

Influence of hatchery origin spawners on the size and age of naturally produced Chinook salmon in the Wenatchee Basin

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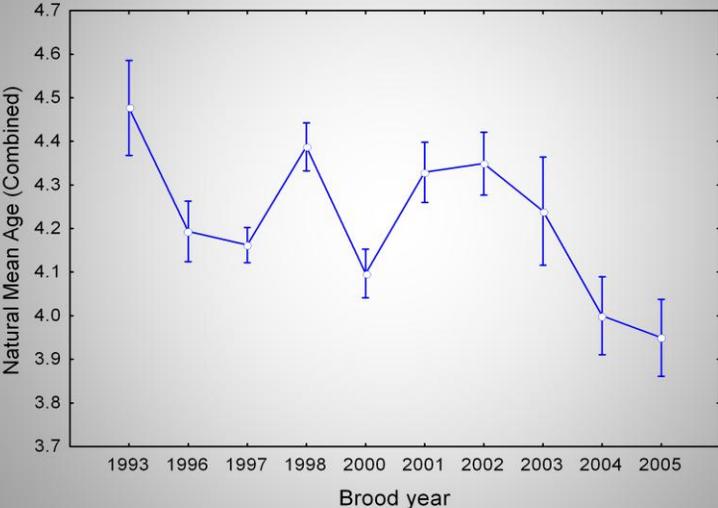
Background

- Populations of interest
 - Wenatchee spring Chinook (upstream of Tumwater Dam, no LNFH)
 - Wenatchee summer Chinook
- Hatchery influence
 - Supplementation programs funded by Chelan County PUD
 - 1989 first broodstock collected

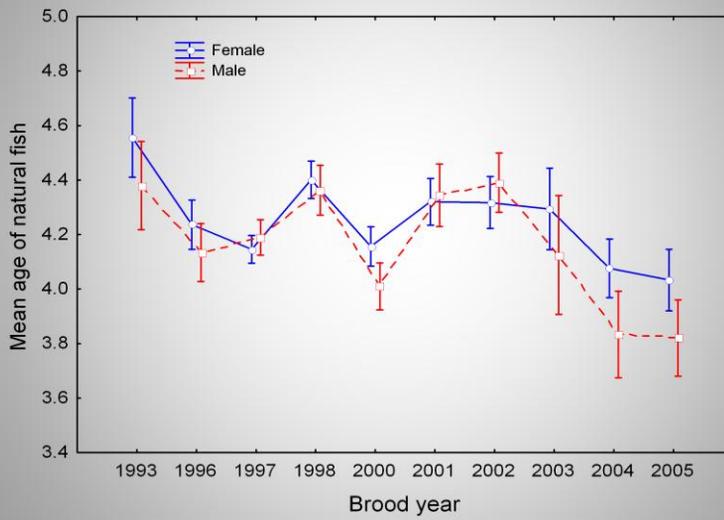
Methods

- Carcasses
 - Post orbital to hypural (POH) length
 - Scales or CWT for age
- Assumptions
 - Size related carcass recovery bias similar across years
 - Scale ages are accurate

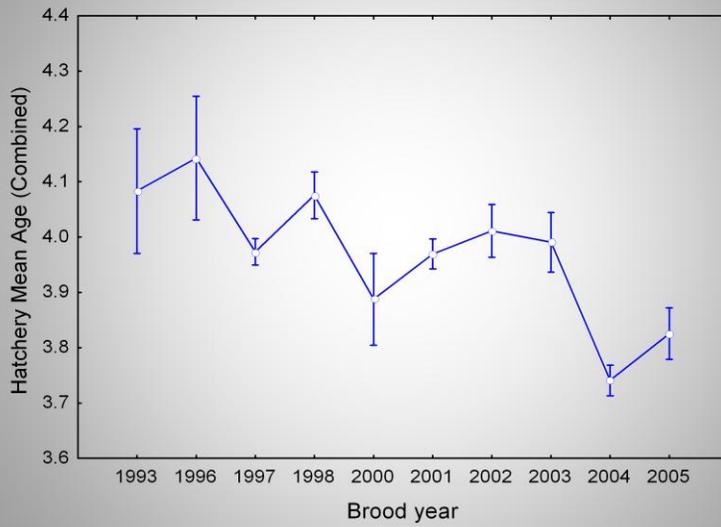
Natural Mean Age (Combined)



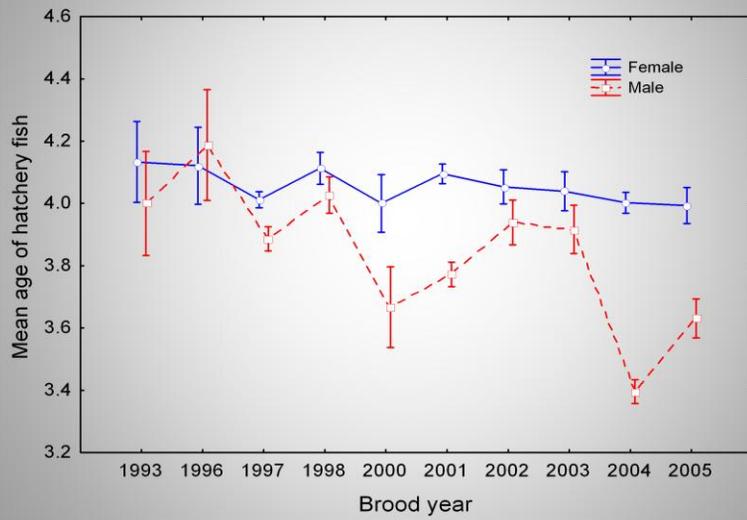
Natural Mean Age by Gender



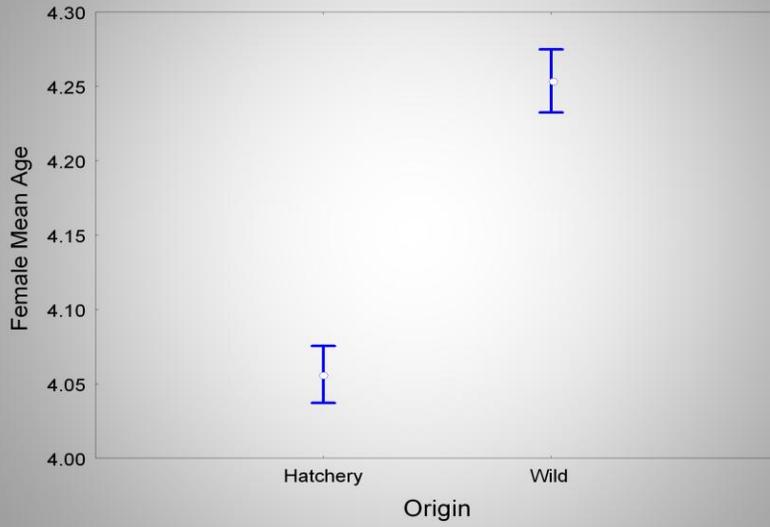
Hatchery Mean Age (combined)



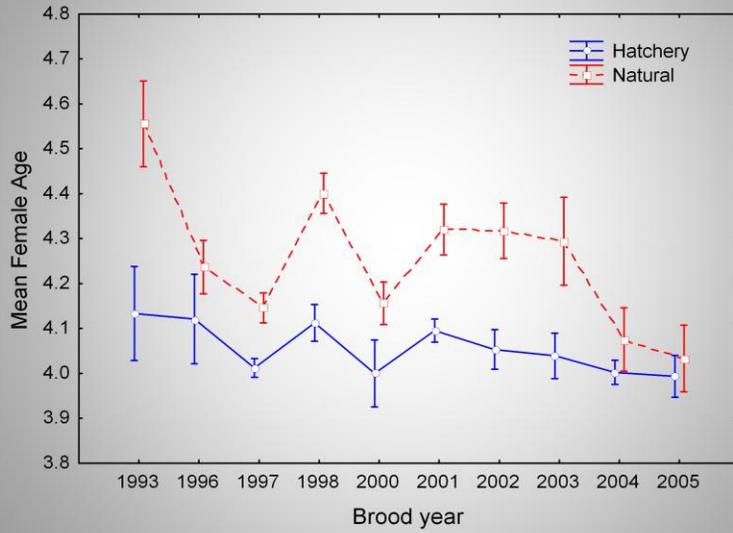
Hatchery Mean Age by Gender



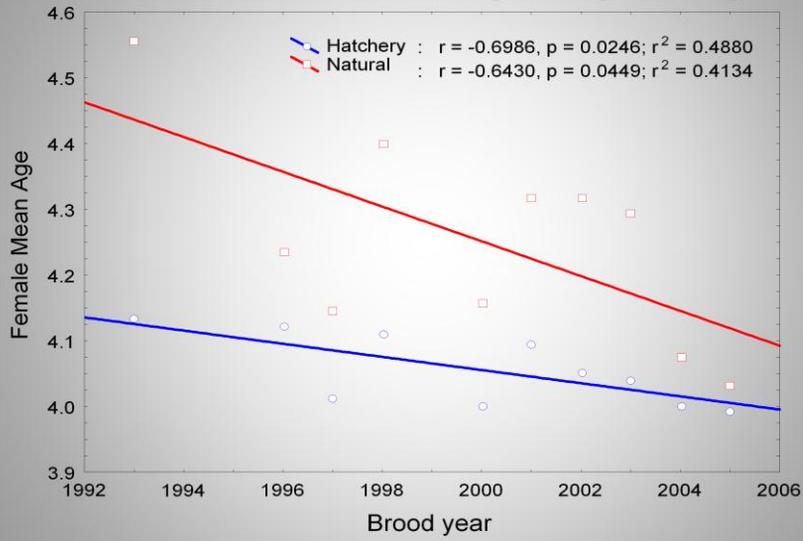
Female Mean Age by Origin



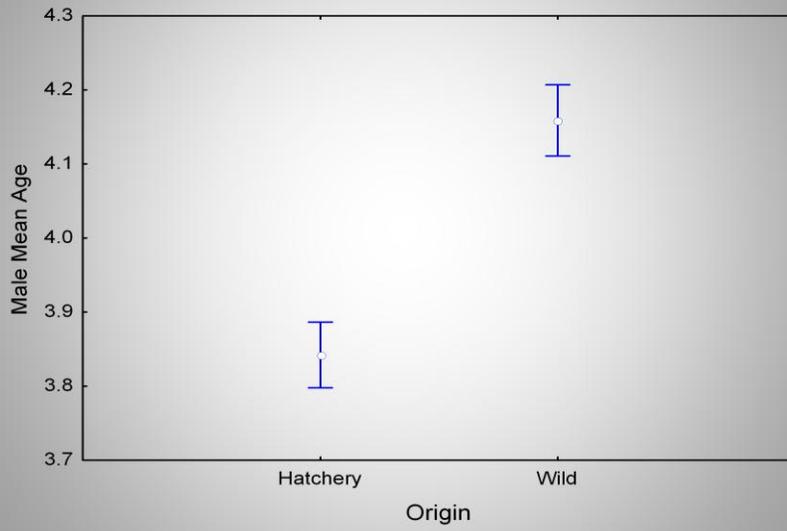
Female Mean Age by Origin



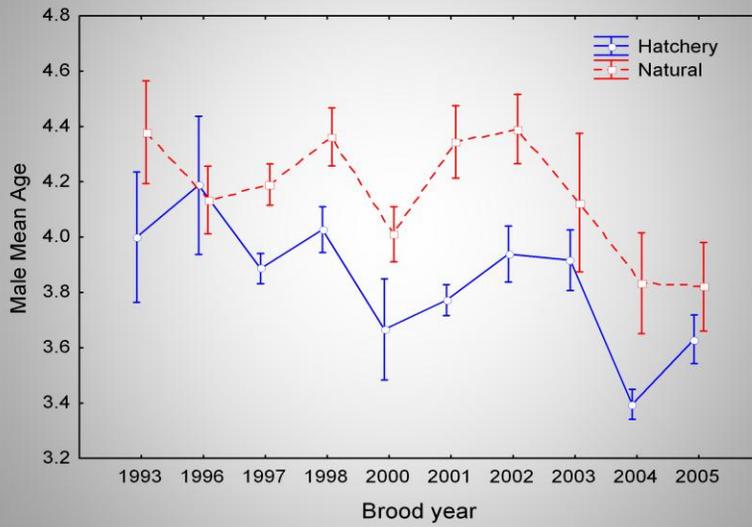
Female Mean Age by Origin



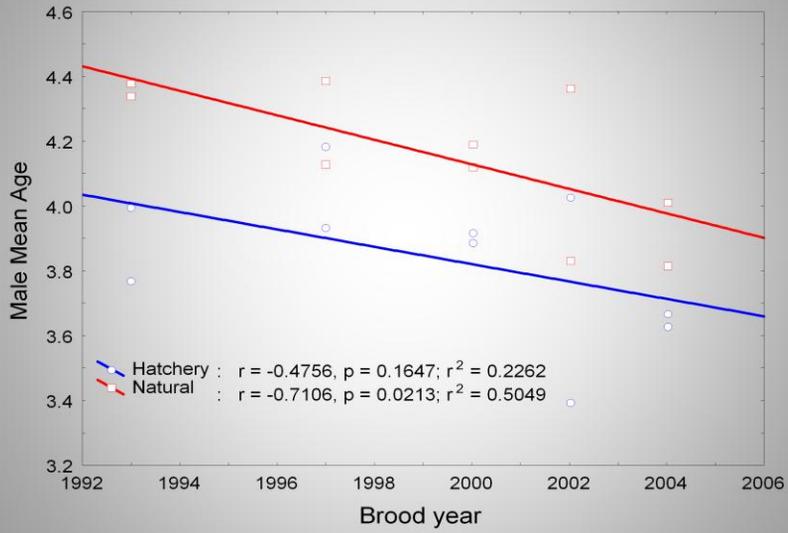
Male Mean Age by Origin



Male Mean Age by Origin



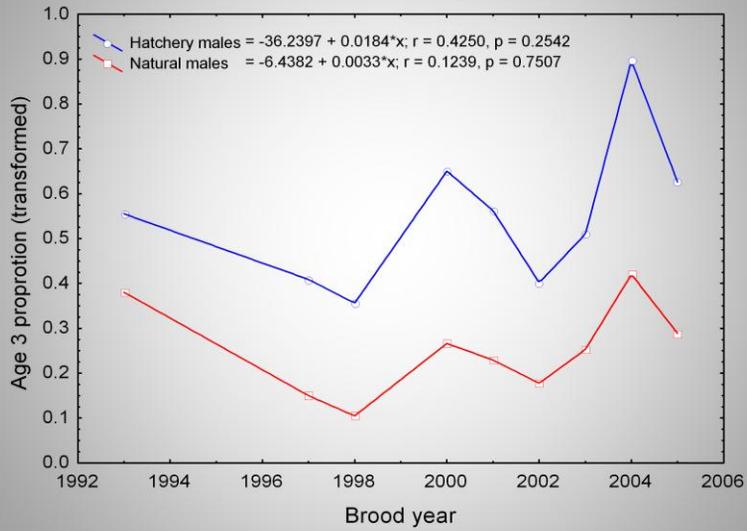
Male Mean Age by Origin



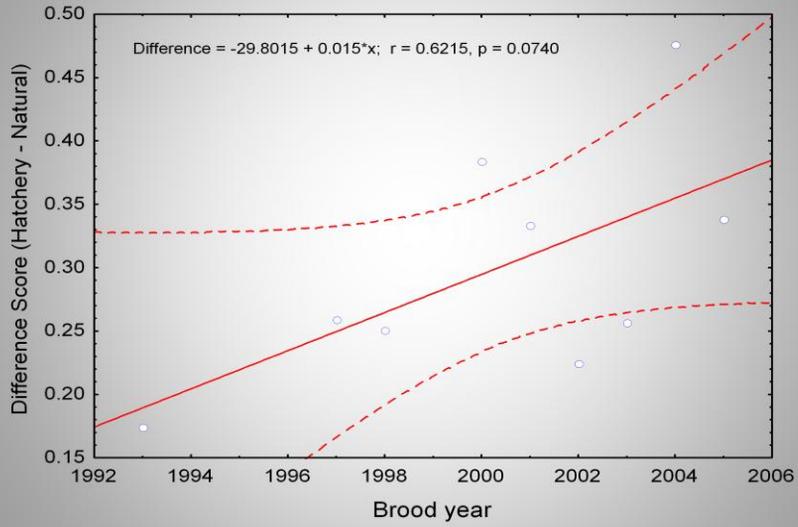
Age Composition

- Males
 - Proportion of broodyear that returned as jacks over time
 - Carcasses for hatchery and natural
 - Hatchery carcasses versus CWT recovery
- Females
 - Proportion of broodyear that returned as age-5 over time
 - Carcasses for hatchery and natural
- Age 5
 - Hatchery carcasses versus CWT recovery

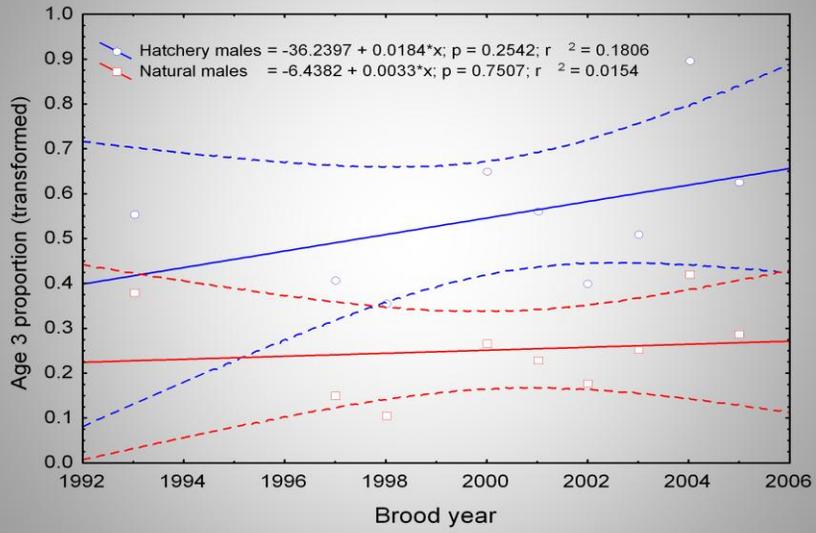
LOWESS Regression



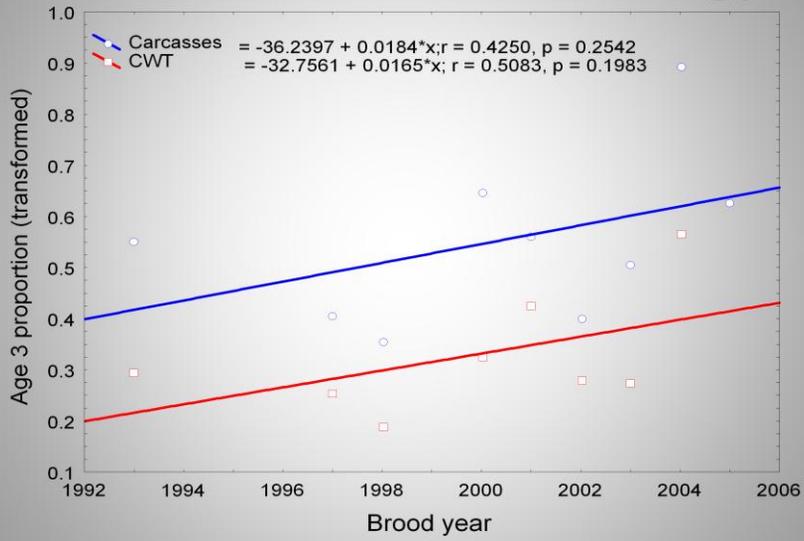
Trend in Difference



Linear regression



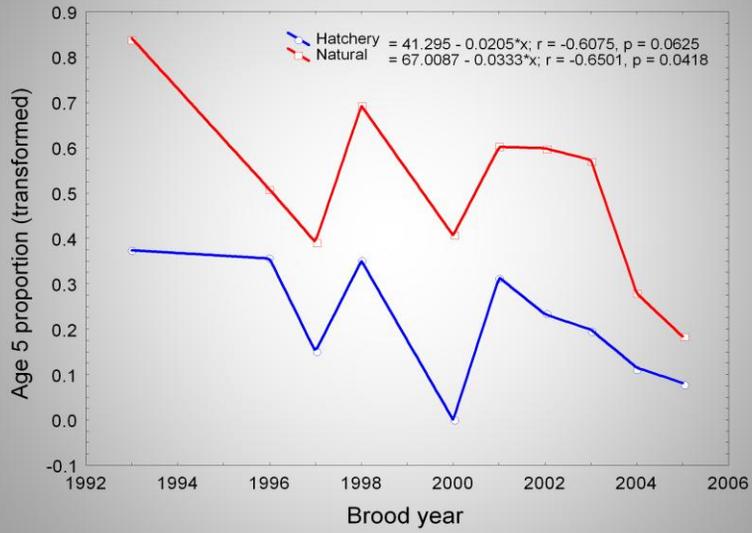
Comparison of methodology



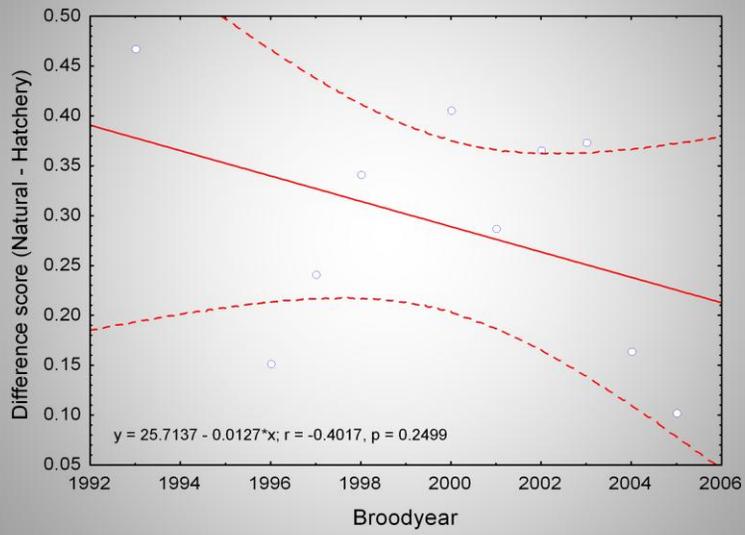
Male Age-3 Composition

- Carcasses
 - Mean hatchery (28%) greater than natural (7%)
 - Correct for bias to obtain accurate rates
- Method for hatchery fish
 - Carcasses (28%) greater than CWT (11%)
 - Harvest rates influence the proportion of age 3 males on the spawning grounds
- Proportion age 3 males is increasing in both hatchery and natural fish
- Rate of increase is not equal (i.e., hatchery fish at faster rate)

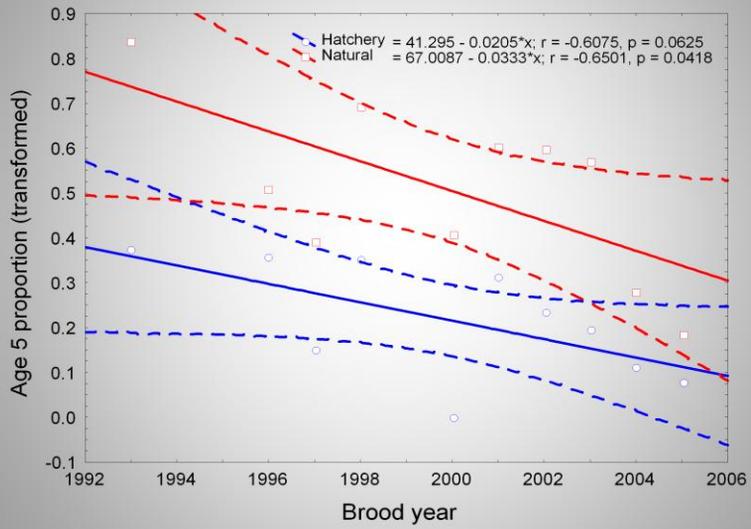
LOWESS Regression



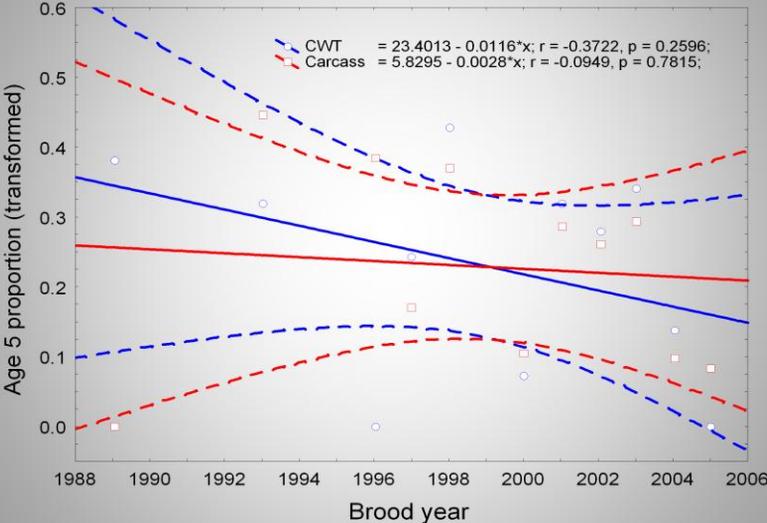
Trend in Difference



Linear regression

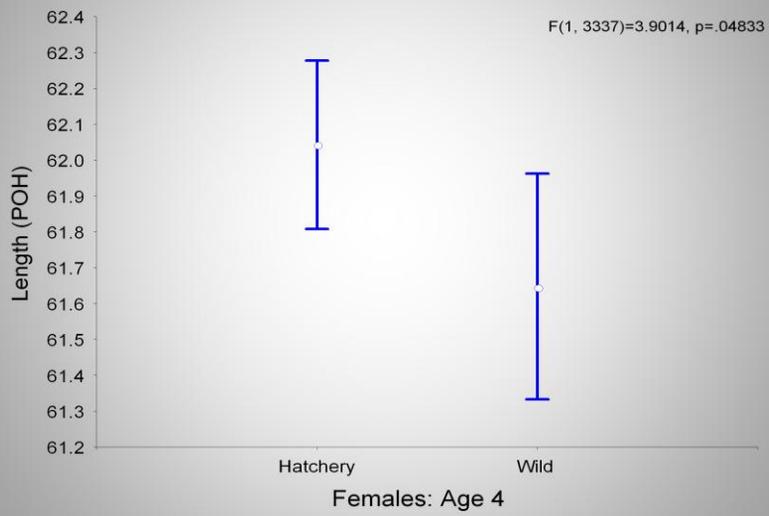


Comparison of methodology

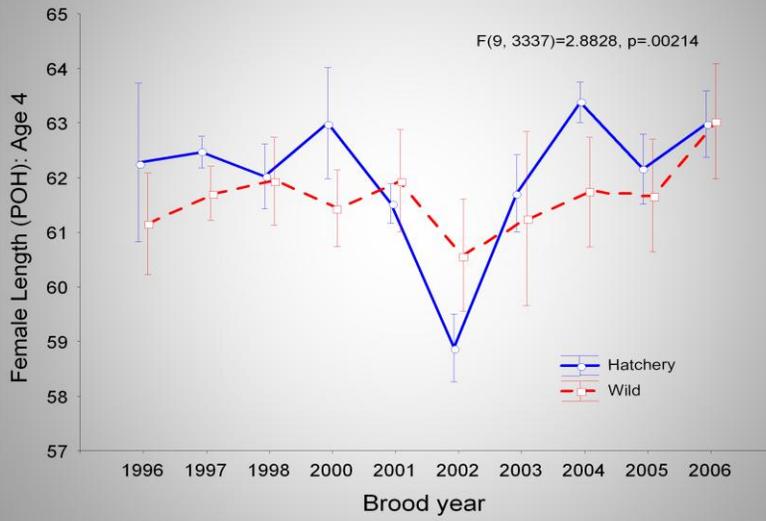


Size at age comparisons
(Age 4, male and females
separately)

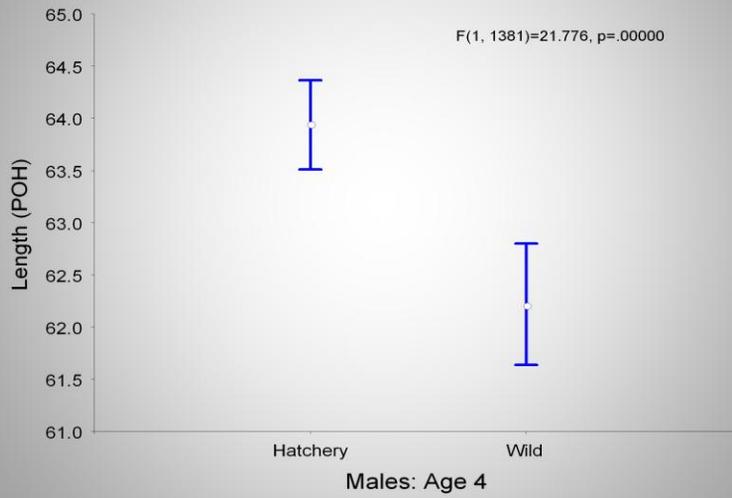
Female size-at-age by origin



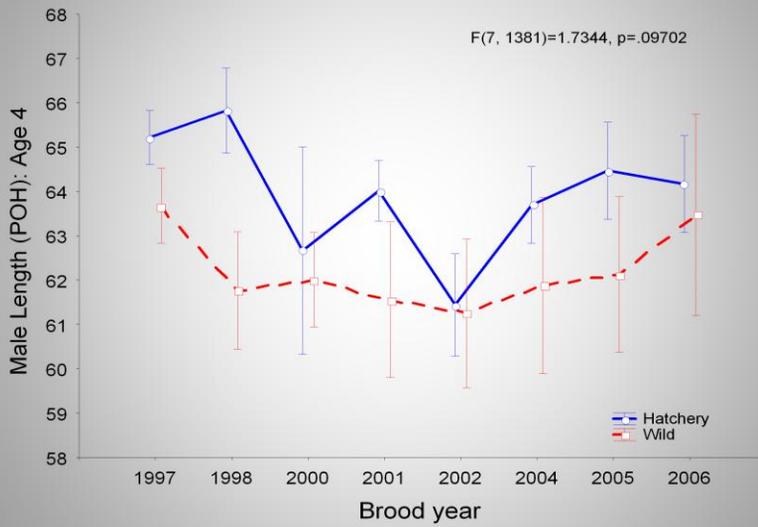
Female size-at-age by origin



Male size-at-age by origin



Male size-at-age by origin



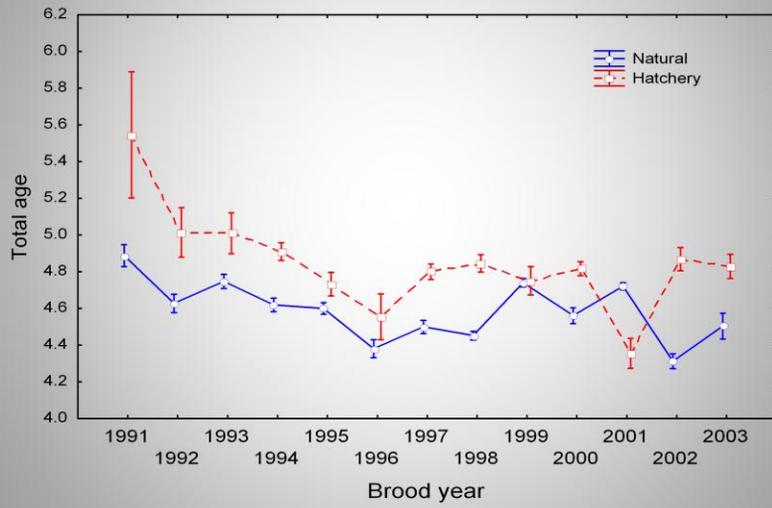
Spring Chinook Summary

- Mean age of natural fish is greater than hatchery fish
- Mean age is decreasing, slightly faster rate of decline for natural fish
- Hatchery fish have a greater proportion of age 3 males than natural fish
- Proportion of age 3 males is increasing, but hatchery fish at a higher rate
- Natural females have a greater proportion of age 5 than hatchery females
- Proportion of natural age 5 females is decreasing
- Hatchery fish larger at age 4 than natural fish, no clear trends over time.
- No clear relationships between proportion of jacks and size at release, SAR, % HOB, %HOS or % age 3 spawners.

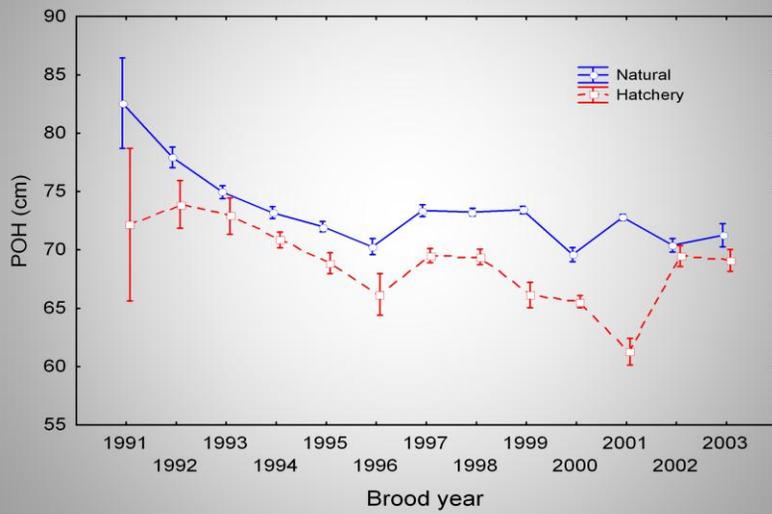
Summer Chinook

- Wenatchee
 - Wild broodstock (pHOS = 0.24)
- Okanogan
 - Mixed broodstock (pHOS = 0.48)
- Diverse juvenile life history
 - Ocean type
 - Reservoir reared type
 - Stream type
 - Factors influencing juvenile life history unknown
- Focus on trends of hatchery and natural by population
- Trends among natural population for possible hatchery influence

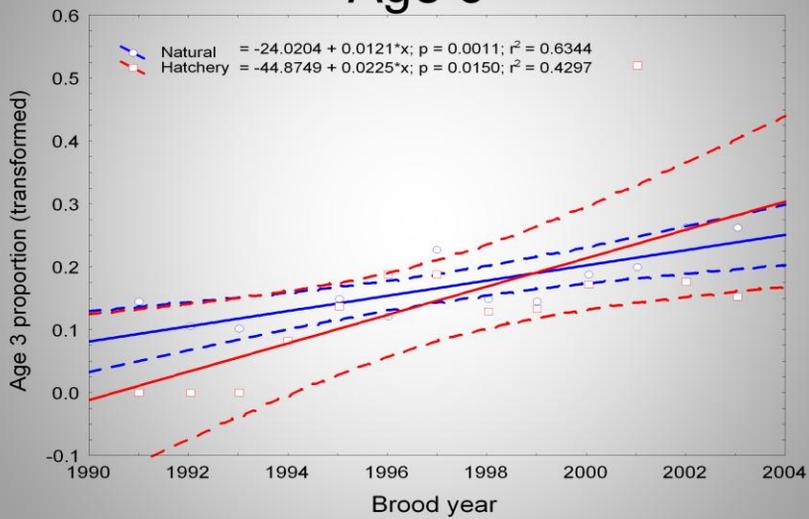
Wenatchee Summer Chinook Mean Age



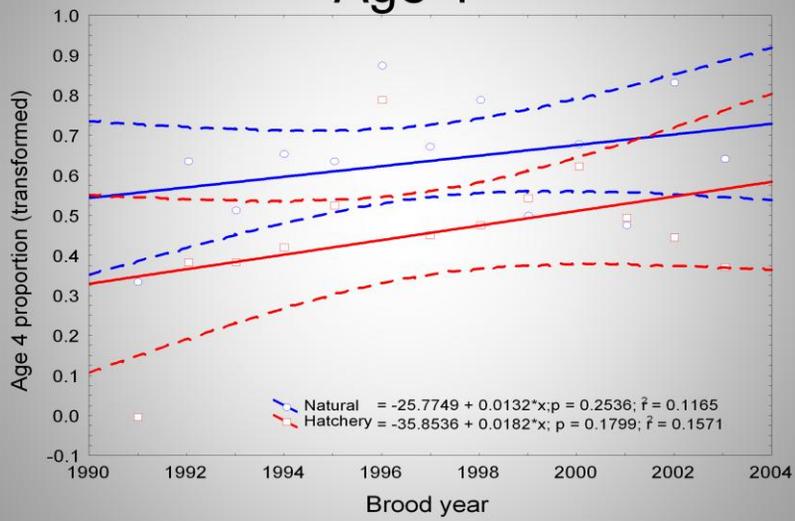
Wenatchee Summer Chinook Mean Size



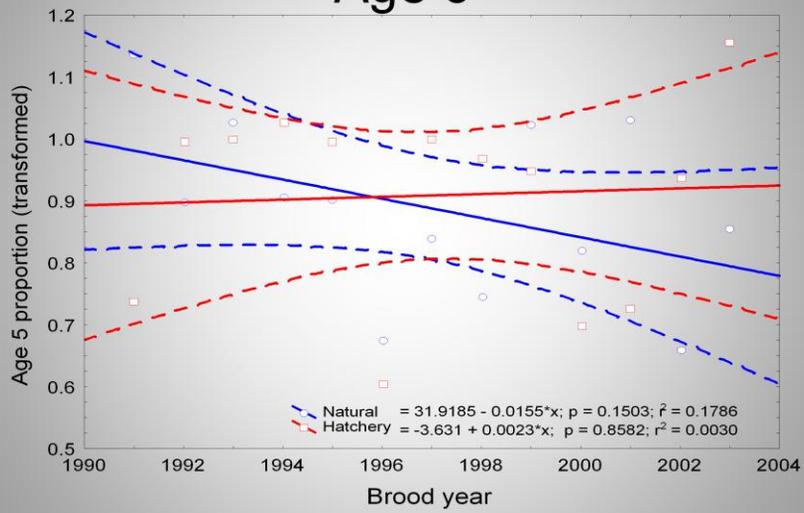
Wenatchee Summer Chinook Age 3



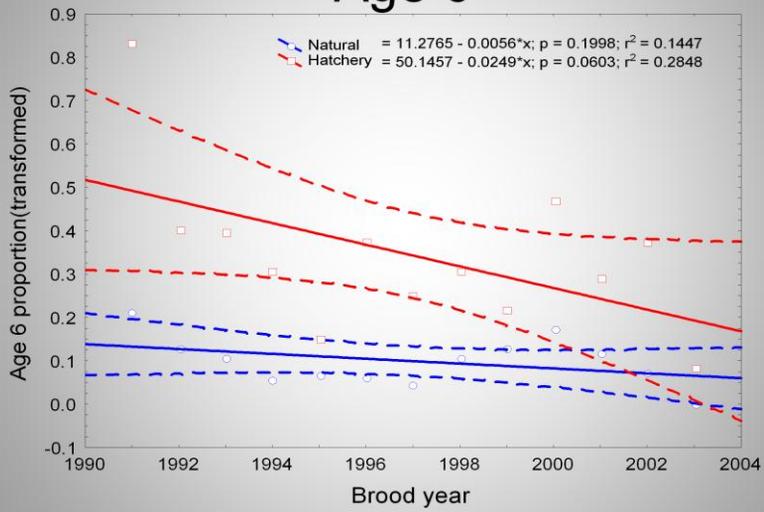
Wenatchee Summer Chinook Age 4



Wenatchee Summer Chinook Age 5



Wenatchee Summer Chinook Age 6



Wenatchee Summer Chinook Summary

- Proportion of age 3 and age 4 may be increasing
- Proportion of age 5 and age 6 may be decreasing
- Maybe be still too early to tell
- Variation in juvenile life history types across years complicates analysis

Conclusions

- Hatchery fish are maturing at an earlier age and that trend is increasing.
- Are hatchery fish influencing natural fish?
 - Lack of data in pre-supplementation period is problematic
 - Data are needed from unsupplemented populations
 - What data should we use and do we need to correct for any biases?

