CAVE *ARRHOPALITES*: NEW TO SCIENCE

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Ten new species of the genus Arrhopalites *are described from caves in Oklahoma, Virginia, and Texas. A system for labeling the circumanal setae is presented, following the scheme of Lawrence (1979).*

This is the second of our papers dealing with new species of North American cave Collembola. In this we describe nine new species of the genus *Arrhopalites*.

Species	Region
caedus	Virginia
carolynae	Virginia
commorus	Virginia
jay	Oklahoma
lacuna	Virginia
marshalli	Virginia
pavo	Virginia
sacer	Virginia
silvus	Virginia
texensis	Texas

Most of these species come from Virginia caves as a result of the remarkable collections of David Hubbard. Virginia appears to have a richer cave fauna of this genus than any other comparable size region of the world.

The genus *Arrhopalites* was proposed by Börner 1906 for the Sminthurinae (in his sense) with the anal and genital segments separate, the latter with only one bothriothrix, and no clavate tenent hairs. The type and only species originally included was *Sminthurus caecus* Tullberg 1871, which has only a single eye on each side. More than 90 names have since been proposed for species assigned to this genus. Some species placed here in the first half of the century have 4-8 eyes per side, and as late as Richards (1968) the generic diagnosis did not emphasize eye reduction; however, species with 4+4 eyes are assigned to *Collophora* Richards 1964 (with anal and genital segments fused), and species with more than 4 eyes per side have been transferred elsewhere (Betsch, 1980). Species placed here at present have no more than 2+2 eyes, a triangular trochanteral organ on the hind leg, acuminate tenent hairs, and some spine—like dental setae. European species have been treated by Stach (1956) and Gisin (1960) and Nearctic species by Christiansen (1966) and Christiansen and Bellinger (1981). More recently many species have been described, especially from caves in Europe, and the present work shows

Table 1. Characteristics New Cave Species Nearctic *Arrhopalites*.

								I---------DENTAL CHAETOTAXY---------I												
species	locality	male seen	subsegments antennal seg. IV	Basal swelling Antennal seg. III	eye nummber per side	clear cephalic spines	e2	e3	e4-5	e6	e8-9	both id2 & 3 present	L1	L2-3	L4	Ve1	Ve2-4	Ve5	unguiculus III apical filament	1) female subanal appendage formula
caedus	Vrginia	-	6	-	1	-	+	s	+	+	-	+	S	S	-	+	+	-	-	10D
carolynae	Virginia	+	5-6	-	2♀,1-2♂	+-♀±♂	+	S	+	+	-	-	S	S	-	+	+	-	+(-)	5D-E
commorus	Virginia	+	(5)6-7	++	1	-	+	s	+	+	-	-	s	+	+	+	+	-	+-	10C
jay	Oklahoma	+	6	-	2	weak	+	S	+	+	-	+	S	S	-	+	+	-	+	2E
lacuna	Virginia	+	6♀,7♂	-	1	-	+	+♀,S♂	+	+	-	-	S	S	-	+	+	-	+-	5C-D
marshalli	Virginia	-	5	-	2	+	+	s (+)	+	+	-	-	S	+	-	+	+	-	+	5D
pavo	Virgina	+	5	-	1	-	+	S	+	+	-	+	S	S♀s♂	-	+	+	-	+	4-5C
sacer	Virginia	-	7	-	1	-	+	+	+	+	-	+	+	s (+)	-	+	+	-	-±	1C
silvus	Virginia	+	(6)-7	weak	1	-	+	+	+	+	-	-	S	S	-	+	+	-	-	5C
texensis	Texas	+?	6	-	1	-,+	+	S	+	+	-	+	S	Ss	-	+	+	-	+♀	10D

S = strongly spine like , s = weakly spine like. +- = both conditions found, ± = weakly developed. 1) See Christiansen 1966, plate 19 for explanation of formulae(assuming all start as a simple sraight cylindrical rod), letter levels represent extremity of modification as shown by second stage modifications shown in level B and . and 5th stage modifications shown by letter E.

Table 2. Chaetotaxy of female lesser abdomen.

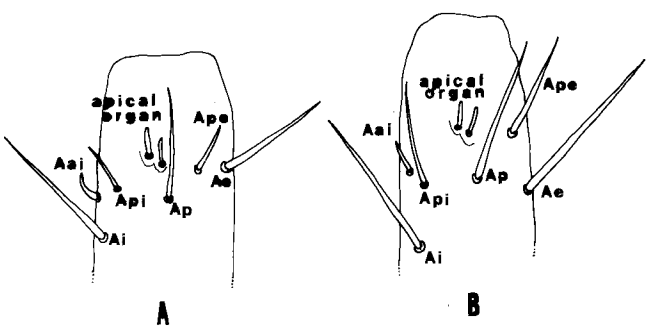
species	DORSAL VALVE SETAE A1	B2	B3	C1	C2	C3	C4	D2	D3	D4	E4	Lateral valve setae F3	F4	C5	C6
A. caedus	+	+	+	+	S,+	S.WL	S.WL	+	+	+	+	+	+	S,WL	S,WL
A. carolynae	+	+	+	+	S,+	+,WL	+,WL	s*	+	+	s*	s*	s*	+,WL	+,WL
A. commorus	sp	+	+	+	S(+)	S(+)	S	+	+	+,-	+	+	+	(S)L	(S)L
A. jay	+	+	+	F	WL	WL	WL	+	+	+	+	+	+	S,WL	S,WL
A. lacuna	+	+	+	+	S	(S)L	(S)L	+	+	-(+)	+	+	+	(S)L	(S)L
A. marshalli	+	+	+	+	L	L	L	+	+	+	+	+	+	L	L
A. pavo	+	+	+	+	S	S	S.WL	+	+	+	+	+	+	S	S
A. sacer	+	+	+	+	+	S	L	+	+	+	+	+	+	S	S
A. silvus	+	+	+	+	S	S(L)	S(L)	+	+	+	+	+	+	S,L	S,L
A. texensis	+	+	+	F	s(L)	WL,L	WL,L	+	+	+	+	+	+	WL,L	WL,L

( ) = exceptional conditions. sp= spine like, + = normal smooth acuminate , S = swollen basally, L = clearly lamellate, WL = weakly lamellate, F = forked. s* = setae in these positions much longer than normal and slightly swollen.

the genus is also well represented and diverse in the United States.

Males are rare in collections and show little interspecific variation in chaetotaxy. They are generally so similar that specific identification is difficult unless they are associated with females. In addition they often show considerable difference from the putative conspecific female specimens.

In our work with the genus we use features previously used to identify species of the genus (Table 1). We have changed the use of the presence or absence of seta Id3 to both Id2 & Id3 present since it is usually impossible to determine whether the missing seta is in fact Id2 or Id3. We have also used the setae of the apex of the third antennal segment following the system developed by Nayrolles (1991). This shows some variations useful in taxonomic separation (Figure 1 A&B) of species. While there is much variation between species the patterns generally are similar to some aspects of one or the other of the forms shown in this figure. We have also examined and use features of the sixth abdominal chaetotaxy in the female (Table 2). Several systems have been developed for categorizing the chaetotaxy of this segment in Sminthuridae (Yosii & Lee, 1963; Yosii, 1969; Lawrence, 1979; Betsch & Waller, 1994; and Bretfeld, 1990, 1994). Unfortunately no two of these systems are really compatible and each requires abandoning all others. The system we found most readily applicable to *Arrhopalites* was that of Lawrence and we have followed this in our work. Figures 2 and 3 show our interpretation of these setae as seen in adult females. There is considerable intraspecific variation in these setae but some features appear to be generally intraspecifically constant and variable between species. Among these is the presence of a fork in the unpaired seta C1, the relative size of the D2, F3, and F4 setae compared to the C setae and their shape, the shape and size of seta A1, the positions of setae C8-C10, the relative sizes of setae E10 & E11, the relative shapes and sizes of setae B11 and C11, and the presence or absence of seta C10. Seta C10 is usually absent but is sometimes small and associated with D10; however in many cases no seta occurs in the position of the normal D10 (in a direct line with D8 and D9) but a large seta occurs much anterior to this. In these cases we interpret this to be seta D10.



Figures 1A & 1B. Semidiagrammatic illustrations of two typical 3rd antennal segment apical setae types.

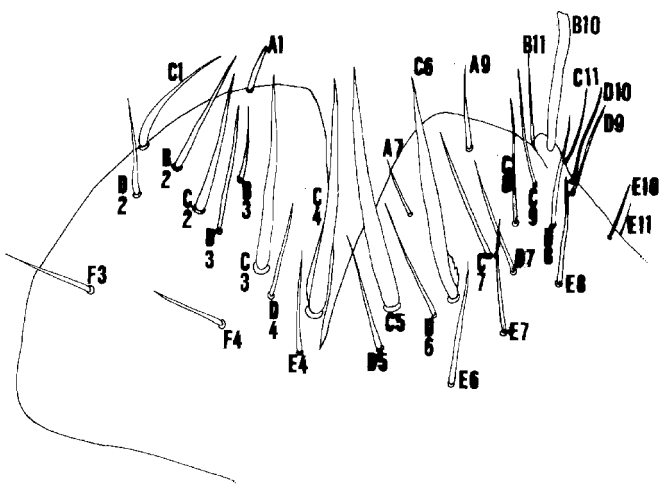


Figure 2. Semidiagrammatic illustration of lateral view of female sixth abdominal chaetotaxy using lettering system after Lawrence (1979).

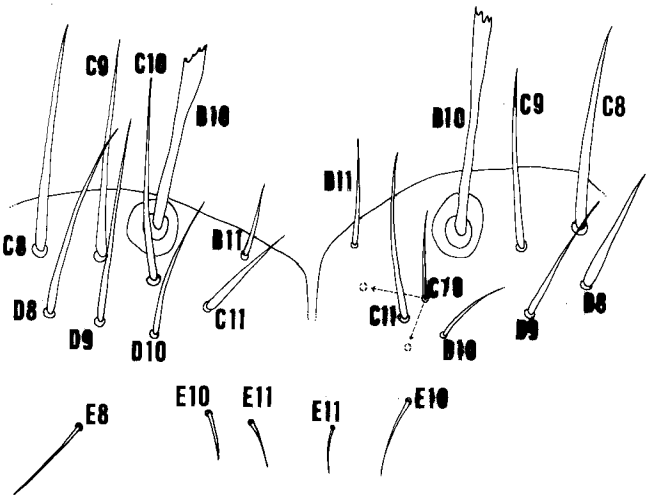


Figure 3. Semidiagrammatic illustration of ventral view of female sixth abdominal chaetotaxy of dorsal valve using lettering system after Lawrence (1979).

The shape of seta B10 has long been known to be of critical importance in the taxonomy of the genus. The setae in males appear to be relatively invariant (Figure 4) and of little taxonomic value.

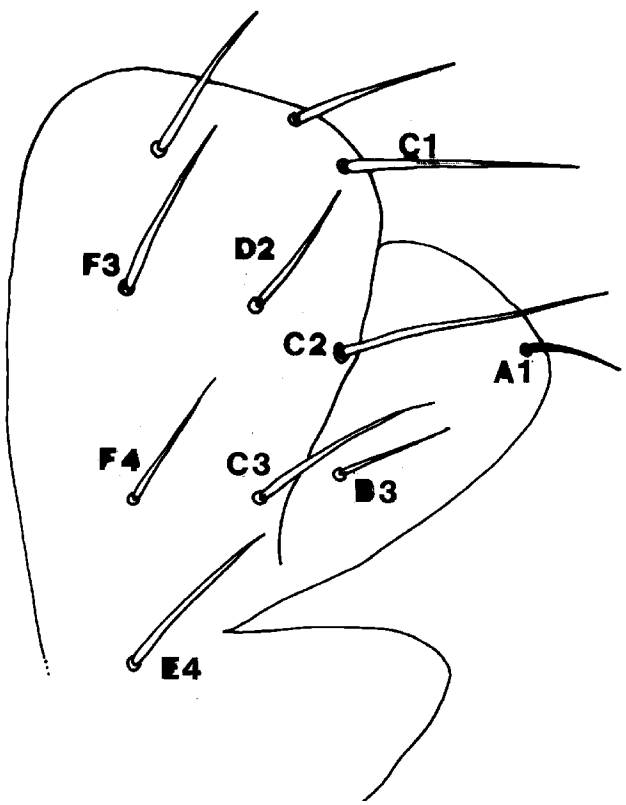


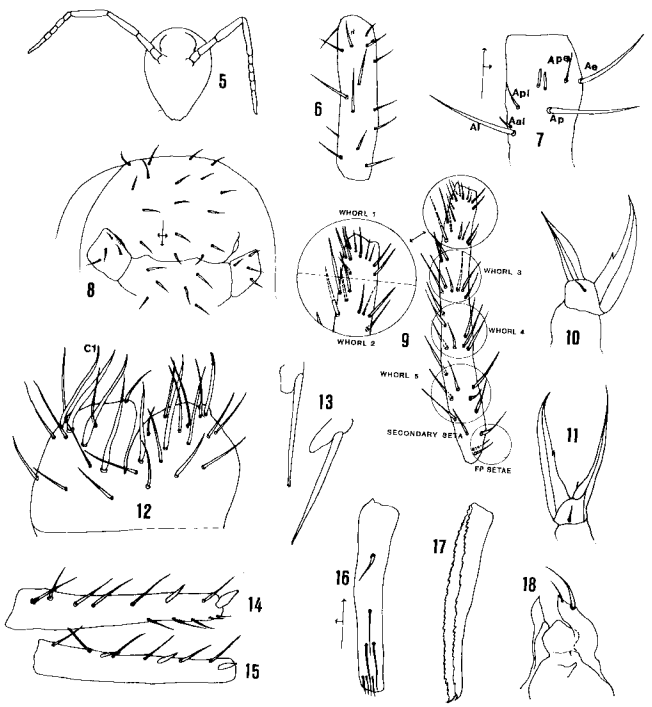
Figure 4. Semidiagrammatic illustration of lateral view of male sixth abdominal chaetotaxy of dorsal valve using lettering system after Lawrence (1979).

New systems have been used to designate the setae of the head; however we see no reason to abandon the system developed by the senior author in 1966 and continue to follow that here. Nayrolles (1988) has developed a system for studying the tibiotarsal chaetotaxy. We have found this system difficult to apply and of only slight taxonomic value in separating species; however we describe (and sometimes illustrate) the posterior tibiotarsal chaetotaxy for all our new species.

The members of this species are best examined when mounted laterally in a slightly dorsal position. This generally allows one to see all the features with some ease. The head is best seen when viewed from the dorsal side.

Arrhopalites caedus sp. nov. (Figs. 5-18)

Description : Eyes 1+1. Color white without trace of pigment. Maximum length 1.5 mm. Antennae 1.35 to 1.8 times as long as cephalic diagonal. Ratios of antennal segments 1-4 as 1/ 1.75-2/ 3-3.5/ 7-8.75. Fourth antennal segment with 6 subsegments and first subsegment 1.55-1.65 times as long as last. Longest setae of segment about 2 & 1/2 times as long as diameter of segment. Third antennal segment without clear basal swelling but slightly thicker on basal half than on distal. Apical organ of third antennal segment of two apically pointed elliptical rods in separate shallow grooves, the outer rod distal to the inner one. Apical seta Aai curved, short, and blunt, about half as long as setae Api and Ape which are straight to slightly curved and acuminate. Seta Ae on a level with Ape, acuminate, slightly shorter and more basally swollen than setae Ap and Ai. Interantennal setae all slender, short, acuminate, and not spinelike. Longest setae (IL3) a little more than half as long as diameter of first antennal segment. Hind tibiotarsal setae all acuminate and smooth, none strikingly differentiated except fine setae of whorl 1. Three FP setae present as well as one secondary seta above whorl 5. Whorls 4 & 5 with 7 setae, whorls 2 & 3 with 8 and whorl 1 with 10. The i setae of whorls 3 & 4 paired. All ungues without trace of tunica. Mid and hind ungues with strong and fore with weak inner tooth. Fore unguis 1.15 to 1.3 times as long as hind. All unguiculi with well developed apical filaments. Fore and mid unguiculi with well developed corner tooth, hind without one. Hind unguiculus subequal to and fore 1-1.1 as long as unguis. Tenaculum typical of genus with posterior unpaired lobe slightly longer than anterior bisetaceous unpaired lobe. Dens 1.25 to 1.5 times as long as mucro. Manubrium with 6+6 slender acuminate smooth setae. Mucro with both edges heavily serrate over whole length and without apical swelling. Female dorsal sixth abdominal setae as shown in table 2. Seta F3 slightly shorter than seta D2. C setae not clearly flanged but in side view a line can be seen possibly representing a minute flange. Seta A1 slender and sometimes curved. Setae D8-D10 slender, acuminate and in a line with seta 9 much longer than other two. Seta C10 absent. Setae C11 and B11 subequal, slender , curved and relatively short. Seta E8 present, E10 and E11 subequal and longer than normal. Female subanal appendage tapered, truncate and either straight or slightly curved apically. Males not



Figures 5-18 all of type specimens of *A. caedus*. 5. Outline of head and antennae. 6. Third antennal segment. 7. Expanded detail of apex of segment, another specimen. 8. Detail of median portion of dorsum of head showing chaetotaxy. 9. Hind tibiotarsal chaetotaxy. 10. Hind foot complex. 11. Fore foot complex. 12. Female sixth abdominal chaetotaxy, lateral view. 13. Female subanal appendages. 14. Outer face of dens. 15. Inner face, same specimen. 16. Ventral surface of dens. 17. Mucro, side view. 18. Tenaculum.

seen.

Holotype: female and 4 female paratypes, Catawba Murder Hole, Botetcourt Co., Virginia, 9 September 1994 D. Hubbard coll., (locality no. 7757).

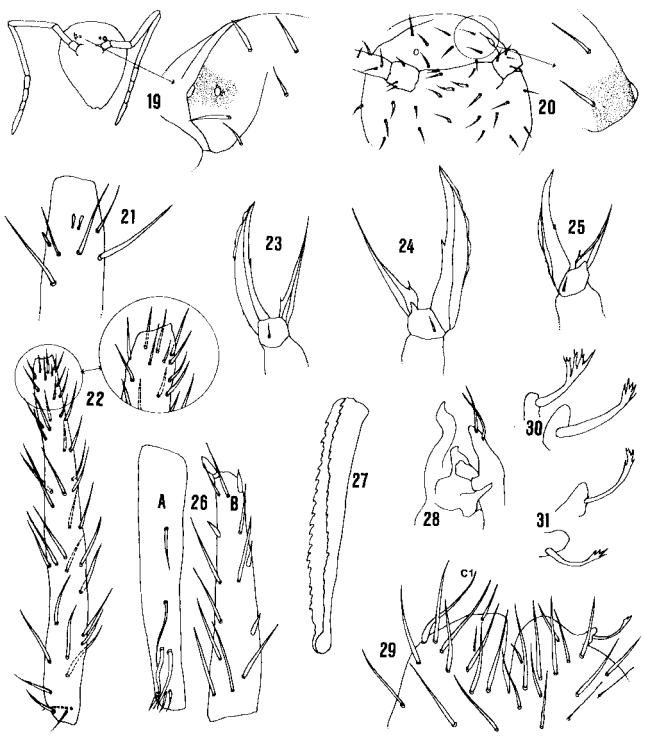
Other locality: Virginia, Little Starr Chapel Cave, Bath Co. water surface, 10 June 1995, Hubbard coll. (locality no. 7841).

Derivatio nominis: from the Latin caedes = killing, after the type locality.

Remarks: This species resembles *A. hirtus* Christiansen 1966 but can be readily separated on the basis of the setae e6 and the shape of the female subanal appendage. It also differs in having a simple C1 seta whereas this is forked in *A. hirtus*. It also resembles *A. pygmaeus* but can be readily separated by the form of the female subanal appendage. There appears to be some variation in the numbers of setae in the various whorls on the hind tibiotarsus.

Arrhopalites carolynae sp. nov. (Figs. 19-29)

Description: Eyes 1+1 to 2+2 in male and 2+2 in female with inner eye smaller than outer and without clear cornea. Color reddish with abundant granules of reddish pigment over head and in two broad longitudinal bands over the dorso-lateral surfaces of the greater abdomen to white without trace of pigment. On the head the pigment, when present, is darkest where eye patches would typically be. Maximum length 1.5 mm. Antennae 1.92 to 2.4 times as long as cephalic diagonal. Ratios of antennal segments 1-4 as 1/ 1.7-2.5/ 3.7-5.0/ 9-11. Longest setae of segment 2.8-3.7 times as long as diameter of segment. Third antennal segment uniform in width to very slightly expanded basally. Apical organ of third antennal segment with two short elliptical rods in common or separate sockets, usually angled out from segment. Apical seta Aai curved to straight, peg like but tapered and from 1/3 to 1/2 as long as setae Api and Ape which are slender, acuminate, and thin walled. Seta Ae and Ap are acuminate, straight to slightly curved, and on the same level. Seta Ai is somewhat longer



Figures 19-29 of *A. carolynae*. 19. Head and detail of female specimen showing integumentary granulations, from Butler Cave, Bath Co. 20. Dorsum and detail of head of male paratype showing eye. 21. Apex of third antennal segment, type specimen. 22. Hind tibiotarsus, specimen from Butler Cave, Bath Co. 23. Fore foot complex, female type specimen. 24. Mid-foot complex, same specimen. 25. Fore foot complex, same specimen. 26. Ventral (a) and dorsal (B) view of dens, female type specimen. 27. Mucro, same specimen. 28. Tenaculum, same specimen. 29. Sixth abdominal chaetotaxy, later view, same specimen (setae beyond D8 and E8 not visible). 30. Female subanal appendage, type specimen. 31. Same, specimen from ButlerCave, Bath Co.

than these and weakly curved to straight. Seta Ae slightly longer and more basally swollen than other two. Fourth antennal segment with first subsegment 1.5-2.3 times as long as last. Female interantennal setae ranging from having A2 A3 L1 L2 IL2 & IL3 all distinctly spine like to having only posterior IL and M setae as well as seta A1 thickened basally but not spine-like. In the male these setae are shorter and somewhat spine-like. The longest seta in the male is about half as long as the diameter of the antennal base. In the female the longest seta (IL3) is distinctly shorter to slightly longer than the basal antennal diameter. Hind tibiotarsal setae in female all smooth and none clearly distinguished except for fine setae in whorl 1. Three FP setae as well as one secondary seta above whorl 5. Whorl 5 with 7 setae and whorls 2-4 with 7-8; whorl 1 with 9-10. Seta i of whorls 2-4 paired. All ungues with inner teeth. Female ungues usually with tunica, clear in mid and hind unguis and weak on the first. Ungual tunica lacking in male. Fore unguis 1-1.2 times as long as hind. All unguiculi with clear corner tooth. Hind and mid unguiculi with short and fore with long apical filaments. Fore unguiculus 0.95-1.35 and hind 0.75-1.4 times as long as corresponding unguis. Tenaculum typical of genus with posterior unpaired lobe much longer than anterior bisetaceous unpaired lobe in females and equal to slightly longer in males. Dens 1.5 to 1.95 times as long as mucro. Manubrium with 6+6 dorsal setae, distolateral 3+3 to 4+4 thickened basally and much longer than inner apical 2+2. Mucro heavily toothed along both margins in most specimens but occasionally weakly serrate or smooth along basal 1/3 to 2/3 of inner margin. Mucro slightly to strongly apically swollen. Female sixth abdominal segment with D, F, & E setae somewhat longer and thicker than normal. Male with typical number of setae but all setae except C1, A1, & B3 much thicker and longer than normal. Setae D8-D10 similar in size and shape, slender, acuminate, and in a row. Seta C10 absent. Setae C11 and B11 similar in size and shape, slender and curved. Seta E8 present, E11 and E10 subequal or with E10 slightly larger. Female subanal appendage stout, curved and apically palmate and serrate.

Holotype: female and three female and one male paratypes, Wildcat Saltpetre Cave, Wise Co. Virginia, 24 January 1995, D. Hubbard coll. (locality no. 7790).

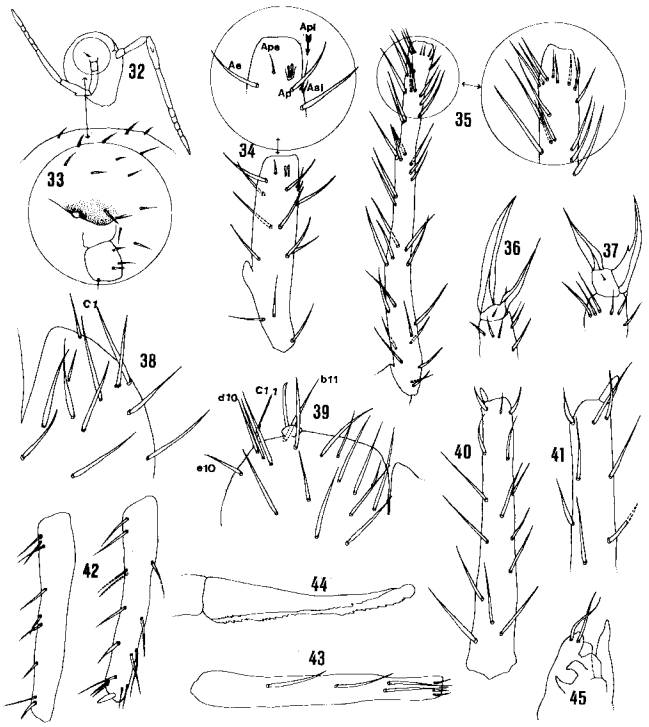
Other localities: Virginia, Staunton Quarry Cave, Augusta Co. 6 April 1995, D. Hubbard Coll. (locality no. 7816); Butler Cave, Bath Co., pool surfaces 1 September 1994 , D. Hubbard Coll. (locality no. 7760); Spangler Cave, Lee Co. 29 March 1995. D. Hubbard coll. (locality no. 7815). Little Starr Chapel Cave, Bath Co. on water surface, 10 June 1995, Hubbard coll. (locality no. 7841); Marshalls Cave, Highland Co. water surface, 27 August 1995, Hubbard coll. (locality no. 7863); Water Sinks Cave, Highland Co., pools 3 September 1995, D. Hubbard Coll (locality no. 7875).

Derivatio nominis: named for the wife of the junior author, without whom he would not have lasted to pursue Collembola so long.

Remarks: This is a remarkably variable species. The first populations we saw were from Bath and Wise Counties and these were so different that we considered them as separate species; however, additional specimens from Lee and Augusta Counties have shown sufficient intermediacy that we now consider them as a single taxon. The Bath County specimens are the most unusual, being the only ones lacking a clear apical filament on the hind unguis, lacking a tunica, and having 2+2 eyes in the male. It should be noted that only single males, one each from Bath, Lee, and Wise Counties, have so far been seen, so it is possible that intrapopulation variation occurs. The Bath and Augusta Counties specimens have 5 subsegments on the 4th antennal segment whereas the others have 6. The Wise County specimens are the only ones with brilliant coloration. The 2+2 eyes in the female as well as the subanal appendages and uncommon 6th abdominal chaetotaxy serve to separate this species from most others. The species is very close to *A. marshalli* n.sp. and they may be part of the same extremely variable taxon.

Arrhopalites commorus sp. nov. (Figs. 32-45)

Description: Eyes 1+1, unpigmented. Color white without trace of pigment. Maximum length 1.5 mm. Antennae 1.73 to 2.08 times cephalic diagonal in females and about 4 times in male. Ratios of antennal segments 1-4 about 1 : 2: 3-3.5; 8-10. Fourth antennal segment with (5)6-7 subsegments and ratio of first to last subsegment 1.5-1.9. Longest setae 2.5-2.8 times as long as diameter of segment in females and 3.5-4.2 times as long in males. Third antennal segment with basal papilla extremely pronounced and apical organ of two elongate elliptical rods in a shallow groove. Apical seta Aai cylindrical and blunt, about 1/2 as long as seta Api which is acuminate, thin walled, and slightly basally expanded. Seta Ape is similar to Api. Setae Ae, Ap, and Ai are similar in size and shape, acuminate, and curved. Seta Ae is on a level with Ap. Cephalic dorsal setae all slender and acuminate, longest (IL2 & IL3) about 1/2 diameter of first antennal segment. Female hind tibiotarsal setae all smooth and acuminate. 3 FP setae present. Setae i of whorls 3 and 4 are paired on all legs. Setae Pi of whorls II-IV are shorter and more spiniform that the other setae. Ungues without trace of tunica. Fore unguis without and hind unguis with or without a small inner tooth. Fore unguis 1.1-1.3 times length of hind unguis. Fore unguiculus with clear corner tooth and terminal filament. Hind unguiculus without both or with small apical filament. Both fore and hind ungues distinctly longer than corresponding unguiculi. Tenaculum typical of genus with posterior unpaired lobe much longer than anterior bisetaceous unpaired lobe. Dens 1.6 to 1.8 times length of mucro. Manubrium with 4+4 acuminate smooth dorsal setae. Mucro with both margins finely serrate and a slight apical swelling. Female sixth abdominal dorsal valve with seta D4 present or absent. Seta A1 straight and slightly spine-like. D2 & B2 setae similar to C setae in length. Seta D8 present or absent, when present in a straight line with D7, D9 & D10. Seta B11 is straight, somewhat thickened, and slightly longer



Figures 32-45 all of type specimens of *A. commorus*. All specimens females unless otherwise noted. 32. Outline of head. 33. Detail of right eye and antennal base, showing integumentary granulations. 34. Third antennal segment with blow-up of apex. 35. Hind tibiotarsus with blow-up of apex. 36. Fore foot complex. 37. Hind foot complex. 38. Dorsal valve, sixth abdominal segment. 39. Ventral valve, another specimen (setae D11 not seen). 40. Right dens of male specimen seen from above. 41. Blow-up of apex of same specimen, left dens. 42. Dentes of female, left external face, right internal face. Dotted lines represent broken setae seen on other specimens. 43. Ventral surface of dens. 44. Mucro. 45. Tenaculum.

than the slender acuminate C11 but C11 is sometimes not visible from side and may be absent. Seta E8 present and seta E10 clearly longer than E11. Male typical of genus. Female subanal appendage subcylindrical, slightly tapered, straight or slightly curved with a flattened finely ciliate apex.

Holotype: female and four female and two male paratypes, Stay High Cave, Giles Co., Virginia, 6 August 1994, D. Hubbard Coll. (locality no. 7754).

Additional records: Virginia: Burton Cave, Lee Co., 29 May 1994, D. Hubbard coll. (locality no. 7710). Little Kennedy & Big Kennedy Caves, Wise Co., 17 April 1995, D. Hubbard coll. (locality nos. 7817 & 7818).

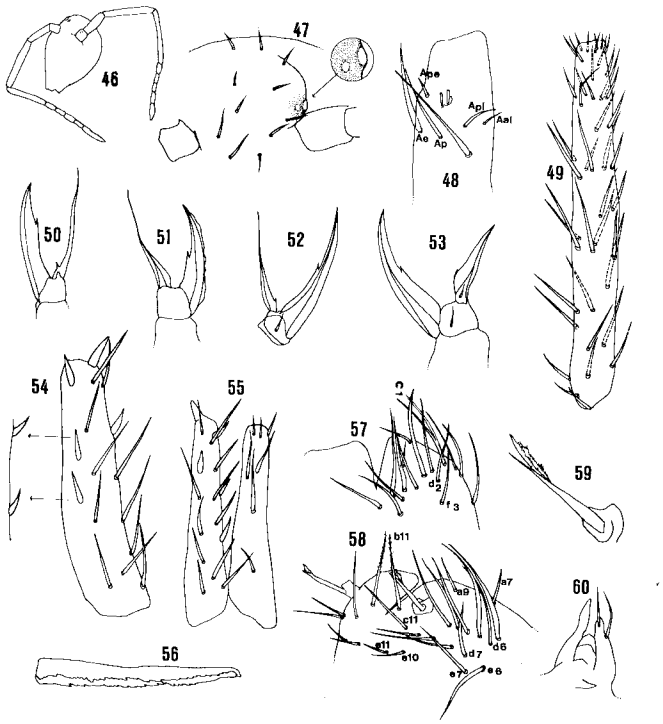
Derivatio nominis: from the Latin commoror to stay, after the type locality cave.

Remarks: This unusual species has a dental seta positioned so that it could be considered either L4 or an Id4. Since there is no case of the existence of an Id4 we interpret it as the former. The species is similar to *A. clarus* Christiansen 1966 in many respects but can be easily distinguished on the basis of the large 3rd antennal segment swelling as well as the absence of a forked C1 seta. The two males examined appeared to have a much larger antenna—cephalic diagonal ratio that the females but were otherwise similar, except for the normally sexually dimorphic features. The males are also unusual in being only slightly smaller than the females. The species also shows considerable variation. The single specimen from Lee Co. has 5 antennal subsegments while those from Wise and Giles counties have 6 to 7 subsegments. The two females from the type series had sixth abdominal segment C8 seta absent while those from other localities had it present.

Arrhopalites jay sp. nov. (Figs. 46-60)

Description: Eyes 2+2 with the inner eyes much smaller than the outer and without pronounced cornea. Color white without trace of pigment.

Maximum length 1.6 mm. Antennae 2.25 to 2.5 times cephalic diagonal. Ratios of antennal segments 1-4 about 1:2: 4.4 : 9-10. Fourth antennal segment with 6 subsegments and the ratio of the first to the last subsegment about 3:1. Longest setae of segment 3.25 to 4 times as long as diameter of segment. Third segment without basal papilla and with apical organ of two ovoid clubs in a shallow groove, the outer below the inner. Apical seta Aai short, thick, curved and apically acuminate, about 1/3 as long as seta Api and Ape which are strongly curved and acuminate. Setae Ae, Ap, and Ai similar, acuminate and slightly curved. Setae Ae and Ap on the same level. Most interantennal cephalic setae weakly spine-like. Longest (Seta A1) 3/4 to 3/5 as long as diameter of first antennal segment. Female hind tibiotarsal setae all acuminate and smooth, none clearly differentiated except for extremely thin setae in whorl 1. Three FP setae present as well as two secondary setae above whorl 5. Setae i of whorls II , III, & IV paired. Only 6 setae in whorl IV. All ungues without trace of tunica and with a small to minute inner tooth. Fore unguis 1.1 to 1.2 times length of hind. Fore unguiculus with and hind unguiculus without corner tooth. Fore unguiculus with prominent apical filament. Hind unguiculus with such in female but without in male. Ratio of fore unguiculus to unguis 1.1.-1.2. Ratio in hind foot about 1.25 in female and 0.8 in male. Tenaculum typical of genus with posterior unpaired lobe much longer than anterior bisetaceous unpaired lobe. Dens about 1.45 times as long as mucro in female and 1.7 in male. Manubrium with 6+6 dorsal and lateral setae, with 1-3 of these much heavier and larger than others. Mucro without apical swelling and with both edges strongly serrate. Female sixth abdominal dorsal setae as shown in table 2. Setae B2 ,D2 & F3 about 2/3 as long as C2. Other A , B, D, & F setae much shorter. Setae D8-D10 slender, acuminate and in a straight row. Seta E8 present and E10 slightly longer or subequal to E11. Seta D10 a little more than 1/2 as long as D9. Seta C10 present or absent and slightly shorter than seta D10. Setae B11 and C11 acuminate and straight to slightly curved. Seta B11



Figures 46-60 of *A. jay*. Outline of head, type specimen. 47. Detail of head specimen from Cherokee Co. showing integumentary granulations. 48. Apex of third antennal segment, type specimen. 49. Hind tibiotarsus, type specimen. 50. Fore foot complex, type specimen. 51. Hind foot complex, same specimen. 52. Fore foot complex, specimen from Cherokee Co. 53. Hind foot complex, same specimen. 54. Dorsal face of right dens, same specimen. 55. Dorsal (left) and ventral (right) face of dens, type specimen. 56. Mucro, type specimen. 57. Dorsal valve of sixth abdominal segment, type specimen. 58. Ventral valves of sixth abdominal segment, specimen from Cherokee Co. 59. Blow-up of female subanal appendage, same specimen. 60. Tenaculum, same specimen.

very slightly weakly ciliate. Male as shown in figure 4. Female subanal appendage deeply branched with outer branch smooth and acuminate and inner branch unilaterally ciliate or serrate.

Holotype: female and 1 female and 1 male paratype, Peach tree Cave, 5 miles south of Jay, Delaware Co., Oklahoma, 5 October 1991 (locality no. 7486).

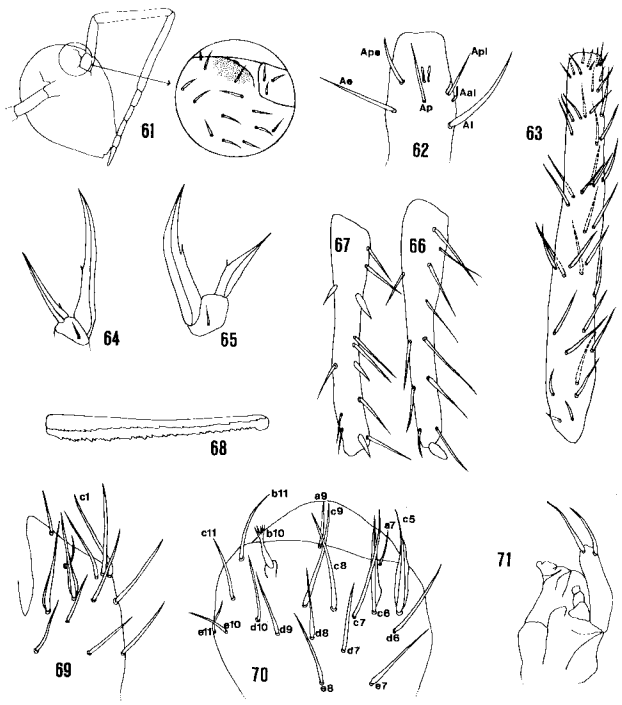
Other locality: Oklahoma: Dressler Cave, 4 miles N. Fort Gibson, Cherokee Co., 26 September 1991 (locality no. 7484).

Derivatio nominis: Named after the town nearest the type locality cave.

Remarks: The unusual female subanal appendage serves to distinguish this species from all other North American forms. The forked subanal appendage places it in a group with *A. hirtus* Christiansen 1966 and *A. texensis* n.sp. The inner eyes may not be eyes at all since they have no evidence of a thickened cornea or pigment; however, the shape, size, and position of these smooth areas all suggest eye vestiges. The eyes are quite different from the only known U.S. surface species with 2+2 eyes, *Arrhopalites bellingeri* Christiansen 1966. We thus have to hypothesize either that this species, as well as the *A. carolynae* group, have evolved from some now extinct surface species, or that both have secondarily acquired this plesiomorphic feature. While neither hypothesis is particularly attractive, the former appears to be more acceptable. This species displays an unusual degree of sexual dimorphism, in the presence of a tunica and an unguicular filament on the posterior foot only in the female. Unfortunately only one male specimen was seen so verification of this difference must await further collections.

Arrhopalites lacuna sp. nov. (Figs. 61-71)

Description: Eyes 1+1. Color varying from white to reddish with pigment granules densely scattered with two bands over dorsolateral surface of greater abdomen and dorsum of head. Maximum length 1.5 mm in female and 1 mm in male. Antennae 2.0 to 2.6 times as long as cephalic diagonal. Ratios of antennal segments: 1: 2: 4-5:10-13. Fourth antennal segment with 6 subsegments in female and 7 in male. Ratio first to last subsegment 2.1-2.5 in females and 1.5 in males. Longest setae 3.0 to 3.8 times as long as diameter of segment. Third antennal segment without basal swelling and with apical organ of two elliptical rods projecting from a shallow pit. Apical seta Aai straight, slightly tapered but truncate and about 1/3 as long as setae Api and Ape which are acuminate and straight to slightly curved and slightly swollen basally. Setae Ae & Ap on same level. Seta Ae slightly shorter than Ap and both clearly shorter than Ai. Dorsal cephalic IL setae plus L1 and posterior M setae slightly thickened basally but not clearly spinelike. Longest setae (usually L1) 4/5 as long as diameter of first antennal segment. Female hind tibiotarsal setae all acuminate and smooth, none clearly differentiated except for extremely thin setae in whorl 1. Setae i of whorls 2-4 paired. 3 FP setae as well as two secondary setae above whorl 5. All ungues without trace of tunica and with clear inner teeth. Fore unguis slightly longer than hind. All unguiculi with clear corner tooth and short apical filaments. Fore unguis 1.2-1.3 X unguiculus; hind 1.3 times unguiculus. Tenaculum typical of genus. Posterior unpaired lobe about as long as setaceous unpaired lobe in females but distinctly longer in the single male seen. Dens 1.5 to 1.8 times as long as mucro. Manubrium with 6+6 dorsal and lateral setae, all similar. Seta e3 on dens is basally more or less expanded in females but not a spine. In males it is clearly a spine. Mucro with both edges clearly serrate and with a slight apical swelling. Female sixth abdominal dorsal setae as shown in Table 2. Setae C3 and C4 vary greatly in the size of the lateral flange; however, it is never serrate. Seta F3 is about 3/4 as long as D2. Setae D8-D10 slender, acuminate, and similar in length. C9 unusually close to and anterior to C10. Setae B11 and C11 similar, curved to straight, slender and acuminate. B11 slightly longer than C11. Seta E8 present with E10 and E11 subequal to each other. One specimen has seta E8 missing. Female subanal appendage apically palmate. Male setae typical in one specimen



Figures 61-71 of female type specimens of *A. lacuna*. 61. Outline of head with details of setae, integumentary granulations of eyes near base of left antenna. 62. Apex of third antennal segment. 63. Hind tibiotarsus, seen from anterior view. 64. Fore foot complex. 65. Hind foot complex. 66. inner face of dens. 67. Outer face of dens, same specimen. 68. Mucro, same specimen. 69. Dorsal valve, sixth abdominal segment seen from side. 70. Left side, ventral valve of different specimen. 71. Tenaculum.

but with seta C2 truncate in the other.

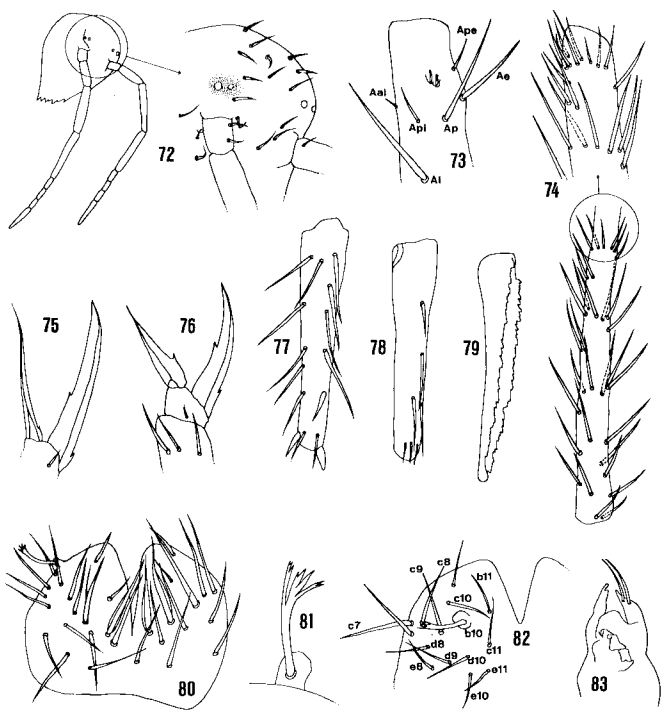
Holotype: female and 14 female and 2 male paratypes, Paxton's Cave, Alleghany Co. Virginia, on pools, 9 & 30 July, 1994, D. Hubbard coll. (locality numbers 7740 & 7753).

Derivatio nominis: from the Latin lacuna-cavern.

Remarks: This species shows a striking sexual dimorphism in the number of antennal subsegments and the fact that the male seta e3 differs strikingly from the female. Only two males were seen and one of these has the unique condition of having the C2 setae truncate. It would be interesting to discover whether this is a unique specimen or a truly polymorphic condition. This species resembles *A. clarus* Christiansen in a number of respects but can be easily separated on the basis of the subanal appendage and the dental chaetotaxy.

Arrhopalites marshalli sp. nov. (Figs. 72-83)

Description: Eyes 2+2 with inner eye much smaller than outer. Color white without trace of pigment. Maximum length 1.7 mm. Antennae (all ratios in parentheses below appear in one unusually large specimen) 1.9-2.3 (2.5) times as long as cephalic diagonal. Ratios of antennal segments as 1/1.8-1.95/3.2-3.7/7.8-8.6 , (1/2.1/4.2/12). Fourth antennal segment with first subsegment 1.6-1.7 (2.0) times as long as last. Longest setae of segment about 3 times as long as diameter of segment. Third antennal segment with seta Aa1 blunt and cylindrical and slightly less than half as long as seta Api; seta Apo short, acuminate, and more anterior than normal in genus. Interantennal setae IL1 L2 & 3 and often M4 and A3 large and spinelike; longest setae about 2/3 as long as diameter of first antennal segment. Hind tibiotarsal setae all smooth and acuminate and none clearly differentiated except for fine setae of whorl 1; three FP setae as well as one secondary seta above whorl 5; whorls 4 & 5 with 7 setae , whorls 2 & 3 with 8, and whorl 1 with 9-10 setae; the i setae of whorls 2-4 are paired. All ungues without tunica and with very small to minute inner tooth; fore unguis slightly longer to slightly shorter than hind and 1-1.25 length of unguiculus; hind unguis 1.1-1.38 times as long as corresponding unguiculus. Tenaculum typical of genus with posterior lobe slightly longer than bisetaceous anterior unpaired lobe. Manubrium with 6+6 setae; posterior lateral



Figures 72-83 of female type specimens of *A. marshalli* except where otherwise noted. 72. Outline of head with detail of central chaetotaxy and eyes showing integumentary granulations around left eyes. 73. Apex of third antennal segment. 74. Hind tibiotarsus with blow-up of apex of apex. 75. Fore foot complex. 76. Hind foot complex, same specimen. 77. Dorsum of right dens. 78. Venter of same. 79. Mucro. 80. Lateral view of circumanal setae. 81. Subanal appendage, another specimen. 82. Ventral valve sixth abdominal setae of specimen form Canyon to Nowhere Cave, Scott Co., Virginia. 83. Tenaculum.

3+3 distinctly thicker and longer than remainder. Mucro clearly toothed along both margins and without apical swelling. Dens 1.5-1.85 times as long as mucro. Abdominal segment 6 with Setae C4-C6 generally clearly lamellate. C7-C9 slender and acuminate. Seta C10 absent or present; when present more anterior and lateral than normal. Setae C11 & B11 slender, acuminate, and similar. Seta E10 longer than E11. Female subanal appendage apically palmate and serially divided. Males not seen.

Holotype: female and six female paratypes, Wininger Cave, Scott Co. Virginia, 22 May 1995 D. Hubbard coll. (locality no. 7839).

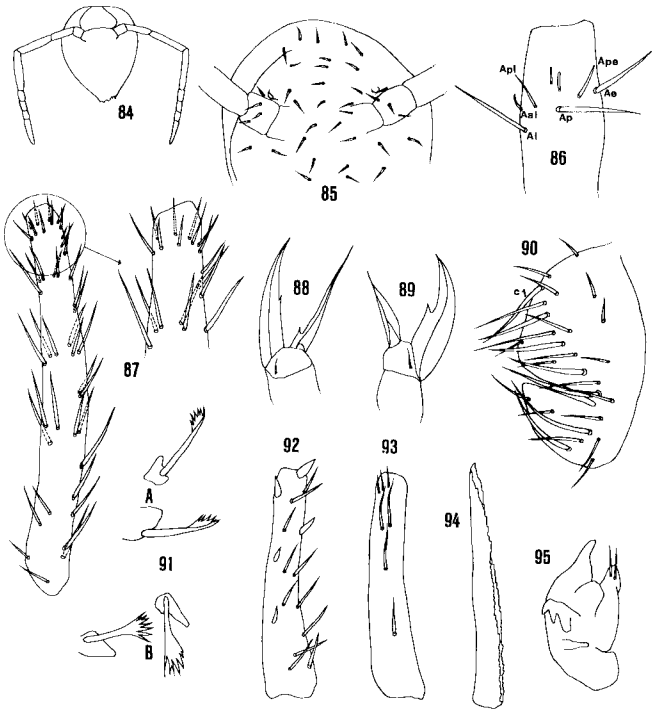
Other locality: Virginia, Canyon to nowhere Cave, Scott Co. 18 April, 1995 D. Hubbard coll. (locality no. 7819).

Derivatio nominis: named in honor of John Marshall whose assistance to us over many years has been invaluable.

Remarks: This species is easily distinguished from all other Nearctic species by the combination of 2+2 eyes and a lack of spinelike dental setae L2 L3. The type locality cave also houses specimens of *Arrhopalites pavo*.

Arrhopalites pavo sp. nov. (Figs. 84-95)

Description: Eyes 1+1. Color white without trace of pigment or with scattering of reddish pigment granules over head and dorsum of body. Maximum length 1.2 mm. Antennae 1.75 to 1.6 times as long as cephalic diagonal in females and about 1.85 in males. Antennal segment ratios as 1/ 2.0 -2.5/ 3 -4 / 9 -13 in females and about 1/-1.9/3/7.5-8.5 in males. Fourth antennal segment with 5 subsegments. First subsegment 1.4 to 1.7 times as long as last. Longest setae 2.1 to 2.4 times as long as diameter of segment. Third antennal segment apical organ of two rods, on surface of segment or in very shallow separate pits. Seta Aai curved, short and blunt, about half as long as seta Api which is slender, straight, and acuminate. Seta Ape similar to Api. Seta Ae on level with seta Ape, slightly heavier and more spine like than setae Ap or Ai. All these three setae acuminate and gradually tapered. Interantennal setae small, slender, and acuminate. Longest setae (L3) about half as long as diameter of first antennal segment. Hind tibiotarsal setae all smooth and acuminate, none strikingly differentiated except for thin setae in whorl 1. Three FP setae as well as one secondary seta above whorl 5. Whorls 4 & 5 with 7 setae, whorl 3 with 8, whorl 2 with 9, and whorl 1 with 9-10 setae. Whorls 2-4 with paired i setae. All ungues without tunica and with strong internal tooth. Fore unguis 1.1-1.2 times as long as hind. Fore and mid unguiculi with and hind without corner tooth. All unguiculi with clear apical filaments. Fore and mid unguiculus 1.2 to 1.3 and hind 1.0 to 1.2 times as long as corresponding unguis. Dens 1.2 to 1.4 times as long as mucro. Manubrium with 6+6 dorsal setae and only the inner basal seta much smaller than others. Female sixth abdominal setae as shown in table 2. Seta A1 straight but not clearly spinelike. Setae D2, F3, and F4 short, slender, and subequal in length. Setae C2-C6 swollen and sometimes with a small, unilateral lamella. Seta D8 absent, D7-D10 slender straight and in a row.



Figures 84-95 of female type specimens of *A. pavo*. 84. Outline of head and antennae. 85. Detail of dorsal cephalic chaetotaxy and eyes. 86. Apical third antennal chaetotaxy. 87. Hind tibiotarsus seen from front. 88. Fore foot complex. 89. Hind foot complex. 90. Sixth abdominal chaetotaxy seen from side. 91 A&B. Subanal appendages of two different specimens. 92. Dorsal chaetotaxy of left dens. 93. Ventral chaetotaxy of same. 94. Mucro seen from side. 95. Tenaculum.

Seta C10 absent. Setae B11 and C11 slender, straight to slightly curved and subequal. Seta E8 present, E10 slightly longer than E11. Female subanal appendage short, stout, and straight, apically deeply serrate, usually unilaterally.

Holotype: female and four female paratypes, Turkey Hill Cave, Rockbridge Co., Virginia, 22 October, 1994, on wood near pools, David Hubbard coll. (locality no. 7763).

Other locality: Wininger Cave, Scott Co., Virginia, 22 May 1995 D. Hubbard coll. (locality no. 7839)

Derivatio nominis: from the Spanish pavo = turkey, after the type locality cave.

Remarks: Two males were seen from Wininger Cave and as this is the type locality of *A. marshalli* n.sp. we at first suspected that they were the males of this species but they clearly belong to *pavo* which also occurs in this cave. In spite of the great difference in location the females from the two localities are very similar. The unguiculi are slightly longer in the Scott County specimens than those from the type locality. This species is very close to the problematic *A. benitus* (Folsom, 1896) and for a time we considered them as synonyms; however, all specimens of *A. benitus* we have seen have some

spinelike cephalic setae while these are totally absent in *A. pavo*. In addition *A. benitus* is usually found in surface localities and is frequently pigmented while *A. pavo* is an entirely cave form. The only cave specimens that we saw identifiable as *A. benitus* had the multiple forked subanal appendage characteristic of surface specimens of *A. benitus* and a different sixth abdominal chaetotaxy from that seen in *A. pavo*. It may be that they are local variations of the same species but we feel it best to consider them separate on the basis of present information.

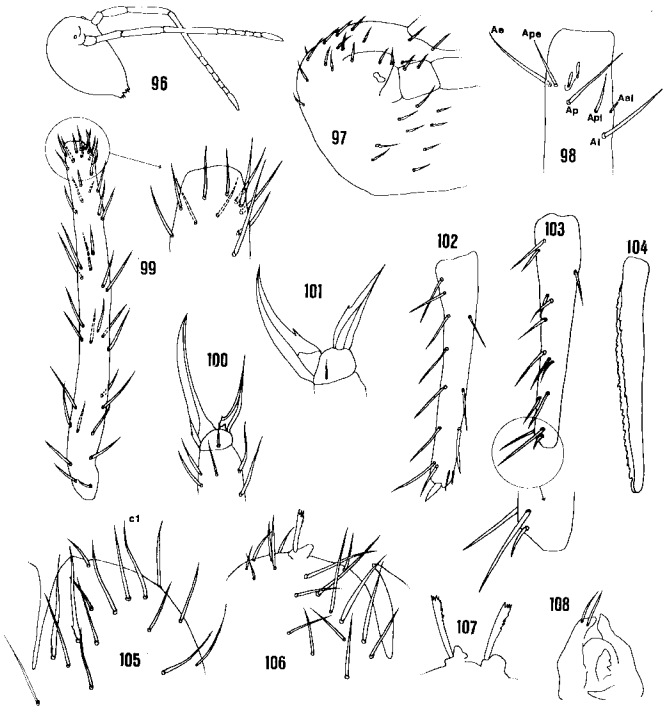
Arrhopalites sacer sp. nov. (Figs. 96-108)

Description: Eyes 1+1. Color white without trace of pigment or with scattering of reddish pigment granules on dorsum of head and abdomen. Maximum length 1.2 mm. Antennae (in adults) slightly more than twice as long as cephalic diagonal. Ratios of adult antennal segments 1-4 as 1/ 2.1-2.4/3.8-4.2/ 10-12. Fourth antennal segment with 7 subsegments and first subsegment 2.2-2.4 times as long as last; longest setae of segment about 2 times as long as diameter of segment. Third antennal segment without basal swelling. Apical organ of third antennal segment of type A (Figure 1) except that setae of apical organ slightly swollen. Hind tibiotarsal setae all acuminate and smooth, none strikingly differentiated except fine setae of whorl 1; three FP setae present as well as one secondary seta above whorl 5; whorls 4 & 5 with 7 setae, whorls 2 & 3 with 8, and whorl 1 with 9; the i setae of whorls 3 & 4 paired. All ungues without trace of tunica. Mid and hind ungues with strong and fore without inner tooth. Fore unguis 1.23 to 1.25 times as long as hind. Fore unguiculus with very small apical filament and mid and hind unguiculi without or with extremely short filaments. Fore and mid unguiculi with small corner tooth, hind without one. Hind unguiculus 0.82 and fore 0.70-0.76 times as long corresponding unguis. Tenaculum typical of genus with posterior unpaired lobe slightly longer than anterior bisetaceous unpaired lobe. Dens 1.5 to 1.7 times as long as mucro. Manubrium with 5+5 slender acuminate smooth setae, inner anterior pair distinctly smaller than others. Mucro with both edges serrate over whole length or with inner lamella clearly serrate only along basal 1/3 to 1/2, and without apical swelling. Female dorsal sixth abdominal setae as shown in Table 2. Seta F3 subequal to seta D2. C setae C3-C6 only slightly swollen, C4 with small serrate lamella basally. Seta A1 slender, short, and curved. Setae D8-D10 slender, acuminate and in a line. Seta C10 absent. Seta E8 present, E10 and E11 subequal and short. Female subanal appendage straight, stout, truncate, and serrate along one distal margin and apically. Males not seen.

Holotype: female and 1 female paratype, Little Starr Chapel Cave, Bath Co., Virginia, 10 June 1995 D. Hubbard coll., (locality no. 7841).

Other locality: Virginia, Butler Cave, Bath Co., 24 September 1994, Hubbard coll. (locality no. 7760).

Derivatio nominis: from the Latin = consecrated, after the type locality.

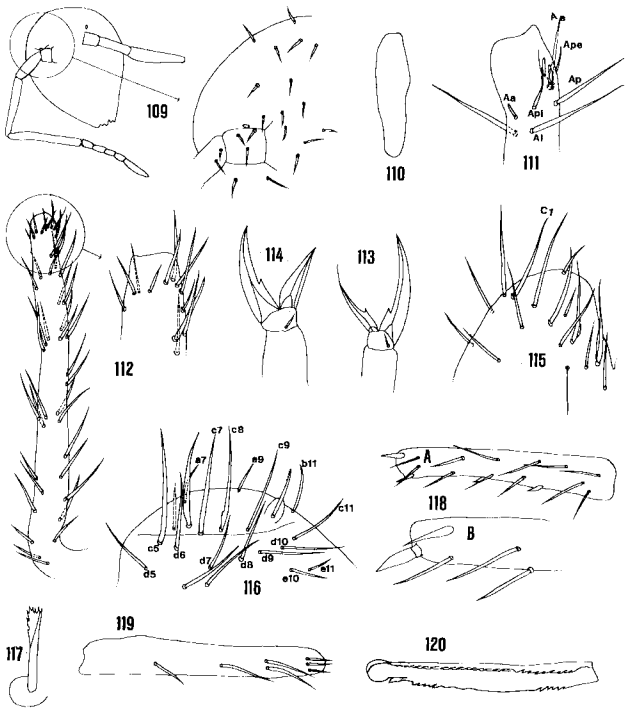


Figures 96-108 of type female specimens of *A. sacer*. 96. Outline of head and antennae. 97. Detail of head and eye of right side, same specimen. 98. Apex of third antennal segment, same specimen. 99. Hind tibiotarsus, same specimen. 100. Fore foot complex, same specimen. 101. hind foot complex, same specimen. 102. Outer face of right dens, same specimen. 103. Inner face of same with blow-up of apex. 104. Mucro, same specimen. 105. Dorsal valve, sixth abdominal segment, side view. 106. Ventral valve, same specimen. 107. Ventral appendages. 108. Tenaculum.

Remarks: This species is similar to *A. commorus* n.sp. but may be easily distinguished by the absence of a third antennal segment basal swelling as well as the slightly more spinelike L2 L3 setae. This species is also extremely close to *A. silvus* n. sp. and may prove to be part of the same geographically variable taxon; however the different female sixth abdominal chaetotaxy as well as dental chaetotaxy difference lead us to consider them as separate species for the present. The single immature paratype differs from the two adult specimens seen in a number of ratios but is otherwise very similar. The type locality also hosts specimens of *A. caedus* and *A. carolynae*. nn.spp.

Arrhopalites silvus sp. nov. (Figs. 109-120)

Description: Eyes 1+1. Color white without trace of pigment. Maximum length 1.3 mm. Antennae 1.95-2.15 times cephalic diagonal. Ratios of antennal segments 1-4 about 1: 2-2.5: 3.5-4: 9-10. Fourth antennal segment with 6-7 subsegments with the first subsegment being 1.7 to 2.2. times as long



Figures 109-120 all of female type specimens of *A. silvus*. 109. Head with enlargement of detail of right eye region. 110. Outline of third antennal segment. 111. Apex of third antennal segment. 112. Hind tibiotarsus seen from front. 113. Fore foot complex. 114. Hind foot complex. 115. Dorsal valve, sixth abdominal segment seen from side. 116. Ventral valve, left side, seen from below and an angle. 117. Female subanal appendage. 118. A, dorsal surface of dens, left side, B, detail of apex of right side. 119. Ventral surface of dens. 120. Mucro seen from above.

as last. Females with longest seta 2.2-2.5 times and single male 1.9 times as long as diameter of segment. Third segment with weak but clear basal swelling over basal 1.3 to 1/2 of segment. Apical organ of third segment of two elliptical rods in shallow pit. Apical seta Aai short, straight, blunt, and peglike, about 1/3 as long as seta Api which is straight and acuminate. Seta Ape similar to Api but slightly longer. Seta Ae on level with apical organ and seta Ape, or slightly posterior to these. Setae Ape, Ap and Ai all straight, acuminate, and not swollen basally. Seta Ae slightly shorter than Ap which is shorter than Ai. No spinelike interantennal setae. Longest setae (A1, IL3 or M5) are 0.5 to 0.6 as long as diameter of first antennal segment in females and 0.75 as long in single male seen. Hind female tibiotarsal setae with normal unusually slender setae in whorl 1. Some of i setae are thicker and slightly more expanded basally than remainder. 3 FP setae present as well as one secondary seta above whorl 5. Whorls 2-5 each with 7 setae. Setae i of whorls 2-4 usually paired. All ungues without trace of tunica. Hind and mid unguis with strong and fore unguis with very small inner tooth. Fore unguis 1.15 to 1.5 times as long as hind. Fore unguiculus with clear but short apical filament. Mid and hind unguiculi with no or very short filament (<0.08 length of rest of unguiculus). Ratio of fore unguis to unguiculus 1.25-1.6; hind 1.25-1.5. Tenaculum typical of genus with posterior unpaired lobe much longer than anterior bisetaceous unpaired lobe. Dens 1.35 to 1.95 times as long as mucro. Mucro serrate for at least part of length on both margins, serrate portion varying from basal 1/3 to whole length. Mucro with small apical swelling, striking when seen from above. Manubrium with 6+6 similar acuminate smooth setae. Female dorsal sixth abdominal setae as shown in Table 2. Lamellae of C setae, when present, very small. Setae F3 1/2 to 3/4 as long as D2 setae. Setae D8-D10 slender acuminate, similar and in straight line. Setae B11 and C11 slender, acuminate, straight to slightly curved with C11 slightly to distinctly longer than B11. Seta E8 present and E10 distinctly longer than E11. Seta C8 sometimes thickened and basally expanded. Subanal appendage short, stout and straight with short serrations on apical 1/3 to 1/4 of dorsal edge and on apex. Male chaetotaxy typical of genus.

Holotype: female and four female paratypes, Woods-Terry Cave, Highland Co.,Virginia, 22 July 1994, from water surface, David Hubbard coll., (locality no. 7741).

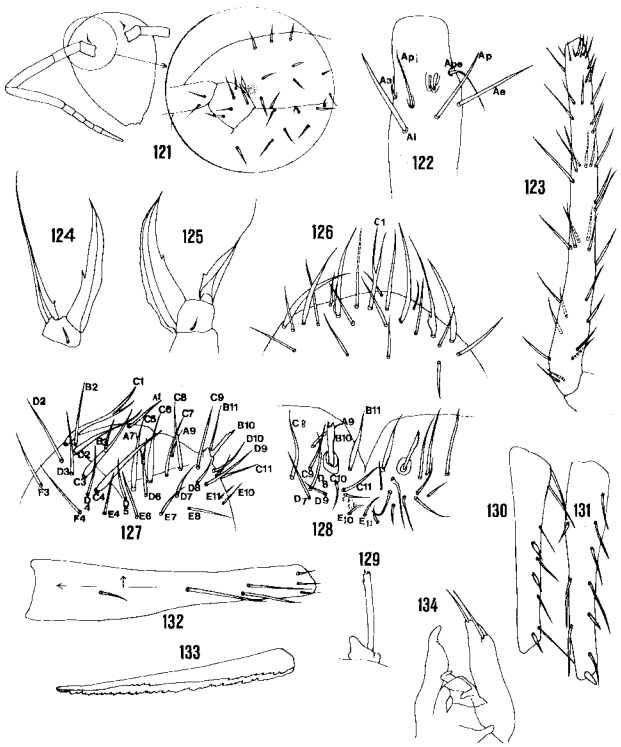
Other locality: Virginia, Hiner Cave, Highland Co., 29 May 1994, D. Hubbard coll. (locality no. 7709).

Derivatio nominis: from Latin Silvae-woods, after the name of type locality.

Remarks: This species resembles *A. hirtus* Christiansen 1966 in a number of respects but can be readily distinguished on basis of a third antennal segment basal swelling and lack of spinelike e3 dental seta as well as the shape of the female subanal appendage. One of the type series females has a very abnormal dorsal lesser abdomen chaetotaxy: C3 seta on the left side is bifurcate and on the right trifurcate. In addition, most of the C setae have short serrate basal flanges. The specimen otherwise resembles the others. One of the type specimen females has 7 antennal segments, as does the single male. The male and a single female were collected from the Hiner Cave along with a number of female (and one male) specimens of *A. pygmaeus* (Wankel), 1860.

Arrhopalites texensis sp. nov. (Figs. 121-134)

Description: Eyes 1+1. Color (in mounted specimens) white without trace of pigment. Maximum length 2.2 mm. Antennae 2 - 2.5 times as long as cephalic diagonal. Ratios of antennal segments 1-4 as 1/ 1.7-2/ 3.3-4.3/ 8-10. Longest setae in females 3-3.3. times as long as diameter of segment. Single questionable male specimen with seta 3.9 times diameter of segment. Third antenna segment without basal swelling and with apical organ of two moderately long elliptical pointed pegs in shallow separate grooves, one slightly posterior to other. Apical seta Aai short, curved, and blunt, about 1/3 as long as seta Api which is slender, acuminate, and similar to seta Ape. Setae Ae, Ap, and Ai are similar, straight to slightly curved and acuminate. Setae Ae & Ap are on same level.



Figures 121-134 of female specimens of *A. texensis*. 121. Head and right antenna, with enlargement of right antennal base chaetotaxy, type specimen. 122. Apex of third antennal segment, same specimen. 123. Hind tibiotarsus, specimen from TWAS Cave, Williamson Co. 124. Fore and 125. hind foot complexes, same specimen. 126. Dorsal sixth abdominal chaetotaxy, Wurzbach Bat Cave. 127. Lateral view sixth abdominal chaetotaxy, specimen from TWAS Cave, Williamson Co. 128. Ventral sixth abdominal chaetotaxy, specimen from Wurzbach Bat Cave, Bexar Co. showing supernumerary setae. 129. Female subanal appendage, specimen from TWAS Cave, Williamson Co. 130. Inner and 131. outer face of dens, same specimen. 132. Ventral dental chaetotaxy, type specimen. 133. Mucro, type specimen. 134. Tenaculum, TWAS Cave, Williamson Co.

Fourth antennal segment with 6 subsegments and with first subsegment 2.3-2.8 as long as last. Interantennal setae with some weakly spine like forms; spinelike nature is most pronounced in setae IL 1-3 and L1. Longest setae (A1) about half as long as basal diameter of antennae. Hind tibiotarsal setae acuminate and smooth, none strikingly differentiated except slender setae in whorl 1. 3 FP setae and one supplementary seta above whorl 5. Whorls 2 & 5 with 7 setae and whorls 3 & 4 with 7 or 8. Whorl 1 with 9 setae. Setae i of whorls 2-4 paired. Hind and mid ungues with well developed tunica. Fore unguis with or without such. All ungues with clear inner tooth. Fore unguis slightly longer than hind. Unguiculi with clear apical filaments, varying greatly in length on hind unguiculus but always long on others. Fore and mid unguiculus with well developed corner tooth and hind with or without same. Fore unguiculus 1.1 to 1.3 and hind 1.0 to 1.3 times as long as corresponding unguis. Tenaculum typical of genus with posterior unpaired lobe much longer than anterior bisetaceous unpaired lobe in all save one specimen of type series where it is subequal. Dens 1.3 to 1.75 times as long as mucro. Manubrium with 6+6 dorsal setae, distal 4+4 much longer than basal 2+2. Mucro with both edges heavily serrate along entire length and without apical swelling. Dental setae L2 & L3 spinelike but small and with short apical filaments. Sixth abdominal segment with C1 seta clearly forked but not swollen. Setae C2 -C6 variable but generally lamellate. Setae D6-D10 all slender, acuminate, and similar in size. Seta B11 thickened and straight to very slightly curved. Seta E8 present and E10 distinctly longer than E11. Subanal appendage thick, straight, and rodlike with fine serrations on inner edge near the apex and at the truncate apex.

Holotype: female and five female paratypes, Haby Salamander Cave, Bandera Co. Texas, 9 September and 31 October 1984, Scott Harden Coll.
(locality nos. 6940 & 6927).

Other localities: (all from Texas) T.W.A.S. Cave, Williamson Co. 16 May 1989, Reddell & Elliott Colls. (locality no. 7138); Whirlpool Cave, Travis Co., 22 September 1988, Grimm Coll. (locality no. 7189); Wurzbach Bat Cave, Bexar Co. 25 June 1993, Reddell Coll. (locality No. 7649).

Derivatio nominis: Named after the only state where it has been found.

Remarks: This species appears to be widespread in Texas caves; however, it is rarely abundant. The forked C1 seta and female subanal appendage and the 8 fourth antennal subsegments as well as the long unguicular filaments readily separate this from other Nearctic species. It also has the unusual feature of having a B11 seta on the 6th abdominal segment much thicker than the C 11 seta. The single specimen from Bexar county had a number of supplementary setae on the venter of the 6th abdominal segment (Figure 128) and may represent a different species. Unfortunately, no males were seen except for a single male specimen from Venom Cave, Williamson Co., which was unassociated with females. It generally shares the characteristics of the species except for a very short apical filament on the third ungues and much weaker ungual tunica.

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