

# Utility of Scales to Estimate Age and Growth of Coastal Cutthroat Trout in Isolated Headwater Streams

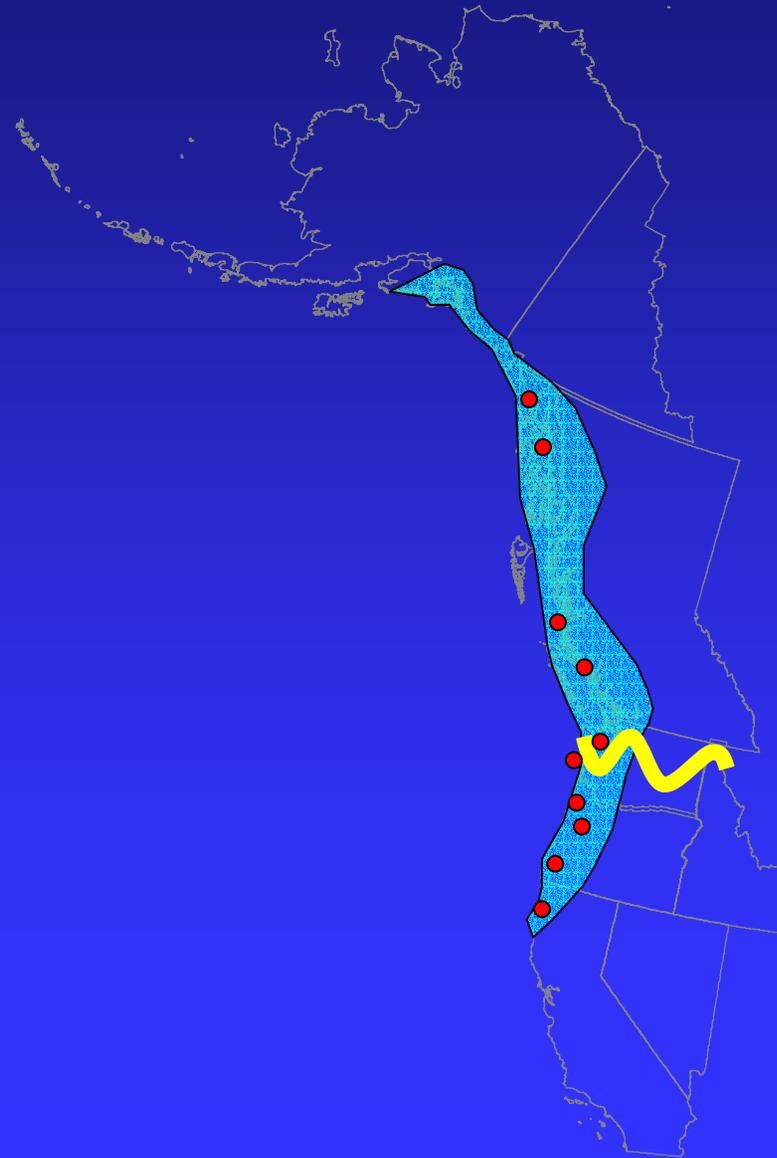
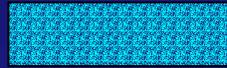


William Rehe<sup>1</sup> and R. E. Gresswell<sup>2</sup>

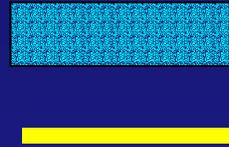
<sup>1</sup>Department of Fisheries and Wildlife, Oregon State University

<sup>2</sup>US Geological Survey, Northern Rocky Mountain Science Center, Bozeman, Montana

Coastal cutthroat trout range  
Glacial extent



Coastal cutthroat trout range  
Glacial extent



Sampling locations



## Third-Order Watersheds with an Isolated Population of Cutthroat by Ecoregion and Geology

● Coast Range Hard

● Coast Range Soft

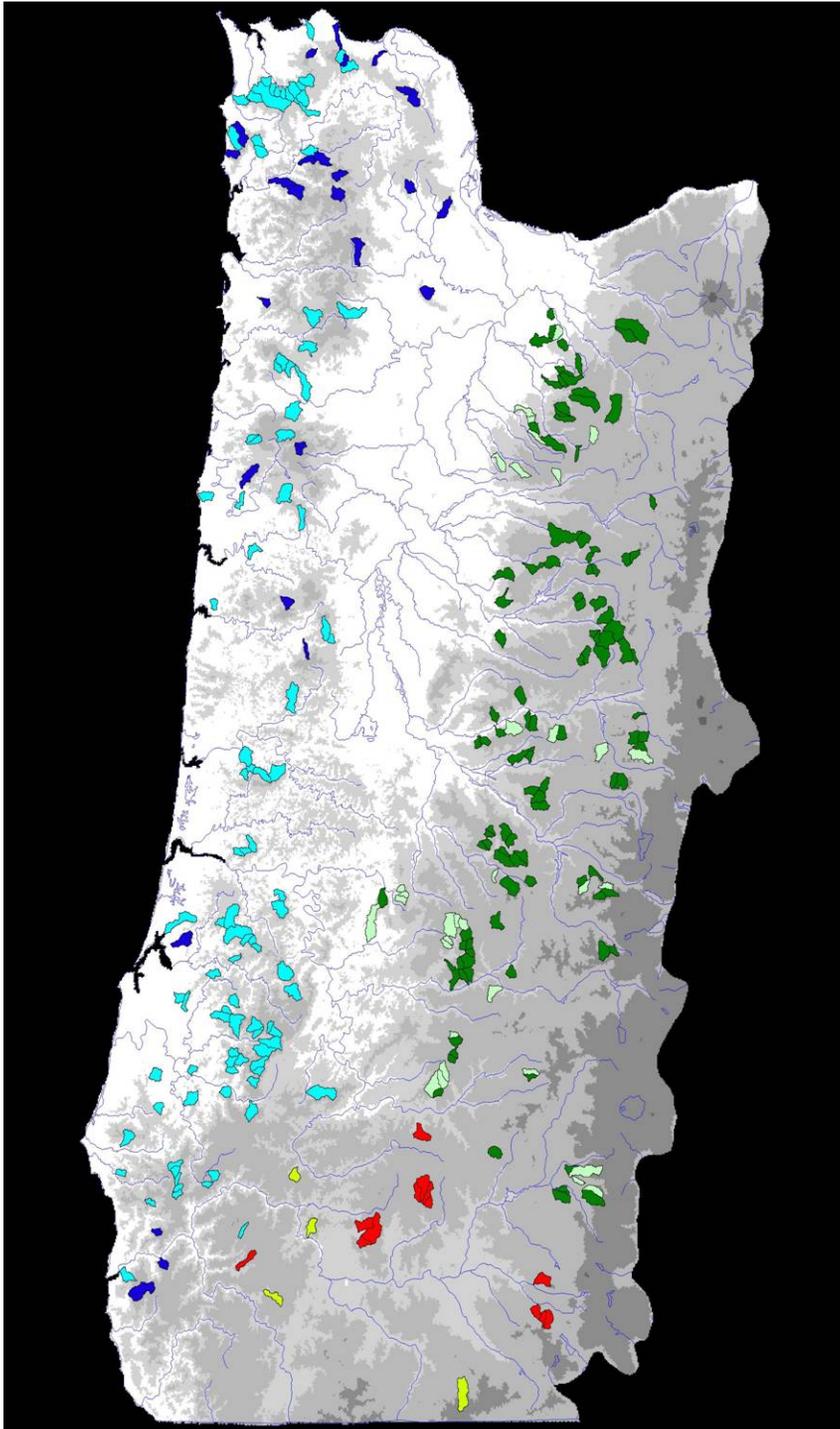
● Cascades Hard

● Cascades Soft

● Klamath Hard

● Klamath Soft

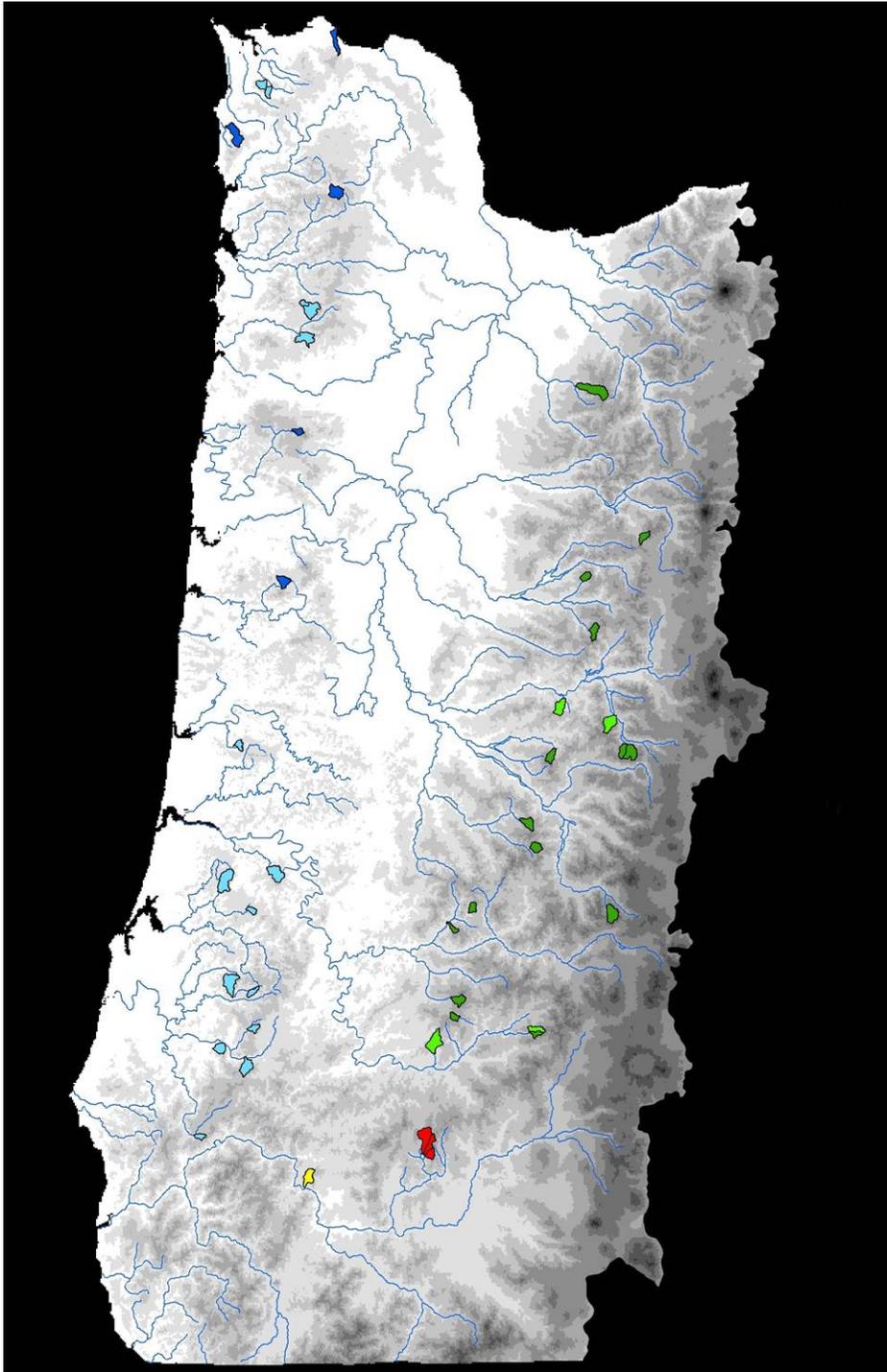
(Gresswell et al. 2004)



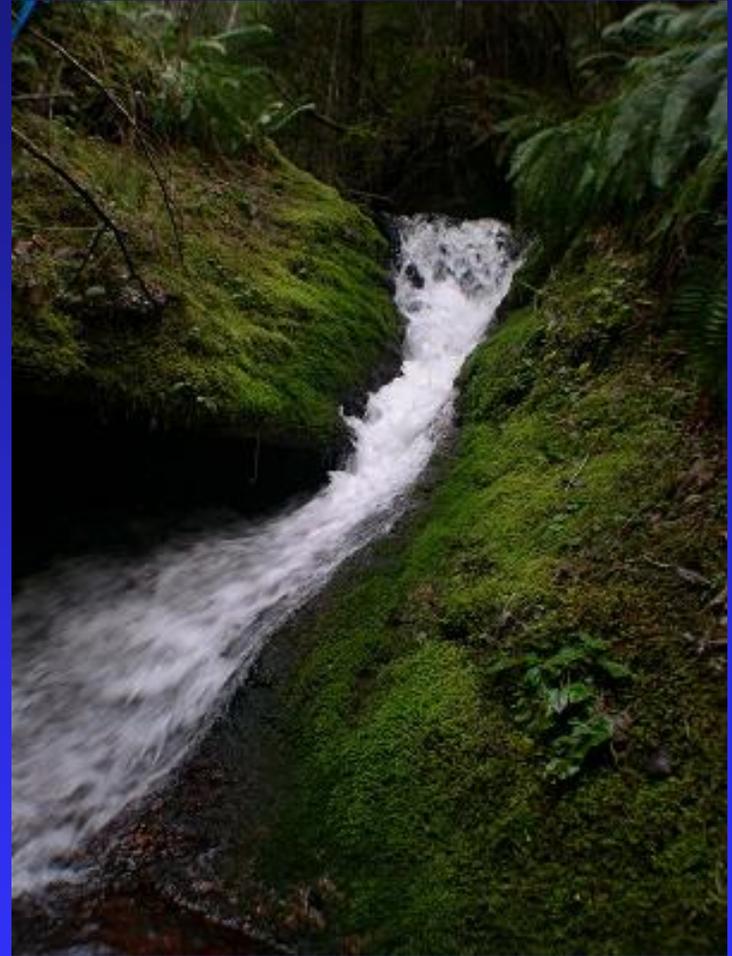
## Distribution of 40 Randomly Selected Third-Order Watersheds

- Coast Range Hard
- Coast Range Soft
- Cascades Hard
- Cascades Soft
- Klamath Hard
- Klamath Soft

(Gresswell et al. 2004)









Deciduous



Conifer



Mixed

# Objectives

- To demonstrate that coastal cutthroat trout in headwater streams can be reliably aged by the scale method
- To describe age and growth structure for headwater streams across western Oregon

# Methods



# Methods



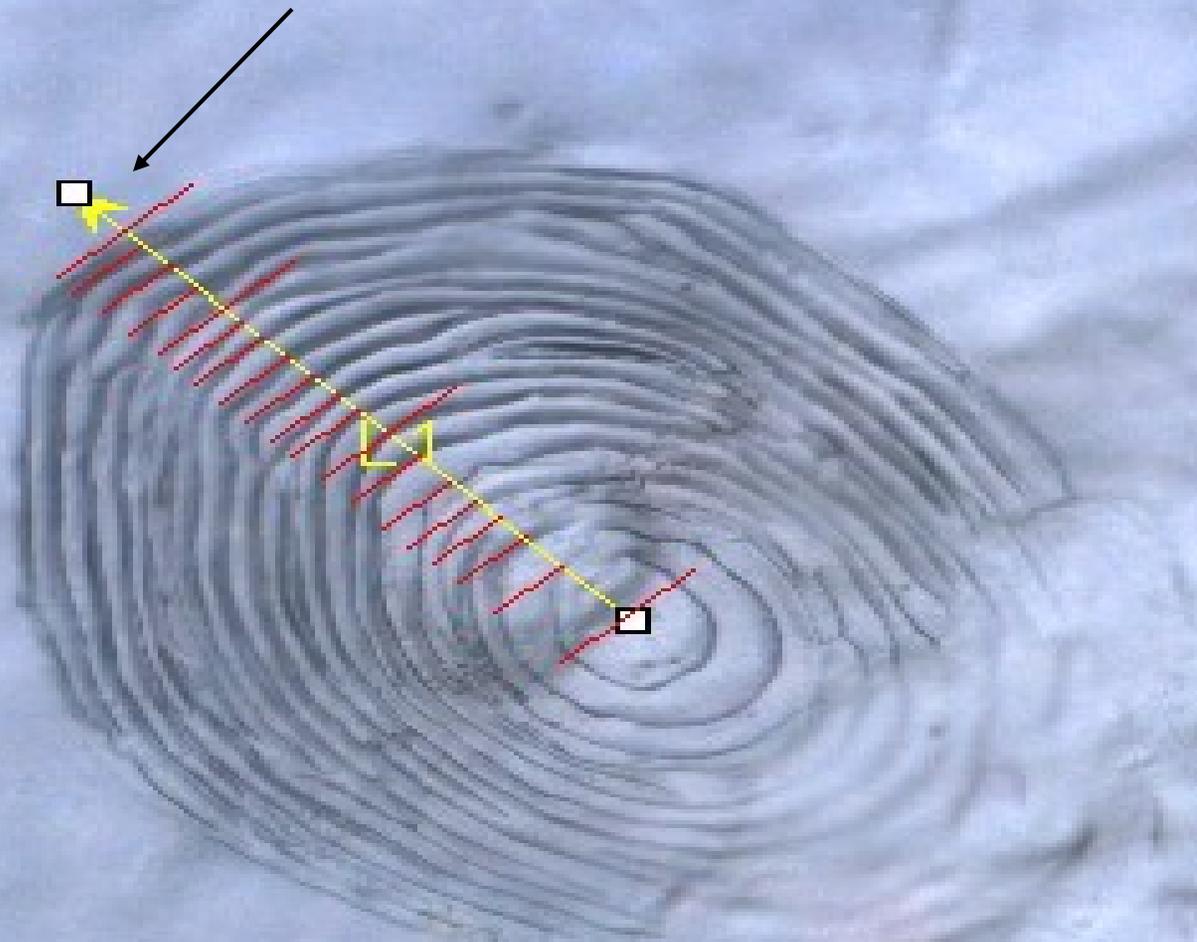
# Methods





Anterior

Reference line



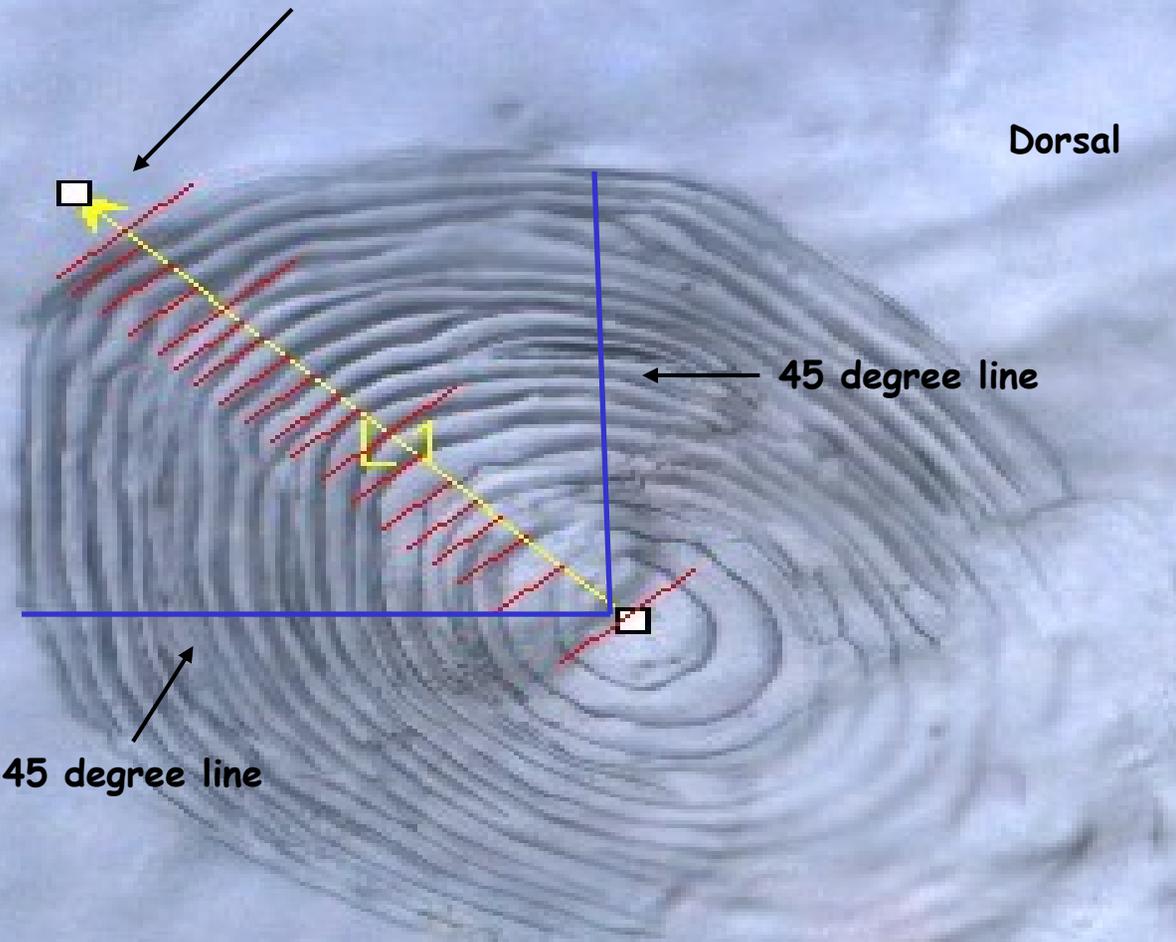
Ventral

Posterior

Anterior

Reference line

Dorsal

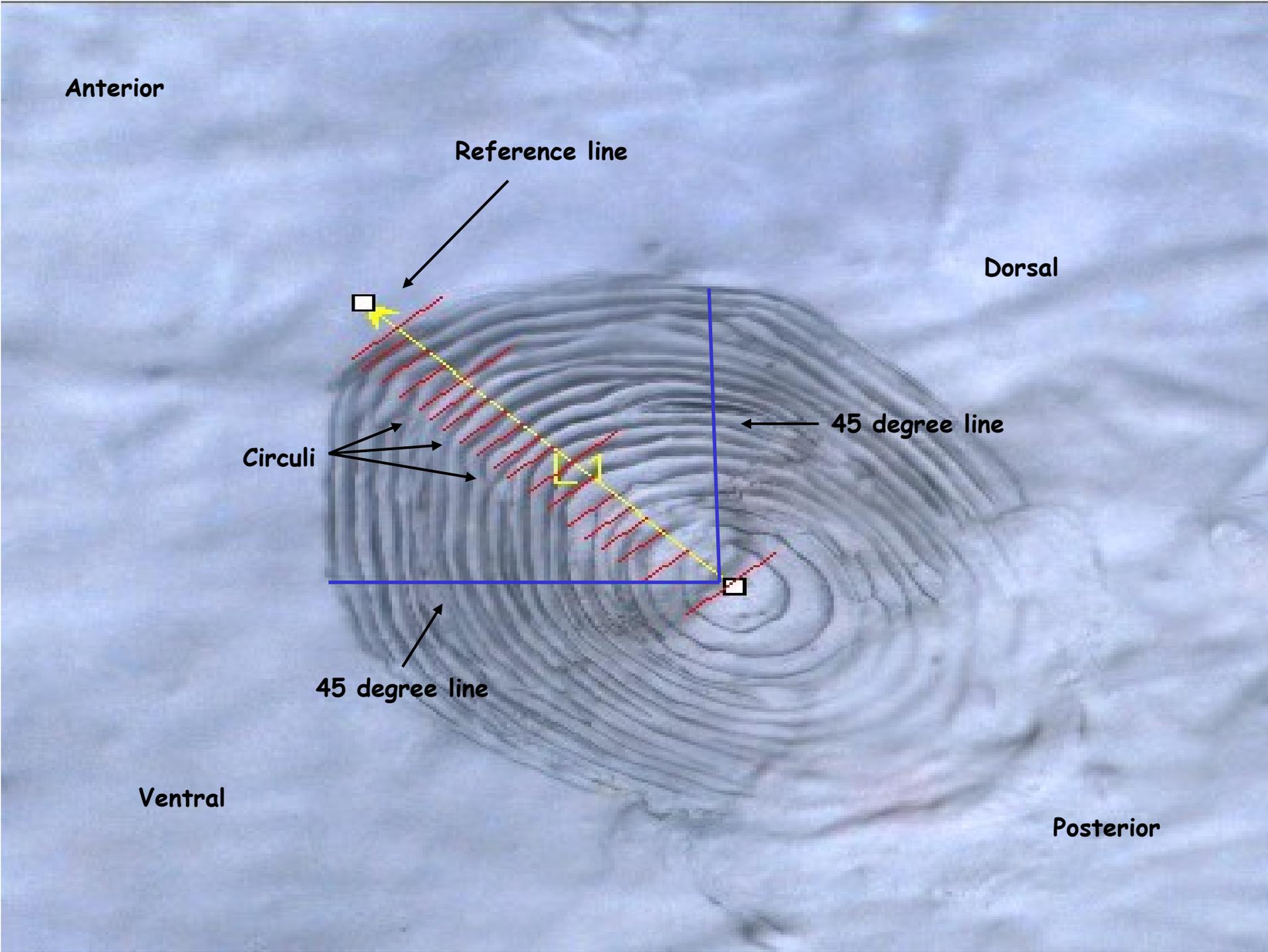


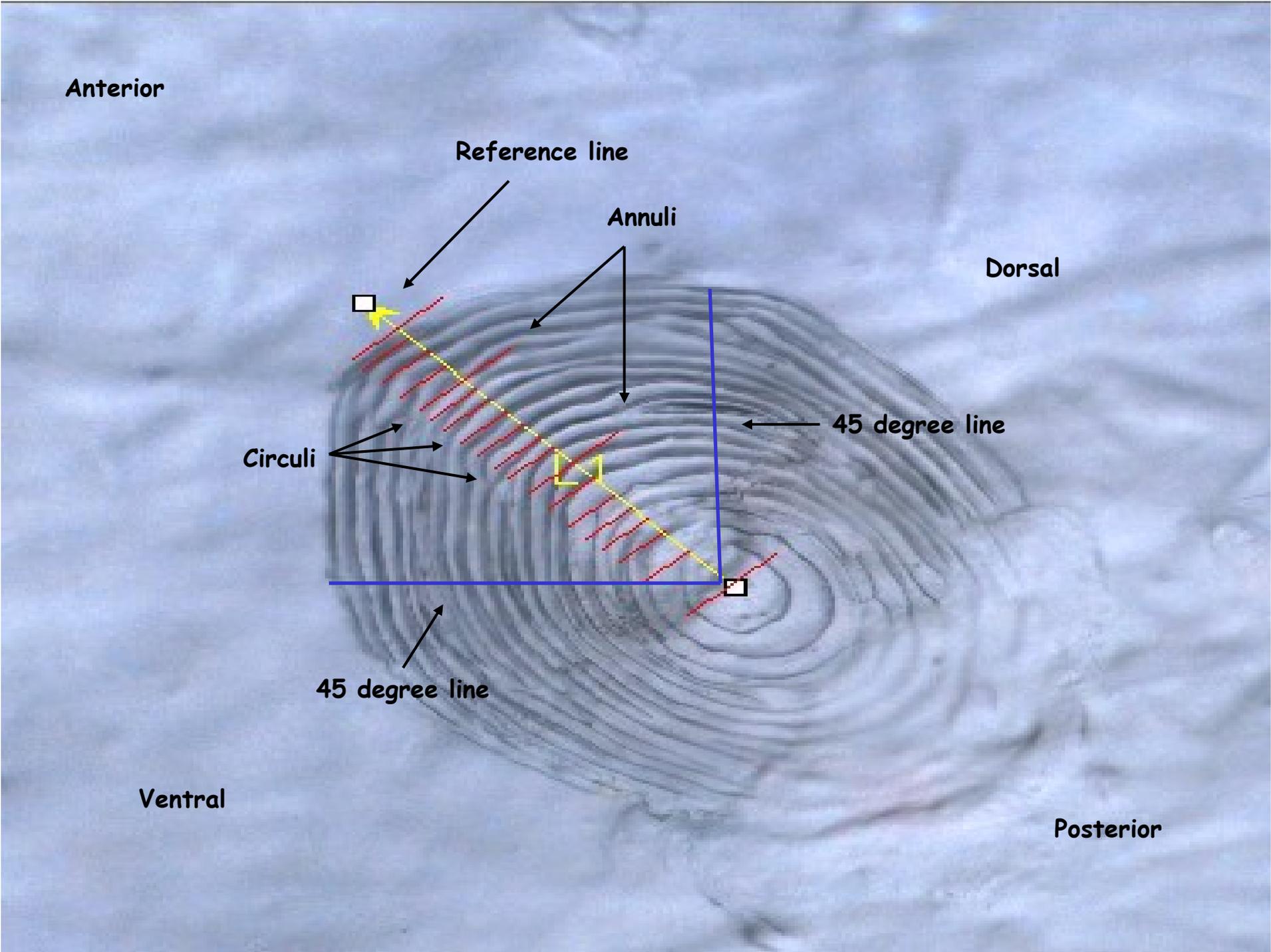
45 degree line

45 degree line

Ventral

Posterior





Anterior

Reference line

Annuli

Dorsal

45 degree line

Circuli

45 degree line

Ventral

Posterior

# Validation and Verification

- *Age Validation*
  - Marked and recaptured fish

# Validation and Verification

- **Age Validation**
  - Marked and recaptured fish
- **Reader precision and bias**
  - Paired scales

# Validation and Verification

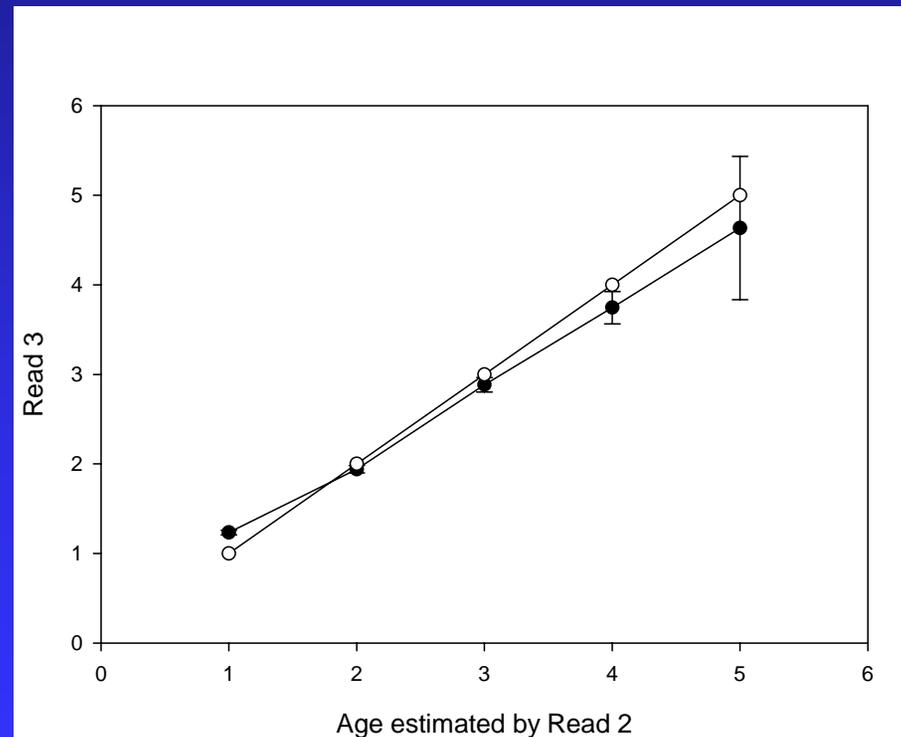
- **Age Validation**
  - Marked and recaptured fish
- **Reader precision and bias**
  - Paired scales
  - Coefficient of variation

# Validation and Verification

- **Age Validation**
  - Marked and recaptured fish
- **Reader precision and bias**
  - Paired scales
  - Coefficient of variation
  - Age frequency tables
  - Age bias plots

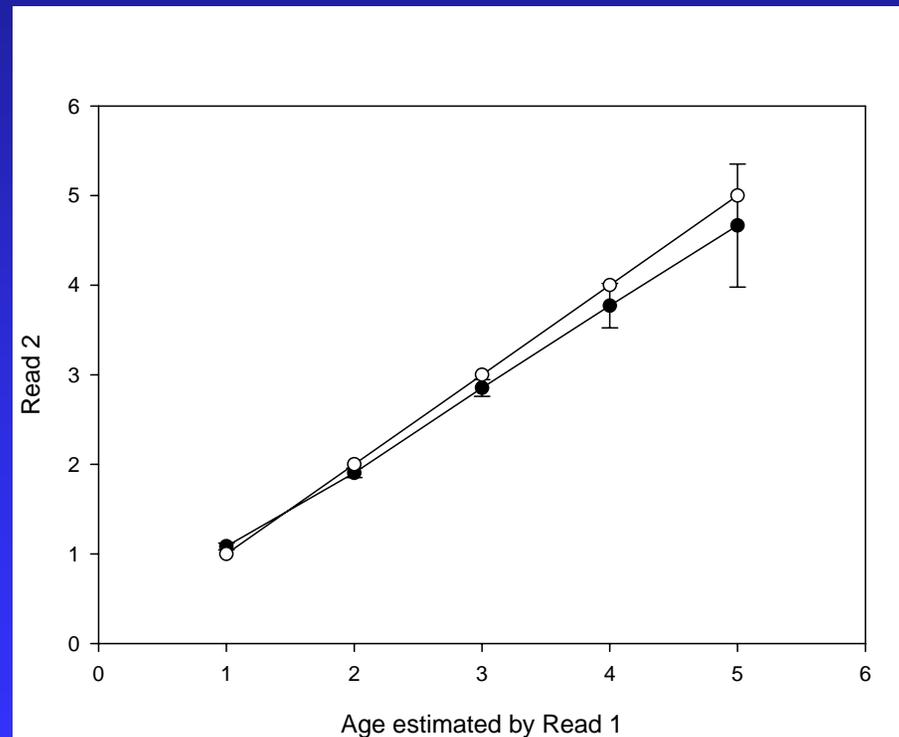
# Validation

# Reader Precision and Bias



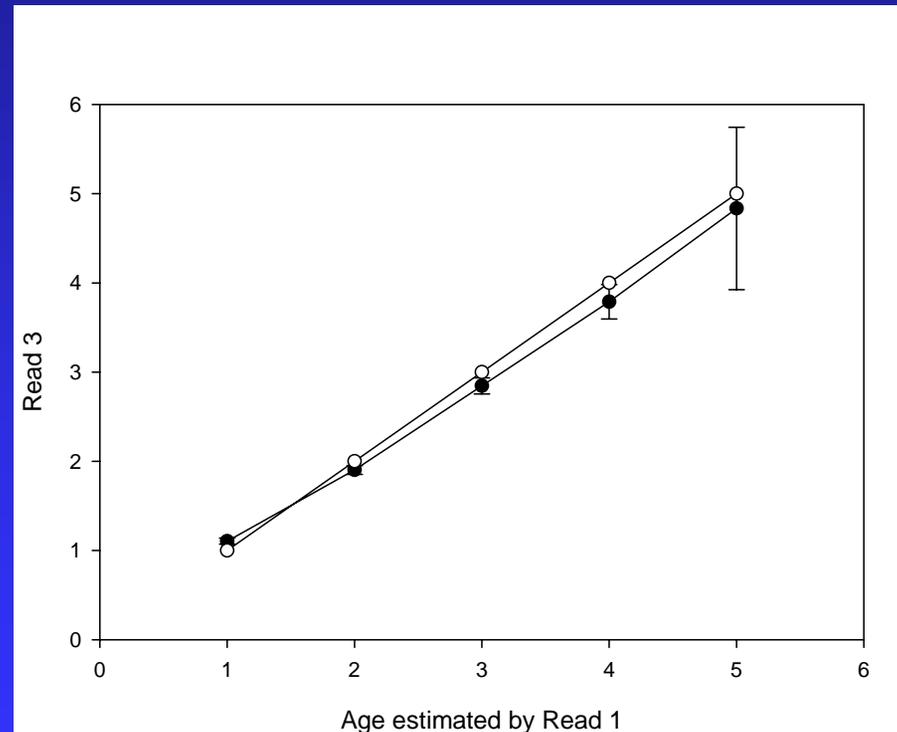
CV% = 5.4

# Reader Precision and Bias



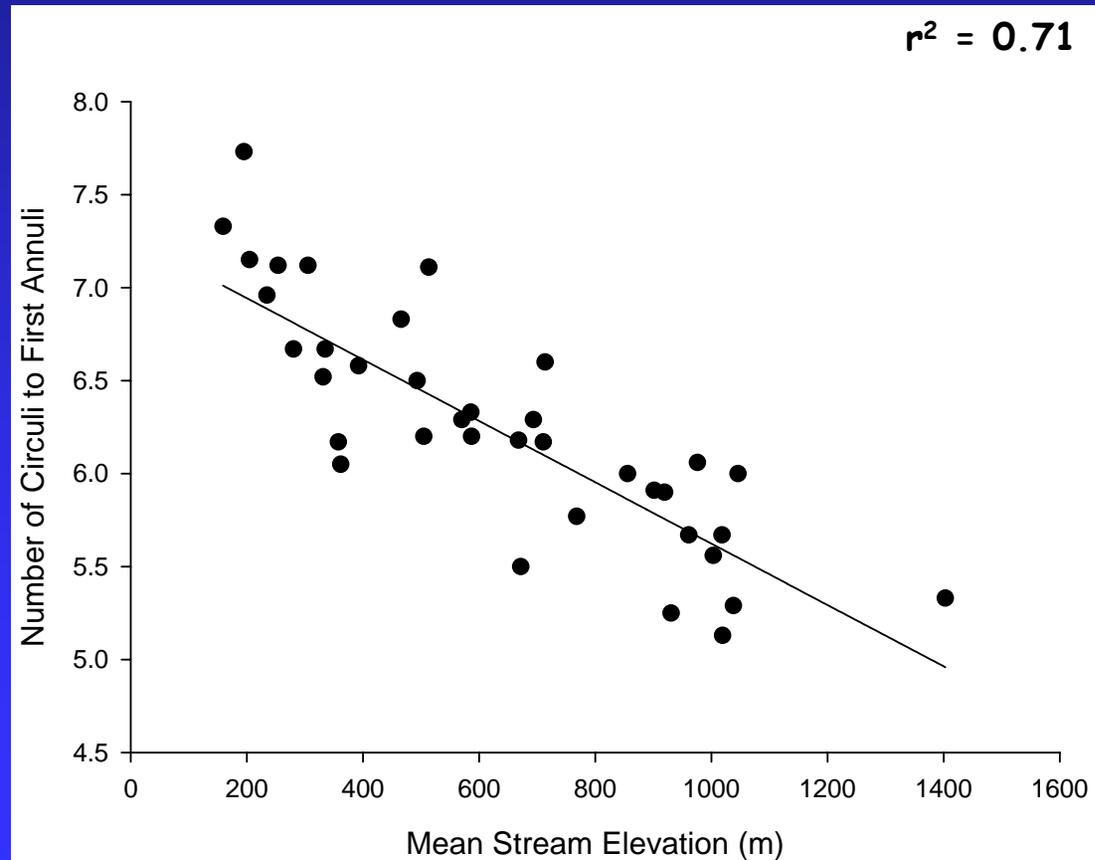
CV% = 4.8

# Reader Precision and Bias

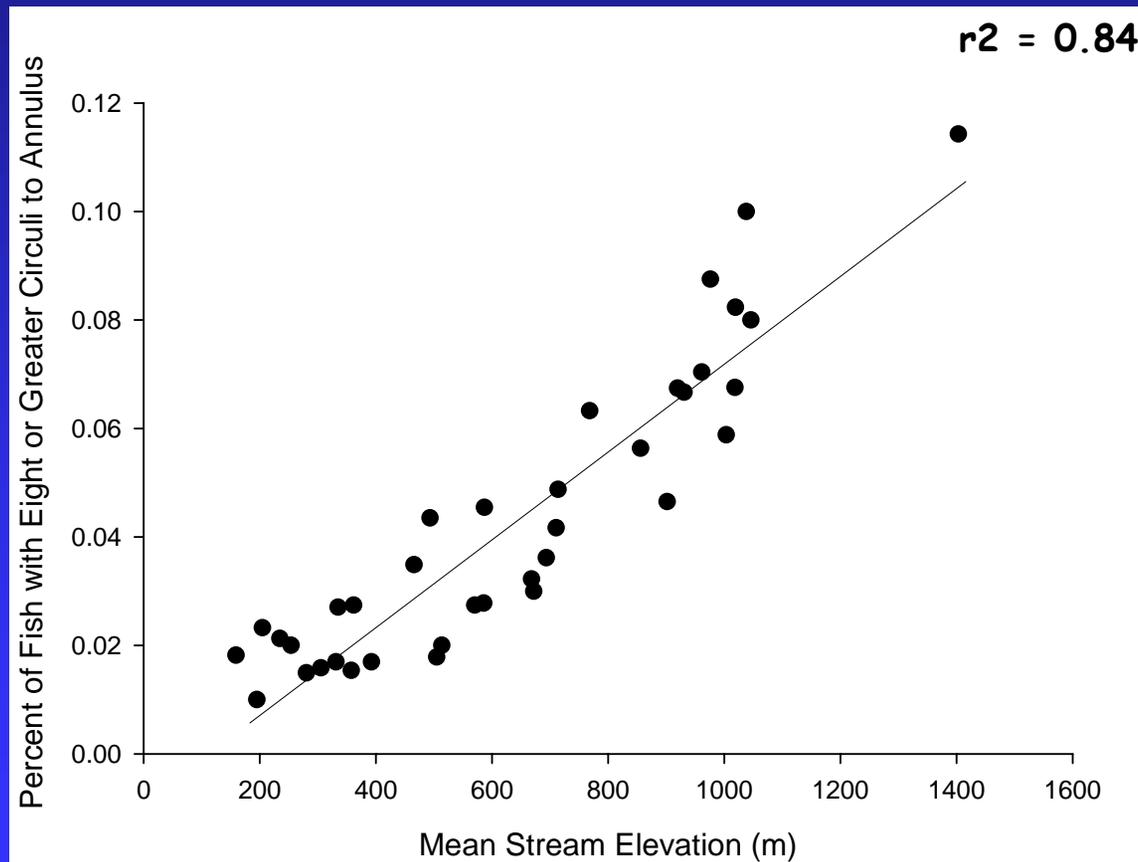


**CV% = 8.3**

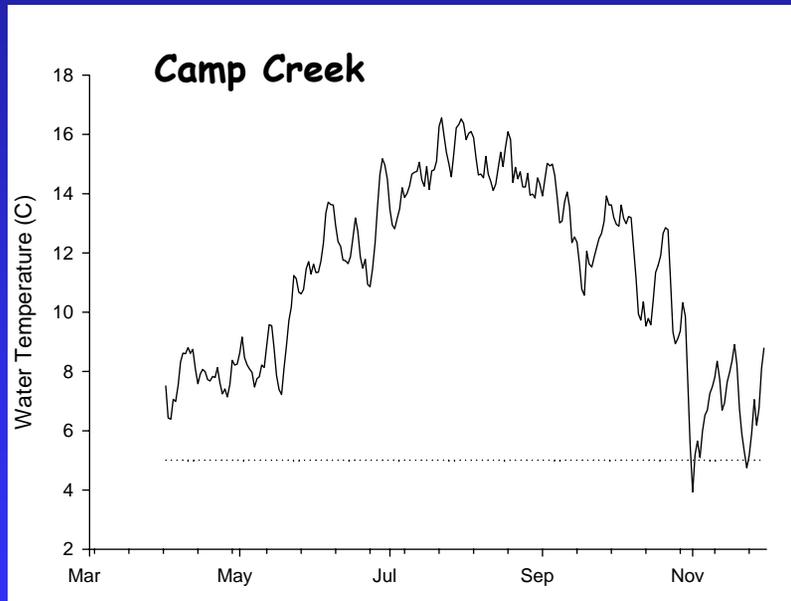
# Circuli to First Annulus



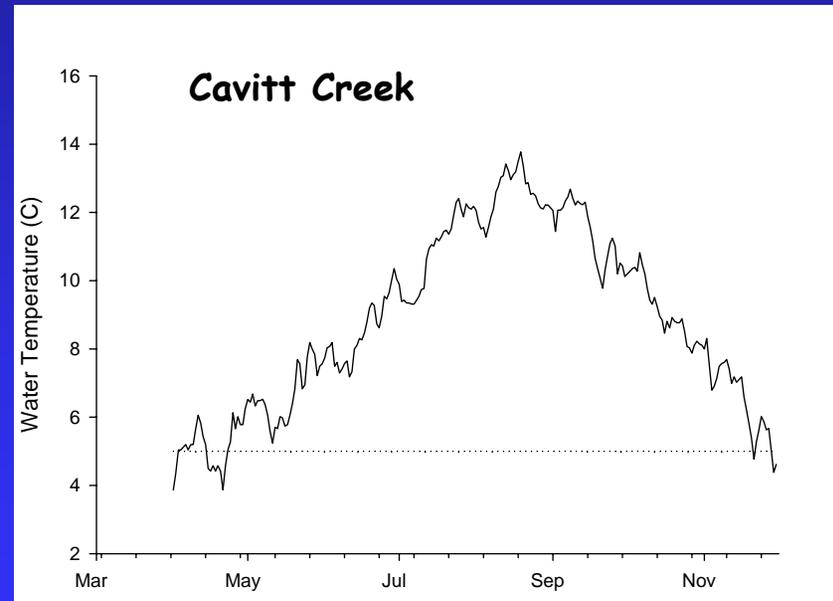
# Circuli to First Annulus



# Degree-days



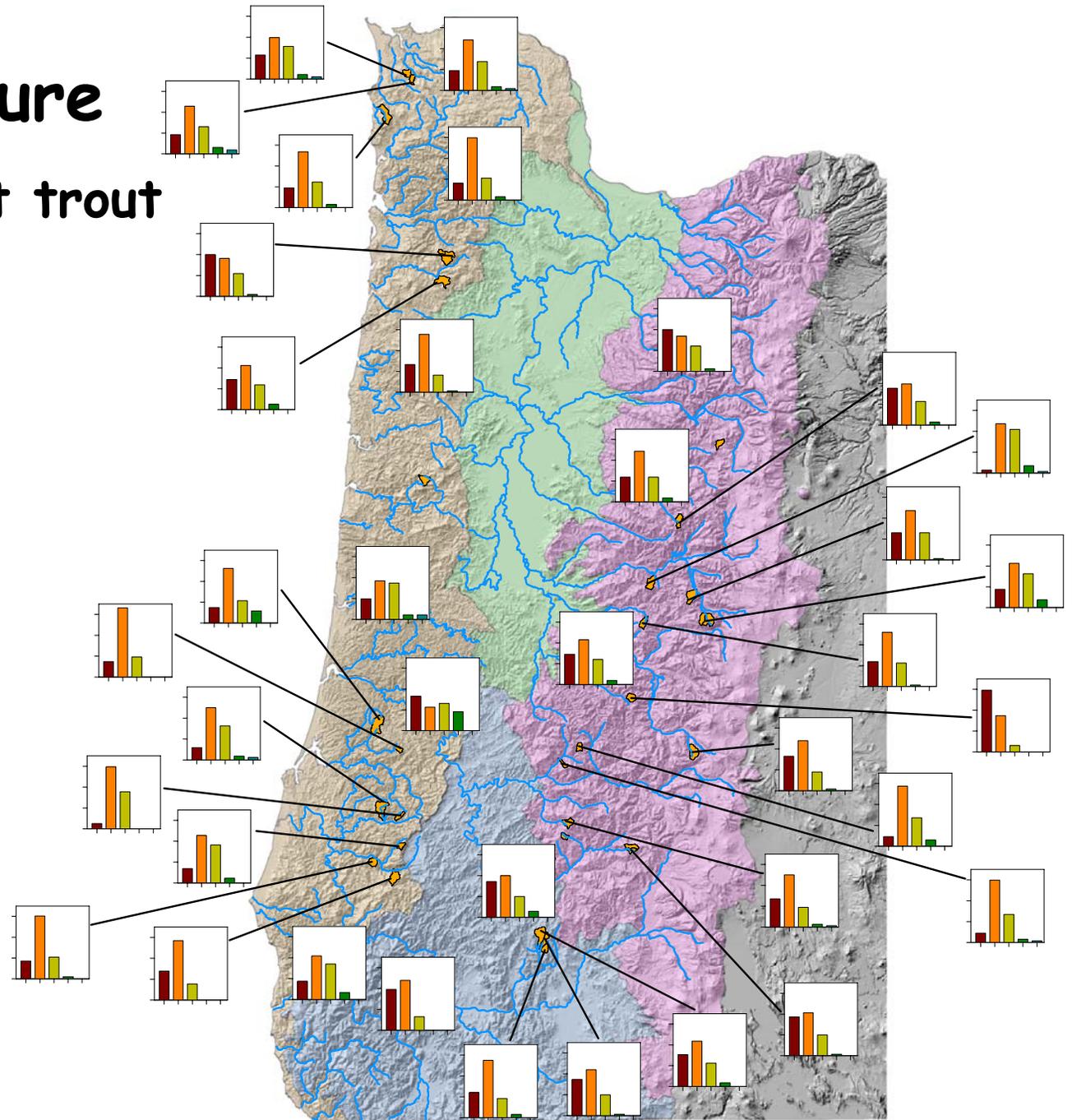
2751



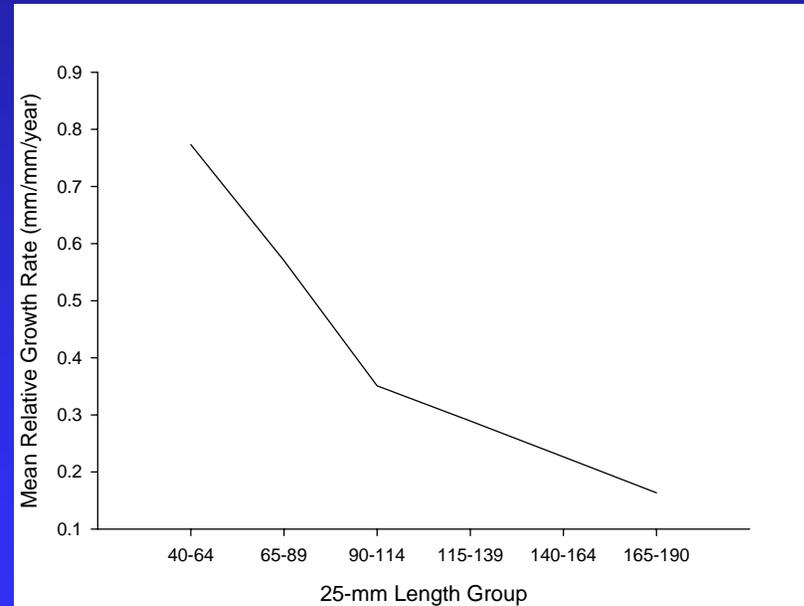
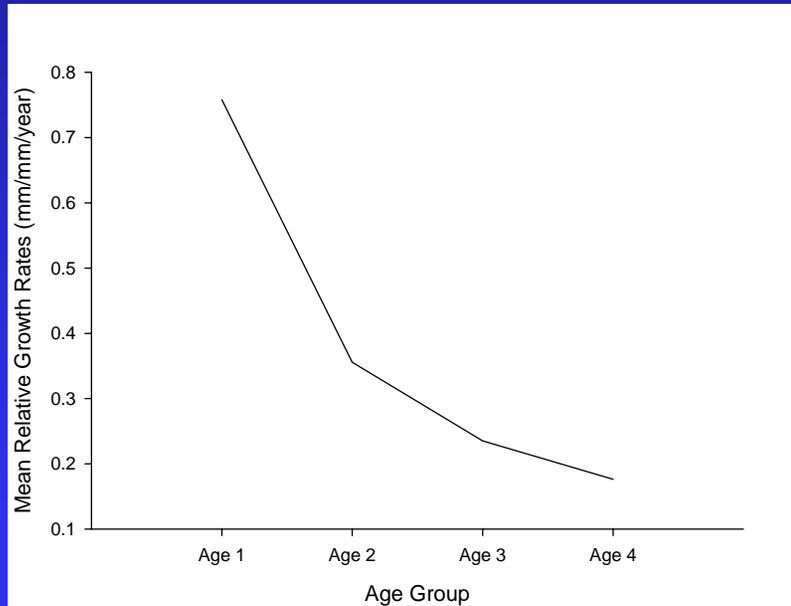
2159

# Age Structure

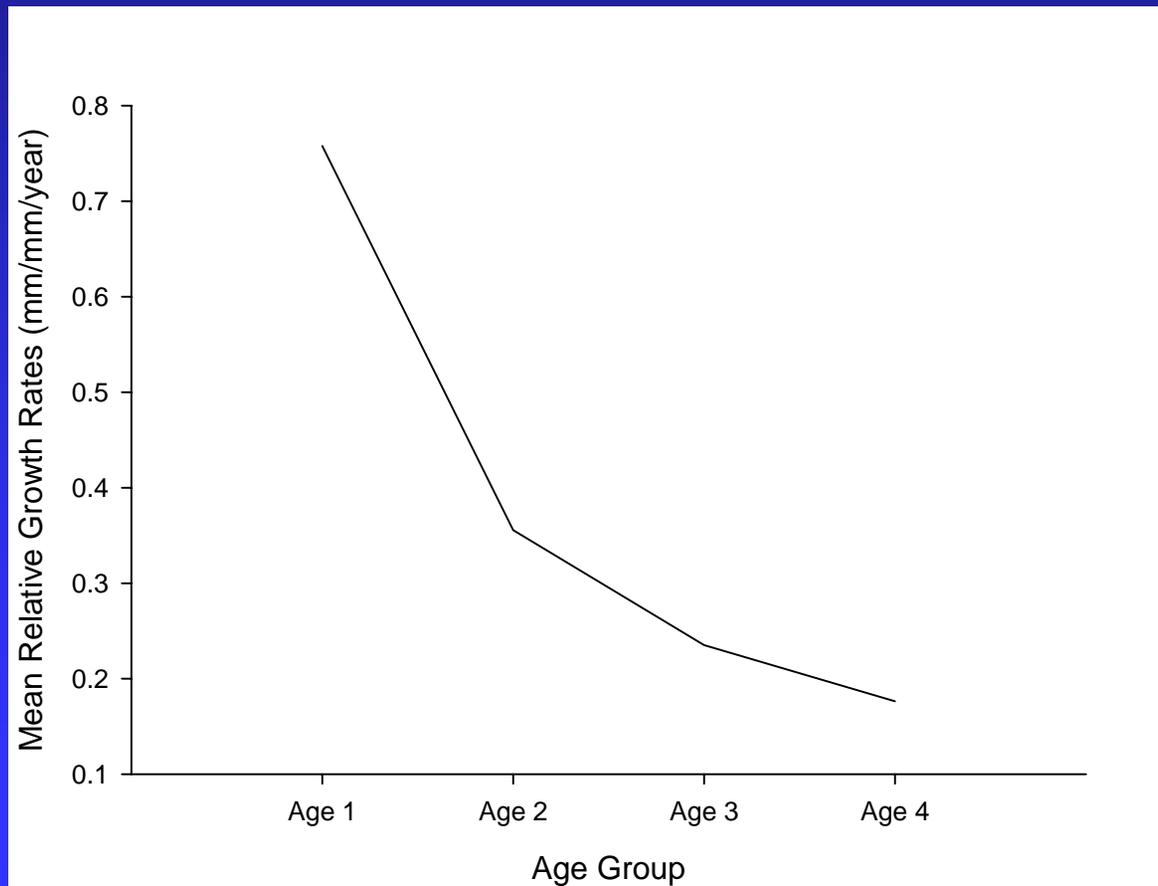
## coastal cutthroat trout



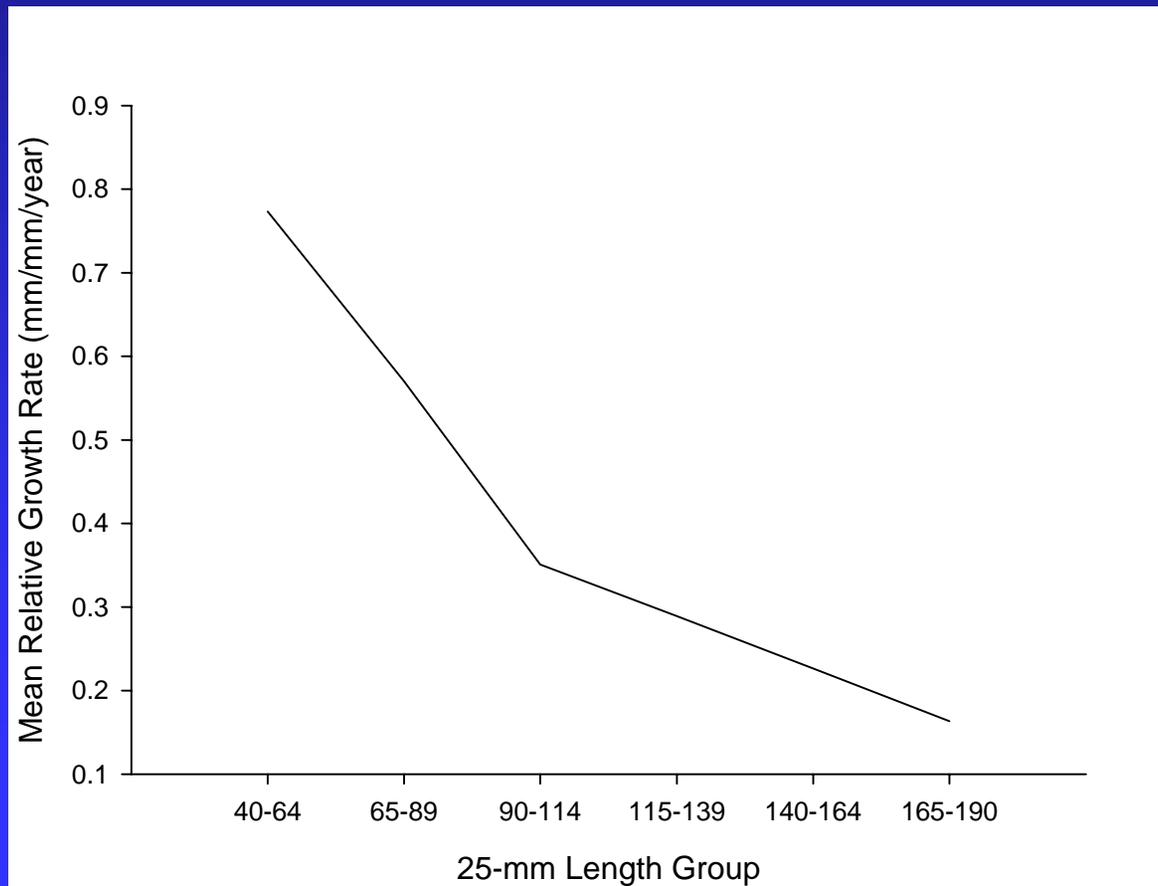
# Relative Growth Rates



# Relative Growth Rate



# Relative Growth Rate



# Study Implications

- Scales are a viable method of age and growth estimation for headwater streams in western Oregon

# Study Implications

- Scales are a viable method of age and growth estimation for headwater streams in western Oregon
- Validation and verification must be integrated in all age and growth studies

# Study Implications

- Scales are a viable method of age and growth estimation for headwater streams in western Oregon
- Validation and verification must be integrated in all age and growth studies
- Degree-days appears to be an accurate indicator of missing first annulus

Thanks to Doug Bateman, David Hockman-Wort, Christian Torgersen, and all the members of the 1999-2001 field crews for all their hard work and support.





C.A.T. 01-00

*O. clarkii*, 210mm, FL.  
CAMP CREEK COASTAL CUTTHROAT

Amelia Gaby Thomas