# CRITFC Scale Ageing Program

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# History-Sampling

- Began with construction of Bonneville Dam Adult Fish Facility in 1985.

- Some sockeye and summer Chinook sampled in 1985 and 1986 but began in earnest in 1987.

- Since then we have annually sampled:
  - Sockeye since 1987 (plus upstream sites)
  - Spring Chinook (<June 1 or 16) since 1987
  - Summer Chinook since 1990
  - Fall Chinook (>= August 1) since 1997
  - Steelhead since 2004 (taking over a long-running ODFW program)
  - Coho in 1999-2003

- Typically over 3000 Chinook and ≈1500 sockeye annually

# Scale Ageing

- I started at CRITFC in June, 1987 as a UW research assistant, full time in October 1989
- Scales had been aged when I started, but data not used and I re-aged them and have been doing all ageing since using various microfiche readers.
- Two other people trained in late 1990's and early 2000's but one soon left and another took a different CRITFC position. I've had final say on all ageing.
- Consulted regularly with John Sneva until his "retirement".
- Since late 2000's used PIT tags to corroborate scale ages and, in more recent years, genetics.
- Sockeye scales, and to a lesser extent, Chinook scales have been used in stock composition and growth studies using a microscope system.

# Scale Source

- Mostly Bonneville Dam
  - Not resorbed, good condition
  - Almost all unknown stock from dozens of wild stocks and probably greater than 100 hatchery programs
- Sockeye from upstream locations
- Nez Perce steelhead spawning ground scales
- In the past, Chinook from upstream dams and spawning grounds

# Chinook Ageing Guidelines-Freshwater

1. Time of migration past Bonneville Dam is a strong predictor of freshwater age (spring/summer/fall).

2. Fin clipped spring and summer Chinook are overwhelmingly hatchery fish and hatchery fish are primarily yearling outmigrants.

3. Unclipped summer Chinook last detected in the Snake River are more likely to be yearling outmigrants, while those last detected above Priest Rapids Dam are more likely to be subyearling outmigrants

# Time of migration past Bonneville Dam is a strong predictor of freshwater age.

Percentage of the Chinook salmon run at Bonneville Dam which aged as yearling and subyearlings 2003-2012.
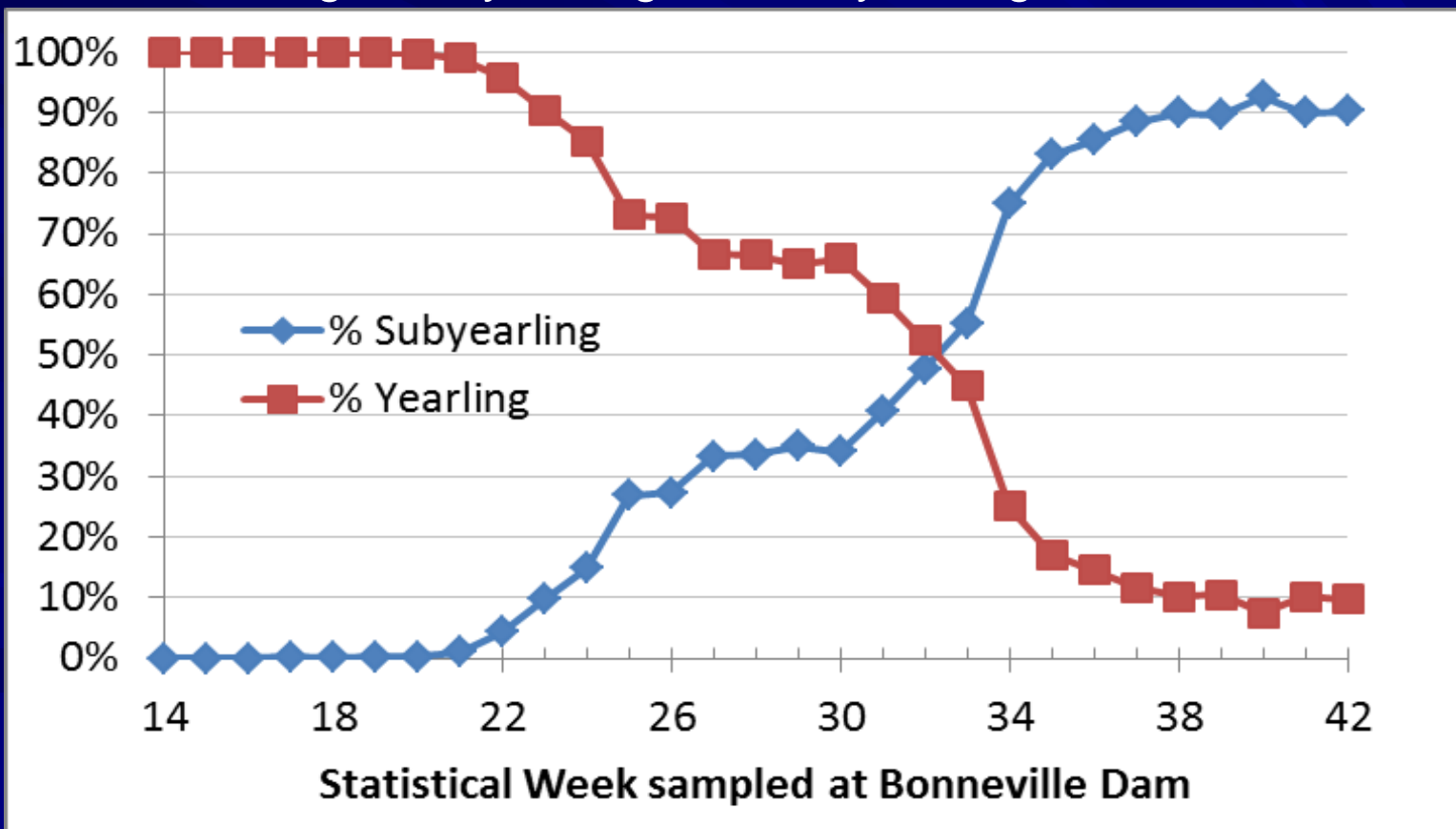
# Time of migration past Bonneville Dam is a strong predictor of freshwater age.

Percentage of fin clipped and unclipped Chinook salmon at Bonneville Dam aged as subyearlings in 2003-2012.
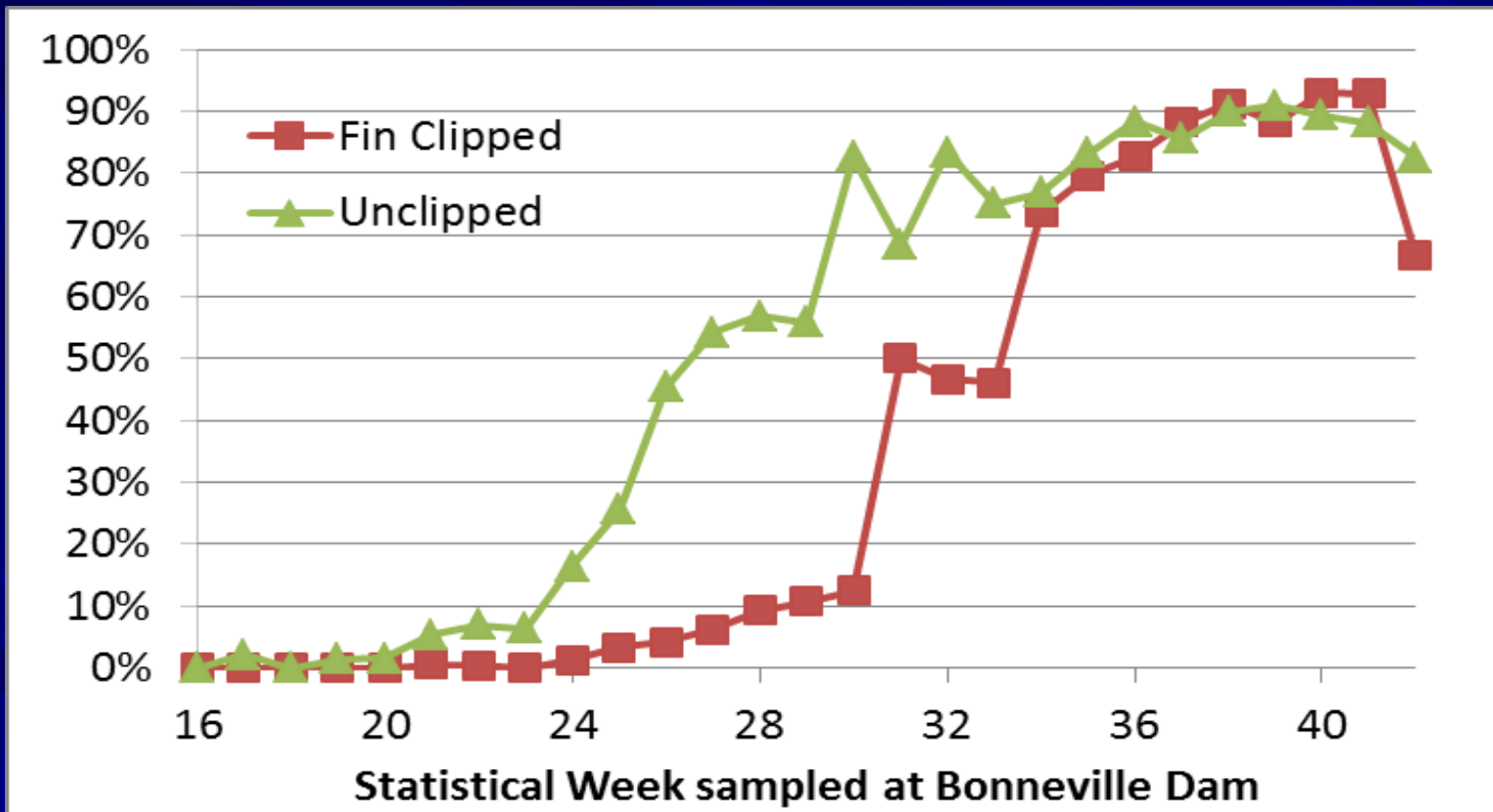
# Chinook Ageing Guidelines-Total Age

4. Length is a generally a strong predictor of age, with some allowance for the time of migration.

5. Coloration (and sex) can be useful in determining whether the last ocean annulus is resorbed.

6. Chinook migrating earlier in the year (April) would be expected to have much less plus growth after the last annulus than those later in the year.

7. Chinook with greater than two ocean annuli tend to have more oval scales and there is much less spacing between annuli than between the first and second annuli.
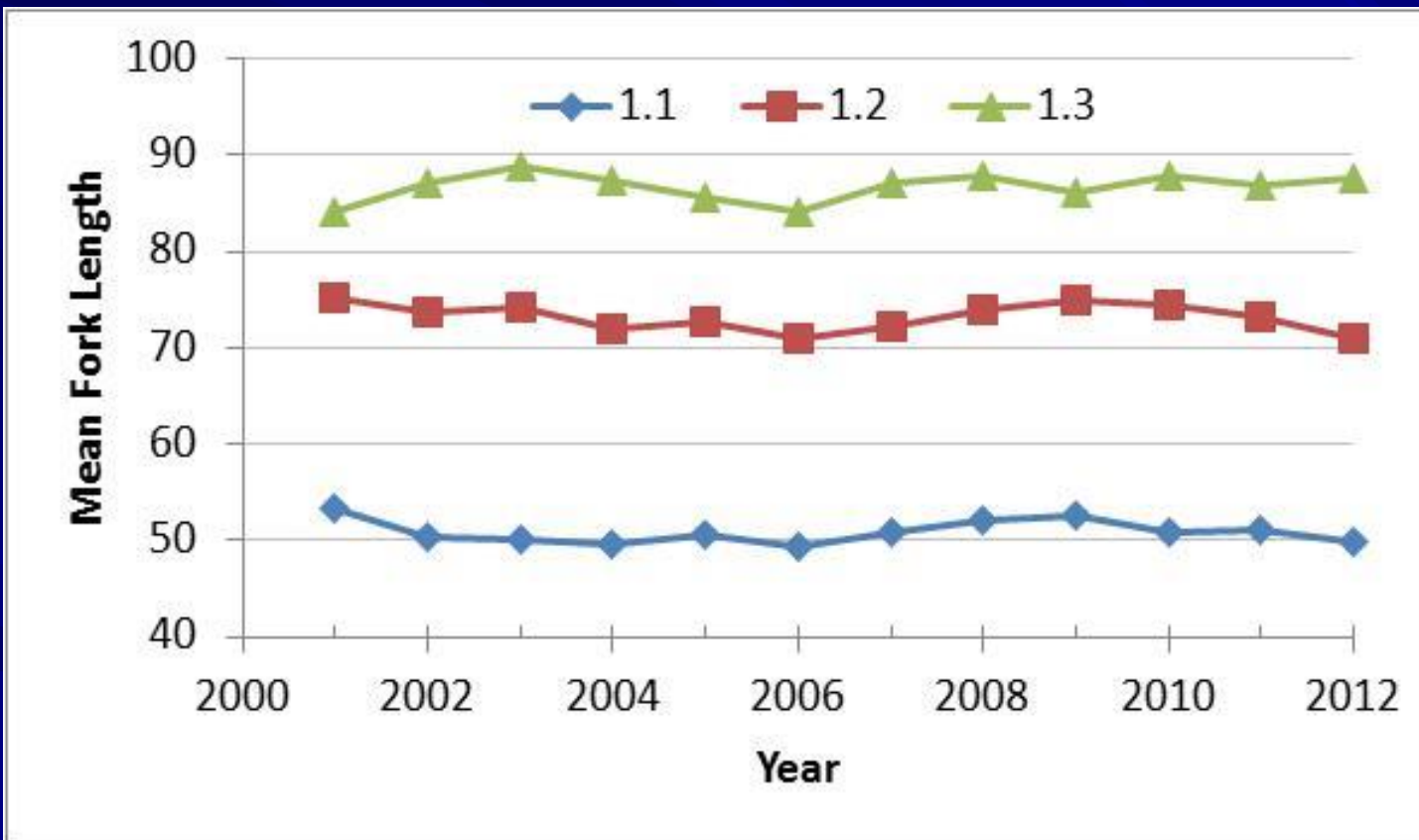
# Length is a strong predictor of age, with some allowance for the time of migration.

Length at age (with 90% c.i.) for spring Chinook sampled at Bonneville Dam 2001-2012
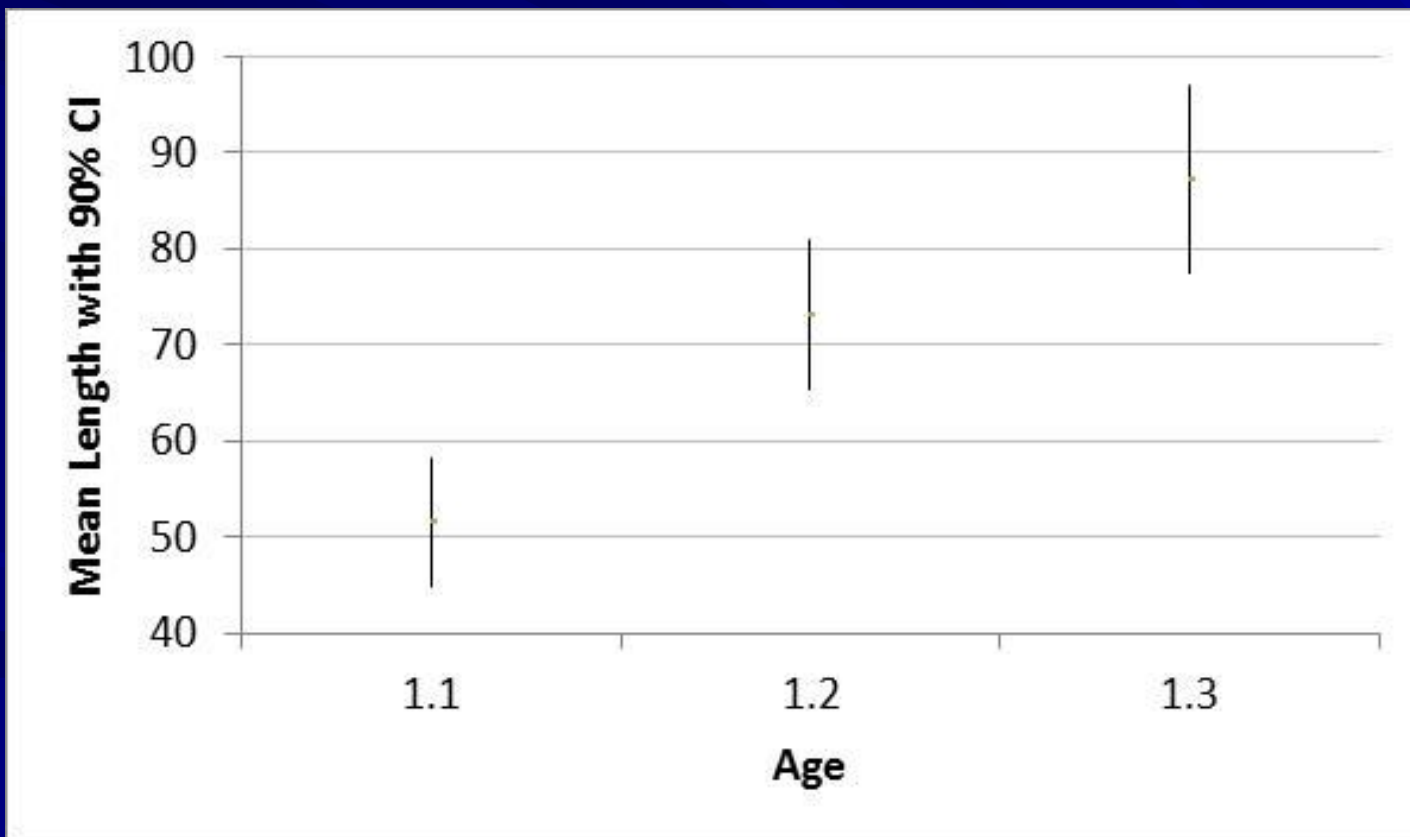
# Length is a strong predictor of age, with some allowance for the time of migration.

Mean length-at-age for spring Chinook sampled at Bonneville Dam by year 2001-2012.

# Length is a strong predictor of age, with some allowance for the time of migration.

Length at age (with 90% c.i.) for summer Chinook sampled at Bonneville Dam 2001-2012
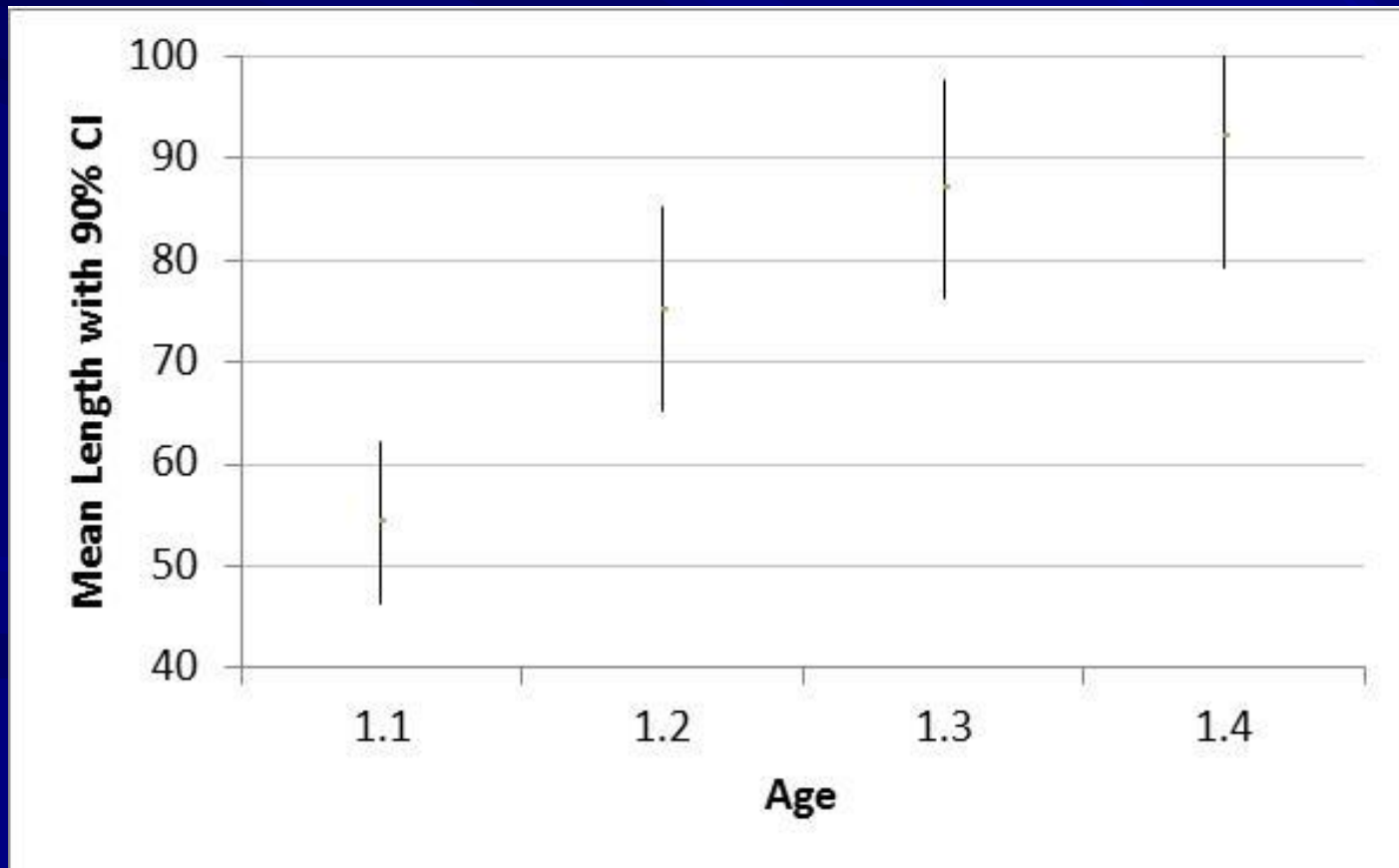
# Chinook Ageing Guidelines-General

8. Age x.0 Chinook are tossed out as minijacks

9. Dark fall Chinook migrating in September and October are referred to in the Columbia Basin as tules and not aged.

10. Lengths that don't match scale ages or scale sizes are corrected (if an error is found or there is video to verify the length), or discarded.

11. Do not assign unusual ages (2.x) or ages that strongly disagree with length and scale size unless the evidence presented by the scale appears overwhelming.

# Post Season Review/Validation

1. Review by others
   a. John Sneva (WDFW) until his "retirement"
   b. 2013 technician at CRITFC being trained
2. Review scales indicated as questionable on first review as well as length-at-age outliers and PIT tag recaps.
3. Compare scale ages with those of PIT tag recaps
4. Compare scale ages with those provided by genetics data (parental based analysis).

# 2013 Accuracy Based on Known Aged PIT tagged Chinook salmon

Spring Chinook:     All 21 correctly aged

Summer Chinook:     All 18 correctly aged

Fall Chinook:       All 8 correctly aged

# 2013 Chinook Ageing Accuracy Based on Genetics (parental based analysis)

| | Genetics (Parental Base Analysis) Total Age | | |
|---|---|---|---|
| **Scale Age** | Age 3 | Age 4 | Age 5 |
| **Age 3** | 250 | 0 | 0 |
| **Age 4** | 6 | 184 | 0 |
| **Age 5** | 0 | 4 | 21 |
| **% Scale age agrees with PTA age** | 97.7% | 97.9% | 100.0% |

**Overall Accuracy:  97.8%**

A few Chinook scale images for which were "wrong" according to genetics data…

April 23, 2013, 1.04, 60 cm.
Aged as 1.2 (4 year old) but genetics says 3 year old.

April 23, 2013, 1.10, 76.5 cm.

Aged as 1.3 (5 year old) but genetics says 4 year old.

May 1, 2013, 2.02, 72 cm.

Aged as 1.2 (4 year old) but genetics says 3 year old.

# Conclusions/challenges

1. Based on PIT tags and genetics "known age" fish, our accuracy is very good.

2. However, this may be inflated by uncertainties in FW/SW ages  (e.g. if PIT/genetics indicated a fish was a three year old, Age 0.2 and 1.1 would both indicate correct ages).   FW/SW age is a key challenge.

3. Accuracy may also be inflated by the fact that most known age Chinook are yearling hatchery Chinook.

4. A challenge is continuing to train (and keep) others to age scales.

5. Then there are steelhead…