

SPECIES FACT SHEET

Common Name: Columbia River Tiger Beetle

Scientific Name: *Cicindela columbica* Hatch 1938

Synonyms: *Cicindela bellissima* Leng 1902 (*Cicindela columbica* Hatch 1938 is regarded by some entomologists as a subspecies of this species.)

Phylum: Arthropoda

Class: Insecta

Order: Coleoptera

Family: Cicindelidae

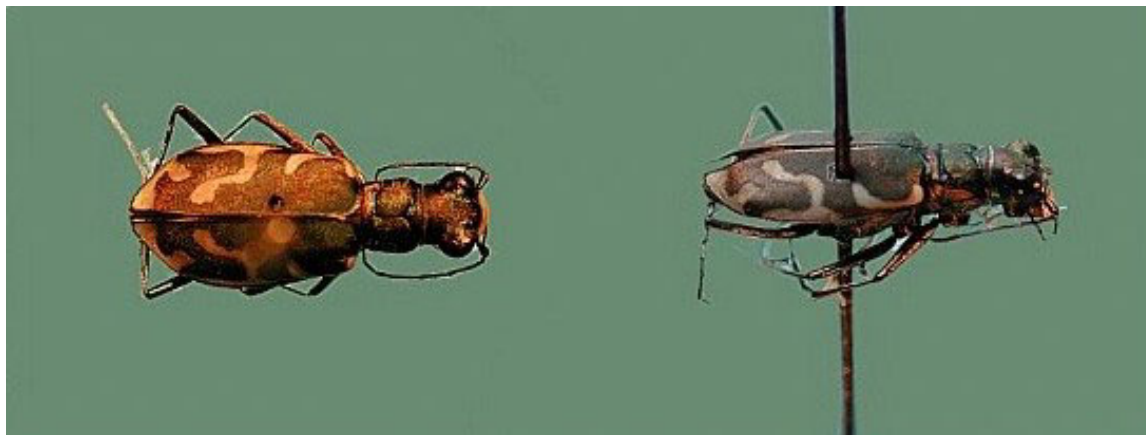
Type Locality: Perry, WA, April 14, 1935, M.C. Lane col.

OR/WA BLM and FS Region 6 Units where Suspected or Documented:

BLM: Deschutes Resource Area.
Central Oregon Resource Area.
Baker Resource Area.
Prineville District.
Vale District.

Description:

The Columbia River Tiger Beetle is 12 to 14 mm long with an iridescent black body and elytra with cream-colored markings. The humeral lunule (crescent-shaped mark near the base of the elytra) is shorter, not extending more than about one-third the distance to the suture, the median band not attaining the suture by an appreciable distance.



**Photographs of *Cicindela columbica* Hatch 1938.
Photo by John Riggins.**

Life History:

Eggs are deposited in the soil, each in a burrow the female digs with her ovipositor. When the eggs hatch, the newly emerged larvae enlarge their burrows. The larvae go through three instars before pupation. Before each molt, the larvae close their burrows and go to the bottom to molt. The burrow is opened again in about a week. Some Tiger Beetles can take as long as 4 years to reach maturity, but two years is more common in the group (Pearson 1988). Before pupation, the third instar plugs the burrow entrance and digs a chamber for pupation. Adults dig out of the soil about 3 days after ecdysis. Adults begin reproduction soon after emergence.

Tiger Beetles spend their immature stages in burrows, often undergoing morphological adaptations which enable them to protect themselves in adverse situations, to construct burrows, to facilitate movement within their burrows, and to capture prey (Pineda and Kondratieff 2003). When disturbed, larval Tiger Beetles drop from the top of their burrows to the bottom and can be difficult to reach by predators. Larvae capture prey from the mouth of their burrows, seldom leaving the burrow.

Tiger Beetle larvae occur within a narrow range of microhabitat conditions and tolerate little variation in soil moisture, temperature, and composition. Other important factors may be soil pH and chemistry. Ideal soils conditions for *C. columbica* have not been identified, however experts hypothesize that the beetle prefers soil that are a mixture of sand, silt, and clay that form a loamy soil (Leffler 1979).. Larvae can survive up to 3 weeks submerged during flooding, but are susceptible to mortality if their burrows are washed out due to erosion.

Some species of Tiger Beetles spend the winter in burrows hibernating. Specific information about *Cicindela columbica* has not been published.

The major enemies of larval Tiger Beetles are parasitoids, especially small ant-like wasps of the genus *Methocha* (Tiphidae), and flies of the genus *Anthrax* (Bombyliidae) (Pearson 1988). Enemies of adults include birds and robber flies (Diptera: Asilidae).

Adults generally forage during the day on sandbars and dunes along rivers during the day and burrow into sand at night. Adults prey upon small invertebrates such as click beetles (Coleoptera:Elateridae), sand mites (Acari), immature grasshoppers (Orthoptera:Acrididae), ants, and small flies (Diptera) (Pineda and Kondratieff 2003). Tiger Beetles are strong fliers and fast runners, and can be difficult to capture.

Adults have been observed outside their burrows from mid-April to May and from the first of August to the end of September (Leffler 1979, Shook

1979). These periods may vary with local weather conditions or geographic location (Bartels 1995).

Range, Distribution (Current and Historic), and Abundance:

Southeast Washington on Snake River beaches (Hatch 1951). Sandbars and dunes along the banks of the Columbia River (Beer 1971). In 1938 this species was locally abundant along on sandbars along the Snake and Columbia Rivers from The Dalles, OR eastward to just west of Lewiston, Lewis County, ID. In 1979, in a personal communication reported in Shook (1981), the well-known Tiger Beetle collector, Vernon Clifford, said he was not aware of any remaining populations of *C. columbica* in Oregon and Washington because all former sites to his knowledge had been flooded by backwaters. Knisely and Schultz (1997) report that this species was extirpated from the Snake and Columbia Rivers when dams were constructed, and that the beetles still occur along the Salmon River in Idaho.

In 1967 *C. columbica* was reported as being collected in Idaho along the Salmon River (Rumpp 1967). The presence of *C. columbica* at this locality was confirmed in 1977, with large populations at two sampling sites (Shook 1981). The distribution of generally large, viable populations of *C. columbica* occur in Idaho within the Lower Salmon River Canyon from near Slate Creek to Eagle Creek (Shook 1981).

Adults have been collected from April – June and August – September. The species is considered a Spring-Fall species (Leffler 1976). Teneral (adults not fully sclerotized) have been collected in mid-August, indicating that adult emergence from the pupal stage occurs into late Summer (Leffler 1979).

Habitat Associations:

Well-established riverine sandbars and dunes along the Snake, Columbia, and Salmon Rivers that are not completely flooded by normal spring run-off and extending 100 m back from the water (Shook 1979). Vegetation on inhabited sandbars include willows (*Salix sp.*), cocklebur (*Xanthium*), and Licorice-root (*Glycyrrhiza*) sparsely covering the area (Bartels 1995). Larvae occur in sandy soil found in riparian sand bars that is moistened from the nearby stream or river (Leffler 1979). The amount of vegetation cover that the species will tolerate in its habitat is unknown, but substantial cover may reduce the suitability as habitat of sand bars and dunes. The Columbia River Tiger Beetle evidently requires well established sand-bars and have not been observed recolonizing apparently suitable habitat along reservoir shores (Shook 1979).

Reportedly foraging on sands ranging in temperature from 26°C to 42°C (Shook 1981). The habitat has been described as generally older, well-established sandbars that extend back from the river sufficiently to generally not be inundated by spring runoff waters.

Threats:

1. Dam construction that eliminates sandbar and dune habitat along the river (Beer 1971).
2. Road construction that disturbs or destroys sandbar and dune habitat (Shook 1981).
3. Predators of the closely related species *Cicindela theatina* Rotger 1944 include robber flies (Diptera: Asilidae) and birds (Pineda and Kondratieff 2003).
4. Four-wheel recreational vehicles and excessive foot traffic in habitat.
5. Encroachment of invasive plant species onto formerly open areas of habitat.
6. Overcollecting is often mentioned as a major threat to rare species (Knisley and Schultz 1997).
7. Soil erosion and subsequent washing out of burrows can lead to larval mortality.
8. Edaphic conditions are among the important limiting factors for tiger beetles. Larvae occur in sandy soil found in riparian sand bars that is moistened from the nearby stream or river (Leffler 1979).
9. Competition for food resources from other tiger beetles that occur in the same localities (Leffler 1979).
10. Pesticides that drift from applications on nearby locations. Care should be taken to prevent any pesticide drift into existing populations of this species.

Conservation Considerations:

Studies suggest that suitable habitats created within the metapopulation are likely to be attractive and quickly colonized by Tiger Beetles (Willis 1967, Pineda and Kondratieff 2003). There may have been some recovery of habitat along the Columbia River in Washington and Oregon since dam development. A thorough survey of the Gorge would confirm the return of this species to this area.

Clearing vegetation and opening new habitats appears to sometimes benefit Tiger Beetles (Knisley and Schultz 1997).

Larval habitats should not be disturbed during the Spring when larvae are developing and preparing to pupate. Adults are probably less

susceptible to management types of disturbance, unless habitat is completely eliminated.

Other pertinent information (includes references to Survey Protocols, etc):

A protocol for sampling is described in detail by Pineda and Kondratieff (2003). A second protocol and trapping methodology is described by Bartels (1995).

Tiger Beetles are diurnal, and many species can be captured at night using lights placed on the open ground over which they run during the day (Wallis, 1961).

Adults can be captured by sweep net collecting on riparian sand bars in localities the species occurs. Specimens that are collected should be pinned (see photograph on page 1) within a few days of collecting. Larvae should be collected and preserved in vials filled with 70-80% ethyl alcohol.

Population/Occurrence Delineation (NatureServe 2005):

Minimum Criteria for an Occurrence: An area of sand or other appropriate substrate, for high quality occurrences generally a cluster of several such areas, along a river or stream or occasionally ditch or some sort of embankment where a colony occurs with potential for persistence or regular recurrence. Minimally a collection or photograph of an adult associated with a habitat patch. Single isolated colonies should not be ranked higher than C and high quality occurrences will be clusters of several such colonies along a river or stream.

Separation Barriers:

Possibly dams, rip-raps, groins etc. but for now it is suggested the disturbances they create be treated as unsuitable habitat unless direct observations show them to be barriers. Some adults should be able to move over or around them, especially during low water periods when unvegetated areas are exposed.

Separation Distance for Unsuitable Habitat: 5 km

Separation Distance for Suitable Habitat: 10 km

Separation Justification:

It is obvious that long term viable occurrences of these taxa are generally metapopulations, although possible that some large single site occurrences are viable for the long term if the habitat is fairly stable. This would be virtually forced by the dynamic nature of the habitat. Local extirpations and colonizations are presumed to have been normal and

persistence may be unlikely (or more often failed to occur) once population dynamics are disrupted. While it seems obvious that dispersal of adults several kilometers along a riparian corridor would have originally be common, there are no direct data on how far adults travel--in part because populations that have been well studied (e.g. along the Connecticut River) are already severely disrupted. However it is known that *C. D. DORSALIS* adults have a very open population structure and move more than 20 kilometers around the Chesapeake Bay and apparently at least two other shore species and two non-shore species, *C. TOGATA* and *C. HEAMORRHAGICA*, are apparently much more dispersive (Pearson et al., 1997). It is assumed that riparian species must be comparably dispersive--and actually *C. TOGATA* is probably somewhat riparian.

As with most tiger beetles it makes no sense to treat every little colony as a separate occurrence, especially considering the dynamic nature of riparian habitats including the potential for floods to greatly alter and create habitat.. These should be clustered into more defensible metapopulations. Some local extirpation and colonization is probably normal. In most cases the suitable habitat distance should be applied along stream or river banks. However, impoundments behind substantial dams (not the typical little 18th century New England mill pond), extensive rip-raps, groins etc. are suggested as unsuitable habitat even for dispersal. Knisley and Schultz (1997) suggest they could even be barriers. The suitable habitat distance is arbitrary but is less than half the distance known to be traveled by adult *C. DORSALIS* which seems to be among the more sedentary of the littoral species (the most similar group with data) and seems reasonable for tiger beetles in general since they clearly colonize over at least a few kilometers rather easily.

Inferred Minimum Extent of Habitat Use (when actual extent is unknown): .5 km

Inferred Minimum Extent Justification:

Inferred extent is extremely problematic, and while this seems unrealistic there is usually no choice but to confine it to the immediate location pending further exploration. It does seem reasonable that if the observer notes very similar habitat within half a kilometer up or down stream that it be included. Occurrences of most or all taxa originally often, if not always, extended for many kilometers and adults are good fliers. Now however, much potential suitable habitat is really unsuitable due to factors such as flood control practices ORV use, heavy trampling by people or livestock. There are also natural unknowns and mappers/observers may not really understand the exact habitat needs. So if the inferred extent would matter, the only reasonable course of action is to do field work to establish boundaries--ideally based on larvae as well as adults.

ATTACHMENTS:

- (1) Map of Range and Distribution**
- (2) BLM Distribution Maps**
- (3) Key to Identification of the Species**
- (4) Digital Pictures by Pacific Analytics, LLC**
- (5) List of Pertinent References/Literature**
- (6) Original Published Description**

Hatch, M.H. 1938. The Coleoptera of Washington: Carabidae Cicindelinae. University of Washington Publications in Biology 5:229-239.

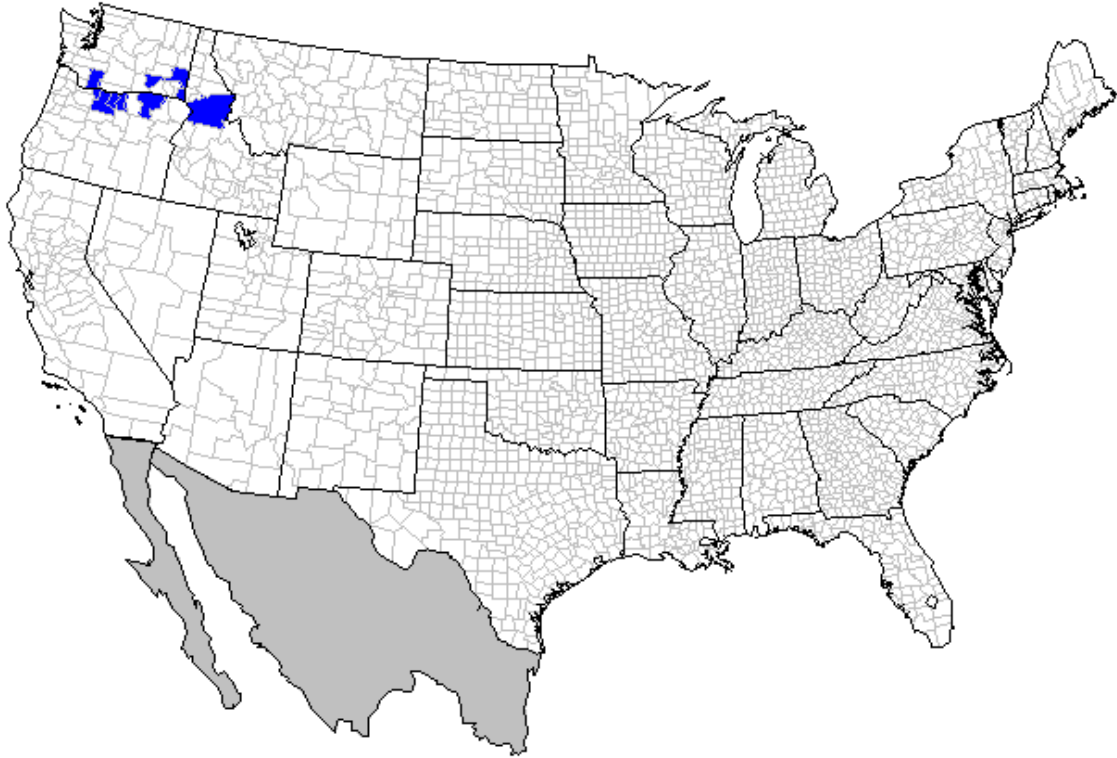
(7) Other Pertinent Papers

Shook, G. 1981. The status of the Columbia tiger beetle (*Cicindela columbica* Hatch) in Idaho (Coleoptera: Cicindelidae). Pan-Pacific Entomologist 57(2):359-363.

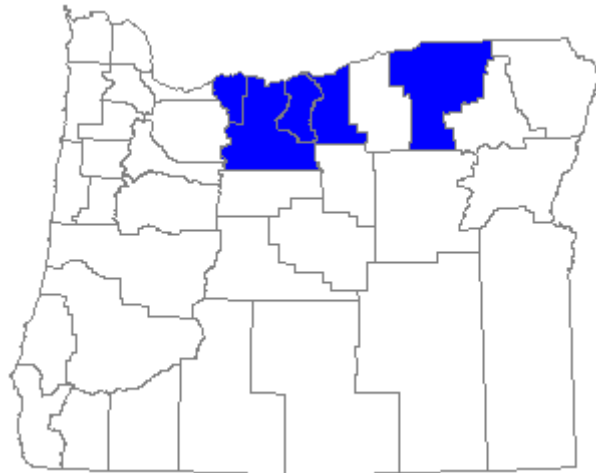
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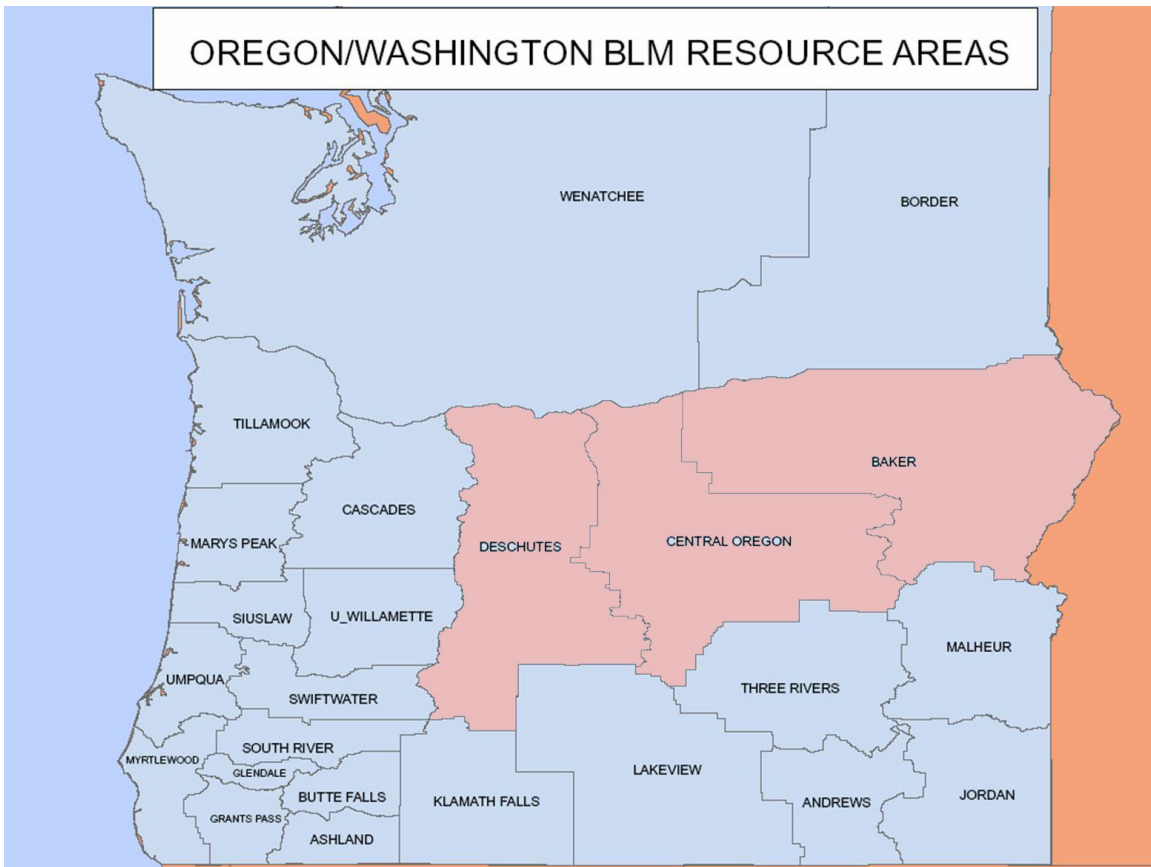
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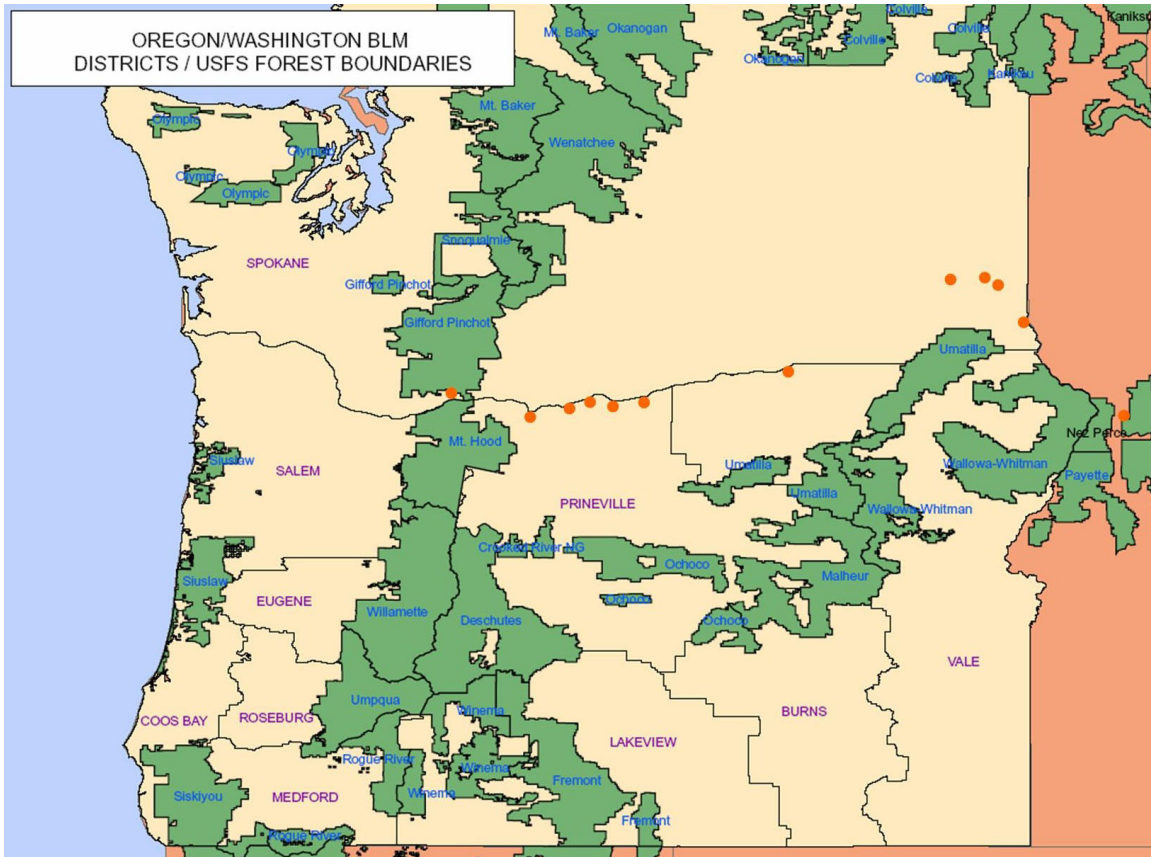
**Distribution of *Cicindela columbica* Hatch 1938 in the United States.
Map from USGS website, Tiger Beetles of the United States.**



**Distribution of *Cicindela columbica* Hatch 1938 in Oregon.
Map from USGS website, Tiger Beetles of the United States.**



BLM Resource Areas in Oregon where *Cicindela columbica* Hatch has been found.



BLM Districts/USFS Forests in Oregon where *Cicindela columbica* Hatch has been found.

**Identification Key
From Hatch 1938**

Tribe CICINDELINI

CICINDELA L.

Subgenus *Cicindela* s. str.

1. Middle band of elytron not connecting with humeral lunule on disc
2. Abdomen not red
3. Front pubescent
4. Humeral lunule reduced to a subhumeral spot or absent; surface dull, not shining
5. Elytral markings narrow, frequently reduced; pronotum and elytra both more or less of the same color; length 12-16 mm. (fig. 3-5).....*purpurea* Oliv.
 - a. Pronotum bronzed; middle band of elytra oblique, without much of a transverse portion
 - b. Reddish cupreous to bronzed.....typical form

Distribution. British Columbia and Quebec to North Carolina and Washington. E. WASH.: Palouse (Kamiak Butte).

Bibliography. Horn, Col. Cat. 86, 1926, p. 264.—Nicolay and Weiss, Jour. N. Y. Ent. Soc., XL, 1932, pp. 344, 346; Ent. News XLV, 1934, pp. 127-131, 153-155.—Smyth, Ent. News, XLIV, 1933, pp. 197-204; XLVI, 1935, pp. 14-19, 44-49.

- b'. Dull green with cupreous reflections, especially on the pronotum (fig. 3).....ab. *auduboni* LeC.

Distribution. Throughout the range of the species especially from Kansas and Utah to the Pacific. E. WASH.: Blue Mts. (*L*), Clarkston, Palouse (Kamiak Butte), Perry (*L*), Pullman, Spokane, Wawawai (*S*), Wilma (*L*). W. WASH.: Olympia, Rochester.

Bibliography. Horn, Col. Cat. 86, 1926, p. 264.—Nicolay and Weiss, Jour. N. Y. Ent. Soc., XL, 1932, pp. 344, 346.

- a'. Pronotum not at all bronze; middle band of elytra transverse at base or obsolete
 - c. Green or bluish green (fig. 4).....var. *pugetana* Csy.

Distribution. British Columbia, Washington, Idaho, Montana, Wyoming. E. WASH.: Buena (*L*), Toppenish, Touchet (*L*). In sagebrush. Our specimens are not quite typical, being somewhat larger, but otherwise very similar. This is the *pugetana* of Nicolay and Weiss.

Bibliography. Horn, Col. Cat. 86, 1926, p. 265; Trans. Am. Ent. Soc. LVI, 1930, p. 80.—Varas Arangua, Rev. Chilene Hist. Nat. XXXII, 1928, p. 245.—Nicolay and Weiss, Jour. N. Y. Ent. Soc. XL, 1932, pp. 345, 353.—Smyth, Ent. News, XLVI, 1935, p. 46.

c'. Black (fig. 5).....ab. *nigerrimoides* nov.

Type: Buena, Wash. Apr. 15, 1928, M. C. Lane (in Hatch collection). Additional specimens occur in the Lane collection from Adrian, Buena, Perry, and Touchet in eastern Washington. Occurs with *pugetana* in sagebrush.

Identical with the *nigerrima* Leng of the Casey collection, but would seem to differ from the true *nigerrima* Leng (*auduboni* LeC., 1856, Leng, etc.) by the basal portion of the middle band being transverse.

5'. Elytral markings broad, complete; color bright green to bluish green, very slightly tinged with cupreous; humeral spot always absent; subhumeral spot present in about one-third of the specimens; length 11-14 mm. (fig. 6)....*decemnotata* Say³

Distribution. Alaska and Alberta to Wyoming, Nebraska, Kansas, Utah, and California. E. WASH.: Ewan (*L*), Lind (*L*), Perry, Ritzville (*L*), Touchet (*L*), Walla Walla (*S*). In sagebrush, often with *pugetana* Csy.

Bibliography. Horn, Col. Cat. 86, 1926, p. 267.—Nicolay and Weiss, Jour. N. Y. Ent. Soc., XL, 1932, pp. 343, 345.

4'. Humeral lunule an oblique line or entire

6. Humeral lunule "C" shaped

7. Lower limb of lunule shorter, not directed forward; humeral lunule and median band usually not connected along margin; length 12-13 mm. (fig. 7, 7-a).....*duodecimguttata* Dej. subsp. *repanda* Say

Distribution. Quebec and British Columbia to Oregon, Arizona, Colorado, Louisiana, and Florida (*Leng, Horn*). E. WASH.: Almota, Central Ferry (*L*), Clarkston (*S*), Newport (*L*), Palouse Falls (*S*), Pasco (*S*), Perry, Pullman, Vantage, Wawawai, Wilma (*L*). On sand bars of the Snake and Columbia rivers.

Bibliography. Leng, Trans. Am. Ent. Soc., XXVIII, 1902, pp. 146, 147.—Horn, Col. Cat. 86, 1926, p. 268; Trans. Am. Ent. Soc., LVI, 1930, p. 81.

7'. Lower limb of humeral lunule longer, directed forward at tip; humeral lunule and median band usually connected along margin; length 13-14 mm. (fig. 8).....*hirticollis* Say

Distribution. Washington, Alberta, and Quebec to Florida, Texas, and Oregon; Mexico (*Leng, Horn*). E. WASH.: Pasco (*S*), Perry, Pullman (*S*), Spokane, Vantage, Wawawai, Wilma (*L*).

³Washington specimens of *decemnotata* are less cupreous and more brilliantly green with narrower markings than are specimens from Alberta (var. *albertina* Csy.).

Bibliography. Leng, Cat. Col. Col. Am. n. of Mex., 1920, p. 40.—Horn, Col. Cat. 86, 1926, p. 269.

- 6'. Humeral lunule oblique
8. Elytra not "greasy"
9. Markings narrower; humeral lunule broken in our forms; median band in our forms not expanded along the side margin of the elytron; head more or less unimpressed between the eyes with the pubescence confined to the front; bright green or (ab. *roguensis* Harris) bronzed or very dull green; length 11-17 mm. (fig. 9) . . . *tranquebarica* Herbst var. *vibex* Horn

Distribution. British Columbia and Montana to Utah and California. The form *roguensis* Harr. is reported from Oregon and Montana. It is impossible in Washington to draw a sharp line between it and *vibex*. E. WASH.: Al-mota (S), Bead Lake, Blue Mts. up to 5,500 ft., Burbank (L), Coulee City (L), Dayton (S), Diamond Lake (L), Ewan (L), Grand Coulee, Granger, Lincoln (L), Lind (L), Lowden (L), Newport, Pend Oreille Lake, Perry, Pullman, Satus (L), Sprague (L), Springfield, Sullivan Lake, Toppenish (L), Touchet (L), Walla Walla, Wawawai. W. WASH.: Seattle, Whidby Is.

Bibliography. Horn, Col. Cat. 86, 1927, p. 271.

- 9'. Markings somewhat broader; humeral lunule entire; median band greatly expanded along the side margin of the elytron; head more or less transversely impressed between the eyes with more pubescence on the vertex; length 10-14 mm.
 *bellissima* Leng

- a. Humeral lunule extending approximately half the distance to the suture, the median band nearly attaining the suture (fig. 10) typical form

Distribution. Seacoast of Oregon (Yaquina Bay—*Leng*; Seaside—*Lane*) and southwestern Washington (Oysterville, Seaview, Snag Island.)

Bibliography. Leng, Trans. Am. Ent. Soc., XXVIII, 1902, pp. 116, 142, pl. IV.—Horn, Col. Cat. 86, 1926, p. 272.

- a'. Humeral lunule shorter, not extending more than about one-third the distance to the suture, the median band not attaining the suture by an appreciable distance.
 subsp. *columbica* nov.

Type: Perry, Wash., Apr. 14, 1935, M. C. Lane col. in Hatch collection. There are four nearly similar specimens in the collection of Walther Horn in Berlin.

- 8'. Elytra "greasy," the markings broader; humeral lunule constricted but entire; color of elytra bronzed or (ab. *westbournei* Cald.) greenish; length 10-13 mm. (fig. 12)
 *fulgida* Say subsp. *parowana* Wick.

Distribution. British Columbia and Manitoba to Washington and Utah. E. WASH.: Coulee City (*L*), Ewan (*L*), Grand Coulee, Lind (*L*), Perry (*L*), Ritzville (*L*), Stratford (*L*), Touchet, Walla Walla. Occurs only on alkali spots.

Bibliography. Horn, Col. Cat. 86, 1927, p. 275; Trans. Am. Ent. Soc., LVI, 1930, p. 82.—Knaus, Pan-P. Ent. III, 1927, p. 114 (*westbournei*).

3'. Front glabrous; humeral lunule rarely entire

10. Middle band more transverse and feebly angulate or absent; humeral lunule variable, entire, broken in two, with the basal spot absent, or entirely absent; elytra impressed at basal third⁴; nearly black (typical form, fig. 13) to bronze and dull green (ab. *oslari* Leng, figs. 14, 15) or bright green and bright greenish blue (ab. *columbiana* Csy., fig. 11); the ab. *vestalia* Leng is immaculate and green or greenish bronze in color; length 13-17 mm. (figs. 11, 13-15).....*longilabris* Say

The forms *oslari* and *columbiana* are apparently confined to altitudes above three thousand feet in the Wallowa Mts. of northeastern Oregon (Aneroid Lake, 7,500 feet. *Lane-columbiana*), and in the Blue Mountains (*oslari*), the northern Cascades (Glacier Peak, Sauk—*oslari* and *columbiana*), and the Olympics (North Skokomish River—*columbiana*) of Washington. The occurrence together, however, of the typical form and *oslari* in the Blue Mountains and of *oslari* and *columbiana* in the northern Cascades would seem to indicate that the differences are not very deep seated. The ab. *vestalia* comes from Pullman.

Distribution. Alaska and Newfoundland to California, New Mexico, Illinois, and New York. E. WASH.: Bead Lake (Newport) (*L*), Blue Mts. (3,000 to 6,000 ft.), Cle Elum (*L*), Dayton, Mt. Adams (Bird Creek, 5,000 ft.), Mt. Spokane (*L*), Pullman, Spokane, Springdale. W. WASH.: Glacier Peak (6,400 ft.), North Skokomish R. (5,000 ft.), Olympia, Sauk. Inhabits timbered areas.

Bibliography. Horn, Col. Cat. 86, 1926, pp. 272-273.

- 10'. Middle band strongly bent at middle, the median band prominently lobed to evenly curved; humeral lunule broken, the basal spot present or absent; palpi pale (male) or dark (female); color black, dull bronze, dull green, green, or blue; length 9-14 mm. (figs. 16, 17).....
.....(Oregon tiger beetle) *oregona* LeC.

The extreme conditions noted above (curved median band, no basal spot, and brighter color) appear together or separately in an appreciable percentage of the mountain specimens (Mt. Baker, Mt. Rainier, Mt. Adams, Mt. Hood, Crater Lake) and constitute the ab. *depressula* Csy. (fig. 17). In adequate series, however, it is impossible to draw a distinct line between *depressula* and the typical form.

Distribution. Alaska, Alberta, and Kansas to New Mexico, northwestern Mexico, and California. E. WASH.: Almota, Beverley, Bumping River (*L*), Central Ferry (*L*), Clarkston (*L*), Coulee City (*L*), Ellensburg, Goldendale

⁴Mr. Lane has a blue green variety, near *perviridis* Schaup, from Mt. Hood, Oregon, in which the elytra are not impressed at the base.

(L), Grand Coulee, Kahlotus (L), Lake Chelan (L), Lincoln (L), Lind (L), Lowden (L), Medical Lake, Newman Lake (L), Newport, Outlook (L), Paha (L), Palouse Falls (L), Pasco, Paterson (L), Perry, Pullman, Ritzville (L), Satus (L), Soap Lake (L), Sprague (L), Springdale, Stratford (L), Sullivan Lake (L), Toppenish, Touchet (L), Upper Grand Coulee, Vantage, Walla Walla (L), Wawawai, Yakima. W. WASH.: Arlington, Auburn, Bellingham, Chehalis, Cicero, Darrington, Ilwaco, Index, Keyport, Lake Cushman, Manchester, Mt. Adams (3,000 feet, Lane; Bird Creek, 5,000 feet; 6,000 feet), Mt. Baker (Austin Pass), Mt. Rainier (Paradise Park, Sluiskin Falls, Sunrise Park, Tipsoo Lake), Renton, Seabeck, Seattle, Silver Lake (Whatcom Co.), Stillaguamish Club (Snohomish Co.), Sultan, Whidby Is. This is the most widely distributed *Cicindela* in the state and the only common species in western Washington.

Bibliography. Horn, Col. Cat. 86, 1926, p. 274.—Essig, Ins. w. N. A. 1926, p. 373, fig. 252.—Varas Arangua, Rev. Chilena Hist. Nat., XXXII, 1928, pp. 247-250; XXXIII, 1929, pp. 394-397.

2'. Abdomen red; markings somewhat resembling *oregona* LeC. with the humeral lunule either complete or broken, and with a lateral spot behind the middle band; length 10-16 mm.
 *carthagena* Dej. subsp. *haemorrhagica* LeC.

Brownish black to black (fig. 18) var. *nigroides* nov.

The var. *nigroides* is distinguished from typical *haemorrhagica* by the absence of a greenish tinge from the elytra.

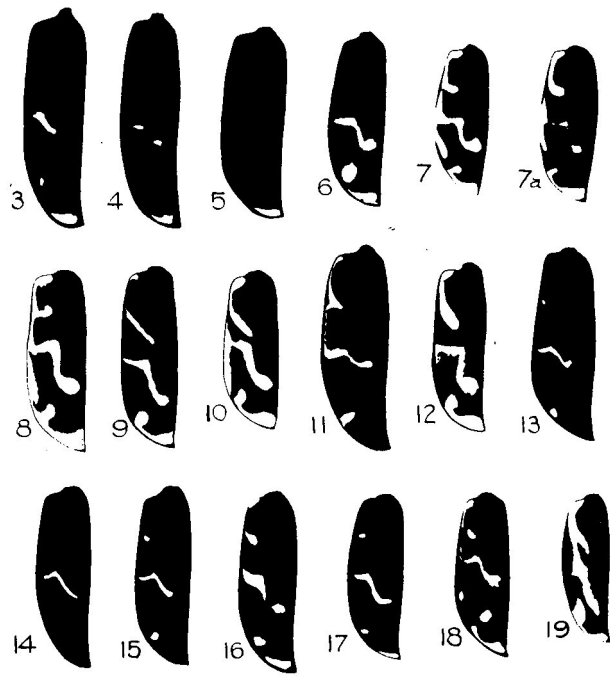
Distribution. E. WASH.: Grand Coulee, Kahlotus (L), Lind (L), Paha (L), Ritzville, Soap Lake (L), Stratford (L), Toppenish (L), Walla Walla, Wallula (L), Yakima. Type: Walla Walla, Washington, VIII-9-1927, M. C. Lane (in Hatch Collection). Taken along the margins of lakes and on wet spots in irrigated districts in late summer.

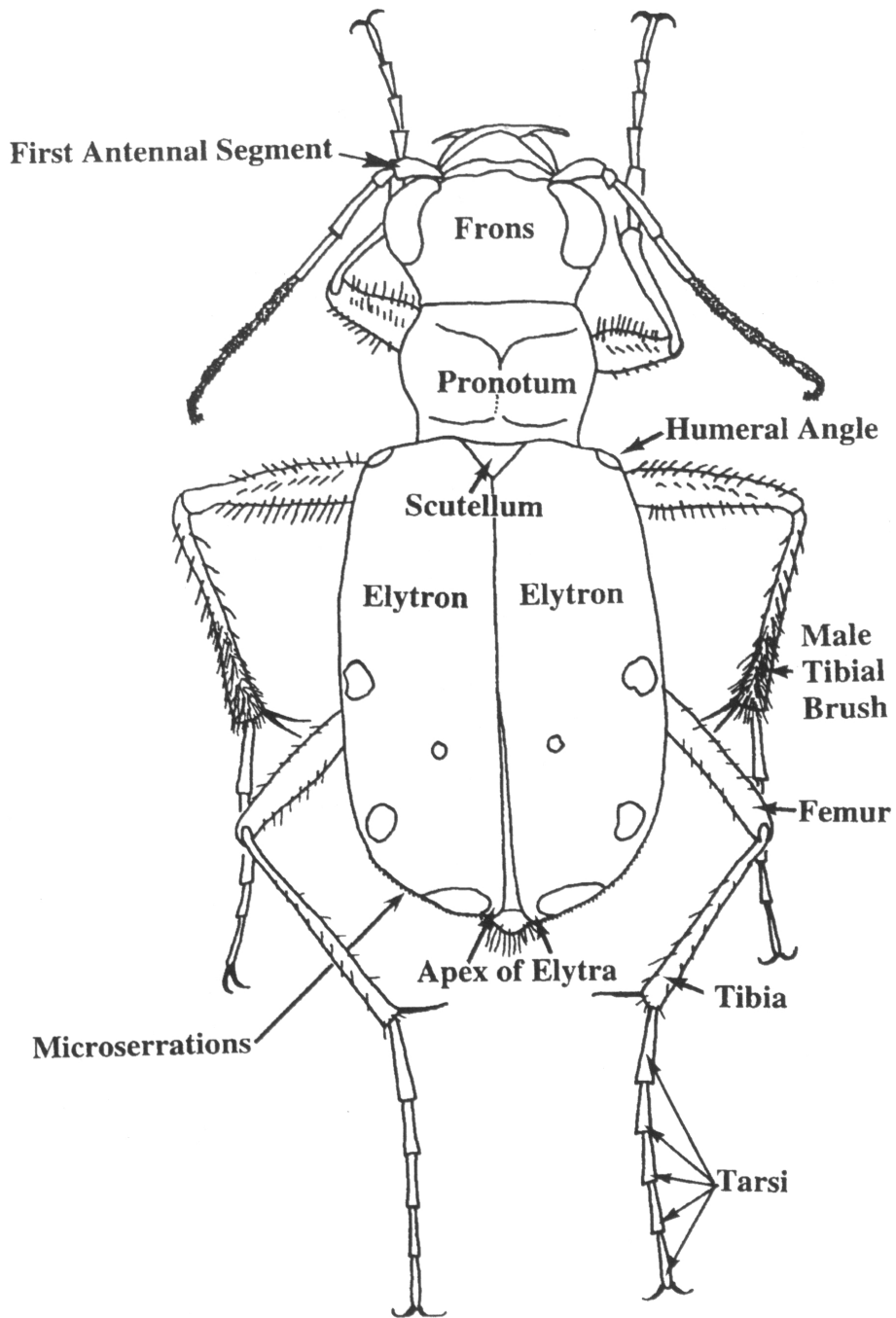
1'. Middle band connected with humeral lunule on disc, the markings forming an oblique band which does not attain the side margin at its middle portion and extends from the humerus inwards towards the suture terminating close to the suture at about the apical fifth, this band giving off a spur, the remnant of the humeral lunule, at about the basal third; in addition there is a complete apical lunule; length 9-12 mm. (fig. 19)
 *pusilla* Say subsp. *imperfecta* LeC.

Single specimens of this form from Grand Coulee and Tampico are immaculate, the markings being represented by bronzed densely alutaceous opaque areas on the elytra.

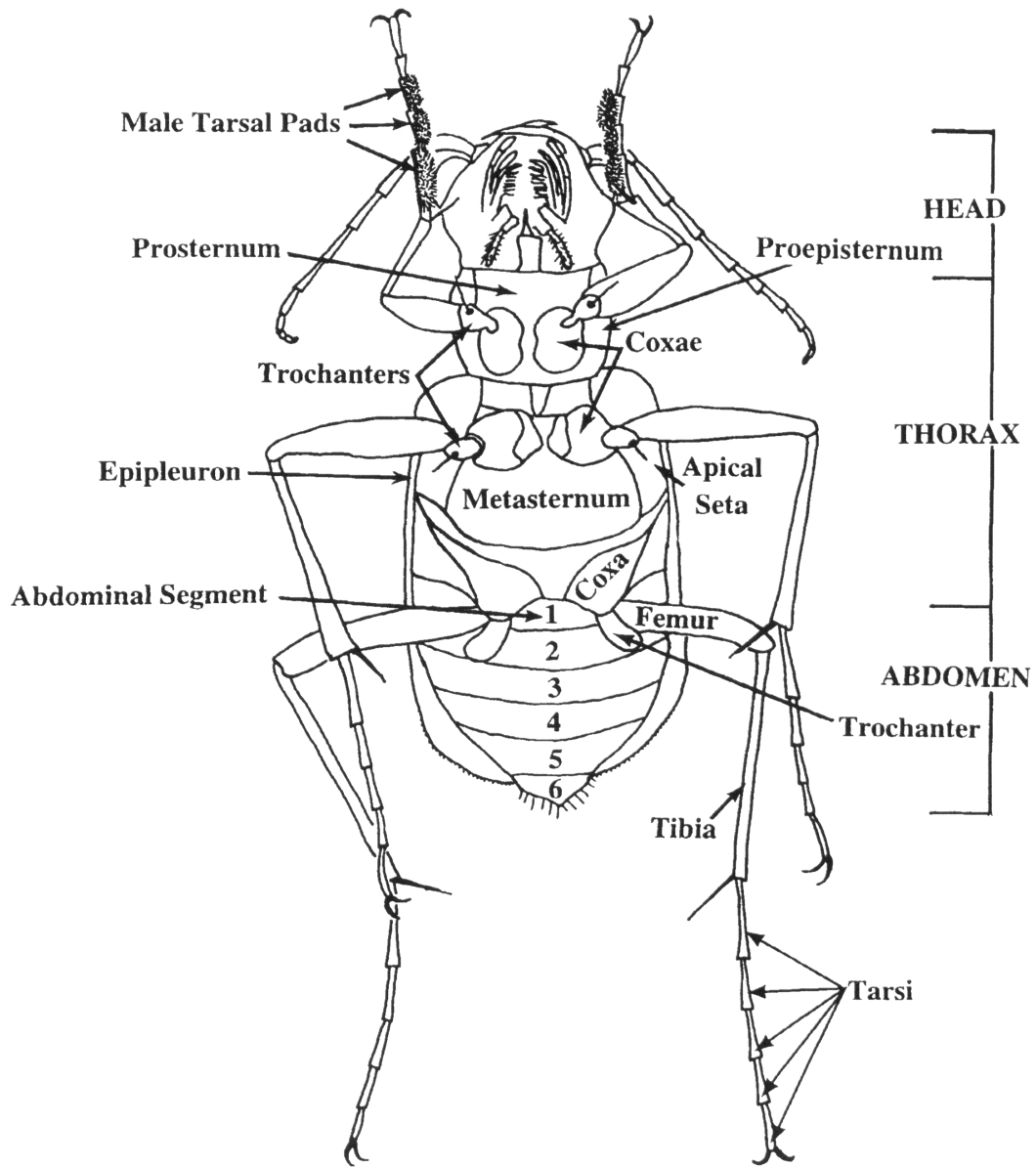
Distribution. British Columbia and Wyoming to Utah, California, and Lower California. E. WASH.: Beverley, Ephrata, Ewan (L), Gardena (L), Granger, Lind (L), Lowden (L), Outlook (L), Paha (L), Perry (L), Ritzville (L), Tampico, Toppenish (S), Walla Walla (L), Yakima. W. WASH.: Cooks, Seattle, Whidby Is. Occurs in sagebrush and on irrigated tracts in eastern Washington. Leng (Trans. Amer. Ent. Soc., XXVIII, 1902, p. 156) suggests that Schaupp's (Bull. Brooklyn Ent. Soc., VI, 1884, p. 96) citation of *cinctipennis* LeC. from Washington may refer to *imperfecta*.

Bibliography. Horn, Col. Cat. 86, 1926, p. 292.





**Dorsal View of *Cicindela* sp. Showing characters used in identification keys.
Drawing from Leonard and Bell 1999.**



**Ventral View of *Cicindela* sp. Showing characters used in identification keys.
Drawing from Leonard and Bell 1999.**

**Digital Pictures
By Pacific Analytics, LLC**

**These images are available and can be used by the BLM.
Please acknowledge photographs are Pacific Analytics, LLC 2005.**



**Dorsal View of *Cicindela columbica* Hatch 1938.
Photo by Pacific Analytics, LLC 2005**



**Lateral View of *Cicindela columbica* Hatch 1938.
Photo by Pacific Analytics, LLC 2005**



**Frontal View of *Cicindela columbica* Hatch 1938.
Photo by Pacific Analytics, LLC 2005**

References

Acorn, J. 2001. Tiger Beetles of Alberta. The University of Alberta Press, Edmonton. 120 pp.

Arnett, Jr., Ross H., ed. 1983. Checklist of the Beetles of North and Central America and the West Indies. Flora and Fauna Publications, Gainesville, Florida. 24 P. (Pertains to all subsequent fascicle updates as well).

Bartels, P. 1995. Columbia Tiger Beetle 1995 Survey: Columbia River and Snake River, Region Two. A report prepared for the Washington Department of Fish and Wildlife.

Bartels, P. 1996. Columbia Tiger Beetle (*Cicindela columbica*). Addendum to the 1995 Columbia Tiger Beetle Report. A report prepared for the Washington Department of Fish and Wildlife.

Freitag, R. P. 1999. Catalogue of the tiger beetles of Canada and the United States. National Research Council Research Press, Ottawa, Canada. 195 pp.

Hatch, M.H. 1938. The Coleoptera of Washington: Carabidae Cicindelinae. University of Washington Publications in Biology 5:229-239.

Hatch M.H. 1949. Studies on the Coleoptera of the Pacific Northwest. Pan Pacific Entomologist 28:113-118.

Hatch, M.H. 1951. The Beetles of the Pacific Northwest. Part 1: Introduction and Adephaga. University of Washington Publications in Biology 16:1-340.

Knisley, C.B. and T.D. Schultz. 1997. The Biology of Tiger Beetles and a Guide to the Species of the South Atlantic States. Virginia Museum of Natural History Special Publication Number 5. 210 pp.

Leffler, S.R. 1976. Tiger Beetles of Washington. *Cicindela* 8(2/3):21-59.

Leffler, S.R. 1979. Tiger Beetles of the Pacific Northwest (Coleoptera:Cicindelidae). PhD dissertation, University of Washington. 791 pages.

Leng, C.W. 1902. Revision of the Cicindelidae. Transactions of the American Entomological Society 28: 93-186, ill.

Leonard, J.G. and R.T. Bell. 1999. Northeastern Tiger Beetles. A field guide to Tiger Beetles of New England and Eastern Canada. CRC Press, Boca Raton. 176 pp.

Maser, C. 1984. Notes on Cicindelid Habitats in Oregon. *Cicindela* 16(3/4):39-59.

NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: August 17, 2005).

Pearson, D.L. 1988. Biology of Tiger Beetles. *Annual Review of Entomology* 33:123-147.

Pearson, D.L., T.G. Barraclough, A.P. Vogler. 1997. Distribution maps for North American species of tiger beetles (Coleoptera: Cicindelidae). *Cicindela* 29(3/4):33-84.

Pearson, D.L. and A.P. Vogler. 2001. Tiger Beetles. The evolution, ecology, and diversity of the cicindelids. Comstock Publishing Associates. Ithaca. 333 pp.

Pineda, P.M. and B.C. Kondratieff. 2003. Natural history of the Colorado Great Sand Dunes tiger beetle, *Cicindela theatina* Rotger. *Transactions of the American Entomological Society (Philadelphia)* 129(3-4):333-360.

Riggins, J. 2005. Tiger Beetles of the United States. USGS Northern Prairie Wildlife Research Center website
<http://www.npwrc.usgs.gov/resource/distr/insects/tigb/usa/>.

Shook, G. 1981. The status of the Columbia tiger beetle (*Cicindela columbica* Hatch) in Idaho (Coleoptera: Cicindelidae). *Pan-Pacific Entomologist* 57(2):359-363.

USGS. 2005. Tiger Beetles of the United States. Northern Prairie Wildlife Research Center website
<http://www.npwrc.usgs.gov/resource/distr/insects/tigb/usa/>.

Wallis, J.B. 1961. The Cicindelidae of Canada. University of Toronto Press, Winnipeg, Canada. 74 pp.

Wells, S.M., R.M. Pyle, and N.M. Collins. 1983. The IUCN Invertebrate Red Data Book. ICUN Conservation Monitoring Center, Cambridge.

Willis, H.L. 1968. Artificial key to the species of *Cicindela* of North America North of Mexico (Coleoptera: Cicindelidae). Journal of the Kansas Entomological Society 41(3):303-317).

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