Red Bluff Technical Report Abstract

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The objective of our juvenile monitoring program was to generate in-river estimates of passage of juvenile chinook salmon, *Onchorhyncus tshawytscha*, and rainbow trout, O. mykiss, emigrating past Red Bluff Diversion Dam (RBDD). These data were utilized by the Bureau of Reclamation (BOR) for their evaluation and assessment of the potential for entraining emigrating salmonids into experimental water lifts (pumps) at the Red Bluff Research Pumping Plant (RPP).

Four distinct races or “runs” of chinook salmon were documented emigrating past RBDD based on length-at-date criteria. Length frequency distributions were bimodal for each race, but were more pronounced for late-fall and spring chinook. Diel patterns in abundance existed below RBDD in close proximity to the RPP. Relative abundance was greater for nocturnal periods (71-74 percent) than diurnal periods (26-29 percent), especially for pre-smolt/smolt sized juveniles. Differences in the horizontal distribution of juveniles existed as well. Relative abundance was greater in mid-channel habitats than for either river-margin. Juvenile chinook salmon were more abundant in the upper-water column than the lower-water column as evidenced by high relative capture of chinook salmon by rotary-screw traps, compared with low relative entrainment of chinook by RPP pumps. Also, relative entrainment of benthic fishes (lamprey ammocoetes and prickly sculpins) was greater for RPP pumps than relative capture by rotary-screw traps.

For all chinook captured, 83.8 percent were fry (<46 mm FL) and 16.2 percent were pre-smolt/smolt sized (>45 mm FL) juveniles. Fall chinook were numerically dominant relative to the other races of chinook. On average, 87.7 percent of chinook captured were fall chinook versus 1.4, 8.6 and 2.3 percent for late-fall, winter and spring chinook, respectively. The annual proportion of fall chinook juveniles available for entrainment into the RPP was 21.0 percent, but is likely to be much less due to their horizontal, vertical and diel distributions. We believe that only a small fraction of fall juveniles was exposed to entrainment. However, greater proportions of late-fall and winter chinook juveniles were vulnerable. On average, 34.8 percent of late-fall emigrants will pass the RPP when pumps are in operation. Therefore, the potential for entraining a greater proportion of late-fall chinook relative to fall chinook exists. A large proportion of annual winter chinook juveniles (38.8 percent) will emigrate past the RPP during operational periods. For winter chinook, the ability of the RPP to pass fish harmlessly back to the river will be critical.

Two temporally distinct age-0 cohorts of rainbow trout emigrated past RBDD. Emergence of the first cohort began in early March and continued through May. On average, 29.3 percent of all juvenile rainbow trout emigrated during this period. The second cohort began to emerge in June and continued through August, representing 18.9 percent of all juvenile rainbow trout. Annual production of rainbow trout and timing of emigration is such that we expect minimal exposure to entrainment by RPP pumps. Fry were only abundant from June through August when RPP pumps were not in operation. Larger fish were available for potential entrainment in March, April and May, but we feel that their greater size and swimming performance may preclude entrainment for a great majority of these individuals.

Over 30 fish species were sampled during the course of this project. Chinook salmon was the predominate species and represented 87 percent of all fish captured. The predominate non-salmonid species captured were Sacramento pikeminnow, *Ptychocheilus grandis* (4 percent), Sacramento sucker, *Catostomus occidentalis* (4 percent) and prickly sculpin, *Cottus asper*, (1 percent). Species of special interest such as green sturgeon, *Acipenser medirostris*, and adult Sacramento splittail, *Pogonichthys macrolepidotus*, were also captured, but in low numbers.