# Clues as to the relative survival of 2001 outmigrants as revealed by the age composition of Chinook and sockeye salmon at Bonneville Dam

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# CRITFC's Bonneville sampling program

- Conducted weekly at the Bonneville Dam Adult Fish Facility on the Washington shore. Fish are anesthetized, length measured, clip and condition information gathered, and scales (4 for sockeye, 6 for Chinook) collected.
- Target sample size is a minimum of 500 fish per run (spring, summer, fall Chinook, and sockeye).
- I have aged all scales since the late 1980's with corroboration by John Sneva (WDFW).

# CRITFC's Bonneville sampling program

- Sampling has occurred annually since
  - 1985 for sockeye salmon
  - 1987 for spring Chinook
  - 1990 for summer Chinook
  - 1997 for fall Chinook
- High water temperatures have sometimes stopped sampling, mostly for fall Chinook. In 2004, no sampling occurred between July 24 and September 1.

# Spring Chinook at Bonneville Dam

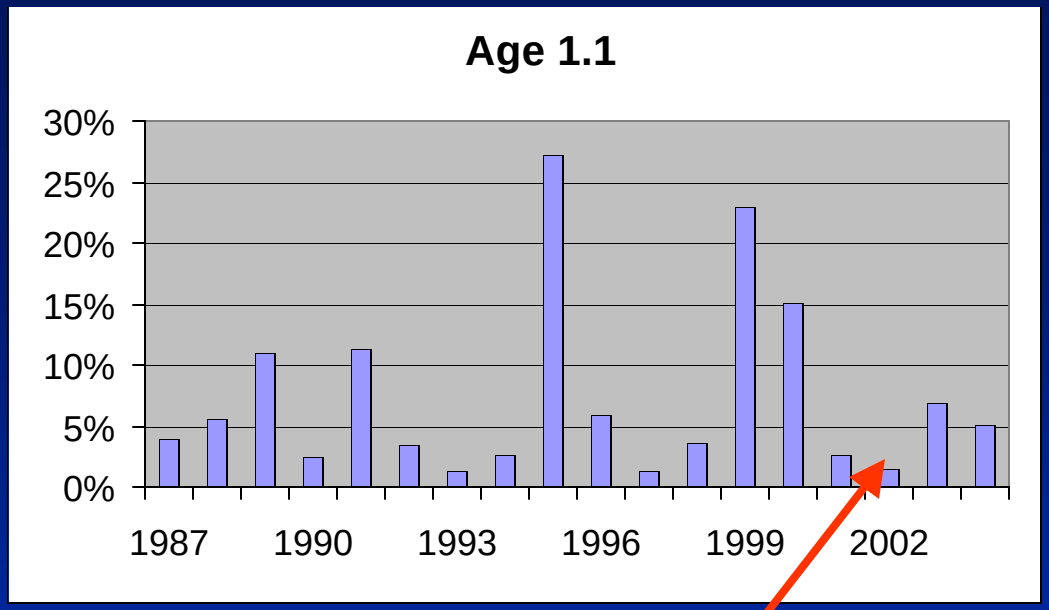
Mean Age Distribution since 1987:

- 73% Age 1.2
- 21% Age 1.3
- 6% Age 1.1
- Less than 0.1% other age classes

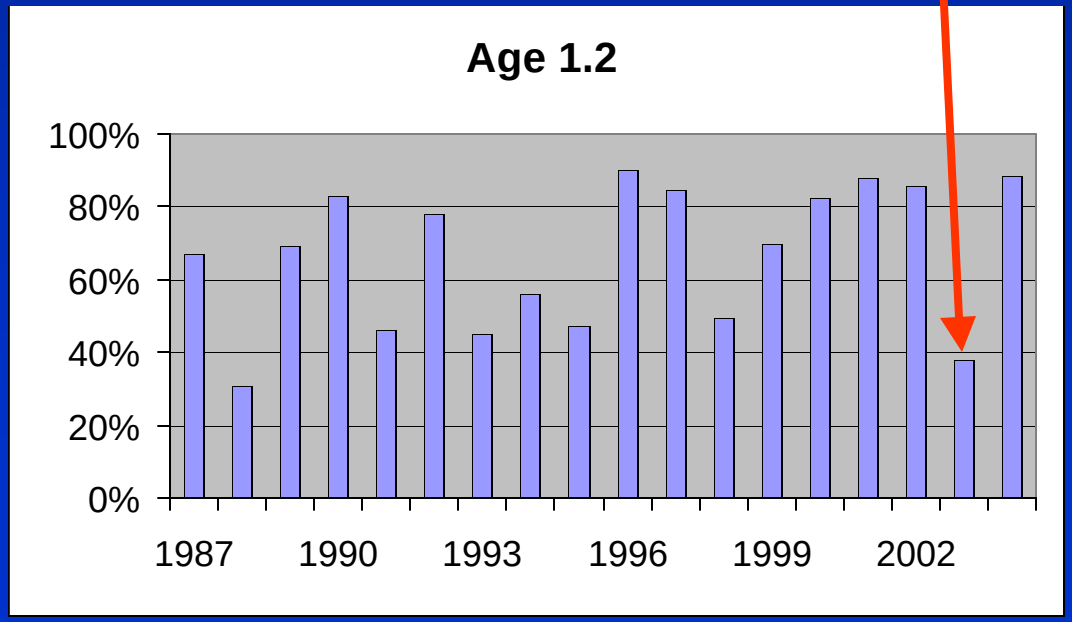
# Spring Chinook

2002 Age 1.1 returns: 1.4% of run, tied for second lowest since 1987.

2003 Age 1.2 returns: 38% of run, second lowest since 1987.

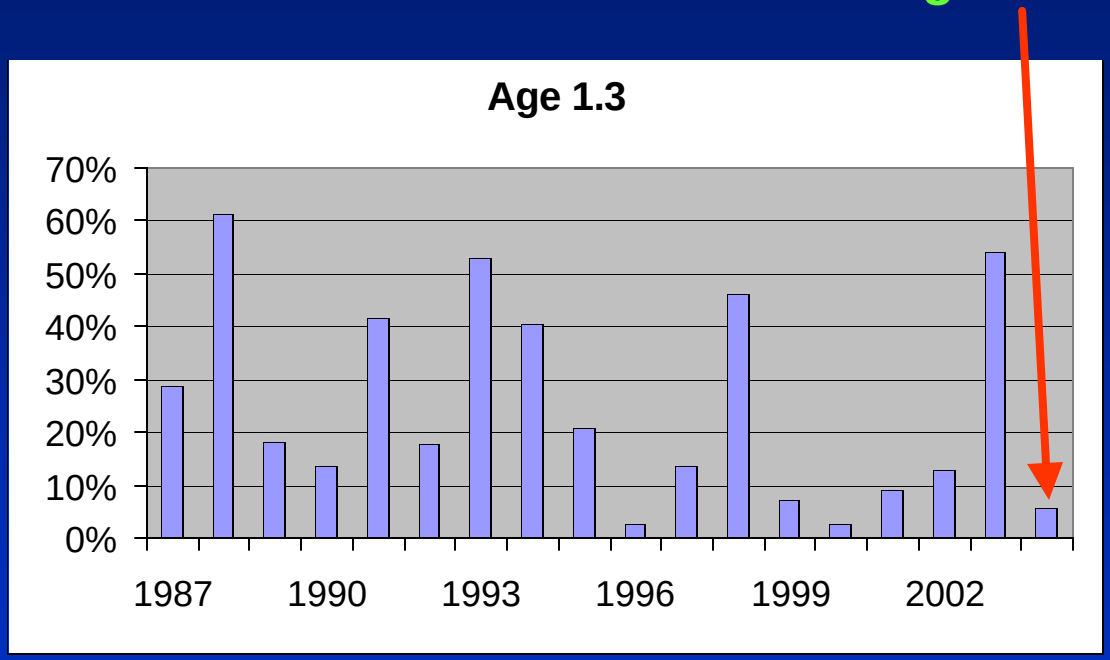



**2001 Outmigrants**



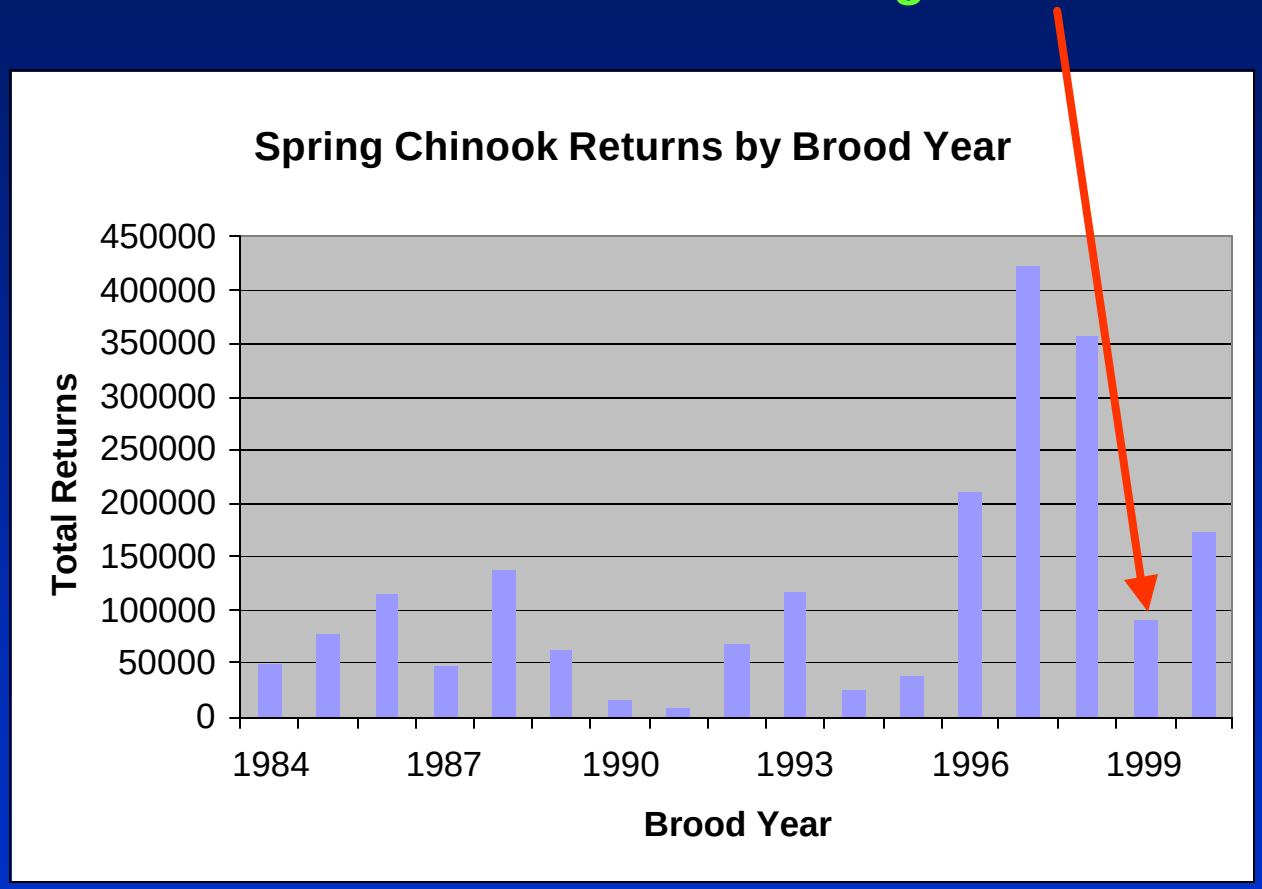
# Spring Chinook

2004 Age 1.3 returns: 5.6% of run, third lowest since 1987.



# Spring Chinook

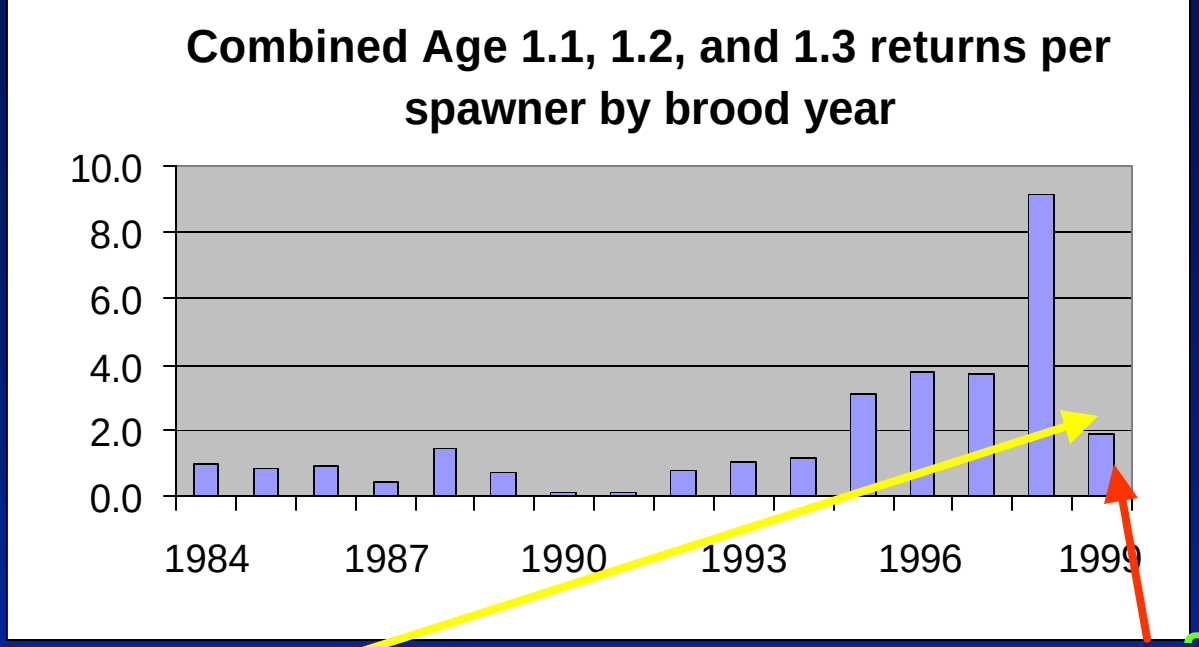
1999 brood still 8th highest in 17.



- This approach does not take into account the number of spawners. A better measure may be returns per adult spawner.

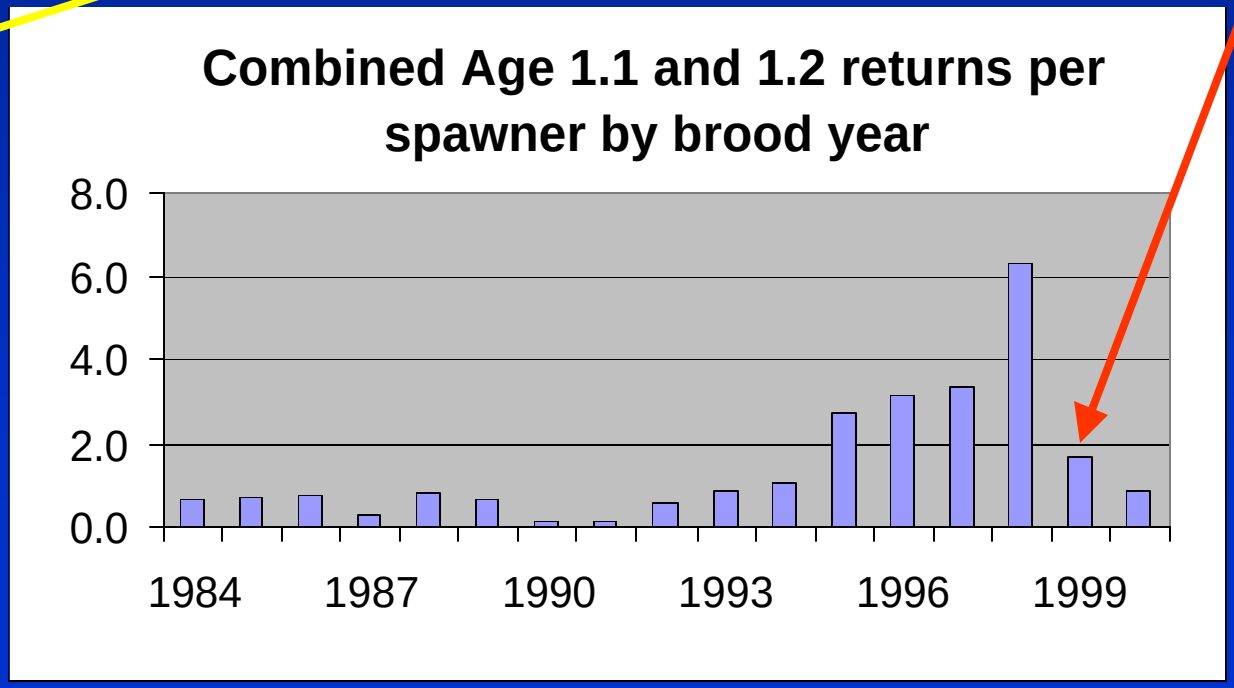
- Spawners are estimated as the adult return to Bonneville for a given brood year. The effect of fisheries and pre-spawning mortality on the number of spawners were not factored out, except for fisheries in the case of sockeye salmon. Fisheries have not been significant for spring and summer Chinook until very recently.

# Returns per spawner




2001 Outmigrants

Had the fifth highest rate of return since 1984 but lowest in past 5 years.



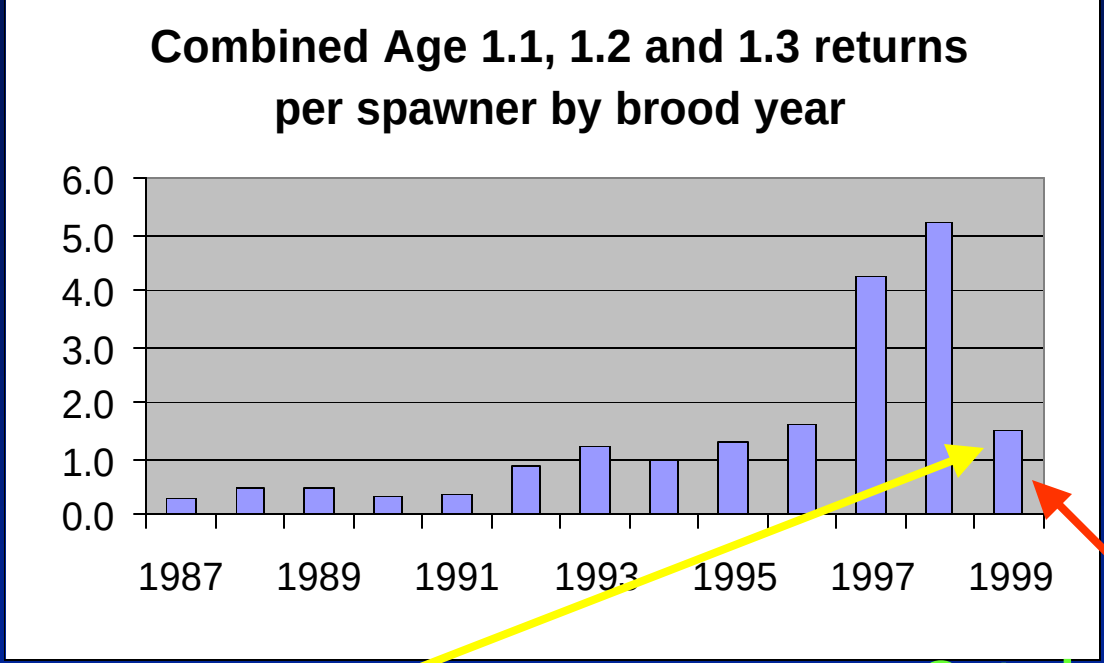
# Spring Chinook 1999 Brood Year (2001 outmigrants)

- The low return, when compared to 1995-1998 brood years, tends to support the hypothesis that the 1999 brood year was adversely affected by migrating downstream during a drought year. However, returns from the 2000 brood year also look low. (Though this may also be a result of considering all 200,000 fish returning in 2000 as spawners.)

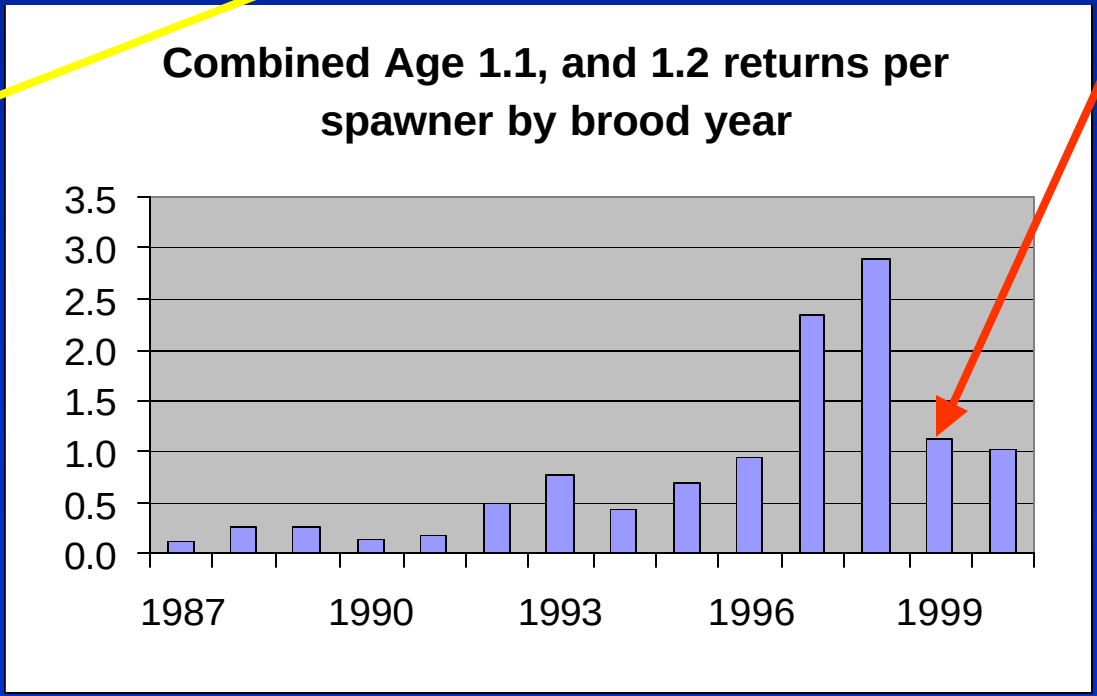
# Summer Chinook

- Complicated by multiple age classes; Ages 1.1, 0.3, 1.2, 0.4, and 1.3 all average over 5% of the run (1990-2002), while Age 0.1, 0.2, 0.5 and 1.5 have also been observed.
- Multiplicity of age classes and a broad range of scale patterns makes age estimation more difficult.

# Summer Chinook returns per spawner

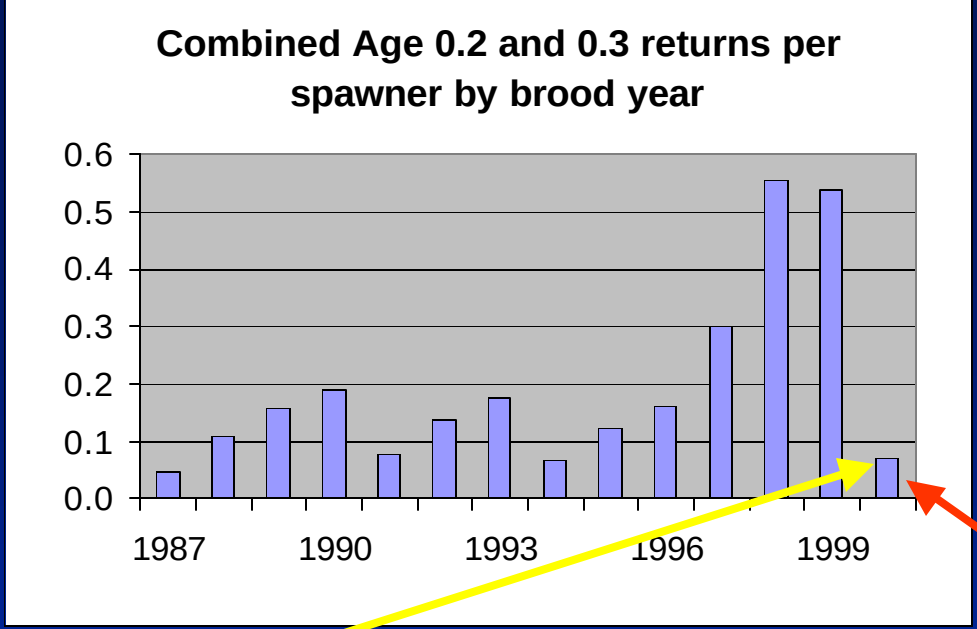



2001 Outmigrants

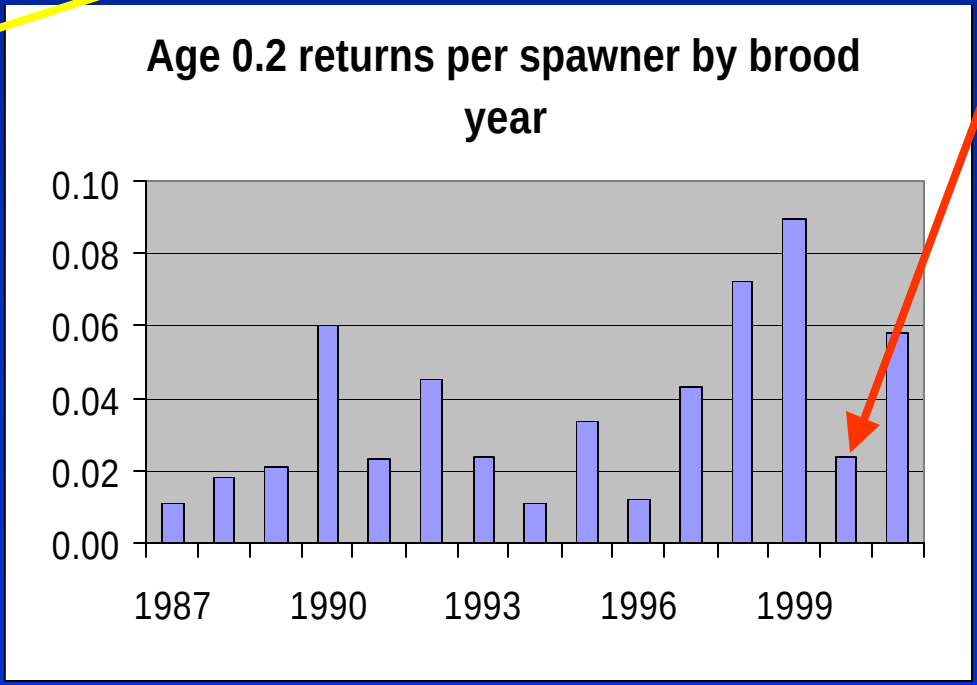



Fourth highest combined rate of return of yearling outmigrants (1.1, 1.2, 1.3) in 14 years but lowest in past 4 years.

# Summer Chinook returns per spawner




2001 Outmigrants

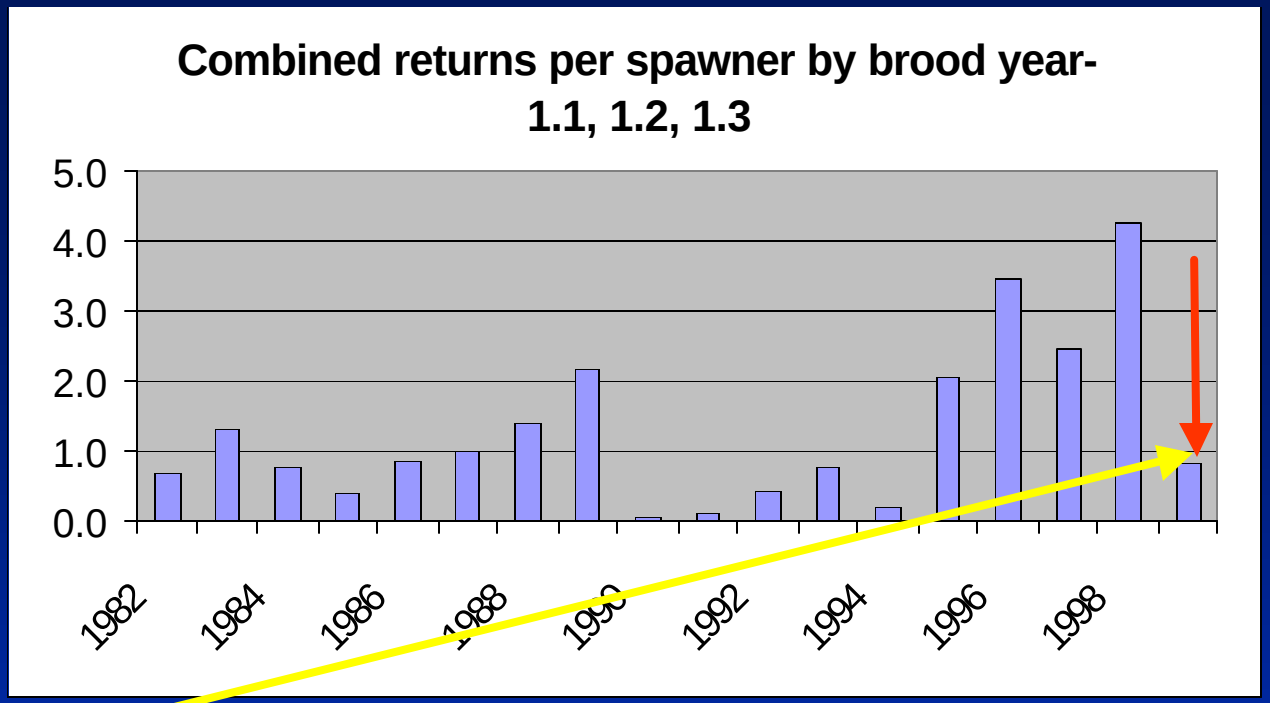



Third lowest combined rate of return of subyearling outmigrants (0.2 and 0.3) in 14 years.

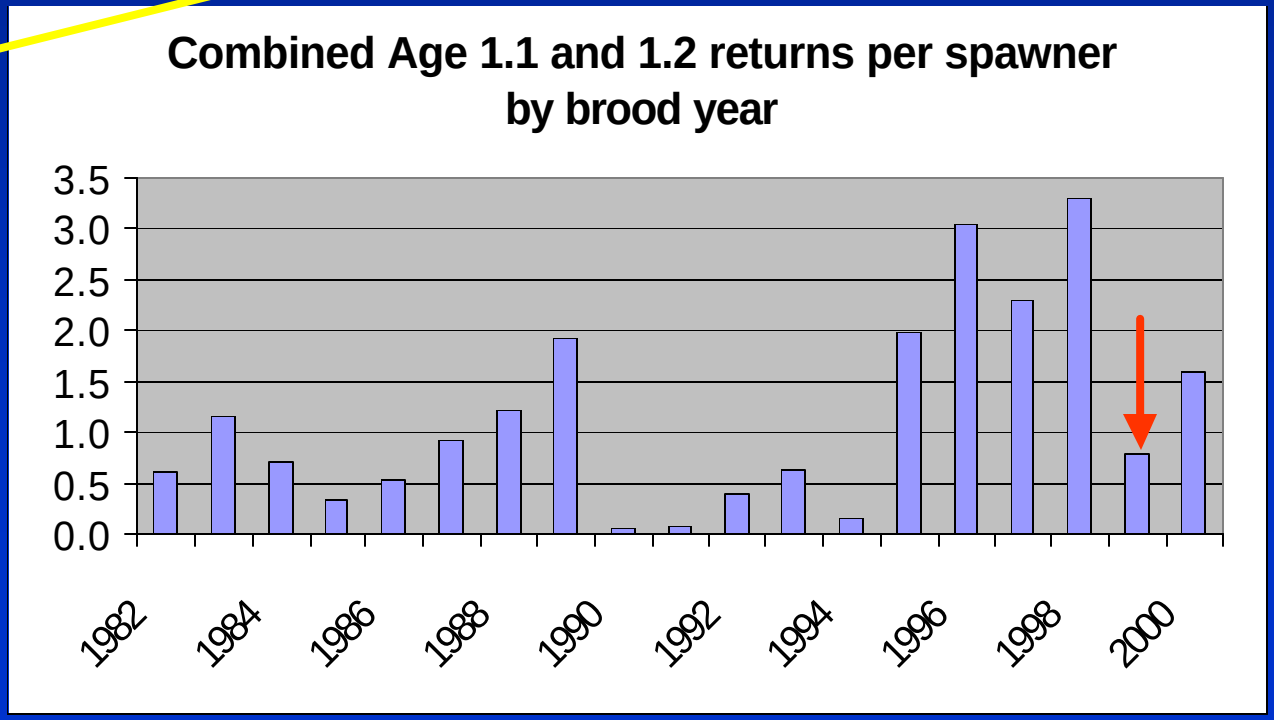
# Summer Chinook 2001 outmigrants

- If age composition differences we observed can be explained by 2001 outmigration conditions, then these conditions adversely affected subyearling outmigrants much more than yearling outmigrants.

# Sockeye Returns per Spawner (fishery effects factored out)



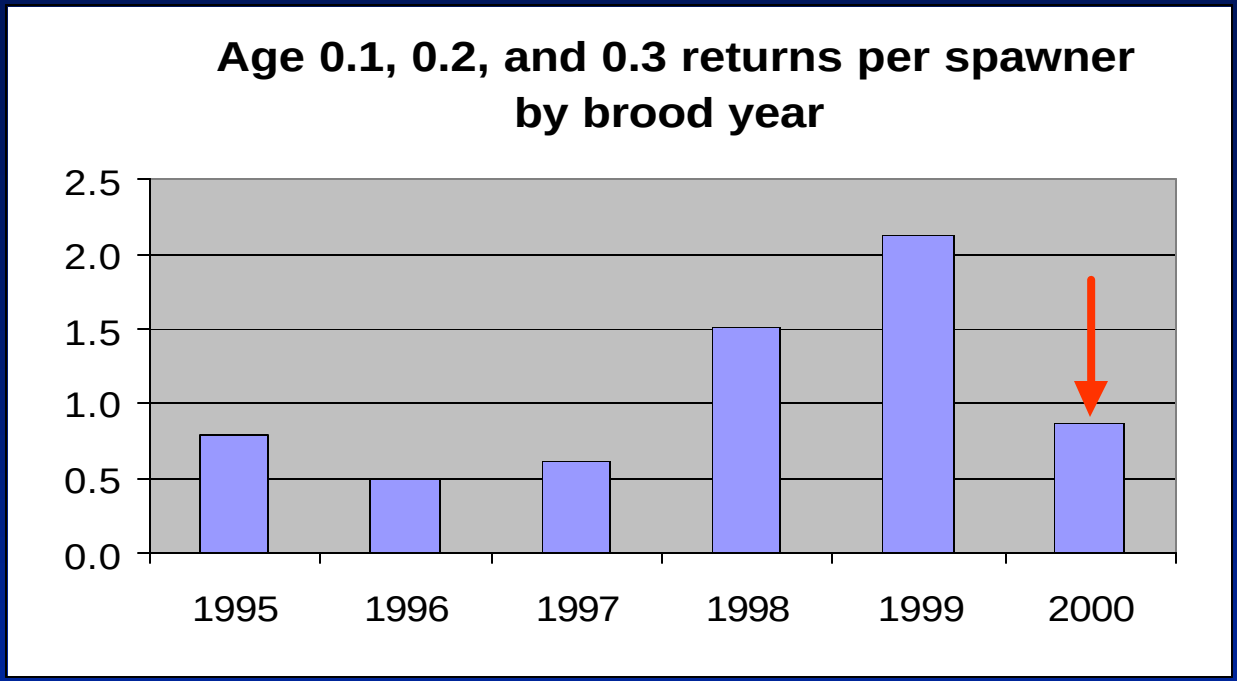

Tenth highest combined rate of return of Age 1.1,1.2, and 1.3 fish in 19 years but by far the lowest in the past five years.

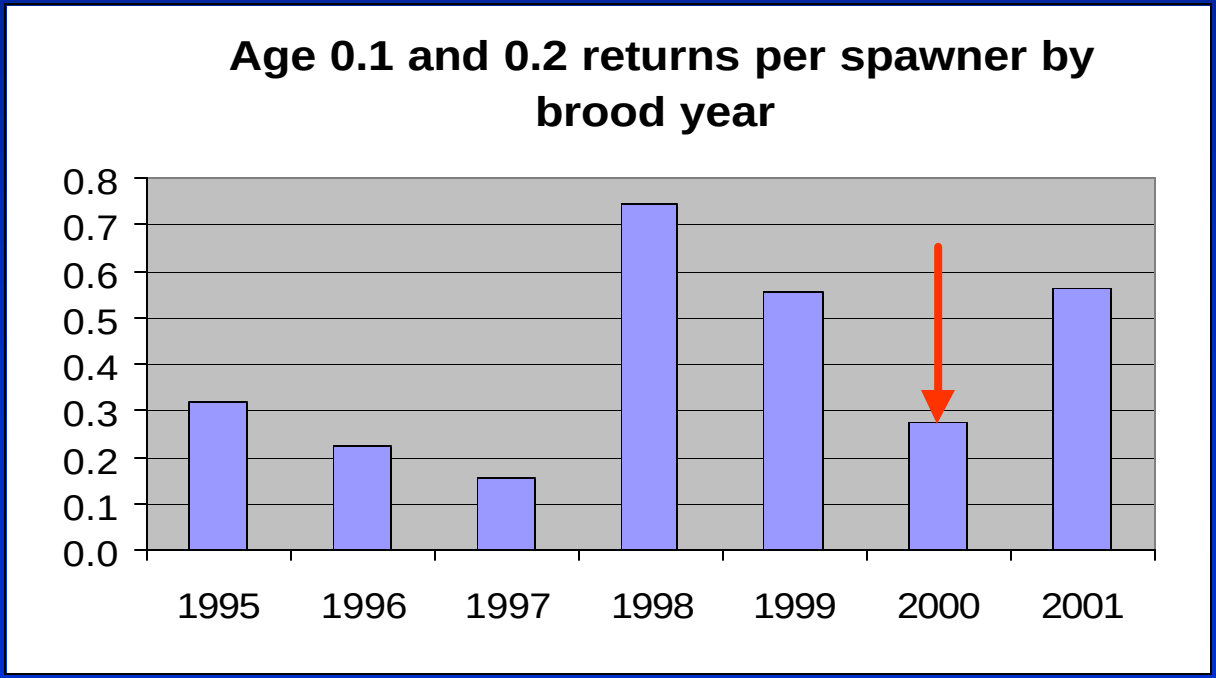


# Fall Chinook

- Only eight years of data, four of which were adversely impacted by the suspension of sampling due to high water temperatures.  (This included 2003 and 2004.)

# Fall Chinook Returns per Spawner



# Conclusions

- The abundance of age classes of returning Chinook and sockeye salmon that outmigrated in 2001 was low relative to immediately preceding years.
- Comparing 2001 outmigrants with 2002 outmigrants, subyearling Chinook and sockeye salmon returned at a lower rate in 2001 than in 2002, while yearling Chinook returned at a similar rate. This suggests that subyearling Chinook and sockeye juveniles were more affected than yearling Chinook by the poor outmigration conditions that occurred in 2001.

# Conclusions

- The rate of return of Chinook and sockeye salmon outmigrating in 2001was generally greater than that for fish outmigrating before 1998.
- After 2005, we will have a more complete picture of both the 2001 and 2002 outmigration with the return of Age 0.4 and 1.4 fish outmigrating in 2001 and Age 0.3 and 1.3 fish outmigrating in 2002.
- Similar analyses in future years should better account for fisheries and surpluses at hatcheries as they make up an increasing portion of the run when run sizes get large.