1896:98-125, 99m; Thompson, 1897:6-22, 8-10m; Finch, 1965:140-147, 141m, 143m; Reddell, 1977b:274-275)

+Manhole Cave, 3.2 km S Yocat, Mpo. de Ticul (Reddell, 1977b:284)

Actún Nohcacab, Santa Elena, Mpo. de Santa Elena (Reddell, 1977b:277-278)

*Actún Okobichén, 8 km SW Santa Elena, Mpo. de Santa Elena (Reddell, 1977b:278)

+Actún On, 4 km SW Oxkutzcab, Mpo. de Oxkutzcab (Finch, 1965:136-140, 137m)

+Actún Oxkintok, 2 km SW Calcehtok, Mpo. de Opichén (Mercer, 1896:44m, 45-46; Hatt, 1953:18-20, 19m; Reddell, 1977b:270)

Cueva de Oxkintok—see also Actún Xpukil

+Gruta de Pichjabín, near Muna, Mpo. de ?Muna (Gonzalez-Ochoa, 1963b:84)

Caverna P'us—see Actún Puz

+*Actún Puz, near Oxkutzcab, Mpo. de Oxkutzcab (Pearse, 1938a:10, 11m; Reddell, 1977b:275-276)

*Actún Sabacá, 6 km SW Tekax, Mpo. de Tekax (Mercer, 1896:146-149, 147m; Reddell, 1977b:282)

Actún Sabacha—see Actún Sabacá

Actún Sabaká—see Actún Sabacá

Cueva Sabré—see Actún Sabacá

Cueva de San Roque—see Cueva Primera del Camino a San Roque

San Roque Road Cave—see Cueva Primera del Camino a San Roque

+Cueva Primera del Camino a San Roque, on road from Oxkutzcab to San Roque, Mpo. de Oxkutzcab (Reddell, 1977b:276)

+Cueva Segunda del Camino a San Roque, on road from Oxkutzcab to San Roque, Mpo. de Oxkutzcab (Pearse, 1938a:10, 11m; Reddell, 1977b:276)

Caverna Sasich—see Actún Sazich

+Actún Sazich, near Calcehtok, Mpo. de Opichén (Reddell, 1977b:270)

Cueva de Sebacá—see Actún Sabacá

Actún Silil, 3 km S Calcehtok, Mpo. de Opichén (Reddell, 1977b:270)

Actún Sitz—see Actún Ziz

Actún Spukil—see Actún Xpukil

*Actún Tucil, 2 km S Muna, Mpo. de Muna (Reddell, 1977b:268-269)

Actún Tusil—see Actún Tucil

Actún Xcoch—see Actún Xkoch

Caverna Xkic—see Actún Xkyc

Actún Xkoch, north of Santa Elena, Mpo. de Santa Elena (Reddell, 1977b:278)

Actún X-Koyoc—see Actún Coyok

*Actún Xkyc, 2 km S Calcehtok, Mpo. de Opichén (Reddell, 1977b:270-271)

+Actún Xmahit, near Tekax, Mpo. de Tekax (Reddell, 1977b:282)

Actún Xpek, 1 km S Muna, Mpo. de Muna (Reddell, 1977b:269)

Caverna Xpucil—see Actún Xpukil

*Actún Xpukil, 3 km S Calcehtok, Mpo. de Opichén (Hatt, 1953:20-24, 22m; Reddell, 1977b:271-273)
Actún Ziizhá, 2 km S Muna, Mpo. de Muna (Reddell, 1977b:269)
*Actún Ziz, Oxkutzcab, Mpo. de Oxkutzcab (Mercer, 1896:128-129, 129m; Reddell, 1977b:276)

ZACATECAS

+Large cave 8.8 km S Moyahua, Mpo. de Moyahua (Genoways and Jones, 1968:744)
+Cave 21 km W Valparaíso, Mpo. de Valparaíso (Handley, 1959:149-150)

BELIZE

BELIZE DISTRICT

+Cave under Gracy Rock, 8.5 km SSW Hattieville (Neill and Allen, 1962:84) (Sheet 21)

CAYO DISTRICT

Fissure near Mountain Cow Cave, 2 km SE Caves Branch (Sheet 25)
+Augustine Cave n. 1, Augustine, 22 km SSE San Ignacio (Williams, 1976c:602) (?Sheet 28) (NOTE: This is probably one of the Rio Frio Caves)
+Augustine Cave n. 2, Augustine, 22 km SSE San Ignacio (Williams, 1976c:602) (?Sheet 28) (NOTE: This is probably one of the Rio Frio Caves)
+Augustine Cave n. 3, Augustine, 22 km SSE San Ignacio (Williams, 1976c:602) (?Sheet 28) (NOTE: This is probably one of the Rio Frio Caves)
*Buck's Bypass-St. Herman's Cave System, 2 km E Caves Branch, 120 m (Anonymous, 1974a:7; Albert and McLeod, 1971:29) (Sheet 25)
Caves Branch Cave System, 5 km NNE Caves Branch, 40 m (Bartholomew, 1973:260-261) (Sheet 25)
*Footprint Cave, 4 km SW Caves Branch, 120 m (Sheet 25)
+Millionario Cave, near Millionario, 45 km SSE San Ignacio (Williams, 1976c:602 (?Sheet 28)
*Mountain Cow Cave, 2 km SE Caves Branch, 160 m (Sheet 25)
Petroglyph-Satibe Cave System, 2.5 km S Caves Branch, 160 m (Sheet 25)
Rio Frio Cave A, near Augustine, 22 km SSE San Ignacio, 450 m (?Sheet 28)
Rio Frio Cave B, near Augustine, 22 km SSE San Ignacio, 450 m (?Sheet 28)
+Rio Frio Cave D, near Augustine, 22 km SSE San Ignacio, 450 m (LaVal, 1973:25) (?Sheet 28)
St. Augustine Cave, 0.5 km E Rio Frio, near Augustine, 22 km SSE San Ignacio (?Sheet 28) (NOTE: This may be one of the Rio Frio Caves)
St. Herman's Cave—see Buck's Bypass-St. Herman's Cave System
+San Antonio Cave, San Antonio, 10 km SSE San Ignacio (Williams, 1976c:602) (Sheet 23)
Satibe Cave—see Petroglyph-Satibe Cave System
Top Breakout Cave, near Caves Branch (Sheet 25)
*Waterfall Cave, 5 km SSW Caves Branch, 160 m (Sheet 25)

COROZAL DISTRICT

+San Antonio Cave, San Antonio, 2 km ENE Corozal (Quinones et al., 1978:559) (Sheet 2)

GUATEMALA

ALTA VERAPAZ

+Cave, Cacao, Trece Aguas (Froeschner, 1960:661 (NOTE: This is probably Sistema de Seamay-Sejul)
+Cave, Finca Chicoyou, 1 km W Cobán, 1300 m (Jones, 1966:456)
+Cave near Finca Chimoxán (Goodwin, 1934:8)
+Caves, Chipoc (Goodwin, 1934:11)
+Cave 14.5 km S Cobán, 1360 m (Jones, 1966:464, 465)
+*Grotte C3, Sierra de Pampur, W of Cobán and S of the Río Chixoy Onegro (Delamare Deboutteville, 1976: 127m)
+*Grotte G3, Sierra de Pampur, W of Cobán and S of the Río Chixoy Onegro (Delamare Deboutteville, 1976: 126m)
+Grotte de Bombil Pec, NE of Chisec (Dreux, 1974:205, 210m)
+Cueva del Cementerio de los Mayas, Lanquín (Gurnee, 1968:150m)
+Cueva del Cerrito, on the route from Raxjurá to Cobán, 10 km from Raxjurá (Delamare Deboutteville and Juberthie, 1976:23)
+*Cueva Chiacam, Sierra de Chama, near Finca Chiacam, NE of Cobán (Delamare Deboutteville, 1976:128m)
+Cueva Chiantejau, 8 km ENE Lanquín on Cahabón road (Mohr, 1968:172)
+*Cueva Chirrepeck, S of Cobán, 1400 m (Beier, 1974: 101, 102)
+Cueva Golondrinas, Finca Arenal, 10 km S Lanquín (Gurnee, 1968:157)
+Jul'Pec Beneack Yaj, 10 km from Raxjurá on road to Cobán (Delamare Deboutteville and Juberthie, 1976: 23)
+Cueva Jul Seluc, 2 km S Lanquín (Gurnee, 1968:154m)
*Grutas de Lanquín, 1 km NW Lanquín (Gurnee, 1962: 26-27, 27m; Gurnee, 1968:151m, 152)
+Sistema del Río Candelaria, Municipio de Chisec (Delamare Deboutteville and Juberthie, 1976:19, 21m, 23)
+Cueva Sakalkunte, near Senahú, 1800 m (Bartsch, 1906: 117)
Cueva Seamay—see Sistema de Seamay-Sejul
*Sistema de Seamay-Sejul, 2 km SE Senahú, 26 km SE Lanquín (Gurnee, 1968:158-160, 158m; Smith, 1968: 162, 163m; Shawcross, 1971:63-64, 69m, 71)
Cueva Sejul—see Sistema de Seamay-Sejul
+Cueva Seanay, 2 km S Lanquín (Gurnee, 1968:152, 154m)
*Cueva Sepacuite n. 2, Finca Sepacuite, Senahú (Peck and Peck, 1973:70)
Cueva Sepacuite n. 3, Finca Sepacuite, Senahú (Peck and Peck, 1973:70)
+Siguan, 1.5 km W Lanquín (Gurnee, 1968:152)

CHIMALTENANGO

+Cave near Chocoyos, 7 km NW Patzún, 1520 m (Usinger, 1966:298, 360)
+Cave, Santa Elena (Sanborn, 1936:99)

ESCUINTLA

+Cueva de los Ladrones, Finca Los Arcos, 210 m (LaVal, 1973:10)

HUEHUETENANGO

Caves, Km 130, plateau N of Huehuetenango—see Sumidero de Chemal n. 1 and Sumidero de Chemal n. 2

125 ft. pit, plateau N of Huehuetanango—see Cueva de Cul

+Cueva de Agua Escondida, 2 km SW Agua Escondida, 10 km WNW Santa Ana Huista (Broughton, 1973: 52-54, 55m, 57-59; Broughton and Boon, 1975:8-15, 14m)

+Cueva de las Calaveras, Tabacal, 5 km WNW Santa Ana Huista, 750 m (Sbordoni et al., 1977:64-65, 65m)

+Piccolo Pozzo di Chemal, Llanos de Chemal, 14 km NNW La Capellania, 3200 m (Sbordoni et al., 1977: 69)

Sumidero de Chemal n. 1, 14 km NNW La Capellania, 3180 m (Shawcross et al., 1974:63-64m, 66, 71; Sbordoni et al., 1977:68)

Sumidero de Chemal n. 2, 16 km NNW La Capellania, 3290 m (Shawcross et al., 1974:66, 67m)

+Resumidero Chico, La Capellania, 3040 m (Sbordoni et al., 1977:65m, 70)

Cueva de Cul, 12 km NNW La Capellania (Shawcross et al., 1974:66, 69m)

Cueva del Diablo—see PETEN

+Cueva Esculike Alta, Sibila, 2940 m (Sbordoni et al., 1977:67m, 70-71)

+Cueva Esculike Baja, Sibila, 2930 m (Sbordoni et al., 1977:71)

+Resumidero Grande, 1.5 km W La Capellania, 3030 m (Sbordoni et al., 1977:69)

Sima de los Grillos, 4 km N El Retiro, 19 km SW Libertad, 3120 m

+Cueva del Madrón n. 1, El Madrón, 3 km at 215° SSW San Juan Ixcoy, 2750 m (Sbordoni et al., 1977:66, 68)

+Cueva del Madrón n. 2, El Madrón, 3 km at 215° SSW San Juan Ixcoy, 2740 m (Sbordoni et al., 1977:68)

+La Mina, La Capellania, 3030 m (Sbordoni et al., 1977: 70)

*Cueva de los Resadores, Santa Eulalia, 2500 m (Sbordoni et al., 1977:66, 67m)

Sima de El Retiro n. 1, El Retiro, 16 km SW Libertad, 2940 m

Sima de El Retiro n. 2, El Retiro, 16 km SW Libertad, 2880 m

Sima de El Retiro n. 6, El Retiro, 16 km SW Libertad, 2880 m

Cueva del Rodeo, 13 km SE Libertad, 3030 m

+Resumidero de San Miguel, Llanos de San Miguel, San Juan Ixcoy, 3300 m (Sbordoni et al., 1977:69)

Cueva de Santa Eulalia—see Cueva de los Resadores

Cueva de Tabacal, Tabacal, 5 km WNW Santa Ana Huista

Cueva del Tepescuintle—see PETEN

Cueva de Yaxchilán—see Cueva de Juan Flores, PETEN

IZABAL

+Crevice cave, Escobas, near San Tomas (Sanborn, 1936: 95)

+Talus cave, Escobas, near San Tomas (Sanborn, 1936: 94)

Cueva de la Coche, 2.5 km W Livingston (Peck and Peck, 1973:69)

Gruta El Silvino, 34 km W Puerto Barrios (Gurnee, 1962:29, 30m)

JUTIAPA

+Cave 2 km W Tincal (=Tiucal) (Vercammen-Grandjean, 1964:305, 307)

PETEN

+Cave 12 km NNW Chinajá (Jones, 1966:443, 447, 452, 456, 463)

+Second cave 12 km NNW Chinajá (Jones, 1966:443, 463)

+Cave 15 km NW Chinajá (Jones, 1966:447)

+Cave 3 km S Flores (Goodwin, 1955:1, 2)

+Cave, Toocog, 15 km SE La Libertad, 160 m (Jones, 1966:447, 456)

+Cubixinal Cave, S of Flores (Thompson, 1967:252)

+Cueva del Diablo, E side of Río Usumacinta across from Yaxchilán, Chiapas, México, 230 m (Sbordoni et al., 1974:11-12, 12m)

Cueva Jobitzinaj, 7 km S Flores (Gurnee, 1962:28-29, 29m)

+Cueva de Juan Flores, E side of Río Usumacinta across from Yaxchilán, Chiapas, México, 100 m (McEachern, 1974:141, 142m; Sbordoni et al., 1974:10-11)

Cueva Najohnaj Coholtunich, 14 km SW Flores

+Cueva del Tepescuintle, E side of Río Usumacinta across from Yaxchilán, Chiapas, México, 240 m (Sbordoni et al., 1974:13-14, 13m)

Cueva de Yaxchilán—see Cueva de Juan Flores

EL PROGRESO

+Cave at El Progreso (Goodwin, 1934:9, 14)

SOLOLA

+Cueva Camán, near Lago de Atitlán (Causey, 1960: 275, 278)

Appendix 2

LIST OF TROGLOBITES BY STATE

México

Campeche

Creaseriella anops—Isopoda, Cirolanidae
Mayaweckelia cenoticola—Amphipoda, Hadziidae
Mayaweckelia yucatanensis—Amphipoda, Hadziidae
Typhlatya campecheae—Decapoda, Atyidae
Typhlatya pearsei—Decapoda, Atyidae
Creaseria morleyi—Decapoda, Palaemonidae
Diplocentrus mitchelli—Scorpiones, Diplocentridae
Oonops coecus—Araneae, Oonopidae
Metagonia torete—Araneae, Pholcidae
Matta mckenziei—Araneae, Tetrablemmidae
Tohila atelomma—Saltatoria, Gryllidae

Chiapas

Opisthobursa josephinae—Tricladida, Dimarcusidae
Dugesia mckenziei—Tricladida, Dugesiidae
Caecidotea chiapas—Isopoda, Asellidae
Caecidotea vomeroi—Isopoda, Asellidae
Caecidotea zullinii—Isopoda, Asellidae
Brackenridgia acostai—Isopoda, Trichoniscidae
Bogidiella orchestipes—Amphipoda, Bogidiellidae
Bogidiella sbordonii—Amphipoda, Bogidiellidae
Bogidiella tabascensis—Amphipoda, Bogidiellidae
Bogidiella vomeroi—Amphipoda, Bogidiellidae
Bithynops luscus—Decapoda, Palaemonidae
Typhlopseudothelphusa mocinoi—Decapoda, Pseudothelphusidae
Trichodactylus (Rodriguezia) mensabak—Decapoda, Trichodactylidae
Troglohya mitchelli—Pseudoscorpionida, Hyidae
Pachychitra grandis—Pseudoscorpionida, Syarinidae
Cryptocellus sbordonii—Ricinulei, Ricinoididae
Hoplobunus zullinii—Opilionida, Phalangodidae
Mexotroglinus sbordonii—Opilionida, Phalangodidae
Troglostygnopsis anophthalma—Opilionida, Phalangodidae
?*Glomeridesmus sbordonii*—Glomeridesmida, Glomeridesmidae
Cleidogona felipiana—Chordeumida, Cleidogonidae
Cleidogona hunapu—Chordeumida, Cleidogonidae
Polylepiscus vomeroi—Polydesmida, Euryuridae
?*Aceratophallus scutigeroides*—Polydesmida, Rhachodesmidae
Caramba delburro—Polydesmida, Trichopolydesmidae
Caramba delnegro—Polydesmida, Trichopolydesmidae
Caramba grandeza—Polydesmida, Trichopolydesmidae
Chiapadytes bolivari—Coleoptera, Carabidae
Mexanillus sbordonii—Coleoptera, Carabidae

Chihuahua

Psilochorus diablo—Araneae, Pholcidae

Coahuila

Coahuilix hubbsi—Mesogastropoda, Hydrobiidae
Speocirolana thermydronis—Isopoda, Cirolanidae
Sphaerolana affinis—Isopoda, Cirolanidae
Sphaerolana interstitialis—Isopoda, Cirolanidae
Mexistenasellus coahuila—Isopoda, Stenasellidae
Mexiweckelia colei—Amphipoda, Hadziidae
Mexiweckelia particeps—Amphipoda, Hadziidae
Cicurina (Cicurella) coahuila—Araneae, Agelenidae
Cambala speobia—Spirostreptida, Cambalidae
Prietella phreatophila—Cypriniformes, Ictaluridae

Durango

Mexiweckelia mitchelli—Amphipoda, Hadziidae
Leptoneta limpida—Araneae, Leptonetidae
Pholcophora exigua—Araneae, Pholcidae
Psilochorus delicatus—Araneae, Pholcidae
Cryptocellus reddelli—Ricinulei, Ricinoididae

Guerrero

Albiorix bolivari—Psueoscorpionida, Ideoroncidae
Pholcophora gruta—Araneae, Pholcidae
Ceuthauxus constans—Polydesmida, Rhachodesmidae
Pararhachistes amblus—Polydesmida, Rhachodesmidae
Spelaeogastrura guerrerense—Collembola, Poduridae
Juxtlacampa juxtlahuacensis—Diplura, Campodeidae
Anelpistina anophthalma—Thysanura, Nicoletiidae

Hidalgo

Paracophus cladonotus—Saltatoria, Gryllidae
Niptus absconditus—Coleoptera, Ptinidae

México

Caecoa arganoi—Opilionida, Phalangodidae

Nuevo León

Sphaeromicola cirolanae—Podocopa, Entocytheridae
Conilera stygia—Isopoda, Cirolanidae
Sphaerolana affinis—Isopoda, Cirolanidae
Brackenridgia palmitensis—Isopoda, Trichoniscidae
Cylindroniscus cavicolus—Isopoda, Trichoniscidae
Leucohya heteropoda—Pseudoscorpionida, Hyidae
Leucohya magnifica—Pseudoscorpionida, Hyidae
Schizomus bartolo—Schizomida, Schizomidae
Leptoneta isolata—Araneae, Leptonetidae
Leptoneta reclusa—Araneae, Leptonetidae
Nesticus nahuanus—Araneae, Nesticidae
Hoplobunus osorioi—Opilionida, Phalangodidae
Garcibius osorioi—Lithobiomorpha, Lithobiidae
Nuevobius cavicolens—Lithobiomorpha, Lithobiidae
Ceuthauxus palmitonus—Polydesmida, Rhachodesmidae
Oncopodura prietoi—Collembola, Oncopoduridae
Pararrhopalites anops—Collembola, Sminthuridae
Paratachycampa boneti—Diplura, Campodeidae
Podocampa cavernicola—Diplura, Campodeidae
Mexaphaenops prietoi—Coleoptera, Carabidae

Oaxaca

Etlastenasellus mixtecus—Isopoda, Stenasellidae
?*Bogidiella arganoi*—Amphipoda, Bogidiellidae
Bogidiella michaelae—Amphipoda, Bogidiellidae
Bogidiella niphargoides—Amphipoda, Bogidiellidae
Spelaeomysis olivae—Mysidacea, Lepidomysidae
Antromysis (Antromysis) reddelli—Mysidacea, Mysidae
Alpheopsis stygicola—Decapoda, Alphaeidae
Macrobrachium villalobosi—Decapoda, Palaemonidae
Neoplaemon nahuatlus—Decapoda, Palaemonidae
Procambarus (Austrocambarus) oaxacae oaxacae—Decapoda, Cambaridae

Procambarus (Austrocambarus) oaxacae reddelli—Decapoda, Cambaridae
Diplocentrus cueva—Scorpiones, Diplocentridae
Troglohya carranzai—Pseudoscorpionida, Hyidae
?Schizomus firstmani—Schizomida, Schizomidae
Schizopelma reddelli—Araneae, Theraphosidae
Metagonia martha—Araneae, Pholcidae
Neogovea mexasca—Opilionida, Sironidae
Hoplobunus apoalensis—Opilionida, Phalangodidae
Cleidogona baroqua—Chordeumida, Cleidogonidae
Mexicambala fishi—Spirostreptida, Cambalidae
Pseudosinella bonita—Collembola, Entomobryidae
Pseudosinella finca—Collembola, Entomobryidae
Platynus (Mexisphodrus) urquijoi—Coleoptera, Carabidae

Puebla

Speocirolana pelaezi—Isopoda, Cirolanidae
Reddellobus troglobius—Spirobolida, Spirobollelidae

Querétaro

Tegenaria caverna—Araneae, Agelenidae
Leptoneta delicata—Araneae, Leptonetidae
Hoplobunus queretarius—Opilionida, Phalangodidae
Mexiterpes metallicus—Chordeumida, Trichopetalidae
Unculabes arganoi—Polydesmida, Rhachodesmidae
Cixius orcus—Homoptera, Cixiidae
Mexaphaenops elegans—Coleoptera, Carabidae
Paratrechus (Hygroduvalius) pallescens—Coleoptera, Carabidae

Quintana Roo

Creaseriella anops—Isopoda, Cirolanidae
Mayaweckelia cenoticola—Amphipoda, Hadziidae
Antromysis (Antromysis) cenotensis—Mysidacea, Mysidae
Typhlatya mitchelli—Decapoda, Atyidae
Typhlatya pearsei—Decapoda, Atyidae
Creaseria morleyi—Decapoda, Palaemonidae
Paraphrynus chacmool—Amblypygida, Phrynidae
?Theotima martha—Araneae, Ochyroceratidae
Oonops coecus—Araneae, Oonopidae
Metagonia torete—Araneae, Pholcidae
Pholcophora pearsei—Araneae, Pholcidae
?Ophisternon infernale—Synbranchiformes, Synbranchidae

San Luis Potosí

Eodrilus mexicanus—Haplotaxida, Acanthodrilidae
Diaptomus (Microdiaptomus) cokeri—Calanoida, Diaptomidae
Sphaeromicola cirolanae—Podocopa, Entocytheridae
Sphaeromicola coahuiltecae—Podocopa, Entocytheridae
Mexilana saluposi—Isopoda, Cirolanidae
Speocirolana bolivari—Isopoda, Cirolanidae
Speocirolana pelaezi—Isopoda, Cirolanidae
Mexistenasellus parzefalli—Isopoda, Stenasellidae
Mexistenasellus wilkensi—Isopoda, Stenasellidae
Spherarmadillo cavernicola—Isopoda, Sphaeroniscidae
Trichorhina boneti—Isopoda, Squamiferidae
Brackenridgia bridgesi—Isopoda, Trichoniscidae
Cylindroniscus vallesensis—Isopoda, Trichoniscidae
Mexiconiscus laevis—Isopoda, Trichoniscidae
Spelaeomysis quinterensis—Mysidacea, Lepidomysidae
Troglocubanus perezfarfanteae—Decapoda, Palaemonidae
Typhlochactas elliotti—Scorpiones, Chactidae
Aphrastochthonius russelli—Pseudoscorpionida, Chthoniidae
Tyrannochthonius pallidus—Pseudoscorpionida, Chthoniidae
Agastoschizomus huitzmolotitlensis—Schizomida, Protoschizomidae
Agastoschizomus lucifer—Schizomida, Protoschizomidae
Schizomus cookei—Schizomida, Schizomidae
Paraphrynus velmae—Amblypygida, Phrynidae
Euagrus anops—Araneae, Dipluridae
Schizopelma stygia—Araneae, Theraphosidae
Metagonia tlamaya—Araneae, Pholcidae
Cryptocellus osorioi—Ricinulei, Ricinoididae
Hoplobunus boneti—Opilionida, Phalangodidae
Hoplobunus planus—Opilionida, Phalangodidae
Rhagidia trisetata—Acarina, Rhagidiidae
Rhagidia weyerensis—Acarina, Rhagidiidae
Newportia (Scolopendrides) sabina—Scolopendromorpha, Cryptopidae
Glomeroides caecus—Glomerida, Glomeridae
Mexiterpes egeo—Chordeumida, Trichopetalidae
Mexiterpes fishi—Chordeumida, Trichopetalidae
Mexiterpes sabinus—Chordeumida, Trichopetalidae
Unculabes crispus—Polydesmida, Rhachodesmidae
Unculabes porrensis—Polydesmida, Rhachodesmidae
Tylogoneus rainesi—Polydesmida, Trichopolydesmidae
Mexicambala russelli—Spirostreptida, Cambalidae
Pseudosinella petrustrinatii—Collembola, Entomobryidae
Acherontides potosinus—Collembola, Hypogastruridae
Paracophus cladonotus—Saltatoria, Gryllidae
Paracophus lippus—Saltatoria, Gryllidae
Oeclidius hades—Homoptera, Kinnaridae
Mexaphaenops fishi—Coleoptera, Carabidae
Troglobacanius bolivari—Coleoptera, Histeridae
Astyanax jordani—Cypriniformes, Characidae

Tabasco

Opisthobursa mexicana—Tricladida, Dimarcusidae
Bogidiella tabascensis—Amphipoda, Bogidiellidae
Macrobrachium acherontium—Decapoda, Palaemonidae
Mexobisium maya—Pseudoscorpionida, Hyidae
Schizomus pecki—Schizomida, Schizomidae
Paraphrynus chiztun—Amblypygida, Phrynidae
Glomeridesmus sbordonii—Glomeridesmida, Glomeridesmidae
Troglobacanius maya—Coleoptera, Histeridae
Poecilia sphenops—Cyprinodontiformes, Poeciliidae

Tamaulipas

Dugesia barbarae—Tricladida, Dugesiidae
Dugesia typhlomexicana—Tricladida, Dugesiidae
Eodrilus albidus—Haplotaxida, Acanthodrilidae
Sphaeromicola cirolanae—Podocopa, Entocytheridae
Speocirolana bolivari—Isopoda, Cirolanidae
Speocirolana pelaezi—Isopoda, Cirolanidae
Mexicerberus troglodytes—Isopoda, Microcerberidae
Spherarmadillo cavernicola—Isopoda, Sphaeroniscidae
Brackenridgia bridgesi—Isopoda, Trichoniscidae
Spelaeomysis quinterensis—Mysidacea, Lepidomysidae
Typhlochactas rhodesi—Scorpiones, Chactidae
Aphrastochthonius major—Pseudoscorpionida, Chthoniidae
Aphrastochthonius parvus—Pseudoscorpionida, Chthoniidae
Tyrannochthonius troglobius—Pseudoscorpionida, Chthoniidae
Paravachonium bolivari—Pseudoscorpionida, Vachoniidae

Paravachonium superbum—Pseudoscorpionida, Vachoniidae
Schizomus lukensi—Schizomida, Schizomidae
Schizomus mitchelli—Schizomida, Schizomidae
Schizomus reddelli—Schizomida, Schizomidae
Paraphrynus baeops—Amblypygida, Phrynidae
Euagrus cavernicola—Araneae, Dipluridae
Cicurina (Cicurusta) mina—Araneae, Agelenidae
Tegenaria blanda—Araneae, Agelenidae
Leptoneta capilla—Araneae, Leptonetidae
Theotima pura—Araneae, Ochyroceratidae
Metagonia pachona—Araneae, Pholcidae
Metagonia pura—Araneae, Pholcidae
Cryptocellus osorioi—Ricinulei, Ricinoididae
Hoplobunus boneti—Opilionida, Phalangodidae
Troglostygnopsis inops—Opilionida, Phalangodidae
Ortholasma sbordonii—Opilionida, Nemastomatidae
? *Newportia (Scolopendrides) sabina*—Scolopendromorpha, Cryptopidae
Glomeroides promiscus—Glomerida, Glomeridae
Cleidogona pecki—Chordeumida, Cleidogonidae
Strongylodesmus harrisoni—Polydesmida, Rhachodesmidae
Unculabes causeyae—Polydesmida, Rhachodesmidae
Speodesmus pecki—Polydesmida, Trichopolydesmidae
Tylogoneus minus—Polydesmida, Trichopolydesmidae
Mexicambala blanda—Spirostreptida, Cambalidae
Mexicambala inopis—Spirostreptida, Cambalidae
Pseudosinella petrustrinatii—Collembola, Entomobryidae
? *Oncopodura prietoi*—Collembola, Oncopoduridae
Paracophus caecus—Saltatoria, Gryllidae
Antroforceps bolivari—Coleoptera, Carabidae
Mexaphaenops intermedius—Coleoptera, Carabidae
Platynus (Mexisphodrus) profundus—Coleoptera, Carabidae
Troglobacanius reddelli—Coleoptera, Histeridae
Troglobacanius sbordonii—Coleoptera, Histeridae
Ptomaphagus (Adelops) mckenziei—Coleoptera, Leiodidae
Ptomaphagus (Adelops) troglomexicanus—Coleoptera, Leiodidae
Astyanax jordani—Cypriniformes, Characidae

Veracruz

Caecidotea pasquinii—Isopoda, Asellidae
Mexistenasellus magniezi—Isopoda, Stenasellidae
Cyathura sbordonii—Isopoda, Anthuridae
Trichorhina atoyacensis—Isopoda, Squamiferidae
Brackenridgia villalobosi—Isopoda, Trichoniscidae
Typhlotricholigioides aquaticus—Isopoda, Trichoniscidae
Bogidiella arganoi—Amphipoda, Bogidiellidae
Procambarus (Austrocambarus) oaxacae reddelli—Decapoda, Cambaridae
Procambarus (Austrocambarus) rodriguezi—Decapoda, Cambaridae
Typhlochactas reddelli—Scorpiones, Chactidae
Vaejovis gracilis—Scorpiones, Vaejovidae
Mexobisium paradoxum—Pseudoscorpionida, Hyidae
Schizomus firstmani—Schizomida, Schizomidae
Schizomus pallidus—Schizomida, Schizomidae
Nesticus arganoi—Araneae, Nesticidae
Metagonia atoyacae—Araneae, Pholcidae
Glomeroides addititius—Glomerida, Glomeridae
Glomeroides pellucidus—Glomerida, Glomeridae
Cleidogona crucis—Chordeumida, Cleidogonidae
Bonetesmus ojo—Polydesmida, Oniscodesmidae
Bonetesmus verus—Polydesmida, Oniscodesmidae
Acutangulus alius—Polydesmida, Rhachodesmidae
Acherontides atoyacense—Collembola, Hypogastruridae
Oncopodrua atoyacense—Collembola, Oncopoduridae
Litocampa atoyacensis—Diplura, Campodeidae
Platynus (Mexisphodrus) veraecrucis—Coleoptera, Carabidae

Yucatán

Creaseriella anops—Isopoda, Cirolanidae
Troglophiloscia laevis—Isopoda, Philosciidae
Trichorhina pearsei—Isopoda, Squamiferidae
Cylindroniscus maya—Isopoda, Trichoniscidae
Mayaweckelia cenoticola—Amphipoda, Hadziidae
Antromysis (Antromysis) cenotensis—Mysidacea, Mysidae
Typhlatya mitchelli—Decapoda, Atyidae
Typhlatya pearsei—Decapoda, Atyidae
Creaseria morleyi—Decapoda, Palaemonidae
Diplocentrus anophthalmus—Scorpiones, Diplocentridae
Vachonium boneti—Pseudoscorpionida, Vachoniidae
Vachonium cryptum—Pseudoscorpionida, Vachoniidae
Vachonium kauae—Pseudoscorpionida, Vachoniidae
Vachonium maya—Pseudoscorpionida, Vachoniidae
Paraphrynus chacmool—Amblypygida, Phrynidae
Paraphrynus reddelli—Amblypygida, Phrynidae
Cicurina (Cicurella) maya—Araneae, Agelenidae
Theotima martha—Araneae, Ochyroceratidae
Oonops coecus—Araneae, Oonopidae
Metagonia chiquita—Araneae, Pholcidae
Metagonia torete—Araneae, Pholcidae
Pholcophora pearsei—Araneae, Pholcidae
Orthoporus spelaeus—Spirostreptida, Spirostreptidae
Orthoporus zizicolens—Spirostreptida, Spirostreptidae
Cyphoderus innominatus—Collembola, Entomobryidae
Metasinella falcifera—Collembola, Entomobryidae
Troglopodetes maya—Collembola, Entomobryidae
Tohila atelomma—Saltatoria, Gryllidae
Typhliasina pearsei—Perciformes, Brotulidae
Ophisternon infernale—Synbranchiformes, Synbranchidae

Guatemala

Alta Verapaz

Bogidiella holsingeri—Amphipoda, Bogidiellidae
Typhlopseudothelphusa juberthiei—Decapoda, Pseudothelphusidae
Typhlopseudothelphusa mitchelli—Decapoda, Pseudothelphusidae
Aphrastochthonius verapazanus—Pseudoscorpionida, Chthoniidae
Paraliochthonius strinatii—Pseudoscorpionida, Chthoniidae
Mexobisium guatemalense—Pseudoscorpionida, Hyidae
Telema mayana—Araneae, Telemidae
Aceratophallus scutigeroides—Polydesmida, Rhachodesmidae
Pseudosinella finca—Collembola, Entomobryidae
Juxtlacampa hauseri—Diplura, Campodeidae
Speocolpodes franiai—Coleoptera, Carabidae

Huehuetenango

Caecidotea mitchelli—Isopoda, Asellidae
Colombophiloscia cavernicola—Isopoda, Philosciidae
Bogidiella pasquinii—Amphipoda, Bogidiellidae
Mayaphaenops sbordonii—Coleoptera, Carabidae

Belize

Cayo

Mexobisium goodnighti—Pseudoscorpionida, Hyidae
Vachonium belizense—Pseudoscorpionida, Vachoniidae
Metagonia jarmila—Araneae, Pholcidae
Cynortina misteca—Opilionida, Phalangodidae
Stygnomma pecki—Opilionida, Phalangodidae
Jarmilka alba—Spirostreptida, Cambalidae

SUPPLEMENT

While this manuscript was in press several additional publications have appeared or been brought to my attention which include information on troglobites from this region. The following citations follow the style used in the systematic review. The page references in parentheses following the species name refers to the page on which the species is mentioned. Bibliographic references follow the systematic citations.

Diaptomus (Microdiaptomus) cokeri Osorio Tafall (p. 81)
Diaptomus cokeri: Bowman, 1979:225.

Conilera stygia Packard (p. 84)
Conilera stygia: Richardson, 1904:6.
Conilera: Birstein, 1964:25.

Creaseriella anops (Creaser) (p. 84)
Creaseriella anops: Wilkens, 1979:265, 266, 267, fig. 2.

Speocirolana bolivari (Rioja) (p. 86)
Cirolana (part): Birstein, 1964:25.
Speocirolana bolivari: Holt, 1973:223.

Speocirolana pelaezi (Bolívar) (p. 86)
Cirolana (part): Birstein, 1964:25.
Speocirolana pelaezi: Holt, 1973:223.

Caecidotea chiapas (Bowman) (p. 88)
Caecidotea chiapas: Lewis, 1980:321, 324.

Caecidotea mitchelli Argano (p. 88)
Caecidotea mitchelli: Lewis, 1980:324.

Caecidotea pasquinii Argano (p. 88)
Caecidotea pasquinii: Lewis, 1980:324.

Caecidotea vomeroi Argano (p. 88)
Caecidotea vomeroi: Lewis, 1980:324.

Caecidotea zullinii Argano (p. 89)
Caecidotea zullini: Lewis, 1980:324 (erroneous spelling).

Mexistenasellus coahuila Cole and Minckley (p. 90)
Mexistenasellus coahuila: Magniez, 1977:130.

Mexistenasellus magniezi Argano (p. 90)
Mexistenasellus sp. nov.: Magniez, 1977:130.

Mexistenasellus parzefalli Magniez (p. 90)
Mexistenasellus parzefalli: Magniez, 1977:130.

Mexistenasellus wilkensi Magniez (p. 90)
Mexistenasellus wilkensi: Magniez, 1977:130.

Brackenridgia bridgesi (Van Name) (p. 95)
Protrichoniscus: Strouhal, 1953:175.

Mayaweckelia cenoticola Holsinger (p. 101)
Mayaweckelia cenoticola: Wilkens, 1979:265, fig. 2.
Mayaweckelia spp. (part): Wilkens, 1979:266.

Mayaweckelia yucatanensis Holsinger (p. 102)
Mayaweckelia yucatanensis: Wilkens, 1979:265, 266, fig. 2.
Mayaweckelia spp. (part): Wilkens, 1979:266.

Mexiweckelia colei Holsinger and Minckley (p. 102)
Mexiweckelia (part): Holsinger and Longley, 1980: 9, 10, 27, 51.

Mexiweckelia mitchelli Holsinger (p. 102)
Mexiweckelia (part): Holsinger and Longley, 1980: 9, 10, 27, 51.

Mexiweckelia particeps Holsinger (p. 102)
Mexiweckelia particeps: Holsinger and Longley, 1980:9, 10.

Antromysis (Antromysis) cenotensis Creaser (p. 103)
Antromysis cenotensis: Wilkens, 1979:265, 266, fig. 2.

Typhlatya campecheae Hobbs and Hobbs (p. 106)
Typhlatya campecheae: Buden and Felder, 1977: 114; Wilkens, 1979:265, 266, fig. 2.
Typhlatya (part): Wilkens, 1979:268, 269.

Typhlatya mitchelli Hobbs and Hobbs (p. 107)
Typhlatya mitchelli: Buden and Felder, 1977: 114; Wilkens, 1979:265, 266, 268, fig. 2.
Typhlatya (part): Wilkens, 1979:268, 269.

Typhlatya pearsei (Creaser) (p. 107)
Typhlatya pearsei: Buden and Felder, 1977: 112; Wilkens, 1979:265, 266, 268, 269, fig. 2.
Typhlatya (part): Wilkens, 1979:268, 269.

Bithynops luscus Holthuis (p. 108)
Bithynops: Strenth, 1978:67.

Creaseria morleyi (Creaser) (p. 109)
Creaseria morleyi: Wilkens, 1979:265, 266, 267, 269, fig. 2.

Macrobrachium villalobosi Hobbs (p. 109)
Macrobrachium (part): Strenth, 1978:67, 68.

Neopalaemon nahuatlus Hobbs (p. 110)
Neopalaemon: Strenth, 1978:67.

Troglocubanus perezfarfanteae Villalobos (p. 110)
Troglocubanus perezfarfanteae: Strenth, 1978:67-68.
Troglocubanus: Strenth, 1978:67, 68.

Mexobisium goodnighti Muchmore (p. 121)
Mexobisium goodnighti: Muchmore, 1980:125.

Albiorix bolivari Beier (p. 121)
Albiorix bolivari: Muchmore, 1979:317.

Agastoschizomus lucifer Rowland (p. 125)
Agastoschizomus lucifer: Rowland and Reddell, 1980:21.

Schizomus bartolo Rowland (p. 126)
Schizomus bartolo: Rowland and Reddell, 1980:2, 4, 5, 6, 7, 8, 9, 10, 15, 19, fig. 1, 5, 21, 40.

Schizomus cookei Rowland (p. 127)
Schizomus cookei: Rowland and Reddell, 1980:2, 4, 5, 11, 15, 16, 17, 21, 22, fig. 1, 12, 27, 30-31.

Schizomus firstmani Rowland (p. 128)
Schizomus firstmani: Rowland and Reddell, 1980: 23-25, 26, 27, 28, 29, 30, fig. 63, 65, 67-68, 74-75.

Schizomus lukensi Rowland (p. 128)
Schizomus lukensi: Rowland and Reddell, 1980:2, 4, 5, 7, 8-9, 10, 15, 19, fig. 1, 7, 20, 38.

Schizomus mitchelli Rowland (p. 129)
Schizomus mitchelli: Rowland and Reddell, 1980: 2, 4, 5, 11, 15, 16, 17, 21-22, fig. 1, 11, 29, 35, 59-62.

Schizomus pallidus Rowland (p. 129)
Schizomus pallidus: Rowland and Reddell, 1980: 2, 4, 5, 10, 11, 13, 14, 15, 16, 19, fig. 1, 13, 26, 43.

Schizomus pecki Rowland (p. 129)
Schizomus pecki: Rowland and Reddell, 1980:16, 23, 24, 25, 26, 29-30, 31, 32, fig. 63-64, 66, 69, 79.

Schizomus reddelli Rowland (p. 129)
Schizomus reddelli: Rowland and Reddell, 1980: 2, 4, 5, 7, 10, 12, 13, 15, 17, fig. 1, 10, 22, 36-37.

Nesticus arganoi Brignoli (p. 141)
Nesticus arganoi: Brignoli, 1979:919.

Nesticus nahuanus Gertsch (p. 141)
Nesticus nahuanus: Brignoli, 1979:919.

Cryptocellus osorioi Bolívar (p. 157)
Pseudocellus osorioi: Platnick, 1980:352.

Discussion.—Platnick (1980) erected the new genus *Pseudocellus* to include all of the described Mexican cave and epigean ricinuleids previously assigned to *Cryptocellus.*

Cryptocellus reddelli Gertsch (p. 159)
Pseudocellus reddelli: Platnick, 1980:352.

Cryptocellus sbordonii Brignoli (p. 159)
Pseudocellus sbordonii: Platnick, 1980:352.

Neogovea mexasca Shear (p. 159)
Neogovea mexasca: Shear, 1979:238; Shear, 1980: 2, 4, 14, 15-17, 18, fig. 21-25.

Discussion.—Shear (1980) erected the family Neogoveidae to include the genus *Neogovea* and related genera.

Hoplobunus boneti (Goodnight and Goodnight) (p. 164)
Hoplobunus bonet: Elliott, 1979:66, 80 (erroneous spelling).

Chirrepeckia lyncilecta Hoffman (insert on p. 189)
Chirrepeckia lyncilecta Hoffman, 1976:744-746, fig. 1-3.

Type-locality.—Cueva Chirrepeck (1400 m), south of Cobán, Dept. Alta Verapaz, Guatemala.

Distribution.—Known only from the type-locality.

Discussion.—This is a minute pigmentless species known only from the male holotype. The genus *Chirrepeckia* is monotypic and is without known close relatives.

Cambala speobia (Chamberlin) (p. 192)

Cambala speobia: Shelley, 1979:551, 552, 553, 556, 557, 564, 566, 567, 568, 569, fig. 9, 13.

Cambala reddelli reddelli Causey, 1964:239-241, 243, 246, pl. 58(fig. 1-4); Shelley, 1979:552, 564.

Cambala reddelli inornatus Causey, 1964:239, 241-242, 246, pl. 58(fig. 5); Shelley, 1979: 552, 564.

Cambala reddelli Causey, 1964:237, 239, 240; Shelley, 1979:566, 567.

Type-localities.—Of *C. reddelli reddelli:* Border Cave, Culbertson (=Culberson) County, Texas, U.S.A.; of *C. reddelli inornatus:* Big Mouth Cave, 2 miles north of Shamrock, Wheeler County, Texas, U.S.A.

Discussion.—Shelley (1979) synonymized *C. reddelli* with *C. speobia.* This increases the range of this species west into New Mexico. Causey (1964) reported specimens intermediate between *C. r. reddelli* and *C. r. inornatus* from epigean localities in Colfax County, New Mexico; and of typical *C. r. reddelli* from an epigean locality in San Miguel County, New Mexico. The populations from west and northwest Texas and New Mexico have ocelli; regardless of the correctness of Shelley's synonymy, the populations of this species from caves in the Edwards Plateau and adjacent Coahuila are doubtless cave restricted.

Mexicambala blanda Causey (p. 192)

Mexicambala (part): Shelley, 1979:533.

Mexicambala fishi Causey (p. 193)

Mexicambala (part): Shelley, 1979:533.

Mexicambala inopis Causey (p. 193)

Mexicambala (part): Shelley, 1979:533.

Mexicambala russelli Causey (p. 193)

Mexicambala (part): Shelley, 1979:533.

Oncopodura prietoi Bonet (p. 200)

Oncopodura prietoi: Christiansen and Bellinger, 1980:1010, 1011, 1016-1017, fig. 832B, 831.

Discussion.—Christiansen and Bellinger (1980) consider the family Oncopoduridae to be a subfamily of the Entomobryidae. They report a specimen of this species from a cave in Lincoln County, New Mexico, U.S.A.

Litocampa atoyacensis Wygodzinsky (p. 203)

Plusiocampa (Litocampa) atoyacensis: Condé, 1948:45-46.

Oeclidius hades Fennah (p. 216)

Oeclidius hades: Fennah, 1980:686.

Astyanax jordani (Hubbs and Innes) (p. 238)

Anoptichthys jordani: Breder and Roemhild, 1947:33, 34, 35, 40, fig. 1; Allee and Schmidt, 1951:643; Coates and Atz, 1954:1468-1470; Keenleyside, 1955:205-206; Stolk, 1958:397; Friedman, 1962:75-76; Zeitlen, 1973:461-462; Herwig, 1976:297, 299; Olivereau et al., 1980: 390.

Anoptichthys: De Buen, 1941:5; Breder and Halpern, 1946:155, 170, 174-175; Friedman, 1962:73; Keenleyside, 1979:55; Olivereau et al., 1980:401.

Anoptichthys sp.: Breder and Roemhild, 1947:33, 34, 35, fig. 1.

Blind cave fish: Breder and Roemhild, 1947:32, 39.

Astyanax jordani: Quinn, 1980:123-127.

Astyanax mexicanus, cave derivatives of: Rasquin, 1958:9.

Astyanax hubbsi: Durand, 1979:198.

Astyanax, eyeless: Wiley and Mitchell, 1971:1-12.

Astyanax mexicanus, cave populations of: Herwig, 1976:297-324, fig. 1-2, 3b-c, 4, 7-10, 11a-c, 12a-b, 13b; Dickson et al., 1979:120; Wilkens et al., 1979:128, 129-130, 131-134, 136, fig. 5, 7, 9-10; Wilkens, 1980a:103-111, fig. 1-3; Wilkens, 1980b:232-238, fig. 1.

Astyanax mexicanus, blind: Omura, 1975:99-112, fig. 1-9; Sadoglu, 1979:369-371.

Astyanax mexicanus, Mexican cave fish: Beck, 1978:23.

Astyanax mexicanus, troglophilic: Dickson et al., 1979:124.

Anoptichthys (blind form of *Astyanax mexicanus*): Durand, 1979:196-205, fig. 1-14.

"*Anoptichthys*": Wilkens, 1979:269; Schemmel, 1980:9, 10, 20, 21.

Astyanax mexicanus f. *anoptichthys:* Schemmel, 1980:9-22, fig. 1-4.

Poecilia sphenops Valenciennes (p. 245)

Poecilia sphenops, cave population: Wilkens et al., 1979:127, 128, 131, 135-136, fig. 11.

Typhliasina pearsei (Hubbs) (p. 245)

Typhlias pearsei: Yamaguti, 1961:67.

Typhlias: De Buen, 1941:9.

Typhliasina pearsei: Miller, 1966:778, 800; Schemmel, 1977:191-202, fig. 1-8; Wilkens et al., 1979:129; Wilkens, 1979:264, 266, 267, 268, fig. 1.

Typhliasina: Miller, 1966:780.

Ogilbia pearsei: Cohen and Nielsen, 1978:?; Wilkens, 1979:266.

Ophisternon infernale (Hubbs) (p. 246)

Pluto: De Buen, 1941:8.

Furmastix infernalis: Miller, 1966:778, 794.

Furmastix: Miller, 1966:780.

Ophisternon infernale: Wilkens, 1979:264, 267, 268, 269, fig. 1; Wilkens et al., 1979:129, fig. 6.

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