

## **Chum salmon (*Oncorhynchus keta*) in the San Joaquin River, California: new record**

SHAUN T. ROOT,\* MATT J. BIGELOW, AND DONALD E. PORTZ

*Bureau of Reclamation, Fisheries and Wildlife Resources Group, P.O. Box 25007, Denver, CO 80225, USA (STR, DEP)*

*California Department of Fish and Wildlife, 1234 E. Shaw Ave., Fresno, CA 93710, USA (MJB)*

*\*Correspondent: sroot@usbr.gov*

**Key words:** California, locality record, *Oncorhynchus keta*, chum salmon, San Joaquin River, San Joaquin Restoration Program

---

Chum salmon (*Oncorhynchus keta*) are the most widely distributed and abundant in terms of total biomass of all Pacific salmon, and may have contributed up to 50 percent of the annual biomass of the seven species of Pacific salmon in the North Pacific Ocean (Salo 1991). In North America, they are found from the Sacramento River in California (Hallock and Fry 1967) northward to the Arctic shore of Alaska (Walters 1955), with a southernmost record in the USA from the San Lorenzo River near Monterey Bay, California (Behnke 2002). Chum salmon are not historically known from the San Joaquin River system (Behnke 2002, Moyle 2002).

As part of the San Joaquin River Restoration Adult Chinook Salmon Trap and Haul effort, salmon were captured at the terminal end of irrigation canals using large, hand-held dip nets at six locations (Delta Rd., Midway Rd., Hereford Rd., Deepwell Rd., Britto Rd., and Cozzi Ave.) near Los Banos, Merced County, California. These locations were visited on a daily basis, with increased sampling in areas with barriers that blocked or severely restricted further upriver migration. Fish captured were subjected to standard handling and transportation methods (collection of biometric data and tissue samples) following standard procedures (Portz 2013).

A single female chum salmon (Figure 1) was captured on 11 December 2013 from the Midway Road Irrigation Canal, which is hydrologically connected to the San Joaquin River via Salt Slough (120° 44' 56" E, 37° 03' 30" N). Three Chinook salmon (*Oncorhynchus tshawytscha*) also were captured during this effort (Portz 2013). The fish were transported approximately 55 kilometers in a fish haul tank and released into the San Joaquin River following processing and tissue collection. The chum salmon was verified by Don Portz, Bureau of Reclamation Fisheries and Wildlife Group and Jacque Keele,



**FIGURE 1.**—Female chum salmon (*Oncorhynchus keta*) captured in the Midway Road Irrigation Canal, Merced County, California, USA, on 11 December 2013. The individual was a wild female (no egg mass palpated), as indicated by the presence of an adipose fin. The fork length was 637 mm and total length was 683 mm.

Bureau of Reclamation Detections Laboratory for Exotic Species, and was identified with 100 percent similarity following Handy et al.(2011); DNA most closely matched entries from British Columbia, Canada, and Oregon, USA, as per Ratnasingham and Hebert's (2007) hierarchical placement program.

We assume that this individual is a "stray." Historical records indicate a very small run was present in the Sacramento River North during the 1950s (Hallock and Fry 1967), but no spawning has been recorded in recent decades (Moyle 2002), indicating that individuals present in the Sacramento River North and its tributaries would also be strays. To our knowledge, this is the first record of *O. keta* in the San Joaquin River and is a new record for Merced County, California (Behnke 2002, Moyle 2002).

#### ACKNOWLEDGMENTS

Funding was provided by the San Joaquin River Restoration Program. Special thanks are extended to C. Hueth and P. Ferguson, as well as all other California Department of Fish and Wildlife or Bureau of Reclamation personnel that have made this project possible.

## LITERATURE CITED

- BEHNKE, R. J. 2002. Trout and salmon of North America. The Free Press, New York, USA.
- HALLOCK, R. J., AND D. H. FRY, JR. 1967. Five species of salmon, *Oncorhynchus*, in the Sacramento River, California. California Fish and Game 53:5-22.
- HANDY, S. M., D. JONATHAN, N. IVANOVA, P. HEBERT, R. H. HANNER, A. ORMOS, D. WEIGHT, M. M. MOORE, AND H. F. YANCY. 2011. A single laboratory validated method for the generation of DNA barcodes for the identification of fish for regularity compliance. Journal of AOAC International 94:201-210.
- MOYLE, P. B. 2002. Inland fishes of California. Revised and expanded. University of California Press, Berkeley, USA.
- PORTZ, D. 2012. [Internet] Central Valley steelhead monitoring plan for the San Joaquin River Restoration Area [cited 8 August 2014]. Available from: [http://www.restoresjr.net/flows/data-reporting/2013/2013\\_SJRRP\\_Steelhead\\_Monitoring\\_Plan.pdf](http://www.restoresjr.net/flows/data-reporting/2013/2013_SJRRP_Steelhead_Monitoring_Plan.pdf)
- PORTZ, D. 2013. [Internet] San Joaquin River restoration program, 2013. Chinook salmon trap and haul summary [cited 8 August 2014]. Available from: [http://www.restoresjr.net/flows/data-reporting/2013/2013\\_USBR\\_Trap-&-Haul-Summary.pdf](http://www.restoresjr.net/flows/data-reporting/2013/2013_USBR_Trap-&-Haul-Summary.pdf)
- RATNASINGHAM, S., AND P. D. N. HEBERT. 2007. BOLD: the barcode of life data system. Molecular Ecology Notes 7:355-364. DOI: 10.1111/j.1471-8286.2006.01678.x
- SALO, E. O. 1991. Life history of chum salmon (*Oncorhynchus keta*). Pages 231-310 in C. Croot and L. Marcolis, editors. Pacific salmon life histories. UBC Press, Vancouver, British Columbia, Canada.
- WALTERS, V. 1955. Fishes of western Arctic America and eastern Arctic Siberia: taxonomy and zoogeography. American Museum of Natural History Bulletin 106:255-368.

*Received 15 September 2014*

*Accepted 14 November 2014*

*Associate Editor was D. Lentz*