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## NEW CAVERNICOLOUS PSEUDOSCORPIONS FROM CALIFORNIA (PSEUDOSCORPIONIDA, CHTHONIIDAE AND GARYPIDAE)

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### ABSTRACT

Three species are described: *Aphrastochthonius grubbsi*, new species, and *A. similis*, new species, from Lost Piton and Carlow's Caves in Calaveras County, and *Archeolarca aalbui*, new species, from Mitchell Caverns in San Bernardino County.

### INTRODUCTION

During a biological reconnaissance of the caves in the Stanislaus River region of Calaveras and Tuolumne Counties, California (see McEachern and Grady 1978) many pseudoscorpions were collected. Of those, this paper describes two new species belonging to *Aphrastochthonius* Chamberlin, a genus not hitherto recorded from California. In addition, a large series of pseudoscorpions collected during an ecological survey of Mitchell Caverns in San Bernardino County proved to belong to *Archeolarca* Hoff and Clawson, another genus not previously known from the state.

#### *Aphrastochthonius grubbsi*, new species

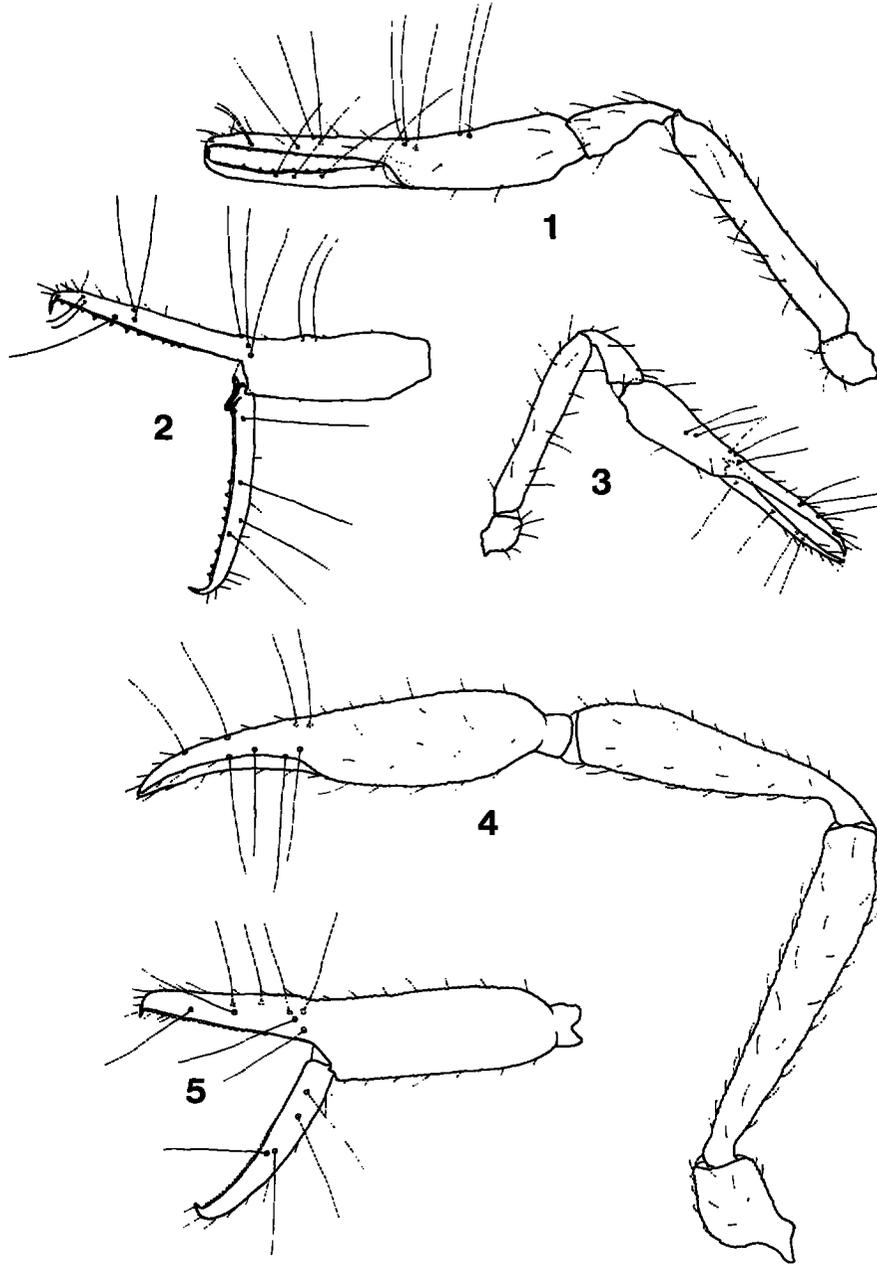
Figs. 1, 2

**Material.**—Holotype female (WM4751.01001) from Lost Piton Cave, 6.5 km SE Angels Camp, Calaveras County, California, 6 May 1977, A. G. Grubbs; in Florida State Collection of Arthropods, Gainesville, FL.

**Diagnosis.**—Like *Aphrastochthonius pachysetus* Muchmore (1976) with heavy, blunt-tipped setae, but smaller than that species (palpal femur < 0.6 mm long) and with six rather than seven setae on the cheliceral hand.

**Description of female (male unknown).**—With the characters of the genus (Muchmore 1972). Carapace about as long as wide; anterior margin slightly depressed at middle and with eight tiny denticles; no eyes. Chaetotaxy of carapace m4m-4-4-2-4; except for the simple, anterolateral microsetae (m), all setae heavy, roughened and blunt-tipped as in *A. pachysetus*. Coxal area typical; chaetotaxy 1+m-2-1-2m:3m-3-1-CS:2-3-CS:2-4:2-4; palpal coxa with two microsetae (2m) on dorsolateral surface; each coxa I with three microsetae

(3m) on base of apical projection; about five, flat parallel-rayed coxal spines on coxa I and five similar spines on coxa II; intercoxal tubercle with two small setae. Abdomen typical. Tergal chaetotaxy 4:4:4:6:6:6:6:6:6:4:T2T:0; setae anteriorly like those of carapace, posteriorly becoming longer and more acute. Sternal chaetotaxy 6:(3)7(3):(3)9(3):12:11:11:10:9:2T1T2:0:2; setae relatively heavy, but all acuminate.



Figs. 1, 2.—*Aphrastochthonius grubbsi*, new species, holotype female: 1, right palp, dorsal view; 2, left chela, lateral view. Fig. 3.—*Aphrastochthonius similis*, new species, holotype female; left palp, dorsal view. Figs. 4, 5.—*Archeolarca aalbui*, new species, holotype male: 4, right palp, dorsal view; 5, left chela, lateral view.

Chelicera 0.77 as long as carapace; hand with six setae, *sb* quite long and heavy; movable finger with eight and fixed finger with seven teeth, the distal one largest on each finger; spinneret a distinct elevation; flagellum of about eight pinnate setae.

Palp typical of the genus (Fig. 1). Trochanter 1.5, femur 6.2, tibia 2.05, and chela 5.75 times as long as broad; hand 2.86 times as long as deep; movable finger 1.2 times as long as hand. Femur about 1.5 and chela about 2.1 times as long as carapace. Some setae on femur, tibia and chelal hand heavy and scaly. Placement of trichobothria typical (Fig. 2). Movable finger with eight spaced, acute teeth; fixed finger with 13 similar teeth and one accessory denticle distally. Sensillum on movable finger far proximad of last tooth.

Legs typical. Leg IV with entire femur 2.75 and tibia 4.4 times as long as deep. A few setae heavy and scaly.

**Measurements (mm).**—Body length 1.39. Carapace length 0.385. Chelicera 0.295 long. Palpal trochanter 0.15 by 0.10; femur 0.59 by 0.095; tibia 0.215 by 0.105; chela 0.805 by 0.14; hand 0.385 by 0.135; movable finger 0.46 long. Leg IV: entire femur 0.465 by 0.17; tibia 0.35 by 0.08; metatarsus 0.18 by 0.055; telotarsus 0.36 by 0.04.

**Etymology.**—The species is named for Andy Grubbs, who collected this and many other pseudoscorpions in caves of the Stanislaus River region.

**Remarks.**—Previously the only species of *Aphrastochthonius* known to occur in southwestern United States was *A. pachysetus* from Doc Brito Cave in Eddy County, New Mexico. With the discovery of the new species, the known range of the genus is extended over 1,500 km to the northwest. Very likely other forms are present in southwestern caves but have been overlooked by collectors because of their small size and pale coloration.

*Aphrastochthonius similis*, new species

Fig. 3

**Material.**—Holotype female (WM4750.01001) from Carlow's Cave, 7.5 km SE Angels Camp, Calaveras County, California, 16 May 1977, A. G. Grubbs, N. Boice, and D. Broussard; in Florida State Collection of Arthropods, Gainesville, FL.

**Diagnosis.**—Similar to *A. grubbsi*, but smaller (length of palpal femur < 0.5 mm) and with less slender appendages (1/w of palpal femur < 6.2).

**Description of female (male unknown).**—With the characters of the genus (Muchmore 1972). Carapace little longer than wide; anterior margin straight and with about 10 tiny denticles at middle; no eyes. Chaetotaxy m4m-4-4-2-4; except for the simple anterolateral microsetae (m), all setae heavy, roughened, and blunt-tipped. Coxal area with chaetotaxy 1+m-2-1-2m:3m-3-1-CS;2-3-CS;2-4;2-4; palpal coxa with one microseta (m) on apical process and two microsetae (2m) on dorsolateral surface; each coxa I with three microsetae (3m) on base of apical projection; about five flat, parallel-rayed coxal spines on coxae I and II; intercoxal tubercle not observed (specimen broken). Abdomen typical. Tergal chaetotaxy 4:4:4:6:6:6:6:6:4:T2T:0; anterior setae like those of carapace, posteriorly becoming longer and more acute. Sternal chaetotaxy 6:(3)8(3):(3)9(3):11:10:11:11:9:2T1T2:0:2; setae rather heavy but all acuminate.

Chelicera 0.7 as long as carapace; hand with six setae, *sb* quite long and heavy; movable finger with eight and fixed finger with seven teeth, the distal one largest on each finger; spinneret a distinct elevation; flagellum of eight pinnate setae.

Palp typical of the genus (Fig. 13). Trochanter 1.4, femur 6.15, tibia 2.0, and chela 5.6 times as long as broad; hand 2.55 times as long as carapace. Few setae on femur, tibia and

chelal hand heavy and scaly. Placement of trichobothria typical for the genus. Movable finger with seven and fixed finger with nine spaced, acute teeth; fixed finger also with an accessory denticle distally. Sensillum on movable finger far proximad of last tooth.

Legs typical. Leg IV with entire femur 2.5 and tibia 4.2 times as long as deep. Few setae heavy and scaly.

**Measurements (mm).**—Body length 1.1 Carapace length 0.35. Cheliceral 0.245 long. Palpal trochanter 0.11 by 0.08; femur 0.43 by 0.07; tibia 0.16 by 0.08; chela 0.59 by 0.105; hand 0.27 by 0.105; movable finger 0.325 long. Leg IV: entire femur 0.35 by 0.14; tibia 0.25 by 0.06; metatarsus 0.13 by 0.045; telotarsus 0.35 by 0.03.

**Etymology.**—The species is called *similis* because of its close similarity to *A. grubbsi*.

**Remarks.**—Though Carlow's Cave, the type locality of this species, is less than 1,000 m from Lost Piton Cave, the type locality of *A. grubbsi*, the two caves are well separated, being on opposite sides of Coyote Creek and in different blocks of the Calaveras Formation marble (W. R. Elliott, *in litt.*). It is unlikely that there is any direct connection between the caves. The two populations of *Aphrastochthonius* appear to have been isolated in the caves for a long while after originating from a common ancestral population at the surface. No epigeal *Aphrastochthonius* are presently known from anywhere in the United States, but this may be due to lack of sampling in appropriate habitats.

*Archeolarca albuli*, new species

Figs. 4, 5

**Material.**—Holotype male (WM5496.01002) and 44 paratypes (20 ♂, 15 ♀, 9 nymphs) taken in pitfall traps in Mitchell Caverns, Mitchell Caverns State Park, San Bernardino County, California, May 1978-June 1979, R. L. Aalbu; in Florida State Collection of Arthropods, Gainesville, FL.

**Diagnosis.**—Much like *A. guadalupensis* from western Texas but slightly larger and with slightly more slender appendages.

**Description**, based mainly on eight mounted specimens (5 ♂, 3 ♀).—Sexes similar but female slightly larger and with slightly less slender appendages. Generally well sclerotized and colored; carapace and palps brown, other parts lighter. Carapace trapezoidal; anterior margin nearly straight; surface heavily granulate, with a distinct transverse furrow about 0.6 length from anterior margin; four eyes, anterior ones corneate, posterior ones on distinct tubercles but small in diameter; about 34 slender, curved setae, six at anterior and four at posterior margin. Coxal area typical of genus, widest across fourth coxae.

Abdomen typical; tergites 2-9 and sternites 4-8 divided. Tergal chaetotaxy of holotype male 5:6:7:8:10:11:9:10:10:T5T:9:2; others similar but varied. Sternal chaetotaxy of same 17:[3-3]:(0)19(0):(0)6(0):8:7:8:7:8:8:3:2; other males similar; female genital opercula each with 8-11 setae. Internal genitalia of both sexes typical (see Muchmore 1981).

Chelicera small, about 0.35 as long as carapace; hand with four setae; galea of male slender and unequally bifid, that of female very long and terminally trifid; flagellum of four setae, distal one sparsely dentate; serrula exterior of about 16 blades.

Palp long and slender (Fig. 4); femur about 1.5-1.6, tibia 1.3-1.4, and chela 1.65-1.85 times as long as carapace. Palpal femur 5.3-5.9, tibia 3.9-4.35, and chela 3.95-5.0 times as long as wide; hand 2.25-2.75 times as long as deep; movable finger 0.84-0.89 as long as hand. Surfaces distinctly granulate except for chelal fingers; most setae arcuate. Tricho-

bothria as shown in Fig. 5. Fixed finger with 30-34 contiguous, cusped marginal teeth; movable finger with 29-31 similar teeth.

Legs long and slender; leg IV with entire femur 5.2-5.6 and tibia 6.35-7.0 times as long as deep. Surfaces partly scaly; setae arcuate; no tactile setae. Arolia entire, twice as long as claws.

**Measurements (mm).**—Figures for the holotype given first, followed in parentheses by ranges for the seven mounted paratypes. Body length 2.49 (2.34-2.75). Carapace length 0.635 (0.60-0.695). Chelicera 0.22 (0.22-0.245) long. Palpal femur 1.00 (0.975-1.065) by 0.18 (0.17-0.20); tibia 0.835 (0.82-0.895); chela (without pedicel) 1.11 (1.035-1.17) by 0.235 (0.23-0.29); hand (without pedicel) 0.605 (0.55-0.64) by 0.23 (0.22-0.28); pedicel 0.08 (0.075-0.095) long; movable finger 0.51 (0.49-0.555) long. Leg IV: entire femur 0.73 (0.70-0.78) by 0.13 (0.125-0.145); tibia 0.56 (0.525-0.58) by 0.08 (0.08-0.09).

**Etymology.**—The species is named in honor of Rolf L. Aalbu, who collected all of the known specimens.

**Remarks.**—This is the first species of *Archeolarca* to be discovered in California. Other cavernicolous forms have been found in Coconino County, Arizona and Culberson County, Texas (Muchmore 1981). The one known epigeal species, *Archeolarca rotunda* Hoff and Clawson, has been recorded from Utah and Cache Counties, Utah, Deschutes County, Oregon, and Bernalillo County, New Mexico, where it is usually recovered from the nests of pack rats, *Neotoma* spp., (Hoff and Clawson 1952, Hoff 1956, Benedict and Malcolm 1977, Muchmore 1981). It is perhaps significant to note here that of about 125 collections of pseudoscorpions from *Neotoma* nests made by Kenneth W. Cooper in southern California, not one has contained any specimens of *Archeolarca* (unpublished).

#### ACKNOWLEDGMENTS

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