

## NEW OR LITTLE KNOWN SPECIES OF PSELAPHID BEETLES FROM SOUTHEASTERN UNITED STATES

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### INTRODUCTION

Quite a few undescribed species of Pselaphidae have been discriminated in the course of studying collections that were submitted for identification. This report is an attempt to explore partially the relatively poorly known fauna of the southeastern United States. Twenty-one new species are described of which there are four from Alabama, three from Florida, one from Georgia, one from Kentucky, two from Mississippi, two from North Carolina, seven from Tennessee, and one from Virginia.

The male sex is described for two species that were known only from the female, and several poorly known species have had their original descriptions augmented.

Included are keys, new state records, and in the case of one cavernicole there are data on food and activity pattern under controlled laboratory conditions. Of especial interest is the increased information on American cave-dwelling pselaphids. Of the latter there are six new species, two from Alabama, one from Kentucky, two from Tennessee, and one from Virginia. The important genus *Batrisodes* has two subgenera (*Batrisymmodes* and *Babnormodes*) that include American cavernicoles. In the case of *Babnormodes* an attempt is made to evaluate the evolutionary divergence of epigean from hypogean species by an analysis of the male secondary sex characters.

I thank the following for either the gift or the loan of specimens: Dr. Stanley I. Auerbach, Oak Ridge National Laboratory, Oak Ridge, Tennessee; Molly Balamuth, Berkeley, California; Professor R. H. Beamer, University of Kansas, Lawrence; T. P. Copeland, University of Tennessee, Knoxville; Henry Dietrich, Cornell University, Ithaca, New York; Henry Dybas, Chicago Natural History Museum; Dr. Henry F. Howden, University of Tennessee; Dr. René Jeannel, Museum National d'Histoire

Naturelle, Paris; L. M. Eisenach, Neenah, Wisconsin; Dr. Walter B. Jones, State Geologist of Alabama; and Dr. J. Manson Valentine, Highlands, North Carolina.

## SPELEOBAMINI

*Prespelea copelandi* new species

Type Male. Head 0.29 mm. long x 0.29 mm. wide; pronotum 0.33 x 0.23; elytra 0.53 x 0.48; abdomen 0.37 x 0.53; total length 1.5 mm.

Body orange brown with yellow palpi; integuments shining, finely and inconspicuously punctulate; dorsal surface with body pubescence long, sparse but very conspicuous on elytra and abdomen; on these areas the setae are very long and tend to curl distally to give a shaggy appearance; ventral surface lightly pubescent.

Head with prominent eyes of about 50 rather coarse facets, the eyes in anterior half of head and oval in lateral view; two vertexal foveae that are vestigial and hardly discernible; occiput and cervicum dorsally wholly obscured by the conspicuous speleobamine ruff of long setae; these setae arise on occiput and extend over cervicum; ventrally, this ruff not developed. Antennae, maxillary palpi, pronotum and elytra as in *Prespelea quirsfeldi* Park (1953, p. 251).

Abdomen with five tergites visible in a medium length ratio of 2.5-1.0-0.7-1.4-1.0 with the first three narrowly margined; basal abdominal carinae not apparent; first tergite deeply impressed at base, this depression pubescent, the setae golden and contributed by the tergite and apical elytral margins. Seven visible sternites in a median length ratio of 1.0-4.0-0.2-0.2-0.2-1.0-0.7 with first sternite obscured by golden setae; sixth sternite distally incised to contain the small, transversely oval aedeageal plate.

Prosternum medianly tumid and sparsely setose on tumidity; mesosternum long, medianly longitudinally carinate; metasternum very tumid, the tumidity slightly flattened in posterior half of length; at center of each mesocoxal margin the metasternum is elevated in a small blunt process; mesocoxae subcontiguous, the coxal cavities barely confluent at center between long acute mesosternal and metasternal processes. Legs slender, unmodified except that each metathoracic trochanter has a reflected right-triangular tooth on ventral face; tarsi as for *P. quirsfeldi*.

Described from one male, the type in author's collection, obtained by Berlese extraction of forest floor leaf mold in Cades Cove, Blount County, Tennessee, in the summer of 1953 by T. P. Copeland, in whose honor this species is named.

This new species necessitates a modification of the diagnosis of Speleobamini as given by Park (1951, p. 51 and 1953, p. 250): eyes either well developed, or vestigial, or absent; metathoracic wings either well developed, or vestigial, or absent.

The developed eyes and wings of *copelandi* require the erection of a new subgenus, *Fusjuguma* with *copelandi* as type of subgenus. The three known species can be separated by the following key:

- 1 Exclusively cavernicolous; eyes and wings absent; vertexal, pronotal and elytral foveae absent; male known only  
*Speleobama vana* Park (1951)
- Not cavernicolous; eyes and wings vestigial to well formed; vertexal foveae vestigial; pronotal and elytral foveae weakly formed (*Prespelea* Park, 1953) ----- 2
- 2 (1) Eyes vestigial, two or six coarse facets (subgenus *Prespelea sensu strictiore*) ----- 3
- Eyes large and prominent, of about 50 coarse facets (subgenus *Fusjuguma* new subgenus); male known only  
*Prespelea copelandi* new species

3 (2) Eyes of six facets; seven sternites  
*male Prespelea quirsfeldi* Park (1953)

Eyes of two facets; six sternites  
*female Prespelea quirsfeldi* Park.

The males of *copelandi* and *quirsfeldi* are separated with ease. In addition to the conspicuous difference in the eyes, *quirsfeldi* has a less differentiated antennal club, is a larger insect, has the head longer than wide, elytra wider than long, the first tergite is relatively much longer in a ratio of 6/2.5 and the metasternum is erected into a large and conspicuous cuspid tubercle.

#### EUPLECTINI

##### *Actium mollyae* new species

Type male. Head 0.13 mm. long x 0.16 mm. wide; pronotum 0.17 x 0.14; elytra 0.24 x 0.30; abdomen 0.27 x 0.29; total length 0.8 mm.

Yellowish brown; moderately shining, lightly punctulate integument; pubescence sparse, short, appressed and inconspicuous.

Head rounded triangular; eyes vestigial, circular, of six minute facets, placed much nearer ventral than dorsal surface, being about three times their diameter from the vertex and hardly visible from above; tempora rounded, twice as long as eye; occiput broadly and shallowly medianly indented; a pair of nude vertexal foveae united by an entire arcuate interfoveal sulcus; interantennal line of front tumuloid; antennal tubercles and simple declivous face in same plane; ventral surface of head with capitulate setae. Maxillary palpi as for genus.

Antennae moderately separated from each other, 0.20 mm. long, *i.e.*, two-thirds as long as head and pronotum united; eleven-segmented, first two segments large, I largely hidden by front, II suboval; III to VIII minute, subequal in width, third obtriangular, fourth to eighth transverse moniliform; IX slightly wider than eighth, transverse trapezoidal; X wider than ninth, transverse trapezoidal; XI forming the club, as long as preceding five segments but appearing longer as a consequence of the dense apical pubescence.

Pronotum with simple convex disc; biarcuate antebasal transverse sulcus that is medianly expanded in a nude obtriangular fovea, sulcus ends each side in a nude fovea that is within the lateral margin and quite visible from above.

Elytra with subdentate humeri; each elytron bifoveate at base, the foveae slightly pubescent and relatively large; outer fovea at base of distinct, oblong impression that is very short, not reaching beyond basal fourth of elytral length; inner fovea at base of entire sutural stria; flank with entire carina parallel to margin and turning abruptly and deeply mesiad at subhumeral area, with a nude subhumeral fovea in its angle.

Abdomen with five visible tergites in a median length ratio of 1.4-1.2-1.0-0.8-0.8 with first three laterally margined; first tergite with a pair of distinct, short, triangular basal abdominal carinae that are separated by 25% of total segmental width. Seven visible sternites in median length ratio of 0.6-1.4-0.7-0.6-0.4-0.3-0.4 with last in the form of a small subcircular aedeagal plate. Venter nearly straight in lateral view; sternite medianly polished, laterally near margins sternites II to V slightly flattened and microgranulate; third sternite strongly modified in each lateral third being deeply excavated, with the mesial wall of the excavation erected into an oblique carina, this ridge bearing a fringe of long, closely packed setae that project obliquely laterad over the excavation, just distal of these setae tips the excavation bears a deep, circular, pubescent fovea; fourth sternite also laterally excavated, the excavations of the third and fourth sternites forming an oblique oviform, glabrous field (Fig. 1).

Legs slender; essentially unarmed except that the apex of the ventral face of the pro- and mesotrochanters is compressed and darkened to appear like a minute, prostrate cusp; ventral face of profemora flattened and bearing three foveoid impressions; tarsi as for genus; metacoxae subcontiguous.

Female as described for male except that (1) only six sternites present, in median length ratio of 0.5-1.5-0.8-0.6-0.5-0.8 and (2) sternites III and IV unmodified.

Described from a type male and three paratype females in the author's collection. The type and two paratypes collected by Molly Balamuth, in whose honor this species is named, from Cooks Springs, St. Clair County, Alabama (21 miles east of Birmingham) on March 5, 1950. Type and paratype from beneath a rotten pine log and one paratype from deep leaf mold. The type locality is in pine woods, with deep leaf mold and abundant artesian springs. The fourth paratype taken by L. M. Eisenach on November 27, 1949, from stump mold of yellow pine near Tryon, Polk County, North Carolina.

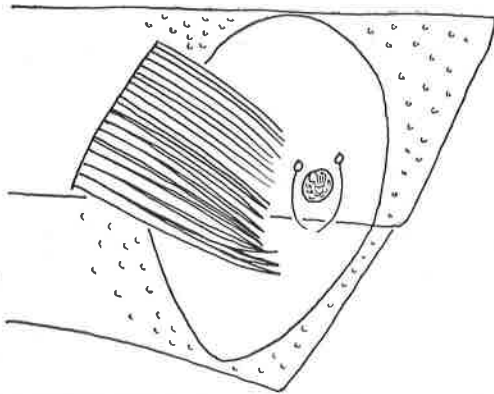


Fig. 1.\* *Actium mollyae* new species. Left lateral aspect of third and fourth sternites of male.

This odd little species has no close allies. Since both sexes have the minute, vestigial eyes the suggestion arises that it is a deep mold species. It is nearest to *Actium globifer* (LeConte) and *Actium parabolicum* (Brendel). I examined the type of *globifer* (MCZ No. 6178) and found it to be a male with prominent, coarsely faceted eyes that are longer than rounded tempora, and with an entirely different venter: the seventh sternite is a large subcircular plate about as long as preceding three sternites united, and the sternites unmodified and simply convex. Similarly, *parabolicum* has prominent eyes, the antennal club is relatively well developed with segments IX and X unusually developed, and the mesotrochanters armed with a conical tooth. Three other remote possibilities have been considered and rejected. These are *Ramecia arcuata* (LeConte) of the southeastern United States, *Melba americana* (LeConte) known from Alabama, and *Melba simplex* (LeConte) known from Florida. The eyes of *arcuata* and *americana* are relatively normal, prominent and visible from above, as attested by examination of the type specimens in the Museum of Comparative Zoology. There is some question as to the location of the type of *simplex* but (a) the suspected type has eyes that, although small, are prominent and visible from above, and (b) LeConte (1878, p. 384) notes that

\*Figures 1, 2, 5, 7, 10, 11, 12, 14, 16, 17, 18, 19, 20, 21, 27, 28 and 30 were drawn at a magnification of 70X.

\*Figures 3, 4, 6, 8, 9, 13, 15, 22, 23, 24, 25, 26, 29, 31 and 32 were drawn at a magnification of 430X.



*simplex* is similar to *americana* except that the base of the head is not medianly longitudinally indented or at most scarcely visibly impressed. In other words, the eyes are not obviously vestigial in all probability or this would have been observed.<sup>1</sup>

<sup>1</sup>Dr. P. J. Darlington, Jr. very kindly examined the type specimens of *arcuata*, *americana*, and *simplex*. In a personal communication, he noted that there was no specimen on the *simplex* point mount but located a head and prothorax in the box which may be the missing type in question. This can be studied and probably allocated at a future visit to the museum.

### *Eutyphlus dybasi* new species

Type Male. Head 0.20 mm. long x 0.30 mm. wide; pronotum 0.33 x 0.32; elytra 0.53 x 0.53; abdomen 0.53 x 0.47; total length 1.6 mm.

Yellowish brown, modestly shining with microgranulate punctulate integument; pubescence abundant and relatively conspicuous.

Head with prominent, strongly convex eyes that are slightly shorter than tempora, of about 36 rather coarse facets; vertex with a pair of large, deep vertexal foveae that are united by an entire interfoveal, inverted-V sulcus; face simply declivous; labrum three times wider than long with a concave distal margin; mandibles strong, left crossed dorsal to right; maxillary palpi four-segmented, first minute, second elongate pedunculate and arcuate; third subtriangular about as wide as distal swollen part of second; fourth largest, nearly twice as wide as second and about as long, acute oviform with a long palpal cone at apex; ventral surface of head with abundant, long, bristling and capitate setae.

Antennae distant at base from each other; as long as head and pronotum united, eleven-segmented; I elongate cylindrical; II large, not as wide as first and slightly longer than wide; III elongate pedunculate; IV and V as wide as third and slightly transverse moniliform; VI to X similar in general shape, trapezoidal, gradually increasing in size and in relative width; XI almost as long as preceding five segments united, the acute distal half bearing an indented, transverse and densely pubescent area on one face.

Pronotum with disc longitudinally bisected by a long sulcoid impression in median half of length; a deep, nearly straight, transverse antebasal sulcus ending on each side in a deep fovea set mesiad of the lateral margin. Lateral margins relatively smooth and entire. Base coarsely rugose-punctate, this area bisected by a minute longitudinal carina that is so small and short that it is hardly discernible and not as long as the rugose area.

Elytra with sloping humeri; each elytron quadrifoveate near base, the outer pair close together, sutural stria entire, vague broad discal impression can be traced with difficulty to apical third; flank with a longitudinal carina and a subhumeral fovea.

Metathoracic wings present.

Abdomen with five visible tergites in a median length ratio of 2.2-2.2-2.0-2.0-2.0 with first three laterally margined. Seven visible sternites in median length ratio of 1.0-1.3-1.0-0.7-0.4-1.0-2.5 with the venter strongly concave in lateral view, the sternites simple and unmodified laterally; seventh sternite of great relative size for the genus, elongate suboval.

Prosternum strongly medianly longitudinally carinate; mesocoxae contiguous in confluent cavities; metacoxae slightly separated; metasternum broadly longitudinally sulcate. Legs relatively simple; tarsi three-segmented, first small, second and third long, the third shorter than second and bearing a single large tarsal claw.

Described from one specimen, the male type in author's collection, obtained by Henry Dybas, in whose honor this species is named, two and a half miles from Chimney Camp Ground, Great Smoky Mountain National Park, Sevier County, Tennessee on November 16, 1953 by sifting leaf litter.

This species is isolated in the genus. It is the only known species with each elytron quadrifoveate; the large and prominent eyes and large aedeageal plate are also distinctive.

*Eutyphlus prominens* Casey

Casey (1883, p. 460) described this species on a female specimen from Lee County, Virginia. Henry F. Howden berlesed two males and five females from Unicoi County forest floor mold, in Tennessee at 3,500 feet elevation on July 5, 1953. The females were checked against a female from North Carolina, which had been checked with care against the *prominens* type in the U. S. National Museum by the author. The Unicoi females were in full agreement, both on measurements and details of external anatomy. The following is a description of the male.

Male. Head 0.17 mm. long x 0.25 mm. wide; pronotum 0.27 x 0.27; elytra 0.37 x 0.42; abdomen 0.39 x 0.35; total length 1.2 mm.

Yellowish brown, shining; pronotum and abdomen subimpunctate, elytra subrugose punctulate; head sparsely granulate; pubescence rather abundant but flavous, appressed and inconspicuous.

Head with prominent, strongly convex eyes that are as long as tempora, of 24 coarse facets, the eyes rounded oblong, obviously longer than wide and set obliquely on the genae; rest of head as described for *dybasi* except that the long bristling setae of the ventral surface of head are minutely capitate. Maxillary palpi as for *dybasi* except that the third segment is more transverse.

Antennae eleven-segmented, distant from each other at base, slightly shorter than head and pronotum united; segment I elongate cylindrical; II about as wide as first, elongate rounded oval; III elongate pedunculate; IV-VI as wide as third, transversely moniliform; VII slightly wider than sixth; VIII slightly narrower than seventh; VIII-X trapezoidal, increasingly larger and more transverse; XI about as long as three preceding segments united, base truncate, relatively wider and less constricted apically than is usual in genus, an indented, transverse, densely pubescent area on lateral face at distal three-fourths.

Pronotum with disc longitudinally sulcoid as usual; a deep, nearly straight, transverse antebasal sulcus that ends each side in a deep fovea mesiad of lateral margin; lateral margins acute crenulated; base very sparsely granulated, nearly smooth with a conspicuous longitudinal carina from basal bead to disc that bisects the transverse sulcus.

Elytra with subdentate humeri; each elytron trifoveate, the two lateral foveae close together and in the same depression, the basal convex rim of which is carinoid; sutural stria entire; vague discal impression to slightly more than basal third; flank with a strong longitudinal carina and a conspicuous subhumeral fovea.

Abdomen with five visible tergites in a median length ratio of 1.3-1.4-1.5-1.4-0.7 with first three laterally margined; first tergite with a pair of strongly divergent basal abdominal carinae that are separated at their tips by 26% of the total segmental width and by 45% of the discal segmental width (the transverse distance between inner lines of the lateral margins), these carinae about half as long as segment but are actually longer as a consequence of their great divergence; second tergite with a pair of minute basal abdominal carinae, no more than tuberculations and difficult to discern. Seven visible sternites in a median length ratio of 1.0-1.3-1.0-1.0-0.5-0.5-1.0 with the venter very concave in profile. Seventh sternite bearing medianly a minute aedeagal plate which is strap-like, being about three times longer than wide. Third and fourth sternites modified (Fig. 2). Third sternite deeply excavated in lateral sixth each side; this excavation with the high mesial wall arched over the excavation; floor of excavation bearing an erect lamina from base to apical margin at center; both edge of mesial wall and lamina lengthily setose; fourth sternite deeply, obliquely excavated each side in lateral third, this area not modified further.

Prosternum and legs as described for *dybasi*. Metasternum simply convex.

The aedeagus (Fig. 3) measures 0.120 mm. long x 0.067 mm. wide. It is a complex organ. At 430 diameters magnification it has at least four optical levels: most dorsally is an arcuate lobe that terminates distally in three spinoid setae; below this is a broader, distally fimbriated process; below this and closely associated with it is an extensive membranous projection; and deepest is an oblique, sclerotized bar.

Female as for the male except that (1) the body is proportionally heavier with cephalic, pronotal, and elytral foveae larger and more pubescent, and the bristling setae of the ventral surface of the head are strongly capitate; (2) eyes vestigial, of from two to five coarse facets; (3) tempora about as long as wide and rapidly convergent as contrasted with the females of *similis* LeConte; (4) two lateral foveae of elytron base much closer together so that the elytron appears bifoveate on cursory examination, but in reality is trifoveate; (5) seven visible tergites in median length ratio of 1.0-1.7-1.7-1.0-0.7-0.6-0.3 with the venter longitudinally convex in profile, the sternites simple and laterally unmodified, the seventh very short but strongly transverse.

So far as known, there is but one other species in the genus in which the males have secondarily modified sternites. This is *Eutyphlus schmitti*

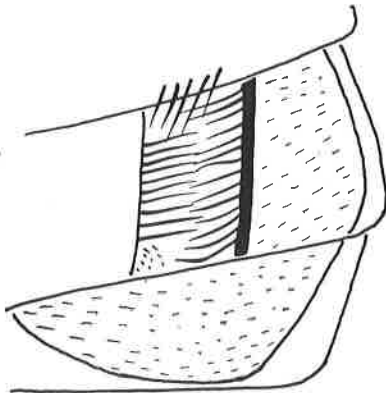


Fig. 2. *Eutyphlus prominens* Casey.  
Left lateral aspect of third and  
fourth sternites of male .

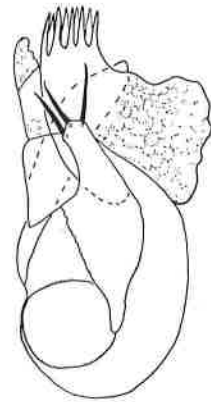


Fig. 3. *Eutyphlus prominens*  
Casey. Aedeagus, dorsal  
aspect.

Raffray (1903, p. 546 and fig. 9) described from the male only, from St. Vincent, Westmoreland County, Pennsylvania. I do not know *schmitti* except from Raffray's description and figure of the modified venter. In *schmitti* the lateral parts of the third, fourth and fifth sternites are excavated, these excavations are simple, in marked contrast to the third sternite of *prominens* (Fig. 2), and the third sternite is medianly developed as a prominent lobe that projects posteriorly over the base of the fourth sternite.

#### *Eutyphlus thoracicus* new species

Type Male. Head 0.17 mm. long x 0.20 mm. wide; pronotum 0.24 x 0.23; elytra 0.30 x 0.30; abdomen 0.25 x 0.30; total length 0.96 mm.

Yellowish brown, shining; head sparsely microgranulate; pronotum and abdomen subimpunctate; elytra sparsely subrugose; pubescence short, flavous, inconspicuous.

Head with prominent eyes that are slightly shorter than tempora and formed by 18 coarse facets each; vertex with a pair of deep, pubescent vertexal foveae that are united by an entire inverted U-shaped sulcus; narrow face simple and vertical; labrum about three times wider than long with the distal margin almost straight; strong mandibles with left crossed dorsal to right; maxillary palpi as for *dybasi*; ventral surface of head with bristling setae as for *prominens*.

Antennae distant at base, 0.37 mm. long, eleven-segmented; segment I elongate cylindrical and II elongate rounded oval, slightly wider than first, these first two segments relatively large; III elongate pedunculate; IV-VI as wide as third, transverse moniliform; VII-X increasingly transverse trapezoidal; XI large, as long as preceding five segments united, the acute distal portion with a transverse, densely pubescent, indented area on lateral face.

Pronotum unique in genus, the disc simple and slightly flattened and not bisected by the usual longitudinal sulcoid impression; a deep, nearly straight, transverse antebasal sulcus that ends in each side in a deep pubescent fovea mesiad of lateral margin; lateral margins microcrenulate, the crenulations very minute, acute and sparse; base sparsely microgranulate, with a conspicuous longitudinal carina from basal bead to disc, bisecting the transverse sulcus.

Elytra with subdentate humeri; each elytron bifoveate at base, the foveae pubescent and proximally overhung by a carinoid rim; entire sutural stria; discal impression nearly to center of length; flank with longitudinal carina and pubescent subhumeral fovea.

Abdomen with five visible tergites in median length ratio of 1.4-1.3-1.2-1.2-0.6 of which the first three have strong lateral margins; first tergite with a pair of straight, divergent basal abdominal carinae that are one-third the segmental length and separated at tips of 33% of the total segmental width. Seven visible sternites in median length ratio of 1.0-1.3-0.8-0.6-0.3-0.4-0.4 and the venter being slightly concave in lateral view, the sternites simple and unmodified laterally, and the seventh in form of a minute elongate aedeageal plate.

Prosternum and legs as described for *dybasi*; metasternum as for *prominens*.

Female as for male except that (1) body proportionally heavier and foveae larger and more pubescent; (2) eyes vestigial, consisting of a single facet each; (3) bristling setae of ventral surface of head strongly capitate; (4) seven visible sternites also, but the seventh is a short, very transverse plate and the venter is slightly convex in lateral view.

Described from five specimens: type male and four female paratypes, in collection of author. Male and two females berlesed from spruce-fir floor mold on September 14, 1953 at 5,700 feet elevation in Rocky Creek Gap, Smoky Mountain National Park by Henry Dybas and S. I. Auerbach. One female 2½ miles north of Chimney Camp Ground, Smoky Mountain National Park, Tennessee by sifting leaf litter at 3,600 feet elevation by S. I. Auerbach on September 16, 1953. One female collected by T. P. Copeland at 5,500 feet elevation from Sevier County, Tennessee, in the summer of 1953.

The genus *Eutyphlus* is closely allied structurally to *Trisignis* of California (Park and Schuster, 1955). The latter genus is the type of a new subtribe, *Trisignina*, which differs from *Bibloporina*, holding *Eutyphlus*, in having two prominent tarsal claws. Both *Eutyphlus* and *Trisignis* have both sexes with seven visible sternites.

Where both sexes have been available for study (*similis*, *prominens*, *thoracicus*) the males have relatively well developed eyes and the setae on the ventral surface of the head are microcapitulate, whereas the females of these species have vestigial eyes and the homologous setae are strongly capitate. This suggests that the female sex is provided with additional



sensory compensation in these setae in converse correlation with reduction of visual organs. The more pronounced pubescent area of the distal antennal segment in the females has been alluded to in this connection by Casey (1893, p. 460).

In at least one species, *similis*, both sexes lack functional metathoracic wings. This species is variable, and may include a number of subspecies. Where males have been examined with respect to the aedeagus, this copulatory apparatus has been found the same in all cases, yet there are variations in external anatomy from locality to locality. For example, the basal abdominal carinae of the first visible tergite may be separated by from 35% to 41% of the discal width of this segment in the male, and from 27% to 33% in the female; an elytron may be trifoveate or bifoveate.

There appears to be considerable variation in size and number of ocular facets in the genus. In *similis* eleven males were studied and had the following facet count (left eye): 4, 4, 5, 6, 6, 7, 10, 16, 18, 22, 26; 93 females were studied in this connection, and of these 81 had two facets, six had 1 facet and six had 3 facets.

Confirming earlier views of Brendel and Raffray, the female is relatively abundant. In a total series of 121 *similis* from 13 localities in the Appalachian uplift from New York to Tennessee there were 110 females to 11 males, or a sex ratio of 10 to 1.

Obviously, this genus needs more study. Probably quite a few new species are yet to be discovered, and within each plastic species population, with similar genital apparatus, the local breeding populations should be discriminated if feasible. Much more material must be assembled, with exact locality data, for such a study to be of service.

The unique pronotum of *thoracicus* warrants at least subgeneric separation, and this species is designated the type of the new subgenus, *Planityphlus*.

The known species of *Eutyphlus* may be separated by the following key:

- |       |   |   |
|-------|---|---|
| 1     | Pronotal disc bearing a median, longitudinal sulcus or sulcoid depression (subgenus <i>Eutyphlus</i> )  | 3 |
|       | Pronotal disc simple, slightly flattened, not sulcate or sulcoid medianly (new subgenus <i>Planityphlus</i> )   | 2 |
| 2 (1) | Eyes well developed, of 18 coarse facets<br>male <i>thoracicus</i> new species  |   |
|       | Eyes vestigial, of a single facet<br>female <i>thoracicus</i> new species   |   |
| 3 (1) | Last sternite with right and left lateral pieces enclosing a median aedeageal plate that is longer than wide (males)  | 4 |
|       | Last sternite always very transverse and undivided (females)  | 7 |
| 4 (3) | Aedeageal plate relatively very large and conspicuous, elongate suboval and more than twice as long as the sixth sternite; each elytron obviously quadrifoveate<br>male <i>dybasi</i> new species |   |
|       | Aedeageal plate small, difficult to discern, in the form of an elongate oval or strap-like piece much shorter than noted above; elytron either bifoveate or trifoveate                            | 5 |
| 5 (4) | Third sternite deeply excavated on each side  | 6 |
|       | Third sternite not excavated, unmodified; aedeagus as illustrated (Fig. 4)<br>male <i>similis</i> LeConte   |   |
| 6 (5) | Third sternite with a median lobe that extends over the base of the fourth sternite; lateral excavations simple<br>male <i>schmitti</i> Raffray   |   |

Third sternite without such a lobe; lateral excavations complex and secondarily modified (Fig. 2); aedeagus as illustrated (Fig. 3)

male *promineus* (Casey)

- 7 (3) Tempora as long as wide; basal abdominal carinae separated by 45% or more of the discal width of first tergite

female *promineus* (Casey)

Tempora longer than wide; basal abdominal carinae separated by from 27% to 33% of discal width of first tergite

female *similis* LeConte

### *Euplectus infossus* Raffray

This species was described by Raffray (1903, p. 541) from a male collected in Pennsylvania, probably Westmoreland County. It was questionably integrated in the Nearctic fauna by Bowman (1934, p. 27) but has not been reported on since the original description.

Henry Dybas and Stanley Auerbach collected a male *Euplectus* in Tennessee that agrees well with Raffray's brief Latin description and particularly

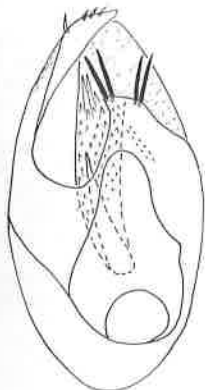


Fig. 4. *Eutyphlus similis* LeConte. Aedeagus, dorsal aspect.

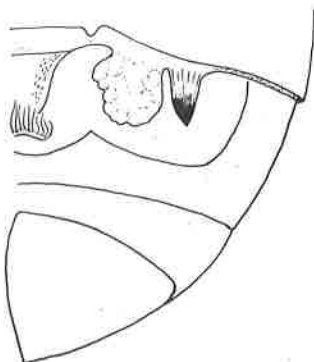


Fig. 5. *Euplectus infossus* Raffray. Left lateral aspect of fourth to seventh sternites of male.

so with the complicated sternite modifications as described and figured by Raffray. Such sternite details are usually diagnostic in this genus and it is a pleasure to place *infossus* in the modern taxonomic system. The following diagnosis places emphasis on essential key characters and sternite modification.

Male, 1.5 mm. long. Head slightly narrower than pronotum; vertexal foveae large, pubescent, mutually farther apart than either from its adjacent eye. Mandibles very long, with recurved and slender external rami, the left crossed dorsal to the right. Pronotum widest through distal third, thence sides convergent to base; discal foveae oval, deep, one-third longer than wide, two-thirds as long as disc. Each elytron quadrifoveate at base, the foveae pubescent, and the two lateral foveae so close together that superficially the elytron appears to be trifoveate; subhumeral fovea and longitudinal carina on elytral flank well developed. First and second tergites each with a transverse pubescent patch at base, limited each side by a basal abdominal carina; basal abdominal carinae of first visible tergite slender, straight, divergent separated by 32% of total tergite width (36% of total discal width) and about two-thirds as long as segment. Legs simple, not armed with spines or teeth.

Seven visible sternites. Fourth sternite complex: posterior margin slightly toothed on each side of median third, below this sclerotized margin and arising secondarily from the intersegmental membrane is a rounded lobe that is slightly concave and ends distally in a recurved fan of setae; on either side of this median lobe is an opaque, white, irregularly shaped process that appears to be formed from the intersegmental membrane; laterad of this mass is a large, conical, acute spine that projects over the fifth sternite. Fifth sternite deeply excavated in basal three fourths of length, the cavity enclosing dorsally the complicated structures of the fourth sternite, and with the posterior margin of this fossa trisinate. Seventh sternite longitudinally bisected as usual in males of the genus, the right and left aedeageal plates meeting in an arc ("pygidial carina") that is convex to the right when the specimen is observed ventral side up. These sternite modifications illustrated (Fig. 5).

Distribution of Guard Setae: on the head, one distal of each vertexal fovea, arcuate distally; one proximal of each vertexal fovea on occiput, arcuate mesiodistally. On pronotum: two on each lateral margin, one at apical third and one at basal third, vertical. On the elytra one near each humeral angle, arcuate distally, and one near center of flank. Tergites: one seta on each lateral margin of third, fourth and fifth, and in addition a transverse row of setae near distal margin of fourth and fifth tergites.

The male upon which this additional information is based was collected at 2000 feet elevation in mold in a deep basal tree hole at two feet below ground surface, in a maple, November 17, 1953, in Cherokee Orchard, Sevier County, Tennessee (Smoky Mountain National Park) by Henry Dybas and Stanley Auerbach. In collection of the author.

There are two points of divergence between Raffray's original description and the diagnosis. Raffray notes that the discal fovea of pronotum is smaller than described. This is a variable feature and would place *infossus* near *interruptus* LeConte and *excavatus* Bowman in the latter's key (1934, p. 27). The general sternite features of *infossus* places the species more naturally with *sexualis* Casey.

Second, Raffray describes the elytron of *infossus* as trifoveate. This is quite understandable. Magnification and excellent illumination are requisite to discriminate the two lateral antebasal foveae from one another.

## BYTHININI

### *Machaerites synstygicus* new species

Type Male. 1.5 mm. long with moderately abundant and coarse pubescence that is semierect on head and pronotum and semi appressed on elytra and more appressed on abdomen. Integuments moderately shining; lightly punctulate on head, pronotum and abdomen; elytra with shallow, broader, irregular foveoid punctures, with the elytral base scarified punctate; pronotum and elytra microreticulate.

This new species belongs to the subgenus *Speleocheus* (Park, 1951) which held previously two species, both cavernicoles in Alabama caves. The dorsal outline and proportions, and the external anatomy of the head, pronotum, elytra, and abdomen are as described for *stygicus* (Park, 1951, p. 47-48, fig. 11) except for the following details: size, face, maxillary palpi and legs as described for *ferus* Park (1951, pp. 49-50).

The aedeagus of *synstygicus* (Fig. 6) is unique, and differs widely from the aedeagus of *stygicus* (Park, 1951, fig. 12) and of *ferus* (Park, 1951, fig. 14).

Described from one male, the type, collected by Walter B. Jones and Orlando Park on September 18, 1952, in Barclay Cave, King Mountain, Madison County, Alabama.

The three species of the subgenus may be separated with respect to the male sex:

- |   |   |   |
|---|---|---|
| 1 | Head truncate-ovoidal in dorsal outline; ventral surface of head simple, unmodified ----- | 2 |
|---|---|---|

Head subtriangular in dorsal outline; ventral surface of head complex, entire gular-genal field hollowed out with floor of this fossa formed by a thin, trilobed, arcuate shelf arising near cervical constriction with the lateral lobes sickle-shaped and the median lobe longer and truncate

*ferus* Park

- 2 (1) Body larger, 1.7 mm.; distal segment of maxillary palpi falciform with convex mesial face and nearly straight lateral face; aedeagus with the pair of exsertile basal teeth broadly bifid at tips

*stygicus* Park

Body smaller, 1.5 mm.; distal segment of maxillary palpi sinuate-falciform with convex mesial face and strongly concave lateral face; aedeagus with the pair of exsertile basal teeth slender and lengthily and simply acute at tip

*synstygicus* new species

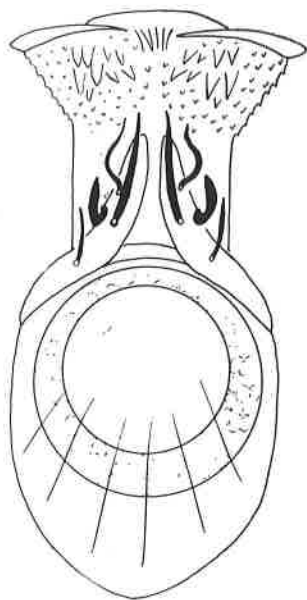


Fig. 6. *Machaerites synstygicus* new species. Aedeagus, dorsal aspect.



Fig. 7. *Batrisodes profundus* new species. Ventral aspect of ninth, tenth and eleventh antennal segments of male.

## BATRISINI

### *Batrisodes reduncus* new species

Type Female. 2.8 mm. long. Shining reddish-brown subimpunctate integuments; pubescence long, flavous, semierect except on abdomen where it is semiappressed.

This is a large cavernicole in subgenus *Batrisosymmodes* on external anatomy. The general aspect and external anatomy are as described for the female of *spelaeus* Park (1951, pp. 16-20). It differs from *spelaeus* in the following ways: (1) The vertexal foveae are smaller; (2) the clypeus is not bisected by a median longitudinal carina; (3) the pronotum has four basal foveae, e.g., two on each side of the median carina that extends from basal

bead to median antebasal fovea whereas *spelaeus* has six basal foveae, e.g., three on each side of the carina; (4) lateral pronotal margins with the tooth not evident; (5) median longitudinal sulcus and lateral sulci of pronotum not evident; (6) last tergite without the diagnostic cusps of *spelaeus*, and with about two rows of irregular punctures on the distal third of this tergite; (7) last sternite as long as third plus fourth.

Female *reduncus* differ from *quisnamus* Park (1951, p. 20-21) in having (1) an eye of 18 facets, as in *spelaeus*, rather than eye of 10 facets; (2) clypeus not bisected by a median longitudinal carina; (3) lateral pronotal marginal tooth not evident; (4) median and lateral longitudinal pronotal sulci not evident; (5) last tergite with irregular punctures as noted.

Female *reduncus* differ from *troglydites* Park (1951, p. 23-25) in which sex the eye is flat, vestigial, of nine facets and in many other ways. These two species are quickly separated since both sexes of *troglydites* have pubescent vertexal foveae and bifoveate clytron.

There is but one other species in this subgenus which is a cavernicole. This is *jeanneli* Park (1951, p. 21-22) known from the male sex only. The external anatomy of *jeanneli*, discounting the male secondary sex characters, is more similar to that of *reduncus* than any known species in the subgenus. Both species agree in (1) absence of the median longitudinal carina of the clypeus; (2) the absence of the supraocular carina; (3) only four basal pronotal foveae; (4) absence of the median discal pronotal sulcus. They differ in that *reduncus* has well developed lateral clypeal carinae as found in *spelaeus* and *quisnamus* whereas these carinae are absent in *jeanneli* and (2) *reduncus* has the usual two pairs of recurved pronotal discal teeth whereas *jeanneli* has a single pair, among other details.

Described from three females, the type and two paratypes, collected in Sam Lackey Cave, 1.5 miles southwest of Gallatin, Sumner County, Tennessee on March 24, 1949 by W. B. Jones and J. M. Valentine. These specimens were sent to Dr. Jeannel, who in turn very kindly gave them to me for identification and retention.

### *Batrisodes cavicrus* (Casey)

This species has been reported previously from North Carolina, South Carolina, Ohio, and Indiana (Park, 1947, p. 69). Dr. Jeannel kindly gave me a specimen of what was later identified as this species. It was collected by H. Henrot on August 10, 1946 by sifting on Rabun Bald, Rabun County, Georgia and constitutes a new state record for this poorly known species. It is a member of the subgenus *Batrisymmodes*.

### *Batrisodes beameri* new species

Type Male. 1.9 mm. long. Body shining, reddish brown, with head lightly granulate and pubescence straw yellow, moderately abundant and semiappressed, especially so on pronotum and abdomen.

This is a member of the subgenus *Batrisymmodes*. It is closely allied to *monstrosus* (LeConte). This latter species has been diagnosed, keyed, and illustrated (Park, 1947, pp. 56-61; 66-67; 99-100, figs. 3, 7 of Pl. III) and the following description is concerned chiefly with diagnostic features of external anatomy.

Occiput-vertex with three carinae, a median longitudinal and a right and left oblique, that tend to converge apically. Vertexal foveae relatively large and nude. Eyes large and prominent, of about forty-six facets. Face simple, declivous, not transversely excavated beneath an overhanging frontal margin.

Pronotum with longitudinal carinae represented by two small recurved spines in apical half and a conical basal spine; disc bisected, between these spines, by a median sulcus.



Elytra with humeral angles longitudinally plicate and each angle bearing a minute tooth, smaller than in *monstrosus*; elytron trifoveate at base, and flank bearing a subhumeral fovea as usual.

Prothoracic legs with tibia arcuate in basal half, with a small cusp at base and a rounded triangular tooth at center of dorsal face. Mesothoracic legs with femur bearing a rounded notch at apical four-fifths. Tarsi normal, e.g., second segment not sinuate above and notched below, but the two surfaces parallel. Metathoracic trochanter bearing a slender, acute spine that is distally arcuate.

The chief divergence between *beameri* and *monstrosus* is in the antennae. In *monstrosus* segment VIII has a slightly produced lateral face; IX flattened on ventral face; X obliquely excavated on mesioventral face; XI not spined at base. In *beameri* the complexities are found on the seventh and eleventh segments; VII bears an elongate oval, oblique excavation on ventral face; VIII, IX, and X are not modified; XI bears a short, thick dentoid tubercle appressed to ventral face at base.

Described from a unique male type, deposited in the University of Kansas collection, collected June 20, 1951 at Sebring, Florida.

Up to the present there are but two subgenera of *Batrisodes* that have been found in caves in the United States. These are the subgenera *Batrisymmodes* and *Babnormodes*. *Batrisymmodes* is diagnosed easily: the metatibiae lack a distal spur of setae in both sexes; where studied, the aedeagus is provided with one or two styles, and generally the males have the metathoracic trochanters each provided with a conspicuous, acute, arcuate to recurved spine. Also in general the females have small eyes with a relatively low facet number.

There are known so far twelve species in *Batrisymmodes*. Of these seven are epigean species, and five are cavernicolous. The following key to this subgenus integrates the new species and supersedes previous keys to the group (Park, 1947, 99-100; 1951, pp. 14-15).

- |       |   |   |
|-------|---|---|
| 1     | Exclusively cavernicolous, known only from caves in Alabama and Tennessee   | 2 |
|       | Exclusively epigean, known only from the deciduous forest biome of the United States and its extensions                                 | 8 |
| 2 (1) | Metatrochanter bearing a spine that is usually contorted or anvil-shaped; eyes relatively prominent, of from 28 to 48 facets (Males)    | 3 |
|       | Metatrochanter not spined; eyes vestigial, of from 9 to 18 facets (Females)   | 5 |
| 3 (2) | Vertexal foveae pubescent; elytron bifoveate<br><i>troglogytes</i> Park (1951)  |   |
|       | Vertexal foveae nude; elytron trifoveate  | 4 |
| 4 (3) | Pronotal disc bearing a median, longitudinal sulcus<br><i>spelaeus</i> Park (1951)  |   |
|       | Pronotal disc with this sulcus absent<br><i>jeanneli</i> Park (1951)  |   |
| 5 (2) | Last tergite medianly sulcoid with a pair of conspicuous spinoidal lamina bounding the median impression<br><i>spelaeus</i> Park (1951) |   |
|       | Last tergite convex, without lamina   | 6 |
| 6 (5) | Vertexal foveae pubescent; elytron bifoveate<br><i>troglogytes</i> Park (1951)  |   |
|       | Vertexal foveae nude; elytron trifoveate  | 7 |

- 7 (6) Clypeus bisected by a longitudinal carina; pronotal disc bisected by a longitudinal sulcus  
*quisnamus* Park (1951)  
 Clypeus with median longitudinal carina absent; disc of pronotum not bearing a median longitudinal sulcus  
*reduncus* new species
- 8 (1) Eyes vestigial, of from 6 to 14 facets; metatrochanter never spined (Females) 9  
 Eyes prominent, of 40 or more facets; metatrochanter usually spined (Males) 12
- 9 (8) Occiput with three apically converging carinae, a median, and a right and left oblique 10  
 Occiput with the median longitudinal carina only  
*confinis* (LeConte), 1850
- 10 (9) Lateral pronotal margin bearing a posteriorly-directed spine  
*sandersoni* Park (1947) 11  
 Lateral pronotal margin not spined
- 11 (10) Relatively large (2.4 to 2.7 mm. long)  
*monstrosus* (LeConte), 1850  
 Relatively small (1.7 to 2.0 mm. long)  
*cavicus* (Casey), 1893
- 12 (8) Occiput with three apically converging carinae, a median, and a right and left oblique 13  
 Occiput with the median longitudinal carina only  
*carolinae* Casey (1893)
- 13 (12) Prothoracic tibia with a conspicuous tooth or tumulus near center of dorsal face 14  
 Prothoracic tibia lacking this feature  
*cavicus* (Casey), 1893
- 14 (13) Second tarsomere of metathoracic tarsus greatly swollen, ovate and as wide or wider than tibial apex  
*armiger* (LeConte), 1850  
 This tarsomere simple, compressed-cylindrical, much narrower than tibial apex 15
- 15 (14) Antennal segment VII simple, VIII with lateral face slightly produced, IX flattened on ventral face, X obliquely excavated on mesioventral face; XI not spined at base  
*monstrosus* (LeConte), 1850  
 Antennal segment VII obliquely excavated on ventral face; VIII, IX, X not modified; XI with short, thick dentoid tubercle appressed to ventral face at base  
*beameri* new species

*Batrissodes profundus* new species

Type Male. 2.1 mm. long, shining reddish brown; head sparsely microgranulate; clytra and abdomen shallowly punctate, the clytral punctures larger, more crowded, with their proximal rims more sharply defined. Pubescence golden and appressed.

This species is a member of the subgenus *Babnormodes* and is most closely allied to *uncicornis* Casey. This latter species has been diagnosed (Park, 1947, pp. 57, 73, Pl. II, fig. 1) and the following description emphasizes the diagnostic differences between *uncicornis* and *profundus*.

The external anatomy is essentially that of *uncicornis* with the exception

of the antennae. In *unicornis* antennal segment X is irregularly trapezoidal with a deep excavation on the ventral surface rather eccentrically placed (Park, 1947, Pl. II, fig. 1); in *profundus* the distal two-thirds of the ventral face of antennal segment X are glabrous, flattened near margins and slightly concave (Fig. 7).

The aedeagei of these species are similar but exhibit small, consistent differences. The aedeagus of *unicornis* (Fig. 9) was taken from a specimen collected in Central Park, New York City on July 20, 1912 by C. F. A. Schaeffer. This was compared with Casey's type specimen, from New York City, deposited in the U. S. National Museum and is apparently identical with type. This comparison was by the author in November, 1941. It will be noted that this aedeagus is bilaterally asymmetrical, with the median lobe evenly convex on the morphological left side and broadly angulated on the right side in distal fourth; second, the internal sac is seen to be provided with numerous short dentoid tubercles.

The aedeagus of *profundus* is bilaterally symmetrical, and second, the internal sac is sparsely provided with much more minute denticles (Fig. 8).

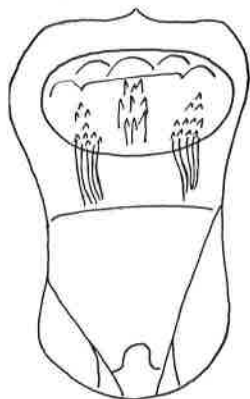


Fig. 8. *Batrisodes profundus* new species. Aedeagus, dorsal aspect.



Fig. 9. *Batrisodes unicornis* Casey. Aedeagus, dorsal aspect.

Type Female. Similar to the male except that it lacks the secondary sexual characters, as follows: (1) the front in the male is declivous between antennal bases, this declivity coarsely punctate, with a small secondary concavity distally, and the overhanging frontal margin ogival in outline, ending medianly in an acute point; the face deeply, transversely excavated, this excavation not very high and densely pubescent; this pubescence appears to arise from three chief sources, from a tuft at center of clypeus and on either side from a pencil of incurved setae; clypeal margin similarly ogival with acute median point, the clypeus not tuberculate. In the female the face is not transversely excavated, and the fronto-clypeal region is steeply declivous between antennae, also coarsely punctate and the distal margin of the clypeus is ogival, as in the male, with an acute median point but is much more conspicuous since the lack of transverse cleft and lack of special pubescence does not obscure the field of vision. (2) The tenth antennal segment is not excavated beneath and the eleventh antennal segment is not

spined beneath at base. (3) The female protibiae are simple, whereas in the male the protibiae are increasingly flattened and broadened from proximal three-fourths to apex, to form a glabrous, slightly twisted, paddle-shaped outline that bears a dense brush of setae along ventral margin in apical fourth. (4) The female has simple mesotarsi, whereas the male has abnormal tarsi (diagnostic of the subgenus *Babnormodes*), with the tarsi greatly compressed in basal half, the second segment having a carinoid ventral margin and the ventral face of this tarsal segment sinuate. The amount of sinuation is relatively small for the subgenus, and in this respect is similar to *uncicornis* Casey and *schaefferi* Park.

Both sexes have well-developed metathoracic wings and well-developed eyes, although the eyes of the female are typically smaller.

Described from four males and five females (type and eight paratypes) collected in Turk's Cave, near Brooklyn, Conecuh County, Alabama on October 2, 1952 by Walter B. Jones. Type and three paratypes deposited with Dr. Jones and five paratypes in author's collection.

This species of cavernicole presents some interesting features. It is only slightly modified from its presumed epigeal allies, e.g., *uncicornis* populations, and in this respect is unique among North American species of cavernicolous *Babnormodes*. The suggestion is that *profundus* has not evolved far with respect to its cavernicolous allies.

One of the males is post-teneral, with light yellow integuments. It had pupated probably within a week to ten days prior to collection.

#### *Batrisodes henroti* new species

Type Male. 2 mm. long, shining reddish brown with subimpunctate pubescence and rather sparse, semiappressed setae except for a few longer and bristling setae on tergites.

This is a member of the subgenus *Babnormodes* and closely allied in external anatomy to *valentinei* Park (1951, pp. 32-35, fig. 8).

Head as in *valentinei*, with prominent eyes of about 40 small facets, with the exception of the fronto-clypeal area or face. In *valentinei* the face is sharply declivous at the line of the antennal bases; this declivity is longitudinally concave, subglabrous and narrows rapidly as a triangular field that is surrounded by the granulate-punctate clypeus; a transversely ovate, sparingly setose concavity near origin of facial declivity. In *henroti* the face is gently declivous, in the same plane from between antennal bases to distal margin of clypeus; frontal area subglabrous and bears medianly a small, circular, convex tumulus; the clypeus is granulate-punctate.

Antennae, maxillary palpi, and pronotum as in *valentinei*. Each elytron with three nude, inconspicuous basal foveae; the surface is not scarified as in *valentinei* and *subterraneus* Park (1951, pp. 30-32, fig. 7); the elytral flank has the vestigial subhumeral fovea of *subterraneus* rather than the better developed subhumeral fovea of *valentinei*.

Tergites and sternites as in *valentinei* except that the basal abdominal carinae are relatively longer in *henroti* (22% of the length of first visible tergite) than in *valentinei* (20% of segment length).

Protibiae only very slightly contorted, as in *subterraneus*, rather than the more pronounced condition in *valentinei*. Mesotarsi very abnormal, characteristic of subgenus, with second tarsomere strongly compressed and with dorsal face sinuate in distal half, and ventral face abruptly incised near base. Metatibiae with a long terminal spur of setae.

Aedeagus (Fig. 10) without lateral styles, and with an almost bilaterally symmetrical median lobe. In this feature it resembles *subterraneus*, with a bilaterally symmetrical median lobe and differs greatly from *valentinei* in which the median lobe is obviously asymmetrical. The declivous acute

apex of the median lobe is well to the left of the median line in *valentinei*, median and short in *subterraneus*, nearly median and much longer in *henroti*.

Female as described for male except that (1) there is no convex tumulus on face; (2) the eye is vestigial, of ten small facets; (3) protibiae not flattened or twisted in distal half; and (4) the mesotarsi are not modified.

Described from two males and one female (type and two paratypes) in the author's collection. Collected by H. Henrot, in whose honor this species is named, in Vance Cave, Barren County, Kentucky on August 27, 1946. These specimens are the gift of Dr. Rene Jeannel, and represent the first cavernicolous pselaphid described from Kentucky, and the farthest north of any cavernicolous pselaphid in the Western Hemisphere.

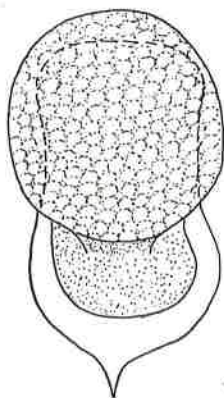


Fig. 10. *Batrisodes henroti* new species. Acedeagus, dorsal aspect with internal sac exerted.

### *Batrisodes gemmus* new species

Type Male. 2.0 mm. long, shining brown, elytra reddish, legs, maxillary palpi and antennae yellowish brown. Integuments subimpunctate; head, pronotum, elytra and abdomen distinctively microreticulate, i.e., under high illumination and magnification the surface is covered with irregular, closely placed lines. Pubescence moderately sparse, long and semiappressed.

This new species belongs in the genus *Babnormodes* and has as close allies the cavernicoles *subterraneus*, *valentinei*, and *henroti*. It differs from all of these on the structure of the face.

Head with prominent eyes of about 40 facets; lateral vertexal carinae well developed; vertex ogivally elevated between the two nude, deep vertexal foveae and U-shaped interfoveal sulcoid impression. Face (front and clypeus) declivous between antennal bases, the frontal declivity medianly concave, and ending distally in an entire, ogival margin that is blackened and bears irregularly minute beads; this margin overhanging antennal acetabulae; face subvertical medianly and slightly concave so that although the face is not transversely impressed in the usual sense it is slightly indented medianly; clypeus sparingly but distinctly microgranulate and pubescent.



Antennae with segments unmodified, not bearing teeth, spines, foveae or excavations.

Pronotum and elytra as in *valentinei*. Metathoracic wings present.

Abdomen as in *valentinei* except that the basal abdominal carinae are much more ponderous and cuneiform in *gemmus* and slightly longer (22% of length of first tergite), and the last sternite is relatively shorter, four-fifths of length of preceding two sternites united whereas in *valentinei* the basal abdominal carinae of first tergite are slender, inconspicuous and 20% as long as first tergite and the last sternite is slightly longer than the combined length of the preceding two sternites.

Legs as in *valentinei*.

Female similar to the male except that (1) the eye is small, of 14 facets; (2) the face is steeply declivous between the antennal bases, granulate punctate, lacks any frontal margin, but medianly the face is very slightly transversely indented; (3) protibiae not modified by flattened and contorted distal surfaces; (4) mesotarsi not modified.

Described from four specimens, two of each sex, of which the type and a paratype are in Dr. Jones' care and two paratypes are in the author's collection. Collected by Walter B. Jones and J. Manson Valentine on September 24, 1951 from Jewel Cave, 12 miles northwest of Dickson, Dickson County, Tennessee.

#### *Batrisesodes schaefferi* Park

This species was described (Park, 1947, pp. 104-105, Pl. VI, fig. 6) on a male and female labeled simply "North Carolina." We can give a more full locality citation at this time. L. M. Eisenach collected rich leaf mold and yellow pine stump mold in the foothills near Tryon, Polk County, North Carolina on November 27, 1949. These samples were berlesed and yielded one male from the leaf mold and four males from the stump mold.

This is another member of the large subgenus *Babnormodes*. In the males, although the mesotarsi are modified, the situation of the ventral edge of the second tarsomere is less developed than is usual in the subgenus. In this respect *schaefferi* resembles *profundus* and *uncicornis* noted previously.

#### *Batrisesodes valentinei* Park

This species was described (Park, 1951, pp. 32-35, fig. 8) from a series of caves in northern Alabama and one cave in southern Tennessee. Usually, cavernicolous pselaphids are known from but a single cave or a series of caves that are so close together that present or past inter-cave connections are assumed. In the case of *valentinei* a broader distribution is found: Crystal Cave, Monteagle, Grundy County, Tennessee, and in Alabama from Clements Cave, Jackson County, Talucah Cave, Morgan County, and its known greatest population density in Madison County, where the species has been taken from Goat Cave, Keel Mountain, Moon Cave, Newmarket, and Toll Gate Natural Well at Monte Sano.

Of the 55 specimens upon which the species was described, 43 came from Goat Cave in Keel Mountain.

About a year after the species was described the author had the opportunity to visit Goat Cave for the first time and the attempt was made to obtain *valentinei* alive for further study. Three males and two females were collected at 1:00 PM, September 19, 1952. The beetles were found under moist limestone fragments at the bottom of a small tube-like shaft eight feet high and three feet wide near an entrance to Goat Cave. This shaft was about twenty feet from the mouth of the cave and connected with the rest of the cavern by a transverse gallery seven feet from the cave entrance floor in height. The beetles were noted by gasoline lantern, picked up with a small brush, and placed in a quart thermos. The latter contained several strips of wet tissue paper and had been allowed to reach the cave

temperature (about 50° F. in the collecting area). Dr. Walter B. Jones, whose invitation made the trip possible, was operating in another part of the cave and obtained five more *valentinei* so that ten individuals were available for study.

The thermos was enclosed in an insulated container and taken by automobile to the author's laboratory. By afternoon of September 20, observations were begun on several aspects of the ecology of *Batrissodes valentinei*.

The period of study was fifty days, from 4:00 P.M., September 20 to 4:00 P.M., November 1, 1952. During this time the displaced beetles were kept in covered petri dishes with an inside diameter of two inches. The bottom of the dishes was covered with filter paper.

Normal cave conditions of constant darkness, constant air temperature of 50° F., and high relative humidity of 90% or higher, were simulated as closely as feasible.

When not being observed the beetles were kept in total darkness. Observations were held to a minimum. They varied from fifteen seconds every hour or two hours, as the case might be, in experiments on activity pattern, to as much as an hour several times during the whole period, where feeding and cleaning behavior patterns were under study. All such observations were made in low intensities of light, of from 15 to 30 foot-candles. Air temperature was held as constant as feasible. The total range in temperature for the period was from 60° to 75° F., but for any given experiment on activity or aggregation the range was held to five degrees, usually from 65° to 70° F. The filter paper was kept near saturation with distilled water and it was assumed that the small enclosed dish space had a rather constant and very high relative humidity and yet there was some diffusion between cover and dish to provide ventilation.

In general the Pselaphidae are predaceous and feed on a variety of smaller animals. These latter include insect larvae, Collembola, and Acarina (Park, 1942, p. 3). The genus *Batrissodes* follows the family pattern, and in addition certain species show a tendency toward scavengerism, i.e., *Batrissodes globosus* pick up and chew dead fly larvae that have been reduced to little more than shreds of integument. Such larvae have been dead for from one to two days and have been killed and partially eaten. *Batrissodes globosus* has been observed in the field, with a hand lens, feeding on oribatoid mites (Park, 1947), and in the laboratory has been fed on bits of freshly killed earthworms (Park, 1929). *Batrissodes globosus* feeds on larvae of the ant, *Lasius niger americanus* in laboratory ant nests (Park, 1932) and *Batrissodes frontalis* feeds on larvae of *Lasius umbratus aphidicola* in similar nests (Park, 1947).

Third instar larvae of the fruit fly, *Drosophila melanogaster*, are eaten by a variety of genera of pselaphids in the laboratory nests and provide an easily maintained food supply. Such larvae were offered to *valentinei*.

The food and physical conditions of the artificial environment as described were tolerated very well by the beetles. At least no death or apparent loss of vigor occurred.

#### *Feeding and Cleaning Behavior.*

*Batrissodes valentinei* were offered fruit fly larvae five times during the period: 10:00 AM, September 24; 8:00 PM, September 27; 6:00 A.M., September 29; 8:00 PM, October 9; 10:00 AM, October 26.

These beetles apparently can go without food for relatively long periods of time, at least seventeen days. Commonly in laboratory studies on other species, an individual would eat an ant- or fly-larva and then take no more

food for several days, although such food was available. In the case of cavernicoles such ability may serve as a positive adjustment to the cave community.

Since at least a part of the *valentinei* population fed on all five occasions, the following typical sequence of observations will serve our purpose.

- 10:00 AM, September 24. Third instar larva placed in petri nest.
- 10:53 AM A teneral *valentinei* got astride the larva and began chewing and licking at central dorsal area of larva. During this period the beetle tapped the larva occasionally with the last antennal segment and frequently tapped the larva with the distal segment of the maxillary palpi. Under the dissecting binocular it could be noted that bits of fat body and haemolymph were being eaten, the mandibles working in unison, and alternately to the laciniae of the palpi in unison.
- 11:00 AM Beetle stopped feeding and began cleaning its foretarsi and maxillary palpi by drawing each through its mandibles and laciniae repeatedly as previously described (Park, 1947).
- 11:01 AM Beetle feeding again at same area of larva.
- 11:04 AM Beetle stopped feeding and began cleaning foretarsi and palpi.
- 11:14 AM Beetle No. 2 passed by teneral feeding on larva.
- 11:16 AM Teneral (No. 1) left larva.
- 11:17 AM Beetle No. 2 returned to larva, tugged at it and began feeding at same area.
- 11:30 AM No. 2 stopped feeding and started cleaning foretarsi and palpi.
- 11:34 AM No. 2 began feeding again. Larva now one third eaten and no longer showing any overt signs of life.
- 11:38 AM No. 1 quartering dish, walked over spot where larva had been placed initially. Stopped here and tore at filter paper for five seconds.
- 11:48 AM No. 2 stopped feeding and began cleaning. No. 1 found larva and began feeding.
- 11:49 AM No. 1 stopped feeding and began cleaning. Larva now displaced several mm. No. 2 stopped cleaning; began wandering over area and found spot where larva had been previously lying. Found shred of tissue and chewed on it.
- 11:54 AM No. 1 stopped cleaning and began wandering over the immediate area. Larva now two-thirds eaten, and removed to begin another activity pattern experiment.

It is note-worthy that during cleaning and feeding operations neither the weak light intensity nor tapping the dish cover elicited any apparent response from these two pselaphids. They were the only beetles in the particular dish reported on above.

#### *Aggregative Behavior*

In the course of this study it was noted that individuals of *valentinei* appeared to show a tendency to congregate in a relatively small part of a dish. A simple experiment was designed to test this hypothesis.

Ten beetles were placed in a dish, the floor of which was covered by a nearly-saturated filter paper that was ruled off into 25 "squares." The dish was in total darkness except for regular 30 second observations in which the number of beetles on the squares was noted visually and recorded. These data are given in Table I.

TABLE I

Hourly Distribution of *Batrisodes valentinei*

Square	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	
No.	PM 20. IX. 52										MAM 21. IX. 52					AM					
1	0	3	2	1	1	1	1	1	2	0	•	•	•	1	1	•	•	0	0	0	14
2	1	0	0	1	0	1	0	1	0	0	•	•	•	0	0	•	•	0	0	0	4
3	0	2	1	0	1	1	1	0	0	0	•	•	•	0	0	•	•	0	0	0	6
4	1	0	0	0	1	0	1	0	1	0	•	•	•	0	0	•	•	0	0	0	4
5	0	2	2	3	3	2	1	0	0	0	•	•	•	0	0	•	•	0	0	0	13
6	0	1	0	0	0	0	1	0	0	0	•	•	•	0	0	•	•	0	0	0	2
7	0	0	0	0	0	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	0
8	5	1	0	0	0	0	1	2	0	0	•	•	•	1	0	•	•	0	1	1	12
9	0	0	1	0	0	0	0	1	3	4	•	•	•	1	1	•	•	0	0	0	11
10	0	0	0	0	1	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	1
11	0	0	0	0	0	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	•	•	•	0	1	•	•	0	0	0	1
13	0	0	1	0	0	0	0	1	0	0	•	•	•	0	0	•	•	0	0	0	2
14	0	0	0	0	0	0	0	0	0	1	•	•	•	0	2	•	•	1	1	1	6
15	0	0	0	1	0	0	0	0	1	0	•	•	•	0	0	•	•	1	1	1	5
16	0	0	0	0	0	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	0
19	0	0	0	1	0	0	0	0	0	0	•	•	•	2	0	•	•	2	2	2	9
20	0	0	0	0	1	1	0	0	0	0	•	•	•	0	0	•	•	0	0	0	2
21	0	1	0	0	0	0	0	0	1	•	•	•	1	0	•	•	1	1	1	1	6
22	0	0	0	0	0	0	1	0	0	0	•	•	•	0	0	•	•	0	0	0	1
23	2	0	1	0	0	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	3
24	1	0	0	0	0	0	0	0	0	0	•	•	•	0	0	•	•	0	0	0	1
25	0	0	2	3	2	4	3	4	3	4	•	•	•	4	5	•	•	5	4	4	47
Totals	10	10	10	10	10	10	10	10	10	10				10	10			10	10	10	150

• No observations made

In this simple experiment the beetles were liberated at the center of the dish and given one hour adjustment time before the first observation. At the termination of the experiment the filter paper was still near saturation and for the entire period the air temperature was between 60° and 65° F. As can be seen from the totals in the last vertical and horizontal columns of Table I all beetles were accounted for each observation period. The only obvious disturbing factor was the 30 second observation period at low light intensity.

It is noteworthy that after the third hour square 25 began to hold a relatively large part of the experimental population, namely 31%. The four "corner squares" (1, 5, 21 and 25) might have been beneficially stimulating were positive thigmotaxis operating alone, and it would appear that in nature pselaphids tend to place a large amount of the body in contact with the substrate. Despite this observed response to the substrate, the squares 1 and 5 accounted for only 9.3% and 8.6% respectively of the population, whereas square 21 accounted for no more than some of the exposed squares with no dish wall.

Even on the basis of this single experiment, there seems to be a tendency to form a place aggregation. Such a gathering probably is motivated by both automatic aggregation response, *e.g.*, toward a favorable habitat niche, and by more subsocial influences, *e.g.*, collecting of animals as a result of a positive reaction to the presence of others of the same species (Allee, 1927; Allee, Emerson, Park, Park and Schmidt, 1949, p. 394). More experimentation is needed in the case of *valentinei* to demonstrate this aggregative tendency

statistically. Under the circumstances, the limited material, obtained with considerable difficulty, had to be used in a variety of ways over a short period of time.

The results of the experiment (Table I) support the personal observations of the author in nature. In caves with freely communicating passages, crevices and rooms, cavernicolous pselaphids usually will be relatively abundant in certain areas and sparse to absent in others. In such caves, to the human perceptions at least, there appear to be an almost limitless number of similar to identical habitat niches that are not so occupied.

If this is so then such aggregative tendencies should have a positive selection value for species survival since in nature widely roaming cavernicolous pselaphids of opposite sexes might not meet one another sufficiently often to copulate and maintain the population. This presupposes enough food organisms to support the local population and caves have insect larvae, Collembola and diverse arachnids.

#### Activity Pattern

Four *valentinei* were used. These included one teneral beetle, with straw yellow, translucent integument (No. 1), and three that were fully sclerotized. The last three were marked differentially with minute dots of red liquid nail polish (Nos. 2, 3, 4).

The beetles were placed in a dish, the bottom of which was covered with a nearly saturated filter paper that was ruled off into eight equal-area triangles. In the center of the dish was a bit of decayed leaf, about two square centimeters in area, found in Goat Cave. The dish was in total darkness except for fifteen second observations taken every two hours under low light intensity. The air temperature over the course of the experiment had a range of from 66° to 75° F., but most of the time was between 70° and 75° F.

The readings every two hours were to note the distribution of the four beetles on the eight squares, so that minimum shift in position could be obtained. This was considered to be a consequence of minimum spontaneous activity in simulated cave conditions, e.g., darkness, constant temperature and high relative humidity. Maximum or total activity could not be measured as, at his time, there was no recording equipment available that could report continuously and objectively the movements of insects with a body weight in the neighborhood of 0.004 gram. The data for this first experiment are given in Table II. A two hour period of adjustment was allowed prior to the first observation.

In Table II "night" was taken arbitrarily as the period from 6:00 PM to 5:00 AM, and "day" from 6:00 AM to 5:00 PM. For three of these "days" and "nights" the four *valentinei*, including a teneral individual, were observed for fifteen seconds every two hours. Since the beetles spent much of their time aggregated beneath the bit of leaf in the dish center, although in total darkness, any given observation would determine which beetle had moved from beneath the leaf to a particular equal-area triangle of filter paper. Since there were four beetles, a shift of any beetle from triangle to triangle, or to and from the leaf fragment was at least a 25% shift in position. These percentages are given for each two hour period in the fourth column. The fifth column gives the sum of these readings for each "day" and "night." If such sums can be thought of as activity indices, then we see that for this experiment there were 625 such units for the three "nights" and 625 units for the three "days," or an average of 208 units per "day" or "night" and an average for a 24-hour day of 416 units.

These data are too few, there are too few beetles, and the air temperature was not constant. Even so, the information suggests that the cavernicole *valentinei* does not exhibit a diurnal rhythm in activity under the conditions of the experiment. The epigeal species of the genus, where tested, e.g., *globosus* are nocturnal in nature and select the dark end of a gradient in light intensity (Park, 1947). Furthermore, such apparent arrhythmicity with



TABLE II

Activity of *Batrissodes valentinei* in Constant Darkness

Date	Period	Time	Activity in Per cent of Minimum Shift of position	Sum of Per cent per Period
22.IX.52	Night 1	6 PM	0	
		8 PM	0	
		10 PM	25	
		12 M	25	
23.IX.52	Day 1	2 AM	25	
		4 AM	25	100
		6 AM	50	
		8 AM	0	
		10 AM	25	
		12 N	25	
		2 PM	50	
		4 PM	25	175
24.IX.52	(Beetles fed) Night 3	6 PM	50	
		8 PM	50	
		10 PM	25	
		12 M	50	
25.IX.52	Day 3	2 AM	50	
		4 AM	50	275
		6 AM	50	
		8 AM	25	
		10 AM	75	
		12 N	25	
	Night 4	2 PM	25	
		4 PM	25	225
		6 PM	50	
		8 PM	25	
		10 PM	25	
		12 M	50	
26.IX.52	Day 4	2 AM	50	
		4 AM	50	250
		6 AM	50	
		8 AM	50	
		10 AM	25	
		12 N	25	
		2 PM	50	
		4 PM	25	225

respect to the day-night cycle has been found in a cave crayfish, *Cambarus pellucidus* (Park, Roberts, and Harris, 1941). Where cave colonization has been operating over geological time, it may be that the external manifestation of an overt activity rhythm is lacking. Ecologically, such an arrhythmic pattern should be a positive adjustment in the relatively constant environment of a cavern.

There was time to perform another experiment. In this the same four *valentinei* were used and the same technique employed as described, except that the "day" was artificially illuminated continuously at 300 foot-candles. These results are given in Table III.

TABLE III

Activity of *Batrissodes valentinei* in Alternating Dark and Artificial Illumination

Date	Period	Time	Activity in Per Cent of Minimum Shift of Position	Sum of Per Cent per Period		
27.IX.52	Night 5	6 PM	75			
		8 PM	25			
		10 PM	75			
		12 M	25			
		2 AM	50			
28.IX.52	Day 5 (300 f. c. constant)	4 AM	50	300		
		6 AM	50			
		8 AM	25			
		10 AM	25			
		12 N	25			
		2 PM	25			
		4 PM	0			
		Night 6	6 PM		25	150
			8 PM		75	
			10 PM		50	
			12 M		25	
29.IX.52	Day 6	2 AM	25	225		
		4 AM	25			
		6 AM	50			

Table III demonstrates that a single twelve-hour period of continuous light depresses overt activity. Probably under these conditions, the negative phototaxis of the genus is reinforced by their positive thigmotaxis and aggregative tendency, so that the beetles spent most of their time beneath the central leaf fragment. These are suggestive data only, and *valentinei* or its hypogean allies should be a good biological material for a study of habit induction by means of exogenous factor mediation.

#### Analysis of *Batrissodes*, subgenus *Babnormodes*, based on Male Secondary Sex Characters

At present there are eighteen species known in the wholly American subgenus *Babnormodes*. This subgenus is characterized by (1) metatibiae each bearing an apical spur; (2) mesotarsi of the males modified, the dorsal surface of the second tarsomere is sinuate distally and the ventral surface sharply incised or sinuate near base; (2) the aedeagus does not have lateral styles.

In the large genus *Batrissodes*, as noted previously, two subgenera dominate the North American cave fauna in the Appalachian Uplift, namely *Batrissymmodes* and *Babnormodes*.

Of the eighteen species in *Babnormodes* there are eleven epigean and seven hypogean species. The secondary sex characters of the males offer a diverse array of features for analysis. This has been discussed previously (Park, 1951, p. 82, fig. 17; Park, 1953b) and additional data are now available. The chief features are listed in Table IV.

TABLE IV

Male Secondary Sex Characters in *Batrissodes* (*Babnormodes*)

Species	Character						Score
	I	II	III	IV	V	VI	
Epigeal Populations							
1. <i>antennatus</i>	1	0	1	1	1	0	4.0
2. <i>riparius</i>	1	0	1	1	0	1	4.0
3. <i>hairstoni</i>	1	½	0	1	½	½	3.5
4. <i>schaefferi</i>	1	1	0	1	0	0	3.0
5. <i>unicornis</i>	1	0	0	1	0	1	3.0
6. <i>cavicornis</i>	½	0	0	1	1	0	2.5
7. <i>appalachianus</i>	1	1	0	0	0	0	2.0
8. <i>foveicornis</i>	½	0	0	1	½	0	2.0
9. <i>punctifrons</i>	1	1	0	0	0	0	2.0
10. <i>rossi</i>	1	0	0	1	0	0	2.0
11. <i>spretus</i>	1	0	0	1	0	0	2.0
Hypogean Populations							
12. <i>profundus</i>	1	0	0	1	0	1	3.0
13. <i>jonesi</i>	0	1	0	1	0	0	2.0
14. <i>specus</i>	0	0	1	1	0	0	2.0
15. <i>subterraneus</i>	0	0	1	0	0	0	1.0
16. <i>gemmus</i>	½	0	0	0	0	0	0.5
17. <i>henroti</i>	0	½	0	0	0	0	0.5
18. <i>valentini</i>	0	0	0	0	0	0	0.0

In Table IV the six secondary sex characters (I to VI) relate to the head and the antennae, as follows: face transversely excavated between the antennal acetabulae (I); clypeus bearing a tubercle (II); ninth antennal segment abnormal (III); tenth antennal segment bearing a fovea on ventral face (IV); eleventh antennal segment excavated or foveate (V); eleventh antennal bearing a spine on ventral face (VI).

In this table, where a character is present and well developed its presence is recorded as "1," and if it is absent as "0." In a few instances, there is a very weakly developed or just discernible feature and these are listed as "½." The several species are arranged in the order of their score, obtained by adding the values of the six characters, for the above-ground or epigeal, and for the subterranean or hypogean populations.

The average for the whole subgenus is 2.2 whereas the average for the epigeal populations is 2.7 and for the hypogean populations 1.2 points.

In this subgenus usually the eyes of the male are prominent whereas the eyes of the female are small to vestigial, and with significantly fewer facets. Similarly, the secondary sex characters are prominent, often excessive in the male whereas the female has these features lacking. In common with other cavernicolous pselaphids, the cavernicoles tend to show a simplification and/or loss of parts as contrasted with epigeal species in the same taxonomic group. In *Babnormodes*, *profundus* is exceptional in that its secondary sex characters apparently are as well developed as those of the epigeal *unicornis* and of the same kind. The suggestion is that *profundus*, differing only slightly in details of the aedeagus, is a relatively new cavernicole.

To sum up, in the subgenus *Babnormodes* there is an apparent tendency for the female to be externally more simple than the male of the same species, both with respect to eye facet number and secondary sex characters of the face and antennae. Second, there is an apparent tendency for the males of cavernicolous species to be externally more simple than the males of epigeal species with respect to secondary sex characters of the face and antennae.

The interpretation of the second tendency is difficult. The assumption is made that these secondary sex characters in the male subserve sensory functions, at least in part, and experimental evidence demonstrates both tactile and odor perception are impaired with loss or shielding of the

eleventh antennal segment in epigean species, e.g., *Batrisodes globosus*, *Cedius spinosus* and *Cedius cruralis*. If this assumption is valid, it is difficult to explain the reduction or loss of these features in cavernicolous *Batnormodes*. In the constant darkness of caverns, over long periods of time, one would imagine that such tactile and odor perceptive organs to have a positive selection value. Compensatory development of other features may have taken place in this subgenus, but, if so, they have not been found as yet.

*Batrisodes auerbachi* new species

Type Male. 1.8 mm. long, shining reddish brown with legs, face and antennae yellowish brown; pubescence sparse, long, semi-erect on pronotum and elytra; integuments sparsely punctulate except head.

Head (Figs. 11, 12) large, subquadrate, wider than pronotum; eyes prominent, in posterior half of length, of about 48 facets; median vertexal carina from cervicum to a line through posterior margins of vertexal foveae; lateral vertexal carinae very prominent; vertexal foveae large and deep; no interfoveal sulcus; vertex unique, rather abruptly elevated medianly in a high

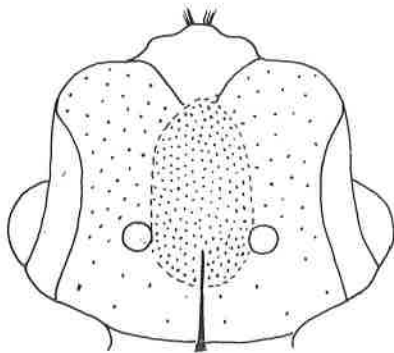


Fig. 11. *Batrisodes auerbachi* new species. Dorsal aspect of head of male.



Fig. 12. *Batrisodes auerbachi* new species. Left lateral aspect of head of male.

tumulus, this tumulus appearing rounded suboblong from above and as a triangular crest in profile; this vaulted vertex closely microgranulate, each granule bearing a minute seta and the granulation regularly less dense from the median vault to the lateral vertexal carinae; vertex-front long, steeply declivous, subimpunctate and progressively concave between antennal bases, the overhanging frontal margin narrowed and produced medianly, this median obtuse extension bearing distally two short setoid processes; face deeply excavated between antennal acetabulae; clypeus transversely carinate, the median portion of carina erected in a tubercle that is setose and projects upward just beneath the median, obtuse area of frontal margin. Ventral surface of head, genal beard and maxillary palpi as for genus.

Antennae eleven-segmented, segment I large with mesial face concave in broader basal half; II elongate; III obconical; IV to VIII as wide as third, third and fourth quadrate, others progressively transverse; club of last three segments, IX abruptly wider than eighth and irregularly transverse; X large, wider than eleventh, obliquely globular from above, but with ventral face obliquely concave, the concavity bearing in its mesio basal area

a large, oviform, setose fovea; XI with ventral face slightly flattened near base.

Each elytron trifoveate near base.

Legs with profemora medianly more tumid than other femora, bearing an oblique carinoid ridge for central half of ventral face, this carinoid ridge apparently transversely serroid; mesotarsi normal, not bearing a sharp sinuation at base of the second segment; metatibiae with an apical spur of setae.

Last sternite simple.

Described on eight males (type and paratypes) in collection of author. Collected by Stanley Auerbach, in whose honor this species is named, and Henry Dybas in the Great Smoky Mountains National Park. Type Greenbrier Cove, 2000 feet elevation, September 17, 1953 in leaf mold from damp pocket. Four males two and a half miles from Chimney Camp Grounds, Sevier County, Tennessee on September 16, 1953 by sifting concentrated leaf litter. Three males sifting leaf litter on September 17, 1953 in Cherokee Orchard.

This new species is a member of the subgenus *Excavodes* and is quickly discriminated from its allies by the remarkable vertex. In Park (1947, p. 59) *auerbachi* keys out to *spretus* (LeConte) but this latter species is in the subgenus *Babnormodes*, the males of which have abnormal mesotarsi.

A male from Chimney Camp Grounds and a male from Cherokee Orchard are general, suggesting that pupation took place in September.

### *Batrisodes mississippiensis* new species

Type Male. 1.8 mm. long, shining reddish brown; pubescence relatively abundant, short and appressed; integuments sparsely punctulate, the punctules tending to have raised anterior rims, especially on elytra.

This new species is a member of the subgenus *Excavodes* and is allied closely to *globosus* (LeConte). It differs from *globosus* particularly on cephalic anatomy as follows. 1.) The frontal margin is broadly and gently rounded, short, not extending apically beyond a line through the centers of the first antennal segments—quite different from the longer, ogival frontal margin of *globosus* (Park, 1947, Pl. IV, fig. 1). 2.) The interfoveal vertexal sulcus is evanescent apically instead of well marked and entire. 3.) The overhanging frontal margin in *globosus*, from a direct facial view is continued medianly as a ventro-posterior carina into the facial excavation whereas in *mississippiensis* this median portion of the frontal margin is simple and not so continued. 4.) Whereas the head external to the interfoveal sulcus is more granulate punctate than the enclosed vertexal area in *mississippiensis*, it is quantitatively much less so than in *globosus*. 5.) The clypeal tubercle of *globosus* is directed apically but in *mississippiensis* this tubercle is directed dorsally.

Antennal segments X and XI, pronotum, elytra and abdomen substantially as in *globosus*. The legs are similar to *globosus*, the males having a weakly developed metatibial setoid spur and the mesotibiae having a well developed setoid spur in both of these species.

In Park (1947, pp. 56-61) the male *mississippiensis* keys out to *spretus* (LeConte) and *auerbachi* new species by virtue of the short overhanging margin. From *spretus* it differs in lacking the pair of prominent, conoidal tubercles on the frontal margin (Park, 1947, Pl. IV, fig. 3); it differs from *auerbachi* in lacking the conspicuous vaulted vertex (Fig. 12).

The aedeagei of *globosus* and *mississippiensis* differ. Both species have bilaterally asymmetrical median lobes, two dorsal membrane-covered fenestrae and lack lateral styles. In *globosus* (Park, 1942, Pl. I, fig. 13) the distal margin of the median lobe bears a projection on the extreme left corner. In *mississippiensis* the distal margin of the median lobe bears this projection off-center, but between the median line and the left corner (Fig. 13).

Described from eight males (type and seven paratypes). The type and three paratypes are deposited in the collections of Cornell University; four paratypes in the author's collection.

All of the specimens were collected by Henry Dietrich. Type and two paratypes at Lucedale, Mississippi, February 27, 1931. Four paratypes from New Augusta, Mississippi, February 11, 1931. One paratype from Richton, Mississippi, March 23, 1931.

### *Batrisodes festinatus* new species

Type Male. 2.0 mm. long, shining reddish brown with relatively abundant and semiappressed pubescence; clytra with vague, broad punctulation; abdomen and pronotum subimpunctate.

Head with prominent eyes with about 48 facets, set at the basal third of length; median longitudinal carina bisecting cervicum, interrupted in occipital region and present on basal half of vertex but poorly developed; lateral vertexal carinae present but poorly developed; a pair of relatively small but deep vertexal foveae on a line through eye centers; interfoveal sulcus weak and distally evanescent; vertex sparsely punctate granulate, but this condition becoming progressively stronger to frontal margin; overhanging frontal margin declivous but extending to the ends of the first antennal segments, this scabrous declivity narrowing to terminate in a narrowed

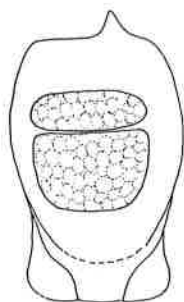


Fig. 13. *Batrisodes mississippiensis* new species. Aedeagus, dorsal aspect.

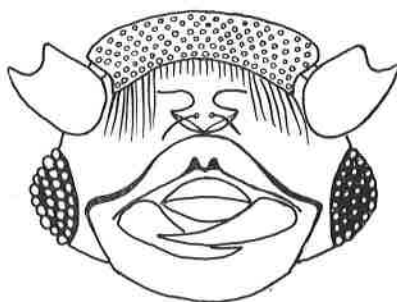


Fig. 14. *Batrisodes festinatus* new species. Direct facial view of head of male.

subtruncate line, the area slightly impressed medianly; face (Fig. 14) with frontal margin slightly produced each side, these angles lengthily setose; from ventral surface of the frontal projection there arises a strong peduncular neck that extends distally to form a thin, translucent plate; plate bears a pair of thick divergent setae, is concave with recurved lateral walls, minutely bifid at tip, and in the general form of a broad spear head; face deeply excavated between antennal acetabulae; frontoclypeal line dorsally arcuate at center, beneath the frontal plate, with the lateral portions sharply raised, carinoid and more setose; distal margin medianly erected into a pair of longitudinal carinoid walls that are subprostrate and not easily seen; labrum with a very arcuate distal margin; mandibles strong, left crossed dorsal to right; ventral surface of head and palpi as for subgenus.



Antennae eleven-segmented; segment I elongate slightly, with simple ventral and mesial faces; II and III obconical; third to eighth slightly narrower than third; IV and V slightly elongate; VI, VII and VIII subquadrate, with seventh slightly larger than either sixth or eighth; club of last three segments; IX distinctly larger than eighth and smaller than tenth, simple, transversely trapezoidal; X bearing a deep, circular, setose fovea at extreme mesio-basal angle of ventral face, the mesial wall of this fovea sharply elevated, this segment not wider than eleventh; XI simple, with no spine or tooth at base of ventral face.

Pronotum and elytra substantially as in *globosus*. Legs as described for *auerbachi*. Last tergite bearing a foveoid impression at apex, the dorsal rim of impression sharply produced. Last sternite longitudinally concave, with the concavity fringed by long, divergent setae.

Described from one male, the type, in the collections of Cornell University. Collected by Henry Dietrich on May 14, 1930 near Lucedale, George County, Mississippi.

This new species is a member of the subgenus *Excavodes* and would appear to be most closely allied to *beyeri* Schaeffer. It is distinct from *beyeri* in that the latter species has the tenth antennal segment obviously wider than eleventh and the facial anatomy is qualitatively different. In a recent key (Park, 1947, pp. 56-61), *festinatus* keys out near *sinuatifrons* (Brendel) and *scabriceps* (LeConte) with neither of which it has much in common.

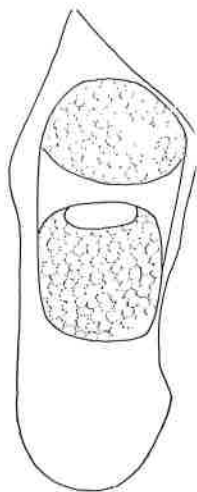


Fig. 15. *Batrisodes schaumii* (Aube). Aedeagus, dorsal aspect.

### *Batrisodes schaumii* (Aubé)

This species has not been reported south of Virginia (Park, 1947). Two new state records extend its known range to the Gulf Coast region: Columbus, Lowndes County, Mississippi, and Lucedale, George County, Mississippi. The aedeagus is figured (Fig. 15). The species is at present in the subgenus *Elytroides* (Park, 1951). It is out of place here by virtue of trifoveate instead of bifoveate elytra. Subgeneric separation is warranted but is not made at this time, pending a review of the genus in North America.

*Batrisodes clypeonotus* (Brendel)

This is one of six species of *Batrisodes* of eastern North America with which the author was unfamiliar (Park, 1947) and had to be placed from data in the original description.

A male is now available for study. It was collected by Molly Balamuth in berlesate of tree-hole mold in a pine forest near Cooks Springs, St. Clair County, Alabama, on March 5, 1950 and constitutes a new state record. This specimen fits the original description of Brendel in all details but one. The tenth antennal segment is not afoveate as noted by Brendel (1893, p. 280, Pl. 4, fig. 4) but has an excessively minute fovea on the ventral face. This fovea is seen with difficulty by strong illumination with 8X binocular objectives; it is not evident with 3X objectives and could have been overlooked easily by Brendel. The anatomical agreement is so strong otherwise, including the peculiar first antennal segment, that the assumption is tenable that this detail was overlooked. The Alabama specimen keys out perfectly to *clypeonotus* (Park, 1947, pp. 56-61) if the foveate tenth antennal segment is considered afoveate for practical purposes. The range of the species is poorly known. Brendel's type locality is Ponchatoula, Louisiana (Park, 1948) and the species has been unrecorded since 1893 until the present northern Alabama record.

*Batrisodes clypeonotus* was questionably assigned to the *furcatus* group by Park (1947, p. 108). It does not belong in this group and has not been given a subgeneric assignment (Park, 1951). It belongs in a new subgenus but, as with other species, such matters are reserved for a generic review.

*Arianops henroti* new species

Type Male. 2.0 mm. long, reddish brown, moderately shining; sparsely and weakly punctulate; pubescence pale, moderately abundant and semi-appressed, especially on abdomen.

Head wider than long (width including ocular spines and length from distal clypeal margin to occiput); eyes absent, replaced each side by a short, acute, triangular spine; vertexal foveae minute and perforate, at basal four-fifths, each in a shallow depression, these depressions united by a long, weak but entire and distally truncate interfoveal sulcoid impression; median vertexal carina weakly formed, from cervicum to a line through area just posterior of ocular spines; lateral vertexal carinae much more strongly formed than median; face declivous, the declivity concave and simple; labrum with a broadly concave distal margin; mandibles strong, left crossed dorsal to right; maxillary palpi as for *cavernensis* Park (1951, pp. 41-43); genal beard moderately formed; ventral surface of head with weak median longitudinal gular impression and with gular fovea at base of head.

Antennae eleven-segmented; segment I simple, elongate; II smaller, elongate; III obconical; fourth to eighth subequal in width and about as wide as third; IV and V slightly longer than wide; VI subquadrate; VII to IX increasingly transverse, the ninth slightly larger than eighth, transverse trapezoidal; X larger than ninth, transverse trapezoidal, ventral face not foveate; XI truncate at base, widest at middle, tapering to an obtuse apex, distal portion suddenly narrower and obscured by several rows of setae on all faces, these setae arising at origin of thin portion.

Pronotum oboval with a subtruncate apex, longer than wide in a ratio of 7.5 to 6.7; widest at apical three-fourths, disc simple and convex; three antebasal foveae, the laterals relatively deep and the median very shallow, oval and discernible with strong oblique illumination at 70 diameters magnification.

Elytra with unarmed, sloped humeri; each elytron with the antebasal foveae absent *per se*, the basal margin obtusely raised with a local thickening inside humeral angle so that there is a vague impression from this thickening

to suture; sutural stria entire; distal impression absent; flank with no subhumeral fovea but with an impressed line parallel to lateral margin.

Abdomen distinctly longer and slightly wider than elytra; five tergites in median length ratio of 4.5-1.3-1.3-6.5-1.8 with first visible tergite having an entire marginal carina each side and a pair of short basal abdominal carinae that are separated by 20% of tergite width.

Seven sternites in median length ratio of 1.0-3.5-1.3-1.3-1.8-2.0-1.8 with first visible seen as a short obtriangular field between metacoxae and greatly obscured by pubescence; fourth sternite bearing a short, acute cusp at center; sixth sternite broadly concave for median three-fourths of width, this concavity deepening posteriorly; seventh in the form of a small, acute obtriangular aedeageal plate, entirely enclosed by fifth tergite and sixth sternite, the apex of this plate fitted into an acute sinus at center of posterior margin of last tergite.

Prosternum not bisected by a carina; mesosternum with the prepectoid area alutaceous and bearing a deep median fovea; mesocoxae in confluent cavities; metasternum convex, bearing a subapical fovea. Femora clavate; mesotrochanters each with a short, acute spine at ventral face; metatibiae each with a spur of setae at apex; tarsi three-segmented, first segment small, last two elongate, second longer than third, third bearing a tarsal claw and a short, divergent accessory claw or seta.

Described from one male, the type, deposited in the collections of the Muséum National d'Histoire Naturelle, Paris. This specimen was loaned to the author for study, and description if new, by Dr. René Jeannel. It was collected by H. Henrot, in whose honor it is named, by sifting ground cover on Rabun Bald, Georgia on August 10, 1946 at 4717 feet, near Rabun Gap, Rabun County.

This new species is a member of the subgenus *Arianops* (*sensu* Brendel, 1893), as a consequence of the presence of a median antebasal pronotal fovea (Park, 1951, p. 41). There are but two species in this subgenus, *amphyooponica* (Brendel), 1890, and *plectrops* Casey, 1887. It is not too closely allied to either of these but is nearest *plectrops* on pronotal measurements, the pronotum being longer than wide, whereas it is nearer to *amphyooponica* by virtue of its minute vertexal fovea. The very weak median pronotal fovea and male secondary sex characters of the venter separate *henroti* from both of these species.

### *Arianops jeanneli* new species

Type. 2.5 mm. long, reddish brown, moderately shining; pubescence pale, short, relatively sparse and semiappressed except on genae where setae are more bristling and tend to have curled or recurved tips; integuments subimpunctate.

Head slightly wider than long, if width includes ocular spines, in a ratio of 7.0 to 6.6; eyes absent, replaced by a short, slender, triangular spine (these ocular spines much more slender than in *henroti*); median and lateral vertexal carinae absent; vertexal foveae reduced to an isolated pair of minute, perforate pits (much smaller than those of *henroti*); interfoveal sulcus absent, the vertex simply convex; front between antennal tubercles bearing a quadrate concavity and beyond this point the face is simply declivous; labrum long and conspicuous, longer than face, the distal portion suddenly wider with a gently concave distal margin; mandibles strong with left crossed dorsal to right; ventral surface of head and maxillary palpi as for *cavernensis*.

Antennae eleven-segmented, slender and unmodified; all segments longer than wide, with VIII the smallest; club of last three segments with XI as long as preceding two and a half united.

Pronotum slightly longer than wide and slightly narrower than head, rounded-truncate oboval; disc simple and convex; a minute, just discernible lateral antebasal fovea each side at basal third; no median antebasal fovea or impression; the extreme base is transversely microstriate or alutaceous and just anterior to this area at center the pronotum is longitudinally elevated.

Elytra with long, gently sloped humeri; sutural stria can be poorly discerned in apical third and evanescent toward base; no antebasal fovea or impressions and no subhumeral fovea or discal impressions; a rather well defined impressed line arises on each flank near center of length, parallels lateral margin for a short distance then curves externally to apex.

Abdomen longer and slightly wider than elytra; five tergites in median length ratio of 8.0-1.8-1.6-3.0-2.0 with the last tergite not ordinarily visible from above (last three tergites slightly damaged); first tergite with entire marginal carina on each side (mount does not allow study of basal abdominal carinae).

Six sternites in median length ratio of 1.0-6.5-1.2-1.0-1.0-2.6 with the first seen as a small obtriangular field between metacoxae, obscured by pubescence; sixth sternite transversely concave in basal half, convex in distal half, with distal margin simply convex.

Prosternum not bisected by a median carina; mesosternum very long, the prepectoid area heavily alutaceous with a moderately large fovea in anterior area; mesocoxae in confluent cavities; metasternum convex, bearing a weak foveoid impression posteriorly. Legs slender; protibiae gradually broadened and with ventral face flattened and arcuate from proximal third to apex. (If this condition is normal then it is unique in the genus. The protibiae may be collapsed. It is difficult to determine since both distal segments of the maxillary palpi are collapsed, yet no other tibiae are affected. More specimens are needed to form a definite opinion.) Tarsi as described for *henroti* but longer and more slender.

The unique type is probably a female. It was collected by J. M. Valentine in August, 1931 in Gilly's Cave, Pennington Gap, Virginia. This specimen was sent to Dr. René Jeannel by Dr. Valentine and Dr. Jeannel loaned the specimen to the author for study, and if new, for description. Type deposited in the Museum National d'Histoire Naturelle, Paris.

This species is a member of the strictly cavernicolous subgenus *Arispelops* (Park, 1951, p. 41) as a consequence of the complete absence of the median antebasal fovea. It has but one ally, *cavernensis* Park (1951, p. 41-43) and is distinguished from the latter by having lateral pronotal foveae, a much longer first tergite and longer second sternite among other features.

## BRACHYGLUTINI

### *Rybaxis appressicornis* new species

Type Male. 1.8 mm. long, reddish brown, moderately shining; sparsely punctulate to subimpunctate; pubescence pale, moderately abundant and long.

This new species is so distinct from its congeners that a relatively short description will suffice.

Head with a pair of pubescent vertexal foveae between the prominent, coarsely faceted eyes; no interfoveal sulcus; a nude concavity between antennal tubercles; ventral surface of head and maxillary palpi as for genus.

Antennae with the eleventh (distal) segment bearing an appressed spine on ventral face near base; this spine with its apex free and pointed distally; from a direct view the spine is seen to be an elongate oval, with only its rim free and the distal end of rim slightly longer and acute (Figs. 16, 17).

Pronotum with convex and unmodified disc; three antebasal foveae that are connected by a nude, angulate interfoveal sulcus; the lateral foveae large and pubescent, the median fovea smaller and nude.

Elytra with rounded humeri, each elytron bifoveate at base, these foveae nude and deep; sutural stria entire; discal stria extending from lateral antebasal fovea to distal three-fourths of elytral length; flank with deep, nude subhumeral fovea and deep longitudinal sulcus.

Abdomen with five visible tergites, the first three of which have strong lateral margins; first tergite with a pair of straight and divergent basal abdominal carinae that are almost half as long as segment and separated at their bases by 21% and at their tips by 29% of the total discal width (*i.e.*, the maximum, transverse distance in a straight line between the inner line of the lateral margins).

Six sternites actually visible, but five visible casually since the fifth and sixth are so closely joined that the line between them is poorly seen. Second sternite bearing a ventral plate; this plate shining and glabrous, translucent brown, arising obliquely from the posterior margin of the segment and extending obliquely ventro-anteriad as a simple lamina; this lamina wider than long, with straight and parallel sides and a straight free distal margin. Sixth sternite separable into three pieces, a right and left lateral, rounded triangular piece, and a median aedeageal plate that is in the form of a narrow, elongate strap.



Fig. 16. *Rybaxis appressicornis* new species. Ventral aspect of eleventh antennal segment of male.



Fig. 17. *Rybaxis appressicornis* new species. Lateral aspect of eleventh antennal segment of male.

Metasternum with sternal processes that are anterior in position, these processes being a pair of short, broad, triangular cusps that are placed obliquely to each other and are inclined slightly posteriad.

Legs with coxae, trochanters and femora unarmed; protibiae each with a short, thin, triangular tooth at center of ventral face, with tibia arcuate between tooth and apex and the ventral surface flattened for this distance. Tarsi as for genus.

Described from one male, the type, in author's collection. It was in the collection of the late Charles F. A. Schaeffer, and bore the datum "Tennessee."

The new species is quickly discriminated. It is the only American species of *Rybaxis* that has in combination a spined distal antennal segment and anterior metasternal processes. Its only two allies, *truncaticornis* Brendel, 1890 and *obliquedens* Fall, 1927, have the distal antennal segment spined and posterior metasternal processes among other differences.

### *Rybaxis bifalxa* new species

Type Male. 2.0 mm. long, with a broad, shining reddish brown body; pubescence relatively abundant, short and semiappressed; integuments sparsely punctulate.

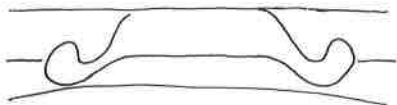


Fig. 18. *Rybaxis bifalxa* new species. Ventral plate of male from a direct view.

Head as described for *appressicornis*. Antennae slender, eleven-segmented; segments I to VII longer than wide, III distinctly longer than either II or IV, obconical; VIII subquadrate; well-marked club of last three segments, the club relatively long; X with ventral face medianly slightly compressed and basal half slightly, progressively expanded proximally so that in a certain view it appears as a diminutive hoof; XI long, with ventral face slightly concave for basal two-thirds and flattened.

Pronotum as for *appressicornis* except that the antebasal sulcus is much more medianly angulated and the basal margin of pronotum is similarly more angulate; extreme base is shallowly scarified-punctate on each side of the medianly elevated area of the marginal subangulation.

Elytra as for *appressicornis*, except that the discal stria of each elytron is more recurved distally and relatively longer, extending to distal five-sixths of elytral length.

Abdomen with five visible tergites, the first three of which bear strong lateral margins; first tergite bears a pair of slightly arcuate and divergent basal abdominal carinae that are relatively short, being one-fifth of segmental length; these carinae are separated at bases by 15% and at their tips by 22% of the total discal width.

Six visible sternites; first relatively long and transversely concave; second short and covered medianly by the remarkable "ventral plate;" this plate bears on each side a conspicuous, distally recurved style or falx (Fig. 18); these styles are complex, each consists of a subcylindrical basal stem and a distal arcuate, obliquely concave cup; in lateral view the distal end is thin and acute (Fig. 19) whereas in mesial view the distal end is obliquely subtruncate (Fig. 20); a stiff rank of setae arise from a knob on the end of the basal stem and extend over the recurved tip; these two styles are divergent ventro-posteriorly. Third sternite short; fourth sternite so short medianly that it is nearly invisible; fifth sternite subsemicircular, partially enclosing the sixth, its distal part very thin and medianly lobed; sixth sternite in three pieces, a right and a left subtriangular piece, and a median elongate aedeageal plate that is asymmetrically articulated internally on the left side; the two lateral plates swing ventrally and the median plate sinistrally to allow extrusion of the aedeagus.

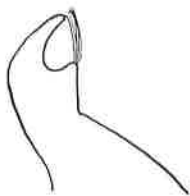


Fig. 19. *Rybaxis bifalxa* new species. Lateral view of an arm of ventral plate of male.



Fig. 20. *Rybaxis bifalxa* new species. Mesial view of an arm of ventral plate of male.



Metasternum with a pair of metasternal processes; these latter are quite posterior in position, being at distal five-sixths of metasternal length; they are minute and inconspicuous, appearing as a pair of short, blackened triangular cusps.

Legs simple except for the anterior pair: profemora very clavate and massive with flattened ventral face near the center of which is a glabrous cavity; protibiae with simply convex dorsal face but the ventral face is longitudinally concave on each side of a median tooth, this tooth fitting into the concavity of the femora (Fig. 21).

Female as for male with the following exceptions. (1) The median portion of the pronotal antebasal sulcus is much less angulated and the basal pronotal margin simply convex. (2) Antennal club much less differentiated, the segments all simple and smaller than in the male; IX not much larger than VIII. (3) Basal abdominal carinae appear to be more arcuate. (4) There are only five visible sternites, all simple and convex, with the venter longitudinally convex in profile, and the "ventral plate" absent. (5) No metasternal processes. (6) Anterior legs unmodified.

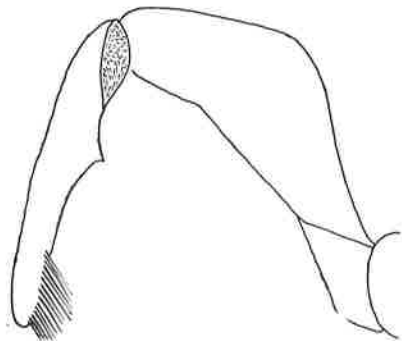


Fig. 21. *Rybaxis bifurca* new species. Male protibia, femur and tochanter.

Described from twelve specimens (five males and seven females), of which the type male and five paratypes are deposited in the collections of Cornell University, and six paratypes in author's collection.

The type series was collected by Henry Dietrich, March 20, 1932 at Mount Vernon, Mobile County, Alabama.

This new species is quickly discriminated. *Rybaxis conjuncta* LeConte (1850) has a very angulated basal pronotal margin but the male protrochanters are acutely toothed at apex of ventral face and the larger metasternal processes are apically truncate when seen in lateral view. *Rybaxis transversa* Fall and *mystica* Casey (1893) have the male eleventh antennal segment flattened beneath and not toothed and metasternal processes posterior in position, but both of these species have a simple ventral plate.

#### *Reichenbachia hardyi* new species

Type Male. 1.2 mm. long, shining reddish brown; pubescence inconspicuous, short and recumbent, especially so on elytra and abdomen; integuments sparsely and inconspicuously punctulate.

Head with three subequally large and mutually separated, pubescent

foveae: a pair of vertexal foveae between the coarsely faceted and prominent eyes, and a frontal fovea in a median concavity between antennal tubercles.

Antennae eleven-segmented, slender, simple, slightly longer than head and pronotum united. From a lateral view: segments I and II relatively large and subequal in length, longer than wide, second slightly narrower than first and not arcuate; III as long as second, much narrower, obconical; IV, V, VI elongate, subequal in width to third, and V longer than IV or VI; VII subequal in width to sixth and slightly longer; VIII smallest segment, quadrate; club of last three segments, IX slightly longer than wide, elongate sub-obtrapezoidal, about as long as fourth and wider than eighth; X subquadrate, obtrapezoidal, distinctly wider than ninth; XI the largest segment, elongate, base truncate, apical two-thirds narrowing to blunted apex, slightly longer than preceding two united.

Pronotum widest through middle, apex narrower than base, rounded subhexagonal; disc simply convex and sparsely punctulate; three free ante-basal foveae, the laterals large, pubescent, and from a direct view set in

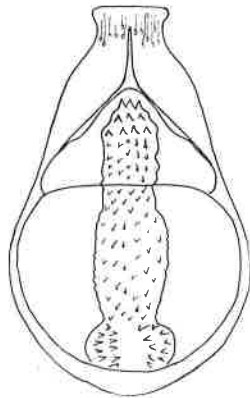


Fig. 22. *Reichenbachia hardyi* new species. Aedeagus, dorsal view.

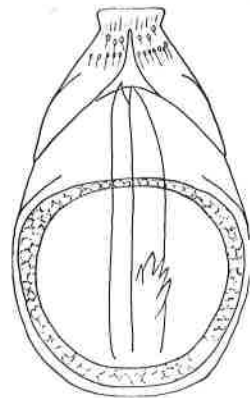


Fig. 23. *Reichenbachia tumidicornis* Casey. Aedeagus, dorsal view.

obliquely transverse oviform impressions that are similar to those of the Brazilian *gounellei* Raffray; median antebasal fovea small but distinct and perforate; base with several rows of large but shallow punctures.

Elytra with rounded but distinct humeri; each elytron trifoveate, the foveae nude; sutural stria entire; discal stria extending to distal four-fifths of elytral length; flank simple, with impressed line near to, and parallel to lateral margin.

Metathoracic wings 1.8 mm. long.

Abdomen with five visible tergites; first three margined laterally; first with a pair of basal abdominal carinae that are separated at their bases by exactly the stria interspace (the maximum transverse distance in a straight line between the elytral sutural striae, with elytra closed); these carinae straight and slightly divergent, slightly more than one-fourth of segmental length; last tergite with distal margin medianly concave or sinuate.

Five visible sternites; first and fifth relatively long and the three intermediate sternites short; last sternite with distal margin convex to fit apical situation of last tergite.

Protrochanters each with a small, straight tooth at extreme base of ventral face. Mesotrochanters each with a much larger, arcuate spine at base of ventral face.

Female similar to male except that (1) the antennal club is smaller; (2) basal abdominal carinae separated by slightly more than striae interspace; (3) first tergite relatively shorter, so that basal abdominal carinae are relatively longer, *i.e.*, 36% of tergite length; (4) five sternites but first relatively long and other four very short and subequal in median length; (5) pro- and mesotrochanters unarmed.

Aedeagus (Fig. 22) is allied structurally very closely to that of *tumidicornis* Casey (Fig. 23) of California, both species having the distal margin of the median lobe entire, *i.e.*, not bifurcated into a right and left process. *Reichenbachia tumidicornis* is a member of Group IV of Bowman (1934) whereas *hardyi* is a member of Group I. These species groups are based primarily on male secondary sex characters of antennae and legs, and on amount of separation of the basal abdominal carinae. This comment is made simply to suggest that external structure may not be as reliable a guide to the evolutionary process in the genus as the male copulatory organ.

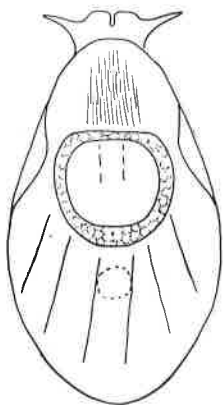


Fig. 24. *Reichenbachia facilis* Casey. Aedeagus, dorsal view.

Within Group I, *hardyi* is closely allied to *facilis* Casey (1884). *Reichenbachia facilis* has a radically different aedeagus (Fig. 24).

Described on three specimens, type male and paratype female deposited in the University of Kansas collections; paratype male in author's collection. Collected January 28, 1943, by D. E. Hardy, in whose honor the species is named, at Morrison Field, West Palm Beach, Florida.

#### *Reichenbachia ectofacilis* new species

Type Male. 1.7 mm, long, shining reddish brown with paler appendages; pubescence short, recumbent and inconspicuous, more abundant than in *hardyi*; integument finely punctulate, but more densely than in *hardyi*, especially on elytra.

Head as described for *hardyi*.

Antennae eleven-segmented, slender, simple, slightly longer than head and pronotum united; all segments longer than wide; I and II relatively large, the first arcuate and slightly larger than second; III distinctly longer than second, cylindrical-obconical; IV to VIII subequal in width, as wide as third, subcylindrical, V as long as III and longer than IV or VI; slightly longer than VII; VIII smallest and only slightly longer than wide; club of

last three, IX slightly wider than VIII, slightly obconical; X larger than IX and only slightly longer than wide; XI as for *hardyi*.

Pronotum as described for *hardyi*, sides slightly more rounded and with the lateral antebasal foveae set as usual in subcircular impressions.

Elytra as described for *hardyi*.

Abdomen with five visible tergites of which the first three are laterally margined; first tergite with a pair of slender, straight, slightly divergent basal abdominal carinae; these carinae are 25% as long as segment, separated at their bases by 14% and at tips by 20% of total discal width and exactly equal at bases to the stria interspace; fifth tergite with distal margin much more deeply concave than in *hardyi*.

Six visible sternites, first and fifth relatively long, the three intermediate segments medianly short and progressively shorter, so that fourth is shortest; venter longitudinally concave in profile, the first sternite with a distinctive circular concavity in distal half; second, third and fourth medianly flattened, fifth broadly concave from base to apex for median third of width, with a convex distal margin.

Pro- and mesotrochanters unarmed, but mesocoxae each armed with an acute, straight spine on mesial face (this spine hardly discernible when coxae contiguous and obscured by pubescence, but is distinctive in Hoyer slide mounts); each metatibia with a short, broad, ogival spur at apex.

Female as described for male except that (1) antennal segment VIII subquadrate; V slightly shorter than III but as long as IV and longer than VI and VII, which last two are subequal; club smaller with IX subquadrate and much wider than VIII and X subquadrate; (2) basal abdominal carinae are slightly shorter and slightly more separated at their bases; (3) venter with first sternite not medianly concave but flattened, and fifth sternite is distinctly concave, but the concavity smaller, occupying the median fifth; (4) mesocoxae not armed; mesotibiae not bearing apical spur.

Since the female has a concave last sternite, a flattened first sternite, and since the mesocoxal spines of the male are not clearly discernible, sex is best determined by dissection, or if this is not feasible, by presence or absence of mesotibial spur.

Aedeagus (Fig. 25) is quite distinct from that of *hardyi* (Fig. 22) or of *facilis* (Fig. 24), both species being closely allied to *ectofacilis* on external anatomy, and all three in Group I of North American *Reichenbachia*. The aedeagus of *ectofacilis* has the pair of short distal processes of the median lobe truncate and appressed (at 70 diameters these processes are seen as simply oblong structures, rather than as shown in the figure at 430 diameters); there are five items worth noting in the internal sac: a median spine cluster, a right and left cluster of lateral spines, and a right and left arcuate falx. On extrusion of the internal sac (Fig. 26) these three groups of spines are displaced distally, with a falx on each side.

Described on six specimens, three males and three females. Type male and two paratypes in the collections of Cornell University; three paratypes in author's collection. This series was collected by H. Dietrich on March 20, 1932 at Mount Vernon, Mobile County, Alabama.

Included in this species, but not included in the type series, is a second series of five specimens collected May 15, 1926 at Gainesville, Alachua County, Florida. This Florida material agrees very well with the type series from Alabama, but the specimens are a little smaller in size and the males lack the concavity of the first sternite, this area being flattened in both sexes. The aedeagus agrees closely in both series, and it may be that with more material this Gainesville lot will prove to be subspecifically distinct.

*Decarthron howdeni* new species

Type Male. 1.3 mm. long, shining reddish brown; broad, with clytra nearly twice as wide as pronotum in a ratio of 9 to 5; pubescence rather sparse, fairly long, bristling, the setae brown in color and easily broken; integument of head, pronotum and abdomen subimpunctate to sparingly punctulate, coarse shallow and obvious on elytra.

Head with a pair of deep, nude vertexal foveae, each with the diameter of an ocular facet, on a line through centers of the prominent and very coarsely faceted eyes; each fovea at base of a faint, convergent impression that is difficult to trace to the simply declivous front between antennal tubercles; a deep, nude, elongate acute oval median gular fossa.

Antennae ten-segmented; segment I elongate; II smaller than first, slightly longer than wide; III narrower, subobconical; IV to VI as wide and slightly shorter than third, slightly longer than wide; VII smallest segment,

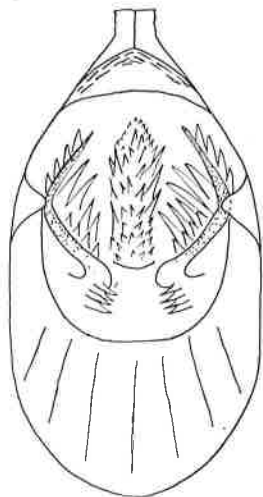


Fig. 25. *Reichenbachia ectofacilis* new species. Aedeagus, dorsal view, internal sac withdrawn. Compare with Fig. 26.

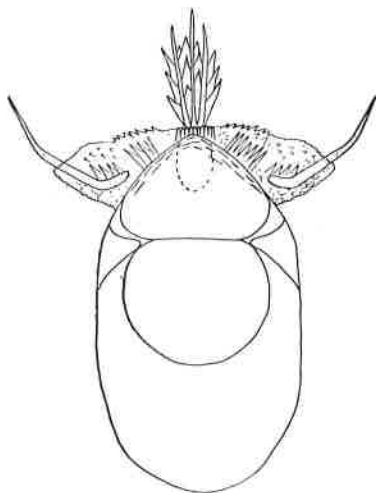


Fig. 26. *Reichenbachia ectofacilis* new species. Aedeagus, dorsal view, internal sac exerted. Compare with Fig. 25.

quadrate; VIII larger, transverse trapezoidal; IX much larger, transverse trapezoidal; X largest segment, as long as preceding two united, slightly longer than wide, base truncate, apex rounded, nearly distal half of ventral face excavated and densely setose.

Pronotum slightly wider than long, with a single antebasal fovea, this fovea deep and nude.

Each clytron bifoveate, the foveae nude; entire sutural stria; discal stria extending to distal five-sevenths of length; flank simple.

Abdomen with five visible tergites, first three laterally margined; first tergite much longer than others, but not quite twice as long, with a pair of arcuate basal abdominal carinae that are separated by half the total segmental width and only half as long as segment.

Five visible sternites with first longer than others united; second, third, and fourth very short medianly and progressively slightly longer; fifth sternite nearly twice as long as fourth, medianly concave, with distal margin rather abruptly produced in an arcuate lobe.



Fig. 27. *Decarthron howdeni* new species. Male profemur, posterior face.

Profemur (Fig. 27) moderately inflated, bearing a long, narrow, glabrous strip that is slightly elevated on the distal part of dorsal face; protibia with a thick, blunt apical spur.

Mesofemur (Fig. 28) swollen, bearing a glabrous excavation at distal three-fourths of dorsal face, this excavation limited dorsally by a short, blunt spine and limited posteriorly by an incomplete, blackened carinoid ridge; mesotibia bearing a narrow, blunt apical spur that is about the size and shape of the femoral spine.

Metatibiae not apically spurred.

Female as for the male except that (1) antennal segments IV, V and VI shorter and subquadrate; (2) fifth sternite not so arcuate distally and medianly flattened; (3) femora slender and simple; protibiae not apically spurred, and mesotibiae with a smaller apical spur.

Aedeagus (Fig. 29) typical of genus, about 0.24 mm. long and 0.18 mm. wide.

Described from seventeen specimens (6 males and 11 females); type and seven paratypes in author's collection; nine paratypes in collection of Dr. Howden, in whose honor this species is named. Collected in moss on February 9, 1952, by H. and A. Howden, at Southern Pines, Moore County, North Carolina.

On the basis of current information, *howdeni* is most closely allied to *abnorme* (LeConte), 1850, of the eastern United States and Canada, although the aedeageal features are unworked for the Nearctic species of *Decarthron*. *D. abnorme* is much darker in color with blackish brown body and slightly reddish elytra; the first tergite is relatively much wider and shorter; the mesofemoral excavation and spine larger.



Fig. 28. *Decarthron howdeni* new species. Male mesofemur, posterior face.

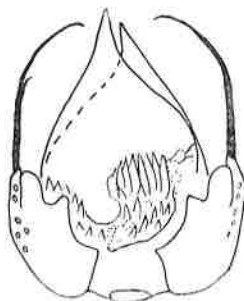


Fig. 29. *Decarthron howdeni* new species. Aedeagus, ventral face.



## TYCHINI

Key to the species of *Tychus* of North America,  
east of the Great Plains

- |       |   |   |
|-------|---|---|
| 1     | In addition to normal tibial pubescence, each tibia bearing a very long, stiff, conspicuous guard seta near center of external face       | 2 |
|       | Tibia lacking such a guard seta   | 3 |
| 2 (1) | Prominent eyes of about 24 facets; seven visible sternites; metasternum with T-shaped tubercle near center                                |   |
|       | male <i>daggyi</i> Park   |   |
|       | Vestigial eyes of four to ten facets; six visible sternites; no metasternal tubercle  |   |
|       | female <i>daggyi</i> Park   |   |
| 3 (1) | Seven visible sternites (males), the seventh a small to minute transversely oval or ogival aedeageal plate                                | 4 |
|       | Six visible sternites (females), the sixth short and simple from side to side of venter   | 7 |
| 4 (3) | Vertex bearing conspicuous, large, coarse punctures   |   |
|       | male <i>eisenachi</i> new species   |   |
|       | Vertex subimpunctate  | 5 |
| 5 (4) | Metasternum bearing a tubercle  | 6 |
|       | Metasternum not bearing a tubercle  |   |
|       | male <i>minor</i> LeConte   |   |
| 6 (5) | Metasternal tubercle near posterior margin, almost between metacoxae, and in the form of a longitudinally compressed cone                 |   |
|       | male <i>spiculifer</i> Casey  |   |
|       | Metasternal tubercle at center of metasternum, and in the form of a longitudinally compressed cone bearing a transverse bar at apex       |   |
|       | male <i>verticalis</i> Casey  |   |
| 7 (3) | Vertex bearing large, coarse punctures  |   |
|       | female <i>eisenachi</i> new species   |   |
|       | Vertex subimpunctate  | 8 |
| 8 (7) | Postfrontal spicules of vertex vestigial and inconspicuous  | 9 |
|       | Postfrontal spicules of vertex acute, relatively large and conspicuous  |   |
|       | female <i>spiculifer</i> Casey and  |   |
|       | female <i>verticalis</i> Casey  |   |
| 9 (8) | Minute postfrontal spicules each set on a flat tuberculiform tumulus immediately anterior to each vertexal fovea (known only from female) |   |
|       | female <i>pocahontas</i> Casey  |   |
|       | Minute postfrontal spicule not so placed  |   |
|       | female <i>minor</i> LeConte   |   |

*Tychus eisenachi* new species

Type Male. 1.5 mm. long, moderately shining chestnut brown with orange brown legs, maxillary palpi and antennae; pubescence translucent brown, relatively sparse (*i.e.*, about 130 seta per elytron, set in staggered rows), semibristling, and long (*i.e.*, the setae of the second tergite are longer than the segment); integument sparsely, obviously punctate, the punctures of the head, elytra and abdomen especially prominent by virtue of their raised rims.

Head with the vertex sparingly but coarsely punctate, these punctures becoming more numerous and coarser in a semicircular field posterior of antennal rostrum; vertex with a pair of rather large vertexal foveae, these foveae mutually farther apart than either to its adjacent eye and behind a postfrontal spicule; these vertexal foveae are not easily seen, and appearing to have an irregular orifice in certain lights, as a consequence of the dark,

punctate integument; postfrontal spicules very short, blunt and inconspicuous; eyes of moderate size, of about 20 coarse facets, difficult to count because of their dark color against the dark integument; median longitudinal sulcus arises on the posterior portion of the vertex, then becomes narrow and shallower up to base of antennal rostrum, where it again deepens and broadens, and continues over rostrum as a narrow, shallow sulcus to end between antennal tubercles; face a simple, narrow, punctate strip between antennal acetabulae; labrum transverse; small tubercle at center behind submentum.

Maxillary palpi (Fig. 30) large and conspicuous, four-segmented, segment I small and subcylindrical; II glabrous, slightly arcuate, asymmetrically pedunculate; III pubescent, internal face strongly produced and rounded, four-sevenths as long as second segment (relatively much shorter than *daggyi* Park, 1949, pp. 327-29, Pl. V, where the third segment is six-sevenths as long as second); fourth pubescent, wider than third and nearly 40%

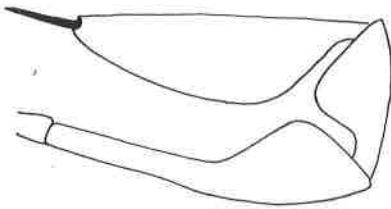


Fig. 30. *Tychus eisenachi* new species. Maxillary palpus.



Fig. 31. *Tychus eisenachi* new species. Aedeagus, dorsal face.

longer, whereas in *daggyi* the fourth segment is as wide as third and 25% longer; fourth segment terminating in a long palpal cone.

Antennae eleven-segmented, articulated close to each other on either side of antennal rostrum; segment I simple, elongate cylindrical; II slightly narrower than first, subquadrate; III briefly obconical; IV, V, VI subquadrate, as wide as third; VII and VIII slightly wider, subequal; club of last three segments, IX much larger and slightly wider than long; X larger, transverse; XI largest, slightly wider than tenth, slightly longer than preceding two segments united, three-fourths as wide as long.

Pronotum rounded subhexagonal with simple convex disc; seven antebasal foveae: a large, pubescent lateral fovea each side; a large elongate oval, nude fovea at center; two small, nude fovea each side between lateral and median foveae.

Elytra with sloped humeri; each elytron bifoveate at base, the foveae large, deep and nude; entire sutural stria; deep discal stria to distal five-eighths of elytral length; flank simple.

Abdomen with five visible tergites, the first three laterally margined; fourth and fifth closely articulated; first tergite lacking basal abdominal

carinae *per se*, but with a minute tubercle at either side of a pubescent, transversely oval fossa that occupies 30% of total segmental width.

Seven visible sternites, the venter flattened medianly and concave in profile; seventh sternite a small, transversely acute oval aedeageal plate.

Metasternum with a broad, conspicuous concavity for entire length in median third of width; a prominent tubercle at extreme base, posterior of mesocoxae, its anterior face convex, its posterior face concave, the two faces meeting ventrally in a blackened, sharp carinoid edge.

Legs slender and simple. Tarsi three-segmented; first small, second and third subequal on meso- and metatarsi; third segment slightly longer than second on protarsi.

Female as for the male except that (1) the eyes are smaller, of about 16 coarse facets; (2) the discal clytral stria is a little shorter, extending half the clytral length; (3) six visible sternites, the venter convex in profile, and the sixth sternite a short, subsemicircular ring from side to side of abdomen; (4) metasternum obliquely flattened, and with no metasternal tubercle.

It is of interest to note that both sexes have vestigial metathoracic wings; these organs are about 0.5 mm. long (about one-third of body length, whereas the normal wing is longer than body length) and narrow, about one-third as wide as long. It is doubtful if *eisenachi* can fly.

Aedeagus (Fig. 31) 0.30 mm. long by 0.15 mm. wide, in two parts: a basal subquadrate piece bearing ventrally the foramen of the ductus ejaculatorius, and a small, arcuate, acute spine at its left distal corner; the apical part is complex, bearing two tapering acute spines on the right side, the external falx broadly based and covering most of the internal falx, and distally the part is curved ventrally in a narrow loop.

Described from two males and two females, type and three paratypes, in author's collection. They were collected by L. M. Eisenach, in whose honor this species is named, at Tryon, Polk County, North Carolina. One female berlesed from tree-hole mold on November 21, 1949; the other three specimens were berlesed from forest floor leaf mold in foot-hills on November 27, 1949.

There is also a single female, not included in the type series, berlesed from forest floor mold near Wilmington, Delaware, on June 18, 1953, by Dr. Robert S. Howard.

*Tychus eisenachi* is distinctive as a consequence of the roughly punctured head. It has no close allies in the eastern half of the United States.

### *Tychus daggyi* Park

Description of male. This species was described on a single female (Park, 1949, pp. 327-29, Pl. V) collected by Dr. Tom Daggy in Egg Rock Woods, Cabarrus County, North Carolina. It was berlesed from a leaf mold sample on February 11, 1949.

Since this description I have received three females and three males from the type locality, collected by Dr. Daggy: a male (No. 22012) November 15, 1954; a female (No. 22745) January 16, 1955; two females (No. 23115, No. 23167) and two males (No. 23006, No. 23166) April 8, 1955.

In addition, I have received a male collected by the late Dr. Arthur Jacot ten miles west of Asheville, Buncombe County, North Carolina, on December 18, 1934, and one male berlesed from a forest leaf mold sample by L. M. Eisenach in foothills near Tryon, Polk County, North Carolina.

The male of *daggyi* is as described for the female with the following exceptions: (1) Prominent eyes, of about 26 coarse facets, placed near center of head length, and the eyes are longer, from a dorsal view, than their distance from the cervical constriction. (2) Left mandible crossed dorsal to right mandible. (3) Fourth segment of maxillary palpi relatively longer, 32% longer than third segment. (4) Antennae with segments IV and V

subquadrate, as wide as third; club longer, as long as segments II to VIII inclusive; XI longer, longer than the three preceding segments united. (5) Seven visible sternites, the seventh a minute, transverse, rounded triangular aedeageal plate. (6) Metasternum with a median prominent, erect, more or less T-shaped tubercle; anterior aspect of tubercle flat; posteriorly, the stem of the tubercle is vertically carinoid, so that the stem is triangular in cross-section, and the transverse bar of the tubercle has an oblique face.

In the original description of the female, the unique type had eyes of four facets. The small eyes of the female vary as to facet number. The three females examined subsequently have each eye with ten facets.

Of interest is the fact that both sexes of *daggyi* have normally large wings, measuring on the average 1.7 mm. long and 0.64 mm. wide. This species probably can fly, whereas both sexes of *eisenachi* have vestigial wings.

The aedeagus of *daggyi* (Fig. 32) is relatively large (0.32 mm. long and 0.15 mm. wide through basal bulb), and bilaterally symmetrical, of two pieces, with the distal piece terminating in a pair of flat, semimembranous, oblong lobes and between these lobes is a long, narrow, sclerotized stylus.

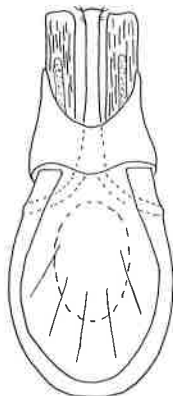


Fig. 32. *Tychus daggyi* Park. Aedeagus, dorsal face.

#### SUMMARY

This is a report on beetles of the family Pselaphidae of the southeastern United States. It includes descriptions of twenty-one new species, among which are six new species of cavernicoles; a discussion of epigeal and hypogean species in terms of the secondary sex characters of the male sex; experiments on a cavernicolous species with respect to feeding and cleaning behavior, aggregation, and activity pattern.

The following new species are described: in the tribe Speleobamini, *Prespelea copelandi* (Tennessee); in Euplectini, *Actium mollyae* (Alabama), *Eutyphlus dybasi* (Tennessee), *Eutyphlus thoracicus* (Tennessee); in Bythinini, *Machaerites synstycticus* (cavernicole, Alabama); in Batrisini, *Batrisodes reduncus* (cavernicole, Tennessee), *Batrisodes beameri* (Florida), *Batrisodes*

*profundus* (cavernicole, Alabama), *Batrissodes henroti* (cavernicole, Kentucky), *Batrissodes gemmus* (cavernicole, Tennessee), *Batrissodes auerbachii* (Tennessee), *Batrissodes mississippiensis* (Mississippi), *Batrissodes festinatus* (Mississippi), *Arianops henroti* (Georgia), *Arianops jeanneli* (cavernicole, Virginia); in Brachyglutini, *Rybaxis appressicornis* (Tennessee), *Rybaxis bifalxa* (Alabama), *Reichenbachia hardyi* (Florida), *Reichenbachia ectofacilis* (Alabama), *Decarthron howdeni* (North Carolina); in Tychini, *Tychus eisenachi* (North Carolina).

Keys are given for the tribe Speleobamini, the genus *Eutyphlus*, the American species of *Batrissodes* in the subgenus *Batrissodes*, the American species of *Machaerites*, and the genus *Tychus* east of the Great Plains.

Two new subgenera are described. These are *Fusjuguma* in the genus *Prespelca*, with *copelandi* new species as the type of the subgenus and *Planityphlus* in the genus *Eutyphlus*, with *thoracicus* new species as type of the subgenus.

*Euplectus infossus* Raffray is rediscovered and redescribed.

Two species which were described on the female sex are now known from the male, and the latter sex is described. These species are *Eutyphlus prominens* Casey and *Tychus daggyi* Park.

In the subgenus *Babnormodes* of the genus *Batrissodes* there are eleven epigeal species and seven cavernicolous species. These eighteen species are analyzed with respect to six secondary sex characters of the male. There is an apparent tendency for the male cavernicoles to be externally more simple with respect to these characters than epigeal males. This is discussed briefly with reference to age and penetration by cavernicoles.

Individuals of the Alabama cavernicole, *Batrissodes valentinei* Park, were collected and studied under controlled laboratory conditions. The feeding behavior and cleaning behavior are described. There is an apparent tendency for individuals to aggregate in constant darkness, temperature and high relative humidity. Under these same conditions, the species appears to be arrhythmic with respect to the twenty-four hour day-night cycle, but when exposed to alternating periods of darkness at night and illumination during day, the species appears to become nocturnal. The nature of the material allowed only a short period of study and the experimental data are too few to warrant more than postulated conclusions.

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## NOTICE

Copies of mimeographed *Preliminary Checklist of the Monocots of Tennessee* may be had by writing to the Secretary, Department of Botany, University of Tennessee, Knoxville 16, Tennessee. They are free.