

NOTES

ATYPICAL HABITAT USE BY THE THREATENED ALAMEDA WHIPSNAKE IN THE EASTERN BAY AREA OF CALIFORNIA

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Abstract.—The Alameda Whipsnake (*Masticophis lateralis euryxanthus*) has been considered a chaparral-associated species by several researchers. Observations over the last two decades have included reports of atypical habitat use, suggesting that the species and subspecies has a higher level of plasticity in habitat use than has been believed previously. We found numerous Alameda Whipsnakes using habitat that has heretofore been considered atypical, including extensive Oak Woodlands and olive orchards. It appears that vegetative structure may be a more critical component of suitable habitat for the Alameda Whipsnake than the type of plant species.

Key Words.—association; chaparral; declining; *Masticophis lateralis euryxanthus*; management; structure

Early descriptions of habitat use of the California Whipsnake (*Masticophis lateralis*) were scant and lacked detail. Hallowell (1853) described habitat associations as adjacent to aquatic sites in California. Van Denburgh (1897) only described the species as a good climber, suggesting that the species was found around vegetative structure and cover within the landscape. Grinnell and Grinnell (1907), and Grinnell and Camp (1917) gave further detail on the habitat types, which were described as brushy places, and Chaparral. References to habitat have invariably focused on chaparral habitats for 160 y following the species description (Ortenburger 1928; Stebbins 1954; Pickwell 1972; Stebbins and McGinnis 2018). Subsequent to the split of *M. lateralis* into two distinct subspecies, the Chaparral Whipsnake (*M. l. lateralis*) and Alameda Whipsnake (*M. l. euryxanthus*) by Riemer (1954), *M. l. euryxanthus* was recognized as declining and was listed as threatened by the California Department of Fish and Wildlife in 1971, and in 1991, by the U.S. Fish and Wildlife Service (USFWS 1994).

Special-status species listing of *M. l. euryxanthus* prompted some researchers to focus their investigations, including specific studies on habitat use. Swaim and McGinnis (1992) defined habitat use as strongly associated with Chaparral habitat; however, Alvarez et al. (2005) summarized 129 observations of atypical habitat use and suggested that the subspecies was not necessarily obligated to Chaparral habitat, but instead used Chaparral as well as adjacent habitats. Swaim and McGinnis (1992) considered *M. l. euryxanthus* use of slope as limited to specific aspects. Alvarez (2006), however, considered aspect use more flexible than that reported by Swaim and McGinnis (1992). Herein, we describe a previously unreported habitat type used by *M. l. euryxanthus*, and further support the contention of Alvarez (2006) that all slope aspects are likely used by this threatened subspecies.

We conducted herpetofaunal surveys at Mt. Wanda, on the John Muir National Historic Site, Martinez, California, in 2018. The site was comprised of non-native annual grasslands, Blue Oak (*Quercus douglasii*) woodland, including small patches of ornamental trees (e.g., eucalyptus, *Eucalyptus* sp., and olive, *Olea* sp.), and two very small patches (total < 0.4 ha) of Coastal Sagebrush Scrub. To effectively sample the site and determine species richness, sampling locations were set up in all available habitat types (Fig. 1). We installed, 10 drift fence lines, each with four funnel traps (two on either

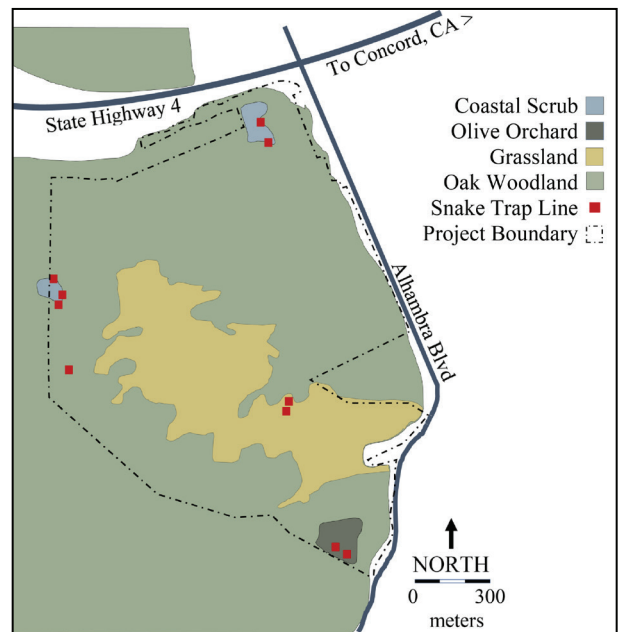


FIGURE 1. A schematic representation of the general habitat types and locations of trapping arrays for reptiles, including the Alameda Whipsnake (*Masticophis lateralis euryxanthus*) in 2018 at Mt. Wanda, John Muir Historic Site, Martinez, California.

TABLE 1. The number of captures (n) of herpetofauna during trapping at 10 locations at Mt. Wanda, John Muir Historic Site, Martinez, California, in 2018. Habitat types defined as CS = Coastal Scrub, GR = Grassland, OW = Oak Woodland, OO = Olive Orchard.

Species	n	Habitat types
AMPHIBIANS		
Salamandridae		
California Newt (<i>Taricha torosa</i>)	13	CS, OW, OO
Plethodontidae		
Arboreal Salamander (<i>Aneides lugubris</i>)	21	CS, GR, OW
Ensatina Salamander (<i>Ensatina eschscholtzii</i>)	2	CS, GR
California Slender Salamander (<i>Batrachoseps attenuates</i>)	6	GR, OW, OO
Hylidae		
Pacific Treefrog (<i>Hyla regilla</i>)	17	CS, GR, OW
REPTILES		
Phrynosomatidae		
Western Fence Lizard (<i>Sceloporus occidentalis</i>)	249	CS, GR, OW, OO
Scincidae		
Western Skink (<i>Plestiodon skiltonianus</i>)	87	CS, GR, OW, OO
Anguidae		
Southern Alligator Lizard (<i>Elgaria multicarinata</i>)	26	CS, GR, OW
Colubridae		
Ring-necked Snake (<i>Diadophis punctatus</i>)	7	GR, OW
Alameda Whipsnake (<i>Masticophis lateralis euryxanthus</i>)	34	CS, OO
Gopher Snake (<i>Pituophis catenifer</i>)	22	CS, GR, OW, OO
Common Kingsnake (<i>Lampropeltis getula</i>)	10	CS, GR
California Night Snake (<i>Hypsiglena torquata</i>)	2	CS
BIRDS		
Troglodytidae		
Bewick's Wren (<i>Thryomanes bewickii</i>)	3	CS, GR, OW
MAMMALS		
Soricidae		
Ornate Shrew (<i>Sorex ornatus</i>)	2	OW
Muridae		
Western Harvest Mouse (<i>Reithrodontomys megalotis</i>)	27	CS, GR, OW, OO
House Mouse (<i>Mus musculus</i>)	9	CS, GR, OW
Cricetidae		
Deer Mouse (<i>Peromyscus maniculatus</i>)	47	CS, GR, OW, OO
Brush Mouse (<i>Peromyscus boylii</i>)	75	CS, GR, OW
Pinyon Mouse (<i>Peromyscus truei</i>)	35	CS, GR, OO
California Mouse (<i>Peromyscus californicus</i>)	18	CS, GR, OO
California Pocket Mouse (<i>Chaetodipus californicus</i>)	6	CS
California Meadow Vole (<i>Microtus californicus</i>)	66	CS, GR, OW, OO
Unknown Mouse (cricetidae)	1	CS
Geomyidae		
Botta's Pocket Gopher (<i>Thomomys bottae</i>)	3	CS, OW

end). The funnel traps were a modified style of the Fitch Trap (1951) and were checked daily. All specimens were removed, processed (i.e., weighed, measured, marked) and released at the site of capture.

While searching the site, we collected four species of amphibian from the families Salamandridae and

Plethodontidae; four species of lizard from the families Phrynosomatidae, Scincidae, and Anguidae; and three species of snake from the family Colubridae (Table 1). Among the colubrid snakes collected, we captured *M. l. euryxanthus* at three locations (Table 1). Two sites were in the ecotone between two small, isolated patches of



FIGURE 2. Representative photograph of the historic olive (*Olea* sp.) orchard at Martinez, California, that was used by at least eight Alameda Whipsnakes (*Masticophis lateralis euryxanthus*) in 2018. (Photographed by Angel Sprague).

Coastal Scrub (0.04 and 0.36 ha) and extensive Blue Oak woodlands, where we captured 16 individuals (65% of captured whipsnakes). A third site was a 1.3 ha historic olive orchard on an eastern-aspect slope, where we captured nine individuals (35% of captured whipsnakes). The olive orchard was comprised of regularly spaced olive trees on relatively bare substrate (Fig. 2). Widely spaced patches (1–2 m²) of low growing (< 1 m tall) Buck Brush (*Ceanothus cuneatus*) were also growing on the edges of the olive orchard. The orchard was generally surrounded on the north and west by an extensive stand of California Bay (*Umbellularia californica*), on the south by a large woodland of Coast Live Oak (*Q. agrifolia*), and on the east by ungrazed, non-native annual grassland.

Masticophis l. euryxanthus that we released after data collection at these three sites regularly retreated by rapidly climbing adjacent, low growing shrubs, and then ultimately climbing into the intersecting canopy of olive trees or adjacent oaks (*Quercus* spp.; Fig. 3). We suspect that the olive orchard appeared structurally similar

to oak woodlands with woody understory (i.e., partially closed canopy with bare ground substrate and/or various lower-level shrubs) and represented structure preferred by this subspecies (Ortenburger 1928; Stebbins 1954; Pickwell 1972; Stebbins and McGinnis 2018). Numerous researchers suggest that *M. lateralis* seeks an escape route that uses its semi-arboreal ability (Grinnell and Grinnell 1907; Ortenburger 1928; Stebbins 1954). The olive orchard on the Mt. Wanda site that *M. l. euryxanthus* used appeared to have a high level of habitat suitability: food (i.e., three lizard species), basking sites (olive tree canopy), retreat and cover sites (structure of vegetation, structure type), and seasonal retreat sites (rodent burrows). Although a small (0.7 ha) historic olive orchard on an eastern slope typically would not be considered suitable habitat for this subspecies, it is likely the structure, rather than the vegetation type, added to or created the suitability. Alternatively, this snake may have a greater level of habitat plasticity than previously suspected. In either case, we were able to document the use of the olive tree orchard by at least 10 individual adult *M. l. euryxanthus*, along with other snake species.

We were also able to document that *M. l. euryxanthus* was capable of using extremely small patches of Coastal Scrub habitat that were completely surrounded by extensive Blue Oak woodland. We trapped 12 adult snakes adjacent to the larger of the two small patches (i.e., 0.36 ha) of Coastal Scrub. This patch was smaller than the smallest home range reported for a single male *M. l. euryxanthus* (1.9 ha; Swain 1994) indicating that the snakes were very likely using surrounding habitat with some level of regularity. This would strongly suggest that the protection of habitats adjacent to Chaparral and/or scrub may be critical in protecting the species.

A greater understanding of habitat components and their use may play a role in the successful management of declining species. Land managers and regulators considering actions affecting habitat within the suspected range of *M. l. euryxanthus* should consider any vegetation



FIGURE 3. A 1.3 m long Alameda Whipsnake (*Masticophis lateralis euryxanthus*) in a Blue Oak (*Quercus douglasii*) on Mt. Wanda, John Muir Historic Site, Martinez, California, in 2018. (Photographed by Kelly A. Davidson).

type that is structurally similar to Chaparral as potential habitat for the species. The structure of orchards, ornamental gardens, and residential landscapes, especially those adjacent to occupied natural areas, may provide habitat for this threatened snake, and careful attention should be used when managing such sites in the range of *M. l. euryxanthus*.

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ANGEL SPRAGUE is a Wildlife Biologist currently researching Alameda Whipsnake populations in the San Francisco Bay Area. She received her B.S. in Conservation Biology from California State University, Sacramento, and her M.S. in Wildlife Biology from Fort Hays State University, Kansas. She has also studied federally listed as threatened Northern Myotis (*Myotis septentrionalis*) in the midwestern prairie and the Desert Tortoise (*Gopherus agassizii*) in the desert Southwest. She hopes to continue researching population dynamics, and the conservation and climate change impacts of threatened and endangered species. (Photographed by Denise Amador).