

The Effect the Pyrethroid Pesticide, Bifenthrin, on reproductive endpoints of steelhead (*Oncorhynchus mykiss*)

Kristy L. Forsgren, Neeti Riar, and Daniel Schlenk. University of California, Riverside. Department of Environmental Sciences, 2258 Geology, Riverside CA 92521, Office: 562-773-8378, Fax: 951-827-3993, klforsgren@gmail.com

Abstract: The Bay-Delta is an important breeding ground and nursery for many species. Habitat quality and contamination of surface waters and sediments are limiting factors for ESA-listed fish stocks in watersheds with significant land use. Bifenthrin, a 4th generation pyrethroid, has received little attention regarding its effects on salmonid populations despite being detected in northern California runoff. While the potential for aquatic toxicity is evident, it is unknown what effect bifenthrin exposure has on the reproductive health of fishes. Plasma sex steroids and gonadosomatic index (GSI) were determined in juvenile steelhead exposed to bifenthrin (low: 0.028 ± 0.006 $\mu\text{g/L}$; high: 0.719 ± 0.073 $\mu\text{g/L}$) for 14 days. Additionally, gonadal tissue was examined histologically. Females exposed to bifenthrin (high dose) had significantly ($P = 0.0251$) elevated estradiol-17 β (E2) levels. There was no difference in testosterone (T; $P=0.1430$), 11 α -ketotestosterone (11 α -KT; $P = 0.0760$) or GSI ($P = 0.1937$). Although ovarian follicle diameter significantly ($P<0.0001$) increased in bifenthrin-treated fish, widespread atresia was observed throughout the ovary with $91.24 \pm 8.89\%$ total atresia after low dose treatment and $82.76 \pm 10.84\%$ after the high dose treatment. In male steelhead, sex steroids were not significantly altered (E2 $P = 0.0634$, T $P = 0.0833$, 11 α -KT $P=0.3057$) after treatment. Although GSI was reduced ($P= 0.0231$), the testis did not show measurable histological damage. These data indicate potential effects to developing female steelhead. The ecological implications are uncertain, but further study is warranted given the prevalence of pyrethroids in urban runoff, which impacts salmonid habitat.

Statement of Relevance: As a result of urbanization, salmonids migrate waterways that pass through dense urban environments. This research is aimed at understanding the impact of bifenthrin exposure on the reproductive health of salmonids, which will be imperative for improving risk assessment of pesticide use in the Bay-Delta in coming years.