A REVISION OF THE GENERA *NANULARIA* CASEY AND *AMPHEREMUS* FALL (COLEOPTERA, BUPRESTIDAE, CHALCOPHORINAE)

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A REVISION OF THE GENERA *NANULARIA* CASEY AND *AMPHEREMUS* FALL (COLEOPTERA, BUPRESTIDAE, CHALCOPHORINAE)¹

C. L. Bellamy²³⁴

ABSTRACT. A taxonomic revision of the chalcophorine beetle genera *Nanularia* and *Ampheremus* is presented along with information on species distribution and biology. Seven species are recognized in *Nanularia*, with two described as new: *N. alpina*, from the San Gabriel Mts., Los Angeles Co., California and *N. monensis*, from Mono Co., California. *Ampheremus* is monotypic and resurrected from a subgeneric rank under *Nanularia*. Descriptions, illustrations, keys, and character diagnoses are included to facilitate identification of the species of both genera. Lectotypes are designated for *N. californica* (Horn) and *N. cupreofusca* Casey.

INTRODUCTION

The genera *Nanularia* Casey and *Ampheremus* Fall are two of five North American genera currently included in the tribe Chalcophorini (Nelson, 1981). Both genera are strictly Nearctic in their distribution and restricted to the western continental United States and adjacent Baja California Norte, Mexico. This study was undertaken to bring together all of the information known about the species of these two genera, because two species have been described and two others transferred into or out of *Nanularia* since the only short review and key (Van Dyke, 1942).

METHODS AND MATERIALS

This study is the result of five years of field collecting and the examination of more than 1500 pinned specimens, thought to be the majority known. In addition to the material I have collected, a large amount of material was borrowed from a number of private and institutional collections. The names of the individuals that loaned specimens are listed in the acknowledgments along with the institutional acronyms used in the text. My name is abbreviated in the text as CLB. The collection acronyms are based upon the system of Arnett et al. (1986), with most having been designated in that work; those not listed there are as follows:

ACAS: A. Cobos collection, Almeria, Spain.
AJGC: A.J. Gilbert collection, Fresno, California.
GAWC: G.A. Williams collection, Lansdowne, N.S.W., Australia.
MTCJ: M. Toyama collection, Nishinomiya, Japan.

Contributions in Science, Number 387, pp. 1–20
Natural History Museum of Los Angeles County, 1987

RHHC: R.H. Hasegawa collection, Long Beach, California.
RKVC: R.K. Velten collection, Riverside, California.

The synonymies listed for the previously described taxa are virtually complete with the possible omission of odd catalogue listings or locality records. Holotypes or syntypes of all described species were examined. A short diagnosis plus an abbreviated redescriptions is given for previously described taxa with the two new species more fully described. Lectotypes are designated herein for *N. californica* (Horn) and *N. cupreofusca* Casey. For lectotype designation, the label data are given exactly as printed. A slash mark (/) separates data from individual labels and my notations are in parentheses with the abbreviations (h) = handwritten and (p) = printed. All other label data are presented exactly as on the labels. For brevity, I have omitted the collector(s) name in Material Examined, except for under new species.

The nomenclature used in discussing the host plant genus *Eriogonum* follows the work of Reveal, presented in Munz (1968).

TAXONOMIC HISTORY

Casey (1909) erected the genus *Nanularia* for a new species, *N. cupreofusca* from Poway, San Diego Co., California. He also provisionally included *Gyascutus californicus* Horn on the basis of its description (Horn, 1875), as he apparently had not seen the type.

*Ampheremus cylindricollis* Fall (1917) was described from a unique specimen of unknown sex, collected at Palm Springs, Riverside Co., California. At the time of the description, Fall

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compared *Ampheremus* to the recently described *Nanularia* and commented on their similarities. Both genera have undergone a number of taxonomic shifts throughout the literature.

Leng (1920) considered both *Nanularia* and *Ampheremus* to be valid, but catalogued them in the Buprestinae. Chamberlin (1926) considered *Nanularia* to be congeneric with *Hippomelas* Laporte and Gory, but retained *Ampheremus* as a valid genus. Obenberger (1926) catalogued *Nanularia* as a subgenus of *Gyascatus*, which is currently placed as a subgenus of *Hippomelas*, and placed it in the Chalcosphorini. Subsequently, Obenberger (1930) placed *Ampheremus* in the tribe Buprestini.

Van Dyke (1942) placed *Nanularia* as a subgenus of *Hippomelas* and stated that the dominant characters of the genus were entirely in agreement with those of the Chalcosphorini. He described two new species, *Hippomelas* (*Nanularia*) *granulatus* from Baja California and *H. (N.) inyoensis* from Owens Valley, Inyo Co., California. Blackwelder (1944) retained *Nanularia* as a subgenus of *Hippomelas* but did not consider *Ampheremus*, since it did not occur within the geographical boundaries of his catalogue.

Nelson and Barr (1960) synonymized *Ampheremus* under *Nanularia*, which they considered to be a subgenus of *Hippomelas*. They also synonymized *H. (N.) inyoensis* under *H. (N.) cylindricollis* and transferred *H. brunneata* Knnull (1947) to *Nanularia*.

Barr (1970) reviewed the subgenera of *Hippomelas*, elevated *Nanularia* from the subgeneric rank and resurrected *Ampheremus* from synonymy to a subgenus of *Nanularia*. At the same time, he transferred *H. (N.) granulatus* to the subgenus *Gyascatus*. Knnull (1971) described *N. obrienorum* from four specimens collected at McKittrick, Kern Co., California. Nelson (1980) transferred *H. pygmaea* Knnull (1941) to *Nanularia* based upon the generic criteria used by Barr (1970).

DISCUSSION

Even though the distributional data are incomplete, in most cases the species I have recognized in *Nanularia* are allopatric in the broadest sense of the term (Erwin, 1981). The general external morphology, host plant relationships, and geographical distribution were conjoinedly used to define each species. Due to a high degree of intraspecific variability, single character differences were not found and the species are defined using a combination thereof.

*Nanularia californica* and *N. obrienorum* are thus defined as aggregates of allopatric populations, not just geographically, but ecologically isolated, with each population using a different species or variety of *Eriogonum* as its host. In the case of *N. obrienorum*, different varieties of *Eriogonum* spp. have yielded different phenotypes which are reflected externally in the ground coloration, punctuation, and range of size. There appears to be an inverse relationship between the distance of geographical separation and the degree of phenotypic difference within these two species. *Nanularia californica* shows little phenotypic difference between the widely sepa-
length found in the ratio of body length to genitalia length in the male, which I believe is generically significant. The structure and general configuration of the male genitalia is similar for *Nanularia* spp. but is much different in *A. cylindricollis*.

**TAXONOMY OF *NANULARIA* AND *AMPHEREMUS***

As stated in the introduction, *Nanularia* and *Ampheremus* are two of five genera of North American buprestids that are classified in the tribe Chalcophorini. The three remaining chalcophorine genera are *Hippomelas, Chalcophora* Solier, and *Texania* Casey. *Chalcophora* and *Texania* differ from the other genera by having a clearly sulcate pronotum, while *Hippomelas, Nanularia*, and *Ampheremus* may be separated as follows.

1a. Inner margin of eyes gradually converging dorsally (Fig. 4); antennal segments 4–10 elongate, suberrate or, in part, parallel-sided and strongly flattened (Fig. 7); elytral apices normally deeply emarginate and bidentate (Fig. 10) —— *Hippomelas*

1b. Inner margin of eyes parallel, or nearly so (Figs. 5, 6); antennal segments 4–10 compact, triangularly serrate and not flattened (Figs. 8, 9); elytral apices rounded to slightly emarginate, not bidentate, but usually with subtoral tooth (Figs. 11, 12) —— *Nanularia*

2a. Lateral margin of pronotum carinate, usually from base to past middle (Fig. 13); epipleuron with sublateral carina evident on about basal ½ (Fig. 13) —— *Nanularia*

2b. Lateral margin of pronotum not carinate, or if so, then only slightly indicated basally (Fig. 14); epipleuron without sublateral carina (Fig. 14) —— *Ampheremus*

The species of *Hippomelas* are also generally much larger than either *Nanularia* or *Ampheremus*. Both genera can also be separated from *Hippomelas* by virtue of the general biological habits. *Hippomelas* species use a wide variety of trees, shrubs, and perennial plants as hosts (Linsley and Ross, 1976), with no apparent co-evolutionary relationship. On the other hand, species of *Nanularia* and *Ampheremus* use only a selected number of species of the polygonaceae genus *Eriogonum*.

Any statement regarding the phylogeny of these related genera must still await the clarification and redefinition of the subfamilies Buprestinae and Chalcophorinae. Traditional studies have separated these two taxa almost solely upon the distribution of the antennal pores, whereas the wing venation study of Good (1925) and comments of recent authors, e.g., Cobos (1980) and Toyama (1986 and in litt.) suggest that the tribes and genera of these two very similar subfamilies currently exist within a very artificial mosaic and are in need of a thorough re-evaluation.

Casey (1909) viewed the "cleft" between the meso- and metasterna (Fig. 15) as a way of relating *Nanularia* to *Trachykele* Marseul and *Spectralia* Casey (=*Cinyra* Auctorum, not Laporte and Gory). He also discussed "a pronounced tendency in them toward a more mobile connection between the first and second abdominal segments," but he further stated that "there is, however, little or no harmony between these three genera in other structural characters."

An examination of the wings figured herein (Figs. 1–3) and by Good (1925) does show "relationship" for *Nanularia, Ampheremus, Hippomelas, Trachykele, and Spectralia*, as well as *Buprestis* Linnaeus and *Melanophila* Eschscholtz, based on Good's concepts of specialized characters. Unfortunately, a strict phylogenetic statement of monophyly cannot be made because of the symplesiomorphic nature of Good's characters that relate this group of genera. Most important in this assessment of plesiomorphy is the closed anal cell (2d–2dA), a character shared by the Schizopodinae and Dascillidae.

Based upon the most contemporary higher classification by Cobos (1980), the distribution of the antennal pores is still the only way to separate the Chalcophorinae from the Buprestinae, but does not prove to be absolute. As seen in the key to the higher buprestid taxa of North America by Nelson (1981), at least one tribe, Psilopterini, of Chalcophorinae has the antennal pores dense within foveae as in the Buprestinae. Casey (1909) commented that Lacordaire, in his choice of primary characters, "seemingly in despair, seized upon a few antennal features for major group division, . . . that the grouping suggested by that author, . . . is not satisfactory." Clearly, another approach is needed and the wing venation would seem to be well worth pursuing in a broader sense than Good's initial study.

**Genus Nanularia Casey**


*Gyascatus* (*Nanularia*): Obenberger, 1926:160.


**DIAGNOSIS.** Size small, length generally less than 15.0 mm; subcylindrical, robust, convex; surface punctate and pubescent.

**REDESCRIPTION.** Head (Fig. 5) large, narrower than pronotum; surface clothed with erect white setae; eyes large, ovoid, inner margins parallel; clypeus broadly emarginate; labrum short, subcoriaceous, feebly sinuate, sparsely punctate, with short stiff setae; mentum short and transverse, very broadly parabolically rounded; palpi slender; antennae (Fig. 8) inserted in small, widely separated foveae, each margined above by oblique carina and reaching behind middle of pronotum when laid along side; scape and segments 2 and 3 subcylindrical, 3 longer than 2, 4–10 serrate, transverse, somewhat flattened, 11 flattened ovoid and appendiculate; sensory pores on both surfaces of segments 5–11 (Fig. 8).

Pronotum wider than long; apical margin arcuate, clothed with short setae; sides broadly rounded, lateral margins carinate on basal ½; basal margin sinuate; surface punctate, with vague transverse depression anterior to impunctate basal lobe.
Scutellum small, transverse, impunctate.

Elytra wider than pronotum, widest near base; sides subparallel, narrowing gradually on apical 1/3; epipleura carinate basally; lateral margins serrulate apically; surface irregularly punctate, with recumbent setae.

Underside strongly convex, densely punctate and clothed with recumbent pubescence; abdomen with suture between first two sternites moderately indicated, first sternite not free; last sternite with serrate subapical carina before broadly rounded apex.

Legs punctate; inner margin of protochanter with feeble apical tooth; pro- and mesofemora slightly fusiform; metafemora with sides subparallel; tibiae straight, apically armed with two short spines; tarsal segments 1–4 each with ventral pulvillus, metatarsi with segment 1 subequal in length to 5, as long as 3 and 4 together; claws slender, entire (Fig. 18).

Metathoracic wings (Fig. 2) with subcosta fused to radius at about basal 1/3; radial cell closed, very narrow and elongate; radial sector vein feebly fused to medial vein; radio-medial cross-vein opposite radial cross-vein, becoming vague as it approaches medial vein; IstA vein free; cubito-anal vein present; “wedge cell” 2d-2A closed.

Genitalia: male, as in Figures 19–24; female ovipositor, as in Figure 26.

**TAXONOMIC CHARACTERS OF NANULARIA**

The various species and populations of *Nanularia* are in such a state of evolutionary flux that writing a reliable key to separate them is very difficult. In many cases, infraspecific variation is almost as great as the interspecific differences and any character examined in a given population will show a wide range of variation. Therefore, the key is written only to separate species in their broadest sense and the user will have to refer to the following discussions for satisfactory identification.

I discuss the taxonomy of *Nanularia* in terms of species or superspecies based on the following morphological characters. More specific characters and a discussion of infraspecific variation will be found under each species description. This general morphological information should be used in combination with the distributional data and will allow a fairly reliable method of species separation.

1. General body proportions. The overall proportions (maximum length vs. width) of the entire body and pronotum are stable characters in the broad sense but still exhibit a certain degree of infraspecific variation. This variation would seem to be allometric, influenced by host plant size and chemistry and is a reflection of various ecological factors, e.g., climatic, edaphic, acting on the various species and varieties of *Eriogomum*. Species are generally parallel (e.g., Fig. 28) or robust (e.g., Fig. 31), with smaller specimens of several robust species being parallel instead.

2. Punctuation and vestiture. Punctuation seems to vary only in degree, i.e., size and density, and is usually very similar on the head and pronotum. Several species generally seem to have pronotal callusities and this character appears to be constant. The elytral punctuation is basically striate and more or less regular in configuration. The presence or absence of vague elytral costae is constant within species but is often difficult to see on non-iridescent forms. The density, size, shape, and color of the setae on the head and pronotum are generally uniform with infraspecific variation seemingly linked to locality climate, e.g., denser setation on specimens from more xeric localities. This is perhaps linked to the amount of pulverulence found in various populations (see Biology).

3. Color. The only value of color in species definition is between species that are always metallic and those that have the elytra non-iridescent. The non-iridescent elytra generally vary from brunneneous to rufobrunneous on the disc and are completely margined by a dark border. The presence of this non-metallic condition only in the extreme part of the range of two species (*N. californica* and *N. cupreofusca*), while always present over the entire range of another (*N. brunnenea*) suggests a climatic effect on color production while in pupal diapause. Variation within metallically colored species or populations is often fairly constant but can be affected by the method of killing and/or preserving the specimens (see Van Dyke, 1942:113) and therefore, not definitive. In some populations, the degree of color variation seems to be allometric.

A number of characters that are usually constant, and therefore definitive, in other buprestid genera were examined and found to exhibit a large degree of infraspecific variation for *Nanularia*. These include shape and proportions of antennal and leg segments, the degree of convexity of the eyes, the clypeal emargination, the lateral pronotal carinae, the basal constriction of the pronotum, and the elytral sutureal tooth. The shape of the male genitalia is not constant and varies between populations, although there are two general configurations, with the first (Figs. 19–22) being proportionally smaller and with the parameres less apically lobate and the second (Figs. 23, 24) being larger and having the parameres apically lobate.

The following species and superspecies are defined and based upon the qualifications discussed before and in the following key. In all but the last case, infraspecific or infrapopulational variation should be considered in combination with the recorded distribution.

1. *Nanularia californica*. The populations that make up this species are generally uniform in their form (parallel), punctuation, and vestiture. The coloration varies both between and within populations, but is generally dark cupreous with reddish or greenish reflected tints. In addition, some specimens from the northernmost locality are non-iridescent and superficially resemble specimens of *N. brunnenea* and *N. cupreofusca*, but can be separated by differences in punctuation, vestiture, coloration of the head, pronotum, and underside, and distribution. The male genitalia belong to the first group.

2. *Nanularia* (superspecies *brunnenea*). This species aggregate is composed of *N. (brunnenea) brunnenea*, *N. (brunnenea) cupreofusca*, and *N. (brunnenea) alpina*, new species. The first two species are very similar in several respects. Most specimens are robust, but smaller forms approach the parallel condition. The vaguely costate nature of the elytra in *N. cupreofusca* is harder to see in *N. brunnenea* but is partially
present. Most specimens have a pair of callosities anterior to the middle of the pronotal disc. The punctuation and vestiture is similar, with *N. alpina*, new species, having the punctuation slightly coarser and the vestiture slightly reduced. The male genitalia belong to the first group. In all examined specimens, *N. brunneata* has non-metallic elytra. Non-iridescent forms of *N. cupreofusca* are very hard to separate and if they had not been collected along with metallic specimens at the same locality (Baja California, La Virgen) at the southern extreme of the range, they would have been placed with *N. brunneata*. Nearly contiguous distributions, using the same host plant species in these areas and the general morphological similarities suggest that these two species have differentiated ecologically, with *N. brunneata* reflecting a more xeric adaptation and *N. cupreofusca* being the coastal or higher elevation form.

3. *Nanularia* (superspecies *obrienenorum*). Only two species belong to this aggregate, *N. (obrienenorum) obrienenorum* and *N. (obrienenorum) monensis*, new species. These two species are generally robust, but again, smaller specimens approach the parallel condition. The populations of *N. obrienenorum* are discussed under that species and have a high degree of variation both between and within in their coloration. *Nanularia monensis*, new species, with its melanic coloration and its limited range is quite removed from that of *N. obrienenorum*. The male genitalia of the second type. Populations of *N. obrienenorum* seem to approach the southern range limits of *N. californica* at the northwestern extremes and nearly overlap with *N. cupreofusca* at one locality in the southern Tehachapi Mts. (Acton, Kern Co.).

4. *Nanularia pygmaea*. This seemingly divergent species differs from all others by having a very coarse punctuation over the entire surface, the elytra widest at the apical ⅓ and apically rounded, the single Texas locality far removed, and an unrelated putative larval host plant (see remarks under this species).

**KEY TO THE SPECIES OF NANULARIA**

1a. Elytra broadest at apical ⅔, apices rounded; entire surface coarsely punctate... (Texas) ...... *N. pygmaea*

1b. Elytra broadest basally or with sides subparallel in basal ⅓, apices more or less truncate, with sutureal tooth; punctuation reduced ........................................... 2

2a. Pronotum constricted anterior to base, the sides slightly wider at base .................................................. 3

2b. Pronotum not constricted, or feebly so; sides subparallel in basal ⅓ .................................................... 8

3a. Bicolorous: head, pronotum, and underside cupreous; elytra non-iridescent, bruneous ...................... 4

3b. Unicolorous: aeneous, cupreous or purplish; color more or less uniform over entire surface ............. 5

4a. Eyes larger, dorsal apex of eye more rounded (Fig. 16); head, pronotum, and underside bright cupreous, often with a faint purplish reflection; punctuation of head and pronotum coarser, more dense, vestiture more dense ...................... *N. (superspecies brunneata)* (part)

4b. Eyes smaller, dorsal apex of eye more acuminate (Fig. 17); head, pronotum, and underside dark cupreous; punctuation of head and pronotum finer, sparser; vestiture sparser ........................................ *N. californica* (part)

5a. Body more cylindrical, length usually greater than 3.2× width (Fig. 28) .................................................. 6

5b. Body more robust, length usually less than 2.9× width (Fig. 31) .................................................. 7

6a. Purplish cupreous; elytra with a series of feebly elevated longitudinal costae, each with a single line of punctures; costae separated by at least two lines of punctures; dorsal apex of eye more rounded; punctuation and vestiture as in 4a ............. *N. (brunneata) cupreofusca* (part)

6b. Dark cupreous, sometimes with a reddish tint; elytra not costate; dorsal apex of eye more acuminate; punctuation and vestiture as in 4b ...... *N. californica* (part)

7a. Size smaller, length usually less than 9.0 mm; color aeneous with more greenish tint; pronotum with four well-defined callosities before middle, two on each side with one central, one lateral ........................................ *N. (brunneata) alpina*, new species

7b. Size larger, length usually greater than 10.0 mm; color dark aeneous; pronotal callosities, if present, limited to discal pair ....... *N. (obrienenorum) obrienenorum* (part)

8a. Bicolorous ............. *N. (brunneata) brunneata* (part)

8b. Unicolorous .................. 9

9a. Black with slight bluish or purplish reflection .......... .................. *N. (obrienenorum) monensis*, new species

9b. Aeneous or cupreous .......... 10

10a. Aeneous, or sometimes dark cupreous but with a greenish tint ....... *N. (obrienenorum) obrienenorum* (part)

10b. Cupreous, often with either purplish or reddish tint .......................... 11

11a. Purplish cupreous; elytra with a series of feebly elevated longitudinal costae, each with a single line of punctures; costae separated by at least two lines of punctures; dorsal apex of eye more rounded; punctuation and vestiture as in 4a .......... *N. (brunneata) cupreofusca* (part)

11b. Dark cupreous, sometimes with a reddish tint; elytra without costae; dorsal apex of eye more acuminate; punctuation and vestiture as in 4b .......... .................. *N. californica* (part)

The ordering of species below follows the previous order of superspecies, but may differ for species within superspecies. This ordering does not and should not imply any strict phylogenetic grouping.

*Nanularia californica* (Horn)

Figures 13, 17, 19, 26, 28, 36

*Gyascatus californicus* Horn, 1875:147; Kerremans, 1892: 55.


*Hippomelas cupreofusca* (Casey): Chamberlin, 1926:206.

*Gyascatus (Nanularia) californica*: Obenberger, 1926:160.

**DIAGNOSIS.** Size, 7.0–12.5 mm long × 1.9–3.8 mm wide; subcylindrical; convex; shining dark cupreous with reddish or greenish reflected tints on head, pronotum, and underside; specimens from northern California sometimes with non-iridescent bruneous elytra; pulverulence generally not present.

**REDESCRIPTION.** Male. 7.0–11.5 mm long × 1.9–3.5 mm wide. **Head.** Moderately punctate and clothed with short erect white setae; frons convex between eyes; median sulcus on vertex; oblique supra-antennal carinae strongly elevated; clypeus broadly, triangularly emarginate, margin obtuse at sides. **Antennae.** Serrate segments bicolour laterally.

**Pronotum.** Length subequal to width, widest at middle; densely, coarsely punctate, with sparse, short recumbent setae; anterior margin feebly sinuate; basal margin feebly trisinate; mediobasal lobe impunctate, slightly elevated apically; lateral margins arcuate, carinate on basal ½; disc convex, somewhat flattened medially, with slight transverse depression before anterior margin. **Scutellum.** Transverse, rounded laterally, deeply impressed medially.

**Elytra.** Wider than pronotum, widest basally; sides almost parallel to apical ¼, then gradually narrowing to subtruncate apices, serrate along lateral margins to short sutural tooth; punctation coarse, dense, and irregular; surface clothed with short, recurved white setae; vague costae indicated throughout length of disc; suture at base rounded and elevated.

**Underside.** Moderately clothed with long recumbent white setae; punctation of pro-, meso-, and metasternum coarse but less dense than dorsum; prosternum with anterior margin broadly convex, process broadly acuminate, with lateral angles obtuse.

**Genitalia.** As in Figure 19.

**Female.** 7.5–12.0 mm long × 2.2–3.8 mm wide; generally more robust; serrate antennal segments more compact, unicellular; abdominal sternites more convex and declivous.

**VARIATION.** **Nanularia californica** is one of the more stable species, with less infraspecific variation between populations. The body proportions are more or less stable in the majority of specimens, although some allometric change is noted in larger specimens. There is some variation in ground color, punctation, and vestiture; the coastal populations are darker cupreous and more densely punctate and setose whereas those from the foothills of the Sierra Nevada are brighter cupreous with a reddish or greenish reflection and have punctation and vestiture that are reduced. Specimens from the northernmost localities have the non-iridescent color condition with bruneous elytra which resemble **N. bruneata** and some **N. cupreofusca**.

**LECTOTYPE DESIGNATION.** Male, one of six syntypes from the LeConte and Horn collections, with label data as follows: (p) CAL/(p) Lectotype 3422 (Red label, from arbitrary unpublished designation) (MCZC). The lectotype and paralectotype series generally is in poor condition as is the

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**Figures 19–25.** Male genitalia, dorsal view. **Fig. 19, N. californica.** Fig. 20, N. cupreofusca. Fig. 21, N. bruneata. Fig. 22, N. alpina. Fig. 23, N. obrienorum. Fig. 24, N. monoensis. Fig. 25, A. cylindricollis.
series from MNHN that the syntype series is believed to have come from (Van Dyke, 1942:113).

TYPE LOCALITY. “occurs in the San Joaquin Valley, California.” (Horn, 1875.)

DISTRIBUTION (Fig. 36). Northern and central California, generally from low foothills bordering the San Joaquin and Sacramento valleys; also from the foothills around the San Francisco Bay and San Luis Obispo Co.


HOSTS. Adults have been collected from the stems of E. fasciculatum Benth., E. latifolium Sm. in Rees and E. nudum Dougl. ex Benth. Larvae have emerged from (Mariposa Co.) and been cut (Tehama Co.) from the roots of E. nudum (R.L. Westcott, in litt.).

FLIGHT PERIOD. June to September.

REMARKS. The general overall morphology of N. californica suggests the closest relative to be N. cupreofusca. The overlap of distributions between N. californica and N. obrinorum in Monterey and San Luis Obispo counties is curious and perhaps just an artifact of collecting, as no host plant information was recorded on these specimens. Specimens of both species from these areas are generally easy to separate as indicated in the key.

**Nanularia cupreofusca** Casey

Figures 16, 20, 29, 37


Nanularia (Nanularia) cupreofusca: Barr, 1970:3.

DIAGNOSIS. Size, 6.8–12.0 mm long × 1.9–4.2 mm wide; subcylindrical, convex; purplish cupreous; some specimens from extreme southern locality in Baja California with ealy non-iridescent brownish; disc of elytra with vague unimpressed striae.

REDESCRIPTION. Male. 6.8–9.5 mm long × 1.9–3.0 mm wide. Head. Densely punctate, sparsely clothed with short setae; frons somewhat flattened with a smooth callosity on either side of median depressed line; oblique supra-antennal carinae moderately elevated; elypeus broadly arcuate, margin obtuse at sides. Antennae. Serrate segments brownish lateraly.

Pronotum. Length subequal to width, widest in middle; coarsely punctate with short recurved setae; disc convex laterally, medially flattened with one smooth callosity posterior to middle on either side of median depression; anterior margin sinuate; basal margin strongly sinuate, with mediobasal lobe vaguely sinuate, impunctate; lateral margins slightly arcuate anteriorly, slightly constricted before base, carinate from acute basal angles to before middle. Scutellum. Subtriangular, broadly impressed medially.

Elytra. Wider than pronotum, widest basally; sides narrowing gradually to apical ¼, then tapering more steeply to subtruncate apices; lateral margins slightly serrate to slight sutural tooth; punctuation and vestiture as on pronotum, with punctuation somewhat reticulate basally; fine unimpressed striae arranged in pairs, more or less evident throughout width; suture at base moderately elevated and rounded.

Underside. Punctuation and vestiture on prosternum as on pronotum; meso- and metasterna and abdominal sternites with punctuation finer, more dense; setae longer, recumbent; prosternal process acuminate, lateral angles acute; abdominal sutures straight, subparallel, arcuate laterally.

Genitalia. As in Figure 20.

Female. 7.0–12.0 mm long × 2.8–4.2 mm wide; generally more robust; antenna segments more compact and unicol-
Figures 28–33. Dorsal outlines. Fig. 28, *N. californica*. Fig. 29, *N. cupreofusca*. Fig. 30, *N. brunneata*. Fig. 31, *N. obrienorum*. Fig. 32, *N. pygmaea*. Fig. 33, *A. cylindricollis* (scale bars = 1 mm).
Nanularia cupreofusca is fairly uniform in the central and southern portions of its range, but there are some specimens from isolated northern populations, such as in Los Angeles Co., that suggest a strong relationship with N. obrieriorn. Specimens from the southern portion of the range have a bruneous color phase resembling N. bruneata and some N. californica from their northernmost localities.

LECTOTYPE DESIGNATION. Female, one of two syntypes from the Casey collection, with label data as follows: (p) Poway, CAL/(p) Type, USNM 35857/(h), Nanularia cupreofusca Csf. (USNM). This designation is based on information from Buchanan (1935), who discussed the Casey collection and outlined those specimens that should be considered as the “type.” The sex of the paratype was not determined but the locality data are the same as for the lectotype.

TYPE LOCALITY. California, San Diego Co., Poway.

DISTRIBUTION (Fig. 37). Coastal southern California: Ventura, Los Angeles, San Bernardino, Orange, and San Diego counties; Baja California Norte.

MATERIAL EXAMINED. CALIFORNIA: VENTURA CO.: Sespe Canyon, 10-VII-1959 (UCDC); LOS ANGELES CO.: Acton, 16-VII-1960, 1961, on E. fasciculatum (GHNC, RLWE, CLBC); Encinal Canyon, Charmlee Park, 28-VII-1974 (RLWE); San Gabriel Canyon, Rincon Station, 27-VII-1975, on E. elongatum (DSVC); San Gabriel Canyon, 1600 ft., reared ex E. elongatum, coll. 8-VII-1975, emerged 4-VIII-1975 (RLWE); Tanbark Flat, 13-VII-1950 (CISC); SAN BERNARDINO CO.: N shore Baldwin Lake, 2-VI-1984, on E. kennedyi (RKVC, CLBC); ORANGE CO.: Laguna Beach, 14-VII-1951 (DSVC); SAN DIEGO CO.: Poway (CASC), 20-VII-1940 (CASC), 9-VI-1885 (FMNH); La Mesa, 6-VII-1953, 1-VII-1957 (CASC); Dulzura, 28-VIII-1949 (FMNH); Barret, 16-VI-1974, cut from roots of E. fasciculatum (BKDC), 14-VII-1979 (CLBC, BKDC), 6-TX-1982 (CLBC) on E. fasciculatum; 2.7 mi. E Potrero, 24-VI-1979, cut from roots of E. fasciculatum (BKDC); 3 mi. E Potrero, 14-VIII-1982, on E. fasciculatum (CLBC); Otay Lake, 16-VII-1983, on E. fasciculatum (CLBC); MEXICO: BAJA CALIFORNIA NORTE: 6 and 12 mi. S Santo Tomas, 27-VI-1976 (DSVC), 12.5 mi. S Santo Tomas, 30-VI-1973 (RLWE); 9 and 21 km S Santo Tomas, 6-VIII-1980 (CLBC, RLWE), all on E. elongatum; 13 mi. S San Augustin, 29-VII-1955 (CASC); 0.5 mi. N La Virgen, 1-VII-1973 (RLWE); 2 mi. N Catavina, 28-VI-1976, on E. elongatum (DSVC); Sierra San Pedro Matir, 5 mi. S Mike’s Sky Ranch, 16-VII-1977 (RLWE).

HOSTS. Adults have been collected from the foliage of E. elongatum Benth., E. fasciculatum, and E. kennedyi Porter ex Wats. Larvae and adults have been cut from the roots of E. fasciculatum and reared from E. elongatum.

FLIGHT PERIOD. June to September.

REMARKS. Nanularia cupreofusca comes closest to N. bruneata, although, as discussed previously, it seems to come near N. obrieriorn in several northern populations. The former two species have distributions that are almost contiguous in Los Angeles and San Diego counties, apparently separated by the coastal transverse ranges.

Nanularia bruneata (Knull)

Figures 2, 21, 30, 37


DIAGNOSIS. Size, 6.8–12.0 mm long × 1.7–4.2 mm wide; subcylindrical, convex; head, pronotum, and underside shining cuprous; elytra bruneous with lateral margins and suture dark; pubescence on head, pronotum, and underside moderately dense, with thick pulverulent coating, especially on specimens from desert localities.

REDESCRIPTION. Male. 6.8–11.0 mm long × 1.7–4.2 mm wide. Head. Convex between eyes, closely, densely punctate; frons and clypeus clothed with long recurrent white setae; supra-antennal carinae moderately elevated; clypeus arcuately emarginate, margin obtuse laterally. Antennae. Serrate portion of segments 4–11 bruneous.

Pronotum. Wider than long, widest before middle; irregularly coarsely punctate with short fine recurved setae; anterior margin broadly arcuate; lateral margins arcuate, carinate basally, carinae not reaching to middle; disc convex, median depression separating two smooth callosities before middle; mediobasal lobe impunctate, slightly elevated apically. Scutellum. Wider than long, slightly depressed medially.

Elytra. Widest at base, wider than pronotum; sides gradually converging to subtruncate apices, with sutural tooth; lateral margins serrulate on apical ½; disc densely punctate basally, punctures becoming finer and less dense apically, indistinctly striate apically; surface with short recurved white setae.

Underside. Finely densely punctate with fine, long recurved setae; prosternum with anterior margin broadly arcuate; process acuminate, lateral angles acute; abdomen convex with sutures parallel.

Genitalia. As in Figure 21.

Female. 9.0–12.0 mm long × 2.8–4.2 mm wide; generally larger, more robust; serrate antennal segments more compact, unicorial; abdomen more convex, with apical sternites more steeply declivous.

VARIATION. Nanularia bruneata is generally uniform throughout its wide range. The differences noted are probably environmentally induced and may be allometric as well, such as altitudinal, e.g., smaller overall size with increasing elevation, or climatic, e.g., more pulverulence in more arid localities. These differences can also be correlated with host plants, but since this would not agree with the observation of increased overall size in relation to larger root crowns, e.g., larger individuals in E. inflatum, which has the smallest
roots generally of the hosts recorded below, I favor the environmental explanation.

**TYPE LOCALITY.** Holotype, female (FMNH): California, Riverside Co., Palm Springs, 30-VI-1946, D.J. and J.N. Knoll.

**DISTRIBUTION** (Fig. 37). Inland southern California: Arizona, Nevada, Utah, and Idaho.


**HOSTS.** Adults have been collected from foliage, cut from roots or emerged from E. elongatum, E. fasciculatum, E. kearneyi Tidestr., and E. inflatum Torr. and Frem. (see Nelson and Westcott, 1976). Larvae have been cut from roots of E. elongatum and E. inflatum. Barr (1971) states that the material from Utah and Idaho is associated with E. microthecum Nutt. and an unidentified species of Eriogonum. The records from Artemisia californica and Acacia greggii are incidental adult resting collections.

**FLIGHT PERIOD.** May to September.

**REMARKS.** Nanularia brunneata comes nearest to N. cupeofoesca and is, in fact, hard to separate from non-irridecent specimens of the latter species. Nanularia brunneata occupies the widest variety of habitat types occurring from the low desert of southeastern California and adjacent Arizona to the submontane chaparral biome of Pinyon Flats, Santa Rosa Mts., California, then north and east into Great Basin and Upper Sonoran desert habitats, respectively, in Nevada, Utah, Idaho, and Arizona.

I suspect that N. brunneaeta will be found in northeastern Baja California, and perhaps also in northern Sonora, since several of its recorded hosts occur there and the distribution is almost contiguous with the border in several places. A specimen labelled OKLAHOMA: Beaver, 16-VII-32 (FMNH) was not included on the distribution map because of its doubtful nature. This locality is approximately 700 miles east and slightly north from the next closest locality in eastern Arizona.

**Nanularia alpina** Bellamy, new species

Figures 22, 34, 37

**DIAGNOSIS.** Size, 7.5–11.5 mm long × 2.2–3.2 mm wide; subcylindrical, convex; shining aeneous with greenish tinge; surface moderately coarsely punctate.

**DESCRIPTION.** Holotype male. 7.5 mm long × 2.2 mm wide. Head. Somewhat flattened between eyes; median depression on vertex, widening above antennal cavities; surface very coarsely, irregularly punctate, clothed with semierect, recurved setae; oblique supra-antennal ridges strongly elevated laterally, with short diagonal carinae above; clypeus shallowly emarginate, sides obtuse. Antennae. Segment 3 almost twice as long as 2; 4–10 somewhat flattened, transversely rounded, serrate; 4 slightly longer than wide; length
subequal to width in segments 5–10; 11 oblong, appendiculate.

**Pronotum.** Length subequal to width, widest at middle; anterior margin broadly arcuate; basal margin feebly trisinuate; lateral margins arcuate, constricted slightly before acute basal angles; surface moderately, coarsely punctate on disc, denser laterally; clothed with fine recurred setae; disc convex laterally, somewhat flattened medially; mediobasal lobe impunctate and slightly elevated apically; five small smooth callosities arranged as follows: two anterior on disc with slight depression between; one longitudinal in center; two basal, each halfway between basal angle and lobe. *Scutellum.* Transverse, glabrous.

**Elytra.** Wider than pronotum, widest at humeri; sides subparallel to apical ⅓, then gradually tapering to slightly truncated, suturally rounded apices; margins serrulate in apical ⅓; surface punctuation dense and coarse basally, reduced discally and apically; uniformly clothed with recurred setae; each elytron with slight longitudinal depression between humerus and internal short carina; irregular series of costae between basal carina and suture; suture slightly elevated and impunctate around scutellum.

**Underside.** Thoracic sternites clothed with long semi-erect setae; prosternum coarsely, meso- and metasterna shallowly punctate; prosternal process with lateral angles acute; abdomen shallowly punctate with short recumbent setae.

**Legs.** Punctate with recumbent setae; femora slightly enlarged medially; tibiae straight, armed apically with two short spines; posterior tibiae longer than tarsi; first segment of posterior tarsus as long as 3 and 4 together, shorter than 5; claws expanded at base.

**Genitalia.** As in Figure 22.

**FEMALE PARATYPES.** 8.0–11.5 mm long × 2.5–3.2 mm wide; slightly more robust than male; serrate antennal segments more compact; callosities anterior on disc of pronotum larger, two smaller callosities laterally; abdomen more steeply declivous; one female with purplish tinge rather than green.

**MATERIAL EXAMINED.** Holotype male (LACM): CALIFORNIA: LOS ANGELES CO.: San Gabriel Mts., Throop Peak Trail near Dawson Saddle (Fig. 37), 8100 ft., 28-VI-1975, R.L. Westcott, in root of *Eriogonum kennedyi*; 2 female paratypes with same data as holotype, except on foliage of *E. kennedyi*; 1 female paratype with same data, except 8-VII-1975. Paratypes deposited in RLWE and CLBC.

**ETYMOLOGY.** The species is named for being from the highest elevation of any *Nanularia* spp.

**HOST.** The specimens are labelled as collected from *Eriogonum kennedyi* Porter ex Wats.; however, the work of Reveal (1968) suggests that based on the altitude of the type locality, this should be the variety *alpinum* M. and J.

**REMARKS.** *Nanularia alpina* is separated from the others by a combination of its smaller size, larger punctuation, coloration, and distribution. The male genitalia resemble those of *N. cupreofusca*, which occurs widely and at lower elevations in the San Gabriel Mountains.

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*Nanularis obrienorum* Knell

Figures 5, 8, 11, 15, 18, 23, 31, 36


**DIAGNOSIS.** Size, 7.0–15.0 mm long × 2.0–5.5 mm wide; subcylindrical, slightly flattened above, convex below; shining dark cupreous to aeneous; specimens from lower elevations generally densely covered with white pubescence.

**REDESCRIPTION.** Male. 7.0–11.7 mm long × 2.0–4.1 mm wide. **Head.** Densely, coarsely punctate, punctures confluent along eyes; densely clothed with white pubescence; frons depressed between eyes; clypeus emarginate, margin obtuse at sides; supra-antennal carinae strongly elevated, with obtuse tooth at sides. **Antennae.** With serrate segments brunneous laterally.

**Pronotum.** Wider than long, widest at middle, wider at base than at apex; anterior margin broadly arcuate; basal margin trisinuate; sides broadly arcuate apically, sinuate towards base; lateral margins carinate on basal ⅔; surface very coarsely punctate, more so than on head; mediobasal lobe much less punctate, slightly elevated apically, with transverse depression towards disc; entire surface sparsely clothed with recumbent white pubescence, slightly longer laterally. **Scutellum.** Transverse, glabrous.

**Elytra.** Wider than pronotum, widest just behind humeri; sides sinuate to about middle, then broadly rounded to trun-
cate apices; lateral margin finely serrate on apical \( \frac{1}{2} \); suture with short spine at apex; disc with surface irregularly densely punctured, with feebly indicated irregular costae; punctuation similar to head; recumbent white setae short, longer along suture.

**Underside.** Clothed with short recumbent setae, longer on pro-, meso-, and metasterna; prosternum convex, surface densely coarsely punctate, punctures of rest of ventral surface much smaller, except for last abdominal sternite, which is coarsely punctate.

**Genitalia.** As in Figure 23.

**Female.** 9.0–15.0 mm long \( \times \) 3.5–5.5 mm wide; generally more robust, differs from male with the antennae slightly shorter and the serrate segments more compact and unicolorous and the abdominal sternites more steeply declivous.

**VARIATION.** The population from the type locality generally has the largest size range, darker coloration, and a dense pulverulent coating. These differences may be allometric and induced by the very robust host plant, *E. nudum* var. *indicatum* (Jeps.) Reveal. Populations from Frazier Park and Lebec use a different variety of *E. nudum*, var. *saxicola* Heller and are similar in size range and color. The population from Gorman uses *E. elongatum* and differs from the other populations by being more aecious and having the punctuation reduced slightly. Specimens from all but the type locality have the pulverulent coating reduced.


**DISTRIBUTION** (Fig. 36). California: Monterey, Kern, and Los Angeles counties.

**MATERIAL EXAMINED.** CALIFORNIA: MONTEREY CO.: 12 mi. SW Parkfield, 29-VII-1983 (AJGC, CLBC, GHNC, RLWE); KERN CO.: McKittrick and 1 mi. S, various dates in July and August, on *E. nudum* var. *indicatum* (CLBC, RHHC, RKVC, DSVC, GCWC); Frazier Park, 15-VII-1972 (FTHC, DSVG); 2 and 2.5 mi. W Lebec, various dates, mid-July, on *E. nudum* var. *saxicola* (CLBC, GCWC); LOS ANGELES CO.: Gorman, 0.5, 5.0, and 5.4 mi. N, various dates, mid-July, on *E. elongatum* (CLBC, RHHC, DSVC); Vincent, 24-VII-1947 (MCZC, UCRC); 8 mi. SW Willow Springs, 5-VIII-1969 and 12 mi. W Lancaster, 9-VIII-1969, all (GHNC).

**HOSTS.** Adults have been collected from the foliage of *E. elongatum*, *E. nudum* var. *indicatum*, and var. *saxicola*. The variety *saxicola* is used since that is the name recorded on the specimens, but Reveal (1968) synonymized *saxicola* under the name var. *pubiflorum* Benth.

**FLIGHT PERIOD.** July and August.

**REMARKS.** Further collecting is needed to determine the entire range of phenotypic variation. The relationship with *N. cupreofusca* and possibly with *N. californica* is discussed under those two species. *Nanularia obrienenorum* comes closest to *N. monoensis*, new species as I mentioned previously since they are most similar with regard to the morphology of the male genitalia, but their respective ranges are widely separated and there is no overlap in choice of *Eriogonum* hosts.

**Nanularia monoensis** Bellamy, new species

Figures 24, 35, 40

**DIAGNOSIS.** Size, 8.0–12.5 mm long \( \times \) 2.2–4.3 mm wide; subcylindrical, slightly flattened above, convex below; shining black with slight purplish or bluish reflection; fresh specimens with moderate coating of white pulverulence.

**DESCRIPTION.** Holotype male. 10.5 mm long \( \times \) 3.2 mm wide. Head. Coarsely, irregularly punctate with erect recurved setae; frons somewhat flattened between eyes, transversely depressed above supra-antennal carinae; carinae strongly elevated to rounded median point; clypeus broadly triangularly emarginate, margin strongly flattened along emargination, sides obtuse. *Antennae*. With segment 3 slightly more than twice as long as 2; segments 4–10 slightly flattened, transversely rounded, serrate; 4 longer than wide; 5 as long as wide; 6–10 with length subequal to width; 11 appendiculate.

**Pronotum.** 1.5 \( \times \) as wide as long, widest at middle; anterior margin feebly sinuate; base feebly trisinuate; lateral margins rounded in front, subparallel from middle to base, carinate on basal \( \frac{1}{4} \); basal angles acute; disc laterally convex, medially...
strongly depressed from before middle to slightly before mediobasal lobe; two small callosities laterally in front of discal depression, one on either side; surface coarsely, densely punc-
tate, moderately clothed with recurved setae. Scutellum. Tri-
angular, widest anteriorly, glabrous.

Elytra. Slightly wider than pronotum, widest at humeri; sides subparallel to apical $\frac{2}{3}$, then narrowing to slightly trunc-
cated apices, margin slightly serrulate; surface densely punc-
tate discally, sparsely at sides; clothed with short recumbent setae; disc vaguely striate.

Underside. Prosternum coarsely punctate, anterior areas between punctures slightly elevated, callose; process with lat-
eral angles acute; meso- and metasterna and abdomen sparsely shallowly punctate, whole surface clothed with long re-
cumbent setae; last sternite with apex rounded.

Legs. Sparsely punctate, clothed with long setae; pro- and
mesofemora slightly fusiform, metafemora with sides parallel; pro- and mesotibiae straight, armed with two short apical spines; metatibiae slightly arcuate, longer than tarsi; metatarsi with segment 1 slightly shorter than 3 and 4 together, subequal to 5; claws slightly expanded at base.

Genitalia. As in Figure 24.

MALE VARIATION. The male paratypes vary from 8.0–12.0 mm long × 2.2–4.0 mm wide; the degree and density of pronotal punctuation vary slightly and the coloration ranges from a purplish to bluish reflected tinge.

FEMALE VARIATION. The female paratypes vary from 9.5–12.5 mm long × 3.0–4.3 mm wide; and differ from males as follows: antennal segments more compact; lateral punctate areas of pronotum slightly more callous and abdomen slightly more declivous.

MATERIAL EXAMINED. Holotype, male (LACM):
CALIFORNIA: MONO CO. (Fig. 36): 6.5–7.0 mi. NW Benton Hot Springs, 2000 m, 7-VIII-1979 on E. k. kearnyi, R. L. Westcott; 56 male, 45 female paratypes as follows: 4 male, 2 female, same data as holotype; 1 male, same data except, emerged VIII–1980 from roots collected at the type locality, 7-VIII–1979; 2 male, 3 female, 6.5–7.5 mi. NW Benton Hot Springs, 6700 ft., 15/6–18-VIII–1979; 1 female, 4.3 mi. W Calif./Nev. line, Hwy. 167, 17–18-VIII–1979, all CLB; 14 male, 7 female, 6.5 mi. NW Benton Hot Springs, 2000 m, 3-VIII–1980, R.L. Westcott; 25 male, 21 female, 6.5 mi. W Benton, Hwy. 120, 30/31-VII–1981, G.H. and J.M. Nelson, G.C. Walters, on E. kearnyi var. monoenosis; 1 male, 4 mi. W Nevada border, Hwy. 167, 7-VIII–1981, R.K. Velten; 6 male, 8 female, 0.2–1.0 mi. W Benton Hot Springs, Hwy. 120, 8-VIII–1981, CLB and R.K. Velten; 3 male, 3 female, T3N, R28E, 6700 ft., 8-VIII–1969, O. Shields (LACM). Paratypes are deposited in ACAS, WFBC, CLBC, LACM, GHNC, MTCJ, RKVC, DSVC, GCWC, GAWC, RLWE, and USNM.

ETYMOLOGY. The name is derived from Mono Co., California, the only area from which the species is currently known.

HOSTS. All specimens were collected or emerged from E. k. var. kearnyi Tidestr. and var. monoenosis (S. Stokes) Reveal. According to Reveal (1968), the variety kearnyi is known only from the northeast shore of Mono Lake, whereas monoenosis is the common variety in the Mono Basin.

REMARKS. Nanularia monoenosis comes nearest to N. obtiorum and can be separated by differences in color, sculpture, shape of the male genitalia, and by their disjunct ranges and host plants.

Nanularia pygmaea (Knoll)

Figure 32, del. from transparency of holotype

Hippomelas pygmaea Knoll, 1941:386.

DIAGNOSIS. Size, 8.0 mm long × 3.0 mm wide; robust, subcylindrical, somewhat flattened above, more convex below; entirely cuprous and coarsely punctate.

REDESCRIPTION (from holotype and modified from Knoll, 1941:386). Female. Peak. Convex; surface rugose, a smooth callosity on front, pubescence inconspicuous. Antennae. Short, not reaching middle of pronotum when laid along side margin; segment 1 stout; segment 2 much shorter; segment 3 as long as segment 1; segment 4 shorter than 3; segments 5–11 decreasing in length to 11 with 4–11 serrate.

Pronotum. Wider than long, widest basally, constricted at apex; sides broadly rounded in front, parallel on basal ½; anterior margin nearly straight; basal margin trisinate with median lobe broad; disc convex, a transverse depression in front of scutellum, a smooth callosity on each side of anterior ½; lateral carinae present on basal ½ only; surface very coarsely, irregularly punctate, pubescence absent. Scutellum. Small, triangular, longitudinally depressed in middle.

Elytra. Wider than pronotum, widest at apical ½ (although not indicated in Fig. 32); sides rounded in front, constricted about middle, broadly rounded posteriorly to separately rounded apices, margins serrate on apical ½; disc convex.

basal depression on each elytron near humeral angle; surface striate, punctures of intervals large, smaller than those of pronotum, irregularly placed, pubescence absent.

Underside. Abdomen beneath finely densely punctate, pubescence; prosternal process slightly acute laterally; last abdominal sternite rounded at apex; surface rugose.


DISTRIBUTION. Known only from the type locality.

REMARKS. The very disjunct locality, differences in the morphology, and lack of certain host plant knowledge make the placement of this species in Nanularia questionable. While it is undoubtedly closer to Nanularia than to Hippomelas (Gyscactus), from which it was transferred by Nelson (1980), further study and material are needed to determine its proper placement. Unfortunately, this species is known only from the unique female holotype. The vague and secretive locality data recorded on the label make the search for additional material particularly difficult. Independent efforts by myself and G.H. Nelson during 1982 and 1983 in Val Verde Co., failed to yield additional specimens. However, a single larva, suspected to be this species, was collected by R.L. Westcott and W.F. Barr with the following information: TEXAS: Val Verde Co., Hwy. 90 at Pecos River crossing, 14-VII-1984, ex root crown of Coldenia canescens DC. (Boraginaceae). The larva complements favorably to N. californica and C. canescens has a similar growth habit to that of many species of Ereigorham (R.L. Westcott, in litt.).

Genus Amipheremus Fall

Amipheremus Fall, 1917:68; Leng, 1920:179; Chamberlin, 1926:87; Obenberger, 1930:422.

TYPE SPECIES (by original monotypy). Amipheremus cylindrificollis Fall, 1917:69.

DIAGNOSIS. Small, length generally less than 9.0 mm; elongate, subcylindrical, slightly flattened above and below; surface finely punctured and moderately pubescent.

REDESCRIPTION (modified from Fall, 1917:68). Body narrow, subcylindrical, mentum very strongly transverse, arcuate; emarginate anteriorly; labrum short, bilobed; clypeus broadly sinuate; antennal cavities rather large, separated by slightly more than ½ the total width between the eyes, upper margins oblique and slightly reflexed; eyes moderate, their inner margins nearly parallel; antennae short, rather thick, serrate from 4th segment, these densely, finely punctate and opaque inferiorly, sensory pores diffuse on both surfaces.

Pronotum cylindrical, not margined at sides except for a very short distance before basal angles; base with a short, broad, sinuate, feebly reflexed lobe. Scutellum very short, broad, anterior margin broadly arcuate.

Elytra narrow, parallel, a little wider than the pronotum, lateral margins not serrulate.

Prosternum (Fig. 14) broadly convex, more strongly so
between coxae, basally truncate, process slightly dilated behind procoxae, then gradually pointed; procoxae separated by about their own widths; middle coxae slightly more distant; metepisterna moderately wide, about 2.5 × long as wide; metacoxal plates scarsely dilated internally, posterior margin concave, slightly oblique.

Abdominal sternites (Fig. 14) 2–4 equal in length, first conspicuously and fifth slightly longer, sutures straight, the first finely but distinctly impressed.

Legs moderate, tarsi subequal in length to the tibiae, basal joint distinctly longer than the second, segments 1–4 lobed beneath; claws simple.

Metathoracic wing (Fig. 3) membranous; subcosta fused with radius at basal ⅓; radial cell narrow, elongate; radial sector distant from medial vein; radio-medial cross-vein absent; anal veins vaguely indicated; 1st A free; cubito-anal vein incomplete; “wedge cell” 2d-2d A closed.

Genitalia. Male, as in Figure 25; female ovipositor, as in Figure 27.

*Ampheremus cylindricollis* Fall
Figures 3, 6, 9, 12, 14, 25, 27, 33, 38, 39

*Ampheremus cylindricollis* Fall, 1917:69; Leng, 1920:179; Chamberlin, 1926:87; Obenberger, 1930:422.


**DIAGNOSIS.** Size, 5.0–9.0 mm long × 1.0–2.5 mm wide; elongate, subcylindrical, slightly flattened above and below; surface finely punctured and moderately pubescent with fine whitish setae, which are recumbent on the elytra and slightly longer and more erect on the head and pronotum; head, pronotum, and undersides dull metallic green; elytra either same color or reddish purple.

**REDESCRIPTION** (modified from Fall, 1917:69). Male. 5.0–6.5 mm long × 1.0–2.0 mm wide. **Head** (Fig. 6). Subequal in width to apical width of pronotum; frons convex, densely punctate, with two very small tuberculiform prominences at middle, with slight impression between. **Antennae** (Fig. 9). Equal in length to pronotum and attaining the middle of the latter; segments 1 and 3 moderately elongate; 2 and 4 shorter; 4 triangular, as long as wide; 5–11 transverse, their lower edges feebly then rapidly oblique to base.

**Pronotum.** Cylindrical, length subequal to width, widest near middle; sides sinuate from base to middle, then nar-
rowing to apex; disc slightly more strongly convex anteromedially, with short ante-median impression; surface nearly evenly punctate, punctures separated by their own, or slightly greater, diameters, interstices polished; hind angles not carinate.

Elytra. Slightly wider than pronotum; parallel to apical ½; apex (Fig. 12) obutely rounded or subtruncate; surface rather densely punctate; vaguely and finely striate; punctures of the intervals similar to and much confused with those of the striae.

Underside. Rather closely punctate and finely pubescent, punctures coarser at middle of prothorax, somewhat denser at sides of body; posterior margins of ventral segments 2 to 5 smooth at middle; last segment subtruncate apically.

Genitalia. As in Figure 25.

Female. 6.9–9.0 mm long × 1.9–2.5 mm wide; differ from the males by being generally larger; slightly more robust and by having the abdomen more steeply declivous.

VARIATION. Some specimens of both sexes have the elytra concolorous with the head and pronotum.


DISTRIBUTION (Fig. 38). Utah, Nevada, California, Arizona, and New Mexico.

MATERIAL EXAMINED. UTAH: WASHINGTON CO.: Ivins, 8-VI-1968 (EMUS) (new state record); NEVADA: MINERAL CO.: Candelaria, Pickhandle Gulch, 23-VI-1952; 4 mi. S Belleville, 2-VII-1952, all (CASC); CALIFORNIA: INYO CO.: many localities, many dates in late May through June, from N of Bishop, south through Owens Valley, on E. inflatum (many collections); KERN CO.: 3.5 mi. N Ricard, 1-VI-1960; Randburg, 30-V-1960, all (DSVC); SAN BERNARDINO CO.: 3 mi. S Halloran, 12-V-1974 (DSVC); Afton Canyon, 23 mi. SW Baker, 25-IV-1977 (CISC); Manix, 25-V-1953, on E. inflatum (UCRC); 29 Palms, 24-IV-1949 (LACM); RIVERSIDE CO.: Sky Valley, 1 mi. W 1000 Palms Canyon Rd./Dillon Rd., 11-IV-1970 (DSVC); 19.4 mi. W Desert Center, 4-VI-1966, on E. trichopes (UCRC); SAN DIEGO CO.: Borrego Valley Dunes, 18-IV-1957 (CASC, UCDC); ARIZONA: MOHAVE CO.: Littlefield, 30-IV-1982 (EMUS); YUMA CO.: foothills, E Yuma, emerged 20-V-2-VI-1980, from Eriogonum sp. (FMBC); PIMA CO.: Ajo, 26-IV-1935 (FMNH); Tucson, 30-IV-1936 (CASC); NEW MEXICO: HIDALGO CO.: 2 mi. N Rodeo (specimens labelled Chiricahua Mts.), 27-VI-1949, on flowers of Eriogonum sp. (FMNH); Antelope Corral, 4040 ft., 6 mi. N Rodeo, 31°55′-56′N, 109°00′-01′W, 4-VI-1983 (CHAH, CLBC); Lordsburg, 23-VI-1949 (FMNH).

HOSTS. Adults have been collected from E. inflatum throughout their range (Fig. 39), with additional collections from E. trichopes and spp.

FLIGHT PERIOD. April to June; with the adults active earlier in the more southerly portion of their range.

REMARKS. Van Dyke seemingly ignored Fall’s description when he described H. (N.) inyoensis; it is unlikely that he ever saw the type but considering Fall’s comment relating Amphereus to Nanularia, the oversight is still curious.

BIOLOGY OF NANULARIA AND AMPHEREMUS

Knill (1970) reported adults of Amphereus on the flowers of Eriogonum sp. Adults of N. monoensis were found feeding on the stem tissue of E. kearneyi (Fig. 40).

Larvae for most species were collected from their hosts. Extensive notes by R.L. Westcott (in litt.) indicate that the females of N. californica apparently oviposits at ground level or below the surface in the root crown. The larvae burrow extensively throughout the woody portions of the root. Emergence holes were always found below the surface.

The life cycle apparently involves several years, since fully mature larvae were collected from roots of E. kearneyi concurrently with adults on the foliage. However, it is possible that the pupal phase is short and emergence could take place in the same year.

Newly emerged adults of several species of Nanularia are often covered with a waxy pulverulence, which is thought to
be a waste product and may inhibit desiccation. This pul- 
ervulent coating may also afford cryptic coloration since the 
growing stems of many *Eriogonum* spp. are pubescent or 
glaucescent. Species of other buprestid genera, such as *Hippo-
melas* and *Chrysobothris*, often have a similar covering. Those 
species or populations of *Nanularia* from the most arid areas 
are the most heavily coated with this waxy covering. The 
species that are most often collected with a pulvulent coat 
are *N. brunneata*, *N. monoensis*, and *N. obrienorum*.

**BEHAVIOR OF *NANULARIA***

The adults of *Nanularia* are most active during the warmest 
period of the day. They are very alert and quick to fly when 
approached, but will often circle the stem they are resting on 
before flying. Males were observed to be more active, since 
more were collected in flight. The females generally sit to- 
wards the outer portion of the stems. Mating was not ob-
erved except for a single occurrence; no courtship or mating 
behavior is known or was observed.

The adults spend the cooler parts of the day and overnight 
at the base of the stems and can be observed moving up or 
down, depending on the time of day and air temperature. 
R.L. Westcott (*in litt.*) writes of the collection of a large series 
of *N. californica* during a thunderstorm by sweeping in the 
late afternoon, with the beetles apparently not induced to 
“take cover” (move to the base of the plant) on an otherwise 
hot day.

**SUMMARY AND CONCLUSIONS**

The species of *Nanularia* are in the midst of a period of high 
evolutionary flux. *Ampheremus* is sufficiently distinct mor- 
phologically to infer that considerable time has passed since 
the divergence of these taxa.

As stated in the introduction, I believe that the use of a 
diversity of *Eriogonum* species and varieties as hosts during 
a more mesic climatic phase than at present was the initial 
vicariant event in the speciation of *Nanularia*. As the climate 
shifted to a more xeric condition, the range or distribution 
of the various *Eriogonum* spp. decreased and isolated the 
populations. Restrictions of the various gene pools and the 
specific chemistry of the hosts initially produced different 
genotypes and thus subsequent phenotypic differentiation. 
In addition to the host biochemistry, there is evidence to suggest 
that the size of the host plant itself and, hence the size of the 
root crown, yields populations with size range (allometric) 
differences. As an example, the specimens of *N. obrienorum* 
from the type locality use the more robust variety of *E. 
compositum*, var. *indicium*, and this population has the largest 
average size of any of the four phenotypes of this species. 
R.L. Westcott (*in litt.*) has observed this same phenomenon 
in species of *Chrysobothris* that utilize *E. compositum* in 
Oregon. A similar size range difference is noted in species 
that occur over a variety of elevations, with the size generally 
smaller at higher elevations. Interestingly though, an 
expected similar relationship was not found with *N. brunneata* 
which has the largest latitudinal range. Many biological gra-

dients show similar patterns in elevation and latitude shifts, 
but the populations of *N. brunneata* from southern California 
and Utah appear to have a very similar size range.

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**LITERATURE CITED**

Alexeev, A.V. 1969. O pistschevych formach uzkotejol zlatki 
*Agrius viridis* (L.) (Col., Buprestidae). Zoologicheski 
Zhurnal 48:85–92.

Arnett, R.H. 1971. *The Beetles of the United States.* 3rd 
ed. The American Entomological Institute, Ann Arbor, 
Mich. xii + 1112 pp.

Arnett, R.H., G.A. Samuelson, J.B. Heppner, G.M. Nishida, 
J.C. Watt, and R.E. Woodruff. 1986. *The Insect and 
Spider Collections of the World.* E.J. Brill/Flora & Fauna 

Barr, W.F. 1970. *The subgenera of Nanularia and Hippo-
melias*. Biological Society of Nevada, Occasional Pa-
pers, No. 25, 9 pp.

Northwest*, Part V, ed. M.H. Hatch, 55–89. Univ. of 


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