

## **NOAA Fisheries Scientific Forum: 2008 Collapse of the Sacramento Fall Chinook Stock and Decline of other West Coast Salmon Stocks**

### Objective and Approach

NOAA Fisheries will convene a scientific forum to consider potential causes of the recent collapse of the Sacramento River fall Chinook salmon stock, and what may be a broader depression of salmon productivity for stocks involved in West Coast fisheries from the Sacramento River north to Puget Sound.

The approach to investigate the sudden failure of the Sacramento River fall Chinook stock will be to examine potential factors that could have contributed to the low survival of the 2004 and 2005 brood years (see attachment 1), and attempt to identify possible causative factors.

The approach on questions of broader salmon productivity depression will be to address the issue from the perspective of carrying capacity/productivity degradation by suites of anthropogenic impacts or by climate change effects that have made salmon populations much less resilient and thus more susceptible to precipitous declines like the one occurring in the Sacramento. While ocean conditions may have been the proximate cause in recent years, current populations are vulnerable to precipitous decline from any number of factors. Thus restoring the productivity of various stocks, to the extent feasible, will require a comprehensive approach to address many potential issues.

### Work Group

The NOAA Fisheries west coast science centers will lead a group of scientists from NOAA Fisheries, the US Fish and Wildlife Service, California Department of Fish and Game, CalFED, as well as selected academic scientists with specific knowledge of Central Valley salmon populations and the ocean ecology of salmon coast wide. In addition, scientists from Washington and Oregon Departments of Fish and Wildlife, Native American Tribal governments and the Pacific Fishery Management Council will be invited to participate as either members of the Work Group or as observers. The Work Group leads will be Drs. Churchill Grimes and John Stein from the SW and NW Fisheries Science Centers, respectively.

### Work Group Tasks

- 1) Assess the possible causes for the low returns in 2007 and projected low returns in 2008 of the Sacramento River fall Chinook stock, including viewing the issue within the context of California Current Large Marine Ecosystem.
- 2) Assess if a regionally broader depression of productivity of salmon populations coast-wide has occurred and may persist.
- 3) Initiate development of improved predictors of ocean survival and recruitment.
- 4) Develop research and monitoring recommendations.
- 5) Produce an interim and final report to the PFMC and submit a paper for publication in a peer reviewed journal.

### Process and Schedule

First Work Group Meeting (July, 2008, 2 – 3 days):

Internal organization meeting to confirm the approach, develop terms of reference for the Work Group for conducting the analysis and synthesis of available information and identification of information gaps, organize how the report will be developed (e.g., subgroups by topic), organize approach to collect existing data (e.g., web based), etc.

First Formal Work Group Meeting (July/August, 2008 in Sacramento, CA):

Conduct a public meeting in a similar manner to a NOAA Fisheries Biological Review Team meeting when data and input on the issue from interested individuals/agencies is sought. Knowledgeable parties will be invited and asked to bring data on subjects of interest to assessing the possible causes for the decline, such as water withdrawals (Bureau of Reclamation and California Department of Water Resources); hatchery operation, such as number of fish released onsite, numbers in net pens, etc. (US FWS/CDFG); special events such as the Benicia bridge construction (permit issuing agencies), etc.

Status Report to the Pacific Council at the September 7-12, 2008 meeting in Boise, Idaho.

The status report will review data and information from the first formal meeting of the Work Group and the approach to developing a final report.

A public comment meeting in California (January, 2009).

This meeting will provide an opportunity for public input and comment.

Draft Final Report presented formally at the March 7-12 2009 Pacific Council meeting in Seattle, Washington.

Submission to scientific journal, spring 2009.

-NOAA Fisheries  
June 11, 2008

# **ATTACHMENT I - FOCUS AREAS OF RESEARCH RELATIVE TO THE STATUS OF THE 2004 AND 2005 BROODS OF THE SACRAMENTO RIVER FALL CHINOOK SALMON STOCK (NATURAL AND HATCHERY COMPONENTS)**

*The essence of this listing was originally submitted to the Council as a California Department of Fish and Game Report at the Council's March 2008 meeting (Agenda Item D.1.b., CDFG Report, March 2008). This listing has been characterized by PFMC staff as representing an initial start towards a comprehensive selection of areas to be investigated as potential causative factors of the record low abundance of the 2004 and 2005 broods.*

## **Freshwater Focus: Potential Biological Areas**

- 1) Was the level of parent spawners too low, for natural or hatchery populations?
- 2) Was the level of parent spawners too high, for natural or hatchery populations?
- 3) Was there a disease event in the hatchery or natural spawning areas?
- 4) Was there a disease event in the egg incubation, fry emergence, rearing, or downstream migration phases?
- 5) Was there any disease event during the return phase of the 2 year old age class (jacks)?
- 6) Were there above average mortalities at the time of trucking and release of hatchery fish?
- 7) Were there changes in the pattern of on-site release of hatchery fingerlings compared to trucked downstream release?
- 8) Were there changes in broodstock collection, spawning strategies, or incubation operations at hatcheries?
- 9) Did thermal marking occur for any hatchery releases? What were the effects of this or other studies (e.g. genetic stock identification of parental broodstock)?
- 10) Were there any changes in the methodology or operations of the estuarial net pen 'acclimation' program for trucked hatchery fish?
- 11) Were there any problems with fish food or chemicals used at hatcheries?

## **Freshwater Focus: Potential Habitat Areas**

- 1) Were there drought or flood conditions during the spawning, incubation, or rearing phases?
- 2) Was there any pollution event where juveniles were present?
- 3) Was there anything unusual about the flow conditions below dams during the spawning, incubation, or juvenile rearing phases?
- 4) Were there any significant, unusual in-water construction events (bridge building, etc.) or miscellaneous human activities (e.g., waterfront industries, pollution) when these broods were present in freshwater or estuarine areas?
- 5) Was there anything unusual about the water withdrawals in the rivers or estuary areas when these broods were present?
- 6) Was there an oil spill in the estuary when fish from either brood year was present, as juveniles or jacks?
- 7) Were there any unusual temperatures or other limnological conditions when these broods were in freshwater or estuarine areas?
- 8) Was there any unusual population dynamics of typical food or prey species used by juvenile Chinook salmon in the relevant freshwater and estuarine areas?

- 9) Was there anything unusual about habitat factors during the return of the jacks from these broods?
- 10) Were there changes in the recovery of juvenile outmigrants observed in the USFWS mid-water trawl surveys, radio tagged fish monitoring programs, or other monitoring programs in freshwater or estuary areas?

### **Freshwater Focus: Species Interactions**

- 1) Was there any unusual level of predation by bird species when these broods were in freshwater or estuarine areas?
- 2) Was there unusual sea lion abundance or behavior when these broods were in freshwater or estuarine areas?
- 3) Were there unusual striped bass population dynamics or behavior when these broods were in freshwater or estuarine areas?
- 4) Were northern pike present in any freshwater or estuarine areas where these broods were present?
- 5) Is there a relationship between declining Delta smelt, longfin smelt, and threadfin shad populations in the Delta and Sacramento River fall Chinook survival?
- 6) Was there increased hatchery steelhead production, and if so, additional inriver competition or predation?

### **Marine Focus: Biological Areas**

- 1) Was there anything unusual about the ocean migration pattern of the 2004 and 2005 broods?
- 2) Was there anything unusual about the recovery of tagged fish groups from the 2004 and 2005 broods the ocean salmon fisheries?
- 3) Was there anything unusual about the bycatch in non-salmonid fisheries (e.g., whiting, groundfish)?

### **Marine Focus: Habitat Areas**

- 1) Were there periods of reduced upwelling or other unusual oceanographic physical conditions during the period of smolt entry into the marine environment, or during the period of marine residence up to the return to freshwater of the jacks?
- 2) Were there any unusual effects to these fish from the 'dead zones' reported off Oregon and Washington in 2006 and 2007?
- 3) Were phytoplankton levels depressed off California, especially during the smolt entry periods for these broods?
- 4) Were there any oil spills or other pollution events during the period of ocean residence of these two broods?
- 5) Was there any aquaculture occurring in the ocean residence area of these two broods during 2005-2007?
- 6) Was there any offshore construction for wave energy or other purposes in the area of ocean residence?

### **Marine Focus: Species Interactions Areas**

- 1) Was there any unusual population dynamics of typical prey species (zooplankton, krill, juvenile anchovy or sardines, etc.) used by juvenile Chinook salmon in marine areas?
- 2) Was there an increase in bird predation on juvenile salmonids caused by a reduction in the availability of other forage food?
- 3) Was there an increase of marine mammal predation on these broods?
- 4) Was there an increase in predation on these broods by Humboldt squid?
- 5) Was there increased predation on these broods by other finfish species (e.g., lingcod)?
- 6) Were there any unusual effects to these broods from an increase in krill fishing worldwide?

### **Cumulative Effects Focus**

- 1) Were there other ecosystem effects that affected these broods in an unusual way?
- 2) Were there synergistic effects of significant factors that can explain the unprecedented low survival of these two broods?