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Overwintering California Tiger Salamander (*Ambystoma californiense*) Larvae

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In California, overwintering in larval salamanders is known for three ambystomatid species. Northwestern Salamander (*Ambystoma gracile*) and Long-toed Salamander (*A. macrodactylum*) larvae overwinter in areas where ambient and water temperatures are cold (Stebbins 1985; Stebbins and Cohen 1995; Zug 1993). Introduced Tiger Salamanders (*A. tigrinum*) also may overwinter as larvae (Sexton and Bizer 1978; Riley et al., *in press*). Stebbins and Cohen (1995) and Storer (1925) reported that larvae of a fourth ambystomatid, the California Tiger Salamander (*A. californiense*), do not overwinter; however, B. Shaffer (Univ. California, Davis; pers. comm.) found one larval *A. californiense* in late fall 1993, in Monterey County. I report observations of *A. californiense* larvae overwintering in the Los Vaqueros Watershed, Contra Costa County, California.

Of the 90 managed stock ponds in the Los Vaqueros Watershed, 63 are perennial and 27 seasonal. California tiger salamanders were observed in 66 ponds (45 perennial, 21 seasonal) between 1998 and 2002. Within three perennial stock ponds in the upper Kellogg Creek drainage (eastern Contra Costa County, California), *A. californiese* larvae were recorded through the late fall and winter. On 5 November 1998, a perennial stock pond was drained for maintenance and adult and larval *A. californiese* were found at the bottom of the pond. The three larvae captured ranged in size from 71 to 77 mm SVL, and 125 to 135 mm TL. The pond was located in a heavily grazed grassland at the headwaters of Kellogg Creek (533 m elevation). With the exception of a small stand of cattails (*Typha* sp.), the banks of the pond were devoid of emergent vegetation. Tadpoles of *Rana aurora draytonii* also were observed to be overwintering at this location (Fellers et al. 2001).

During October 1998, a second perennial pond was found with *A. californiense* larvae. The pond was located in an area of grazed annual grassland/oak woodland (300 m elevation) and was devoid of emergent vegetation. Salamanders in this pond were monitored through the winter of 1998/1999. During January 1999, 15 adult and 37 larval salamanders were observed. Larvae ranged in size from 58 to 84 mm SVL, and 114 to 144 mm TL (average = 77.6 mm and 127.3 mm, respectively). Freshly laid eggs also were present in the pond. This pond was monitored weekly until 12 March 1999. During that period, young of the year hatched and developed at a rate that was consistent with other ponds in the watershed.

At a third pond in the Los Vaqueros Watershed (440 m elevation), a single *A. californiense* larva was found in mid-January of 2001. This animal measured 97 mm SVL, 126 mm TL. Again the pond was perennial, associated with cattle grazing, and devoid of emergent vegetation.

Tails tips were collected for genetic analysis from *Ambystoma* larvae overwintering in the Los Vaqueros Watershed. Results confirmed that samples came from *A. californiense* with no detectable level of hybridization (H. B. Shaffer, Univ. California, Davis; 3 genes analyzed: 1 mtDNA, 2 nuclear DNA, 20 specimens, 2 sites, August 2003, pers. comm.).

This report is important because the introduced *A. tigrinum* is being recorded in many areas across California. *Ambystoma tigrinum* is known to overwinter and therefore may be incorrectly identified if the presence of overwintering larvae is the sole characteristic used to determine species. In addition, some authors have suggested that *A. californiense* may not occur regularly in perennial pools (Jennings and Hayes 1994; Storer 1925), yet my findings show 45 of 66 (68%) occupied sites were perennial. Finally, management considerations for perennial ponds may need to be re-evaluated if *A. californiense* larvae are found to overwinter throughout their range. The proper management of *A. californiense* should provide for thoughtful consideration of the implications of overwintering in the species.

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