

## SPECIES SPOTLIGHT: Ohlone Tiger Beetle

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California's grasslands harbor a host of wildlife species that depend greatly on the structure and distribution of our native grass species. One such species, the Ohlone tiger beetle (*Cicindela ohlone*), serves as an indicator for the subtle diversity of grassland habitats. Endemic to the coastal prairie terraces in Santa Cruz County, this highly range-restricted beetle remained unknown to science until its discovery and description in 1993 (Freitag et al. 1993). Under intense pressure from human development and invasive grasses altering its habitat, it was recognized at the time of its discovery as a species in dire need of protection, resulting in its listing as endangered by the federal government in 2001 (USFWS 2001). It is currently known from only eight sites near the City of Santa Cruz (Arnold et al. 2012).

Ohlone tiger beetles are bright, metallic green, with irregular bronze blotches on their elytra (wing covers). Like most *Cicindela* species, adults are fast-moving, highly active predators, chasing down small invertebrates that come into view. They have very large eyes and a well-developed sense of sight; long legs, which allow a fast running speed; and oversized, sickle-shaped mandibles for prey capture (Pearson 1988, Knisley 2011). In this way, they are adapted to hunting in the gaps of bare ground between individual bunches of native grasses, using long lines of sight available in these habitats to identify prey at a distance, then rapidly closing in to effect a successful capture. Bare ground also provides a warm, sunlit surface on which the beetle can thermoregulate and quickly attain the elevated body temperature necessary to maintain its high activity level (Knisley 2011). Larval Ohlone tiger beetles, too, are dependent on bare ground within grasslands. They dig burrows into the ground, typically near margins where vegetation acts as a natural drift line to channel small invertebrates toward them (Arnold et al. 2012). Waiting near the entrance, they lunge from the burrow to seize passing prey.



Ohlone Tiger Beetle (*Cicindela ohlone*). Photo: U.S. Fish & Wildlife Service

Unlike many insects that are dependent on the presence of specific plant species due to specialized food requirements, the Ohlone tiger beetle is instead dependent on the basic structural organization of native grasslands. Because of the species' reliance on bare ground between bunches of vegetation, one could say that the importance of native grasses is not so much where they grow, but where they do not grow. This leads to an all-too-familiar discussion of the loss of native grasslands to invasive Eurasian species such as French broom (*Genista monspessulana*), velvetgrass (*Holcus* sp.), and filaree (*Erodium* sp.), whose dense growth pattern shades or encroaches into the patches of bare ground so crucial to the beetle's life history (USFWS 1998).

In a recent study designed to inform management decisions, Arnold et al. (2012) found that grazing, if conducted in a non-intensive fashion, as well as moderate hiking and bicycle use, were all positively correlated with *continued next page*



## Ohlone Tiger Beetle *continued*

Ohlone tiger beetle occupancy at sites known to have harbored the species at some time since its discovery in 1993. These activities tend to maintain bare ground in the coastal prairie habitat within the species' range. Extirpations had occurred at many previously occupied sites, and it is noteworthy that while these sites all had been grazed when the beetle was first discovered on them, management practices had changed to either intensify grazing or to remove grazing altogether.

Native grasses associated with the beetle include California oatgrass (*Danthonia californica*) and purple needlegrass (*Stipa [Nassella] pulchra*), two species that are widespread in coastal California grasslands. Why then, is the Ohlone tiger beetle restricted to such a small area? Home to many microclimates, California offers abundant opportunities for species diversity among similar, but spatially separated habitats. Segmented off from other tiger beetle populations, possibly by the Santa Cruz Mountains, *Cicindela ohlone* evolved into a distinct species adapted to the moist, foggy coastal prairie terraces and developed a winter-spring adult active period distinct from the spring-summer active period found in closely related species (Freitag et al. 1993). Perhaps due to elevational restrictions or an inability to traverse the dense redwood forests surrounding its coastal prairie habitat, the beetle remained confined within the area that would one day become Santa Cruz County and held on through the stresses of human development and invasion by Eurasian annual grasses.



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The mission of the California Native Grasslands Association is to promote, preserve, and restore the diversity of California's native grasses and grassland ecosystems through education, advocacy, research, and stewardship.

The Ohlone tiger beetle is only one example from a plethora of highly range-restricted grassland insect species within California. With the immense loss and modification of native grassland habitat, it is tempting to speculate that many endemic insects may have been lost in the early days of human settlement, before European naturalists arrived on the scene and began to document the region's biodiversity in ways still accessible to science today. Early entomological collections, such as those made by the Russian naturalist Johann Friedrich Eschscholtz in 1824, were largely from coastal areas with only limited penetration into Central Valley grasslands. In addition, many early specimens collected in California were lost to science when the California Academy of Sciences collections were destroyed during the Great Earthquake and Fire of 1906. Again, it is tempting to speculate that specimens of endemic species, unrecognized at the time and now extinct from habitat loss, may be a gap in current knowledge. Although many patches of native grasses survive in protected and well-managed areas today, we may never know what diversity was present when these habitats flourished at full strength in California, rich with subtle interactions that are irreproducible in the modern landscape. Yet species such as the Ohlone tiger beetle can serve as indicators to give us a window into how those interactions worked, because the microhabitats where it survives must share at least some similarity to the habitats that once were. Studying those factors that allow the beetle to persist may hint at how native grassland systems functioned and how we should shape our management practices.



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