

Studies in the Cnemeplatiini I: A New Subtribe and Revision of the Genus Alaudes Horn (Coleoptera: Tenebrionidae: Pimeliinae: Cnemeplatiini), with Descriptions of New Species from the Southwestern USA and Mexico, Including Notes on Distribution and Biology

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STUDIES IN THE CNEMEPLATIINI I: A NEW SUBTRIBE AND REVISION OF THE GENUS *ALAUDES* HORN (COLEOPTERA: TENEBRIONIDAE: PIMELIINAE: CNEMEPLATIINI), WITH DESCRIPTIONS OF NEW SPECIES FROM THE SOUTHWESTERN USA AND MEXICO, INCLUDING NOTES ON DISTRIBUTION AND BIOLOGY

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ABSTRACT

The genus *Alaudes* Horn is revised and placed in a new subtribe, Alaudina. The genus includes *A. singularis* Horn, *A. setigera* Blaisdell, *A. alternata* Fall, and the following new species: *A. mojavensis* Aalbu, Caterino, and Smith (Mojave Desert: California and Arizona), *A. coloradoensis* Aalbu, Caterino, and Smith (Colorado Desert, California), *A. moenkopiensis* Aalbu, Caterino, and Smith (Colorado Plateau, northern Arizona and southern Utah), *A. californicus* Aalbu, Caterino, and Smith (Central Valley, California), and *A. vizcainensis* Aalbu, Caterino, and Smith (Vizcaino Desert: Baja California and Baja California Sur, Mexico). *Alaudes fallax* Fall, *A. testacea* Blaisdell, and *A. squamosa* Blaisdell are placed as new synonyms of *A. singularis* Horn. The subtribe Alaudina is described and diagnosed. A key is provided to the known *Alaudes* species. The biology of the genus is discussed, including host preference, immatures, life expectancy, and habitat diversity. All *Alaudes* species are associated with various species of ants (Formicidae), and some degree of colony integration is indicated by their possession of trichomes. The species span a range of habitats from extreme deserts to mid-elevation mesic montane forests. The immature stages are not known.

Key Words: taxonomy, darkling beetles, California, Arizona, Utah, Nevada, Baja California, myrmecophily, ants

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G. H. Horn (1870) described *Alaudes singularis* (erroneously asserting that the eyes were absent) and *Cnemeplatia sericea*, which he placed in the Opatriini. He provided a key in which *Alaudes* Horn keyed out in a couplet along with *Cnemeplatia* Costa. Horn separated *Alaudes* from *Cnemeplatia* based on the presence of a broad intercoxal process and the absence of eyes (as opposed to the narrow, acute, intercoxal process and large eyes found in *Cnemeplatia*). Blaisdell (1919) added three new species: *A. squamosa*, *A. setigera*, and *A. testacea*. He also provided a key to the species. Fall (1928) added another two species and also provided a key to the *Alaudes* species. Because of

their small size, it is not surprising that all three of these early authors (Horn, Blaisdell, and Fall) characterized *Alaudes* as blind, not noticing the single eye facet present on the sides of the head in all species.

Csiki (1953) was the first to establish the tribe Cnemeplatiini for *Cnemeplatia*, *Psilachnopus* Reitter, *Lepidocnemeplatia* Bousquet and Bouchard (see discussion in Bousquet *et al.* 2018), and *Hyocis* Pascoe (now Hyocini), which he placed in the “tentyroid” group of subfamilies. Medvedev (1968) was the first to include *Alaudes* along with the genera *Cnemeplatia*, *Philhammus* Fairmaire, and *Lepidocnemeplatia* in the Cnemeplatiini, which he

placed in the subfamily Lachnogyinae. Later, Doyen (1994) placed all of the above genera, along with *Thorictosoma* Lea and *Actizeta* Pascoe (transferred by Watt (1992) from the Opatrini), in the Cnemeplatiini within the subfamily Pimeliinae.

Currently, the Cnemeplatiini are divided into eight genera in four subtribes – Thorictosomatina Watt, 1992: *Thorictosoma* Lea, 1919 and *Wattiana* Matthews and Lawrence, 2005; Actizetina Watt, 1992: *Actizeta* Pascoe, 1875; Rodoniellina Ferrer and Moragues, 2000: *Rondoniella* Kaszab, 1970 and *Durandius* Kaszab, 1970; and Cnemeplatiina: *Philhammus* Fairmaire, 1871, *Lepidocnemeplatia* Bousquet and Bouchard, 2018, and *Alaudes* Horn, 1870. Although *Alaudes* are generally rare in collections, a number of specimens have been accumulated through the years, with some collected relatively recently. Specimens representing five previously undescribed species were identified and are described herein, along with new distribution records for previously described species. Morphological differences (detailed below) between members of the genus *Alaudes* and other genera currently placed within Cnemeplatiina necessitate the erection of a new subtribe, Alaudina, to contain the genus.

MATERIAL AND METHODS

For this revision, over 1,150 specimens of *Alaudes* were examined. Material was borrowed from the following individuals and institutions. These persons (in parentheses) are gratefully acknowledged for loan of their materials:

ADSC	Aaron Smith Collection, Flagstaff, Arizona (Aaron Smith).
ASUT	Frank M. Hasbrouck Insect Collection, Arizona State University, Tempe, Arizona (Nico Franz).
CASC	California Academy of Sciences, San Francisco, California (Dave Kavanaugh).
CDFA	California State Collection of Arthropods, Sacramento, California (Charles Bellamy, Andy Cline).
CIDA	Orma J. Smith Museum of Natural History, College of Idaho, Caldwell, Idaho (William Clark).
CISC	University of California, Essig Museum of Entomology, Berkeley, California (Kipling Will).
CNCI	Canadian National Collection of Insects, Ottawa, Ontario, Canada (Patrice Bouchard).
CUIC	Cornell University, Ithaca, New York (James Liebherr).
FMNH	Field Museum of Natural History, Chicago, Illinois (James Boone).

FSCA	Florida State Collection of Arthropods, Gainesville, Florida (Paul Skelley).
JPGC	J. P. Gruber Collection, Madison, Wisconsin (Jeff Gruber).
OSUC	C. A. Triplehorn Insect Collection, Ohio State University, Columbus, Ohio (Charles A. Triplehorn).
OSAC	Oregon State University Arthropod Collection, Corvallis, Oregon (Chris Marshall).
RLAC	Rolf L. Aalbu Collection, El Dorado Hills, California (Rolf Aalbu).
SBMN	Santa Barbara Museum of Natural History, Santa Barbara, California (Mike Caterino, Matt Gimmel).
SDMC	San Diego Natural History Museum, San Diego, California (David Faulkner).
TAMU	Texas A & M University, College Station, Texas (Ed Riley).
UAIC	University of Arizona Insect Collection, Tucson, Arizona (Wendy Moore).
UCDC	Bohart Museum of Entomology, University of California, Davis, California (Steve Heydon).
UCRC	Entomology Research Museum, University of California, Department of Entomology, Riverside, California (Doug Yanega).
USNM	National Museum of Natural History, Smithsonian Institution, Washington, District of Columbia (Warren Steiner).
WBWC	William B. Warner Collection, Chandler, Arizona (Bill Warner).

Measurements were taken using digital calipers or an optical micrometer attached to a Leica MZ16 APO stereomicroscope. SEMs were taken using the following systems: a Zeiss EVO 40 scope, with most specimens sputter-coated with gold or uncoated specimens examined in ‘variable pressure’ mode; or a Zeiss Supra 40VP, with specimens sputter-coated, in the Imaging and Histology Core Facility at Northern Arizona University. Conventional photographs were taken using a Visionary Digital Passport system (Dun, Inc.), based around a Canon 7D camera with a 65mm macro lens. Image stacking was done using Helicon Focus.

Subtribe Alaudina Aalbu, Caterino, and Smith, new subtribe

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Description. Cnemeplatiini. Mentum small to very small (Fig. 1C, D), trapezoidal. Mandible with prostheca, mandibular mola very weakly sclerotized. Eye reduced to single facet, positioned

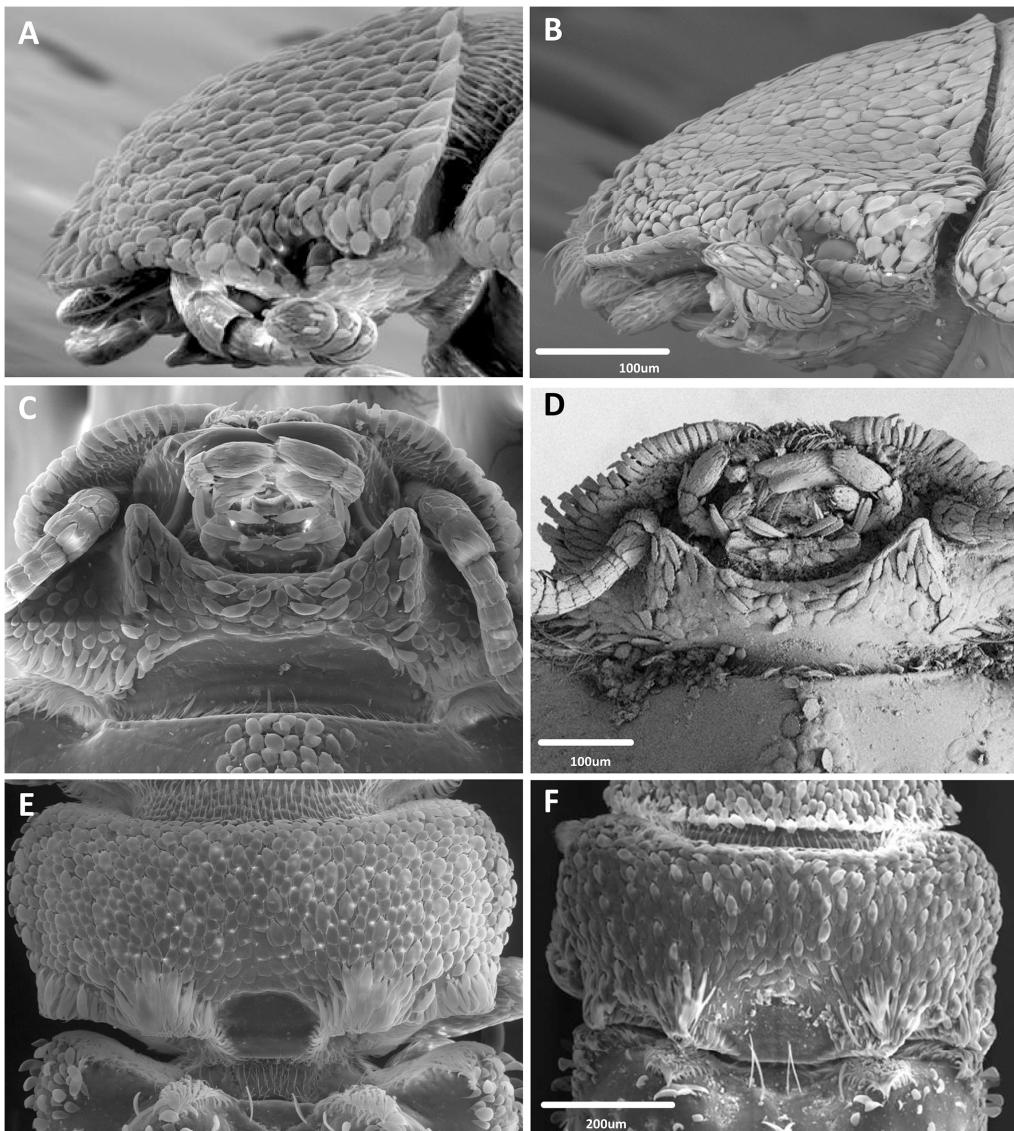


Fig. 1. *Alautes* species. A) *A. californicus*, head showing eye facet, B) *A. coloradoensis*, head showing eye facet, C) *A. californicus*, head, ventral view, D) *A. vizcainensis*, head, ventral view, E) *A. californicus*, pronotum, dorsal view, F) *A. singularis*, pronotum, dorsal view.

along lateral margin of head. Elytron with 10 striae and bearing setae or scales. Epipleura gradually narrowing from apex to base. Aedeagal tegmen with apicale longer or shorter than basale (Fig. 2). Sternite 8 of male not emarginate. Male with penis ventral. Female (Fig. 3) lacking external genitalia. Internal tract with bursa, spermatheca multiple, lateral; spermathecal accessory gland apical.

Type Genus. *Alautes* Horn, 1870.

Diagnosis. At present, Alaudina is monotypic, containing only its type genus. *Alautes* differs from other Cnemeplatiini by the following: 1) Eye reduced to single facet; 2) Male genitalia with penis ventral and parameres longer or shorter than basal piece; 3) Female internal tract with multiple subapical spermathecae and apical spermathecal accessory gland. In Cnemeplatiina, the eyes are large and composed of many facets, the male genitalia have the aedeagal tegmen with the apicale

not longer than the basale, and the female internal tract has a small spermatheca positioned at or near the apex of a large bursa and the spermathecal accessory gland is lacking. It is clear from the above characters that *Alaudes* does not fit into the subtribe Cnemeplatina or in any other currently existing subtribe, thus necessitating description of a new subtribe.

Alaudes Horn, 1870

Alaudes Horn 1870: 362. Type species: *Alaudes singularis* Horn, 1870.

Redescription. Length 1.4–2.2 mm. width 0.6–1.0 mm. color dark brown, luster opaque to slightly shiny. **Body:** Compact, subrectangular, apterous. **Head:** Transverse, slightly broader behind, emarginate anteriorly; upper surface transversely shallowly rounded, sometimes slightly concave and reflexed laterally; upper and lower surface completely covered with short, appressed scales. Eye reduced to single facet, positioned dorso-laterally but usually not visible from above. Antenna 11-segmented, compact, first 2 antennomeres broader than next 6, last 3 antennomeres forming compact club. Mandibles with mandibular mola very weakly sclerotized. Mentum short, transverse, ligula often obscured by large setal scales on mentum. Maxillary palpi short, apical segment elongate oval. Gular region with sides strongly produced anteriorly around mentum, anterior angles acute, apex between angles arcuate, concave, laterally depressed forming groove for antenna. **Pronotum:** About as broad as elytra, transverse. Surface covered with short, appressed scales except on central aspect of base, which is bare and forms a broad hexagon, apex often bearing a small pore. Anterior margin nearly straight to slightly concave, lateral aspect variable. Posterior margin bearing 2 trichomes, comprising pairs of longer, flattened setal clumps, 1 positioned around central bare area and 1 on posterior lateral margin. **Scutellum:** Visible, transverse triangular. **Elytra:** Slightly inflated, surface punctate-striate; punctures, setal shapes, and patterns variable; middle of basal margin of each elytron typically with small patch of scale-like setae opposing trichome of posterior pronotal margin; laterally nearly parallel to slightly inflated at midpoint; surface mostly bare, punctures variable, set in more or less even striae on disc, laterally becoming more confused; with variable setal patterns; anterior margin concave. **Venter:** Epipleura gradually narrowing from apex to base; prosternal process vertically convex between procoxae, mesosternum not excavate; Prosternum bare except central aspect with rounded scales, extending laterally on prosternal process; first visible sternite with more or less pronounced

grooves extending laterally from sternal base. **Legs:** Moderate in length, slender, not inflated; femur similar in length to or slightly longer than tibia; tibiae and tarsi densely setose, femora sparsely setose; tarsi with ventral surface bearing numerous, short, stiff, black setae. Basal 3 or 4 tarsomeres similar in length, the distalmost about twice as long. **Genitalia:** Male (Fig. 2A–F) with penis ventral, basal piece and parameres similar in length, though somewhat variable among species, often curved basally or recurved. Female (Fig. 3) lacking distinct ovipositor. Internal tract with bursa, spermathecae multiple, lateral; spermathecal accessory gland apical.

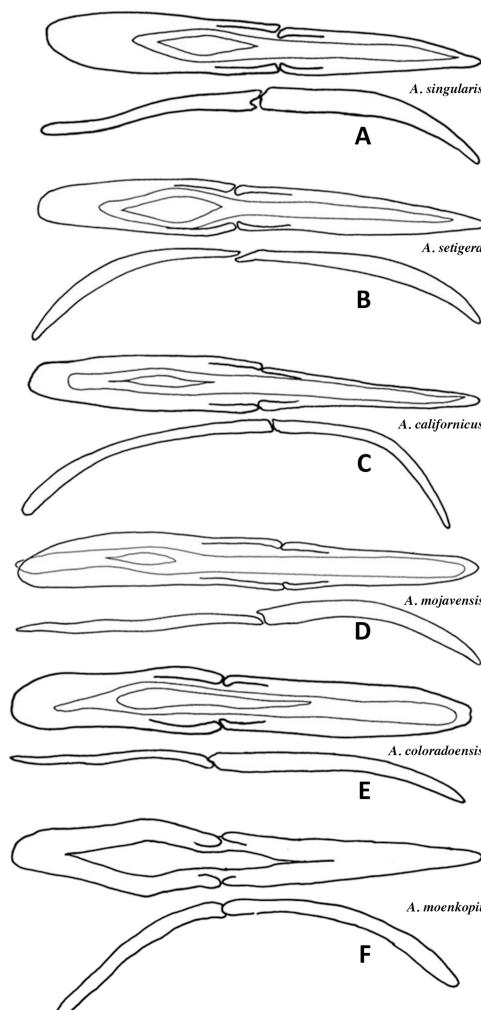


Fig. 2. *Alaudes* species, male genitalia. A) *A. singularis*, B) *A. setigera*, C) *A. californicus*, D) *A. mojavensis*, E) *A. coloradoensis*, F) *A. moenkopii*.

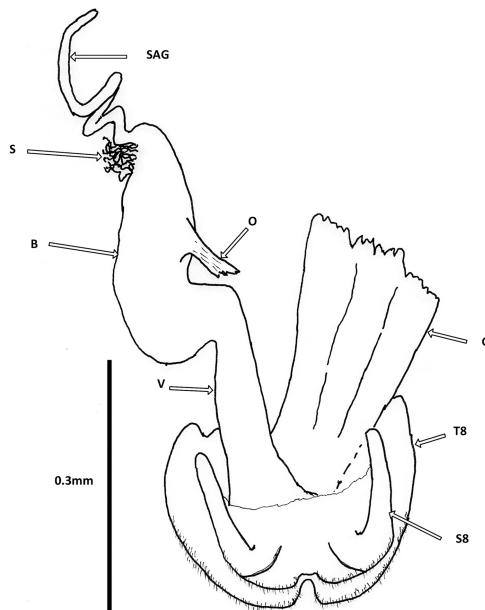


Fig. 3. *Alautes moenkopi*, female genitalia. SAG = spermathecal accessory gland; S = spermathecae; B = bursa; O = oviduct; V = vagina; G = gut; T8 = tergite 8; S8 = sternite 8.

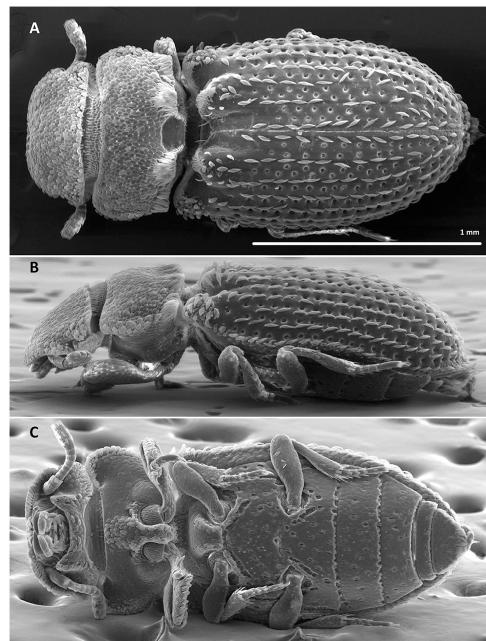


Fig. 4. *Alautes californicus*. A) Dorsal habitus, B) Lateral habitus, C) Ventral habitus.

Alautes californicus Aalbu, Caterino, and Smith, new species

Zoobank.org/urn:lsid:zoobank.org:act: 636C2BB0-5078-4E3E-92D3-E279AE409996 (Figs. 1A, C, E, 2C, 4, 10, 11D)

Diagnosis. Elytral vestiture always much longer than twice width, composed of thick, strongly re-cumbent posterior setae (Fig. 4).

Description. Length 1.47 mm, width 0.63 mm. Color dark brown, luster opaque. **Head:** Transverse, broader behind, anterior margin broadly rounded, with central aspect straight. Laterally with indentation at eye level. Upper surface transversely, shallowly rounded, upper and lower surfaces completely covered with short, appressed scales. Mentum short, transverse, ligula visible. Maxillary palpi short, apical segment elongate oval. **Pronotum:** About as broad as elytra, transverse. Surface covered with short, appressed scales except central aspect of base, which is bare and forms a broad hexagon, apex of bare area lacking a small pore. Anterior margin slightly concave, lateral aspect with anterior angles broadly rounded, posteriorly narrowing, very slightly concave before base. Posterior margin bearing 2 pairs of longer, flattened setal clumps, 1 positioned around central bare area with very long, appressed scales and 1 on posterior lateral margin with moderately long, appressed scales.

Lateral aspect of pronotum with short, appressed scales. **Elytra:** Slightly inflated, surface strongly punctate, punctures set in uneven striae on disc, laterally becoming more confused; punctures large, impressed near lateral margins, deeply perforate centrally. intervals mostly bare, with 7 series of moderately long, appressed scales. Anterior margin concave with 2 bare, depressed areas mid-laterally and 1 centrally and 4 alternately elevated areas of concentrated scales corresponding to areas on posterior margin of thorax. **Venter:** Prosternal process vertically convex between procoxae, mesosternum not excavate; Prosterum bare except central aspect with rounded scales, extending laterally on prosternal process; metasternum with few scattered punctures, extending to first 3 visible abdominal sterna; first visible sternite with 2 shallow grooves extending laterally from sternal base; sternal ratios (anterior to posterior midline) 1:0.8: 0.6:0.4:0.7. **Legs:** Covered with short appressed scales, leg ratios (femur:tibia) pro- 1:0.6; meso- 0.8:0.6; meta- 0.8:0.6. Tarsal length ratios as follows (base to apex): protarsus 1:1:1:2; mesotarsus 1:1:1:1:1.7; metatarsus 1.7:1:1.3:3. **Genitalia:** Male (Fig. 2C) with basal piece longer and broader than parameres, gradually curved basally. Parameres strongly curved basally at midpoint.

Type Material. **HOLOTYPE:** Male. CALIFORNIA: Kern Co.: Ft. Tejon SP, 34.8756°N,

118.8953°W, II-9-2008, Caterino & Chatzimanolis. Deposited in SBMN. **PARATYPES:** (39 specimens from 13 localities) – CALIFORNIA: Fresno Co.: 1 mi. N Cedar Brook, VI-4-1961, manzanita duff, D. J. Burdick (1) CASC; 10 mi. NE Auberry, I/31/1966, berlese *Arctostaphylos* duff, J. Prince (2) FSCA; 15 mi. E Squaw Valley, II-26-1977, A. J. Gilbert (3) RLAC; same data except (13) CDFA; Italian Creek, 6 mi. NE Auberry, V-29 to XI-13-1982, A. J. Gilbert & N. Smith (1) CASC; Kern Co.: 5 mi. SE Tehachapi, XI-8-1984, berlese *Ceanothus* duff, A. J. Gilbert (1) CDFA; Sequoia NF Breckenridge Mt. Rd., 35.4644°N, 118.6475°W, XI-8-2007, Caterino & Short (1) SBMN; Sequoia NF, Water Cyn. Rd., 35.0899°N, 118.4941°W, XII-6-2005, *Quercus* litter, Caterino & Chatzimanolis (1) SBMN; Los Angeles Co.: Angeles NF, Hideaway Cyn., 34.6993°N, 118.5465°W, V-14-2007 to V-28-2007, cantharidin pitfall, Caterino & Chatzimanolis (1) SBMN; same locality except VI-13-2007 to VI-23-2014, unbaited pitfall, Caterino & Chatzimanolis (1) SBMN; same locality except V-14-2007 to VI-28-2007, cantharidin pitfall, Caterino & Chatzimanolis (4) SBMN; same locality except unbaited pitfall, Caterino & Chatzimanolis (3) SBMN; same locality except VI-13-2007 to VI-23-2007, unbaited pitfall, Caterino & Chatzimanolis (1) SBMN; Mariposa Co.: 1977, A. J. Gilbert (1) CDFA; San Benito Co.: 1.8 mi. SW Idria, III-25 to VI-8-1981, A. J. Gilbert & N. Smith (1) CDFA; San Luis Obispo Co.: Carrizo Plain NM, Selby Campg., 35.1227°N, 119.8288°W, IV-2-2004 to IV-25-2004, FIT, Caterino (1) SBMN; Tulare Co.: 5 mi. SW Badger, II-26-1977, Berlese deciduous oak litter, A. J. Gilbert (1) CDFA.

Other Material Examined. CALIFORNIA: Los Angeles Co.: Angeles NF, Hideaway Cyn., 34.6993°N, 118.5465°W, VI-23-2007 to VII-2-2007, cantharidin pitfall, Caterino & Chatzimanolis (1) SBMN.

Distribution. Restricted to the hills along the mid- and lower San Joaquin Valley in California.

Collection Data. Mainly Berlesed oak litter and from *Arctostaphylos* (manzanita) and *Ceanothus* duff or in pitfall traps. Elevation range 450–1,524 m.

Alaudes mojavensis Aalbu, Caterino, and Smith, new species

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Diagnosis. Lateral aspect of pronotum with slender, hair-like setae; sides of pronotum sinuate, expanding anteriorly, anterior angles rounded; elytral vestiture erect, slender and hair-like throughout, always much longer than twice width.

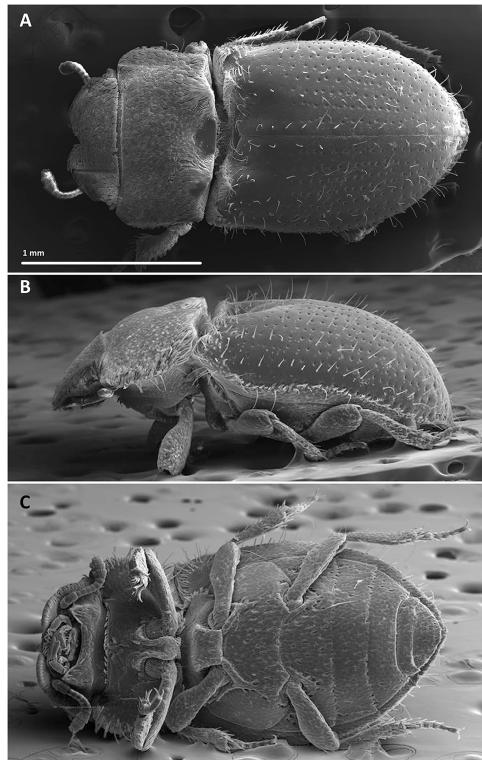


Fig. 5. *Alaudes mojavensis*. A) Dorsal habitus, B) Lateral habitus, C) Ventral habitus.

Description. Length 1.87 mm. width 0.9 mm. Color dark brown, luster opaque. **Head:** Transverse, broader behind, anterior margin broadly rounded, with central aspect concave. Laterally with slight indentation before eye level. Upper surface centrally, transversely, shallowly rounded, with concave indentations laterally, upper and lower surface completely covered with short, appressed scales. Mentum short, transverse, hexagonal, with lateral areas somewhat extended, covered centrally with appressed scales, ligula visible, with long, appressed scales oriented laterally. Maxillary and labial palps with apical segments elongate-oval.

Pronotum: About as broad as elytra, transverse. Surface covered with short, appressed scales except central aspect of base, which is bare and forms a broad hexagon, apex of bare area with small, shallow pore. Anterior margin slightly concave, lateral aspect with anterior angles produced antero-laterally, narrowly rounded, posteriorly narrowing, slightly concave before base. Posterior margin bearing longer, flattened setal clumps with long, appressed scales, clumps more pronounced in central bare area and on posterior lateral margin. Lateral aspect of pronotum with long, thin setae.

Elytra: Slightly inflated, surface punctate-striate, punctures small, set in even striae on disc, laterally becoming more confused; punctures small but impressed, more so near lateral margins. Alternate intervals mostly bare, with 7 series of long, thin setae. Anterior margin concave with 2 bare, depressed areas laterally and 1 centrally and 2 more elevated areas of concentrated scales corresponding to areas on posterior margin of thorax. **Venter:** Prosternal process vertically convex between procoxae, mesosternum not excavate; Prosternum bare except central aspect with rounded scales, extending laterally on prosternal process; metasternum covered with appressed setae, with few scattered punctures, extending to sterna; first visible sternite with 2 shallow grooves extending laterally from sternal base; sternal ratios (anterior to posterior midline) 1:0.7:0.5:0.3:0.6. **Legs:** Covered with short, appressed scales, with leg ratios (femur:tibia) pro- 1:0.6; meso- 0.8:0.7; meta-. 0.9:0.8. Tarsal length ratios as follows (base to apex): protarsus 1:1:1:1.2:7; mesotarsus 1.3:1.3:1.3:1.3:3; metatarsus 2.3:1.7:1.3:4. **Genitalia:** Male (Fig. 2D) with basal piece and parameres about equal in length; basal piece slightly broader than parameres, nearly flat. Parameres curved basally at midpoint.

Type Material. HOLOTYPE: Male. CALIFORNIA: Kern Co.: nr. Pearblossom, V-5-1980, Berlese 80-167 in Joshua tree. Deposited in CASC.

Other Material Examined. (227 specimens from 14 localities) – ARIZONA: Maricopa Co.: Gila Riv. at Airport Rd., 33°21'06"N, 112°30'13"W, IV-29-2011 to V-19-2011, (fake burrow) = black pitfalls, W. B. Warner (10) WBWC; same locality except barrier pit trap on river sand, W. B. Warner (5) WBWC; same locality except barrier pit trap on sandy area, W. B. Warner (1) WBWC; same locality except human dung baited pitfall trap, W. B. Warner (1) WBWC. CALIFORNIA: Inyo Co.: 2 mi. N, 2 mi. W Lone Pine, Alabama Hills, 4400', III-31 to IX-11-1981, Ethylene Glycol Pitfall Trap, D. Giuliani (1) RLAC; 2.3 mi. E. Big Pine, White Mountains, 4000', IV-25 to VII-22-1982, Antifreeze Pit Trap, D. Giuliani (1) CDFA; 4 mi. ESE Cantil, Fremont Valley, 2000' IV-16 to IX-7-1982, Ethylene Glycol Pit Trap, sand dunes, D. Giuliani (14) CDFA; same locality except X-7-1982 to IV-4-1984, Ethylene Glycol Pit Trap, sand dunes, D. Giuliani (1) CDFA; Owens River Gorge, 4450', V-12-1982 to XII-20-1982, Antifreeze Pitfall Trap, D. Giuliani (1) CASC; same data except (1) CDFA; Mono Co.: Inyo-White Mts., Westgard Pass, Poleta Cave, V-21 to XI-5-1988, Ethylene Glycol Pitfall Trap #1, R. L. Aalbu (1) RLAC; San Bernardino Co.: 17 mi. SE Baker, Cronise Valley, V-19 to VI-8-1980, Antifreeze Pit Trap on sand dune with creosote and sand verbenas, R. Hardy (2) CDFA;

Barstow, V-30-1941, G.P. Mackenzie (1) UCRC; Basin exit, 3 mi. ENE Cronise dry lk., IV-8/13-1993, pit trap at entrance of *Messor* nest, R. Aalbu (2) RLAC; same locality except pit trap at *Messor* nest, R. Aalbu (1) CDFA; same data except (99) RLAC; 35°05'47.7N, 116°15'42.6W, 3398' III-17/20-2011, pitfall traps, R. Aalbu (2) RLAC; same locality except IV-20/23-2011, pit trap at *Messor* nest, R. Aalbu (1) CIDA; same data except (48) RLAC; Bell Mountain, V-18 to VI-8-1980, Antifreeze Pit Trap along wash in *Hymenoclea* and Quail bush area, R. Hardy (8) CDFA; Pilot Knob Valley, 12 mi. S, 18 mi. E Trona, III-20-1992 to III-25-1993, Antifreeze Pit Trap on sand, D. Giuliani (2) CDFA; 2100', IV-1-1988 to IV-2-1989, Antifreeze Pit Trap, D. Giuliani (2) CDFA. UTAH: Washington Co.: 2 mi. E Washington, V-20 to VI-8-1980, Antifreeze Pit Trap on sand dune with creosote and sand verbenas, R. Hardy (2) CDFA.

Distribution. California, Mojave Desert, south-central Arizona, and southwestern corner of Utah.

Collection Data. Sandy areas or sand dunes. Often collected in pitfall traps at entrance to nests of *Messor pergandei* (Mayr) (Formicidae). Elevation range 600–1,400 m.

Alaudes coloradoensis Aalbu, Caterino, and Smith, new species

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(Figs. 1B, 2E, 6, 10, 11F)

Diagnosis. Lateral aspect of pronotum with short, clavate setae. Elytral vestiture slender and hair-like throughout, never clavate-lanceolate, of two sizes, length of longest setae equal to or longer than apical three antennomeres combined, always much longer than twice width; punctures fine, distance between punctures distinctly longer than size of puncture, body wider, larger. Anterior margin of head deeply excavate, lateral, basal aspect of head with sublateral indentation, pronotum with lateral apical aspect strongly expanded subapically, Colorado Desert species.

Description. Length 1.7 mm. width 0.79 mm. Color dark brown, luster opaque. **Head:** Transverse, much broader behind, anterior margin broadly rounded, with central aspect concave. Laterally with indentation before eye level. Upper surface transversely shallowly rounded, except for 2 shallowly concave areas postero-laterally; upper and lower surface completely covered with short, appressed scales. Antenna 11-segmented, compact, first 2 antennomeres broader than next 6, last 3 forming compact club. Mentum short, transverse, covered with appressed setae; ligula barely visible with long, antero-laterally produced scales. Maxillary palpi short, apical segment elongate-oval. **Pronotum:**

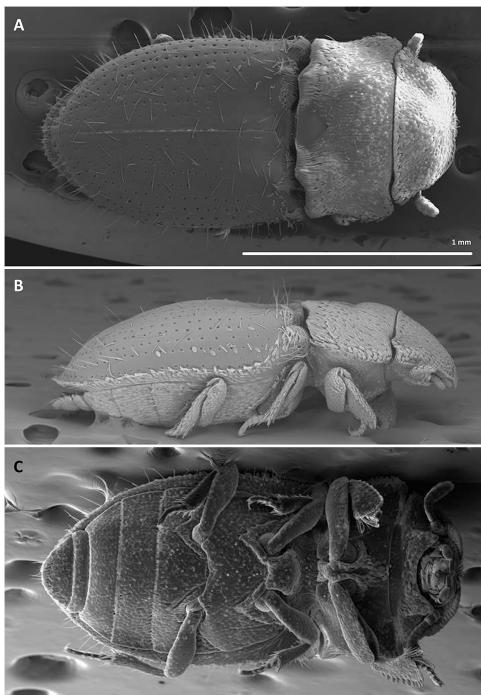


Fig. 6. *Alaudes coloradoensis*. A) Dorsal habitus, B) Lateral habitus, C) Ventral habitus.

About as broad as elytra, transverse. Surface covered with short, appressed scales except central aspect of base, which is bare and forms a broad hexagon, apex with small, shallow pore. Anterior margin nearly straight except 2 small, concave areas before lateral angles that are somewhat produced, lateral aspect anteriorly, broadly rounded, posteriorly concave before base. Posterior margin bearing longer, flattened setal clumps with long, appressed scales, clumps more pronounced in central bare area and on posterior lateral margin. Lateral aspect of pronotum with appressed scales. **Elytra:** Slightly inflated, surface punctate-striate, punctures small, set in even striae on disc, laterally becoming more confused; punctures small but impressed, more so near lateral margins. Alternate intervals mostly bare, with 7 series of long, thin setae. Anterior margin concave with 2 bare, depressed areas laterally and 1 centrally and 2 more elevated areas of concentrated scales corresponding to areas on posterior margin of thorax. **Venter:** Prosternal process vertically convex between procoxae, mesosternum not excavate; Prosterum bare except central aspect with rounded scales, extending laterally on prosternal process; metasternum covered with appressed setae, with few scattered punctures, extending to sterna; first visible sternite with 2 deep grooves extending laterally from sternal base; sternal ratios

(anterior to posterior midline) 1:0.8:0.6:0.3:0.7.

Legs: Covered with short, appressed scales, with leg ratios (femur:tibia) pro- 1:0.7; meso- 0.8:0.5; meta- 0.9:0.7. Tarsal length ratios as follows (base to apex): protarsus 1:1:1:1:2.3; mesotarsus 1:1:1:1:2.3; metatarsus 1.7:2:1.3:3.3. **Genitalia:** Male (Fig. 2E) with parameres longer than basal piece; basal piece and parameres broad. Basal piece nearly flat. Parameres only slightly curved basally and past midpoint.

Type Material. HOLOTYPE: Male. CALIFORNIA: Riverside Co.: Lamb Cyn., 2 mi. NW Gilman Hot Springs, 1,520', V-4-1987 to III-7-1988, Ethylene Glycol Pitfall Trap, K. Cooper. Deposited in CASC. **PARATYPES:** (15 specimens from four localities) – CALIFORNIA: Riverside Co., Lamb Cyn., 2 mi. NW Gilman Hot Springs, 1520', V-4-1987 to III-7-1988, Ethylene Glycol Pitfall Trap, K. Cooper (12) RLAC; same data except K. Cooper (2) RLAC; Painted Canyon, IX-13-1978 to I-7-1979, Ethylene Glycol Pit Trap in desert wash, Fred G. Andrews (1) CDFA; same locality except 500', IX-13-1978 to I-7-1979, Ethylene Glycol Can Trap, Sand Wash- *Larrea*-Paloverde, R. Aalbu (1) RLAC; same except data Ethylene Glycol pitfall trap at base of *Opuntia parryi*, Sand Wash-*Larrea*-Paloverde, Rolf Aalbu (1) RLAC; same locality except 501', I-1979 to XII-1979, Ethylene Glycol Can Trap, Sand Wash-*Larrea*-Paloverde, R. Aalbu (2) RLAC; Whitewater Cyn. Palm Oasis, 2100', V-18-1978 to IX-13-1979, Ethylene Glycol Pit Trap, F. Andrews & K. Cooper (1) CDFA; same locality except 2200', V-29 to IX-25-1976, Ethylene Glycol Can Trap: Dupont, trap 12, R. L. Aalbu (1) RLAC; same data except Ethylene Glycol Can Trap: Union Carbide, trap 16, R. L. Aalbu (1) RLAC.

Other Material Examined. CALIFORNIA, Riverside Co., Lamb Cyn., 2 mi. NW Gilman Hot Springs, 1520', V-4-1987 to III-7-1988, ethylene glycol pitfall trap, K. Cooper (2) RLAC.

Distribution. Restricted to the Colorado Desert in southern California.

Collection Data. In pitfall traps in desert washes, hillsides, at the base of *Opuntia parryi* Engelm. Sand wash with creosote bush and paloverde. Elevation range 150–700 m.

Alaudes moenkopi Aalbu, Caterino, and Smith, new species

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EAF48E82-E38B-4541-8525-9342E0A1ED7D
(Figs. 2F, 3, 7, 10, 11)

Diagnosis. Elytral vestiture composed of extremely short, recumbent and apically expanded setae with length subequal to twice width, giving a “string of pearls” aspect to the elytral intervals (Fig. 7).

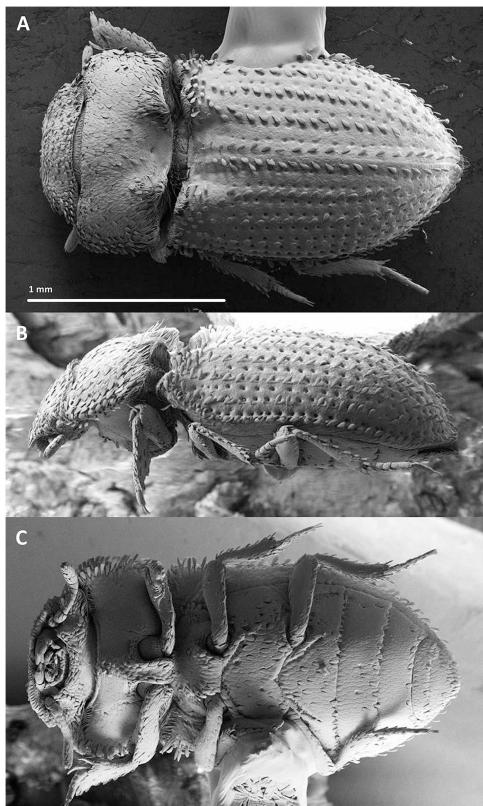


Fig. 7. *Alaudes moenkopi*. A) Dorsal habitus, B) Lateral habitus, C) Ventral habitus.

Description. Length 2.04 mm. width 0.94 mm. Color dark brown, luster opaque. **Head:** Transverse, broader behind, anterior margin broadly rounded, with central aspect straight. Laterally with indentation at eye level. Upper surface transversely, shallowly rounded, upper and lower surface completely covered with short, appressed scales. Eye reduced to single facet, positioned dorso-laterally but usually not visible from above. Antenna 11-segmented, compact, first 2 antennomeres broader than next 6, last 3 forming compact club. Mentum short, transverse, covered with appressed setae; ligula barely visible with laterally produced scales. Gular region with sides strongly produced anteriorly around mentum, anterior angles acute, apex between angles arcuate, concave, laterally depressed, forming groove for antenna. **Pronotum:** About as broad as elytra, nearly rectangular, transverse. Surface covered with short, appressed scales except central aspect of base, which is bare and forms a broad hexagon, apex with a small pore. Anterior margin straight, lateral aspect with anterior angles broadly rounded, only very slightly produced,

sides nearly straight. Posterior margin bearing 2 pairs of longer, flattened setal clumps, 1 positioned around central bare area and 1 on posterior lateral margin, both with moderately long, appressed scales. **Scutellum:** Small, visible, transverse, narrowly triangular. **Elytra:** Slightly inflated; surface punctate-striate, punctures set in uneven striae on disc, laterally becoming more confused; punctures contiguous, moderate in size, impressed near lateral margins. Surface appearing bare except for alternate intervals which have series of short, tear drop-shaped, appressed scales giving appearance of “string of pearls”. Anterior margin concave with 2 bare, depressed areas midlaterally and 1 centrally and 4 alternately elevated areas of short scales corresponding to areas on posterior margin of thorax. **Venter:** Prosternal process vertically convex between procoxae, mesosternum not excavate; Prosternum bare except central aspect with rounded scales extending on prosternal process; metasternum with few scattered punctures, extending to first 3 visible sternite; first visible sternite with 2 deep grooves extending laterally from sternal base; sternal ratios (anterior to posterior midline) 1:0.7:0.6:0.3:0.5. **Legs:** Leg ratios (femur:tibia) pro- 1:0.8; meso- 1:0.7; meta- 1.1:0.8. Tarsal length ratios (base to apex): protarsus 1:1:1:1:3; mesotarsus 1:1:1:1:4; metatarsus 2:1.7:1.3:5. Genitalia: Male (Fig. 2F) with parameres longer than basal piece; basal piece slightly broader than parameres, nearly flat. Parameres curved basally at midpoint. Female (Fig. 3) lacking external genitalia. Internal tract with bursa, spermatheca multiple, lateral; spermathecal accessory gland apical.

Type Material. HOLOTYPE: Male. ARIZONA: Coconino Co.: Hwy 264, 2.3 km SE Moenkopi, $36^{\circ}05'58''$, $111^{\circ}12'01''$ W, 4,700', IV-20-2012, found crawling on sand of sand dunes at night, J. P. Gruber. Deposited in CASC. **PARATYPES:** (15 specimens from seven localities) – ARIZONA: Coconino Co.: Hwy 264, 2.3 km SE Moenkopi, $36^{\circ}05'58''$, $111^{\circ}12'01''$ W, 4700', IV-20-2012, found crawling on sand of sand dunes at night, J. P. Gruber (8) JPGC; Moenkopi dunes, 2.4 mi. S Moenkopi, VII-17-1975, F. G. Andrews & A. R. Hardy (1) CDFA; 2 mi. S. Moenkopi, VII-3-1972, F. G. Andrews & E. A. Kane (1) CDFA. UTAH: Emery Co.: 17 mi. N Hanksville, dunes nr. Glison Butte Well, VII-26-1978, F. G. Andrews & A. R. Hardy (1) RLAC; San Rafael Desert, 14 mi. N Hanksville, 5200', III-IX-1985, Antifreeze Pitfall Trap, D. Giuliani (1) CDFA; San Rafael Desert, Little Flat Rock Mesa, 18 mi. NE Hawkville, 6000', IX-1986 to IX-1987, Antifreeze Pitfall Trap, D. Giuliani (1) RLAC; Washington Co.: Sand Hollow Rd. E entrance State Park, $27^{\circ}06'06''$ N, $113^{\circ}21'13''$ W, IV-3-2012 to V-19-2012, barrier pitfalls, W. B. Warner (1) WBWC.

Other Material Examined. ARIZONA: Coc-nino Co.: Hwy 264, 2.3 km SE Moenkopi, 36°05'58"N, 111°12'01"W, 4,700', IV-20-2012, J. P. Gruber (2) JPGC.

Distribution. Restricted to the Colorado Plateau in northern Arizona and southern Utah.

Collection Data. Mainly collected in pitfall traps, although some were found crawling on sand dunes at night. Elevation range 1,400–1,850 m.

Alaudes vizcainensis Aalbu, Caterino, and Smith, new species

Zoobank.org/urn:lsid:zoobank.org:act: 02C8F9AB-FB8D-440C-81A4-04C759715D28 (Figs. 1D, 8, 10)

Diagnosis. Elytral vestiture erect, slender and hair-like throughout, setae always much longer than twice width; lateral aspect of pronotum slender, with hair-like setae; pronotum regularly slightly expanding anteriorly, anterior angles acute (Fig. 8).

Description. Length 1.86 mm. width 0.86 mm. Color dark brown, luster opaque. **Head:** Transverse, broader behind, anterior margin broadly rounded, with central aspect concave. Laterally with indentation at eye level. Upper surface transversely shallowly rounded, upper and lower surface

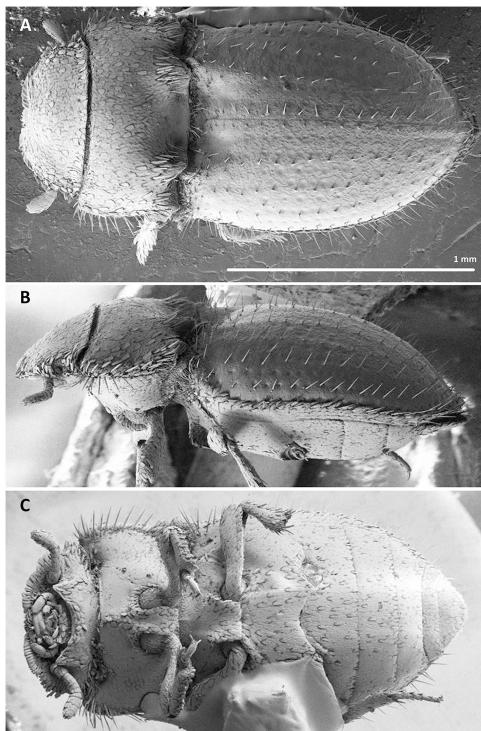


Fig. 8. *Alaudes vizcainensis*. A) Dorsal habitus, B) Lateral habitus, C) Ventral habitus.

completely covered with short, appressed scales. Mentum short, transverse, covered with appressed setae; ligula barely visible with long, laterally produced scales. Maxillary palpi short, apical segment elongate-oval. **Pronotum:** About as broad as elytra, nearly rectangular, transverse. Surface covered with short, appressed scales except central aspect of base, which is bare and forms a broad hexagon, apex with small pore. Anterior margin very slightly concave, lateral aspect with anterior angles not produced, broadly rounded laterally, posteriorly narrowing, very slightly concave before base. Posterior margin bearing 2 pairs of longer, flattened setal clumps, 1 positioned around central bare area with very long, appressed scales and 1 on posterior lateral margin with moderately long, appressed scales. **Elytra:** Slightly inflated, surface finely punctate-striate, punctures set in nearly even striae on disc, laterally becoming more confused; punctures small, more impressed near lateral margins. Intervals appearing mostly bare, with series of long, fine setae. Anterior margin concave with 2 more depressed areas midlaterally and 1 centrally and 4 alternately elevated areas of concentrated scales corresponding to areas on posterior margin of thorax. **Venter:** Prosternal process vertically convex between procoxae, mesosternum not excavate; Prosternum bare except central aspect with rounded scales extending on prosternal process; metasternum with few scattered punctures, extending to first 3 visible sterna; first visible sternite with barely visible grooves extending laterally from sternal base; sternal ratios (anterior to posterior midline) 1:7:0.4:0.3:0.5. **Legs:** Leg ratios (femur:tibia) pro- 1:0.8; meso- 1.1:1; meta- 1.3:1.1; Tarsal length ratios (base to apex): protarsus 1:1:1:1; 2.3; mesotarsus 1:1:1:3; metatarsus 3:1.3:1.3:4.

Type Material. HOLOTYPE: Male. MEXICO: BAJA CALIFORNIA SUR: 7 km N Rancho Tablon, 27°37'N, 113°21'W, 130 m, III-18-1991 to VII-13-1991, Ethylene Glycol Pitfall Trap #2, W. H. Mary H., Cynthia J., Karen D. Clark & Jane E. Luther. Deposited in CASC.

PARATYPES: (Four specimens from three localities) – MEXICO: BAJA CALIFORNIA: 11.3 km N Guerrero Negro, IV-1976 to V-1977, Ethylene Glycol Pitfall Trap, Sand dunes, R. L. Aalbu (1) RLAC; 14 km S. Rosarito, 28°30'N, 114°02'W, IV-8.1998 to IV-9.1998, desert, assoc. with *Pheidole vistana*, A. V. Suarez (1) RLAC. BAJA CALIFORNIA SUR: 22 km SW Vizcaina, 27°34'N, 113°21'W 40 m, VII-6-1991 to V-14-1992, Ethylene Glycol Pitfall Trap, W. H. Clark & P. E. Blom (1) CIDA; 7 km N Rancho Tablon, 27°37'N, 113°21'W, 130m, III-12-1986 to III-18-1991, Ethylene Glycol Pitfall Trap, W. H. & Ellen M. Clark (1) CIDA.

Distribution. Mexico, southern Baja California and northern Baja California Sur.

Collection Data. In pitfall traps in sand dunes; *Pheidole vistana* Forel (Hymenoptera: Formicidae) association. Elevation range 40–130 m.

***Alaudes alternata* Fall, 1928**
(Figs. 9E–F, 10, 11C)

Diagnosis. Elytral vestiture erect, always much longer than twice width, feebly clavate except along the side margins, where these alternate with long, slender setae. Male genitalia unknown.

Material Examined. (Two specimens from three localities) – CALIFORNIA: Los Angeles Co.: Pomona, II-25-1895, Hubbard & Schwartz (1) USNM; same data except II-18-1895 (1) OSUC.

Distribution. Only known from the type locality, Pomona in Los Angeles County, California.

Collection Data. None. Elevation range approximately 300 m.

***Alaudes setigera* Blaisdell, 1919**
(Figs. 2B, 9C–D, 10, 11A)

Diagnosis. Lateral aspect of pronotum with short, clavate setae (Fig. 9D). Elytral setae slender and hair-like throughout, occasionally varying to feebly

clavate-lanceolate, especially toward the sides and apex (Fig. 9C); setae uniform in length, vestiture always much longer than twice width, length of longest setae equal to or shorter than apical two antennomeres combined; punctures deep, well defined, distance between punctures about equal to size of puncture. Parameres (Fig. 2B) longer than basal piece; basal piece slightly broader than parameres, curved basally. Parameres gradually curved basally.

Material Examined. (503 specimens from 70 localities) – ARIZONA: no data, F. Pusa colln. (1) FMNH; Santa Cruz Co.: Washington Camp, K. Stephan (12) FSCA; CALIFORNIA: Fresno Co.: 7 mi. W Kerman, II-9 to IX-19-1979, Ethylene Glycol Pit Trap, A. J. Gilbert (1) CDFA; 8 mi. NW Coalinga in Los Gatos canyon, V-3 to VIII-7-1981, Ethylene Glycol Pit Trap, R. L. Aalbu (1) CISC; San Joaquin River Gorge, 37°05'46"N, 119°32'06"W, 345m, V-12-2012, Berlese Leaf Litter, K. Will (1) CISC; Inyo Co.: 2 mi. N, 2 mi. W Lone Pine, Alabama Hills, 4400', III-31 to X-11-1981, Ethylene Glycol Pitfall Trap, D. Giuliani (1) RLAC; 4 mi. N, 4 mi. E Big Pine, White Mts., 5000', II-27 to VIII-28-1984, Antifreeze Pit Trap, D. Giuliani (10) CDFA; same locality except V-7 to XI-3-1983,

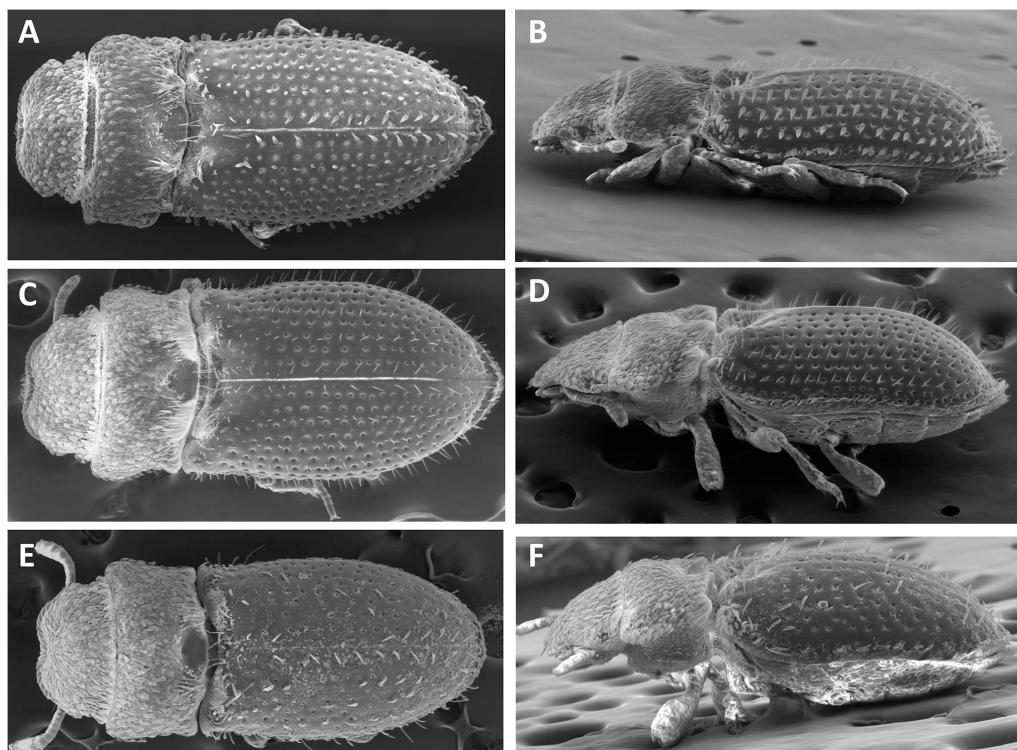


Fig. 9. *Alaudes* species. A) *singularis*: A) Dorsal habitus, B) Lateral habitus; *A. setigera*: C) Dorsal habitus, D) Lateral habitus. *A. alternata*: E) Dorsal habitus, F) Lateral habitus.

Ethylene Glycol Pitfall Trap, D. Giuliani (1) RLAC; same locality except VI-11 to X-1-1985, Antifreeze Pit Trap, D. Giuliani (10) CDFA; same locality except VIII-28-1984 to VI-11-1985, Antifreeze Pit Trap, D. Giuliani (1) CDFA; same locality except X-1-1985 to VI-28-1986, Antifreeze Pit Trap, D. Giuliani (1) CDFA; 5 mi. N, 2 mi. W Bishop, 4500', V-12 to IX-19-1982, Antifreeze Pit Trap, D. Giuliani (1) CDFA; 6 mi. S, 4 mi. E Oasis Fish Lake Valley, 5200', IV-8 to VI-25-1982, Ethylene Glycol Pitfall Trap, D. Giuliani (1) CISC; same locality except VI-24 to VIII-8-1982, Ethylene Glycol Pitfall Trap, D. Giuliani (1) CISC; Death Vly. Nat. Mon. Daylight Pass, 7063', III-14-1979 to VIII-15-1981, Antifreeze Pit Trap, D. Giuliani (4) CDFA; Inyo Mts., Lead Canyon, 6000', VIII-13 to XII-21-1981, Ethylene Glycol Pitfall Trap sage brush, canyon bottom, D. Giuliani (7) CDFA; same locality except III-9 to VIII-13-1981, Ethylene Glycol Pitfall Trap, D. Giuliani (2) RLAC; same locality except III-9 to VIII-13-1981, Ethylene Glycol Pitfall Trap, D. Giuliani (2) RLAC; Lower Lead Canyon, 6000', IV-4 to IX-12-1980, Antifreeze Pit Trap sage brush, canyon bottom, D. Giuliani (2) CDFA; Inyo Mts., Whippoorwill Cyn., 6200' V-25-1983 to VI-11-1984, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Inyo Mts., Willow Springs Cyn., 1.5 mi. N, 6.5 mi. E Independence, 4600', XII-6-1984 to XII-20-1986, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Saline Range, 7063', III-14-1979 to VIII-15-1981, Antifreeze Pit Trap, D. Giuliani (5) CDFA; same locality except III-14-1979 to V-2-1983, antifreeze pit trap, D. Giuliani (1) CISC; White Mts., 4 mi. N, 4 mi. E Big Pine, 5000' II-27 to VIII-28-1984, Antifreeze Pit Trap, D. Giuliani (1) CDFA; same locality except VI-11 to X-1-1985, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Kern Co.: 1 mi. S McKittrick, V-3 to VIII-7-1981, Ethylene Glycol Can Trap, R. L. Aalbu (2) RLAC; 2 mi. W Devil's Den III-19-1975, J. Doyen (12) CISC; 3 mi. E Glenville, Alta Sierra Camp, III-2-1979, berlese oak litter, A. J. Gilbert (1) CDFA; 7 mi. W Buttonwillow, III-13 to IX-6-1979, Ethylene Glycol Pit Trap, A. J. Gilbert & D. Poore (1) CDFA; 8 mi. NNW Coalinga in Los Gatos canyon, V-3 to VIII-7-1981, Ethylene Glycol Can Trap, on sand under cliffs with swallow nests, R. L. Aalbu (3) RLAC; Boron, VI-26-1987 to XI-28-1988, Antifreeze Pit Trap, J. McLaughlin (1) CDFA; China Lake, lower dunes, 8 mi. N, 3 mi. Ridgecrest, 2200', IV-13 to VI-29-1982, Ethylene Glycol Pitfall Trap, D. Giuliani (1) RLAC; Sequoia NF, Black Gulch, 35.5312°N, 118.6635°W, II-27-2004, *Quercus/Pinus* litter, M. Caterino (1) SBMN; Kings Co.: 4.8 mi. W Kettleman City, VI-13-1970, pit trap, Fred G. Andrews & M. S. Wasbauer (8) CDFA; 1 mi. S Kettleman City, IV-4 to V-9-1979, Antifreeze Pit Trap, A. J. Gilbert & L. Bookout (3) CDFA; Los

Angeles Co.: Pasadena (4) CASC; same data except (4) CUIC; same data except H. C. Fall (1) FMNH; same data except (2) CASC; same data except I-25-1917 (1) CASC; same data except J. O. Martin (8) CASC; same data except III (1) CASC; same data except III-14-1917 (1) CASC; same data except III-5-1915, near but not setigera det H. B. Leech 63' (1) CASC; Madera Co.: Exp. Rge. 21 mi. NE Madera, I-25-1974, D. J. Burdick (1) CASC; same locality except III-14-1974, D. J. Burdick (2) TAMU; same data except (3) CASC; same locality except IV-31-1974 (1) CASC; same locality except XI-30-1973 (5) CASC; San Joaquin Exp. Sta., XII-11-1974, C. Burdick (1) CASC; San Joaquin Experimental Range USDA, XI-30-1973, D. J. Burdick (1) CASC; Merced Co.: Los Banos Creek, 400', IV-1 to V-18-1987, Antifreeze Pit Trap N side creek, D. Giuliani (8) CDFA; Mono Co.: 9 mi. N Bishop, Fish Slough, 4200', V-12 to XII-20-1982, Ethylene Glycol Pit Trap, sand dune, D. Giuliani (2) CDFA; same locality except V-9 to VIII-9-1987, Antifreeze Pit Trap, sand dune, D. Giuliani (2) CDFA; White Mts., Coldwater Canyon, V-21 to XI-15-1983, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Riverside Co.: 0.5 mi. SE Aguanga, 2000', I-7-1979 to XII-23-80, Ethylene Glycol Pitfall Trap rocky hillside, Chaparral Scrub, R. L. Aalbu (16) RLAC; 2 mi. NW Gilman Hot Springs, II-III-1980, Antifreeze Pit Trap, F. Andrews (5) CDFA; same locality except V-1 to VIII-9-1981, Antifreeze Pit Trap, R. L. Aalbu (1) CASC; same data except (16) CISC; Gilman Hot Springs, V-3/VIII-7-1981, Antifreeze Pit Trap, R. L. Aalbu (1) CDFA; Box Springs, VI-11-1979, B. & E. McKay (1) CDFA; Lamb Cyn., 2 mi. NW Gilman Hot Springs, V-18-1978 to XI-13-1979, Antifreeze Pit Traps, F. Andrews (10) CDFA; same locality except 1520', V-4-87 to III-7-88, Ethylene Glycol can trap, R. L. Aalbu (1) RLAC; same data except Ethylene Glycol Pit Trap, F. Andrews & K. Cooper (5) CDFA; same data except 1520', III-4-1979 to XII-23-1980, Ethylene Glycol Pitfall Trap hillside coastal sage scrub, R. L. Aalbu (5) CDFA; same data except (31) RLAC; same data except at base of *Opuntia parryi* (42) RLAC; same locality except III-7/XI-27-1888, Ethylene Glycol Can Trap at base of *Opuntia parryi*, R. L. Aalbu (13) CDFA; Prado Dam, V-4-1963, Berlese oak duff, I. M. Newell (1) CDFA; San Benito Co.: 1.8 mi. SW Idria, III-25 to VI-8-1981, Antifreeze Pit Trap under Manzanita, A. J. Gilbert & N. Smith (2) CISC; 15 mi. S New Idria, II-1983 to II-1984, Antifreeze Pit Trap, A. J. Gilbert & N. Smith (1) CDFA; 8.2 mi. W Panoche, Panoche Valley, 1979, A. J. Gilbert (6) RLAC; San Bernardino Co.: 49 Palm Oasis, 2800', X-25-75 to II-14-1976, Ethylene Glycol Can Trap: Union Carbide, trap 13, R. L. Aalbu (1) RLAC; San Diego Co.: 1 mi. W. Warner's Ranch, 2700', I-7-1979 to XII-23-80, Ethylene Glycol Can Trap

Oak-Manzanita, oak litter, rocky area, R. L. Aalbu (3) CASC; same data except (4) RLAC; 9 mi. S Pine Valley, XII-19-1965, N. Ueshima & P. Rubzoff (1) CNCI; Tulare Co.: Ducor, XII-16-1954, R. P. Allen (1) CDFA; Kaweah Power Sta., XI-16-1971, berlese oak duff, F. Andrews (1) CDFA; Kingsburg, I-30-1936, *Ephesia* soil hibernac, H. C. Donahoe (1) USNM; Yolo Co.: 6 mi. N. Rumsey, II-9-1960, L. M. Smith (1) CNCI. NEVADA: Clark Co.: Hwy 167 W Jct. Rt. 2, 36°26'17"N, 114°24'43"W, 430m, VIII-18-2008, pitfall GYP5sh, Suazo & Ibarra (1) UCRC; Lyon Co.: Fort Churchill State Historic Park, 39°17'N, 119°16'W, 1280m, VII-9-2000, under log, sagebrush-riparian, ex *Crematogaster lespera* nest, P. S. Ward (1) RLAC; same locality except VII-6-2000, under stone, sagebrush-riparian, associated with *Solenopsis molesta* colony, P. S. Ward (1) UCDC. NEW MEXICO: San Juan Co.: Ship Rock, 6500', III-IX-1985, Antifreeze Pit Trap, D. Giuliani (1) CDFA. MEXICO: BAJA CALIFORNIA: 10.7 km. E El Rosario, 30°05'35"N, 115°38'25"W, 160m, IV-1-1985 to III-2-1986, Ethylene Glycol Pitfall Trap #1, W. H. Clark & P. E. Blom (2) CIDA; 11 km. air ENE El Rosario, 30°04'40"N, 115°36'36"W, 140 m, I-8-1984 to IV-2-1985, Ethylene Glycol Pitfall Trap #2, W. H. Clark & P. E. Blom (1) CIDA; same locality except II-7-1984 to IV-2-1985, Ethylene Glycol Pitfall Trap #1, W. H. Clark & P. E. Blom (1) CIDA; same data except Trap #2 (3) CIDA; same data except Trap #3 (8) CIDA; same locality except III-21-1986 to XII-18-1988, Ethylene Glycol Pitfall Trap #2, W. H. Clark & P. E. Blom (1) CIDA; same locality except III-9-1991 to VII-18-1991, Ethylene Glycol Pitfall Trap #2, W. H. Mary H., Karen D. Clark & Jane E Luther (1) CIDA; same data except Trap #3 (1) CIDA; same locality except IV-1-1985 to III-2-1986, Ethylene Glycol Pitfall Trap #2, W. H. Clark & P. E. Blom (7) CIDA; same data except Trap #3 (26) CIDA; same data except Trap #4 (15) CIDA; same locality except VI-22-1990 to III-9-1991, Ethylene Glycol Pitfall Trap #1, W. H. & Ellen M. Clark (1) CIDA; same data except Trap #3 (1) CIDA; same locality except VII-18-1991 to V-28-1992, Ethylene Glycol Pitfall Trap #1, W. H. Clark, P. E. Blom & D. M. Ward (1) CIDA; 11.7 km E El Rosario, 30°04'30"N, 115°37'55"W, 180 m, VIII-27-1989 to IV-27-1990, Ethylene Glycol Pitfall Trap #3, W. H. Clark & P. E. Blom (1) CIDA; same locality except I-3-1989 to VIII-27-1989, Ethylene Glycol Pitfall Trap #1, W. H. Clark & Stan Siewert (1) CIDA; same locality except II-7-1984 to IV-2-1985, Ethylene Glycol Pitfall Trap #2, W. H. Clark & P. E. Blom (7) CIDA; same locality except III-21-1986 to XII-18-1988, Ethylene Glycol Pitfall Trap #2, W. H. Clark & P. E. Blom (4) CIDA; same locality except IV-1-1985 to III-2-1986, Ethylene Glycol Pitfall Trap #2, W. H. Clark & P. E. Blom (9) CIDA; same locality except VI-22-1990 to III-9-1991, Ethylene Glycol Pitfall Trap #2, W. H. & Ellen M. Clark (1) CIDA; Arroyo Canada el Aguajito, 30°04'30"N, 115°36'36"W, 140m, IV-1-1985 to III-2-1986, Ethylene Glycol Pitfall Trap #1, W. H. Clark & P. E. Blom (3) CIDA; Arroyo El Sauce, 30°03'N, 115°25'W, 500 m, III-31-2012 to XI-27-2012, Ethylene Glycol Pitfall Trap #1, D. Ward & A. Gillogly (3) CIDA; km 91 Arroyo El Sauce, 30°03'N, 115°25'W, 500 m, III-9-1991 to VII-18-1991, Ethylene Glycol Pitfall Trap, W. H. Mary H., Karen D. Clark & Jane E Luther (1) CIDA; same locality except VII-18-1991 to V-28-1992, Ethylene Glycol Pitfall Trap, W. H. & Ellen M. Clark, P. E. Blom, D. M. Ward (1) CIDA; same locality except XII-16-2006 to V-17-2007, Ethylene Glycol Pitfall Trap #1, D. Ward & A. Gillogly (13) CIDA; same data except Ethylene Glycol Pitfall Trap #2, D. Ward & A. Gillogly (13) CIDA; km 127, 1.5 km SW Guayaquil, 29°57'N, 115°06'W, 600m,

III-10-1991 to VII-3-1991, Ethylene Glycol Pitfall Trap, W. H. Mary H., Karen D. Clark & Jane E Luther (1) CIDA; same locality except III-9-1988 to I-3-1989, Ethylene Glycol Pitfall Trap, W. H. Clark & P. E. Blom (1) CIDA; km 95, 30°03'51.6"N, 115°25'30.2"W, 480 m, XII-13-2007 to IV-26-2008, Ethylene Glycol Pitfall Trap #2, W. H. Clark (1) CIDA; Mesa Palmarito, 29°47'N, 114°44'W, 800 m, II-19-2011 to IV-5-2012, Ethylene Glycol Pitfall Trap #1, W. H. Clark (1) CIDA; same data except Ethylene Glycol Pitfall Trap #4, W. H. Clark (6) CIDA; 1 mi. E Guillermo Prieto, 27°48'32"N, 113°18'31"W, III-14 to VI-19-1999, Ethylene Glycol Pitfall Trap, R. Aalbu & F. Piñero (1) RLAC; SONORA: Nogales, IV-24-1967, C.H. Spitzer (1) USNM.

Variation. There is much variation in scale/seta size. In an Arizona series of specimens, the scales are more linear anteriorly and more scaly posteriorly. In a series from San Diego County, California near Warner's Springs, specimens have distinctly shorter and vaguely scale-like setae. In Kern County specimens, the basal elytral declivity is shallower and does not extend very far back, the basal pronotal declivity is less abrupt, broader, and not as long, and the setae are much more hair-like and elongate. In addition, the setae of the middle elytral elevation do not extend to the dorsal apex.

Distribution. Widespread in central and southern California, western Nevada, southern Arizona, northwestern New Mexico, and northern Sonora and Baja California in Mexico.

Collection Data. Some specimens were collected directly with ants in the genera *Crematogaster* Lund and *Pheidole* Westwood. Specimens were also berlesed or sifted from duff of manzanita, *Ceanothus*, oak, and pine. Collected in pitfall traps in the following habitats: Sand Wash- creosote-Paloverde, cheesebush and quail bush area, "in Joshua tree", "at base of *Opuntia parryi* [Engelm.]", "Ephestia soil hibernac", "hillside coastal sage scrub", "Oak-Manzanita", "Chaparral Scrub", "sage brush", "rocky hillside", "on sand under cliffs with swallow nests", "*Artemesia tridentata* Nutt.", "*Atriplex* [L.]-*Franseria* [= *Ambrosia* L.]", bigcone Douglas fir, "moss under shrubs", "*Rhamnus* [L.] sp.". Also found crawling on sand dunes at night. Elevation range 125–2,200 m.

Alaudes singularis Horn, 1870

(Figs. 1F, 2A, 9A-B, 10, 11B)

Alaudes squamosa Blaisdell 1919: 309. NEW SYNONYMY.

Alaudes testacea Blaisdell 1919: 311. NEW SYNONYMY.

Alaudes fallax Fall 1928: 148. NEW SYNONYMY.

Diagnosis. Lateral aspect of pronotum with short, clavate setae. Elytral vestiture always much longer than twice width, clavate to capitate throughout. Male genitalia (Fig. 2A) with basal piece and parameres about equal in length; basal piece broader than parameres, slightly bent basally, then recurved. Parameres gradually curved basally.

Material Examined. (349 specimens from 98 localities) – No Data (1) FMNH; ARIZONA: Cochise Co.: Chiricahua Mts., X-6-1962, E. A. Maynard (1) CASC; Dragoon Mts. East Stronghold, V-10-1975, K. Stephan (7) FSCA; W. Stronghold, V-30-1973, K. Stephan (2) FSCA; S. W. Research Sta. Chiricahua Mts., X-9-1961, E. A. Maynard (1) CASC; Pima Co.: Catalina Mts., 32.45633°N, 110.73994°W, V-19-2011 (1) UAIC; Gen. Hitchcock Campground, VIII-27-1974 (1) CASC; Redington Pass, IV-11-1976, Karl Stephan (11) FSCA; Santa Cruz Co.: Madera Cyn., VI-10-1971, R. Lenzcy (1) USNM. CALIFORNIA: Alameda Co.: (1) CASC; Fresno Co.: 2 mi. N Tollhouse, XI-28-1977, ex. *Ceanothus* duff, A. J. Gilbert (1) CDFA; 3.5 mi. NE Auberry, I-2 to XI-28-1981, Antifreeze Pit Trap, near *Rhamnus* sp., A. J. Gilbert & N. Smith (1) CDFA; Dalton Creek, 4800' IV, 14, 1920, H. Dietrich (1) CASC; Inyo Co.: Argus Mts., (1) USNM; 2 mi. N, 2 mi. W Lone Pine, Alabama Hills, 4400' III-31 to IX-11, 1981, Ethylene Glycol Pitfall Trap, D. Giuliani (1) CASC; 2.5 mi. NNW Big Pine, 3900' IV-20 to VII-27, 1981, Antifreeze Pit Trap, on sand dune, D. Giuliani (1) CDFA; 3 mi. N. Lone Pine, V-8, IX-4, 1980, Antifreeze Pitfall Trap, sand dune, D. Giuliani (1) CDFA; 3.5 mi S, 4 mi. W Big Pine, 6300' IV-25 to VIII-2, 1982, Antifreeze Pit Trap, D. Giuliani (1) CDFA; 4 mi. N Lone Pine, II-23 to VI-1, 1979, Antifreeze Pitfall Trap, sand dune, D. Giuliani (1) CDFA; 4 mi. N, 2.5 mi. W Deep Springs College, Gilbert Summit, 6400' III to IX, 1983, Antifreeze Pitfall Trap, D. Giuliani (1) CDFA; same locality except III-28 to X-1, 1982, Ethylene Glycol Pit Trap, D. Giuliani (1) CASC; 6 mi. W Independence, Gray's Meadow, 4500' IV-10-2008, Pit Trap-Rotting chicken, M. Caterino (1) SBMN; Big Pine Creek, 2.5 mi. S, 6 mi. W Big Pine, 37°07.542'N, 118°23.396'W, 7000' VII-10 to IX-17, 1998, Ethylene Glycol Pit Trap, R. L. Aalbu (3) RLAC; Inyo Mts., 2 mi. W Cowhorn Valley, 7500' IV-25 to VII-5, 1983, Ethylene Glycol Pit Trap, D. Giuliani (1) CASC; Inyo Mts., Lead Canyon, 6000' III-9 to VIII-13, 1981, Ethylene Glycol Pit Trap, D. Giuliani (2) RLAC; Inyo Mts., Whippoorwill Canyon, 6100' V-5 to VIII-13, 1982, Ethylene Glycol Pit Trap, D. Giuliani (1) CDFA; same locality except 6200' V-25-1983 to VI-11-1984, Antifreeze Pit Trap, D. Giuliani (7) CDFA; Owens Lake Valley, VI-15 to VII-15, 1978, Ethylene Glycol Pit Trap, *Atriplex-Franseria* association (AF), Andrews, Hardy & Giuliani (1) CDFA; Owens

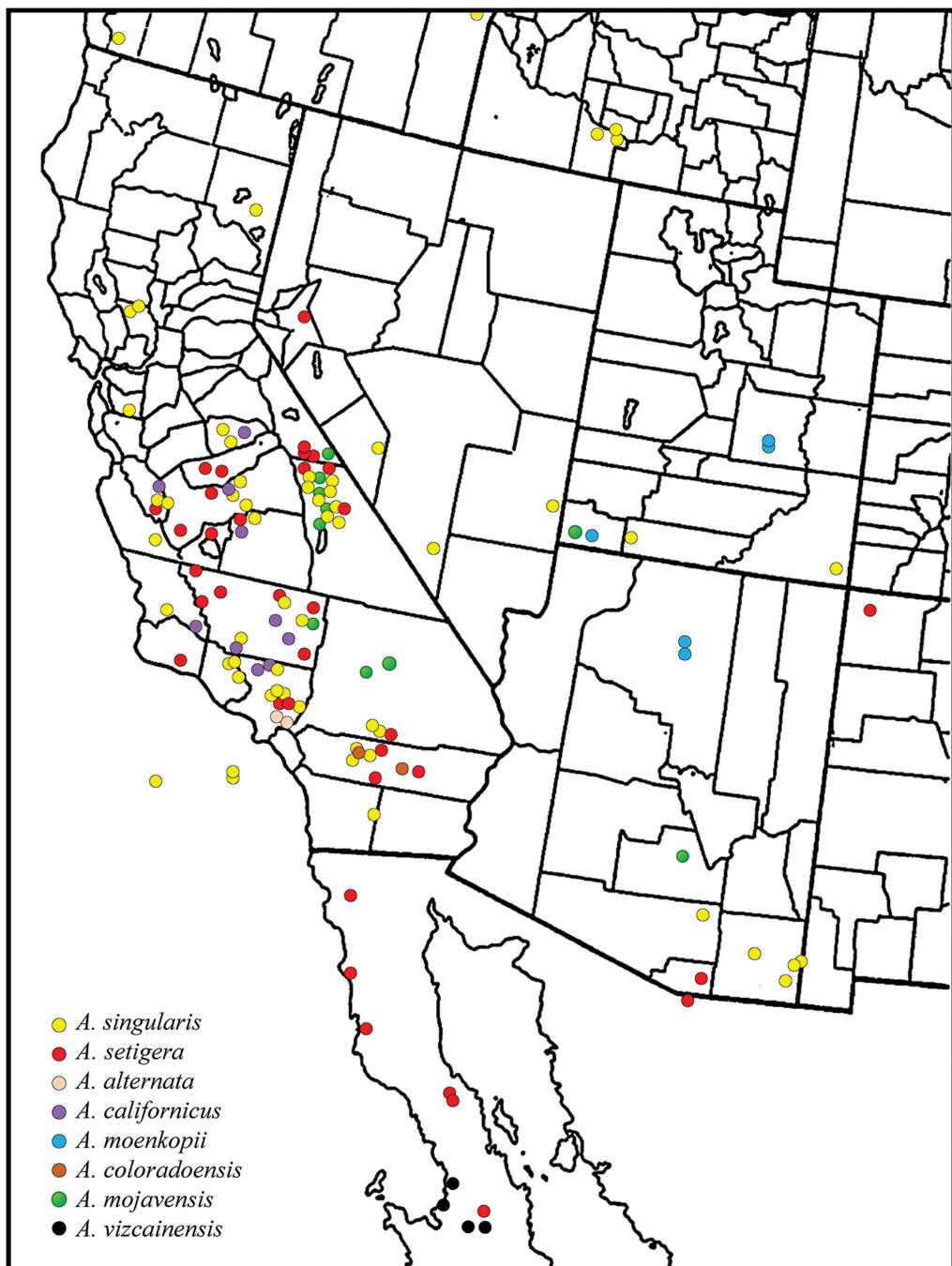


Fig. 10. Distribution of *Alaudes* species. Purple circles = *A. californicus*; Green circles = *A. mojavensis*; Brown circles = *A. coloradoensis*; Blue circles = *A. moenkopi*; Black circles = *A. vizcainensis*; Yellow circles = *A. singularis*; Red circles = *A. setigera*; Tan circles = *A. alternata*.

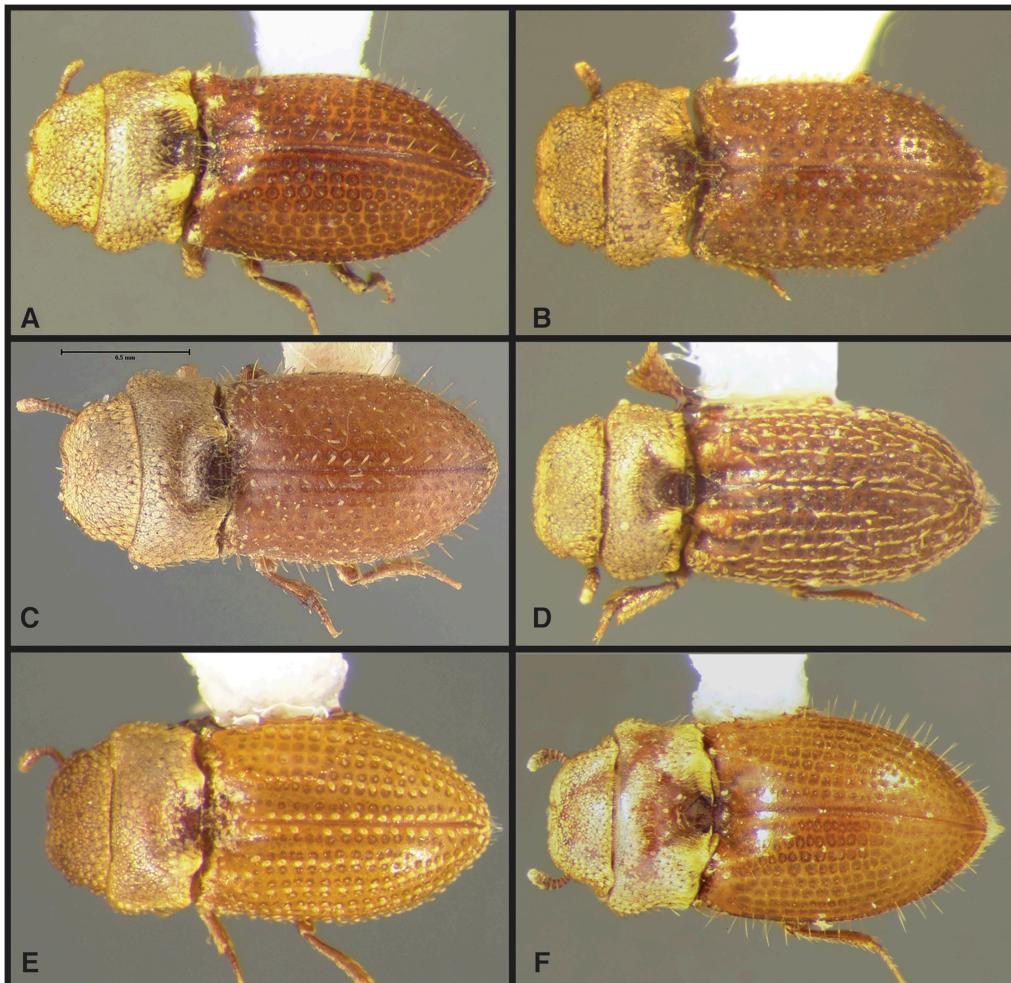


Fig. 11. *Alaudes* species, habitus. A) *A. setigera*, B) *A. singularis*, C) *A. alternata* (type), D) *A. californicus*, E) *A. moenkopi*, F) *A. coloradoensis*.

Valley 1.5 mi. N, 3.5 mi. W Swansea, 3600' XII-18-1986 to XI-5-1987, Antifreeze Pitfall Trap, D. Giuliani (1) CDFA; Owens Valley 5 mi. SE Big Pine, 3900' II-1983 to II-1984, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Owens Valley, Turtle Creek, 4250' XI-26-1982 to VIII-24-1984, Antifreeze Pitfall Trap, D. Giuliani (1) CDFA; Saline Valley, Grapevine Canyon, 5000' XI-29-1986 to XI-27-1987, Antifreeze Pitfall Trap, D. Giuliani (1) CDFA; same locality except V-25 to VIII-15-1981, Ethylene Glycol Pit Trap, D. Giuliani (2) CDFA; same locality except 5700' VII-7 to XI-26, 1982, Ethylene Glycol Pit Trap, G10, D. Giuliani (2) CDFA; same locality except G11, D. Giuliani (3) CDFA; same locality except 5900' XI-23-1983 to IV-20-1985, Antifreeze Pitfall Trap, D. Giuliani (1) CDFA; Sierra Nevada

Range, 2.5 mi. S, 8.5 mi. W Big Pine, 8400' XI-4-1983 to IV-13-1984, D. Giuliani (1) CDFA; 3 mi. S, 4 mi. W Big Pine, 6300' IV-16 to X-6, 1985, Antifreeze Pitfall Trap, D. Giuliani (3) CDFA; Horton Creek Rd., 13 mi. WSW Bishop, 8200' X-6-1986 to VI-20-1987, Antifreeze Pitfall Trap, D. Giuliani (6) CDFA; Sawmill Creek, 5000' XI-26-1982 to VIII-24-1984, Antifreeze Pit Trap, D. Giuliani (6) CDFA; White Mts., 5.5 mi. E Big Pine, 6100' II-27 to VII-28-1984, Antifreeze Pit Trap, D. Giuliani (3) CDFA; 5.5 mi. E Big Pine, 6100' VIII-28-1984 to VI-11-1985, Antifreeze Pitfall Trap, D. Giuliani, 9, CDFA; 6.5 mi. N, 7.5 mi. E Big Pine, 7000' II-27 to VII-28-1984, Antifreeze Pit Trap, D. Giuliani (2) CDFA; Kern Co.: Canebreak Creek mgt. area, 35.7281°N, 118.1706°W, IV-2-2009, M. Caterino & K. Hopp (1)

SBMN; Los Padres NF, Mt. Pinos, 34.8269°N, 119.0871°W, V-9-2008, M. Caterino & K. Hopp (3) SBNM; San Emigido Cyn., 34.8558°N, 119.1428°W, IV-10-2008, M. Caterino (1) SBNM; Sequoia NF, Black Gulch, 35.5312°N, 118.6635°W, II-27-2004, *Quercus/Pinus* litter, M. Caterino (3) SBNM; same locality except V-19-2010, M. Caterino (1) SBNM; Breckenridge Mt. Rd., 35.4808°N, 118.5434°W, VII-5-2005, *Quercus* litter, Caterino & Chatzimanolis (1) SBNM; Lake Co.: UC McLaughlin Reserve, 38.8724°N, 122.4288°W, I-22-2007, *Quercus/Neotoma* litter, Caterino & Chatzimanolis (2) SBNM; Lassen Co.: Hallelujah Jct., 39.7833°N, 120.0667°W, VI-30-2006, in *Pheidole californica* nest, P. S. Ward (2) SBNM; Susanville, IV-22-1075, berlesed from pine duff, T. R. Haig (3) CDFA; Los Angeles Co.: Angeles NF, Hideaway Cyn., 34.6993°N, 118.5465°W, VI-23-2007 to VII-2-2007, cantharidin pitfall, Caterino & Chatzimanolis (4) SBNM; SDEF, Tanbark Flat, 34.2484°N, 117.76375°W, IV-15-2007 to IV-29-2007, cantharidin pitfall, Caterino & Chatzimanolis (1) SBNM; same locality except IV-15-2007 to IV-29-2007, unbaited pitfall, Caterino & Chatzimanolis (1) SBNM; Frazier Mt., I-13-1960, E. L. Sleeper (2) RLAC; Pasadena, VII-4-1959 (1) CNCI; same locality except I-25-1917, 1, CASC; same data except J. O. Martin (1) CASC; same data except III (1) CASC; San Clemente Island, 0.3 mi. SE Eagle Cyn., 32.86938°N, 118.42518°W, III-27-2011, *Ceanothus* litter, P. S. Ward (1) SBNM; San Nicolas Island (1) SBNM; Middle Ranch Canyon, 32.8732°N, 118.4907°W, III-30-2010, *Heteromeles* litter, M. Caterino (1) SBNM; Angeles NF, Hideaway Cyn., 34.6993°N, 118.5465°W, VI-23-2007 to VII-2-2007, cantharidin pitfall, Caterino & Chatzimanolis (1) SBNM; Madera Co.: Northfork, III, 13, 1920, H. Dietrich (1) CASC; Mariposa Co., 1977, A. J. Gilbert (1) CDFA; 3 mi. N. Nipinnawasse, XI, 15, 1984, Berlese, *Arctostaphylos* litter, A. J. Gilbert (1) CDFA; Monterey Co.: 1.1 mi. W Bottchers Gap & Palo Colorado Rd., XII-8-1983 to II-23-1984, EGPT, A. J. Gilbert & B. Oliver (1) RLAC; Chualar, 3.5 air mi. S, V-8-1975, berlese ant nest, J. Doyen, 8, CISC; Riverside Co.: 3 mi. E Keen Camp Sta., IV-18-1962, with *Formica rufibarbis occidua* Whlr, C. MacNeil, D. Rentz & R. Brown cl. (27) CDFA; Cactus trail between Hwy. 74 & Horsethief Creek, Deep Canyon area, V-22-1976, J. Bureat, J. Pinto (1) UCRC; Mt. San Jacinto, IV-20-1958, berlesed from *Artemisia*, I. M. Newell (2) RLAC; same data except (17) CDFA; San Jacinto Mts., 4 mi. NW Fulmore Lk., VI-26-1980, 4305', Bill & Emma MacKay (1) CDFA; Temecula, V-1-1967, oak leaves, D. Hagstrum (1) CDFA; same data except (5) ADSC; same data except (9) RLAC; San Benito Co.: 2 mi. S New Idria, II-1983 to II-1984, Antifreeze Pit Trap, A. J. Gilbert & N. Smith (1) CDFA; San Bernardino Co.: E of Wrightwood, VIII-26-1980, 1, CASC; UC Burns Reserve, Railroad Cyn., 34.1405°N, 116.4541°W, IV-1-2008, sifted grass & flood debris, Caterino & Leschen (1) SBNM; San Diego Co.: 9 mi. S Pine Valley, XII-19-1965, *Artemesia tridentata*, N. Ueshima & P. Rubzoff (1) ADSC; same data except (2) CASC; same data except (5) RLAC; Cleveland NF, Kitchen Creek Rd., 32°47'17"N, 115°39'00"W, 4300', V-23-2009, sandy soil, in *Formica francoeuri* Bolton (det. J. Trager), J. P. Gruber (7) JPGC; San Luis Obispo Co.: Carrizo Plain N.M., 34.0267°N, 119.4855°W, IV-24-2004, M. Caterino (1) SBNM; nr. Lopez Lake, 35.2064°N, 120.4482°W, III-2-2005 to IV-16-2005, unbaited pitfall, M. Caterino (1) SBNM; Santa Barbara Co.: Arroyo Hondo Preserve, 25 mi. W. Santa Barbara, 34.482°N, 120.145°W, IV-16-2003, in nest *Formica*, M. Caterino (5) SBNM; Figueroa Mts., E. L. Sleeper (3) CDFA; NE Cuyama, IV-28-1975, ex. *Pseudotsuga macrocarpa*, R. Hobza (1) CDFA; Tulare Co.: 5 mi. SW Badger, I-26-1977, Berlese, deciduous oak litter, A. J. Gilbert (4) RLAC; same data except (19) CDFA; Ventura Co.: Los Padres NF, Jct. Tule & Sespe Cks., 34.5595°N, 119.2667°W, IV-10-2008, M. Caterino (1) SBNM; Ozena Campground, 34.6826°N, 119.3292°W, I-20-2008, *Populus* litter, M. Caterino (19) SBNM; Yolo Co.: 3 mi. N Runsey, VIII-29-1959, R. O. Schuster (1) CDFA. IDAHO: Jerome Co.: Wilson Lake, XI-3-1976, in *Formica* nest, A. D. Allen (5) FSCA; same locality except XI-1976, R. Lenzey (5) USNM; same locality except IX-3-1977, A. D. Allen (4) CASC; same data except (4) CDFA; same locality except IX-3-1977, ex *Formica obscuripes* Forel, A. D. Allen (1) CASC; same data except (1) CDFA; same data except XI-1976 (1) CISC; same data except (1) TAMU; same data except in *Formica* nest (1) CISC; Twin Falls Co.: Derkies Lake, Snake River Cyn., VI-9-1976, A. D. Allen (1) FMNH; same data except (1) USNM; same data except with *Formica*, A. D. Allen (1) FMNH; Shoshone Falls, V-1978, R. Lenzey (3) USNM. NEVADA: Esmeralda Co.: Goldfield, W. M. Mann colln (1) USNM; same locality except III-19-1905, Nunenmacher (3) FMNH; same locality except VI-22-1905, Nunenmacher (2) FMNH; same locality except III-19-1905, *A. squamosa* paratype Blais., F. W. Nunenmacher (1) CASC; same locality except III-19-1908, *A. squamosa* cotype Blais., F. W. Nunenmacher (2) CASC; same data except (1) FSCA; same locality except III-2-1905, *A. squamosa* paratype Blais., F. W. Nunenmacher (1) CASC; same locality except IV-22-1908, *A. squamosa* cotype Blais., F. W. Nunenmacher (1) CASC; same locality except X-18-1907, paratype, F. W. Nunenmacher (2) CASC; same locality except X-23-1905, *A. squamosa* paratype Blais., F. W. Nunenmacher (1) CASC; 1.5 mi. S, 4 mi. W Lida, Lida summit, 7400', III-28 to X-1-1982, Ethylene Glycol Pit Trap, D. Giuliani (1) CASC; 11 mi. N, 8 mi. W Goldfield dry lake, VIII-1988 to VIII-1989, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Goldfield,

1954, *A. squamosa* topotype Blais. (1) CASC; Lincoln Co.: Northfork, 4800' III to IX-1986, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Nye Co.: Mercury (1) USNM; 5 mi. N, 10 mi. E Curran, 7000' X-1982 to IX-1983, Antifreeze Pit Trap, D. Giuliani (1) CDFA; Grapevine Mts., Phinney Canyon, III-16 to VIII-26-1983, Antifreeze Pitfall Trap, D. Giuliani (3) CDFA; Rock Valley, V-12-1975, trap 70 (1) RLAC; Toquima Range, Charnock Pass, 6 mi. N, 15 mi. E Carvers, 8300' IX-1987 to VIII-1988, Antifreeze Pitfall Trap, D. Giuliani (5) CDFA. OREGON: Casey Bequest 1925 (1) USNM; Baker Co.: Huntington, XI-23-1959, Hubbard & Schwartz (2) USNM; Josephine Co.: Rough & Ready St. Pk., 2 mi. N O'Brien, V-20-1960, moss under shrubs, S. D. Lattin (1) OSUO. UTAH: Kane Co.: Zion Nat. Park, 3 mi. N, 7 mi. E Springdale, III, IX, 1985, Antifreeze Pit Trap, D. Giuliani (1) CDFA; San Juan Co.: 8 mi. E Bluff, 4600' III, IX, 1984, Antifreeze Pit Trap, D. Giuliani (4) CDFA. MEXICO: BAJA CALIFORNIA: Sierra Juarez, 1 mi. S km 2875, III, 9, 1962, E. L. Sleeper (2) CDFA.

Variation. Variation occurs in body length (squattiness), pronotal shape, density and relative size of pronotal and elytral scales, and whether or not there are linear scales behind the scutellum. There is also variation of the elevation of the medial part of elytral trichomes (very limited in Tulare County); the shagginess of pronotal sides; the straightness or cordateness of pronotal sides; sinuation of antero-lateral clypeal margin (Inyo County); and density of elytral punctures. In many California populations, the elytral punctures become almost randomly placed. Puncture rows are much better defined in Arizona populations. The variation in this widespread species, as well as variation in preservation of scale-like setae and encrustation, accounts for the synonymies we recognize above. Fall's species (*A. fallax*) was found in the same type locality as Horn's species (Pasadena). Blaisdell's *A. squamosa* and *A. testacea* were found in Nevada and the eastern San Francisco Bay area, respectively, and both fall within the range of variation we have seen.

Distribution. Widespread in California, southern Oregon and Idaho, southern and western Nevada, southern Utah, southern Arizona, and southwestern New Mexico.

Collection Data. There are several records from colonies of *Formica* Linnaeus and one from *Pheidole*. However, most specimens were berlesed or sifted from *Ceanothus* duff, oak/pine litter, oak/woodrat (*Neotoma* Say & Ord) litter, pine duff, *Ceanothus* litter, manzanita litter, *Artemisia* L. litter, *Pseudotsuga macrocarpa* (Vasey) Mayr litter, grass & flood debris, and cottonwood litter. Both baited (cantharidin) and unbaited pitfalls in many habitats from pines to sand dunes. Elevation range 1,000–2,600 m.

DISCUSSION

Alaodes species are particularly noteworthy because of their myrmecophily. Myrmecophily is not uncommon in Tenebrionidae (see Matthews *et al.* 2010 for a review; for a general review in Coleoptera, see Parker 2016). A few myrmecophilous tenebrionids exhibit trichomes, generally taken to indicate stronger integration into the host societies. *Alaodes* species all exhibit distinctive trichomes along the posterior edges of the pronotum, clearly indicating some direct interactions with their host ants. Other than *Alaodes*, New World tenebrionid examples that also have trichome clumps on the posterior edge of the pronotum include the stenosine genus *Ecnomoderes* Gebien (associated with the ant *Acromyrmex lobicornis* Mayr) and the opatrine *Bycrea* Pascoe, although in *Bycrea*, which is associated with ants in the genus *Atta* Fabricius, trichome patches are found on the rest of the body as well. No direct observations of *Alaodes*-ant interactions have been made, likely because *Alaodes* species are nocturnal. However, the wide variety of hosts recorded (see below) suggests a fertile ground for examination of behavioral interactions.

Some *Alaodes* species, such as *A. singularis* and *A. setigera*, seem to be associated with multiple species of ants, while others, such as *A. mojavensis*, have only been associated with one species of *Messor* Forel (*M. pergandei*) despite nests of other ants, such as *Pogonomyrmex* Mayr, occurring in the same locality. Host records of both *A. singularis* and *A. setigera* include species in three different subfamilies of ants. For *A. singularis*, host records include Myrmicinae (*Crematogaster*, *Solenopsis* Westwood, and *Pheidole*: *P. californica* Mayr), Formicinae (*Formica*, including *F. francoeuri* Bolton, *F. moki* Wheeler (originally reported as *F. rufibarbis occidua*), and *F. obscuripes* Forel), and Dolichoderinae (*Liometopum* Mayr). For *A. setigera*, host records include Myrmicinae (*Crematogaster*: *C. hespera* Buren, *Solenopsis*: *S. molesta* Buren, and *Pheidole*: *P. californica*) and Formicinae (*Formica* and *Camponotus* Mayr). *Alaodes*. *vizcainensis* has been associated with the *P. vistana*.

Repeated attempts to obtain larvae from *A. mojavensis* adults captured in overnight pitfall traps at the entrance of *Messor* nests, in some cases with over a hundred adults alive in a container, did not yield larvae. Beetles were kept with and without ant associates while trying to stimulate oviposition. The ants died quickly, while the *Alaodes* adults remained alive for extended periods of time with an average longevity in captivity of 2.5 years. Despite regular sifting of the sand in the rearing containers, no larvae were found, suggesting that perhaps the larvae of *Alaodes* need a specialized environment in the ant nest to grow.

Species of *Alaudea* occur in a wide range of elevations from near sea level (*A. vizcainensis*) to 2,560 m (*A. singularis*), and they occur in a diversity of habitats. Most species (*A. vizcainensis*, *A. mojavensis*, *A. coloradoensis*, and *A. moenkopi*) are restricted to deserts, while others (*A. californicus* and *A. alternata*) are found in more mesic areas as in Mediterranean ecosystems. The more common species (*A. setigera* and *A. singularis*) are found in a variety of environments from desert to oak woodland, chaparral, and *Pseudotsuga* forests. Most specimens of *Alaudea* have been berlesed or collected from pitfall traps, either live from overnight traps or from long duration traps with preservative. Only a few have been collected directly from their hosts or walking around at night during night searches.

CHECKLIST OF THE SPECIES OF *ALAUDES* HORN

Alaudea alternata Fall 1928: 148. California, Los Angeles County only.

Alaudea californicus Aalbu, Caterino, and Smith, new species. California, Lower San Joaquin Valley.

Alaudea coloradoensis Aalbu, Caterino, and Smith, new species. California, Colorado Desert.

Alaudea moenkopi Aalbu, Caterino, and Smith, new species. Colorado Plateau: northern Arizona and southern Utah.

Alaudea mojavensis Aalbu, Caterino, and Smith, new species. California, Arizona, Mojave Desert.

Alaudea vizcainensis Aalbu, Caterino, and Smith, new species. Mexico, Baja California and northern Baja California Sur.

Alaudea setigera Blaisdell 1919: 310. Arizona, California, Nevada, New Mexico, Baja California.

Alaudea singularis Horn 1870: 362. California, Arizona, southern Idaho, Nevada, Oregon, Utah, Mexico, northern Baja California.

Alaudea fallax Fall 1928: 148

Alaudea squamosa Blaisdell 1919: 309

Alaudea testacea Blaisdell 1919: 311

KEY TO ADULTS OF THE GENUS *ALAUDES*

1. Elytral vestiture composed of extremely short, recumbent, and apically expanded setae with length subequal to twice width, giving a "string of pearls" aspect to elytral intervals (Fig. 7) *A. moenkopi* Aalbu, Caterino, and Smith, new species
- 1'. Elytral vestiture variable, always much longer than twice width 2
2. Elytral vestiture composed of thick, strongly posteriorly recumbent thickened setae (Fig. 4) *A. californicus* Aalbu, Caterino, and Smith, new species

- 2'. Elytral vestiture erect, composition variable 3
3. Elytral vestiture slender and hair-like throughout, occasionally varying to feebly clavate-lanceolate, especially toward the sides and apex (Figs. 5, 6, 9B) 4
- 3'. Elytral vestiture not slender and hair-like throughout, either slender setae alternating with shorter clavate setae or setae clavate to capitate throughout (Fig. 9A, C) 7
4. Lateral aspect of pronotum with short, clavate setae (Figs. 6B, 9B) 5
- 4'. Lateral aspect of pronotum slender, hair-like setae (Fig. 8) 6
5. Elytral setae uniform in length, occasionally feebly clavate-lanceolate, especially toward the sides and apex, length of longest setae equal to or shorter than apical 2 antennomeres combined; punctures deep, well-defined, distance between punctures equal to or less than size of puncture (Figs. 9C, D, 11A) *A. setigera* Blaisdell
- 5'. Elytral setae never occasionally clavate-lanceolate, of 2 sizes, length of longest setae equal to or longer than apical 3 antennomeres combined; punctures fine, distance between punctures distinctly longer than size of puncture; body wider, larger. Anterior margin of head deeply excavated, basolateral aspect of head with sublateral indentation (Fig. 6A); pronotum with lateral apical aspect strongly expanded subapically, Colorado Desert species (Fig. 6) *A. coloradoensis* Aalbu, Caterino, and Smith, new species
6. Sides of pronotum regularly, slightly expanding anteriorly, anterior angles acute (Fig. 8). Baja California Sur *A. vizcainensis* Aalbu, Caterino, and Smith, new species
- 6'. Sides of pronotum sinuate, expanding anteriorly, anterior angles rounded, Mojave Desert species (Fig. 5) *A. mojavensis* Aalbu, Caterino, and Smith, new species
7. Elytral vestiture feebly clavate except along lateral margins, where these alternate with long slender setae (Fig. 9C) *A. alternata* Fall
- 7'. Elytral vestiture clavate or capitate throughout (Fig. 9A) *A. singularis* Horn

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