

## Juvenile Fall-run and Winter-run Chinook Salmon Abundance

Jeff McLain and Rick Burmester, US Fish and Wildlife Service

Juvenile chinook salmon abundance and distribution is monitored by beach seine in the lower Sacramento and San Joaquin rivers, the Sacramento-San Joaquin Delta, and San Francisco Bay. In addition, trawling at Sacramento and Mossdale is conducted to document the movement of juveniles into the delta. Trawling at Chipps Island is conducted to document the relative density of juveniles leaving the delta.

### Juvenile Fall-run Chinook Salmon Abundance

Densities in the north delta beach seine between January and March 1998 were the second highest observed since 1986. Catches during these months are composed mostly of fall-run and spring-run fry, as the beach seine is most efficient at capturing the smaller juveniles rearing near shore. The high catches in the delta during this time in 1998 were likely a result of the high outflow conditions. There is a significant relationship between flow at Freeport during February and mean density of fry in the north delta beach seine between January and March (Figure 1).

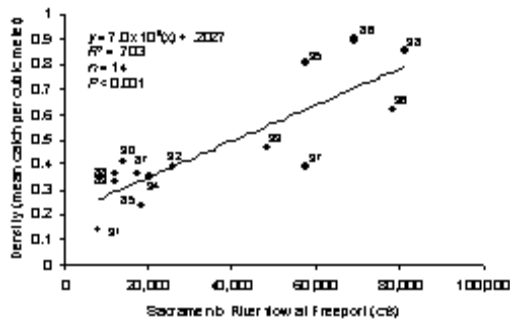


Figure 1 Juvenile chinook salmon fry density in the north delta beach seine (between Sherman Island and Discovery Park on or adjacent to the Sacramento River) in January and March against mean February flow on the Sacramento River at Freeport, 1985-1998

The relative densities of juvenile salmon in the Sacramento midwater trawl between April and June 1998 were low compared to average catches between 1988 and 1998 (Figure 2). Catches were also generally low in 1995, 1996, and 1997 relative to the average in the past (all high flow years). Catches between April and June consisted mostly of smolt-sized fall-run salmon and mainstem spring-run salmon and can be heavily influenced by salmon from Coleman hatchery. The low density observed in 1998 may likely reflect that as flows increased, the proportion of the population entering the delta as larger juveniles was reduced. This hypothesis is supported by the relationship between density and flow (Figure 3). The 1998 data appeared to fit within the established relationship.

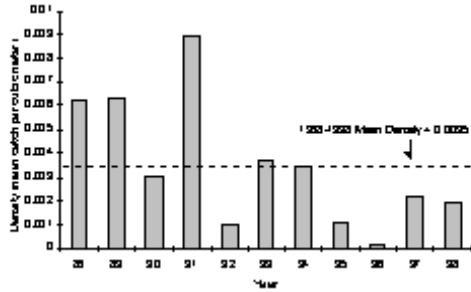


Figure 2 Juvenile chinook salmon density in the Sacramento midwater trawl between 1 Apr and 30 Jun 1988-1998. There was no sampling in April 1992. In 1990, trawling was at Courtland, about 20 mi downstream of the Sacramento site. Dotted line is mean density for 1988-1998.

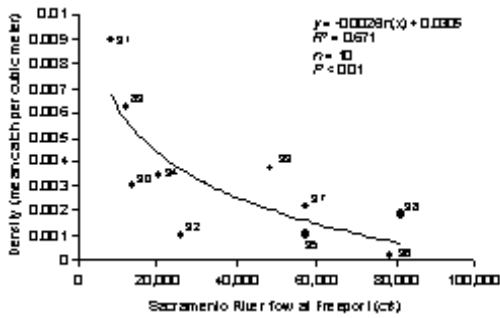


Figure 3 Unmarked chinook salmon smolt density in the midwater trawl at Sacramento between April and June 1989-1997 against mean daily flow on the Sacramento River at Freeport during February

Smolt density at Chipps Island between April and June in the 1998 midwater trawl were higher than the 1978 to 1998 mean. These catches consisted mostly of fall-run and spring-run smolts and were often heavily influenced by hatchery salmon. Density between April and June 1998 appears to support the established significant relationship between mean flow at Rio Vista and mean catch per cubic meter at Chipps Island (Figure 4).

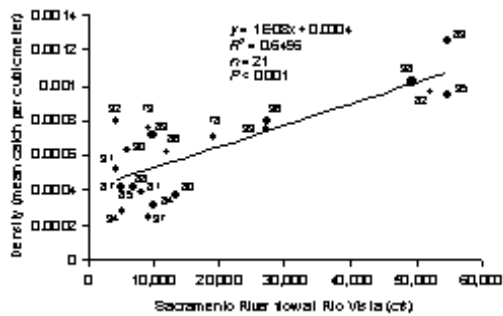


Figure 4 Unmarked chinook salmon smolt density in the midwater trawl at Chipps Island between April and June 1978-1998 against mean daily Sacramento River flow at Rio Vista between April and June

Densities of fall-run salmon between February and June 1998 on the lower San Joaquin River were much higher than in previous years (Figure 5). It is difficult to interpret abundance patterns relative to flow based on data from the last four years, as they were all classified as wet years. Observed densities

may be a result of high flows or the number of spawners using the San Joaquin basin during fall 1997. More years of sampling are needed to analyze the reasons for the variation in densities at seine sites on the lower San Joaquin River.

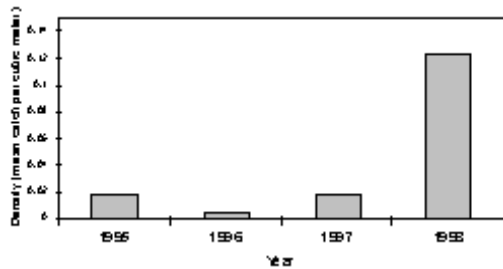


Figure 5 Juvenile chinook salmon density in the beach seine on the lower San Joaquin River between 1 Feb and 30 Jun, 1995-1998

Densities of juvenile salmon between January and March 1998 in the San Francisco Bay beach seine were nearly double the mean, also a result of the high flows present in 1998. A significant relationship exists between the mean flow at Freeport and mean catch between January and March in the San Francisco Bay seine (Figure 6). This suggests that many fry rear in the San Francisco Bay in wet years.

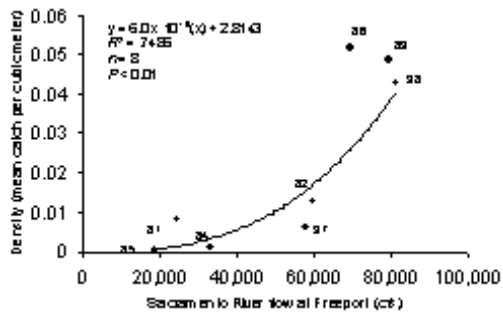


Figure 6 Chinook salmon fry density in the San Francisco Bay beach seine against mean February flow at Freeport between 1 Jan and 31 Mar, 1981-1986, 1997, and 1998. No sampling was conducted from 1987 to 1996.

### Juvenile Winter-run Chinook Salmon Abundance

The classification of salmon as winter-run is based on a daily size criterion model developed by Fisher (1992). Density of winter-run salmon during 1998 in the lower Sacramento River beach seine was above the five-year average (Figure 7). Relative density of winter-run salmon during 1998 was below normal in the delta seine, in the Kodiak trawl at Sacramento, and in the midwater trawl at Chipps Island (Figures 8, 9, and 10). It is unclear why the relative abundance was high in the lower Sacramento River but low in the delta.

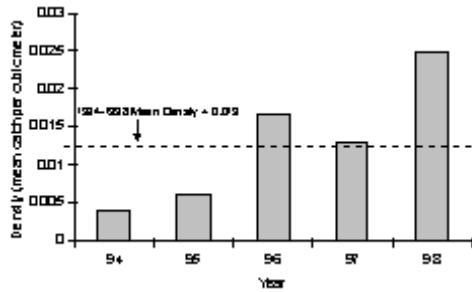


Figure 7 Juvenile winter-run chinook salmon density in the lower Sacramento River beach seine against mean February flow at Freeport between 1 Dec and 28 Feb, 1994-1998

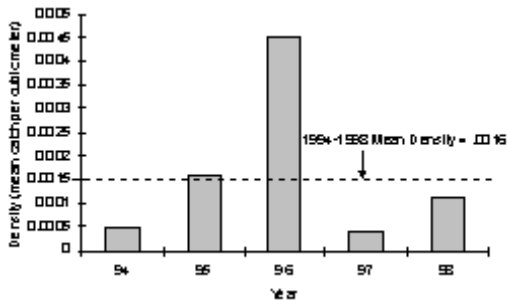


Figure 8 Juvenile winter-run chinook salmon density in the delta beach seine between 1 Jan and 31 Mar, 1994-1998

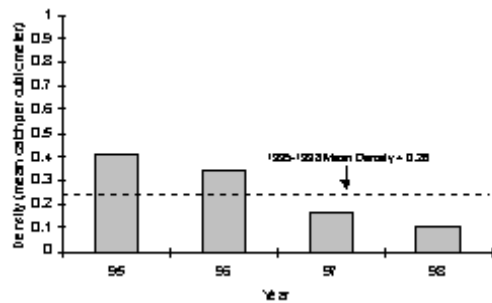


Figure 9 Juvenile winter-run chinook salmon density in the Sacramento Kodiak trawl between 1 Jan and 31 Mar, 1995-1998. The 1997 mean density does not include January because high flows prevented sampling.

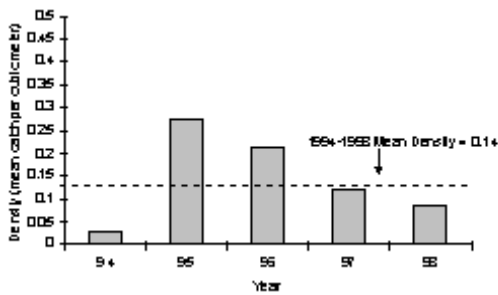


Figure 10 Winter-run chinook salmon smolt density in the Chipps Island midwater trawl between 1 Jan and 30 Apr, 1994-1998