



# **Age and Growth of *Coregonous kiyi* in Lake Superior**

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# Deepwater Coregonids

- Difficult to identify species
  - Cisco (*Coregonous artedi*)
  - Bloater (*Coregonous hoyi*)
  - Blackfin Cisco (*Coregonous nigrippinis*)
  - Shortjaw Cisco (*Coregonous zenithicus*)
  - **Kiyi (*Coregonous kiyi*)**



# *Coregonous kiyi*

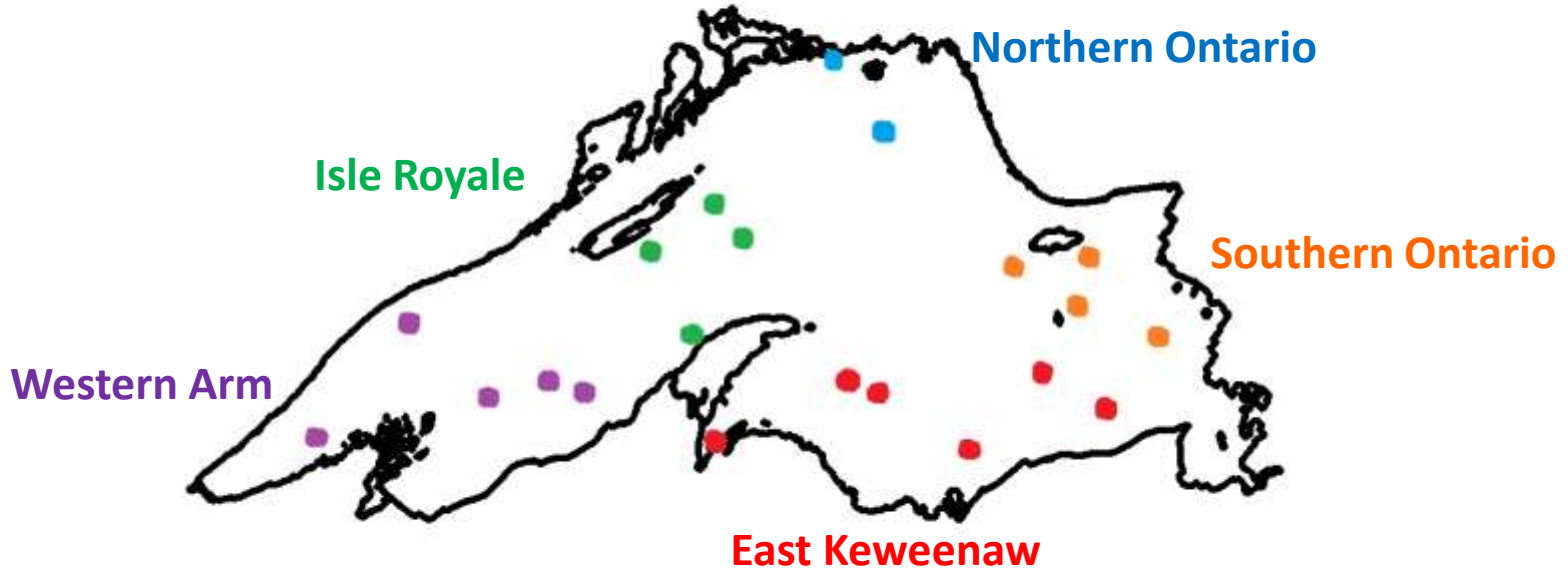


- Smallest of ciscoes
- Historically found in all Great Lakes except Lake Erie
  - Now only in Lake Superior
- Inhabit deep (>100m) waters
- Only scale-derived ages published

# Objectives

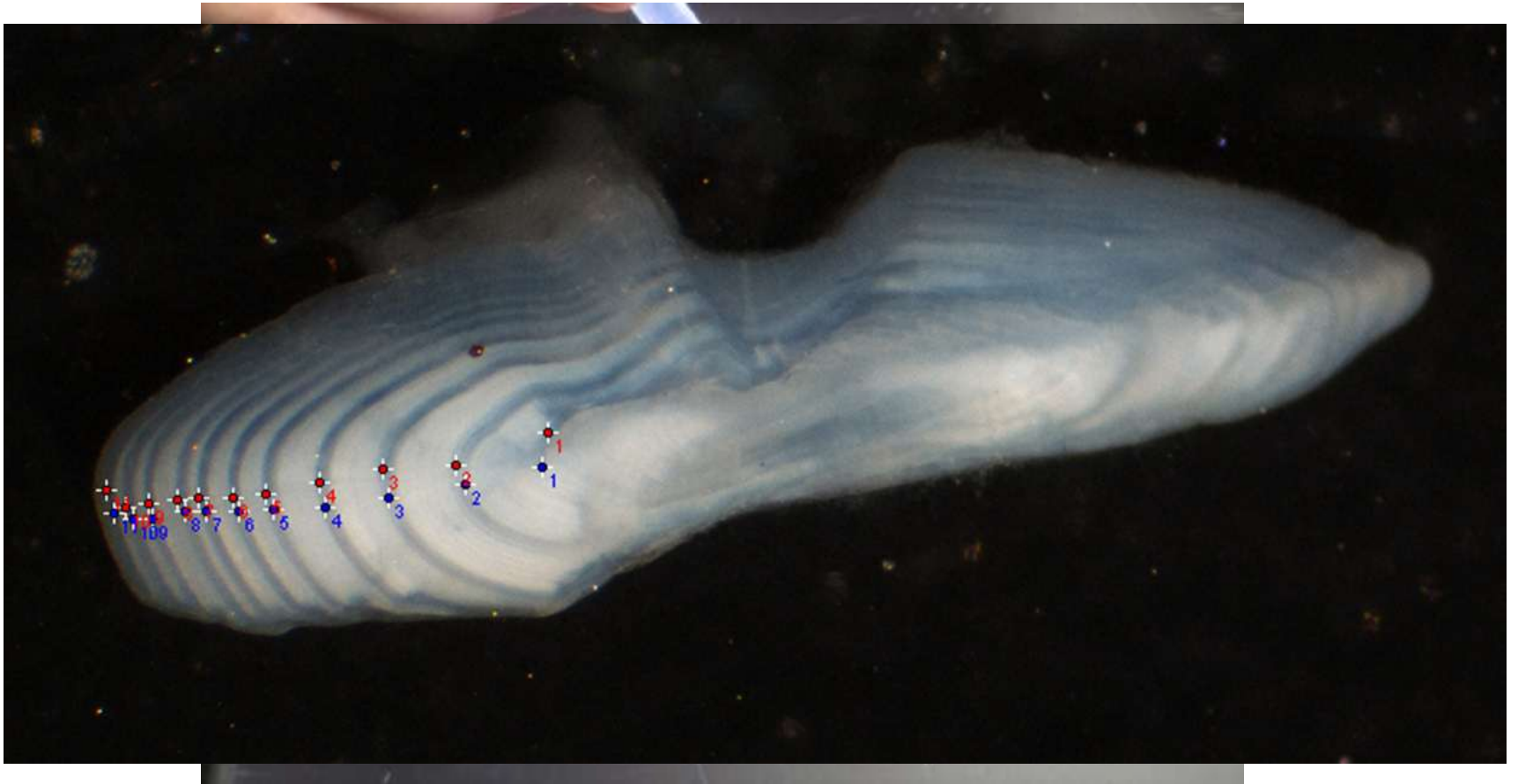
- **Assess ages**
  - Compare scales and otoliths
  - Identify bias and precision among agers for otoliths
- **Assess population characteristics by region**
  - Age distribution
  - Growth

# Field Methods



- 21 sites
- Bottom trawl collections
- Measured all fish
- Subsampled for ageing
  - All fish <159mm
  - 5/sex/10mm from 160-279mm
  - All fish >280mm
- 335 total individuals

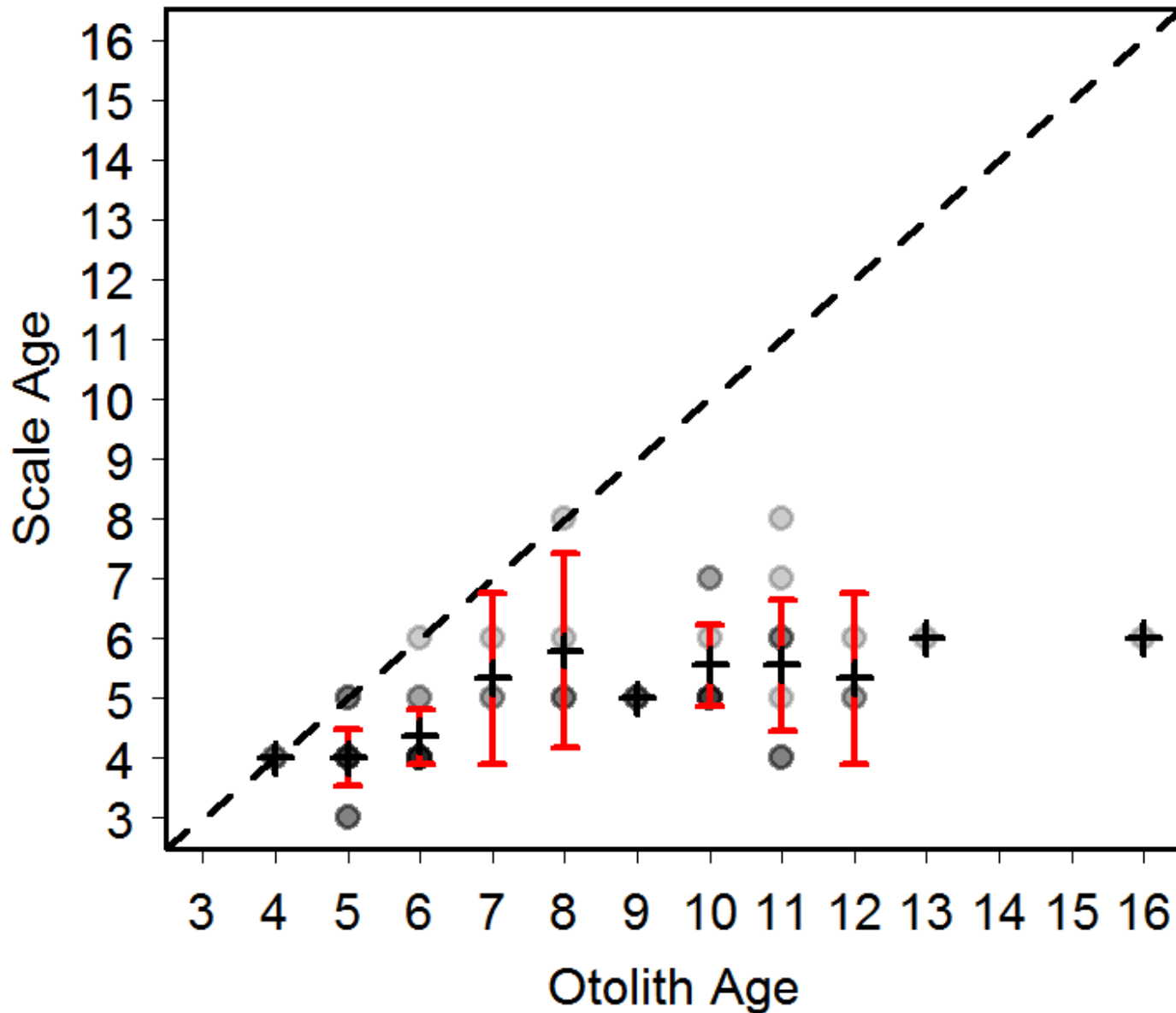
# Lab Methods



# Analysis

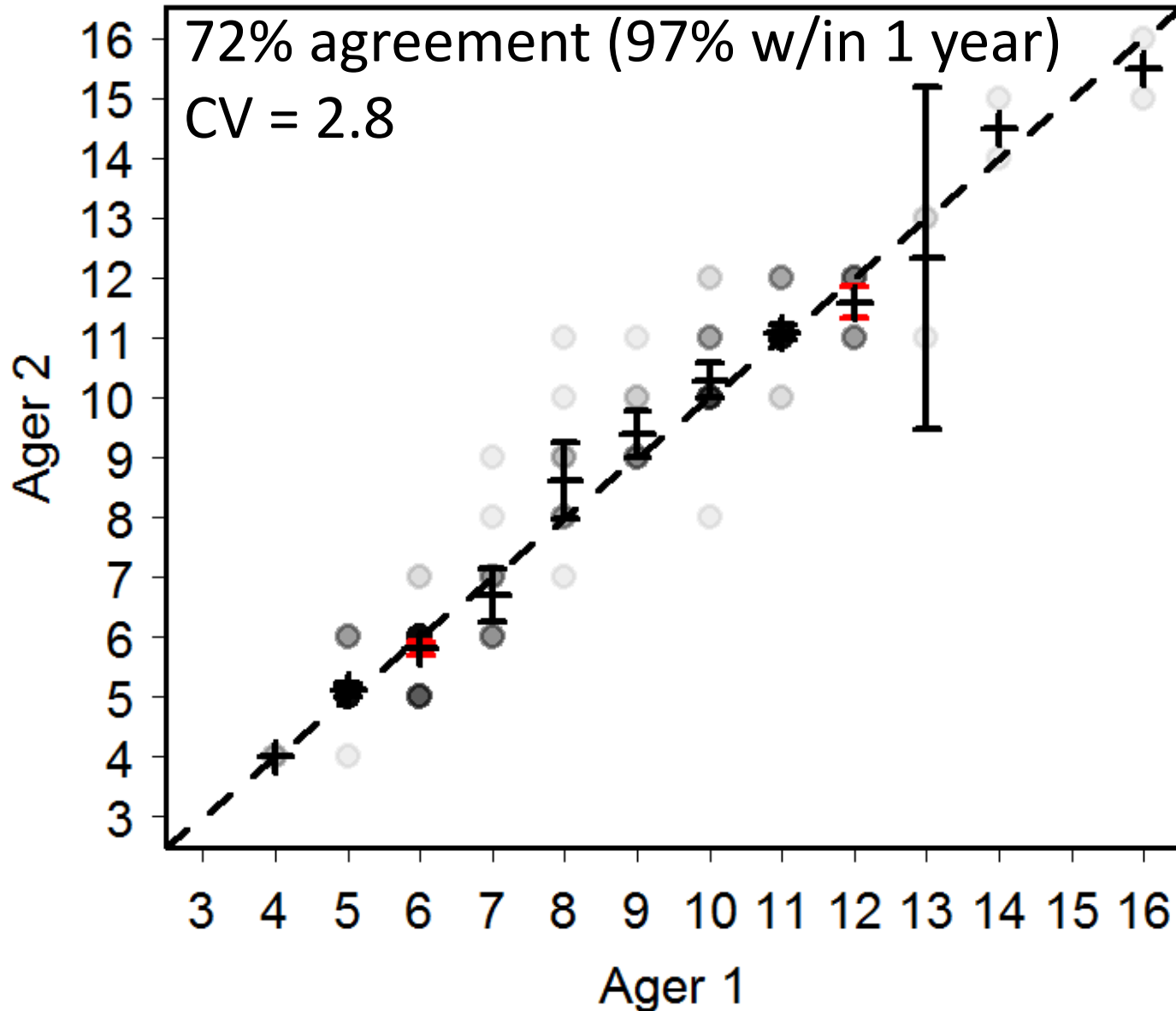
- Assess Age Bias
  - Age Bias Plot
- Assess Age Precision
  - Percent Agreement
  - Coefficient of Variation (CV)
    - measure of relative variability between agers
    - $<5$  implies ages are acceptably precise
- Age Distribution

# Scales vs. Otolith Ages

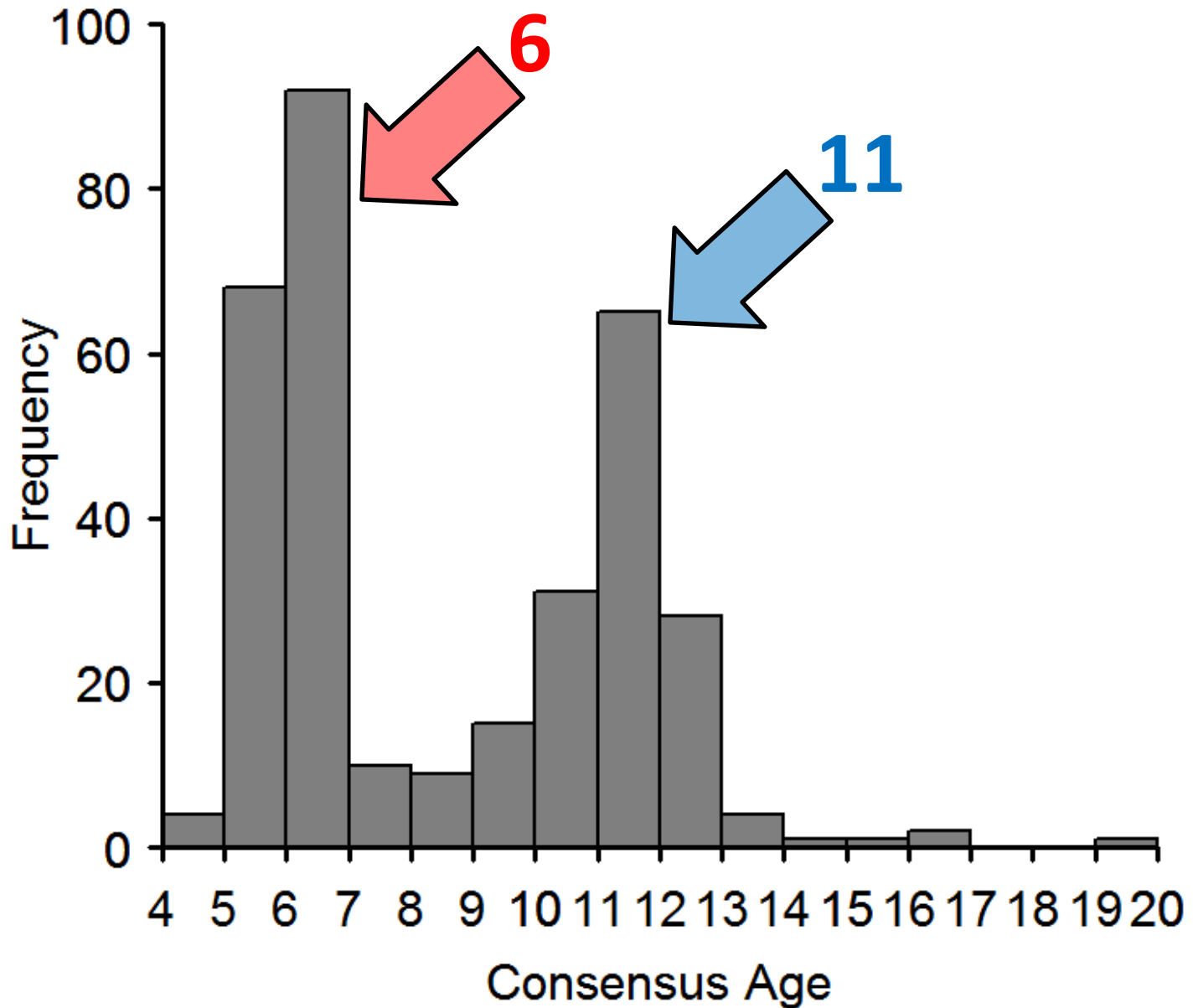




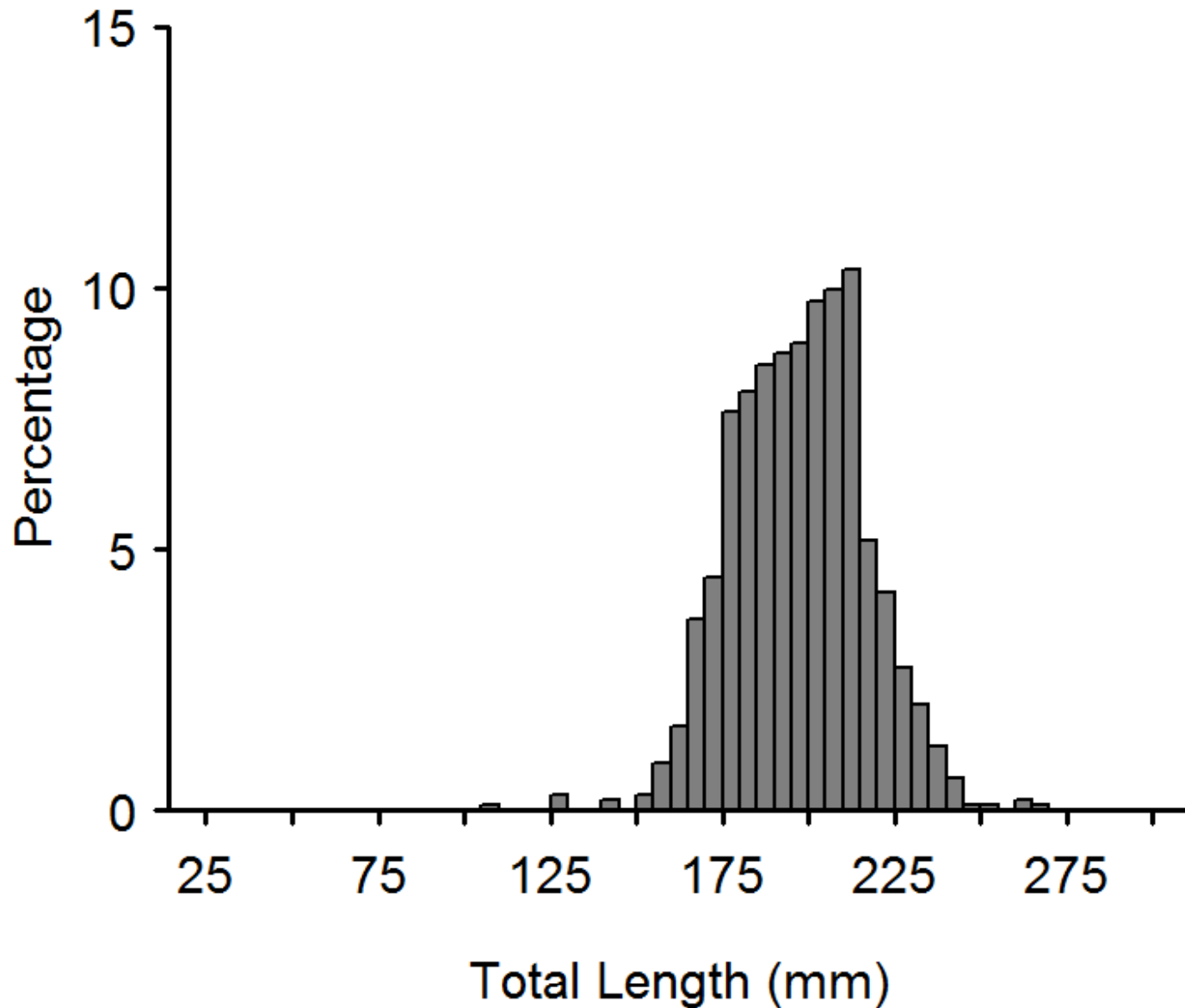
# Between-Ager Otolith Ages



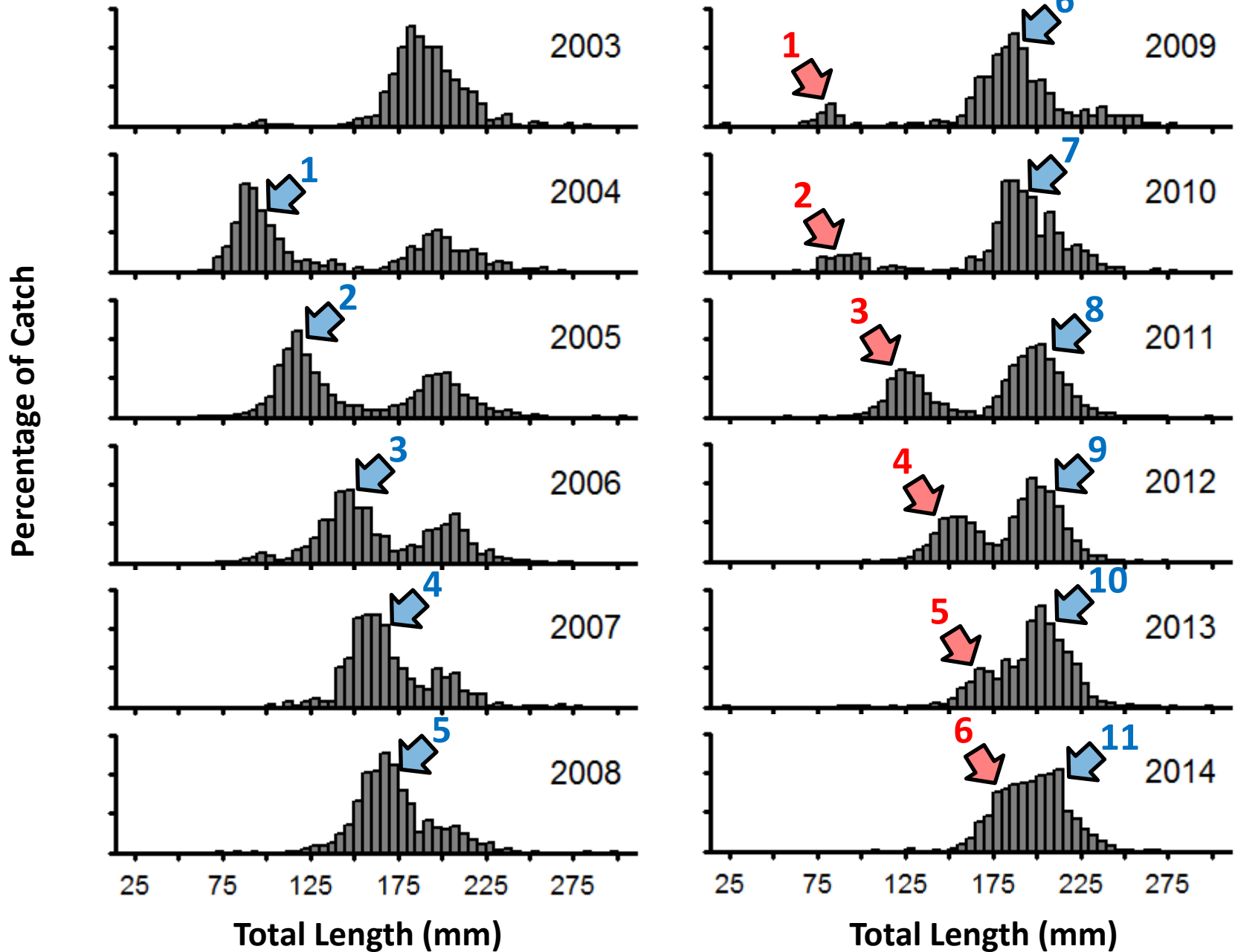
# Overall Age Frequency



# Length Frequency – 2014

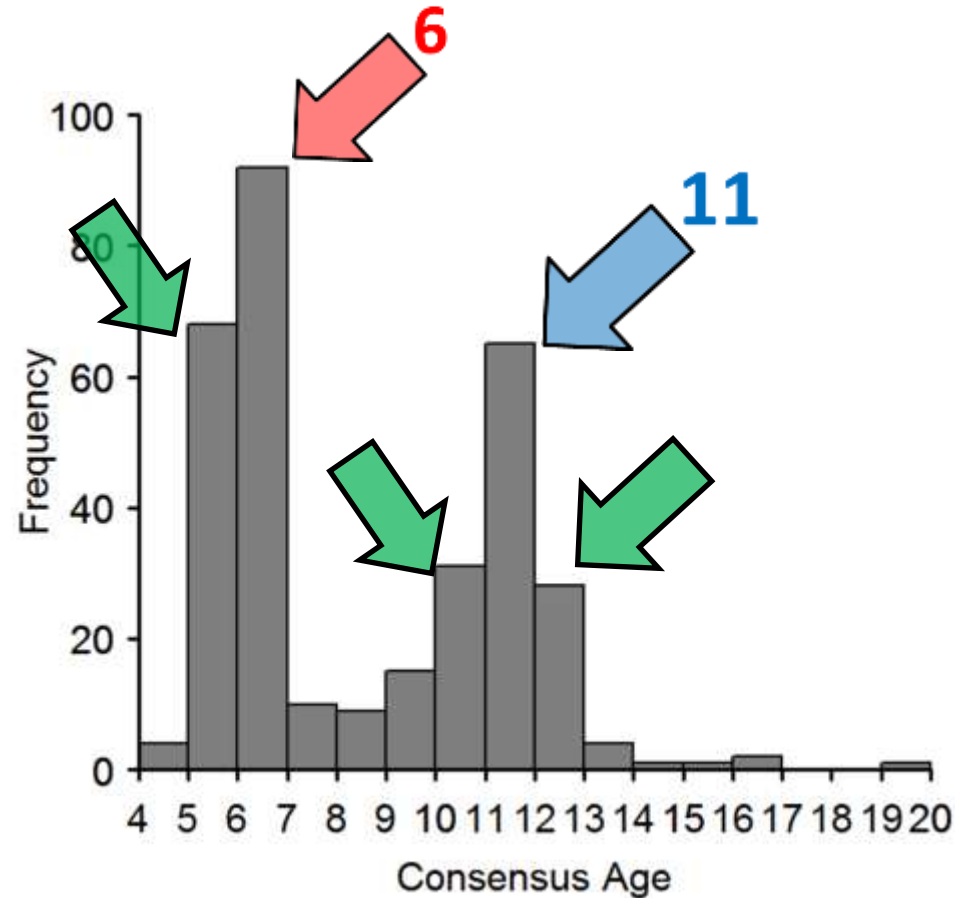


# Length Frequency – 2003-2014



# Age Validation?

- Strong year-classes in 2003 and 2008
  - Age-6 and age-11 in 2014
- High numbers of age-5, 10, and 12 fish





# Conclusions

- **Sporadic recruitment**
  - Only 2 major year-classes since 2003
  - Consistent across all regions of Lake Superior
- **Scales ages lower than otolith ages**
- **Strong year classes allow age validation**
  - Otoliths may provide accurate ages

# Future Work

- Difficulties with center and edge
  - Re-examine pictures
- Examine growth







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