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Mark C. Belk

Brigham Young University, mark_belk@byu.edu

Russell B. Rader

Brigham Young University, russell_rader@byu.edu

Michael D. Mills

Central Water Conservancy District, Orem UT, mikem@cuwcd.com

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LAKE SUCKERS IN THE WESTERN USA: HISTORY, ECOLOGY, AND BIBLIOGRAPHY OF AN ENDANGERED GENUS

Mark C. Belk^{1,3}, Russell B. Rader¹, and Michael D. Mills²

ABSTRACT.—Lake suckers of the genus *Chasmistes* are a unique and important component of the fish assemblages of the western USA. To review recent research, discuss issues, and exchange information, researchers and managers working on the various species participated in a symposium on lake sucker biology as part of the 2010 annual meeting of the Western Division of the American Fisheries Society, 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. To provide a link to the broader peer-reviewed, published literature on lake sucker biology, we have included a bibliography as an appendix.

RESUMEN.—Los peces de la familia Catostomidae de la género *Chasmistes* son un componente único e importante de los ensambles de peces al occidente de los Estados Unidos. En la reunión anual de 2010 de la Western Division of the American Fisheries Society (División Occidental de la Sociedad de Industrias Pesqueras Americanas), se llevó a cabo un simposium en Salt Lake City sobre la biología de esta familia de peces para analizar las investigaciones recientes que se han hecho sobre ella y brindarle la oportunidad a los investigadores y administradores que trabajan con las diferentes especies de reunirse y hablar sobre diversos asuntos e información. Esta publicación especial de *Western North American Naturalist* está dedicada a la ecología e historia natural de los peces de la familia Catostomidae y brinda un lugar central para la divulgación de varias publicaciones que se presentaron en el simposium. Con el fin de otorgar un lazo al resto de la literatura sobre la biología de la familia Catostomidae, incluimos una bibliografía como apéndice.

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 manage-

ment. 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.

Also, 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

¹Department of Biology, Brigham Young University, 401 Widtsoe Building, Provo, UT 84602.

²Central Utah Water Conservancy District, 355 West University Parkway, Orem, UT 84058.

³E-mail: mark_belk@byu.edu

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.

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