

## First record of striped mullet (*Mugil cephalus*) in Humboldt Bay, California

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On 11 June 2015 three juvenile striped mullet (*Mugil cephalus*) were collected by personnel from the California Department of Fish and Wildlife in the Salmon Creek estuary, Humboldt Bay, California (40° 40' 37.7" N, 124° 12' 15.0" W). This record represents a northward range extension of nearly 450 kilometers from the previously reported northernmost occurrence of that species in San Francisco Bay, California (Moyle 2002). All three striped mullet were collected from a brackish off-channel pond during routine surveys for juvenile salmonids in the Humboldt Bay National Wildlife Refuge. Two individuals were released at the location of capture and one was retained as a voucher specimen and deposited in the Humboldt State University Fish Collection (HSU Collection number HSU 5290). Field collections were conducted using a 9.1 m × 1.8 m × 6.4-mm mesh beach seine at a depth of 0.75 m at 0915 near a predicted 1.5-m high tide. Habitat at the collection site was mostly open water with mud substrate. The pond was stratified with a surface temperature of 18.8° C, salinity was 25.0 ppt, and dissolved oxygen was 5.15 mg/l; near the bottom those readings were 21.2° C, 30.6 ppt, and 1.90 mg/l, respectively.

Striped mullet have thick, torpedo-shaped bodies, broad flat heads, small terminal mouths, large eyes, deeply forked caudal fin, two dorsal fins that are widely separated, and translucent adipose eyelids that nearly cover the eye (Moyle 2002). All three striped mullet captured were very similar in size and appearance (Figure 1). Meristic and morphometric characteristics of the voucher specimen (fork length = 69 mm) were consistent with values reported for striped mullet (Miller and Lea 1976, Moyle 2002).

Striped mullet inhabit tropical and subtropical coastal areas around the world. In California they primarily inhabit coastal waters and estuaries in southern California and the lower Colorado River (Miller and Lea 1976, Moyle 2002, McGinnis 2006). Striped mullet



FIGURE 1.—Striped mullet (*Mugil cephalus*) captured by California Department of Fish and Wildlife personnel on 11 June 2015 in an off-channel pond in Salmon Creek Estuary, Humboldt Bay, Humboldt County, California; the scale is in millimeters.

have been reported as far north as San Francisco Bay during El Niño years, but they are rare north of Point Conception (Moyle 2002). They are sometimes among the most abundant fish captured in southern California estuaries (Horn and Allen 1981, Moyle 2002). They were once very abundant in the Salton Sea but now are rare (Moyle 2002, McGinnis 2006) or possibly extirpated (CDFW 2014). They tolerate a wide range of salinities, having been collected in water from 0 to 75 ppt, but cannot tolerate temperatures much below  $\sim 15^{\circ}$  C. Striped mullet often ascend rivers and have been found many kilometers upstream of saltwater in rivers such as the Colorado River, Santa Margarita River, and Los Angeles River (Moyle 2002).

Water quality conditions in the Salmon Creek estuary on 11 June 2015 were similar to conditions typically observed in mid- to late summer during 2010–2014 (Wallace and Allen 2015). Also, ocean temperatures off the coast of California were approximately  $3^{\circ}$  C warmer than historic averages in the Fall of 2014, which ranked among the warmest conditions observed during the last 30 years (data from NOAA Northwest Fisheries Science Center; <http://www.nwfsc.noaa.gov>). Numerous warm-water fishes and invertebrate species that are usually found in more southern waters have been detected off the coast of California during the past 6 to 12 months (Rogers 2014). It is plausible that the striped mullet moved northward from southern or central California and found their way into Humboldt Bay and the Salmon Creek Estuary during these warm water conditions.

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**LITERATURE CITED**

- CDFW (CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE). 2014. Biogeographic Information and Observation System (BIOS). [http://map.dfg.gov/bios/Striped\\_Mullet\\_FSSC-CDFW\\_\[ds\\_1270\]](http://map.dfg.gov/bios/Striped_Mullet_FSSC-CDFW_[ds_1270]) Created 2014-03-01; accessed 12 October 2015.
- HORN, M. H., AND L. G. ALLEN. 1981. Ecology of fishes in Upper Newport Bay, California: seasonal dynamics and community structure. Marine Technical Report 45. California Department of Fish and Game, Sacramento, USA.
- MCGINNIS, S. M. 2006. Field guide to freshwater fishes of California (revised edition). California Natural History Guide Series No. 77. University of California Press, Berkeley and Los Angeles, USA.
- MILLER, D. J., AND R. N. LEA. 1976. Guide to the coastal marine fishes of California. Fish Bulletin 157:1-249.
- MOYLE, P. B. 2002. Inland fishes of California. University of California Press, Berkeley and Los Angeles, USA.
- ROGERS, P. 2014. Unusual warm ocean conditions off California, west coast bringing odd species. San Jose Mercury News, San Jose, California, 2 November 2014. Available at: [http://www.mercurynews.com/science/ci\\_26851300/unusual-warm-%20ocean-conditions-off-california-west-coast](http://www.mercurynews.com/science/ci_26851300/unusual-warm-%20ocean-conditions-off-california-west-coast)
- WALLACE, M., AND S. ALLEN. 2015. Juvenile salmonid use and restoration assessment of the tidal portions of selected tributaries to Humboldt Bay, California, 2011–2012. Fisheries Administrative Report 2015-02. California Department of Fish and Wildlife, Sacramento, USA.

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