



Conservation paleobiology in near time: Isotopic estimates for restoration flows to the estuary of the Colorado River, Mexico

Karl Flessa (1), David Dettman (1), Carlos Cintra-Buenrostro (2), and Kirsten Rowell (3)

(1) Department of Geosciences, University of Arizona, Tucson, AZ 85721 United States (kflessa@email.arizona.edu), (2) Chemistry and Environmental Sciences, University of Texas at Brownsville, Brownsville, TX 78520 USA. Carlos.CintraBuenrostro@utb.edu, (3) Department of Biology, University of Washington, Seattle, WA 98195 USA rowellk@uw.edu

In most years since 1960, the Colorado River has not reached the sea. Upstream dams and diversions in the U.S.A. and Mexico have diverted the river's water for agricultural and municipal use. The river's estuary in the upper Gulf of California, in Mexico, once supported very large populations of *Mulinia coloradoensis*, a trophically important bivalve mollusk, and *Totoaba macdonaldi*, a now-endangered scianid fish,. Because Colorado River water is isotopically distinct from Gulf of California seawater, we used the $\delta^{18}\text{O}$ composition of the pre-dam bivalve shells and fish otoliths to estimate past salinities and river flows. We estimate that five to ten percent of the river's annual flow would be needed to restore *M. coloradoensis* habitat in the river's mouth and to restore the nursery grounds of *T. macdonaldi*. The dead can speak to the living.