

INSECTS OF WESTERN NORTH AMERICA

2. The Cicadas of Colorado (Homoptera: Cicadidae, Tibicinidae)



**Contributions of the
C.P. Gillette Museum of Arthropod Diversity
Department of Bioagricultural Sciences and Pest Management
Colorado State University**

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Cover illustration. *Tibicen dorsatus* (Say), lateral view, Bent Co., Colorado. Photograph, D. A. Leatherman.

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2. The Cicadas of Colorado (Homoptera: Cicadidae, Tibicinidae)

by

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We know that you are royally blest
Cicada when, among the tree-tops,
You sip some dew and sing your song;
For every single thing is yours
That you survey among the fields
And all the things the woods produce,
The farmers' constant company,
You damage nothing that is theirs;
Esteemed you are by every human
As the summer's sweet-voiced prophet,
The Muses love you, and Apollo too,
Who's gifted you with high-pitched song.
Old age does nothing that can wear you,
Earth's sage and song-enamored son;
You suffer not, being flesh-and-blood-less -
A god-like creature, virtually.

- *Anacreontea*, Greece circa 5 A. D.
translated by Rory B. Egan, *Cultural Entomology Digest*

Abstract

Twenty-seven species of cicadas in the families Cicadidae and Tibicinidae are treated for Colorado, clarifying literature records. Four new state records, *Diceroprocta apache* Davis, *Tibicen inauditus* Davis, *Pacarina puella* Davis, and *Okanagana occidentalis* (Walker) are reported. *Platypedia latipennis* Davis is considered a synonym of *P. mohavensis* Davis. Illustrations, color photographs, and keys are presented to aid identification.

Introduction

The cicadas have a rich and diverse history spanning centuries of human cultures, religions, and traditions. A story from ancient Greece recounts the myth of *Eunomos*, who substituted the fifth string of his cithara with a singing cicada to win a musical competition (Egan 1994). The ancient Chinese revered the cicadas as symbols of immortality, with cicadas adorning ritual bronze vessels from the Shang Dynasty as well as ceremonial objects dated from 206 B. C. to 220 A. D. (Riegel 1994). Also, the Mayans were described by Chinese explorers as placing jade cicadas in the mouths of their dead (Riegel 1994). Even Buddhist poets have drawn analogies from the cast cicada skin with the hollow human shell left behind in death before beginning a new life (Riegel 1994). In indigenous American southwestern culture of the Hopi, the hump-backed flute player is equated with the cicada (Capinera 1995).

Still today in many regions of North America, the songs of the cicadas serenade the late spring and summer months, especially the “dog-day cicada” (*Tibicen* spp.) of the deciduous forests of eastern and central North America. In Colorado, these songs can often be heard in the afternoons of hot summer days. These often-complex songs are used to attract mates. Some species form chorus centers for mate attraction.

Cicada Life History

Cicadas pass through three major life stages: egg, nymph, and adult. Female cicadas produce batches of eggs containing between 200-600 eggs, depending on the species (Moulds 1990). In most cicada species the females lay their eggs in slits on tree branches, plant stems, or in dead wood. Often these slits, created by the ovipositor of the female, cause the only true plant injury associated with this insect (Fig. 36). Three to 16 eggs are laid per oviposition site (Beamer and Beamer 1930, Cranshaw and Kondratieff 1991).

Typical cicada eggs are white or cream colored, cigar-shaped, and measure 1.5-3.0 mm in length (Moulds 1990). Environmental factors may affect time spent in the egg stage. However, most cicadas hatch after 70-120 days, while others overwinter in the egg stage (Moulds 1990). There are five instars in cicadas (Beamer 1928).

A *pronymph* hatches from the cicada egg. An ephemeral, thin covering or skin that restricts its appendages surrounds the pronymph. The pronymphal skin is shed minutes after hatching, and the insect falls to the ground. Cicada nymphs use their spade-shaped forelegs to burrow up to 40 cm below the ground surface (Moulds 1990). For days, weeks, months, or years the cicada nymphs feed on the sap in tree or other plant roots with needle-like rostrums. Most Colorado cicadas live underground for two to five years; the periodical cicadas (*Magicicada* spp.) that spend 13 to 17 years underground, do not occur in Colorado (Cranshaw and Kondratieff 1991). Nymphs remain at one feeding site burrowing further only if the host plant dies (Beamer 1928). Most cicadas will feed on a number of host plants that are typically woody, but also include grasses and forbs. Host plant distribution is a major factor influencing the geographical distribution of cicadas.

After the nymphal stage is complete, cicadas dig upward and crawl out onto the soil

surface. There the nymphal skin is cast, and the winged adult stage may live from one to several months, depending on species. The cast nymphal skins or exuviae of cicada nymphs are a common sign of emergences.

Reported predators of cicadas include birds, spiders, parasitoid sarcophagid flies, cedar beetles (*Sandalus niger* (Knoch)), the “cicada killer” wasps (*Sphecius grandis* Say and *S. speciosus* (Drury)), the fungus *Paecilomyces farinosus*, and the bacterium *Corynebacterium okanaganae* (Soper et al. 1976). *Sandalus niger* (Fig. 1) is a common beetle in the Lamar area of southeastern (Prowers County) Colorado, where it is associated with large populations of *T. dealbatus* (Davis).

McAtee (1932) lists 87 North American bird species with cicadas as part of their diet. Leatherman has observed the American kestrel, Mississippi kite, and redheaded woodpecker directly taking *T. dealbatus* adults in August (1998-2001) in Prowers County. The woodpecker appeared to capture 5-6 individuals in the course of one afternoon. One prey was taken atop a large horizontal cottonwood limb, where the bird hammered the insect repeatedly to remove wings and legs. The abdomen was swallowed whole. A loggerhead shrike was observed by J. Thompson to capture an individual of *T. dorsatus* (Say) flushed from the prairie near Walsh, Colorado on 7 September 1992. When the cicada shrilled, the bird released it. Western kingbirds and American robins also have been observed feeding on adult cicadas in Colorado. Tinkham (1941) vividly describes the gut of a lesser nighthawk filled with *Cacama valvata* (Uhler). The phenology of most cicadas varies according to species. Cicadas in Colorado may



Fig. 1. *Sandalus niger* Knoch (Rhipiceridae), Lamar, Prowers Co.

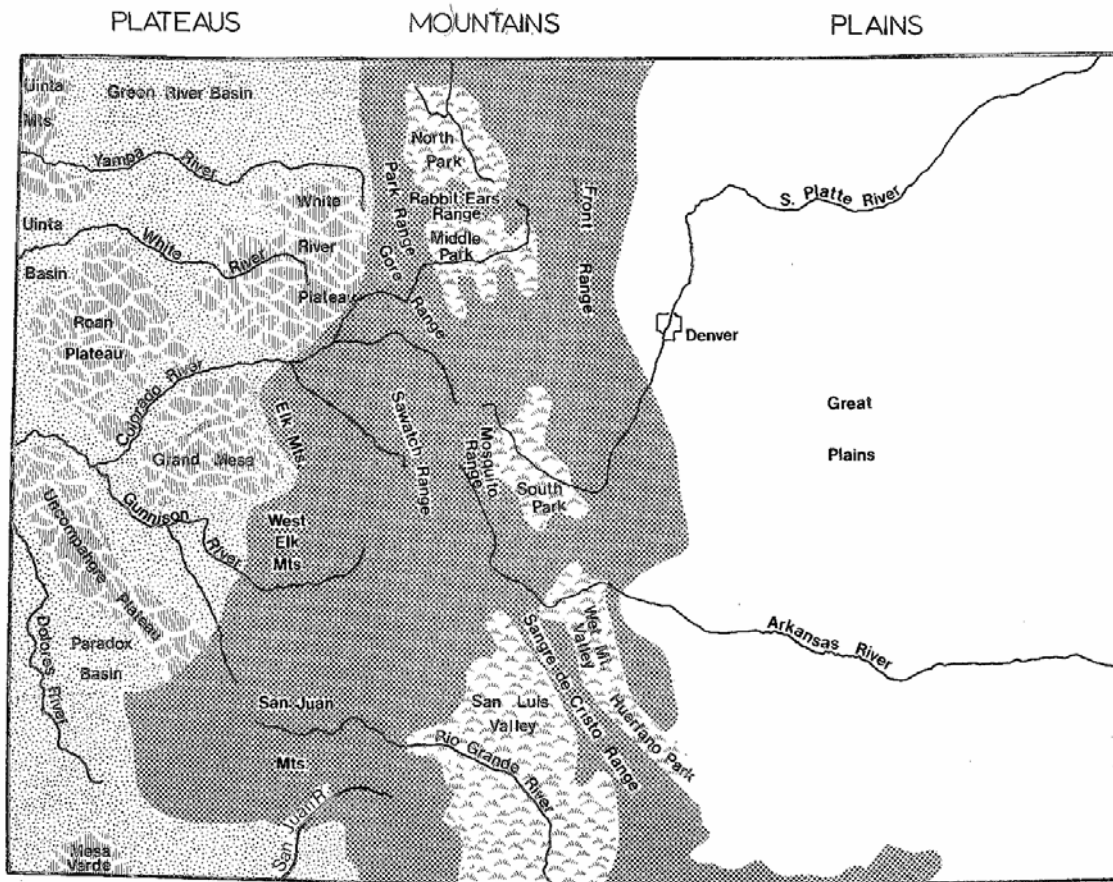


Fig. 2. Major physiographic regions of Colorado.

emerge in the months of April through September, with emergence time being regular in a locality each year. In Colorado, adults of *Platypedia putnami* (Uhler) have been collected as early as April and May in Larimer and Boulder counties. Males of both *T. dealbatus* and *T. dorsatus* can still be heard singing in October.

Cicadas have drawn scientific attention for their strategies of coping with hot environments. Sanborn (1997) reviews the information on the thermal biology of cicadas. He discusses the behavioral mechanisms of thermoregulation that include basking, shade seeking, and changing body orientation with angle of the sun, use of wings as a parasol, microhabitat selection, and suspension activity.

Since the dawn of human history, the cicada has fascinated people, but few texts and little research are devoted to these mysterious and raucous insects. The difficulty in rearing and observing cicadas in captivity has resulted in a paucity of natural history information. However, the following publications are significant sources of information: Beamer (1928), Beamer & Beamer (1930), Beirne (1959), Kato (1956), Moore (1966), and Myers (1929).

DISTRIBUTION

The opening paragraph of Gillette and Baker's (1895) voluminous "Preliminary list of the Hemiptera of Colorado" eloquently summarizes the diverse ecosystems of this state: "Probably there is no state in the Union offering a richer field for the student of natural history than Colorado, whether it be in the line of mineralogy, paleontology, zoology, or botany. Its broad stretch of arid plains crossed by streams of living water, its high mountain ranges, broad plateaus, innumerable gulches and deep canyons, all combine to give it a most exceptional topography with a consequent diversified fauna and flora." The distributions of cicadas in Colorado are associated with the major physiographic provinces of the state and their

characteristic plant communities. This includes the Great Plains, the southern Rocky Mountains, and the Colorado Plateau (Fig. 2) (Chronic and Chronic 1972).

GREAT PLAINS

The gently sloping Great Plains (Figs. 2 and 3) extend over the eastern two-fifths of the state. This region was once characterized by vast grasslands of perennial plants dominated by a mixture of blue grama (*Bouteloua gracilis* (H.B.K.) Lag.) and buffalo grass (*Buchloe dactyloides* (Nutt.) Engelm.). Much of this vegetation has been impacted by cattle grazing or replaced by agronomic crops such as wheat, sunflowers, corn, and alfalfa. Some mesa tops, steep hillsides and flood plains still retain native assemblages of grasses and forbs. Shrubs such as rabbitbrush (*Chrysothamnus nauseosus* (Pallas) Britt.), four-winged saltbush (*Atriplex canescens* (Pursh) Nutt.), and pasture sagebrush (*Artemisia frigida* Willd.) have become abundant in many old fields and pastures. Other distinctive features of the plains are scattered pockets or areas of sandhills or blowouts, and several extensive sand ridges associated with stream courses. Characteristic plants of these sandy areas are sandhill muhly (*Muhlenbergia pungens* Thurb.), blowout grass (*Redfieldia flexuosa* (Thurb.) Vasey), heliotrope (*Euploca convolvulacea* Nutt.), and sand sagebrush (*Artemisia filifolia* Torr.).

Four species of cicadas are closely associated with the Great Plains of Colorado: *Tibicen dorsatus*, *T. bifidus* (Davis), *Okanagana hesperia* (Uhler) and *O. synodica* (Say). Two other species, *Cicadetta calliope* (Walker) and *C. kansa* (Davis) occur locally in relatively undisturbed grasslands of flat-bottomed draws or sides of small hills. Both of these latter cicadas are often overlooked because of their small size and green coloration. Additionally, the shrill call of the



Fig. 3. Shortgrass prairie, Comanche National Grassland, Baca Co.



Fig. 4. Cottonwood riparian woodland, Larimer Co.



Fig. 5. Foothills shrubland, Lory State Park, Larimer Co.



Fig. 6. Ponderosa woodland, Rocky Mountain National Park, Larimer Co.



Fig. 7. Sagebrush shrubland, Eagle Co.



Fig. 8. Pinon-juniper woodland, Las Animas Co.

cactus dodger, *C. valvata*, can be heard from the shrublike cholla or candelabra cactus (*Opuntia imbricata* (Haw.) DC.) in the southeastern portion of the Great Plains. The cactus dodger is also found throughout the southern half of Colorado and on the Colorado West Slope.

Lowland Riparian

The grasslands of the Great Plains were interrupted historically by intermittent and permanent streams, and now by irrigation canals, ponds and reservoirs. These waterways are often bordered by gallery forests (Fig. 4) or those limited to a few trees, typically comprised of plains cottonwood (*Populus deltoides* Marsh.), green ash (*Fraxinus pennsylvanica* Marsh.), boxelder (*Acer negundo* L.), peach-leaved willow (*Salix amygdaloides* Anderss.) and other *Salix* spp. In some areas, especially the Arkansas River and South Platte drainages, this floral assemblage has been replaced by the introduced crack willow (*Salix fragilis* L.), Russian-olive (*Elaeagnus angustifolia* L.), and salt cedar (*Tamarix pentandra* Pallas). The conspicuous cicada of these tree and shrub corridors is *T. dealbatus*. Often deafening choruses of this "dog-day" cicada can be heard throughout the summer. It is especially common along the Arkansas and Purgatoire Rivers (Fig. 2).

Additionally, the growth of cities and towns in portions of the Colorado Front Range has resulted in the creation of isolated urban forests, containing native and many alien deciduous tree species. *Tibicen dealbatus* has become well established in the suburbs of Pueblo, Colorado Springs, Denver, and Fort Collins. Another species, *P. putnami*, a species more typical of mountain shrublands, has appeared more frequently in the urban forests along the central portion of Front Range, especially in Boulder County (Cranshaw and Kondratieff 1991). Males of this species will disperse far from these foothills breeding sites throughout the urban areas of Front Range cities.

Ponderosa Pine – Pinyon-Juniper woodlands

In the southeastern Colorado counties of Baca, Las Animas and Otero, the grasslands of the Great Plains blend into ponderosa pine (*Pinus ponderosa* Laws.) and pinyon (*Pinus edulis* Engelm.) - one-seed juniper (*Juniperus monosperma* (Engelm.) Sarg.), Rocky Mountain juniper (*Juniperus scopulorum* (Sarg., Rydb.) woodlands on low mesas and plateaus. Three species of cicadas, *Diceroprocta eugraphica* (Davis), *T. inauditus* Davis, and *Pacarina puella* Davis are associated with these dry stands. Picture Canyon in Baca County, and the Picket Wire Canyonlands in Las Animas County and Vogel Canyon in Otero County (Fig. 8) are typical collecting sites for these species.

MOUNTAINS

Shrublands

The foothills and montane hillsides are typically dominated by two species of shrubs (Fig. 5): Gambel or scrub oak (*Quercus gambelii* Nutt.) in the southern half of the state, and the more widely distributed mountain mahogany (*Cercocarpus montanus* Raf.). Both of these shrubs reach maximum growth between 7,150 feet (2128 m) and 8,475 feet (2584 m). These communities form a transition zone between the pinyon pine - juniper woodlands and ponderosa pine - Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco) forests. Serviceberry (*Amelanchier* spp.) is also abundant. Two cicadas, primarily *P. putnami*, and in lesser numbers, *O. bella* Davis can be heard calling or seen darting from shrub to shrub.

Montane Forests

Only one common species of cicada, *O. bella*, occurs in montane and lower subalpine slopes up to approximately 10,000 feet (3040 m). This species seems to prefer mixed forests of ponderosa pine (Fig. 6), Douglas fir, and quaking aspen (*Populus tremuloides* Michx.) or

riparian stands of narrowleaf cottonwood (*Populus angustifolia* James).

COLORADO PLATEAU

Sagebrush Shrublands and Semidesert Shrublands

A silvery-blue blanket of big sagebrush (*Artemisia tridentata* Nutt.) covers much of the lower elevations of the Western Slope (Fig. 7), up to 8,000 feet (2432 m), especially in northwestern Colorado. In the more arid lowlands, greasewood (*Sarcobatus vermiculatus* (Hook) Torr.), four-winged saltbush, and shadscale (*Atriplex confertifolia* (Torr. and Frem.) Wats.) mark the drainages of the plateau region. The elevation is generally 4,000-6,000 feet (1216-1824 m), but occasionally extends up to 10,000 feet (3040 m). Extensive stands of greasewood communities occupy the San Luis Valley (Fig. 2).

Several species of cicadas are found in these shrublands, including *Neoplattypedia constricta* Davis, *O. occidentalis* (Walker), *O. striatipes* (Haldeman), and *O. utahensis* Davis. These species can be locally abundant. Additionally, *C. valvata* can often be found in these shrublands, especially in the southern part of Colorado, such as Escalante Canyon in Delta County and Dominguez Canyon in Mesa County. An unusual species with milky white wings, *O. fumipennis* Davis, appears restricted to the greasewood shrublands of southern Colorado, with populations occurring from the San Luis Valley to west to the Four Corners area.

Pinyon Pine-Juniper Woodlands

Dry woodlands of pinyon pine and Utah juniper (*Juniperus osteosperma* Little) mark the mesas, plateaus or mountain flanks throughout the western portion of the state. The area is typically hot and dry during the summer, with very little ground cover. These woodlands support a rich assemblage of cicada species including *T. duryi* Davis, *O. magnifica* Davis, *O. occidentalis*, *O. striatipes*, *O. utahensis*, *P. putnami*, and *P. mohavensis* Davis. *Okanagana*

magnifica, the largest species of cicada found in western Colorado, can become locally abundant, with large number of nymphal exuviae littering the woodland floors. This was the case in June 1992, in the pinyon pine and Utah juniper woodlands around Mesa Verde National Park. *Tibicen duryi* is one of the most difficult cicadas to collect, because it is adept at moving swiftly and camouflaging itself in dense tree branches.

COLORADO CICADA TAXONOMY

William T. Davis described the majority of cicadas occurring in Colorado. Truly a pioneer American naturalist, Davis named and described more than 100 species of cicadas. In addition, he made countless other contributions to the field of natural history and entomology in particular. Born in 1862, Davis first became interested in cicadas as a teenager during the 1877 emergence of the seventeen-year cicada around his home on Staten Island, New York. Decades later, Davis still proudly displayed the *Magicicada* he and his grandmother collected that summer (Abbott 1949).

Even without a formal university education, Davis managed to study and collect in the field with many renowned scientists including Dr. J. P. Chapin, A. Skinner, C. W. Leng, and W. M. Wheeler. Davis worked full-time as a clerk and accountant in a family-owned New York business, but field studies occupied most of his free time during the evenings and weekends.

When Davis was 46 years old, he resigned from his job and dedicated the rest of his life to the study of nature. Although he never lived farther than 20 miles from his Staten Island home, Davis traveled globally. Most notably, Davis studied the geographical distribution and routes of insect dispersal in South America. Davis also classified many different insect families in the collections of the National Museum in Washington D.C., the University of Kansas in

Lawrence, and the British Museum in London. During his lifetime he published 36 papers on cicadas, including the first list of Colorado cicadas in 1921b. Hennessey (1990) and Sanborn (1999) reviewed the type material of Davis' species.

Presently about 16 genera and 180 species of cicadas (see overview by Sanborn 2002) are known from North America, although a consensus regarding the familial classification of the cicadas is lacking. We follow Sanborn (2002). Table 2 lists the families, genera and species known from Colorado.

Davis (1921b) listed 23 species of cicadas known from Colorado (Table 1). Additionally, he listed five species, *T. auriferus* (Say), *T. resh* (Haldeman), *D. eugraphica*, *D. vitripennis* (Say), and *O. striatipes*, as possibly occurring in Colorado. In this paper, Davis also reviewed and corrected Gillette and Baker's (1895) original list of nine species. He also described *O. bella rubrocaudata* from Jefferson County, Colorado in 1925. In 1930, Davis added two more species, *O. gibbera* Davis and *O. canadensis* (Provancher).

Of the 25 species Davis recorded from Colorado, we confirm 20 species. We consider the records in Davis (1921b) for *T. linnei* (Smith and Grossbeck), and *T. walkeri* Metcalf as doubtful, probably based on mislabeled specimens. Additionally, we consider Van Duzee's (1917) record for *T. canicularis* Harris and repeated by Davis (1921b) dubious. Also, Davis' (1921b) listing of *T. auriferus*, *T. resh* and *D. vitripennis* as possibly occurring in Colorado has not been confirmed. These three species are infrequently found west of the Mississippi River. We consider *P. latipennis* Davis as a synonym of *P. mohavensis*. We have examined the single female specimen and another specimen identified by Davis (1930, 1936) as *O. canadensis*. Until a revision of the *O. rimosa* group is completed, we accept these identifications. Presently, we recognize 27 species of cicadas occurring in Colorado (Table 2), including four new state

records.

Material Examined

The majority of the material listed in this paper is deposited in the C.P. Gillette Museum of Arthropod Diversity, Colorado State University. Other collections examined include as follows: National Museum of Natural History (USNM); Snow Entomological Museum, University of Kansas (UK); Natural History Museum, London, British Museum (BM); Staten Island Institute of Arts and Sciences (SIIAS); American Museum of Natural History (AMNH), and J. T. Polhemus (JTP).

Useful regional works for the identification of cicadas are Bibby (1936) [Texas], Lawson (1920) [Kansas], Simons (1954) [California], and Drew et al. (1974) [Oklahoma]. Additionally, Beirne (1959) [Canada] and Froeschner (1952) [Missouri] treat species that occur in Colorado.

Table 1. Species of cicadas listed by Davis (1921b) and Davis (1930).

<i>Diceroprocta eugraphica</i> (Davis) ²
<i>Diceroprocta vitripennis</i> (Say) ²
<i>Tibicen auriferus</i> (Say) ²
<i>Tibicen bifidus</i> (Davis) ¹
<i>Tibicen canicularis</i> (Harris) ¹
<i>Tibicen dealbatus</i> (Davis) ¹
<i>Tibicen dorsatus</i> (Say) ¹
<i>Tibicen duryi</i> Davis ¹
<i>Tibicen linnei</i> (Smith and Grossbeck) ¹
<i>Tibicen resh</i> (Haldeman) ²
<i>Tibicen walkeri</i> Metcalf ¹
<i>Cacama valvata</i> (Uhler) ¹
<i>Beameria venosa</i> (Uhler) ¹
<i>Tibicinoides hesperia</i> (Uhler) ¹
<i>Okanagana bella</i> Davis ¹
<i>Okanagana canadensis</i> (Provancher) ³
<i>Okanagana cruentifera</i> (Uhler) ¹
<i>Okanagana gibbera</i> Davis ³
<i>Okanagana magnifica</i> Davis ¹
<i>Okanagana schaefferi</i> Davis ¹
<i>Okanagana striatipes</i> (Haldeman) ²
<i>Okanagana synodica</i> (Say) ¹
<i>Okanagana utahensis</i> Davis ¹
<i>Cicadetta calliope</i> (Walker) ¹
<i>Cicadetta kansa</i> (Davis) ¹
<i>Platypedia minor</i> Uhler ¹
<i>Platypedia mohavensis</i> (Davis) ¹
<i>Platypedia latipennis</i> (Davis) ¹
<i>Platypedia putnami</i> (Uhler) ¹
<i>Neoplatypedia constricta</i> Davis ¹

¹ Listed by Davis (1921b) as having been collected in Colorado.

² Listed by Davis (1921b) as possibly occurring in Colorado.

³ Listed by Davis (1930) as occurring in Colorado.

Table 2. Species of cicadas known from Colorado (following the classification proposed by Sanborn 2002).

Superfamily Cicadoidea	
Family Cicadidae	
Subfamily Tibiceninae	
Tribe Tibicenini	
1.	<i>Cacama valvata</i> (Uhler)
2.	<i>Diceroprocta apache</i> (Davis) ¹
3.	<i>Diceroprocta eugraphica</i> (Davis)
4.	<i>Tibicen bifidus</i> (Davis)
5.	<i>Tibicen dealbatus</i> (Davis)
6.	<i>Tibicen dorsatus</i> (Say)
7.	<i>Tibicen duryi</i> Davis
8.	<i>Tibicen inauditus</i> Davis ¹
Tribe Fidicinini	
9.	<i>Beameria venosa</i> (Uhler)
10.	<i>Pacarina puella</i> Davis ¹
Family Tibicinidae	
Tribe Tibicinini	
11.	<i>Okanagana bella</i> Davis
12.	<i>Okanagana canadensis</i> (Provancher)
13.	<i>Okanagana fumipennis</i> Davis
14.	<i>Okanagana gibbera</i> Davis
15.	<i>Okanagana hesperia</i> (Uhler)
16.	<i>Okanagana magnifica</i> Davis
17.	<i>Okanagana occidentalis</i> (Walker) ¹
18.	<i>Okanagana schaefferi</i> Davis
19.	<i>Okanagana striatipes</i> (Haldeman)
20.	<i>Okanagana synodica</i> (Say)
21.	<i>Okanagana utahensis</i> Davis
Tribe Cicadettini	
22.	<i>Cicadetta calliope</i> (Walker)
23.	<i>Cicadetta kansa</i> (Davis)
Subfamily Platypediinae	
24.	<i>Platypedia minor</i> Uhler
25.	<i>Platypedia mohavensis</i> Davis
26.	<i>Platypedia putnami</i> (Uhler)
27.	<i>Neoplatypedia constricta</i> Davis

¹ New state record for Colorado

Key to the Cicada Genera of Colorado

1. Medius and cubitus originating from arculus separately in forewing (Fig. 9).....2
 Medius and cubitus originating from arculus together in forewing (Fig. 10); body length
 12-15 mm; mostly green in color.....*Cicadetta* p. 55
2. Mesonotum covering part of posterior portion of metanotum; operculum of male
 exceeding hind coxae.....3
 Mesonotum not covering any of posterior margins of mesonotum; operculum of male
 not exceeding hind coxae.....5
3. Seventh marginal cell of forewing twice as long as broad (Fig. 12).....4
 Seventh marginal cell of forewing less than 1 1/2 as long as broad (Fig. 11)
*Cacama* p. 21
4. Anterior-most cross-veins vertical.....*Diceroprocta* p. 23
 Anterior-most cross-veins strongly oblique (Fig. 13).....*Tibicen* p. 26
5. Body length 15 mm.....6
 Body length >15 mm.....7
6. Head wider than anterior margin of pronotum.....*Pacarina* p. 36
 Head slightly wider than anterior margin of pronotum.....*Beameria* p. 35
7. Node of forewing 2/3 out on the costal margin (Fig. 16).....8
 Node of forewing in middle of costal margin (Fig. 9).....*Okanagana* p. 37
8. Forewing with 8 marginal cells (Fig. 16).....*Platypedia* p. 57
 Forewing with 7 marginal cells (Fig. 17).....*Neoplatypedia* p. 64



Fig. 9. *Okanagana magnifica* (Davis), dorsal habitus.

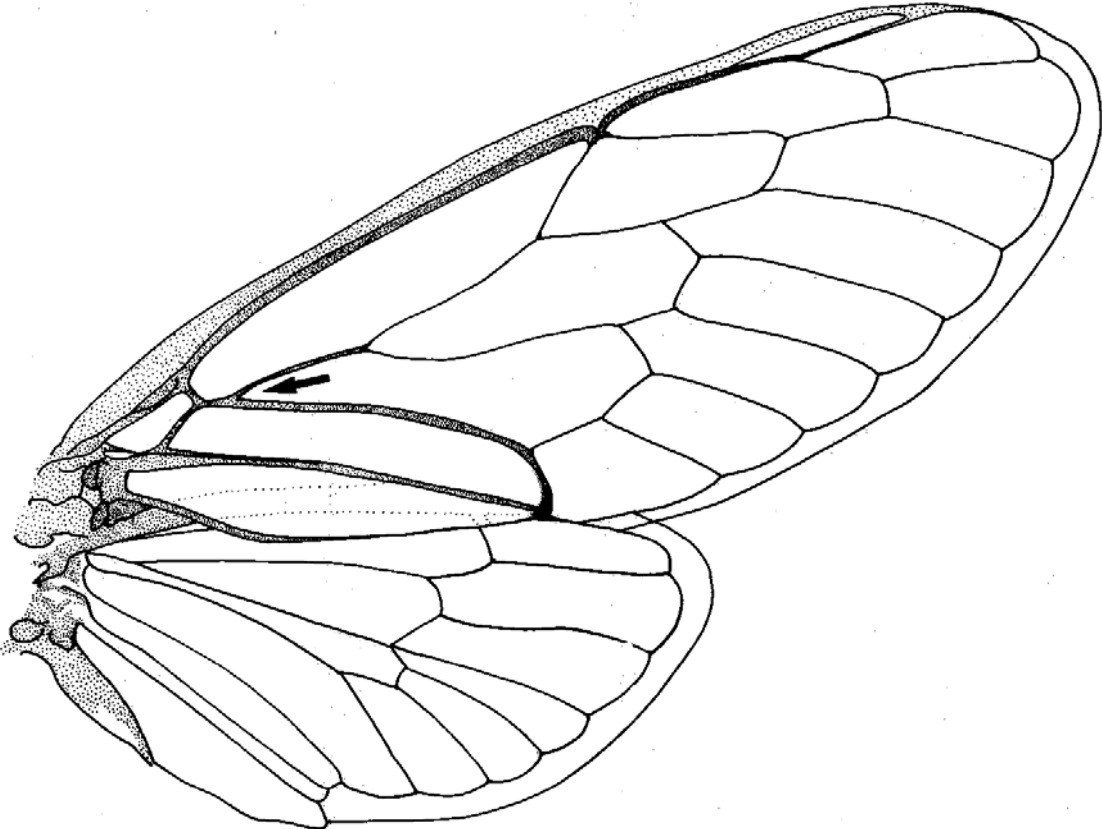


Fig. 10. *Cicadetta calliope* (Walker), right side wings. Arrow indicates medius and cubitus originating from arculus together.

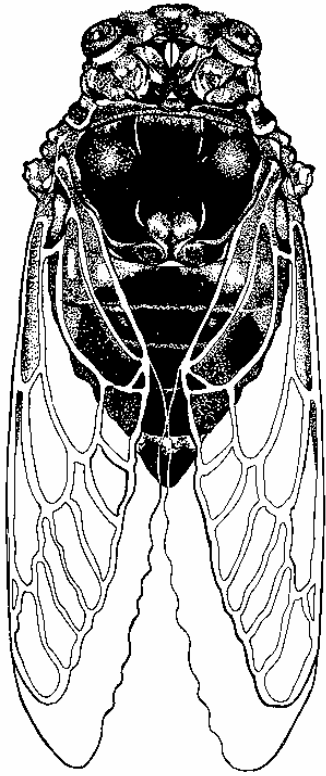


Fig. 11. *Cacama valvata* (Uhler), dorsal habitus.

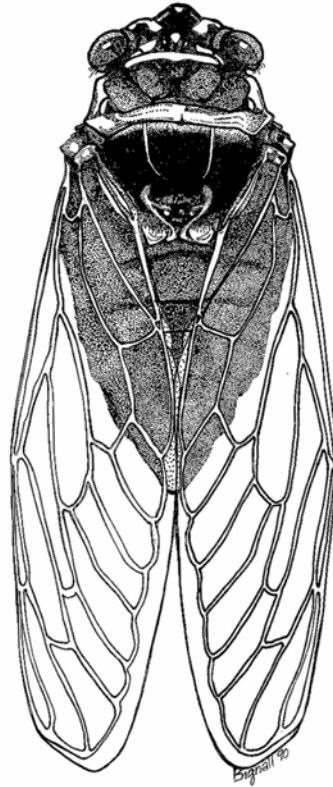


Fig. 12. *Diceroprocta apache* Davis, dorsal habitus.

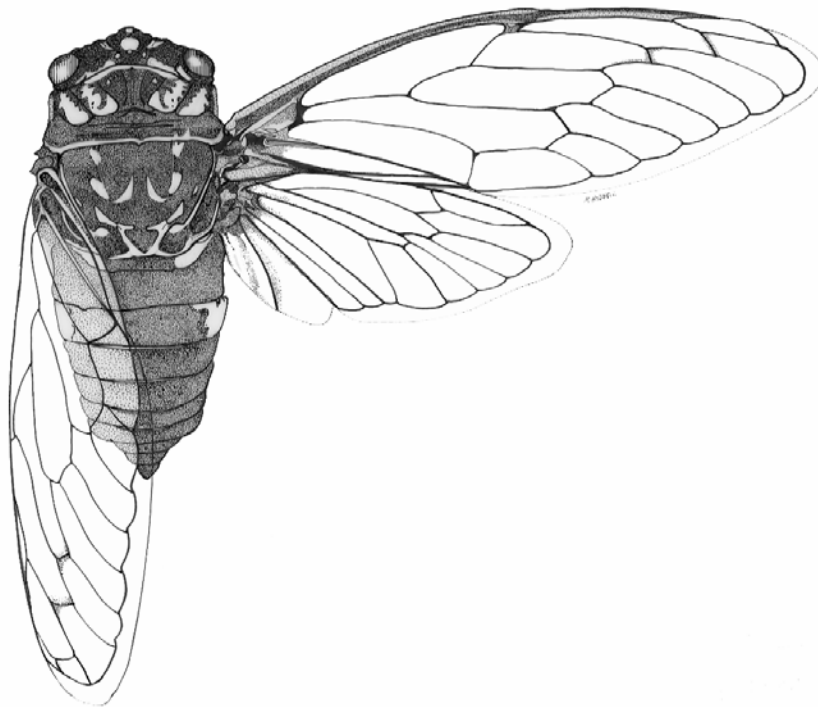


Fig. 13. *Tibicen druryi* Davis, dorsal habitus.

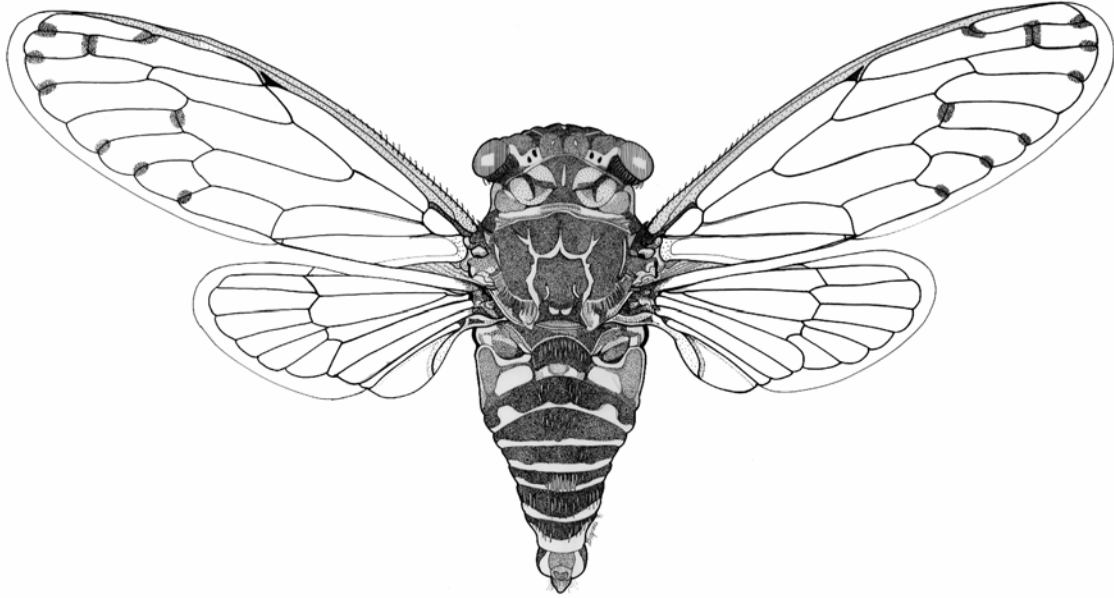


Fig. 14. *Pacarina puella* Davis, dorsal habitus.

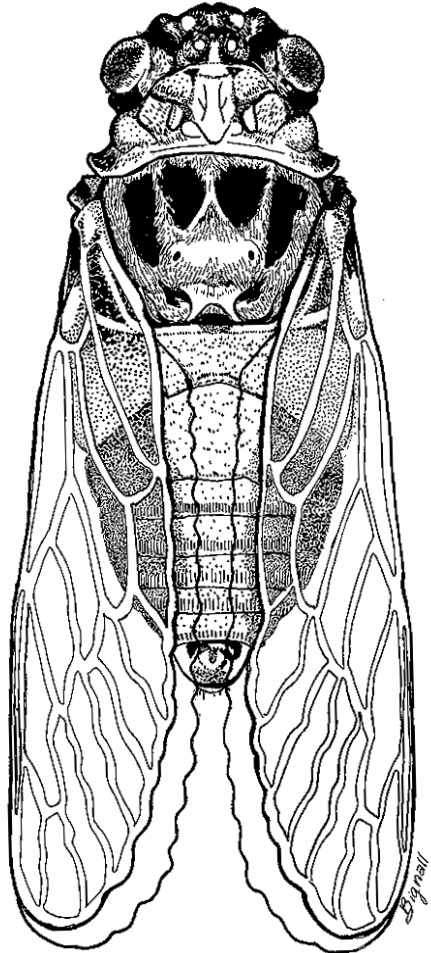


Fig. 15. *Beameria venosa* (Uhler), dorsal habitus.

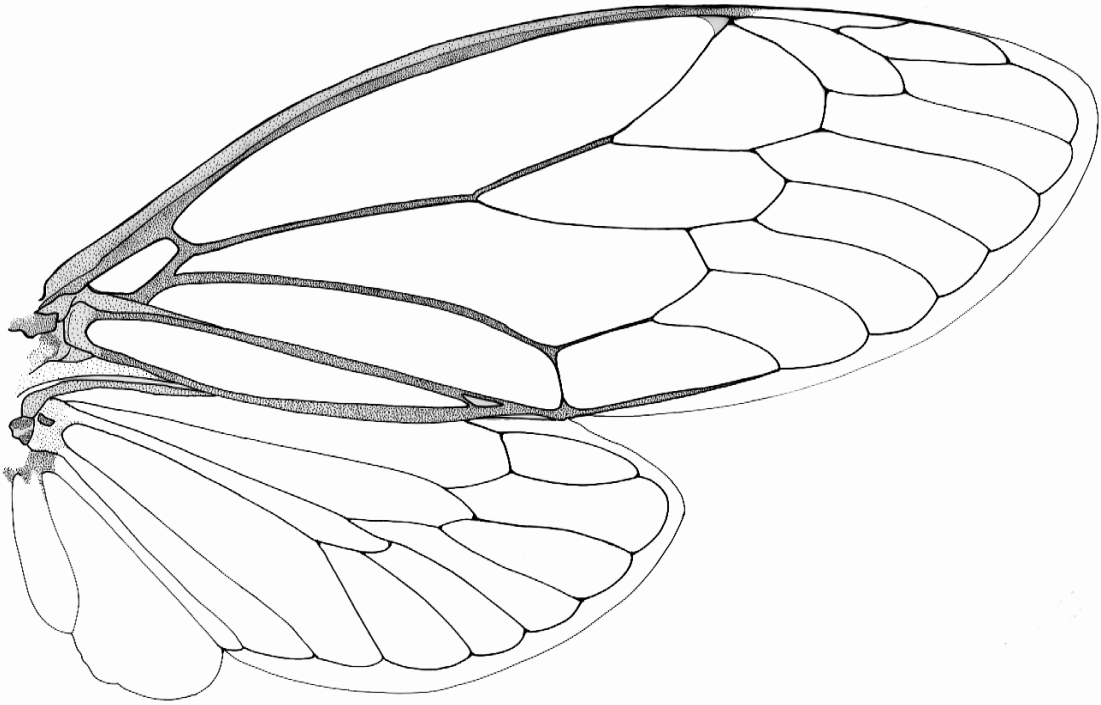


Fig. 16. *Platypedia putnami* (Uhler), right side wings.

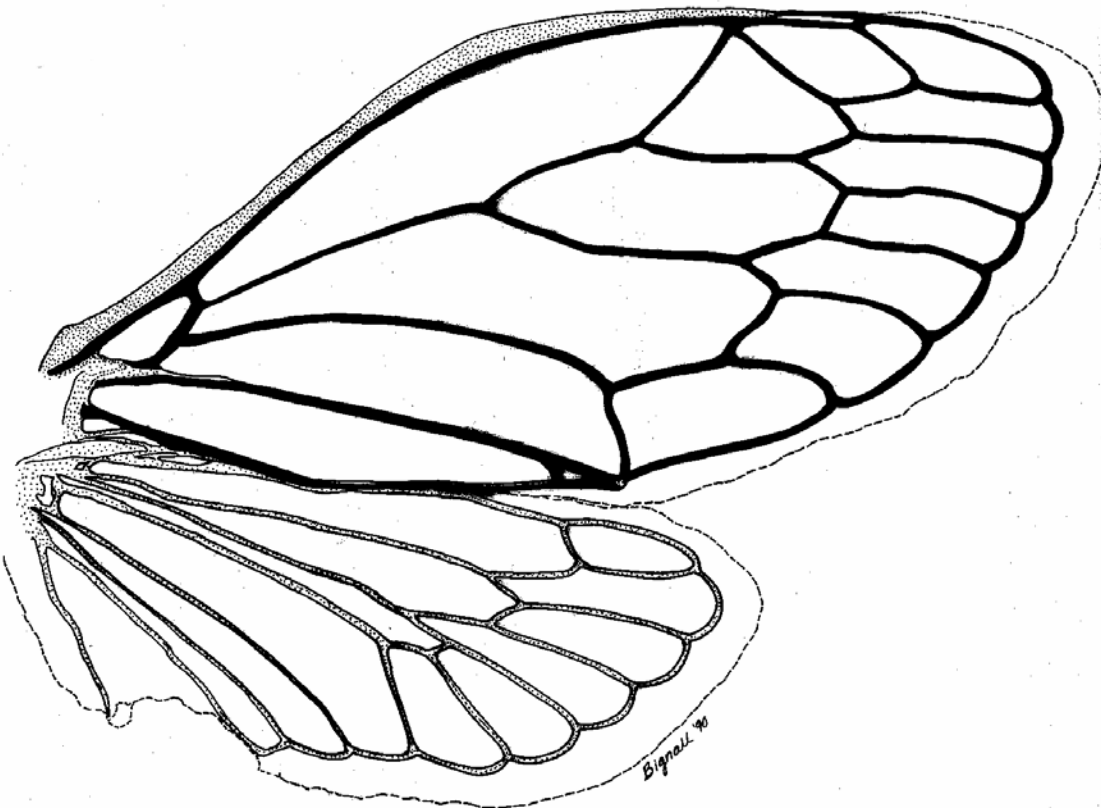


Fig. 17. *Neoplatypedia constricta* Davis, right side wings.

SPECIES TREATMENTS

Cacama Distant

Type species: *Cacama maura* (Distant).

The type species is from Mexico. This genus can be easily distinguished from all other genera occurring in Colorado by its large size, the operculum of the male greatly exceeding the hind coxae, and by the 7th and 8th marginal cells of the forewing being less than 1 1/2 times as long as broad. Davis (1919) has provided a useful review of the genus.

Cacama valvata (Uhler)

Proarna valvata Uhler 1888: 84. Type locality: Camp Grant, Graham Co., Arizona (Sanborn 2002). Holotype ♂, examined (USNM).

Cacama valvata: Metcalf 1963a: 330; Sanborn 2002.

U.S. distribution: Arizona, California, Colorado, New Mexico, Texas, Utah.

Song: A distinctive loud intense shrill, often in short bursts.

Diagnosis: *Cacama valvata* is a large black to blackish brown cicada (Figs. 11,18, 19), averaging body length of 24-26 mm, forewing length of 30-35 mm, and the 7th marginal cell of the forewing are less than 1 1/2 times as long as broad (Fig. 11).

Remarks: This geographically widespread species commonly known as the "cactus dodger," can be found resting and singing on candelabra or cholla cactus during the hottest part of the summer on the Colorado southern and western grasslands. It is a fast flier, often defying the attempts of collectors.



Fig. 18. *Cacama valvata* (Uhler), Escalante Canyon, Delta Co.



Fig. 19. *Cacama valvata* (Uhler), Two Buttes Reservoir, Baca Co.



Fig. 20. *Diceroprocta eugraphica* (Davis), Comanche National Grassland, Baca Co.



Fig. 21. *Tibicen dealbatus* (Davis), Arkansas River, Otero Co.

Adults were observed singing and mating in Escalante Canyon, Delta County on greasewood from 11:00-12:30 pm (June 19). Males would perch on ends of branches while females remained inside the shrubs. The male was producing long wavering shrills. Also the courtship sequence was observed where both the male and female were on an exposed rock face. The male repeated his song while gradually moving closer to the female. Once the male was about 3 in (7.6 cm) from the female, the male song varied: a long shrill followed by shorter sequence of shrills. The male approached the female sideways and then moved head on. The female touched the male with the right leg, the male backed away and the female touched the male again with her leg. The male then moved on to the female's thorax, made a 360 turn and then backed down and over to the side of the female and copulation occurred side-to-side.

Cacama valvata is especially common calling on cholla cactus (the primary host plant) in Baca, Las Animas, and Otero counties. This species is remarkable in its ability to fly at high speeds and safely land on the cacti. Only rarely do individuals become impaled! Beamer and Beamer (1930) provide additional notes on the natural history of this species.

Material Examined: Baca Co., Bent Co., Crowley Co., Delta Co., El Paso Co., Las Animas Co., Mesa Co., Otero Co., Pueblo Co. June-July.

Diceroprocta Stål

Type species: *Cicada transversa* Distant.

At least 21 species are known from North America, north of Mexico (Sanborn 2002), with two species recorded from Colorado. Davis (1927) provides a key to *Diceroprocta*.

Diagnosis: Most similar to the genus *Tibicen*, anterior-most cross vein almost vertical; in the male, uncus bilobed.

Key to Colorado Species of *Diceroprocta*

1. Males: opercula triangular; male and female: pronotal collar yellow, contrasting with darker pronotum and mesonotum (Fig. 12); distribution in extreme southwestern Colorado.....*Diceroprocta apache*

Males: opercula short and broadly rounded; male and female: pronotal collar brown (Fig. 20), usually not contrasting with pronotum and mesonotum; distribution in southeastern Colorado.....*Diceroprocta eugraphica*

Diceroprocta apache (Davis)

Tibicen apache Davis: 1921a: Type locality: Florence, Arizona. Holotype ♂, examined (AMNH).

Diceroprocta apache, Metcalf 1963a: 185; Sanborn 2002.

U.S. distribution: Arizona, California, Colorado, Nevada, Utah, Mexico.

Song: A continuous, even toned, moderately shrill note (Davis 1921a).

Diagnosis: Males are easily distinguished from *D. eugraphica* by the triangular opercula, and both sexes by yellow pronotal collar and pale wing venation (Fig. 12).

Remarks: Metcalf (1963a: 186) listed *D. apache* from Colorado, based presumably on Beamer and Beamer (1930). However, the latter authors merely mention the Colorado River in Arizona and not the state of Colorado. Thus, our record represents a new state record.

Diceroprocta apache is considered a typical Sonoran Desert species, and suggested by Andersen (1994) as an ecological keystone species in the riverine ecosystem of the lower Colorado River. He estimated nymphal densities of 10 individuals/m² within closed-canopy stand of Fremont cottonwood (*Populus fremontii* S. Wats.) and Goodding willow (*Salix gooddingii* Ball) near Parker, Arizona. Ellingson et al. (2002) indicated that nymphs of this species spend three to four years underground, and undergo five instars. Toolson (1987) studied the remarkable thermal biology of adult *D. apache*, including water loss rates and evaporative cooling. Males of this species are adapted to call during the hottest period of the day, when air temperatures often exceed 110°F (43°C).

Material examined: Montezuma Co., San Miguel River, Rt. 160, 11 June 1991, B. Kondratieff and M. Harris, 1 ♂ (CSU).

Diceroprocta eugraphica (Davis)

Cicada eugraphica Davis 1916a: 52. Type locality: Albuquerque, Bernalillo Co., New Mexico.

Holotype ♂, examined (AMNH).

Diceroprocta eugraphica, Metcalf 1963a: 194; Sanborn 2002.

U.S. distribution: Arizona, Colorado, Kansas, New Mexico, Oklahoma, Texas.

Song: A series of clicks, then a high-pitched whirr (Beamer and Beamer 1930). Tinkham (1941) describes the trilling as "less voluble and less metallic (as compared to *D. cinctifera*)."

Diagnosis: In the males, the opercula are broadly rounded; and females can be distinguished by the hyaline forewing and brown to greenish coloration (Fig. 20). Figure 38 illustrates the distinctive male terminalia.

Remarks: The cicada is found in southeastern Colorado associated with xerophytic trees and shrubs, especially on exposed slopes and open gullies. In Baca County most adults were collected on one-seed juniper and mountain mahogany.

Material examined: Arapahoe Co., Baca Co., Bent Co., Las Animas Co., Otero Co. June-July.

Tibicen Latreille

Type species: *Tibicen plebja* Latreille

Sanborn (2002) indicates that there are about 30 species of *Tibicen* in North American, and following Davis (1930), he treats the included species as an Eastern and a Western North American assemblage of species. The Western species seem closely related to Palearctic clades. Many of the Western species are black with red markings, rather than the typical eastern “dog day cicada” that is green with black marking.

Diagnosis: Most similar to the genus *Diceroprocta*, but front wings with anterior-two cross veins strongly oblique.

Key to Colorado Species of *Tibicen*

1. Body length 32-38 mm.....2
Body length 25-30 mm.....3
2. Posterior margin of abdominal tergites brown to yellow, lighter than anterior margin (Figs. 21, 22); usually associated with riparian areas or woodlands of the Great Plains and Foothills.....*Tibicen dealbatus*
Posterior margin of abdominal tergites dark, not lighter than anterior margin (Fig. 23); usually associated with open grasslands of the Great Plains.....*Tibicen dorsatus*

3. In male, uncus long, slender, curved and bifid apically (Fig. 39); general color brown and black with white markings (Fig. 24); eastern distribution from Great Plains to Foothills.....*Tibicen bifidus*
 Uncus short, broad with round to truncate apex (Fig. 42); general color black with red or orange or yellow-brown markings; widespread distribution, including the West Slope
4. Basal membranes of wings orange to red..... *Tibicen duryi*
 Basal membrane of wings brown.....*Tibicen inauditus*

Tibicen bifidus (Davis)

Cicada bifida, Davis 1916: 47. Type locality: Clear Creek, Colorado. Holotype ♂, examined (AMNH).

Tibicen bifidus, Metcalf 1963a: 245; Sanborn 2002.

U.S. distribution: Colorado, Kansas, New Mexico, Texas.

Song: A shrill call lasting 15-90 seconds.

Diagnosis: *Tibicen bifidus* is a medium-size cicada, body length 25-30 mm; with black, brown and white marking (Fig. 24). Additionally, the uncus of the male is laterally long and slender, curved caudally, with the apex bifid (Fig. 39).

Remarks: This species appears to be strongly associated with *Atriplex* communities of the Great Plains. In Picture Canyon, Baca County, adults of *T. bifidus* were, however, abundant on small willows. This cicada species is still locally abundant in certain eastern Colorado localities, but no doubt has had its original range severely reduced by agricultural practices, especially plowing.



Fig. 22. *Tibicen dealbatus* (Davis), Arkansas River, Otero Co.



Fig. 23. *Tibicen dorsatus* (Say), Bent Co.



Fig. 24. *Tibicen bifidus* (Davis), Picture Canyon, Baca Co.



Fig. 25. *Tibicen duryi* Davis, Montrose Co.

Material Examined: Baca Co., Bent Co., Cheyenne Co., Kiowa Co., Larimer Co., Pueblo Co., Yuma Co. June-July.

Tibicen dealbatus (Davis)

Cicada marginata dealbata Davis, 1915c: 162. Type locality: Colorado Springs, El Paso Co., Colorado. Holotype ♂, examined (AMNH).

Tibicen dealbatus, Metcalf 1963a: 260; Sanborn 2002.

U.S. distribution: Colorado, Kansas, Oklahoma, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Texas.

Song: A loud shrill call, lasting 10-60 seconds, often after sunset, occasionally all night.

Diagnosis: A large cicada with body length 32-38 mm. Individuals are green or brown in color with two large pipe-shaped light marks similar to the inverted Hebrew letter “resh” on pronotum (Davis 1930). In both sexes, the posterior margins of abdomen are brown to yellow (Figs. 21, 22). In the male, the uncus is curved, narrowed to obtuse at apex.

Remarks: This large, green or brown cicada was originally described as a variety of *T. marginatus* (= *T. walkeri*) by Davis (1915c), and can be confused with *T. dorsatus* and *T. walkeri*. The above key should separate most specimens from Colorado. In eastern Colorado, *T. dealbatus* and *T. dorsatus* are often observed sympatrically. *Tibicen dealbatus* is the common cicada of riparian gallery forests of the Great Plains. The La Plata County (Durango) record by Davis (1921b) is considerably out of the range of this species, and may be in error. This species has also moved into the planted urban forests associated with the Front Range cities and towns, especially Pueblo, Colorado Springs and eastern edges of the Denver Metro area. In the salt cedar stands along the Arkansas and Purgatoire rivers in Bent, Otero, and Prowers counties, *T.*



Fig. 26. *Tibicen inauditus* Davis, Picture Canyon, Baca Co.



Fig. 27. *Tibicen inauditus* Davis, Picture Canyon, Baca Co.



Fig. 28. *Beameria venosa* (Uhler), Picture Canyon, Baca Co.



Fig. 29. *Okanagana utahensis* Davis, West of Grand Junction, Mesa Co.

dealbatus produces an afternoon chorus in July so intense that it can be heard for miles. Beamer (1928) provides information on the ecology of this species.

Material Examined: Baca Co., Bent Co., Boulder Co., Crowley Co., Denver Co., El Paso Co., Fremont Co., Jefferson Co., Larimer Co., Las Animas Co., Logan Co., Morgan Co., Otero Co., Phillips Co., Prowers Co., Pueblo Co., Sedgwick Co., Washington Co., Weld Co., Yuma Co.
June-October.

Tibicen dorsatus (Say)

Cicada dorsata Say 1825: 331. Type locality: Konza Village (near Atchison), Kansas, Type lost.

Tibicen dorsatus, Metcalf, 1963a: 261; Sanborn 2002.

U.S. distribution: Arkansas, Arizona, Colorado, Iowa, Illinois Kansas, Missouri, Nebraska, Ohio, Oklahoma, South Dakota, Texas.

Song: A loud shrill call, lasting 15-70 seconds, usually during the day.

Diagnosis: In *T. dorsatus*, the posterior margins of abdominal tergites are dark, not lighter than anterior margin, as in the closely related *T. dealbatus*. Also, the mesonotum of *T. dorsatus* appears more hump-backed than *T. dealbatus* (Fig. 23). The male terminalia is illustrated in Figs. 40 and 41.

Remarks: *Tibicen dorsatus* is often called the “giant grassland cicada,” and can be heard calling throughout the summer on hot sunny days from low shrubs such as four-wing saltbush, sagebrush, and rabbitbrush mixed among the Plains grasslands of eastern Colorado.

Additionally, this cicada has acquired a fondness for fence posts; telephone poles and other erect wooden poles. One often finds a calling male perched on every fence post along sandy section roads of this region.

Material Examined: Arapahoe Co., Baca Co., Bent Co., Cheyenne Co., El Paso Co., Kit Carson Co., Larimer, Co., Lincoln Co., Logan Co., Morgan Co., Otero Co., Prowers Co., Washington Co., Weld Co., Yuma Co. June-October.

Tibicen duryi Davis

Tibicen duryi, Davis 1917: 206. Type locality: Jemez Springs, Sandoval Co., New Mexico.

Holotype ♂, examined (AMNH).

Tibicen duryi, Metcalf 1963a: 263; Sanborn 2002.

North American distribution: Arizona, Colorado, New Mexico, Texas, Utah.

Song: A loud shrill call, often in short bursts.

Diagnosis: The black body with red markings, and the orange to red basal wing membrane of *T. duryi* easily distinguishes this *Tibicen* from all other Colorado species of the genus (Figs. 13, 25).

Remarks: *Tibicen duryi* prefers the pinyon pine/Utah juniper woodlands of southwestern Colorado. Beamer and Beamer (1930) provide biological notes on this species noting that, "most specimens were shot because they were found too high in the trees." Hasting and Toolson (1991) report on the thermoregulation and activity period of *T. duryi* in central New Mexico.

Material Examined: Archuleta Co., Delores Co., Las Animas Co., Mesa Co., Montezuma Co., Montrose Co., June-July.

Tibicen inauditus Davis

Tibicen inauditus Davis, 1917: 204. Type locality: Vega, Oldham Co., Texas. Holotype ♂, examined (AMNH).

Tibicen inauditus, Metcalf 1963a: 269; Sanborn 2002.

U.S. distribution: Colorado, New Mexico, Oklahoma, Texas.

Song: A metallic zing lasting 30-90 seconds.

Diagnosis: *Tibicen inauditus* is easily distinguished from other Colorado *Tibicen* by the body length of 20-22 mm, basal membrane of forewing brown and the body black with yellow-brown marking (Figs. 26, 27) The distinctive male terminalia is illustrated in Fig. 42.

Remarks: Davis (1930) included *T. inauditus* in a group of southwestern species generally smaller in size than the typical dog-day cicadas of the genus *Tibicen*. This species is common in southeastern Colorado, especially in Baca County usually associated with xerophytic trees and shrubs. Tinkham (1941) associated this cicada with live oak trees in the Davis Mountains of Texas.

Material Examined: Baca Co., Bent Co., Las Animas Co., Otero Co. June-July.

Doubtful Colorado Records of *Tibicen*

Davis (1921b) listed the following three *Tibicen* species from Colorado, but are considered doubtful records as explained in the remarks section.

Tibicen canicularis (Harris)

Cicada canicularis Harris, 1841: 175. Type locality: Massachusetts, Holotype ♀, not examined (MCZ).

Tibicen canicularis, Metcalf, 1963a: 252; Sanborn 2002.

Remarks: This deciduous forest species has been recorded from eastern, especially northeastern North America. Van Duzee (1917) listed *T. canicularis* from Colorado and Davis (1930) stated "that [this species] extends from Nova Scotia to Manitoba and the mountains of Colorado." We have not collected this species from Colorado, despite adequate efforts. We consider the listing by Van Duzee (1917) in error. The song is high-pitched shrill zing (Davis 1922), easily distinguished it from any Colorado *Tibicen*.

Tibicen linnei (Smith and Grossbeck)

Cicada linnei Smith and Grossbeck 1907:121, 127: (nom. nov. pro *Cicada tibicen* Fabricius 1794 [nec *Cicada tibicen* Linne 1758]). Type locality, West Farms, New York, Lectotype ♂, designation (Sanborn 1999), not examined (AMNH).

Cicada linnei, Metcalf 1963a: 277; Sanborn 2002.

Remarks: Gillette and Baker (1895) listed this species from Colorado; however this species is clearly eastern North American in distribution. Metcalf (1963a) repeats a record for Idaho, which no doubt also is in error. This species can be distinguished from all other *Tibicen* species by the forewing costa bent obtusely near the middle.

Tibicen walkeri Metcalf

Cicada marginata Say 1825:330. Type locality: Missouri. Type lost?

Tibicen walkeri: Metcalf 1955:267 (nom. nov. pro. *Cicada marginalis* Walker 1852. [nec *Cicada marginalis* Scopoli 1763]).

Tibicen walkeri, Metcalf 1963a: 322; Sanborn 2002.

Remarks: This species has often been treated under the name of *T. marginalis* (e.g. Lawson 1920 and Froeschner 1952). Davis (1925) mentioned that this species, when newly emerged may have middorsal abdominal pruinose spots, also present in *T. dorsata* and *T. dealbatus*. Davis (1921b) listed a single male from Colorado in the University of Nebraska collection. No other specimens are known from the state, and this may be a mislabeled specimen. *Tibicen walkeri* seems to be more closely associated with the Mississippi River drainage region and eastern U.S., but the exact range of this species needs to be clarified. For instance the Utah record cited in Metcalf (1963a) also appears doubtful as well.

Beameria Davis

Type species: *Prunasis venosa* Uhler

Davis (1934) reviews the taxonomy of the generic name.

Beameria venosa (Uhler)

Prunasis venosa Uhler 1888: 82. Type locality: "Middle and Southern Texas, not on the coast." Type ♂ (USNM), examined.

Beameria venosa, Metcalf 1963a: 383; Sanborn 2002.

U.S. distribution: Arizona, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas.

Song: Faint whining sound lasting 15-25 seconds, only heard from within a distance to the insect of 1 m.

Diagnosis: *Beameria venosa* is a small cicada, 12-13 mm in length that is gray with darker markings. Veins M and Cu leave the arculus separately as in Fig. 9. The head is slightly wider than anterior margin of pronotum (Fig. 15).

Remarks: The amount of pruinosity and body color can vary. Individuals from eastern Colorado are much more gray-green in coloration, with less pruinosity (Fig. 28) than the more gray and very pruinose individuals of the West Slope of Colorado. Beamer (1928) provides a wonderful description of the life stages of this species. *Beameria venosa* has been collected in both southeastern Colorado and western Colorado. This species is associated with grasses in small arroyos or canyons. Beamer (1928) mentioned that this species is also found on dry hillsides or hilltops "too barren to support vegetation." This small and cryptic cicada is probably more common in Colorado than records indicate. Use of a sweep net to disturb low vegetation and collecting individuals that are forced to take flight is an effective method of collection.

Material examined: Baca Co., Las Animas Co., Mesa Co., Montrose Co. June-July.

Pacarina Distant

Type species: *Pacarina signifera* Distant

Diagnosis: Small, body length less than 15 mm, medius and cubitus veins of forewing leave the arculus separately, compound eyes on lateral prominences, head including eyes wider than anterior margin of pronotum (Fig. 14).

Remarks: Currently only one North American species, *P. puella* Davis is recognized. The documented occurrence of this species in Colorado represents a new state record.

Pacarina puella Davis

Pacarina puella Davis 1923: 11. Type locality: Orizaba, Mexico. Holotype ♂, not examined (BM).

Pacarina puella: Metcalf 1963a: 414; Sanborn 2002.

U.S. distribution: Arizona, Colorado, Oklahoma, Texas.

Song: A prolonged trill.

Diagnosis: This little cicada is easily distinguished by the small size (body length 13-15 mm). Coloration is a drab green to yellow color with black markings. Head is wider than anterior margin of pronotum, and cross veins are infuscated (Fig. 14).

Remarks: *Pacarina puella* is common throughout the West Texas mesquite (*Prosopis* spp.) country, and may reach its most northern range extension in southern Colorado. The Colorado specimens were found singing in late afternoon on one-seeded juniper in the Picket Wire Canyonlands of the Purgatoire River.

Material examined: Las Animas Co., Steinman Ranch, PCMS, Purgatoire River, 13-14 July 1991, M. Kippenhan, B. Kondratieff, D. Leatherman and P. Opler, 3 ♂ (CSU).

Okanagana

Type species: *Okanagana rimosa* Distant 1905: 23.

At least 58 species are currently recognized in *Okanagana* (Sanborn 2002). This group of cicadas is typically black with patterns of orange or red, but also of pale or yellow color. All species have the head narrower than the pronotum. The following key will work with most Colorado specimens, however identification of the *O. rimosa* complex will require further experience and reference specimens. Those of us who become frustrated with these identifications should perhaps take to heart the words of Van Duzee (1915) who stated that the species are, however, "well distinguished by their general facies, habitat and song and in field work there is little danger of confusing them." A thorough revision of this genus is required. The aedeagus of all Colorado species were examined, and as an example, one is figured (Fig. 47) for *O. utahensis*. However, only subtle differences were detected. Heath (1976) indicated that the aedeagus is a useful diagnostic character, but no comparative illustrations or descriptions were provided. A key is provided only for males, females are difficult to separate without associated males.



Fig. 30. *Okanagana hesperia* (Uhler), Fort Collins, Larimer Co.



Fig. 31. *Okanagana synodica* (Say), Pine Ridge Natural Area, Larimer Co.



Fig. 32. *Okanagana synodica* (Say), salmon-colored form, Bent Co.



Fig. 33. *Cicadetta calliope* (Walker), Horsetooth Reservoir, Larimer Co.

Key to the Males of Colorado Species of *Okanagana*

1. Uncus, in lateral view hooked at apex (Fig. 43).....2
 Uncus, in lateral view not hooked at apex (Fig. 44); sometimes slightly down-curved
3
2. Abdominal sternites with extensive middorsal and lateral black markings; pronotum with
 a prominent middorsal light brown or yellow stripe (Fig. 29).....*Okanagana utahensis*
 Abdominal sternites mostly yellow; pronotum at most with a thin, pale, middorsal
 streak.....*Okanagana striatipes*
3. Wings, except marginal cells infuscated with brown or black (Fig. 30)
*Okanagana hesperia*
 Wings hyaline except at base or suffused with milky white.....4
4. Half to 2/3 of forewing and all of hindwing suffused with milky white
*Okanagana fumipennis*
 At most, basal membrane of forewing and hindwing with milky white coloration
5
5. Scutellum with large, yellow markings (Figs. 31, 45); venation pale; forewing length 18-
 20 mm*Okanagana synodica*
 Scutellum without large, yellow markings (Fig. 9); venation with mostly black; forewing
 length 25-38 mm6
6. Forewing length 35 mm or greater*Okanagana magnifica*
 Forewing length 25-29 mm.....7
7. Posterior margins of all abdominal tergites broadly orange (Fig. 46); pronotum usually
 with large orange, lateral spots8

- Posterior margins of posterior abdominal tergites laterally with narrow orange margins; pronotum without large, orange, lateral spots.....9
8. Abdominal sternites yellow-brown with or without black markings; venation yellow-brown; femur of foreleg largely yellow-brown, basally and apically black
.....*Okanagana tanneri*
- Abdominal sternites red-orange with extensive black markings; venation red to orange; femur of foreleg usually largely black*Okanagana schaefferi*
9. Venation of forewing orange except marginal cells; post clypeus produced prominently in dorsal view*Okanagana gibbera*
- Venation of forewing black or brown; post clypeus not prominently produced in dorsal view*Okanagana rimosa* complex.....10
10. Ventrally, mostly light brown to yellow.....*Okanagana canadensis*
- Ventrally, mostly black.....11
11. Abdomen ventrally with long hairs; lateral margins of pronotum obscurely edged with orange or black.....*Okanagana occidentalis*
- Abdomen ventrally at most with few hairs; lateral margins of pronotum distinctly edged with orange.....*Okanagana bella*

Okanagana fumipennis Davis

Okanagana fumipennis Davis 1932: 251. Type locality: near Fort Garland, Costilla County, Colorado. Holotype ♂, examined (AMNH).

Okanagana fumipennis, Metcalf 1963b: 104; Sanborn 2002.

U.S. distribution: Arizona, Colorado, New Mexico, Utah.

Song: "The sound made by the machines that resharpen safety-razor blades" (Davis 1932).

Diagnosis: A large black and reddish-orange species that is readily distinguished by its dark thickened venation and the milky clouded wing membranes from which it derives its name. It most closely resembles *O. schaefferi* in having broad forewings and reddish coloration at the wing bases and anal cells (Davis 1932).

Remarks: This species is associated in sagebrush/greasewood shrublands or juniper-sagebrush woodlands, where they have often been described as locally aggregated (Davis 1932, 1939). Emergence holes and exuviae surrounding big sagebrush plants have been reported by Davis (1932). Emergence holes and exuviae were also observed at the base of greasewood near Cortez. At this site, individuals chorused until almost sunset.

Material Examined: Alamosa Co., Costilla Co., Conejos Co., Montezuma Co. June-July.

Okanagana gibbera Davis

Okanagana gibbera Davis 1927: 377. Type locality: Iron Springs, Iron Co., Utah. Holotype ♂, examined (AMNH).

Okanagana gibbera, Metcalf 1963b: 104; Sanborn 2002.

U.S. distribution: California, Colorado, Nevada, Oregon, Utah, Washington, Wyoming.

Song: Not described.

Diagnosis: A moderately sized black and bright orange species noted for its humped back appearance and its starkly contrasting coloration. Venation is bright orange nearly to the marginal cells where it suddenly turns to black. Most closely resembling *O. schaefferi*, it is distinguished in having only the last three abdominal tergites bordered posteriorly with orange

and in lacking a complete orange border of the pronotum (Davis 1927). Further distinguished from *O. tanneri* by its coloration and the lack of pattern on the pronotum (Davis 1930).

Material Examined: Routt Co. (SIIAS). August.

Okanagana hesperia (Uhler)

Cicada hesperia Uhler 1872:472 (nom. nud.)

Cicada hesperia Uhler 1876:342. Type locality: Denver, Colorado. Holotype ♂, examined (USNM).

Tibicinoides hesperia, Metcalf 1963b: 95.

Okanagana hesperia, Sanborn 2002.

U.S. distribution: Arizona, Colorado, Kansas, Oklahoma, Montana, Nevada, Texas, Utah.

Song: A repeated, medium pitched buzz lasting 30-80 seconds.

Diagnosis: This species can be readily separated from other Colorado *Okanagana*, especially the similar appearing *O. striatipes*, by darkly infuscated wings (Fig. 30) and mottled clypeus.

Usually only the marginal cells are hyaline. Additionally, the wings at base are bright red to orange.

Remarks: Davis (1919b, 1921b and 1930) has previously treated this common Colorado species as an *Okanagana*, but Metcalf (1963b) included it in *Tibicinoides*. *Okanagana hesperia* has both light and dark forms. Davis (1930) mentioned specimens from Turkey Creek Canyon in Jefferson Co. that were almost black. Several specimens examined were almost uniformly salmon-colored. Heath (1976) considered *O. striatipes beameri* Davis as a synonym of *O. hesperia*.

Males are often very cryptic, staying low on small shrubs or plants when calling. This

cicada can be heard in July on sunny days. When disturbed to flight, the flashing of the bright red coloration of the wing bases is striking. These cicadas prefer to perch on protruding, center branches of shrubs, especially saltbush, a possible host. This species and *O. synodica* are the only Colorado *Okanagana* occurring in the Great Plains.

Material Examined: Archuleta Co., Baca Co., Bent Co., Boulder Co., Crowley Co., Delta Co., Douglas Co., El Paso Co., Huerfano Co., Jefferson Co., Kiowa Co., Larimer Co., Las Animas Co., Morgan Co., Otero Co., Pueblo Co., Yuma Co., Washington Co., Weld Co. June-August.

Okanagana magnifica Davis

Okanagana magnifica Davis 1919b: 189. Type locality: Jemez Springs, Sandoval Co., New Mexico. Holotype ♂, examined (AMNH).

Okanagana magnifica, Metcalf 1963b: 105; Sanborn 2002.

U.S. distribution: Arizona, California, Colorado, New Mexico.

Song: Relatively quiet for such a large cicada, the song is short in duration and begins and ends in a series of clicks (Beamer and Beamer 1930).

Diagnosis: A typically colored black and orange species that is recognized by its large size and immaculate nota (Fig. 9). It is the largest of all *Okanagana* species (Davis 1921b), rivaled only by *O. cruentifera* that also has the same coarse venation. It can, however, still be distinguished from this species by its larger size, wing membranes that are more orange than red, abdominal terga that are more evenly edged with orange, and an uncus that is more deeply notched (Davis 1919b, 1926).

Remarks: *Okanagana magnifica* is a species reported primarily from pinyon-juniper woodlands (Davis 1919b, Beamer and Beamer 1930, Heath et al. 1971), as well as sagebrush, Gambel oak,

and cottonwood in western Colorado (Davis 1921b). Large localized emergences of the cicada occur from Huerfano County to Montezuma County. Adults of this species have reportedly been eaten by Navajo children, who removed the wings and said they tasted like pecan nuts (Davis 1919a). Leatherman has eaten them, legless and wingless, roasted in salt and garlic by Native Americans of the Jemez Pueblo Tribe of New Mexico. They had a consistency of cheetos and the seasoning provided the only taste.

Material Examined: Huerfano Co., La Plata Co., Mesa Co., Moffat Co., Montezuma Co. July-August.

Okanagana rimosa complex

This group in Colorado includes four species either previously reported or confirmed from Colorado, *O. rimosa*, *O. bella*, *O. canadensis*, and *O. occidentalis*. These species have often been confused and remain very difficult to distinguish. Members of this group are moderately sized black and orange cicadas, with transparent wings and red wing bases. Unfortunately, very few, often subjective, characters separate these taxa. The difficulty in identifying members of this species group has resulted in problems compiling an accurate list of Colorado *Okanagana*. Literature reports of these species, especially those published before Davis' works (such as Gillette and Baker 1885), should be viewed with caution.

The very close similarities among this species group have resulted in an unsettled taxonomy. Distant (1906) synonymized the three species known at the time, *O. rimosa*, *O. canadensis*, and *O. occidentalis*, giving precedence to Say's (1830) name *O. rimosa*. Later works by Davis (1919b, 1932) stressed the slight differences of wing shape and coloration to distinguish the four species (and others in this group outside of Colorado). However, these

characters are mostly relative to other members, making identification without reference material difficult. Such difficulties have suggested to Beirne (1959) that these species actually represent variants or forms of one or two wide-ranging species. This paper continues to follow the taxonomy of Metcalf (1963b) and Sanborn (2002), that recognizes the species concepts of Davis. *Okanagana rimosa* is considered not to occur in Colorado. References to this species in the western North America (Metcalf 1963b) should be re-examined.

Okanagana bella Davis

Okanagana bella Davis 1919b: 184. Type locality: Stockton, Tooele Co., Utah. Holotype ♂, examined (AMNH).

Okanagana bella, Metcalf 1963b: 100. Sanborn 2002.

Okanagana bella var. *rubrocaudata* Davis 1925: 46. Type locality: Plainview, Jefferson Co., Colorado. Holotype ♂, examined (AMNH).

Okanagana bella rubrocaudata, Metcalf 1963b: 101.

Okanagana rubrocaudata, Duffels and Van der Laan 1985: 211, Sanborn 2002.

U.S. distribution: Alberta, Arizona, British Columbia, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Wyoming, Washington (Metcalf 1963b).

Song: Described as clicks that run together and last a long while (Davis 1921b). The shrill song is loud and lasts 1-2 minutes.

Diagnosis: This shiny black and orange species with relatively broad wings (ratio of width to length of forewing ca. 0.35) most closely resembles *O. occidentalis* (Davis 1919b, Simons 1954). It may be distinguished from *O. occidentalis* by lacking numerous long hairs on the

venter of the abdomen and the pronotum distinctly edged with orange or yellow. The uncus is illustrated in Fig. 44.

Remarks: *Okanagana bella* is typically an arboreal species (Beamer and Beamer 1930, Simons 1954). In Colorado chorusing adults are often associated with pinyon pines and junipers in the Foothills, as well as on aspen and willow trees in the higher elevations. Some specimens have been collected in aspen or pine stands at elevations higher than 10,000 feet (3,040 m).

Davis (1925) recognized *O. b. rubrocaudata*, distinguished by the deep orange to reddish color of the male hypandrium (valve) instead of black as in typical *O. b. bella*. This color form was recorded from Arizona (Heath 1976), Colorado, and New Mexico, and thought by Davis (1932) to be the only notable form of this widespread species. *Okanagana b. rubrocaudata* is the most common form occurring in Colorado. Heath (1976) considered it as a valid species based on the development of forefemoral spines and habitat preferences. Colorado specimens with red hypandria and black hypandria exhibited no differences in femoral spines. Heath (1976) indicated that the spines could vary in size and position. Additionally, in Colorado, there appears to be no distinct habitat relationships. Until further studies, especially one that examines *O. bella* from throughout its reported range, indicates clear specific distinctions, *O. b. rubrocaudata* is recognized here neither as a valid specific nor subspecific taxon.

Material Examined: Boulder Co., Chaffee Co., Douglas Co., Eagle Co., El Paso Co., Garfield Co., Gilpin Co., Grand Co., Huerfano Co., Jefferson Co., La Plata Co., Larimer Co., Mineral Co., Moffat Co., Montrose Co., Park Co., Rio Grande Co., Hinsdale Co., Costilla Co., Jefferson Co., Archuleta Co., Summit Co. June-August.

Okanagana canadensis (Provancher)

Cicada canadensis Provancher 1889: 211 Type locality: Cap Rouge, Quebec, Type specimen, Universite Laval, Quebec (Sanborn 2002).

Okanagana canadensis, Metcalf 1963b: 101; Sanborn 2002.

U.S. distribution: Alberta, Colorado, Maine, Manitoba, New Brunswick, New Hampshire, New York, Michigan, Ontario, Pennsylvania, Quebec, South Dakota, Utah (Metcalf 1963b).

Song: Not described.

Diagnosis: *Okanagana canadensis* is a dull-colored species with proportionately narrow wings, unlike *O. bella* or *O. occidentalis*. Separation from *O. rimosa* is aided by having less hair and the forewing venation often thickened. The basal cell is clouded and blackened. It is not as blue-black as *O. bella* and the pubescence on the upper surface is more abundant and more golden (Davis 1919b).

Remarks: The single female identified by Davis (1930, 1936) from Douglas County, Colorado was examined and appears to be separable from typical *O. rimosa* and *O. canadensis* from northeastern North America. An additional specimen from El Paso County, also determined by Davis as *O. canadensis*, is listed below. However, both specimens could be easily variants of *O. bella*, overlapping in wing width and length ratios and other morphological characters. Until a revision of this group becomes available, his identifications are accepted. Davis (1936) reported *O. canadensis* associated with sagebrush in Utah. Again, the western North American records for this species need to be re-examined.

Material Examined: Douglas Co. 1 ♀ (SIAS); El Paso Co., Rock Creek, vic. Colorado Springs, A. B. Klots, 1-4 July 1939, 1 ♀ July (SIAS).

Okanagana occidentalis (Walker)

Cicada occidentalis Walker in Lord 1866: 339. Type locality: Chilliwack, British Columbia.

Lectotype designation, Sanborn and Webb 2001: 451, not examined (BM).

Okanagana occidentalis Metcalf 1963b: 108; Sanborn 2002.

U.S. distribution: Alberta, California, Colorado, British Columbia, Idaho, Montana, Manitoba, Nevada, Oregon, Utah, Washington (Metcalf 1963b).

Song: Long sustained shrills.

Diagnosis: A shiny black and orange species with relatively broad forewings (ratio of width to length ca. 0.29), characters which separate it from either *O. rimosa* or *O. canadensis* (Simons 1954, Davis 1919b). While resembling *O. bella*, it is not as blue-black as that species and the mesothorax has two V-shaped testaceous marks extending from anterior border to the disk. It is further distinguished by the presence of long hairs ventrally on the abdomen, the clear, or nearly clear, basal cell, many short bristly hairs on head, and lateral margins of pronotum usually black.

Remarks: In Colorado, *O. occidentalis* is strongly associated with sagebrush shrublands of the Colorado West Slope. This species often can be found locally in large numbers.

Material Examined: Mesa Co., Moffat Co., Garfield Co., Montrose Co. June-July.

Okanagana schaefferi Davis

Okanagana schaefferi Davis 1915b: 19. Type locality: Buckskin Valley, Iron Co., Utah (Heath and Heath 1994). Holotype ♂, examined (USNM).

Okanagana schaefferi Metcalf 1963b: 114; Sanborn 2002.

U.S. distribution: Colorado, New Mexico, Utah.

Song: Closely resembles the “whirring noise” of a rattlesnake (Davis 1921b).

Diagnosis: *Okanagana schaefferi* is a large black and orange cicada noted for its very prominent front (Davis 1915b). This species most closely resembles *O. tanneri*, from which it is distinguished by its red-orange coloration and immaculate pronotum (Davis 1930). It is also close in appearance to *O. gibbera*, except that all abdominal terga are bordered in orange (Davis 1927). Davis (1930) states that the shape of the last ventral segment may distinguish females of these three species, with *O. schaefferi* having it truncate.

Remarks: Reported from sagebrush in Utah by Davis (1919b). Named for a collecting partner of Davis's, Mr. Charles Schaeffer of the Brooklyn Museum of Arts and Sciences, where Davis deposited some of his cicadas (Davis 1915a).

Material Examined: Chaffee Co., Montezuma Co. June.

Okanagana striatipes (Haldeman)

Okanagana striatipes Haldeman 1852: 369. Type locality: Utah? Type lost.

Okanagana striatipes, Metcalf 1963b: 115; Sanborn 2002.

U.S. distribution: Arizona, Colorado, Utah, Oregon, California.

Song: One of medium pitch and average duration (Beamer and Beamer 1930). Sanborn et al. (2002) provides a detailed analysis of the song.

Diagnosis: A moderately sized species that is black with yellow or pale coloration. It very closely resembles *O. hesperia* in overall appearance, but males have the characteristic hooked uncus (similar to Fig. 43), and both sexes lack the infuscated wings (see Fig. 30 for *O. hesperia*). From *O. utahensis*, *O. striatipes* can be distinguished by having the abdomen usually entirely yellowish below and in having the basal cell usually transparent (Davis 1919b). A dark-colored

form has been found in Arizona (Davis 1930), but all Colorado specimens examined were typical.

Remarks: Davis (1921b) predicted the occurrence of this species in Colorado. Along with *O. occidentalis* and *O. utahensis*, this species is also closely associated the sagebrush shrublands of western Colorado.

Material Examined: Delta Co., Gunnison Co., Delta Co., Dolores Co., Mesa Co., Montezuma Co., Montrose Co. June-July.

Okanagana synodica (Say)

Cicada synodica Say 1825: 334. Type locality: base of the Rocky Mountains, Type lost? (Sanborn 2002).

Okanagana synodica, Metcalf 1963b: 116; Sanborn 2002.

U.S. distribution: Arizona, Alberta, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Texas, Wyoming, Utah.

Song: Continuous but sometimes brief (Davis 1921a). Sometimes described as a high-pitched winding of a watch.

Diagnosis: This species is easily recognized for its small size and distinct black and yellow coloration (Fig. 31). Length of each forewing rarely exceeds 20 mm.

Remarks: A true prairie species, *O. synodica* has commonly been collected on grasses, sandsage, and low shrubs of the Great Plains and Front Range of Colorado, often having large localized emergences. However, *O. synodica* can be sporadically collected from the shrubland grasslands of western Colorado. In the eastern part of the state it is often observed with *O. hesperia*. Often individuals that are almost completely salmon-colored (Fig. 32) occur among typical specimens.

Material Examined: Bent Co., Boulder Co., Chaffee Co., Cheyenne Co., Clear Creek Co., Crowley Co., Dolores Co., Elbert Co., Huerfano Co., Jefferson Co., Kiowa Co., Larimer Co., Lincoln Co., Mesa Co., Montezuma Co., Otero Co., Prowers Co., Pueblo Co., Washington Co., Weld Co. June–September.

Okanagana tanneri Davis

Okanagana schaefferi tanneri Davis 1930: 64. Type locality: Woodside, Emery Co., Utah.

Holotype ♂, examined (UK).

Okanagana tanneri, Metcalf: 1963b: 117. Sanborn 2002.

U.S. distribution: Colorado, Utah.

Song: Not described.

Diagnosis: *Okanagana tanneri* is black and marked boldly with orange to yellow (Fig. 46), and resembles *O. schaefferi*, and possibly *O. gibbera*. *Okanagana tanneri* can be distinguished from these species by the largely pale pattern of the pronotum (Fig. 46), contrasting with the nearly entirely black pronotum of *O. gibbera* and *O. schaefferi*. The coloration of the forefemora, with black on the basal half and the remainder straw-colored, also helps distinguish this species. In females the last ventral segment is fully rounded (Davis 1930).

Remarks: Originally described as a subspecies of *O. schaefferi* (Davis 1930), but Davis (1938) concluded that specific status was warranted after subsequent collections expanded its range in Utah and Colorado. The few individuals known from Colorado have been collected from sagebrush shrublands.

Material Examined: Gunnison Co., Mesa Co. July.

Okanagana utahensis Davis

Okanagana utahensis Davis 1919b: 216. Type locality: Cedar Creek, Cedar Canyon, Iron County, Utah. Holotype ♂, examined (AMNH).

Okanagana utahensis, Metcalf 1963b: 119; Sanborn 2002:

U.S. distribution: Arizona, California, Colorado, Idaho, Nevada, Oregon Utah, Washington.

Song: Described as "a long shrill call" (Davis 1919b). Detailed analysis provide by Sanborn et al. (2002).

Diagnosis: A moderately sized, black and pale orange species that closely resembles *O. striatipes*, but is distinguished by its larger size, darker color, pale mid-dorsal pronotal stripe (Fig. 29), and the mesonotum with many long silvery hairs (Davis 1919b, 1930). The characteristic hooked uncus is illustrated in Fig. 43.

Remarks: Commonly collected on the sagebrush deserts of southwestern U.S. (Davis 1919b, 1932). Simons (1954) noted that two forms, pale and dark, occur in California and possibly elsewhere. *Okanagana utahensis* is the common *Okanagana* of western Colorado sagebrush shrublands.

Material Examined: Delta Co., Delores Co., Gunnison Co., Mesa Co., Montrose Co., Montezuma Co., La Plata Co. June-July.

Doubtful Colorado records for *Okanagana*

Okanagana cruentifera (Uhler)

Tibicen cruentifera Uhler 1892: 161. Type locality: Reno, Washoe Co., Nevada. Holotype ♂, examined (USNM).

Okanagana cruentifera, Metcalf 1963b: 102; Sanborn 2002.

North American distribution: California, Montana, Nevada, Utah, Washington.

Diagnosis: A large black and red species resembling *O. magnifica*. It is distinguished from the former by its smaller size, lack of thickened venation, double notch of the last ventral segment of the female, and a different-shaped uncus in the male (see Simons 1954).

Remarks: The actual status of this species in Colorado is in doubt. Gillette and Baker (1895) and Davis (1921b) reported *O. cruentifera* from Colorado, but Davis (1926) concluded that his previous report had been in error. His opinion was that Uhler's description of this species having "blood red flaps on both wings" had led to specimens of *Okanagana* being mistakenly labeled as *O. cruentifera*. His concern applies equally to Gillette and Baker's (1895) list. No other records of this species are known from Colorado. Previously reported in error from Bondad, La Plata Co. (Davis 1921b, 1926), this specimen is clearly *O. magnifica*.

Okanagana rimosa (Say)

Cicada rimosa Say 1830: 235. Type locality: Missouri River, North or South Dakota . Type lost?

Okanagana rimosa, Metcalf 1963b: 110; Sanborn 2002.

U.S. distribution: California, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming (Metcalf 1963b).

Diagnosis: *Okanagana rimosa* is a dull-colored species with proportionately narrow wings, distinguishing it from either *O. bella* or *O. occidentalis* (Davis 1919b, Simons 1954). On average it is not as black (the pronotum is often mottled with testaceous), is slightly smaller, and has more hairs than *O. canadensis*. The basal cell is slightly clouded (Davis 1919b).

Remarks: Metcalf (1963b) cites numerous state records for this species, including those reported by Gillette and Baker (1885), as well as by Putnam (1883) for Colorado. These records probably all pertain to *O. bella*. In fact, all western records for *O. rimosa* should be redetermined.

Cicadetta Kolenati

Type species: *Cicadetta montana* (Scopoli)

Diagnosis: Median and cubitus veins coalesce near the base of the forewing, as opposed to reaching the basal cell or arculus separately as in all other North American cicadas (Davis 1920). Sanborn (2002) discusses the nomenclatural history and use of the generic names *Cicadetta* and *Melampsalta*.

Key to Colorado *Cicadetta*

1. Hindwing with 6 apical cells anterior to Cu; both sexes green with little or no darker patterning..... *Cicadetta kansa*
- . Hindwing with 7 apical cells anterior to Cu (Fig. 10); male with dark patterning on thorax, dorsally; female straw-colored..... *Cicadetta calliope*

Cicadetta calliope (Walker)

Cicada calliope Walker 1850: 212. Type locality: Warm Springs, North Carolina? Holotype ♂, not examined (BM).

Cicadetta calliope: Metcalf 1963b: 296, Sanborn 2002.

U.S. distribution: Alabama, Arkansas, Colorado, Florida, Georgia, Kansas, Illinois, Iowa,

Louisiana, Michigan, Mississippi, Nebraska, New Jersey, North Carolina, Ohio, Oklahoma, Tennessee, Texas, Virginia.

Song: The song is almost inaudible, like a faint winding watch or the wind rustling through grass.

Diagnosis: This species is highly variable across its wide range and includes both green (Fig. 33) and brown individuals; females are the larger of the sexes with broader head (Davis 1918).

Small, body length 12-15 mm, hindwing with 7 apical cells anterior to Cu; dark patterning on thorax, dorsally. The female is usually straw-colored.

Remarks: This species is often locally abundant in moist prairie meadows, and appears to be never associated with trees (Beamer 1928). Described as common and widespread in Kansas (Lawson 1920). Both species of this genus are highly cryptic, grass-inhabiting cicadas, and are therefore difficult to collect. A male of *C. calliope* was observed singing on a blade of grass. Beamer (1928) provides an excellent account of the biology of this species.

Material examined: Boulder Co., Larimer Co., Las Animas Co., Prowers Co. June-July.

Cicadetta kansa (Davis)

Melampsalta kansa Davis 1919c: 340 Type locality: Meade, Meade Co., Kansas, Holotype ♂, examined (AMNH).

Melampsalta kansa: Metcalf 1963b: 321; Sanborn 2002.

U.S. distribution: Colorado, Kansas, Oklahoma, Texas.

Song: Similar to *C. calliope*.

Diagnosis: Distinguished by the 6 apical cells anterior to Cu and both sexes green with little or no patterning. Davis (1920) illustrates the uncus.

Remarks: This species may be much more common in Colorado along the eastern border with Kansas and Oklahoma than records indicate. Davis (1920) first recorded this immaculate green little cicada from Prowers County (Lamar) and Baca County (Regnier). This may be the cicada from near the Rocky Mountains that Say (1825) attributed to *Cicada parvula* (*M. calliope*) (Davis 1921b).

Material examined: Baca Co., Kiowa Co., Las Animas Co., Prowers Co. June-July.

Subfamily Platypediinae Kato

Platypediinae Kato: 1956, Metcalf: 1963b: 453, Duffels and van der Laan: 1985: 326.

Duffels and van der Laan (1985) [and Metcalf (1963b)] followed Kato (1956) and recognized *Platypedia* and its allies constituting a separate family, Platypediidae. China (1964) partially reviewed the nomenclature involved concerning the status of this taxon. We follow Sanborn's (2002) treatment of this group. The two genera of Platypediinae occurring in Colorado, *Platypedia* and *Neoplatypedia*, are included in the tribe Platypediini Kato.

Platypedia Uhler

Platypedia Uhler 1888:23. Type Species: *Platypedia areolata* Uhler, by subsequent designation.

At least 24 species have been described, with most occurring in California (Simons 1954, Sanborn 2002).

Diagnosis: Medium-sized cicadas, black with orange or red marking, head bluntly triangular, body elongate, tapering posteriorly, wings at rest nearly vertical (Figs. 34, 35, 48), 8 marginal

forewing cells (Fig. 16); tympanum absent, metaepimeron not prolonged posteriorly to form an operculum; uncus not retractable; aedeagus tube-like basally, distally leaf-like without spines, lateral appendages elongate.

Song: Produced as a clicking sound by flicking their wings, that may be imitated by tapping a dime on a nickel.

Remarks: Metcalf (1963b) listed *P. areolata* Uhler from Colorado. However, this record is from Woodworth (1888), and is in error, and is referable to *P. putnami* (Uhler). As previously suggested by Beirne (1959), synonymies are possible in the numerous species described from California.

Key to the Species of *Platypedia* Occurring in Colorado

MALES

1. Basal membranes of wings white to yellow-white.....*P. minor*
 Basal membranes of wings orange to red.....2
2. Uncus in lateral view thin, tapering evenly (Fig. 49); distal lobes of aedeagus with terminal spines (Fig. 50).....*Platypedia mohavensis*
 Uncus in lateral view arched, thickest near base (Fig. 51) distal lobes of aedeagus without spines (Fig. 52).....*Platypedia putnami*

FEMALES

1. Basal membranes of wings white to yellow white.....*Platypedia minor*
 Basal membranes of wings orange to red.....2
2. Head prominently produced, narrow across eyes.....*Platypedia mohavensis*
 Head not prominently produced, about as broad as wide across the eyes

Platypedia minor Uhler

Platypedia minor Uhler 1888: 81. Type locality "Southern California." Holotype ♂, examined (USNM).

Platypedia intermedia Van Duzee 1915: 24. Type locality: Sabre Vista, Sonoma, Co., California (CAS); Davis 1920: 119.

Platypedia minor, Metcalf 1963b: 959; Sanborn 2002.

U.S. distribution: California, Colorado, Nevada, and Mexico.

Song: Sharp clicks repeated 3 or 5 times (Essig 1929).

Diagnosis: In this species, the basal membranes of wings are white; with forewing two times as long as broad; and in the male, the uncus is thickened at base, tapering to apex; aedeagus apex leaf-like with terminal spines (Fig. 54).

Remarks: Davis (1920) in his review of *Platypedia* synonymized *P. intermedia* with *P. minor*. However, Metcalf (1963b) listed it separately. This species has not been collected from Colorado since the original 1919 collection of 22 males and 35 females taken by E. J. Oslar at Glenwood Springs (Davis 1920a). The collection site may be in error, perhaps a California locality. Oslar was known to collect at railroad stops throughout the western U.S. The holotype male *P. minor* has the right wings missing, the abdomen has been glued to the thorax, and the terminalia is damaged. Essig (1929) indicated this species is abundant in California and oviposits in twigs of native oaks (*Quercus* spp.), baccharis, Madrona, and willow, as well as fruit trees. Adults are active in trees on open grassy slopes or along creeks. This species is purportedly injurious to some economic plants in Northern California (Simons 1954).

Material Examined: Garfield Co., Glenwood Springs, Oslar, 5 ♂ (SIAS). Month?



Fig. 34. *Platypedia putnami* (Uhler), Lory State Park, Larimer Co.



Fig. 35. *Platypedia putnami* (Uhler), Lory State Park, Larimer Co.



Fig. 36. *Platypedia putnami* (Uhler), ovipositional damage, Boulder Co.



Fig. 37. *Neoplatypedia constricta* Davis, Grass Valley Resort, Garfield Co.

Platypedia mohavensis Davis

Platypedia mohavensis Davis 1920:100. Type locality: Trumble Mountain, Mohave Co., Arizona, Holotype ♂, examined (AMNH).

Platypedia mohavensis, Metcalf 1963b: 460, Sanborn 2002.

Platypedia latipennis Davis 1921b: 54. Type locality: Routt Co., Colorado. Holotype ♂, examined (AMNH), Metcalf 1963b: 459, Sanborn 2002. **New synonymy**

Platypedia mohavensis rufescens Davis 1932: 258. Type locality: Jemez Springs, New Mexico. Holotype ♂, examined (AMNH).

Platypedia mohavensis rufescens, Metcalf 1963b: 460.

U.S. distribution: Arizona, California, Colorado, New Mexico, Utah.

Song: Described as a ticking sound - tick-tick-tick-tick, that can be imitated by tapping a dime on a nickel (Davis 1943).

Diagnosis: Resembles *P. putnami* but is much slimmer and has a narrower head and a strongly protruding front (Davis 1920). Basal wing membranes red to orange; uncus in lateral view thin, tapering evenly to apex (Fig. 49); apical portion of aedeagus bearing 1 or more apical spines (Fig. 50).

Remarks: Examination of the types listed above, and of material throughout the range of the species indicates the presence of one species. It is interesting to note that only two specimens, the type from Colorado (Davis 1921b) and another male from Utah (Davis 1935), have been identified as *P. latipennis*. Both specimens are morphologically identical in all respects to typical *P. mohavensis*. Additional paratypes of *P. mohavensis* and *P. mohavensis rufescens* (SIAS) were examined.

A population of *P. mohavensis* was studied in Big Wash, a small canyon off State Route 65 east of Palisade, Colorado. The rocky walls of this canyon are sparsely covered with rabbitbrush and serviceberry. Males flew to individual shrubs, strongly preferring serviceberry, clicking three or five times, usually flying to another branch on the same shrub, repeating this behavior three to five times. Females responded with two fainter clicks. When disturbed, these cicadas would drop to the ground. *Platypedia mohavensis* has been commonly collected in association with *P. putnami* throughout much of its range.

Material Examined: Huerfano Co., La Plata Co., Mesa Co., Montezuma Co., Montrose Co., Routt Co. June-July.

Platypedia putnami (Uhler)

Cicada putnami Uhler 1877:455. Type locality: Clear Creek, Colorado. Holotype ♂, examined (USNM).

Platypedia putnami Metcalf 1963b: 461; Sanborn 2002.

Platypedia putnami lutea Davis 1920:106. Type locality: State Canyon, Provo, Utah Co., Utah. Holotype ♂, examined (AMNH).

Platypedia putnami lutea, Simons 1954:170.

Platypedia putnami lutea, Metcalf 1963b: 462; Sanborn 2002.

U.S. distribution: Arizona , California, Colorado, Montana, Nebraska , Nevada, New Mexico, Oregon, Utah, Washington.

Song: Clicking sound, about eight clicks, rapid at first but slowing (Lutz in Davis 1943). The characteristic song, a clicking sound, is made by flitting or crackling their wings. The duration of singing was recorded by Beamer in Davis (1943) from 5:30 a.m. to 8:00 p.m. "...in all kinds of

trees along the Poudre River, 35 miles from Fort Collins." Sanborn and Phillips (1999) provide a recent analysis of the song of this species.

Diagnosis: The combination of the pronotal collar orange to red; basal wing membranes orange to red; and uncus arched and thickest near base (Fig. 51) easily separates this species.

Additionally, in the male the apex portion of aedeagus is expanded without spines (Fig. 52).

Remarks: *Platypedia putnami* is very similar to *P. areolata* (Uhler), a common species in California and the Pacific Northwest. Two characters, the color of the basal wing membrane and forefemora, have been used to separate these two species (Davis 1920, Simons 1954). However, a recognized geographic form, *P. p. occidentalis* Davis, has chestnut brown, rather than the typical black forefemora. The aedeagus and uncus of typical *P. putnami* and *P. areolata* are extremely similar, if not identical. Future studies may indicate one variable widespread species with *P. areolata* having date priority. Beirne (1959) previously alluded to this in his review of Canadian cicadas. Essig (1929) referred to *P. putnami* as Putnam's cicada.

This species was also found commonly along the banks of Clear Creek in early July and Beamer described the male singing as a peculiar, very faint chirp (Davis 1932). Mating involves the male moving to the side of female, the uncus is rotated 90°, and contact is made with the female. Mating usually lasts for 1-2 minutes. This small cicada is common throughout the shrublands of the foothills and montane hillsides and semidesert shrublands. Little (1943) considered *P. putnami* as a common member of the pinon woodlands. Peak adult activity is between mid-May and mid-June. Nymphs usually emerge from the first to the middle of May. This species is abundant on shunkbrush (*Rhus trilobata* Nutt.) and wild plum (*Prunus americana* Marsh.) in Lory State Park near Fort Collins. Newly emerged adults were observed as late as 2:30 p.m. (27 May 1991). Adults have been considered to cause economic damage to trees. For

example, a large emergence of *P. putnami* in the Boulder area in June 1991 resulted in typical cicada flagging damage to a variety of tree species including green ash (*Fraxinus pennsylvanica* Marsh.), American elm (*Ulmus americana* L.) and silver maple (*Acer saccharinum* L.) due to ovipositional injury (Fig. 36).

Material Examined: Arapahoe Co., Archuleta Co., Boulder Co., Chaffee Co., Delta Co., Dolores Co., Douglas Co., El Paso Co., Fremont Co., Garfield Co., Huerfano Co., Jackson Co., Jefferson Co., La Plata Co., Larimer Co., Las Animas Co., Logan Co., Mesa Co., Moffat Co., Montezuma Co., Montrose Co., Rio Blanco Co. April-September.

Neoplatypedia Davis

Neoplatypedia Davis, 1920:121. Type species: *Platypedia ampliata* Van Duzee, by original designation.

Diagnosis: Seven forewing marginal cells; costal vein strongly expanded and bent beyond the middle of the radial cells (Fig. 17); lateral appendages of aedeagus short and leaf-like (Fig. 55).

Neoplatypedia constricta Davis

Neoplatypedia constricta Davis, 1920:123. Type locality: Trumble Mountain, Mohave Co., Arizona. Holotype ♂, examined (SIAS).

Neoplatypedia constricta, Metcalf 1963b: 466; Sanborn 2002.

U.S. distribution: Arizona, Colorado, Idaho, Utah.

Song: A zip-zip-zip, (similar to sound of a zipper opening and closing) in 2-3 second bursts or longer, 10-30 seconds.

Diagnosis: In the male, the uncus constricted near apex, curved upward in lateral view (Fig. 56);

and the lateral appendages of aedeagus short, apex with terminal spines (Fig. 55). The seven forewing marginal cells (Fig. 17) separate both sexes from *Platypedia*.

Remarks: This species is generally restricted to the West Slope of Colorado. It was first listed from Colorado from Bondad (La Plata County) by Davis (1921b). However, Leatherman collected 2 ♂ from Sterling in Logan County in eastern Colorado.

Two large populations were observed on the hillsides of the dam of Grass Valley Reservoir (Garfield Co.) (Fig. 37) and Big Wash (Mesa Co.) Males were singing on big sagebrush and rubber rabbitbrush. Singing began in afternoon from 1:00-4:00 p.m. Males would call and walk in a jerking manner on lower or interior branches of the shrubs. If a female would answer, he would approach calling, she would reply weakly, the song lasting 1-2 seconds. He would parallel her on the right side and rotate his uncus 90° inserting his aedeagus. Mating would last several minutes. Females apparently prefer inserting eggs into rabbitbrush.

Fautin (1946) considered this species a conspicuous member of northern desert shrub biome in western Utah. At the Big Wash site, *N. constricta* was collected with *O. occidentalis* and *O. striatipes*. Two weeks earlier at this site *P. putnami* and *P. mohavensis* were common.

Material Examined: Garfield Co., Logan Co., Mesa Co., Montrose Co, Montezuma Co. May-August.

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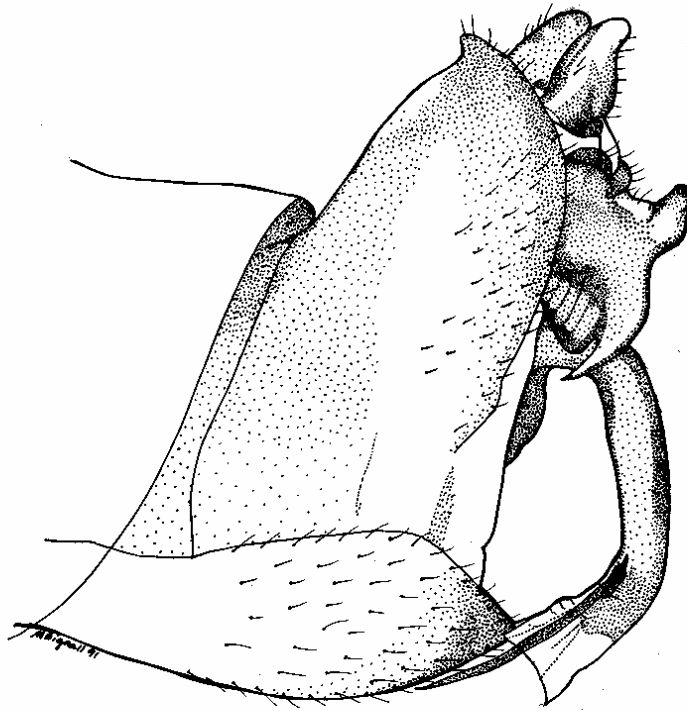


Fig. 38. *Diceroprocta eugraphica* (Davis), male terminalia, lateral view.

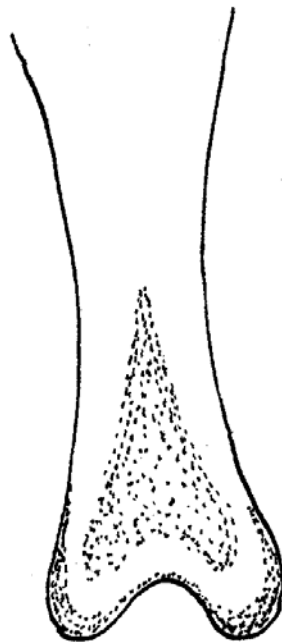


Fig. 39. *Tibicen bifidus* (Davis), uncus, caudal view.

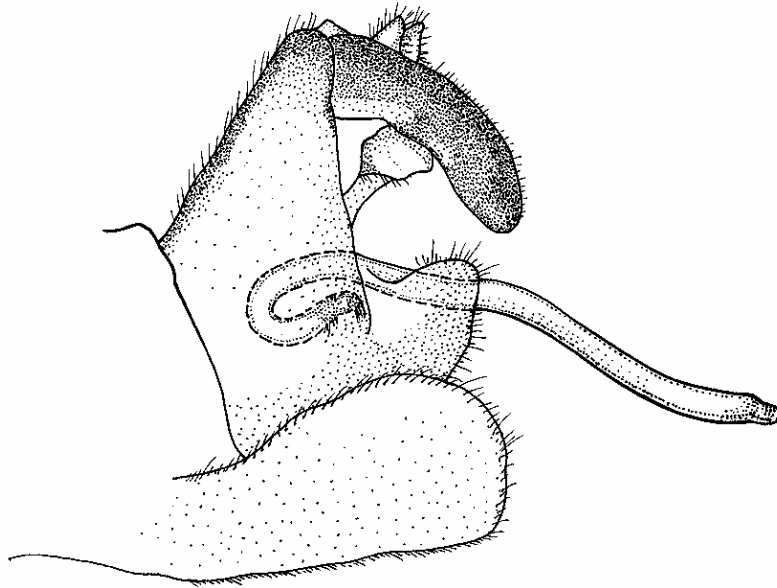


Fig. 40. *Tibicen dorsatus* (Say), male terminalia, lateral view.

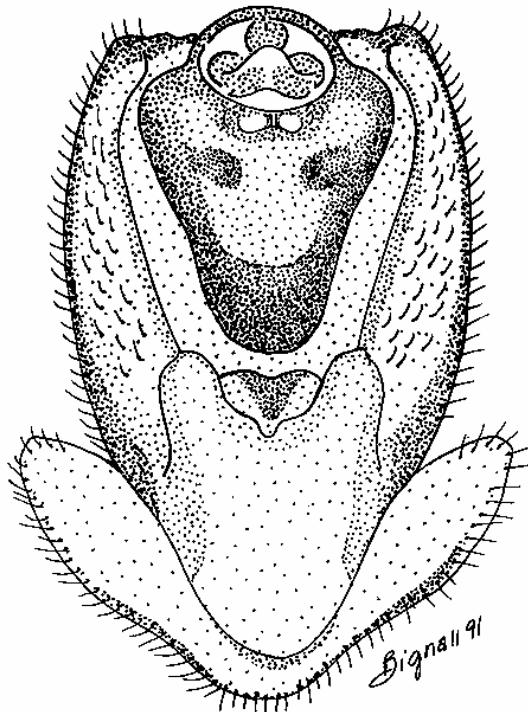


Fig. 41. *Tibicen dorsatus* (Say), male terminalia, caudal view.

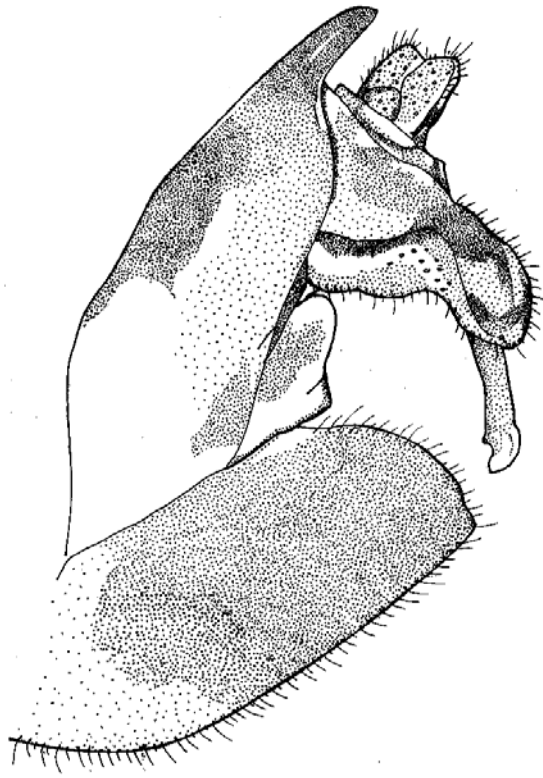


Fig. 42. *Tibicen inauditus* Davis, male terminalia, lateral view.

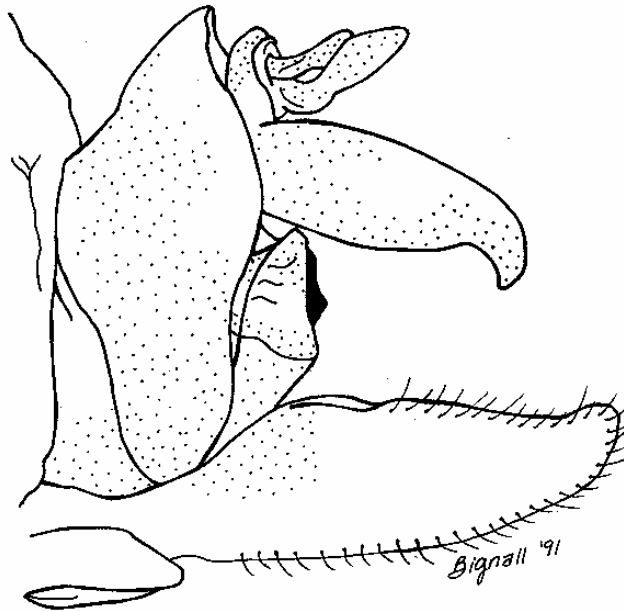


Fig. 43. *Okanagana utahensis* Davis, male terminalia, lateral view.

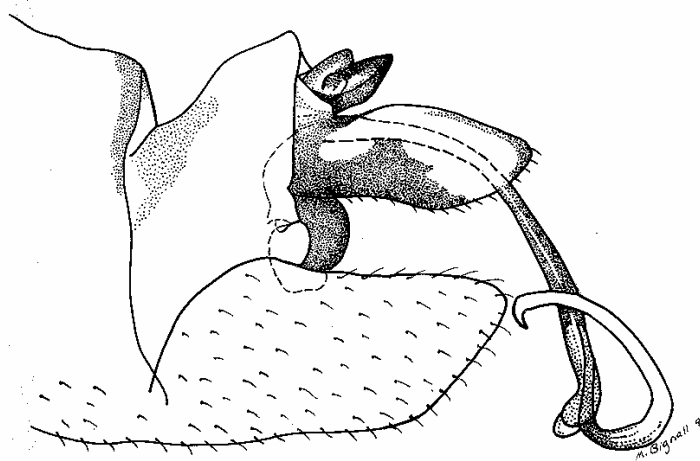


Fig. 44. *Okanagana bella* Davis, male terminalia, lateral view.

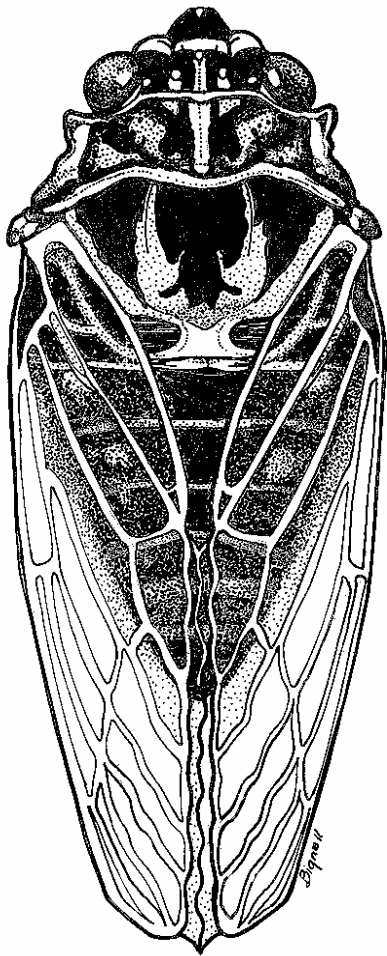


Fig. 45. *Okanagana synodica* (Say), dorsal habitus.



Fig. 46. *Okanagana tanneri* Davis, dorsal habitus, wings absent.

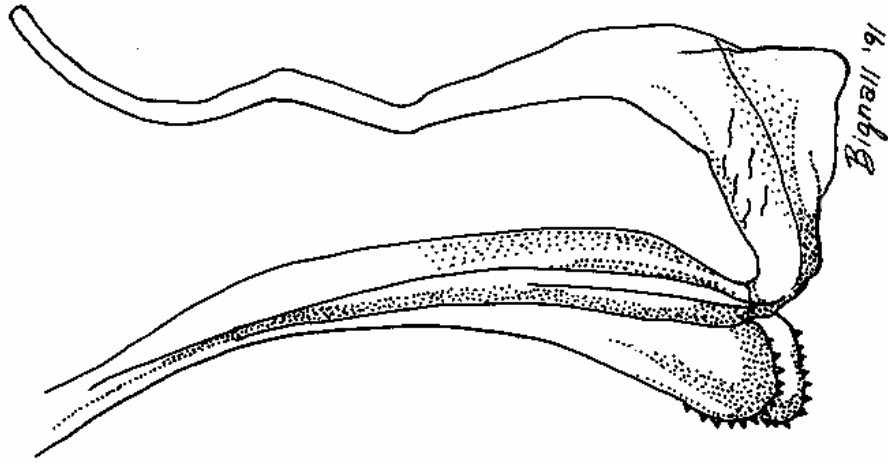


Fig. 47. *Okanagana utahensis* Davis, aedeagus.

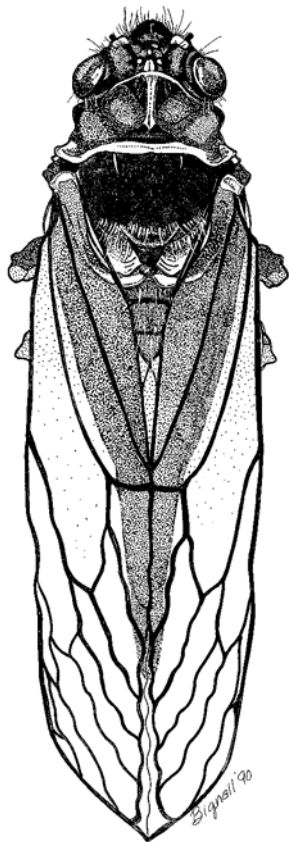


Fig. 48. *Platypedia putnami* (Uhler), dorsal habitus.

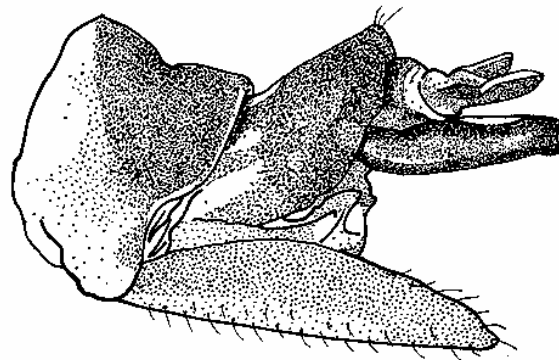


Fig. 49. *Platypedia mohavensis* Davis, male terminalia, lateral view.

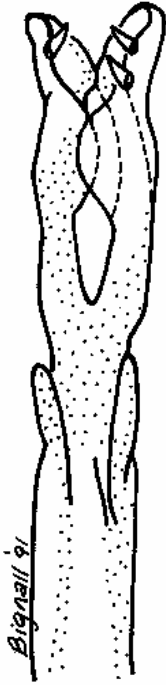


Fig. 50. *Platypedia mohavensis* Davis, aedeagus.

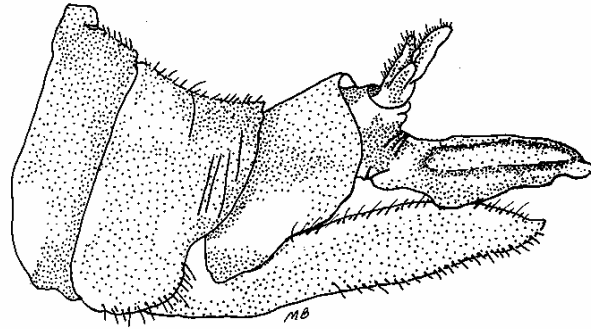


Fig. 51. *Platypedia putnami* (Uhler), male terminalia, lateral view.

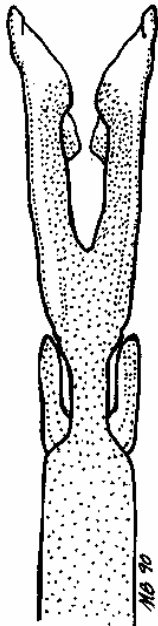


Fig. 52. *Platypedia putnami* (Uhler), aedeagus.

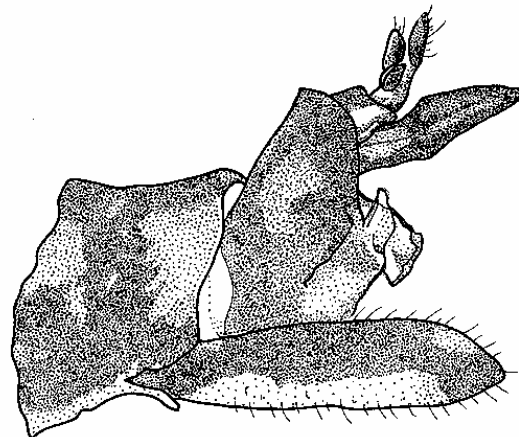


Fig. 53. *Platypedia minor* Uhler, male terminalia, lateral view.

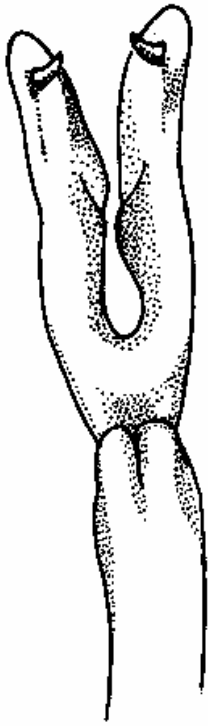


Fig. 54. *Platypedia minor* Uhler, aedeagus.

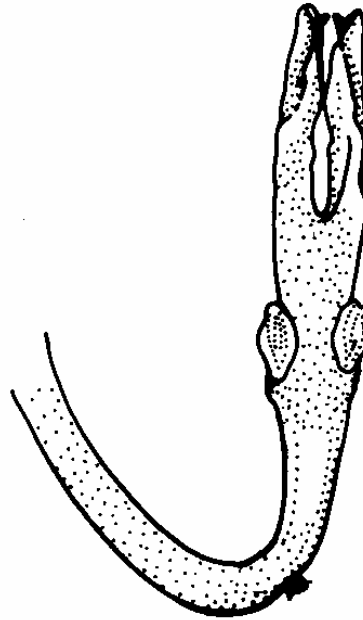


Fig. 55. *Neoplatypedia constricta* Davis, aedeagus.

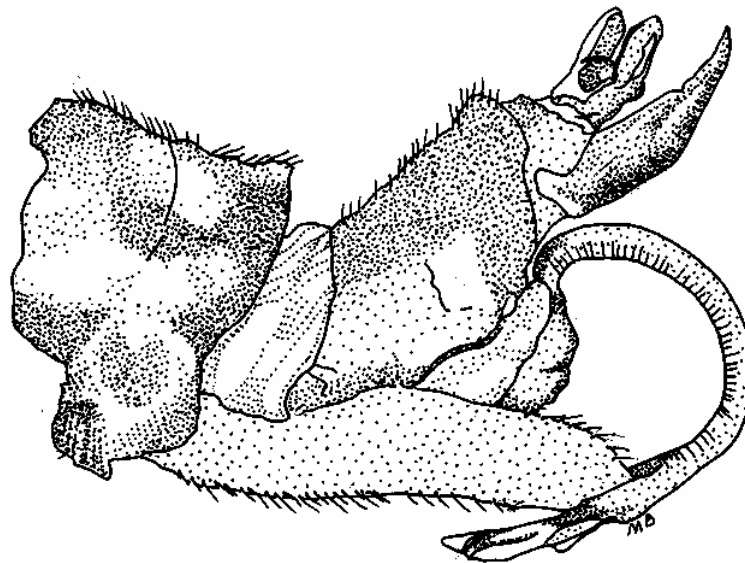


Fig. 56. *Neoplatypedia constricta* Davis, male terminalia, lateral view.

Recipes from cicada gourmet, Larry Weintraub of the *Chicago Sun-Times*:

Newly hatched cicadas, called *teneral*s, are considered best for eating because their shells have not hardened. Remove wings and legs from hardened insects before cooking.

- 1) Marinate cicadas in Worcestershire sauce at least one hour. Dip in egg, then flour or breadcrumbs. Deep-fry and serve with soy or cocktail sauce.

- 2) Place cicadas on cookie sheet and roast for 10 to 15 minutes at 225 degrees Fahrenheit. When dry, grind coarsely and use as nut substitute in bread or on ice cream. A finer grind can be mixed 50:50 with flour to make a high-protein dough.

- 3) Drop cicadas briefly in boiling water. Coat with red pepper, garlic and ground bay leaf.

- 4) Stir-fry with garlic, ginger and bite-size vegetables.

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