

# INSECTS OF WESTERN NORTH AMERICA

## 8. The Checkered Beetle Genus *Trichodes* Herbst (Coleoptera: Cleridae): A Pictorial Key to North American Taxa with Notes on Colorado Species



Contributions of the  
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**Cover illustration.** *Trichodes ornatus* Say. Photographs by Dan West.

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## **8. The Checkered Beetle Genus *Trichodes* Herbst (Coleoptera: Cleridae): A Pictorial Key to North American Taxa with Notes on Colorado Species**

by

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## Abstract

The *Trichodes* is a genus of checkered beetles (Cleridae: Clerinae) consisting predominately of predators of hymenopteran larvae and orthopteran egg pods (Foster, 1976). Adult *Trichodes* are floral visitors, feeding on pollen, mating on flowers, and ovipositing on flowers visited by Apoidea or oviposit directly into nests of ground dwelling bees. Three species inhabiting montane and plateau counties of western Colorado were recorded: *T. nutalli*, *T. ornatus*, *T. simulator*. The genus appears to be absent from the Great Plains Steppe Province of the eastern Colorado. A pictorial key for all North American species of *Trichodes* and recognized subspecies of *T. ornatus* is presented. Notes on the biology of three Colorado species are given. Available county records are also noted.

## Introduction

Adult Cleridae are a group of usually elongate, brightly colored, usually densely pubescent bodied, large-headed beetles. There are at least 291 species of Cleridae recognized in 33 genera in North America (Opitz, 2002). Ecologically, adults are predominately predaceous in behavior, particularly of bark beetles (Scolytinae) in both larval and adult stages, while a few are considered pests of stored animal products, dry carrion, or stored meat products (Furniss and Carolin, 1977; Majka, 2006). However, some clerids feed upon pollen as adults whereas larvae are predaceous, as is the general life history for the genus *Trichodes* (Opitz, 2002). Eleven species of *Trichodes* Herbst are known from North America (Foster, 1976) divided into the *peninsularis* group, the *bibalteatus* group, and the *ornatus* group. Adults of several species in the genus *Trichodes* are commonly observed in Colorado on flowers. *Trichodes* larvae consume bee or wasp larval cells through five instars in the *ornatus* and *bibalteatus* groups. The last two instars are non-feeding, prepupal stages. Pupal chambers are encased with oral secretions, often adjacent to larval hymenoptera cells located in wood or clay. *T. nutalli* (Kirby) and *T. ornatus* Say are considered univoltine, passing winter months in the fourth larval stage. Adult *T. ornatus* and *T. nutalli* forage in the spring and early summer months, whereas *T. simulator* is considered a fall active species. The life cycle of *T. simulator* Horn is considered semivoltine (Foster, 1976).

For the first time, keys to the *Trichodes* found in Colorado and North America are presented. Color images of the distinctive habitus of the species are provided to facilitate identification.

## Methods and Material

Identification was conducted through morphological characters, and where applicable we used a Leica MZ16 stereoscopic microscope at 10-115 × magnification. Imagery was processed through Leica Application Suite v2.8 software coupled with a Leica microphotography camera fitted on the Leica MZ16 microscope. Locality information was cataloged from specimens deposited in the C.P. Gillette Museum of Arthropod Diversity, Colorado State University (CSUC). Examination and images of external anatomy of *T. bicinctus* Green, *T. bimaculatus* Le Conte, *T. nexus* Wolcott, *T. oregonensis* Barr, and *T.*

*orestrus* Wolcott was made possible through loaned material from the National Museum of Natural History, Washington, DC (USNM). Records were imported into a geographic information system for depicting distribution maps (ArcMap 9.3).

## Results

Three species of *Trichodes* occur in Colorado, one species of the *bibalteatus* group (*T. nutalli*), one species of the *ornatus* group (*T. ornatus*), and one species of the *peninsularis* group (*T. simulator*). The following illustrated key will allow separation of the three subspecies of *T. ornatus*.

### *Trichodes* of Colorado

#### *Trichodes bibalteatus* group

##### *Trichodes nutalli* Kirby

*Clerus nutalli* Kirby, 1818:394; Foster, 1976:48

*Trichodes nutalli* (Fig. 1) range from southern Canada and northern United States east of the Continental Divide (Foster 1976), however, records are also available from western Colorado (Fig. 45). The biology of *T. nutalli* is largely unknown, however, Foster (1976) reported adult floral visitation on *Achillea millefolium* L., *Apocynum* spp., *Asclepias* spp., *Aster* spp., *Chrysanthemum leucanthemum* L., *Helianthus* spp., *Heracleum* spp., *Melilotus* spp., *Melilotus albus* Medikus, *Potentilla recta* L., *Rosa* spp., *Rubus* spp., *Rudbeckia hirta* L., and *Spiraea* spp. Unlike most members within this genus having larval associations with bees and wasps, the only larval host record for this species is with the egg pods of a slant faced grasshopper, *Chloeltis conspersa* Harris (Orthoptera: Acrididae) from North Dakota (Foster 1976). It is of note that another species, *T. oregonensis* Barr is also known to attack grasshopper eggs. Further studies on life histories are needed for this species.

#### *Trichodes ornatus* group

##### *Trichodes ornatus ornatus* Say

*Trichodes ornatus* Say, 1823: 189; Foster 1976: 40.

The distribution of the nominate form of *T. o. ornatus* (Fig. 2) includes the Rocky Mountains of Colorado, New Mexico, extreme northern Mexico, west to the Great Basin and Sonoran Desert. Records for Colorado are available from the eastern edge of the Front Range (Chronic and Chronic 1972), west to the border with Utah. This species has not been collected on the High Plains Steppe of Colorado (Fig. 45).

Linsley and McSwain (1943) presented the biology of this subspecies including descriptions of immature stages. Adults frequent flowering plants, favoring *Achillea millefolium* L., *Eriogonum* spp. and *Ceanothus* spp. Eggs are endophytically inserted into flower heads away from the staminate portion of the flower. Larvae hatch and attach to visiting native bees. Once transported to bee cells, larvae begin feeding on bee larvae, attacking multiple larval cells of their respective bee prey. Life cycles are typically univoltine, passing

through five instars, although exceptions occur. Larvae overwinter as fourth instar, pass one instar stage in early spring and pupate in early-summer months (Linsley and McSwain, 1943). Adults are found ten to twelve days post pupation in early summer. Adults may occur on, feed upon, and mate on *Achillea* spp., *Artemisia* spp., *Aster* sp., *Cleome* spp., *Erigeron* spp., *Eriogonum* spp., *Opuntia* spp., *Potentilla* spp., *Sambucus* spp., *Senecio* spp., *Sphaeralcea* spp., *Tamarix* spp., and *Yucca* spp. (Foster, 1976). The megachilid genus *Ashmeadiella* has been reported as prey by Foster (1976).

**A pictorial key to the subspecies of *T. ornatus* Say following Foster (1976).**

- 1 a. Elytra yellow or red with metallic blue or greenish maculations covering less than 50% of surface, middle and subapical yellow or red maculation usually complete to margin .....2
- 1 b. Elytra yellow with dark blue metallic covering >50% of surface (Fig. 3); middle and subapical yellow maculations never attaining lateral margin (Fig. 4); northern Rocky Mountain states and Pacific Northwest, extending north to Alaska ..... *T. o. hartwegianus* White
- 2 a. Elytra yellow (never red) with blue or purple maculations; coastal and mountainous regions of California, Colorado Plateau, Rocky Mountains of Colorado and New Mexico .....3
- 2 b. Elytra red or yellow with metallic blue maculations; Sonoran, Mojave, and Great Basin deserts .....4
- 3 a. Elytra with postmedial dark band strongly constricted on either side near sutural vita (Figs. 5 and 6); setae usually yellowish (fulvous); California and western Oregon ..... *T. o. douglasianus* White
- 3 b. Elytra with postmedial dark maculation only slightly constricted on either side of the sutural vita (Fig. 7); setae usually whitish (Fig. 8); Colorado Plateau and Rocky Mountains ..... *T. o. ornatus* Say
- 4 a. Body small and slender; elytra subparallel (Fig. 9); setae on pronotum and head whitish (Fig. 10); Sonoran and Mojave deserts ..... *T. o. tenuosus* Foster
- 4 b. Body robust; elytra distinctly expanded at posterior one-third (Fig. 11); setae of head and pronotum often dusky (Figs. 12 and 13); Great Basin and Snake River plains.....*T. o. bonnevillensis* Foster

*Trichodes peninsularis* group

***Trichodes simulator* Horn**

*Trichodes simulator* Horn, 1880:149; Foster 1976: 12

*Trichodes simulator* is easily recognized by its bold black and red elytral pattern (Fig. 14). Collection labels from examined specimens from Colorado provide a distribution of mostly western Colorado counties (Garfield, Mesa, and Moffat). Specimens have also been examined from a central Colorado county (Huerfano County, Fig. 45).

Larvae of *T. simulator* are known to be predaceous on Apidae and Megachilidae larvae, particularly species of *Anthophora*, *Microanthophora*, and *Megachila* (Foster, 1976). Adult males can be found day and night on autumnal blossoms of various species of *Achillea*, *Chrysothamnus*, *Cleome*, *Senecio*, and *Solidago*. Females seek oviposition sites at vertical streamside clay banks by night, with floral visitation by day. Adults are present from late-July to mid-September. Foster (1976) has presented aspects of the larval biology.

**Key to Species of Adult *Trichodes* of North America**

(Adapted from Foster 1976)

- 1 a. Elytra coarsely, deeply reticulately punctuate (Fig. 15); humeral umbones unicolorous (Fig. 16) ..... 2
- 1 b. Elytra sparsely and indistinctly punctuate (Fig. 17); humeral umbones bearing a dark spot (Fig. 18) ..... 7
- 2 a. Elytral apices truncate or emarginated (Fig. 19); pronotum clothed with moderately dense, fine setae not obscuring the integument (Fig. 20) (*peninsularis* group) ..... 3
- 2 b. Elytral apices rounded (Fig. 21); pronotum clothed with dense, coarse setae partially obscuring the integument (*bibalteatus* group, Fig. 22) ..... 5
- 3 a. Antennal club at least  $1\frac{1}{2} \times$  longer than broad (Fig. 23); elytra variously colored, maculations never transverse (Fig. 24) ..... 4
- 3 b. Antennal club less than  $1\frac{1}{2} \times$  longer than broad (Fig. 25); elytra orange with three dark, transverse maculations possessing a dark band at apex (Fig. 26); North Dakota, southern Wyoming to northeastern Arizona ..... *T. simulator* Horn
- 4 a. Visible abdominal sternites one through four bearing dense patches of setae on either side (Fig. 27); elytra tricolored, yellow with three broad brown bands bordered with purple, purple may be expanded (Fig. 24); southwestern New

- Mexico west to southern California, and south into Sonora and Baja California,  
Mexico ..... *T. peninsularis* Horn
- 4 b. Visible abdominal sternites one through four lacking patches of setae (Fig. 28);  
elytra bicolored red with blue or greenish bands (Fig. 29); southwestern Arizona,  
across southern New Mexico to the Trans Pecos region .....*T. oresterus* Wolcott
- 5 a. Elytra red or orange with three dark complete or incomplete transverse  
maculations including a blue maculation across apical tips (Fig. 26) ..... 6
- 5 b. Elytra orange with two dark, complete transverse maculations, apices lacking a  
maculation (Fig. 30); southern Great Plains; Kansas to the Mexico border, west to  
New Mexico .....*T. bibalteatus* LeConte
- 6 a. Pronotum with dark burgundy colored setae (Fig. 22); antennal club almost twice  
as long as broad (Fig. 31); Atlantic and Gulf states to Mississippi .....  
..... *T. apivorus* Germar
- 6 b. Pronotum clothed with orange colored setae (Fig. 32); antennal club only slightly  
longer than broad (Fig. 33); southwestern ..... *T. bicinctus* Green
- 7 a. Metallic blue or green; elytra with a single pair of maculations; elytral anterior  
angles dark .....10
- 7 b. Various colored; elytra bearing more than one pair of maculations; elytral  
anterior angles yellow or red .....8
- 8 a. Elytron with a humeral umbone spot produced to the front margin (Fig. 34); dark  
sub-basal band never attaining lateral margin (Fig. 35) .....9
- 8 b. Elytron with a humeral umbone spot completely surrounded by yellow or red  
(Fig. 36); if umbone spot extends to medial suture (Fig. 37) then dark sub-basal  
band attains lateral margin (Fig. 38); Nearctic west of the 100<sup>th</sup> Meridian .....  
..... *T. ornatus* Say
- 9 a. Elytra marked with alternating incomplete testaceous and complete dark  
maculations (Fig. 39), middle and posterior bands narrow (Fig. 40); lower Baja  
California, Mexico .....*T. nexus* Wolcott
- 9 b. Elytra marked with alternating complete red and incomplete blue/purple  
transverse bands of approximately equal width (Fig. 1); southern Canada and  
primarily northern United States through Rocky Mountains .....*T. nutalli* Kirby
- 10 a. Elytra about  $2 \frac{3}{4} \times$  longer than humeral width (Fig. 41); elytral maculations  
attaining lateral margins or separated from by a distance much less than their  
diameter (Fig. 42); Pacific Coast ranges of California ..... *T. bimaculatus* LeConte



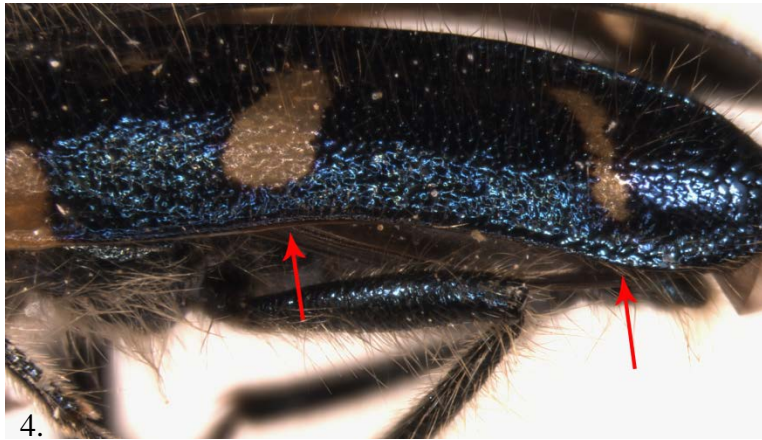
10 b. Elytra about  $2\frac{1}{4}$  × longer than humeral width (Fig. 43); elytral maculations separated from lateral margins by a distance sub equal to their diameter (Fig. 44); Pacific Coastal ranges of southern Oregon and extreme northern California .....  
..... *T. oregonensis* Barr

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**Figures 1-3.** 1. *Trichodes nutalli* Kirby. Dorsal view. 2. *Trichodes ornatus* Say. Dorsal view. 3. *Trichodes ornatus hartwegianus* White. Dorsal view



**Figures 4-6.** 4. *Trichodes ornatus hartwegianus* White. View of middle and subapical yellow maculations never attaining lateral elytron margin. 5. *Trichodes ornatus douglasianus* White. Dorsal view showing the postmedial dark band strongly constricted. 6. *Trichodes ornatus douglasianus* White. Dorsal and lateral elytron view showing the postmedial dark band strongly constricted while not attaining the lateral elytron margin.



**Figures 7-9.** 7. *Trichodes ornatus ornatus* Say. Dorsal view showing the postmedial dark band only slightly constricted on either side of the sutural vitta. 8. *Trichodes ornatus ornatus* Say. Dorsal view showing the postmedial dark band only slightly constricted on either side of the sutural vitta; setae whitish. 9. *Trichodes ornatus tenuosus* Foster. Dorsal view showing elytra subparallel.



10.



11.



12.

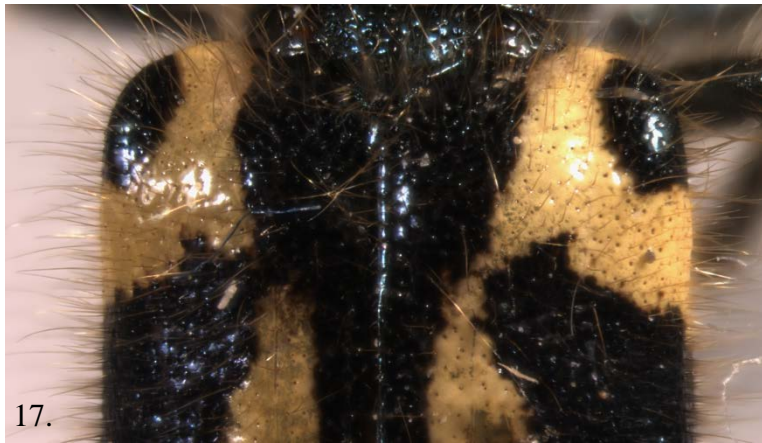
**Figures 10-12.** 10. *Trichodes ornatus tenuosus* Foster. Lateral view of pronotum showing whitish setae on head and pronotum. 11. *Trichodes ornatus bonnevillensis* Foster. Dorsal view showing elytra distinctly expanded at posterior one-third. 12. *Trichodes ornatus bonnevillensis* Foster. Dorsal view showing setae of head and pronotum dusky colored.



**Figures 13-14.** 13. *Trichodes ornatus bonnevillensis* Foster. Lateral view showing setae of head and pronotum dusky colored. 14. *Trichodes simulator* Horn. Dorsal view.



**Figures 15-16.** 15. *Trichodes bibalteatus* Le Conte. Dorsal view of elytral basal area showing deeply reticulate punctuations. 16. *Trichodes bibalteatus* Le Conte. Dorsal view of unicolorous humeral umbones.



**Figures 17-19.** 17. *Trichodes ornatus* Say. Dorsal view of elytral basal area showing sparse and indistinct punctuations. 18. *Trichodes ornatus* Say. Dorsal view of humeral umbones bearing a dark spot. 19. *Trichodes peninsularis* Horn. Dorsal view of elytral truncate or emarginate.





**Figures 20-21.** 20. *Trichodes peninsularis* Horn. Dorsal view of pronotum clothed with moderately dense, fine setae not obscuring the integument. 21. *Trichodes bibalteatus* Le Conte. Dorsal view of elytral apices.



**Figures 22-24.** 22. *Trichodes apivorus* Germar. Lateral view of pronotum with dense dark burgundy colored setae partially obscuring the integument. 23. *Trichodes peninsularis* Horn. Antennal club. 24. *Trichodes peninsularis* Horn. Dorsal view of variously colored elytra.



25.



26.

**Figures 25-26.** 25. *Trichodes simulator* Horn. Antennal club. 26. *Trichodes simulator* Horn. Dorsal view of elytra with dark maculations across the apical tips.



27.



28.

**Figures 27-28.** 27. *Trichodes peninsularis* Horn. Ventral abdominal view with visible sternites one through four bearing dense patches of setae. 28. *Trichodes oresterus* Wolcott. Ventral abdominal view with visible sternites one through four lacking patches of setae.



**Figures 29-30.** 29. *Trichodes oresterus* Wolcott. Dorsal view of bicolored red elytra with blue maculations. 30. *Trichodes bibalteatus* Le Conte. Dorsal view of elytra lacking dark apical maculations



31.



32.

**Figures 31-32.** 31. *Trichodes apivorus* Germar. Antennal club. 32. *Trichodes bicinctus* Green. Lateral view of pronotum clothed with orange colored setae.



33.



34.

**Figures 33-34.** 33. *Trichodes bicinctus* Green. Antennal club. 34. *Trichodes nutalli* Kirby. Dorsal view of humeral umbone spot produced to the front margin



**Figures 35-36.** 35. *Trichodes nutalli* Kirby. Lateral view of dark sub-basal maculation not attaining lateral margin. 36. *Trichodes ornatus* Say. Dorsal view of humeral umbone spot completely surrounded by yellow.





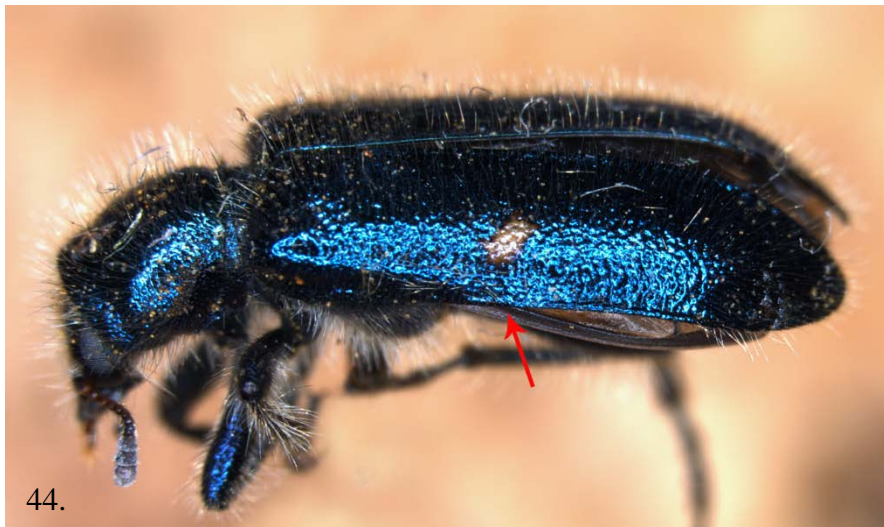
**Figures 37-39.** 37. *Trichodes ornatus hartwegianus* White. Dorsal view of umbone spot extending to medial suture. 38. *Trichodes ornatus ornatus* Say. Lateral view of elytral dark sub-basal band attaining lateral margin. 39. *Trichodes nexus* Wolcott. Dorsal view of elytra marked with alternating incomplete testaceous and complete dark maculations.



**Figures 40-42.** 40. *Trichodes nexus* Wolcott. Dorsal view of elytral middle and posterior bands narrow. 41. *Trichodes bimaculatus* LeConte. Dorsal view of elytra. 42. *Trichodes bimaculatus* LeConte. Lateral view showing maculations attaining lateral margin.

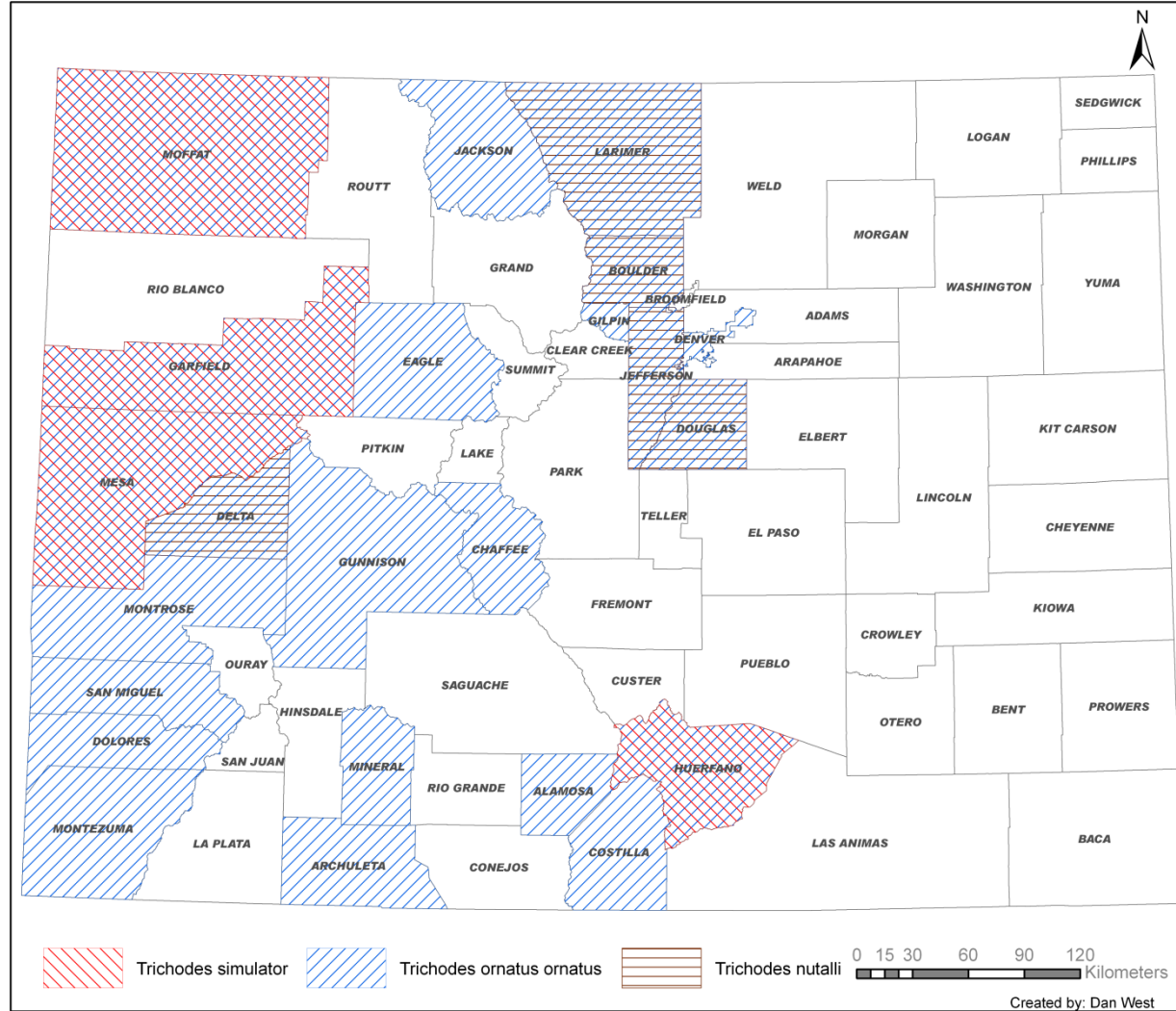


43.



44.

**Figures 43-44.** 43. *Trichodes oregonensis* Barr. Dorsal view of elytra. 44. *Trichodes oregonensis* Barr. Lateral view showing maculations separated from lateral margins by a distance subequal to their diameter.



**Figure 45.** Species distributions of the *Trichodes* of Colorado: *T. nutalli*, *T. ornatus*, *T. simulator*. County records were catalogued from the C.P. Gillette Museum of Arthropod Diversity (CSUC), Colorado State University, Fort Collins, Colorado

