
Diagnostic Indicators Developed to Predict Acute or Chronic Adverse Effects to Salvaged Delta Smelt

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Blood plasma collection methods were tested in a pilot study at the Tracy Fish Collection Facility from April 2004 to June 2004. I also examined the plasma cortisol response for fish groups exposed to (1) the salvage collection and handling (CH) phase, (2) an experimental control treatment, and (3) holding periods in black and white containers. One-hundred twenty-nine plasma samples were collected from cultured, post-spawned, adult delta smelt. These samples were analyzed by UC Davis's Clinical Endocrinology Laboratory using ELISA procedures (enzyme linked immunoassay) in August 2004. The plasma cortisol results were entered in a database and their statistical properties will be examined. This evaluation will help determine the appropriate sample size (number of plasma samples needed to produce statistically valid results) and the efficacy of plasma cortisol as a measure of fish stress at current and future fish facilities.

Preparation for full study implementation was begun in late 2004. Field sampling for wild delta smelt began in mid-November 2004. Due to low catches and initial holding facilities problems, we are extending field collections to obtain the number of wild test fish needed. We are hiring and training technicians and preparing quality assurance documents. Formal study implementation is scheduled to begin in January 2005. Planned experiments will explore acute stress during the collection, handling, transport, and release process, as well as the CH and TR portions, on wild and hatchery-raised delta smelt.

Delta Juvenile Fish Monitoring Project

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Historically, the US Fish and Wildlife Service (USFWS), Stockton Office, has monitored the relative abundance and distribution of juvenile Chinook salmon

(*Onchorynchus tshawytscha*) in the lower Sacramento and San Joaquin rivers and in the Delta for the Interagency Ecological Program. In the early 1990s, the program expanded to monitor other juvenile fish species in the Delta.

All Species

For the reporting period (March 2004 through December 2004), sampling consisted of beach seining at more than 55 seine sites and trawling at three locations. Seine sites were distributed throughout the lower Sacramento River (upstream of river mile [RM] 60), the San Joaquin River (upstream of RM 41), and the Delta, with limited sites in the San Pablo and San Francisco bays. Trawling was conducted at Mossdale (San Joaquin River, RM 54), Sherwood Harbor (Sacramento River, RM 55), and Chipps Island (Suisun Bay, RM 18). Typically, seine sites were sampled once per week and trawls were conducted three days per week. We collected 556 seine samples on the Sacramento River, 191 on the San Joaquin River, 809 on the Delta, and 172 on San Pablo and San Francisco bays combined. We conducted 505 trawls at Chipps Island, 118 at Sherwood Harbor, and 149 at Mossdale. In all, we captured 253,964 fish comprised of 63 species.

During beach seining, 132,867 fish were captured: 28,452 from the Sacramento River, 49,245 from the San Joaquin River, 49,163 from the Delta and 6,007 from San Pablo and San Francisco bays. Inland silversides (*Menidia beryllina*; n = 64,150), red shiners (*Cyprinella lutrensis*; n = 24,772), threadfin shad (*Dorosoma petenense*; n = 9,067), splittail (*Pogonichthys macrolepidotus*; n = 6,229), and Chinook salmon (n = 6,028) dominated the catch in the Sacramento and San Joaquin rivers and the Delta, while top smelt (*Atherinops affinis*; n = 3,558) and Pacific herring (*Clupea harengus*; n = 1,377) dominated the catch in the bays. In addition, we captured 5 rainbow trout (*O. mykiss*), and 60 Delta smelt (*Hypomesus transpacificus*).

We captured 121,097 fish while trawling: 78,895 from Mossdale, 7,635 from Sherwood Harbor, and 34,567 from Chipps Island. At Mossdale, inland silversides (n = 55,822) and threadfin shad (n = 16,047) were the most commonly captured species. Chinook salmon (n = 6,020), and threadfin shad (n = 1,032) dominated the catch on the Sacramento River. At Chipps Island, American shad (*Alosa sapidissima*; n = 15,730), Chinook salmon (n = 13,369), and threadfin shad (n = 1,142) dominated the catch. In addition, we captured 3,664 splittail at Mossdale (March 1 through July 31);

2 unmarked rainbow trout and 1 splittail at Sherwood Harbor; and 222 splittail and 33 unmarked rainbow trout at Chipps Island.

Juvenile Chinook Salmon

A total of 6,028 unmarked Chinook salmon were captured while beach seining. Most of these were captured in the Sacramento River (n = 4,013) and the Delta (n = 2,015). Fifty-six were captured in the San Joaquin River and 86 were captured in the bay. We captured Chinook salmon throughout the reporting period, with the peak occurring mid-March through early April and decreasing through May, with few salmon seen after May. Few unmarked Chinook salmon were captured throughout the summer and fall months; however, the number of unmarked Chinook salmon captured increased in December. The first winter-run-sized juvenile Chinook salmon captured seining for the 2005 sampling period occurred on October 27, 2004, at Miller Park (Sacramento River, RM 57). Juvenile Chinook race designations are based on the Greene modification of the Fisher size criteria.

The majority (n = 21,530) of unmarked Chinook salmon were captured while trawling; 13,369 were captured at Chipps Island; 6,020 in the Sacramento River at Sherwood Harbor; and 2,141 in the San Joaquin River at Mossdale. We captured Chinook salmon throughout the sampling period, from early March through May. The catch of Chinook salmon peaked in late April to early May, with few fish seen after May. Catches of unmarked Chinook salmon increased in December. The first winter-run sized juvenile Chinook salmon captured trawling for the 2005 sampling period occurred on November 1, 2004, at Sherwood Harbor.

A relatively small number (n = 615) of marked (adipose fin-clipped) Chinook salmon were recovered during the sampling period; 555 were recovered trawling and 60 were recovered while beach seining. Of the 555 marked Chinook salmon recovered while trawling, 463 were recovered at Chipps Island and 92 at Sherwood Harbor. Of the 60 marked Chinook salmon recovered while beach seining, 34 were recovered on the Sacramento River, 20 from the Delta, and 6 from the San Joaquin River. There were also 1,129 marked fish recovered as part of the California Department of Fish and Game's (DFG) Region 4, Real-Time Monitoring (RTM) experiments, conducted on the San Joaquin River at Mossdale; all were recovered while Kodiak trawling.

Other Activities

In addition to our IEP sampling obligations, a number of other projects were conducted during the sampling period. Beginning in April, we provided field personnel to Region 4 to assist with Kodiak trawling at Mossdale, as part of the RTM. In December, we released approximately 292,000 late-fall Chinook salmon (obtained from Coleman National Fish Hatchery) as part of the Delta Action 8 experiments. Also in December, sampling effort was increased at Chipps Island from three days per week to seven days per week during the Delta Action 8 experiments.

Suisun Marsh Salinity Control Gates

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The 2004 adult salmon telemetry study at the Suisun Marsh Salinity Control Gates (SMSCG) in Montezuma Slough finished November 8. This was the fourth year of a planned 3-year study of fish passage which began to study the feasibility of using the structures existing boat lock as an alternate means of fish passage in fall 2001. A total of 197 adult Chinook salmon (*Oncorhynchus tshawytscha*) were implanted with ultrasonic tags and monitored for passage time and passage rate through three operational phases of the Salinity Control Gates. During the first portion of each phase, 65 to 66 adult salmon were tagged and released downstream from the gates. In addition to six fixed receivers used to record fish passage at the SMSCG, additional monitors were placed downstream near the Carquinez Strait and in Grizzly Bay; upstream at Chain Island, in the Sacramento River at Rio Vista and Hood, and in the San Joaquin River at Mossdale.

During Phase I of the control phase, gates were held open, flashboards were removed, and the boat lock was closed. Of the 66 fish released in this phase, 58% passed the gates with a mean passage time of 37 hours. After passing the gates, 11 tagged salmon moved back downstream and 28 (42%) moved downstream without passing the gates.

Phase II evaluated the proposed mitigation strategy of providing fish passage through an open boat lock when gates were tidally operated and flashboards were installed. During this period, 55% out of 66 fish passed the gates with a mean passage time of 27.9 hours. After passing the gates,