Red Bluff Technical Report Abstract

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Tucker, M.E., C.D. Martin, and P.D. Gaines, 2003. Spatial and temporal distribution of Sacramento pikeminnow and striped bass at the Red Bluff Diversion Complex, including the research pumping plant, Sacramento River, California: January 1997 to August 1998, Red Bluff Research Pumping Plant Report Series, Volume 10, United States Department of the Interior, Fish and Wildlife Service and Bureau of Reclamation, Red Bluff, California, 32 pp.

Red Bluff Research Pumping Plant (RPP) is being evaluated by the Bureau of Reclamation (Reclamation) to determine if pumping water through Archimedes or internal helical pumps is a viable method for meeting water delivery requirements to the Tehama-­Colusa Canal system. Pumps were installed at the RPP and were operated on an experimental basis. The U. S. Fish and Wildlife Service (Service) was contracted to determine the in-river biological implications of the RPP. A goal of these investigations was to determine if construction and operation of the RPP may influence local population size and distribution of Sacramento pikeminnow, Ptychocheilus grandis, and striped bass, Morone saxatilis, and possible predation impacts on emigrating juvenile salmonids.

This report summarizes monitoring activities at Red Bluff Diversion Dam (RBDD) from January, 1997 through August, 1998. Sacramento pikeminnow and striped bass were sampled by angling and electrofishing, during daylight hours. The areas sampled included RBDD, the RPP, the bypass outfall structure and a relatively undisturbed area downstream of RBDD. Specific sample sites were selected and a uniform sampling protocol was implemented. Mean catch per hour (CPH) was calculated at each site for both species and each sampling technique. A three-way block analysis of variance (ANOVA) was used to determine if significant differences in mean CPH existed among sampling sites, operational protocols at RBDD (gates raised versus gates lowered), and periods when experimental pumps were runmng versus when pumps were idle.

Pronounced differences in temporal distribution of predators was observed between gates raised and lowered, with increases in CPI-1 during gates lowered periods. Possible reasons for the increase may include the spring spawning migration of Sacramento pikeminnow, increased prey availability, and prey vulnerability related to physical conditions created by the RBDD gate operations. Significant differences in mean CR11 existed among sampling locations and between gates lowered versus gates raised operation of RBDD, for each species and sampling technique. Intensive sampling during unusual RBDD gate operations in 1997 strongly suggested that seasonal increases in Sacramento pikeminnow densities within the study area is directly related to the RBDD gate operations.

Few Sacramento pikeminnow and zero striped bass were caught in the RPP Intake (Rack) area. The paucity of these species in this area created difficulties in determining if the localized structure and hydrological impacts of pump operation affected predator distribution. While the RPP Intake area did not appear to attract predators, the sheet pile area just downstream of the RPP Wall appeared to create an attractive environment for Sacramento pikeminnow. The RPP Wall sample site consistently had the highest CPH for Sacramento pikeminnow, for both sampling methods. Striped bass were caught almost exclusively directly below RBDD during periods when the RBDD gates were lowered.

The catch data indicated that many of the Sacramento pikeminnow and most of striped bass were captured in areas around the RBDD where the water was deeper and more turbulent than in the RPP Rack area. Striped bass density was closely related to the RBDD operations, nearly to the point of absence/presence. Swiped bass were caught almost exclusively during periods when the RBDD gates were lowered. Most were captured directly below RBDD where they concentrated along the edges of the turbulent boils produced by water forced under the RBDD gates. The effect of the RPP operations on predator distribution was not as definitive as the effect of RBDD gate operations. Although a higher mean CPH was observed for Sacramento pikeminnow when RPP pumps were running, the results were variable for sampling methods and among locations. The difference may be attributable to coincidental factors such as gate operations and seasonal abundance of predators.

Based upon the information gathered from this study, we conclude that the design and operation of the RPP, and its intake area appears to provide little attraction to predatory fish, during daylight hours. Although the small area of habitat created at the RPP Wall may attract and concentrate Sacramento pikeminnow at certain times of the year, the size (5 x 10 m) of the area would limit the number of predators, and predation levels should not substantially increase within the entire study area.