Lake suckers in the western USA: history, ecology, and bibliography of an endangered genus

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Lake suckers of the genus *Chasmistes* are a unique and important component of the fish assemblages of the western USA. Historically and prehistorically they inhabited many of the large pluvial lake systems found in the Intermountain West from the Late Pleistocene to the present. Because of their large body size and large population sizes, these fishes were ecologically important to the lakes and surrounding natural systems. In addition, these fishes were economically important to human populations near these lakes. Over the last century, as a result of water diversion and the physical degradation of lakes and their tributaries, and as a consequence of the introduction of several non-native fish species, populations of lake suckers of the genus *Chasmistes* have dropped precipitously. All species in the genus are currently considered endangered or extinct (Scoppetone and Vinyard 1991).

Because of their endangered status and historical importance to the systems they inhabit, lake suckers have been the basis of numerous discussions to determine appropriate activities for population recovery and long-term management. However, some decisions and activities have been hindered or slowed by lack of information about basic ecology and natural history of the species. As with many species of non-game, native fishes, only recent research has gone beyond the original taxonomic descriptions and anecdotal natural history. Listing of *Chasmistes* species as endangered, with the accompanying mandate to recover the species to sustainable levels, has led to increased research on each of the species and the water systems they inhabit. Additionally, in response to listing, management and recovery actions were implemented based on available information and unique conditions of each of the species and lake systems (June sucker *Chasmistes liorus*, Utah Lake system, Utah; cui-ui *Chasmistes cujus*, Pyramid Lake system, Nevada; Shortnose sucker *Chasmistes brevirostris*, Lost River sucker *Deltistes luxatus*, Klamath Lake system, Oregon and California). As often is the case, recovery and management efforts proceeded somewhat independently in each of these systems. Consequently, researchers and managers perceived the need...
for a forum on lake suckers to review recent research, discuss issues, and exchange information. In response, Michael Mills, a biologist with the Central Utah Water Conservancy District, organized a symposium on lake sucker biology at the 2010 annual meeting of the Western Division of the American Fisheries Society, which was held in Salt Lake City, Utah.

This special feature of the Western North American Naturalist is dedicated to lake sucker ecology and natural history and provides a central venue for publication of several papers presented in the symposium. Some of the symposium papers presented included information that had already been published, so they were not included in this issue. To provide a link to the broader literature on lake sucker biology, we have included a bibliography as an Appendix. This bibliography includes peer-reviewed, published literature on any of the species listed above. The searches for literature were thorough, but we may have missed some papers, for which we apologize in advance. Although there were 2 symposium papers about cui-ui (Chasmistes cujus) in the Pyramid Lake system, much of the information presented had already been published elsewhere. Good reviews of cui-ui status and biology are available in the published literature (Appendix).

The special feature comprises 6 papers—3 focused on the Klamath Lake system and 3 focused on the Utah Lake system. The first paper on the Klamath Lake system is a review by J. Rasmussen of the history and status of the 2 endangered lake suckers, Chasmistes brevirostris, the shortnose sucker, and Deltistes luxatus, the Lost River sucker. A similar review of the history and status of these 2 species is not available in one place in the published literature, and this article should provide a valuable resource to researchers and managers. The second and third papers on the Klamath Lake system both address ecology of larval suckers. In both the Klamath Lake system and the Utah Lake system, larval survival appears to be a significant bottleneck to recruitment. The paper by Markle addresses larval size and dispersal in Upper Klamath Lake, and the paper by Erdman and Hendrixson addresses the response of larvae to wetland restoration.

A review of the history and status of June sucker in Utah Lake has recently been published by Andersen et al (2007), so we did not include a review of June sucker in this issue. The first of the 3 papers on June suckers is by Billman et al. and is an assessment of release strategies for captive June sucker. Augmentation of the June sucker population from captive-reared stock is an important management strategy, and this paper provides useful information to guide these efforts. The second and third papers on June sucker are focused on larval and juvenile growth and survival. The paper by Belk and Tuckfield provides an assessment of density-dependent effects among larvae and juveniles over several years. The paper by Kreitzer et al. provides an evaluation of growth and survival of larvae in relation to locations in Utah Lake and zooplankton densities.

Overall, these papers and the associated bibliography should provide a valuable resource to those interested in lake sucker biology and conservation. We thank the symposium organizers and presenters for providing a venue and contributing to discussion of the biology and management of these interesting fishes.

LITERATURE CITED


APPENDIX. Bibliography of peer-reviewed publications on lake suckers, 1965–present.


Ellsworth, C.M., T.J. Tyler, and S.P. VanderKooi. 2010. Using spatial, seasonal, and diel drift patterns of larval Lost River suckers *Deltistes luxatus* (Cypriniformes: Catostomidae) and shortnose suckers *Chas- mistes brevirostris* (Cypriniformes: Catostomidae) to help identify a site for a water withdrawal structure on the Williamson River, Oregon. Environmental Biology of Fishes 89:47–57.


APPENDIX. Continued.


