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# THE PSELAPHIDAE (COLEOPTERA) OF TEXAS CAVES

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ABSTRACT

Twelve species of Pselaphidae have been found in Texas caves. Five species are true cavernicoles and are restricted to caves in central Texas: *Batrisodes grubbsi* n. sp., *B. reyesi* n. sp., *B. texanus* n. sp., *B. venyivi* n. sp., and *Texamaurops reddelli* Barr & Steeves. Seven other species are probably found only near cave entrances, in litter washed into caves, or in debris brought in by rodents: *B. uncicornis* (Casey), *B. clypeonotus* (Brendel), *B. globosus* (LeConte), *Cylindrarctus bicornis* Chandler, *Tmesiphorus costalis* LeConte, *Hamotus electrae* Park, and *Trimioarcus musamator* n. sp. *Batrisodes clypeonotus* is associated with the ant, *Camponotus americanus* Mayr, based on many collections from Oklahoma. Two new synonymies have been discovered concerning these species: *B. schneiderensis* Park is a junior synonym of *B. uncicornis* (Casey), and *B. tridens* Casey is a junior synonym of *B. clypeonotus* (Brendel).

## INTRODUCTION

Pselaphids have been recorded from caves since 1855 when *Machaerites spelaeus* Miller was described from a cave at Struge, Yugoslavia. Since then the European pselaphid cave fauna has been extensively documented by a number of authors, while the North American fauna has been treated only recently (Park, 1951; 1956, 1960). The first pselaphid described from a Texas cave was *Batrisodes schneiderensis* Park (1960), based on a single female from Schneider Ranch Cave in Kendall County. Four years later a second species was added, *Texamaurops reddelli* Barr and Steeves (1963), based on a single female from Kretschmarr Cave in Travis County. In the only other paper dealing with pselaphids from Texas caves, Barr (1974) figured the aedeagus of a specimen from Inner Space Caverns believed to be the male of *T. reddelli*, but is here recognized as a new species, *Batrisodes texanus*. *Texamaurops reddelli* is now a registered endangered species listed as the "Kretschmarr Cave mold beetle" (Chambers and Jahrsdoerfer, 1988).

Twelve species are listed from Texas caves in this paper. Five species appear to be true cavernicoles based on their reduced eyes and longer than typical legs and antennae, and are only known from the karst region of the Edwards Plateau in central Texas: *Batrisodes grubbsi* n. sp., *Batrisodes reyesi* n. sp., *Batrisodes texanus* n. sp., *Batrisodes venyivi* n. sp., and *Texamaurops reddelli*. The other seven species are free-living or myrmecophilous, including three species of *Batrisodes*: the myrmecophile *clypeonotus* (Brendel), the free-living troglophile *uncicornis* (Casey) (=*schneiderensis* Park), and *globosus* (LeConte). The free-living *Hamotus electrae* Park was described from Veracruz, Mexico, and is here recorded for the first time in the United States from Texas in caves and at ultra-violet light. *Tmesiphorus costalis* LeConte has been collected with ants

and in several leaf litters, and has been previously recorded from a cave (Park, 1960:100). A specimen of *Cylindrarctus bicornis* Chandler was found in a cave, but is presumed to be associated with leaf litters, based on the common association of the other species in the genus. *Trimioarcus musamator* n. sp. has reduced eyes, but is most likely an inhabitant of rodent nests or deep leaf litter since no other species in its tribe, the Euplectini, is known to be cavernicolous. In summary, five species are troglobites, one a myrmecophile, one a troglophile, and the other five species are probably only found in caves near their entrances or in litter piles washed in or brought in by rodents.

All measurements are in millimeters. The collections where specimens are deposited are indicated by the following codons: ANSP, Academy of Natural Sciences, Philadelphia; DSC, collection of author; FMNH, Field Museum of Natural History, Chicago; JAW, John A. Wagner collection, Evanston, Illinois; TMMC, Texas Memorial Museum Collection, Austin; USNM, National Museum of Natural History, Washington, D.C. The types of all previously described species were examined, and the holotypes of species described here are to be placed in the Field Museum of Natural History, Chicago. Illustrations and descriptions were based on whole and disarticulated specimens in temporary mounts on slides, and checked against whole specimens mounted on points.

## SYSTEMATICS

### 1. *Batrisodes (Babnormodes) uncicornis* (Casey) (Figs. 1-2)

*Batrisus uncicornis* Casey, 1897:576. Type locality: New York City, New York. Male holotype (USNM).

*Batrisodes schneiderensis* Park, 1960:75. Type locality: Schneider Cave, Texas. Holotype female (FMNH). NEW SYNONYMY.

**Description.**—Length 2.32-2.64. Males with head transversely excavate anterior to antennal bases, frons lacking projections, largely covered dorsally by rounded angulate projection of vertex, dense setae projecting ventrally from anterior margin of vertex between antennal bases, vertex coarsely punctate especially on anterior half, lateral carinae strong basally but fading before reaching antennal bases, median carina distinct but not strong and extending anteriorly to line between nude vertexal foveae, eyes with about 32 facets; first antennomere (scape) not enlarged but conspicuously punctate on antero-ventral margin, antennomere IX protruding laterally as a lamina, IX less than twice as wide as long, X with large fovea occupying over half of ventral surface, XI with large ventral tubercle at base.

Pronotum with large scattered punctures particularly anteriorly, median longitudinal sulcus extending to near apex; elytra with three basal foveae and subhumeral fovea; sternite VI vaguely impressed longitudinally; protibiae flattened near apex and densely setate on medial margin, mesotibiae excavate on mesal margin in apical third, thick setae along posterior edge of excavation, second mesotarsomere sinuate ventrally near base.

Females with coarse punctures on head and pronotum; eyes with about 17 facets, lacking modifications of head, antennae, and legs; sternite VI rounded.

Male from Schneider Ranch Cave: antennae 1.10, metafemora 0.84, metatibiae 0.80, metatarsi 0.37.

**Specimens examined.**—43: TEXAS: *Burnet County*: Resurrection Well, VII- 2-1989, M. Grimm (1). *Hays County*: Anaqua Cave, VI-21-1985, A. Grubbs (2); Ezell's Cave, I-16-1979, J. C. Davis, cave area (2); Fern Cave, V-26-1989, A. Grubbs, J. Reddell, M. Reyes (5); Ladder Cave, IX-2-1989, D. Ubick, S. Fend, S. Renkes (1); McGlothlin Sink, V-26-1989, A. Grubbs, J. Reddell, M. Reyes (1). *Comal County*: Klar's Cave, III-12-1988, S. Spence, G. Veni (1). *Kendall County*: The Crack, V-28-1990, D. Pate (1); Schwarz Cave, IX-12-1987, J. Ivy, G. Veni (1); Schneider Cave, VIII-30-1959, T. C. Barr, Jr., H. M. Koepke (type of *schneiderensis*); same locality, IX-8-1963, J. Reddell, D. McKenzie (4). *Llano County*: Enchanted Rock Cave, IV-14-1985, J. Reddell, M. Reyes (1); Freshman Mountain Cave, IV-9-1989, W. Elliott, J. Reddell, M. Reyes (2). *Travis County*: Bandit Cave, V-17-1965, T. C. Barr (1); Cave X, III-30-1974, W. Elliott, W. Russell, S. & R. Fieseler, C. Rogers (1); Ireland's Cave, I-23-1989, J. Reddell, M. Reyes, E. Grimm, M. Grimm (10); LaCrosse Cave, V-8-1990, J. Reddell, M. Reyes (2); Pickle Pit, V-21-1990, J. Reddell, M. Reyes, L. Sherrod (2). *Williamson County*: Beck Ranch Cave (=Beck's Cave), III-24-1989, J. Reddell, M. Reyes (1); same locality, V-16-1965, T. C. Barr (3). Specimens in collections of: DSC, FMNH, JAW, and TMMC.

**Comments.**—*Batrisodes uncicornis* is a widespread species whose range extends from Massachusetts and Florida to Texas. Habitat information has been associated with only a few specimens, and

## Key to Species

1. Abdominal segments II-IV with acute lateral margins ..... 2
Abdominal segments II-IV lacking lateral margins, abdomen round in cross section (Fig. 1) (Batrisinae, Batrisini) ..... 5

2.(1) Last segment of maxillary palpi laterally angulate, previous two segments with spine on outer face (Fig. 21) (Pselaphinae, Tmesiphorini ..... 10. *Tmesiphorus costalis*
Apical segment of maxillary palpi elongate, lacking lateral angulation or spines on previous segments (Figs. 20, 22) ..... 3

3.(2) Last segment of maxillary palpi elongate, penultimate segment angulate on mesal margin (Fig. 20) (Goniacerinae, Tychini ..... 9. *Cylindrarctus bicornis*
Last segment of maxillary palpi enlarged, penultimate segment much smaller (Figs. 22, 24) ..... 4

4.(3) Antennal club of last three segments, penultimate antennomere longer than wide, last segment of maxillary palpus with longitudinal groove on inner margin (Fig. 22) (Pselaphinae, Tyrini) ..... 11. *Hamotus electrae*
Antennal club of last two segments, penultimate antennomere much wider than long, last segment of maxillary palpus lacking any groove (Fig. 24) (Euplectinae, Euplectini) ..... 12. *Trimioarcus musamator*, n. sp.

5.(1) Apex of metatibiae lacking elongate pencil of appressed setae (Fig. 18); all antennomeres more than twice as long as wide (Fig. 17) ..... 8. *Texamaurops reddelli*
Apex of metatibiae with elongate pencil of appressed setae (Fig. 11); with antennomere VIII distinctly less than twice as long as wide except *texanus* with VIII twice as long as wide (Figs. 3, 9) (*Batrisodes*) ..... 6

6.(5) Eyes distinct, with 10 to 50 facets grouped together ..... 7
Eyes apparently absent, possibly up to 10 disassociated pale granules in area where eyes should be ..... 9

7.(6) Vertex of head and anterior portion of pronotum coarsely punctate; males with anterior margin of vertex angulate (Fig. 1); females with vertex coarsely punctate ..... 1. *Batrisodes uncicornis*
Basal half of vertex and anterior portion of pronotum not coarsely punctate; males with anterior margin of vertex truncate to broadly rounded (Figs. 3, 15); females with vertex at most coarsely punctate on antennal tubercles, area between vertexal foveae smooth or sparsely granulate ..... 8

8.(7) Males with anterior margin of vertex broadly rounded, penultimate antennomere with small fovea at base (Fig. 15); females with large eyes of more than 40 facets ..... 7. *Batrisodes globosus*
Males with anterior margin of vertex broadly truncate, penultimate antennomere lacking basal fovea (Fig. 3); females with small eyes of approximately 15 facets ..... 2. *Batrisodes clypeonotus*

9.(6) Antennomeres III-VIII twice as long as wide; sides of head in eye region gently curved (Fig. 9) ..... 5. *Batrisodes texanus* n. sp.
At least antennomere VIII less than twice as long as wide; lateral margins of head slightly angulate and bearing granules where eyes should be (Figs. 7, 13) ..... 10

10.(9) Head lacking lateral and medial vertexal carinae (Fig. 13), vertex smooth ..... 6. *Batrisodes venyivi* n.sp.
Head with at least lateral carinae extending anteriorly from base (Figs. 5, 7), vertex in apical half distinctly punctate or rugulose ..... 11

11.(10) Apical half of vertex roughened (females) or coarsely punctate (males), with faint lateral vertexal carinae, lacking median vertexal carina; males with anterior margin of vertex broadly truncate, first antennomere not modified (Fig. 5) ..... 3. *Batrisodes grubbsi* n.sp.
Apical half of vertex smooth (females) to transversely rugulose (males), with median and lateral vertexal carinae sharply defined; males with anterior margin of vertex broadly bisinuate, first antennomere angulate ventrally (Fig. 7) ..... 4. *Batrisodes reyesi* n. sp.

these have been collected in sawdust, under pine bark, and under stones. This species has not been previously noted as a troglophile, and it is interesting that in surface habitats this species is always collected in quite short series. The longest series I have seen is from Ireland's Cave.

James R. Reddell (pers. comm.) has supplied the following collection information. "It has been found below rocks in moist sinkhole-type caves in association with troglobitic millipedes and other species, but also occurs in total darkness. Most specimens have been found on the underside of rocks lightly buried in silt. A specimen from Beck Ranch Cave was found crawling on moist flowstone more than 200 meters from the cave entrance."

Park (1960) described a single female from Schneider Cave as a new species, *schneiderensis*. Several series from Texas caves contain both sexes, and it is obvious that the type of *schneiderensis* is a typical female of *uncicornis*. *Batrisodes uncicornis* has been placed close to *riparius* (Say) based on the very similar male antennal characters (Park, 1947). The modifications of the legs are also similar, as is the general structure of the head. The punctation of the head is coarser in *uncicornis*, and the apical angle of the vertex is only slightly depressed, while in *riparius* the punctation is not coarse on the pronotum and basal portion of the vertex, and the apical portion of the vertex is strongly deflexed between the antennal bases. Females of *uncicornis* may be confused with those of *globosus* (LeConte), but may be separated by the head being more completely and coarsely punctate.

### 2. *Batrisodes (Excavodes) clypeonotus* (Brendel) (Figs. 3-4)

*Batrisus clypeonotus* Brendel, 1893:280, pl. IV. Type locality: Ponchatoula, Louisiana. Male holotype (ANSP).

*Batrisodes tridens* Casey, 1908:263. Type locality: St. Louis, Missouri. Male holotype (USNM). NEW SYNONYMY.

**Description.**—Length 2.28-2.68. Males with head transversely excavate just anterior to antennal bases, frons with acute medial and lateral tubercles, medial tubercle with short posterolaterally directed setae, lateral tubercles glabrous, vertex sharply angled ventrally between antennal bases, this area set with short obvious setae arising from small distinct punctures, vertexal apex with small median trilobed projection bearing two small tufts of setae, basal portion of vertex smoother, sparsely setate with setae arising from isolated granules, vertexal foveae nude, lateral vertexal carinae weak and extending to antennal bases, median carina weak and extending to middle of vertex, eyes with 12 (Texas) to 40 (Missouri) facets grouped in crescentic pattern; first antennomere (scape) enlarged, impressed at center of anterior face, densely and minutely punctate in impression, antennomere X globose, slightly wider than last antennomere and lacking a ventral fovea.

Pronotum with median longitudinal sulcus extending to near apex, disc sparsely punctate; elytra with three basal foveae and subhumeral fovea;

sternite VI slightly impressed at base with disc rounded; second mesotarsomeres straight.

Females with frons and anterior half of vertex minutely rugose, small eyes with 10-16 facets, lacking modifications of head and antennae, sternite VI broadly rounded.

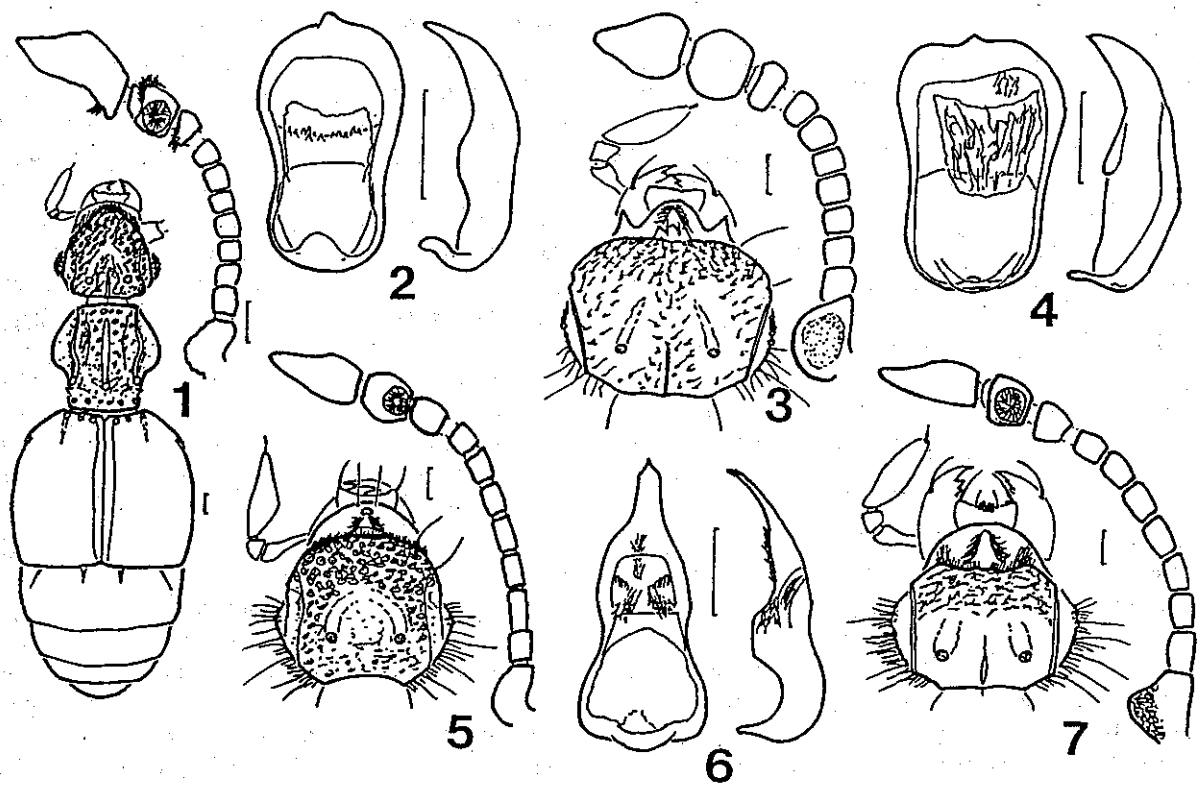
Male from Powell's Cave, Texas: antennae 1.08, metafemora 0.80, metatibiae 0.77, metatarsi 0.45.

**Specimen examined.**—TEXAS: *Menard County*: Powell's Cave, IV-11-1989, E. Shoud, third crevice (TMMC).

**Comments.**—This species has been poorly known since its description, and during preparation of this paper was found to be the senior synonym of *tridens* Casey. Park (1956:84) examined a specimen he placed as this species from northern Alabama, and found a minute fovea of antennomere X. A slide preparation of a specimen from Oklahoma did not reveal any trace of a fovea, and a fovea is not obvious in any of the specimens from several localities mounted on points. Park (1956) believed that *clypeonotus* represented an undescribed subgenus, but it appears typical of *Excavodes* to me. This species is now known from Missouri to Alabama and Texas. The largest series have been generated by collecting specimens with their ant host, *Camponotus americanus* Mayr. Whether this species is an obligate myrmecophile is not known, but the reduced number of eye facets indicates that *clypeonotus* has adapted to a subterranean life.

### 3. *Batrisodes (Excavodes) grubbsi* n. sp.
(Figs. 5-6)

**Description.**—Length 2.32-2.48. Male head with transverse excavation anterior to antennal bases, clypeus with erect blunt tubercle, tubercle densely setate along postero-lateral margin, vertex broadly truncate in dorsal view, in anterior view vertex projecting ventrally to medial point that is slightly angled anteriorly near apex, vertexal apex densely setate into transverse excavation, vertex coarsely punctate, smoothly roughened in area between vertexal foveae, median carina faint, lateral carinae low but distinct and extending to just anterior to eyes, eyes consisting of approximately 8 granules




Figs. 1-7.—*Batrisodes* spp.: 1, *B. uncicornis*, habitus of male and anterior view, right antenna; 2, *B. uncicornis*, dorsal and right lateral view, aedeagus; 3, *B. clypeonotus*, head and anterior view, right antenna of male; 4, *B. clypeonotus*, dorsal and right lateral view, aedeagus; 5, *B. grubbsi*, head and anterior view, right antenna of male; 6, *B. grubbsi*, dorsal and right lateral view, aedeagus; 7, *B. reyesi*, head and anterior view, right antenna of male. Scale line equals 0.1. Apical three segments of male antennae presented in ventral view.

indicating facet remnants; antennomere X with large fovea covering ventral half.

Pronotum with median longitudinal sulcus faint in basal half of disc, disc sparsely and minutely punctate; elytra with 3 basal foveae and subhumeral fovea; sternite VI with lateral setate tubercles at apex, disc between tubercles flat; second mesotarsomeres straight.

Females lacking modifications of head, antennae, and sixth sternite; frons and anterior half of vertex coarsely punctate, posterior half of vertex smoothly roughened.

Holotype male: antennae 1.40, metafemora 0.96, metatibiae 1.00, metatarsi 0.48.

**Specimens examined.**—6: TEXAS: HOLOTYPE male, *Hays County*, Grapevine Cave, VII-1-1990, A. Grubbs, J. Reddell, M. Reyes (FMNH). PARATYPES, all same locality: 1 female, eutopotypical (TMMC); 2 males, 1 female, VI-10-1990, A. Grubbs, L. Davis, J. Elliott (DSC, TMMC); 1 female, VII-9-1990, A. G. Grubbs (DSC). The specimens collected on June 10 are teneral.

**Etymology.**—The species is named for the principal collector of the series, Andrew Grubbs.

**Comments.**—The type series was collected under washed-in leaf litter at the litter-clay floor interface from the terminal room of Grapevine Cave in total darkness (James R. Reddell, pers. comm.). The male modifications of the head are generally similar to those of *clypeonotus*, but differ in the form of the vertexal apex, lack of lateral clypeal spines, and in the form of antennomeres I and X. The male antennae, median clypeal spine, and form of the aedeagus are also similar to those of *venyivi*, but may be readily separated by the truncate vertexal apex and coarse punctation on the anterior half of the vertex.

### 4. *Batrisodes (Excavodes) reyesi*, n. sp.
(Figs. 7-8)

**Description.**—Length 2.36-2.44. Males with head transversely excavate just anterior to antennal bases, frontal horn prominent and with dense short setae directed posterolaterally, anterior margin of clypeus broadly rounded, anterior half of vertex with obscure transverse rugules and smooth on posterior half, anterior margin of vertex weakly biemarginate over transverse excavation, short setae along margin longest near lateral edges, strong lateral carinae of vertex extending anteriorly to antennal bases, median carina extending from base to just anterior to line between nude vertexal foveae, eyes represented by a number of small scattered facet rudiments appearing as granules; first antennomere (scape) angulate on ventral margin, densely and minutely punctate in lower half, antennomere X with large fovea occupying over half of ventral surface.

Pronotum smooth, with median longitudinal sulcus extending to near pronotal apex; elytra with three basal foveae and subhumeral fovea; metasternum at middle with small deep circular impression just anterior to metacoxae; sternite VI medially impressed with tuberculate raised areas laterally, line of thickened setae extending from tubercles to middle; second mesotarsomeres straight.

Females lack modifications of head, antennae, and sternite VI; vertex depressed between antennal bases and smoothly rugulose; metasternal impression present.

Male holotype: antennae 1.52, metafemora 1.04, metatibiae 1.05, metatarsi 0.44.

**Specimens examined.**—13: HOLOTYPE male, Texas, *Burnet County*, Fenceline Sink, IV-17-1990, J. Reddell, M. Reyes (FMNH). PARATYPES: 1 female, eutopotypical (TMMC); 1 male, same locality, V-27-1989, M. Reyes (DSC); 1 male, Snake Pit Sink, XI-20-1990, J. Reddell, M. Reyes, underside of rock loosely buried in silt (TMMC). *Travis County*: 1 female, Armadillo Ranch Sink, IX-23-1990, J. Reddell, M. Reyes, C. Sexton, from crack in rotten wood (DSC); 3 females, Yellow Berry Cave, XII-111990, J. Reddell, M. Reyes (DSC, TMMC); 2 males, 3 females, Moss Pit, III-5-1991, J. Reddell, M. Reyes, underside of rocks deeply buried in silt (DSC, TMMC). The two specimens collected in April are teneral.

**Etymology.**—The name is derived from Marcelino Reyes, the principal collector of the type series.

**Comments.**—*Batrisodes reyesi* was found on the underside of rocks deeply buried in silt at the bottom of the entrance drop of Fenceline Sink, associated with troglobitic spiders, *Cicurina* (*Cicurella*) species, and millipedes, *Speodesmus* species; in Yellow Berry Cave beneath rocks at the bottom of the second drop in total darkness; and in Moss Pit on the underside of rocks deeply buried in silt at cave bottom in association with blind isopods of the family Trichoniscidae (James R. Reddell, pers. comm.).

The general form of the modified vertex and first antennomeres are similar to those of *clypeonotus* (Brendel), a myrmecophile with reduced eyes. The males of *reyesi* are easily distinguished by the relatively flat vertex, the stronger lateral and median

vertexal carinae, and the laterally tuberculate sternite VI.

### 5. *Batrisodes (Excavodes) texanus* n. sp. (Figs. 9-12)

**Description.**—Length 2.60-2.88. Male head with vague transverse impression anterior to antennal bases, impression shallow and medianly angulate, vertex smooth and sparsely setate, antennal tubercles prominent with a few coarse punctures dorsally, sides of head smoothly curved and flat with a few granules present where eyes should be, lateral carinae extending sinuately from head base of outer angle of antennal tubercles, median carina extending anteriorly to point between nude vertexal foveae; antennomeres all elongate, X nearly twice as wide as IX and narrowing in apical half, with large nude fovea covering one-third of surface in ventral view.

Pronotum with median longitudinal sulcus shallow on disc; elytra with three basal foveae and subhumeral fovea; second mesotarsomeres straight.

Females lacking transverse sulcus anterior to antennal bases, vertex merging smoothly with frons, antennomere X barely wider and longer than IX.

Male holotype: antenna 1.63, metafemur, 1.32, mesofemur 1.32, metatarsi lost.

**Specimens examined.**—4: TEXAS: *Williamson County*: HOLOTYPE male, Inner Space Caverns (=Laubach's Cave), V-23-1965, W. Russell (FMNH). PARATYPES (all females): same locality, VIII-1968, W. Elliott (DSC); Off Campus Cave, IV-8- 1989, W. Elliott, J. Reddell, M. Reyes (DSC); Coffin Cave, 10 mi. NW Georgetown, XI-3-1963, J. Reddell (TMMC).

**Etymology.**—The name is derived from its known occurrence restricted to Texas.

**Comments.**—*Batrisodes texanus* was found in Off Campus Cave on the underside of a rock lightly buried in silty clay in total darkness (James R. Reddell, pers. comm.). Since this species was included as the Coffin Cave population of *Texamaurops reddelli* when *reddelli* was listed as an endangered species (Chambers and Jahrsdoerfer, 1988), *texanus* should also be considered endangered under federal law although no specific ruling has yet been published (Steve Chambers, pers. comm. to James R. Reddell).

This species possesses elongate legs and antennae, and is superficially similar to *T. reddelli*. The lack of any ocular projection, and the presence of the pencil of setae at the apex of the metatibiae readily separate the two taxa. The aedeagus of this species was figured by Barr (1974) as *T. reddelli*. *Batrisodes texanus* is placed in the subgenus *Excavodes* due to the modified head anterior to the antennae and the straight mesotarsomeres of the male.

### 6. *Batrisodes (Excavodes) venyivi* n. sp. (Figs. 13-14)

**Description.**—Length 2.24. Males with head transversely excavate just anterior to antennal bases, frontal horn prominent with short dense setae directed posterolaterally, anterior margin of clypeus angulate, anterior margin of vertex rounded with shallow medial emargination, margin anterior to antennal bases depressed, vertex smooth and lacking lateral and medial basal carinae; first antennomere (scape) not modified, antennomere X with fovea occupying one-fourth of face in ventral view.

Pronotum smooth, with median longitudinal sulcus barely attaining middle of disk; elytra with three basal foveae, lacking subhumeral fovea; sternite VI lightly impressed medially, smoothly granulate in impression; second mesotarsomeres straight.

Female unknown.

Male holotype: antennae 1.05, metafemora 0.76, metatibiae 0.80, metatarsi 0.44.

**Specimen examined.**—TEXAS: *Bexar County*: HOLOTYPE male, Helotes Hilltop Cave, IX-29-1984, J. Ivy, G. Veni (FMNH).

**Etymology.**—The name is formed by combination of the names of the collectors.

**Comments.**—It is not close to any other species of *Excavodes* that I have seen. It is easily distinguished by the lack of vertexal carinae, smooth vertex, and lack of a subhumeral fovea on the elytra.

### 7. *Batrisodes (Excavodes) globosus* (LeConte) (Figs. 15, 16)

*Batrisus globosus* LeConte, 1849:100. Type localities: Pennsylvania and Georgia. Syntypes male and female (MCZC).

**Description.**—Length 2.36-2.48. Males with head transversely excavated anterior to antennal bases, frons with acute medial tubercle bearing four small recurved setae at apex and longer laterally directed sinuate setae toward base, frontal tubercle nearly obscured in dorsal view by broadly rounded projecting vertexal lobe, ventral margin of vertexal lobe with small group of setae projecting ventrally lateral to frontal tubercle, vertex coarsely punctate in anterior third, generally smooth in posterior portion with setae arising from small granules,

lateral carinae strong and extending to antennal bases, medial carina distinct and extending from cervix over moderately swollen vertex to point anterior to nude vertexal foveae, eyes with approximately 45 facets; antennomere X large and globose, wider than XI, X with small ventral fovea near base.

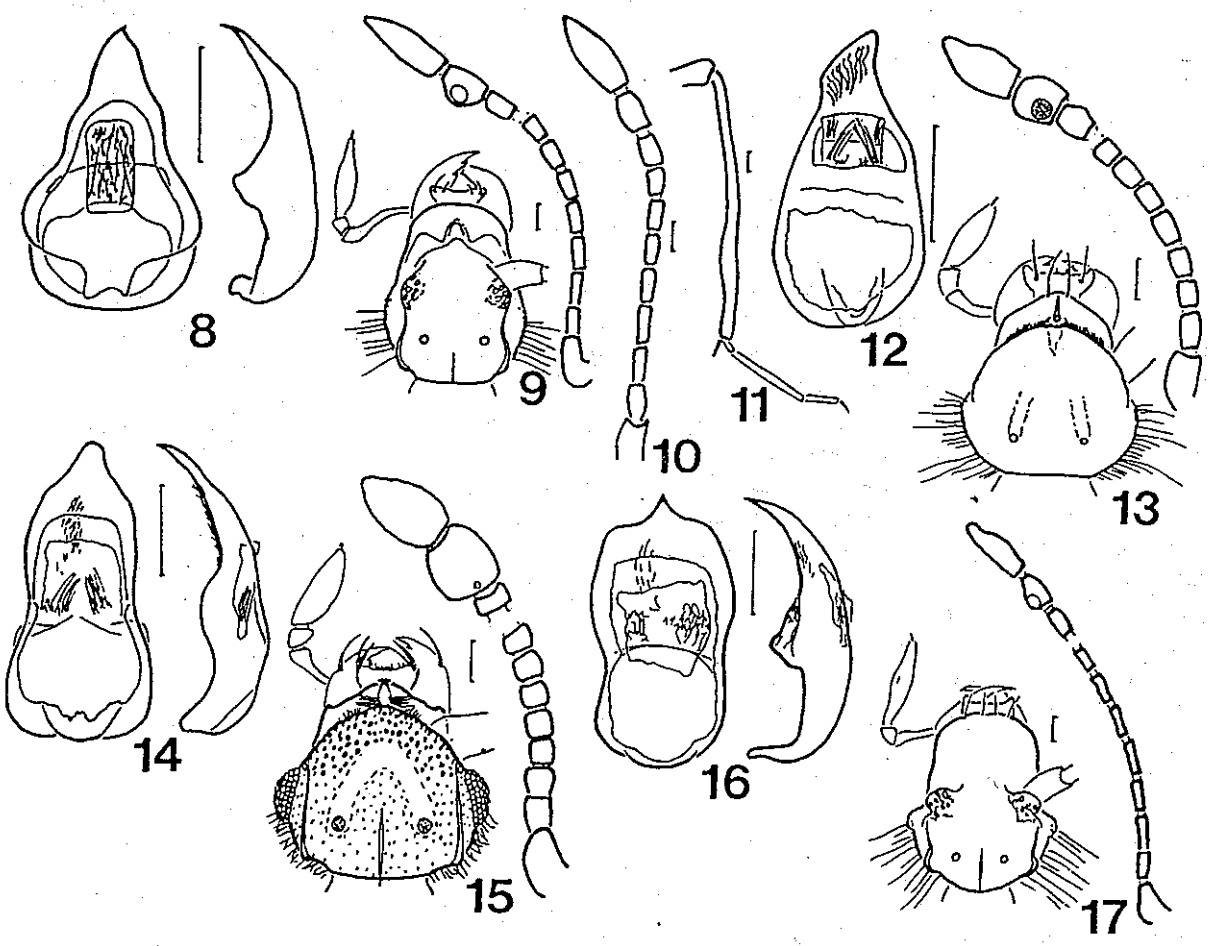
Pronotum sparsely punctate, median longitudinal sulcus extending to near apex; elytra with three basal foveae and subhumeral fovea; sternite VI slightly flattened medially; second mesotarsomeres straight.

Females with coarse punctures only on antennal tubercles and posteriorly to near vertexal foveae, eyes with approximately 42 facets; lacking modifications of head and antennae, sternite VI barely rounded at middle.

Male from Simons Squirm-Around Cave: antennae 1.12, metafemora 0.79, metatibiae 0.76, metatarsi 0.40.

**Specimens examined.**—5: TEXAS: *Burnet County*: 1 male, Simons Squirm-Around Cave, XI-20-1990, J. Reddell, M. Reyes, underside of rock loosely buried in soil (TMMC); 1 female, Road Side Sink No. 1, XI-20-1990, J. Reddell, underside of rock loosely buried in soil (TMMC); 1 male, Persimon Sink, I-17-1991, J. Reddell, M. Reyes (DSC); 1 male, Simons Pretty Pit, I-17-1991, J. Reddell (DSC); 1 female, Snake Pit Sink, II-8-1991, G. Veni (TMMC).

**Comments.**—*Batrisodes globosus* is found throughout eastern North America, with isolated records from Colorado, Washington, and Alberta. It




Figs. 8-17.—8–16, *Batrisodes* spp.: 8, *B. reyesi*, dorsal and right lateral view, aedeagus; 9, *B. texanus*, head and anterior view, right antenna of male; 10, *B. texanus*, lateral view, right antenna of female; 11, *B. texanus*, posterior view, right metatibia of male; 12, *B. texanus*, dorsal view, aedeagus; 13, *B. venyivi*, head and anterior view, right antenna of male; 14, *B. venyivi*, dorsal and right lateral view, aedeagus; 15, *B. globosus*, head and anterior view, right antenna of male; 16, *B. globosus*, dorsal and right lateral view, aedeagus. Apical three segments of male antennae of *Batrisodes* spp. presented in ventral view. 17, *Texamaurops reddelli*, head and anterior view, right antenna of female. Scale line equals 0.1.

is associated with rotten woods (Chandler, 1987, and many collection records), and may be found with ants in the northern half of its range (Park, 1960). Park (1960) noted one population that was found in a cave in Alabama.

Male *globosus* may be separated from *uncicornis* by the more broadly rounded anterior margin of the vertex, and by the form of the apical segments of the antennae. Females lack coarse punctures between the vertexal fovea on the head, and also on the pronotum, while in *uncicornis* coarse punctures will be found in both areas.

### 8. *Texamaurops reddelli* Barr and Steeves (Figs. 17-19)

*Texamaurops reddelli* Barr and Steeves, 1963:118. Type locality: Kretschmarr Cave, Travis Co., Texas. Holotype female (FMNH).

**Description.**—Length 2.72-3.08. Male with vertex smoothly merging into elongate frons, area sparsely setate with prominent antennal tubercles, base of vertex with median and lateral carinae distinct but not prominent, lateral carinae reaching apex of antennal tubercles, median extending to point anterior to nude vertexal foveae, all antennomeres elongate, X with large nude fovea on ventral surface near base, antennomere swollen in basal half, eye area a rounded angulation with approximately 6 granules that appear to be vestigial eye facets.

Pronotum with median longitudinal sulcus faint, extending to near pronotal apex; elytra with 2 basal foveae and subhumeral fovea; metasternum at middle with group of long sparse setae; metatibiae lacking apical pencil of setae, sternite VI laterally with rounded tumuli bearing long setae that are directed laterally.

Females with lateral margins of antennomere X straight, lacking ventral fovea, sternite VI broadly rounded.

Male from Stovepipe Cave: antennae 2.12, metafemora 1.56, metatibiae 1.72, metatarsi 0.80.

**Specimens examined.**—6: TEXAS: *Travis County*: Holotype female, Kretschmarr Cave, 15 mi. NW Austin, III-2-1963, J. R. Reddell, D. McKenzie (FMNH); 1 female, same locality, 1968, R. W. Mitchell (FMNH); 1 female, Tooth Cave, V-3-1964, J. R. Reddell (TMMC); 1 female, same locality, V-14-1966, J. R. Reddell (FMNH); 1 female, Amber Cave, IV-8-1984, J. Reddell, M. Reyes (DSC); 1 male, Stovepipe Cave, X-25-1990, L. Sherrod, under rock lightly buried in silty clay in small side room in total darkness (DSC).

**Comments.**—*Texamaurops reddelli* has only been found in four closely situated caves on the underside of rocks lightly buried in silt in total darkness (James R. Reddell, pers. comm.), and has been placed on the US. List of Endangered Species (Chambers and Jahrsdoerfer, 1988). It has elongate legs and antennae with reduced eyes, and is clearly a troglobite. The holotype and the single male are different from all the other specimens in possessing only two basal foveae on each elytron. The other four specimens, including one from the type locality, have three equal foveae at the elytral base. All other features appear to be similar and these four specimens are placed as *reddelli*.

Barr and Steeves (1963) initially believed that this genus might be best placed in the Amauropsini, a European tribe whose members are all troglobites. Barr later (1974) figured the aedeagus of a purported male, which clearly indicated the placement of *Texamaurops* in the Batrisini since the morphology of the aedeagus in members of the two tribes is quite different (Jeannel, 1948). The male specimen in question has proven to be a new species of *Batrisodes* convergent with *Texamaurops* in appearance, but discovery of a true male of *Texamaurops* confirms the placement in the Batrisini since the aedeagus is similar in form to those of members of *Batrisodes*. The absence of the metatibial pencil of setae is shared by members of *Batriasymmodes* Park, a group with a number of troglobitic species in the eastern United States, and some members of this group also have a fovea on antennomere X. However, the aedeagal form of this genus is consistently different from members of *Batriasymmodes*, and based on the form of the aedeagus and antennal characters *Texamaurops* is probably best considered a lineage derived from *Batrisodes* that has lost the metatibial pencil of setae.

*Texamaurops reddelli* is superficially similar to *texanus* by the greatly elongate antennae and legs, as well as body size. However, *reddelli* possesses a distinct rounded angulate knob where the eyes should be, and the metatibiae lack an apical pencil of setae.

### 9. *Cylindrarctus bicornis* Chandler (Fig. 20)

*Cylindrarctus bicornis* Chandler, 1988:135. Type locality: Texas (probably Bosque County). Holotype male (USNM).

**Description.**—Length 2.20. Males with antennal tubercles on head close, forming a broad tubercle constricted at base, vertexal foveae a distance of one ocular facet from eyes, eyes with about eight large facets, maxillary palpi with last three segments elongate, together nearly as long as antennae, penultimate segment angulate near base on mesal margin.

Pronotum lacking any sulci, with small median and lateral antebasal foveae. Elytra with two basal foveae, lacking subhumeral fovea. Metasternum with short longitudinal carina extending anteriorly from near inner margins of each metacoxa; sternites II-VI broadly flattened at middle; protrochanters with prominent spine, metatrochanters with elongate broad flange extending ventrally.

Females are unknown.

Male specimen from Gorman Cave, Texas: antenna 1.19, metafemur 0.76, metatibia 0.79, metatarsus, 0.47.

**Specimen examined.**—Texas: *San Saba County*, Gorman Cave, 6 mi. SE Bend on Colorado River, III-15-1963, J. R. Reddell (DSC).

**Comments.**—*Cylindrarctus bicornis* was taken from washed-in organic debris in total darkness several hundred meters from the cave entrance (James R. Reddell, pers. comm.). This is the second known specimen of this species. The other specimen, the holotype, was produced by Belfrage from "Texas," where he had collected most extensively at Clifton and Norse in Bosque County. The other members of the genus are most commonly encountered in moist litter near water, and *bicornis* will probably only be found in caves at their entrances since it lacks any obvious cave adapted features. *Cylindrarctus bicornis* is readily separated from the other cave pselaphids by the elongate last three segments of the maxillary palpi that together are nearly equal to the antennae in length.

### 10. *Tmesiphorus costalis* LeConte (Fig. 21)

*Tmesiphorus costalis* LeConte, 1849:77. Type locality: Pennsylvania. Holotype male (MCZC).

**Description.**—Length 3.08-3.52. Males with head and pronotum coarsely punctate, antennomere IX cylindrical and three times length of VIII, with longitudinal groove on outer face, X slightly shorter than IX and flattened ventrally with anterodistal angle tuberculate, XI excavate in basal third on ventral surface; maxillary palpi with apical segment triangular, previous two segments with lateral spine.

Pronotal disc rounded; elytra with two basal foveae, lacking subhumeral fovea; abdomen with sternites II-III lightly flattened at middle.

Females with apical antennomeres narrower, lacking modifications; abdominal sternites broadly rounded.

Male specimen from Puberty Pit, Texas: antennae 1.68, metafemora 1.04, metatibiae 1.20, metatarsi 0.48.

**Specimens examined.**—TEXAS: *Burnet County*: Simon Says Sink, XI-12-1990, J. Reddell, M. Reyes, berlese litter (2, TMMC); Snake Pit Sink, XI-20-1990, J. Reddell, M. Reyes, underside of rock loosely buried in silt (2, DSC); Simons Squirm-Around Cave, XI-20-1990, J. Reddell, M. Reyes, underside of rocks loosely buried in silt (4, DSC); Shin Oak Sink, I-17-1991, J. Reddell, M. Reyes (4,, DSC). *San Saba County*: Puberty Pit, IV-21-1990, D. Allen, W. Elliott, B. Fralia (1, TMMC). *Travis County*: Big Oak Cave, X-17-1990, J. Reddell, M. Reyes, on underside of rock in darkness (1, TMMC); Twin Dig Pit, XII-11-1990, J. Reddell, berlese rodent nests at lowest point of cave in total darkness (1, TMMC).

**Comments.**—This species has been collected in various leaf litters, under bark, with the ant *Aphaenogaster fulva* Roger (Park, 1933), and one specimen has been found in a cave (Park, 1960). *Tmesiphorus costalis* and the other Nearctic species in the genus, *carinatus* (Say), are easily recognized by the form of the maxillary palpi, and the coarsely punctate head and pronotum. *Tmesiphorus costalis* is larger than *carinatus*, the latter being easily distinguished from *costalis* by a median longitudinal carina on the first visible abdominal tergite.

### 11. *Hamotus (Hamotoides) electrae* Park (Figs. 22-23)

*Hamotus electrae* Park, 1942:327. Type locality: San Juan, Veracruz, MEXICO. Holotype male (FMNH).

**Description.**—Length 3.20-3.40. Males with antennomeres IV-VIII transverse, IX twice as long as VIII, IX slightly shorter than X, both IX and X slightly longer than wide; last segment of maxillary palpus enlarged, twice as long as wide, with longitudinal sulcus on mesal margin.

Pronotum with distinct transverse antebasal sulcus, width about half that of median antebasal fovea; elytra with two basal foveae, lacking subhumeral fovea; protrochanters carinate ventrally, a few specimens with small denticle on carina, profemora with

small ventral carina near base, protibiae with small tooth on mesal margin at point about two-thirds of length, mesotrochanters vaguely carinate on ventral margin, metasternum deeply and transversely impressed in apical two-thirds, posterior margin raised as flanges at mesal margins of metacoxae; abdominal sternites II-VI widely impressed.

Females lack modifications of legs and metasternum; abdominal sternites broadly rounded.

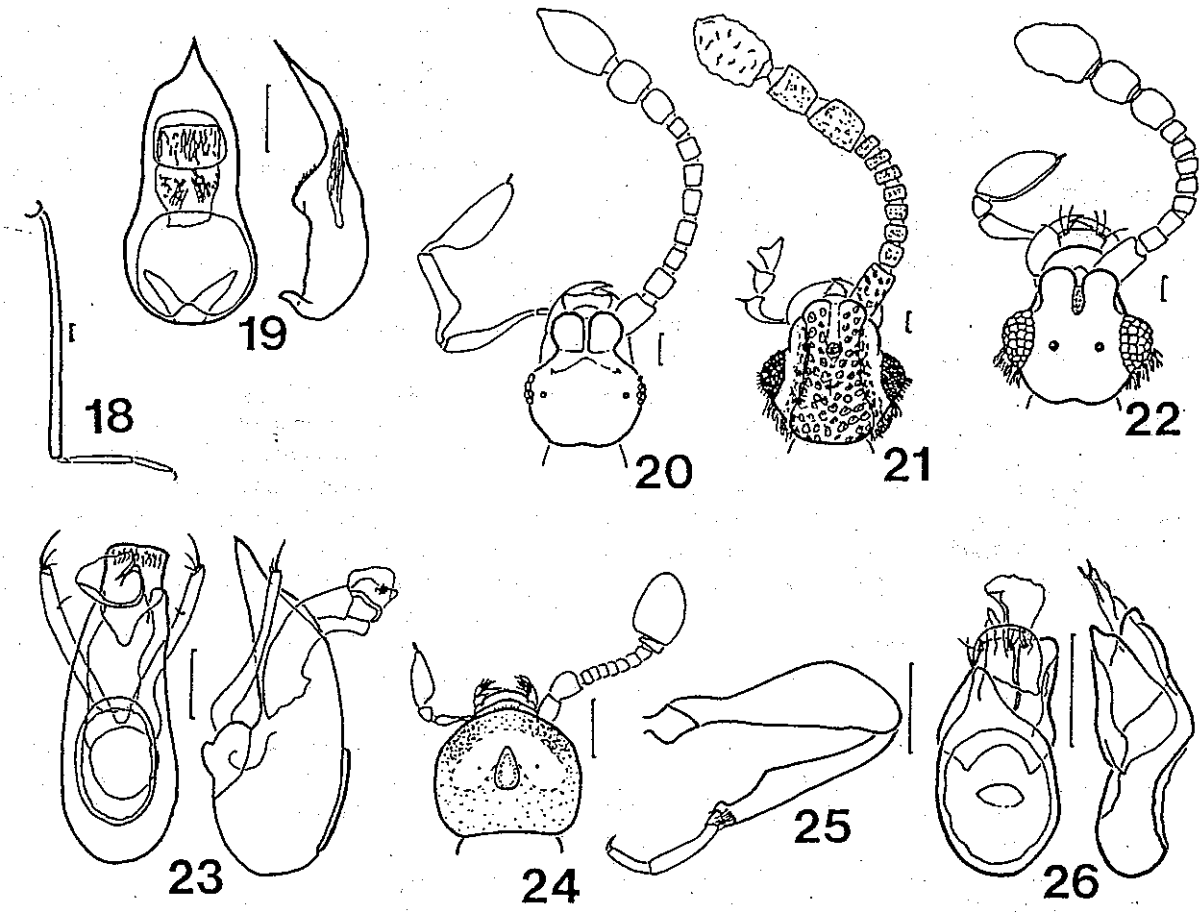
Male specimen from Porcupine Cave, Texas: antennae 1.44, metafemora 1.00, metatibiae 1.08, metatarsi 0.54.

**Specimens examined.**—3: TEXAS: *Kinney County*, Porcupine Cave, X-17-1987, G. Veni, J. Ivy (DSC and TMMC). Five other specimens were collected at Bentsen-Rio Grande St. Pk., VI-10-1975, by Robert Turnbow at ultraviolet light (DSC and RHT).

**Comments.**—This species was previously known only from the holotype male collected in Veracruz, Mexico (Park, 1942). It is apparently a free-living species, and will probably only be found when associated with caves at their entrances. Park (1942) placed this species in Group XII of *Hamotus*, where the other four North American species are placed. The males of *electrae* are readily distinguished from all other *Hamotus* (*Hamotoides*) species by the transverse impression of the metasternum, and the metasternal laminae projecting posteriorly near the mesal margins of the metacoxae in males.

*Trimioarcus musamator* n. sp.
(Figs. 24-26)

**Description.**—Length 1.16-1.24. Male head with vertex extended and flattened laterally, eyes not




Figs. 18-26.—18–19, *Texamaurops reddelli*: 18, posterior view, right metatibia of female; 19, dorsal and right lateral view, aedeagus. 20, *Cylindrarctus bicornis*, dorsal view, male head. 21, *Tmesiphorus costalis*, dorsal view, male head. 22–23, *Hamotus electrae*: 22, dorsal view, male head; 23, dorsal and right lateral view, aedeagus. 24–26, *Trimioarcus musamator*: 24, dorsal view, male head; 25 posterior view, male right middle leg; 26, dorsal and right lateral view, aedeagus. Scale line equals 0.1.

visible in dorsal view, with median elongate tubercle pointed at apex and rounded at base, top of tubercle narrowly rounded, area immediately anterior and lateral to tubercle shallowly impressed and impunctate, minute vertexal foveae lateral to middle of tubercle, anterior margin of vertex broadly rounded, eyes with 13 facets, genal process lateral to maxillary base bearing three setae, antennal club of apical two antennomeres.

Pronotum with biarcuate transverse antebasal sulcus, median antebasal fovea indistinct, distinct lateral antebasal foveae nude, large procoxal foveae meeting internally; elytra with 2 basal foveae; with small lateral mesosternal foveae, otherwise sternal foveae similar to those in figure by Grigarick and Schuster (1980) for *Trimioarcus incisiurus* Park; profemora with 7-8 sensory pits on ventral margin, mesotrochanters with broadly rounded angulation on ventral margin, mesotibiae gradually expanded to past middle on mesal margin, abruptly constricted to apex, apex with angulate spine; only abdominal tergite I with basal longitudinal carinae; sternite VI broadly impressed at middle, penial plate with setae on apical half.

Females with vertex smoothly rounded laterally and eyes easily visible, eyes with 13 facets, vertexal foveae nude; legs lacking modifications; disc of sternite VI broadly rounded.

Holotype male: antenna 0.33 long, metafemora 0.29 long, metatibia 0.30 long, aedeagus 0.22 long.

**Specimens examined.**—7: TEXAS: *Travis County*: HOLOTYPE male, Twin Dig Pit, XII-11-1990, J. Reddell, berlese rodent nests (FMNH). PARATYPES: 3 females, eutopotypical (DSC, TMMC); 1 male, 2 females, Moss Pit, III-5-1991, J. Reddell, M. Reyes, berlese litter from entrance pit bottom (DSC, TMMC).

**Etymology.**—The name was suggested by the collection from rodent nests.

**Comments.**—This species was found in rodent nests in total darkness at the lowest point in Twin Dig Pit, and in litter from the bottom of the entrance pit of Moss Pit (J. R. Reddell, pers. comm.). *Trimioarcus* Park (1952) was created to hold the new species, *incisiurus* Park, from Monterrey, Mexico. A second species, *pajarito*, was recently described from southern Arizona (Chandler, 1985). *Trimioarcus musamator* is closest to *incisiurus* by the broadly expanded head vertex with a median protuberance, and the eyes not visible in dorsal view in the males. The two species differ in the form of the vertexal tubercle; and in *musamator* the small eyes are of equal size with about 13 facets in both sexes, and the middle legs modified in the male. This species looks very much like a member of *Trimiomelba* LeConte, and would be readily placed in this genus except for the presence of lateral mesocoxal foveae and procoxal foveae.

The reduction in eye size is probably a response of this species to its exploitation of rodent nests or deep leaf litter, rather than a response to the lack of light in caves. No other members of the tribe Euplectini are known to be cavernicolous, while a number of species in a variety of genera in this tribe have reduced eyes and are found in deep leaf litter or tree holes.

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