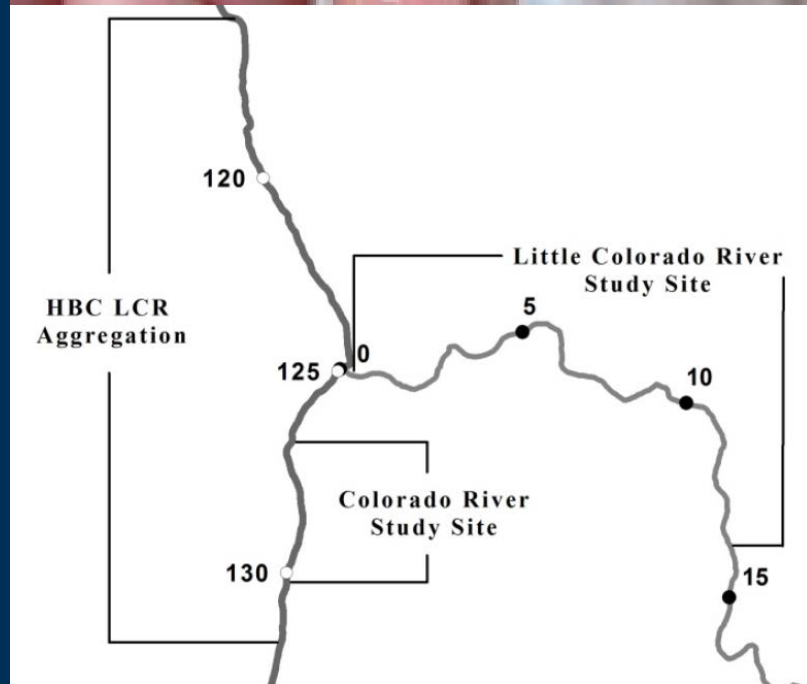


Humpback chub that spawn in the LCR: status and drivers

Annual Reporting for FY16
January 24, 2017

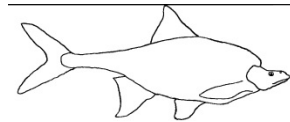
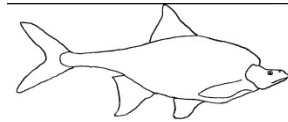
Charles B. Yackulic (U.S.G.S. – GCMRC),
email: cyackulic@usgs.gov

U.S. Department of the Interior
U.S. Geological Survey

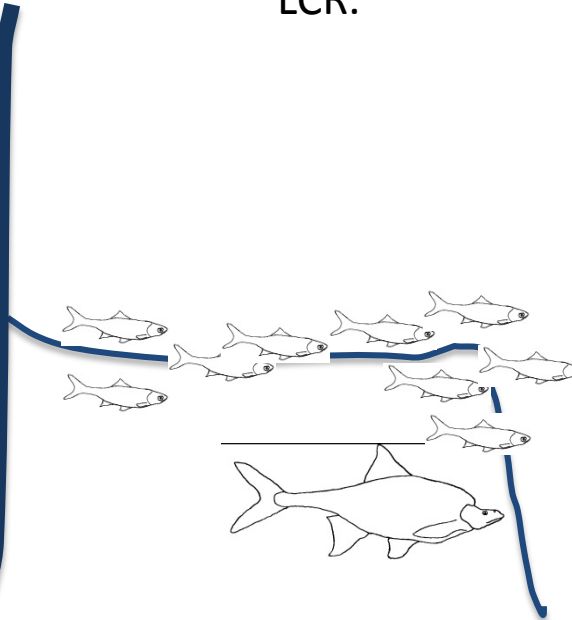


Basics of Chub Life History around the LCR

- Juvenile chub growth is slow in the Colorado River (little to no growth below 12 C). Juvenile chub survival thought to be affected by trout.



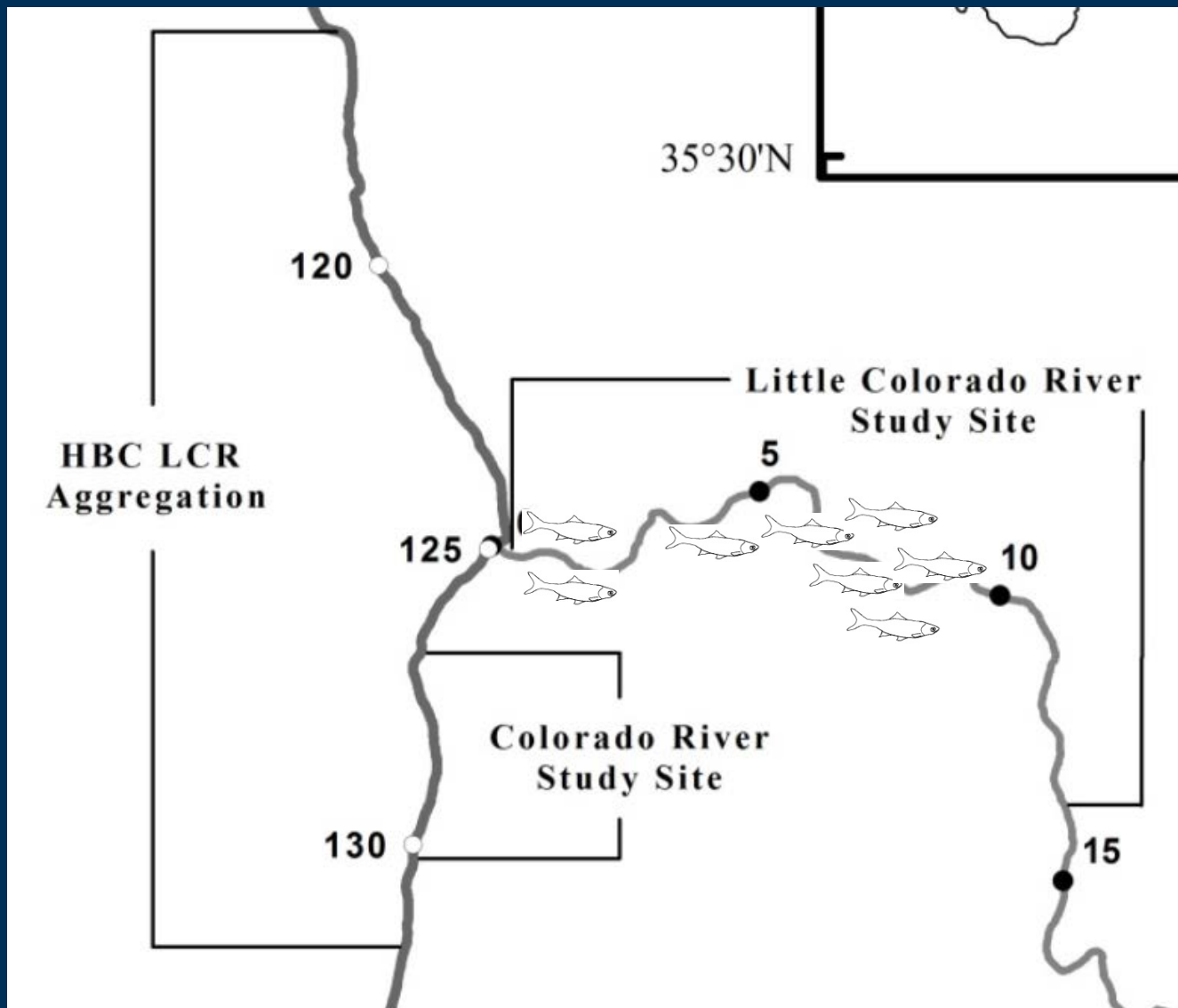
- Majority of chubs recruitment in the LCR.



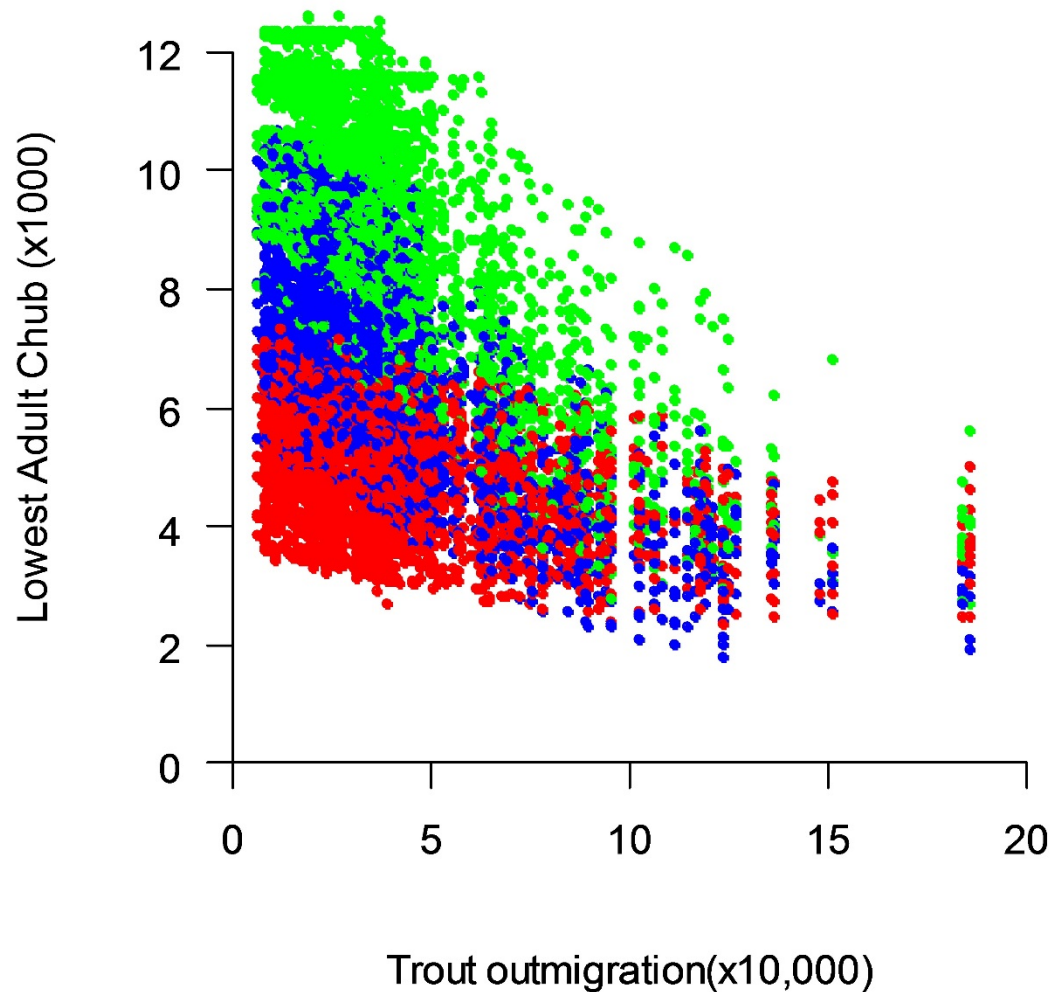
- Some proportion of juvenile chub leave Little Colorado, and most of this outmigration occurs during July – Sept. of their first year.
- Most adults live in Colorado River and migrate back to Little Colorado to spawn, small proportion of adults appear to live year-round in Little Colorado.

Outline

- **Juvenile recruitment**
- Juvenile rearing in the Colorado River
- Setting a target
- Adult body condition and skip-spawning
- Future steps

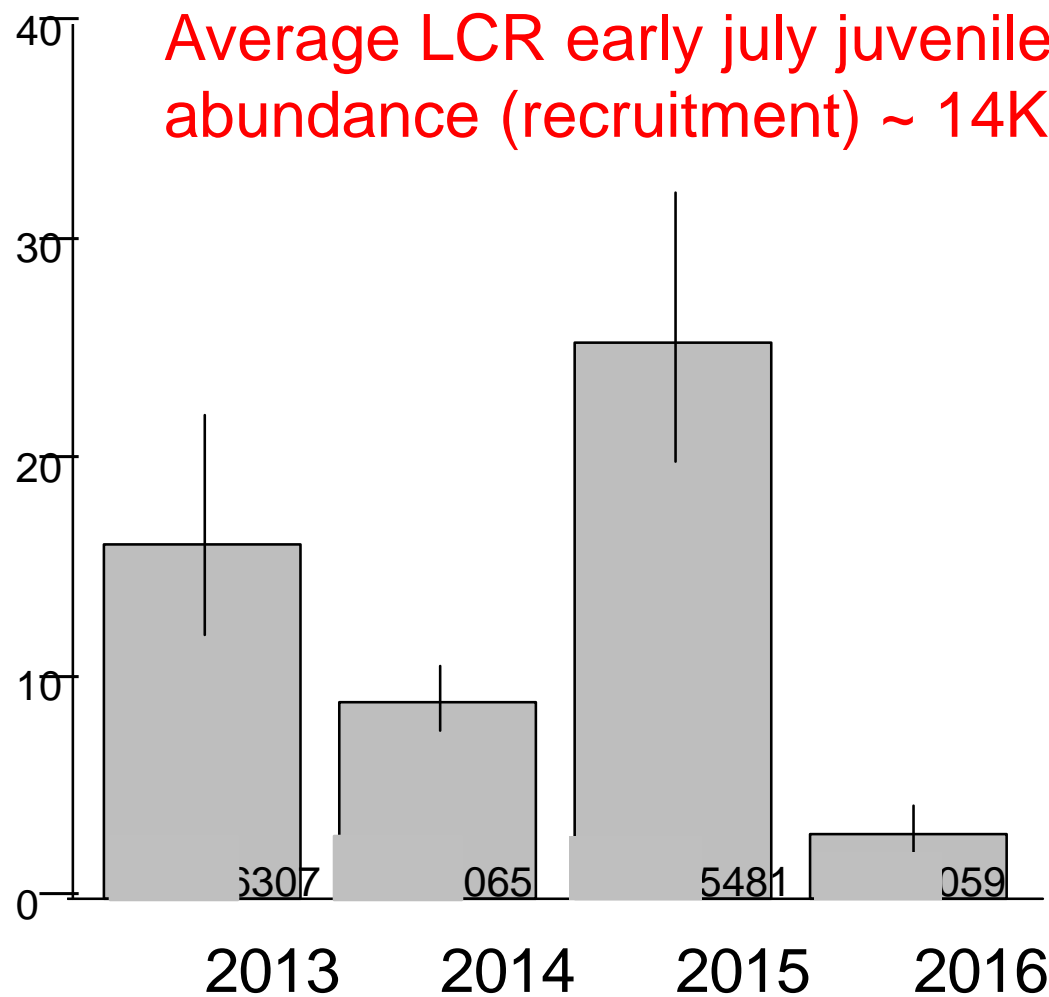


LCR recruitment is a large contributor to uncertainty in predictions.



Abundance (1000s)

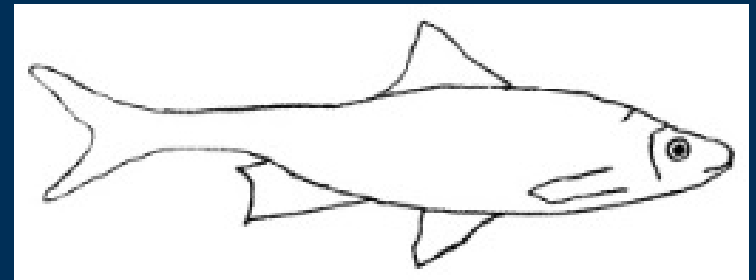
Average LCR early july juvenile abundance (recruitment) ~ 14K.



Outline

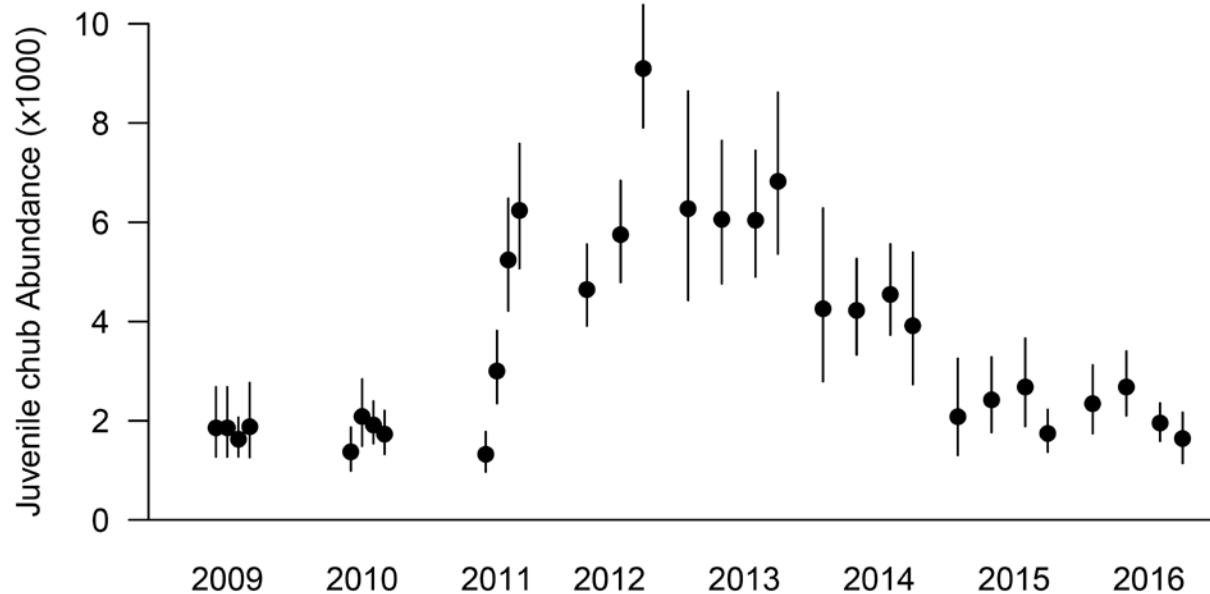
- Juvenile recruitment
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How do temperature, turbidity, rainbow trout, and density dependence affect juvenile survival, growth and capture?

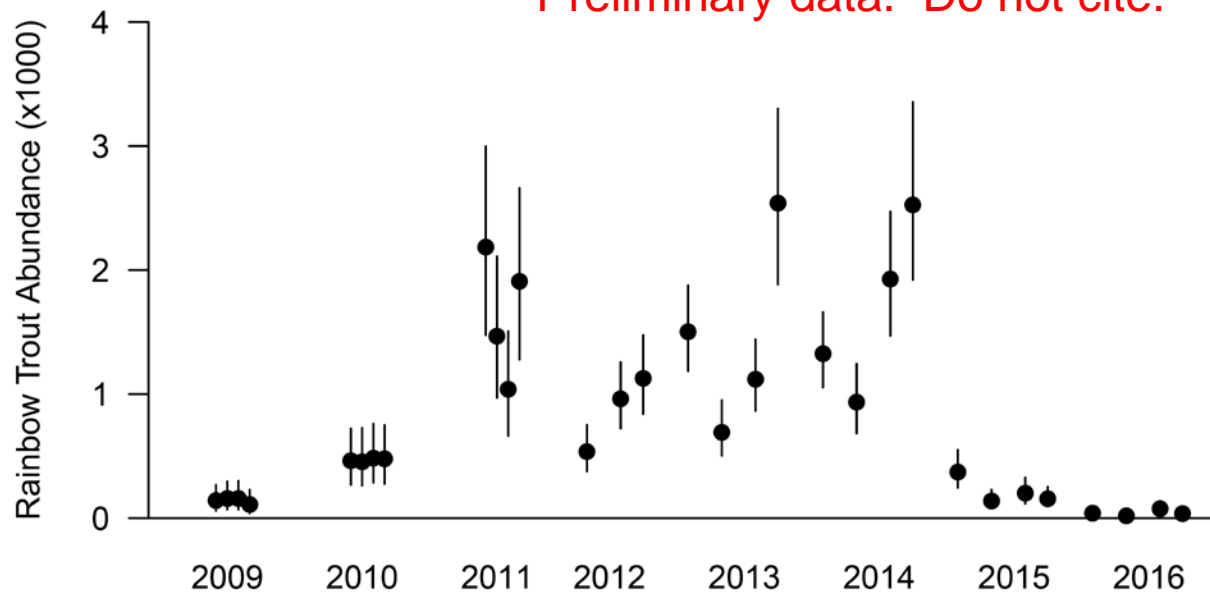
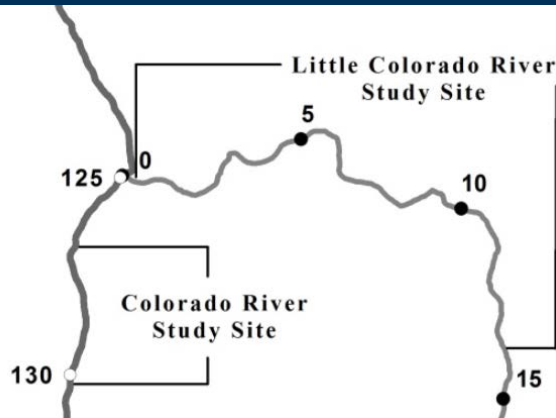


Model improvements

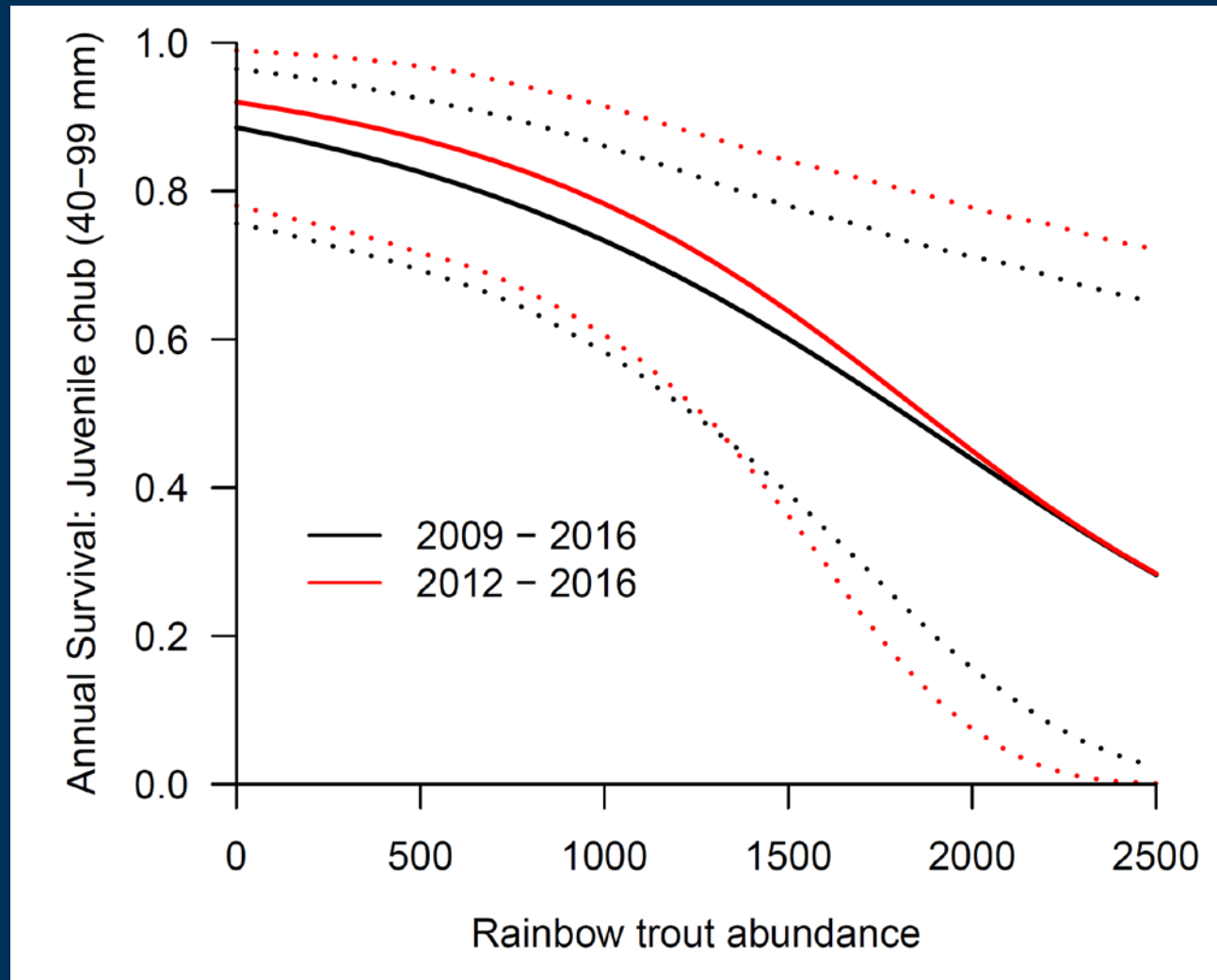
- Now deal with uncertainty in rainbow trout abundance (joint population model).
- Test alternative hypotheses about density dependence.
- Two forms of model selection:
 - Out of sample prediction.

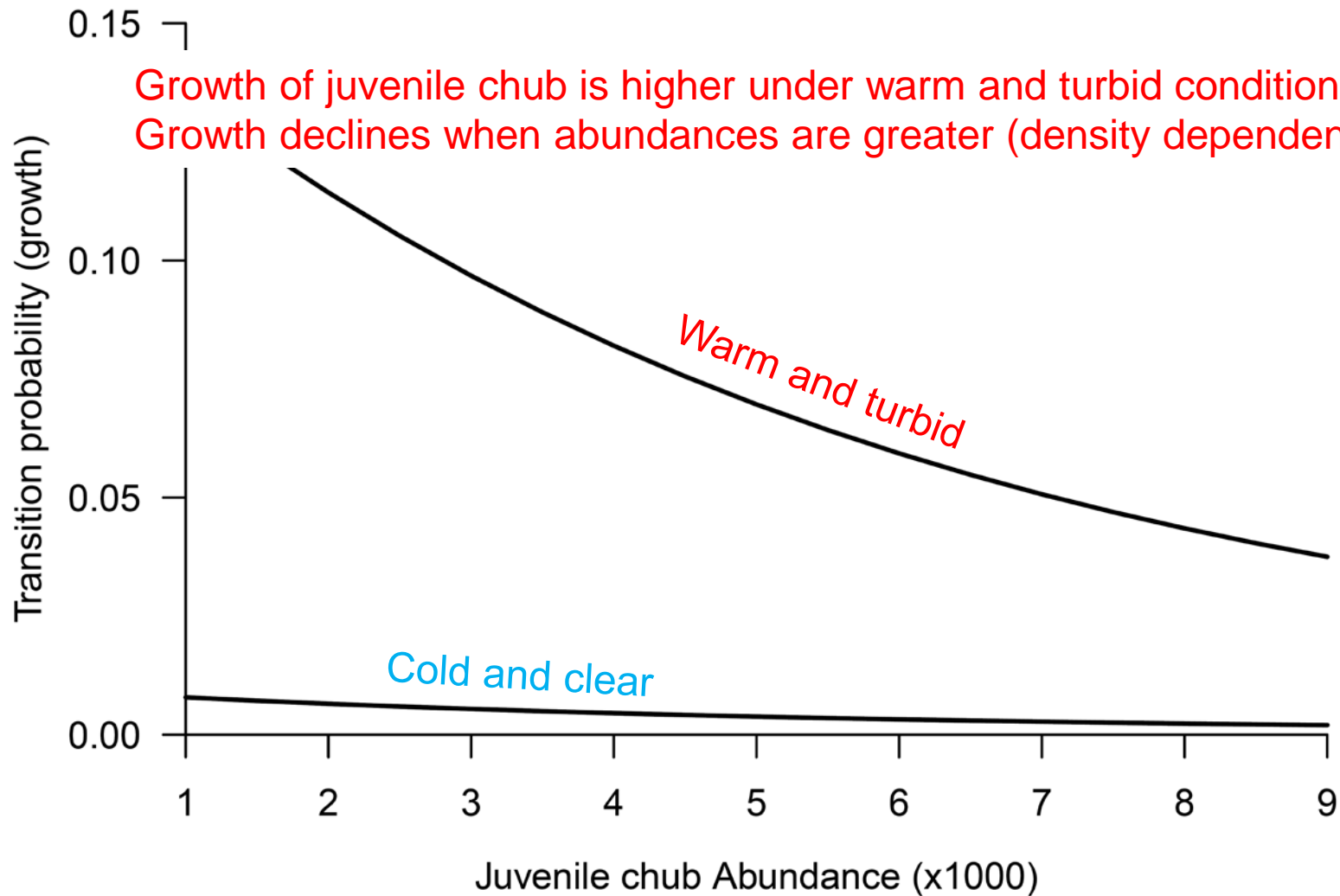
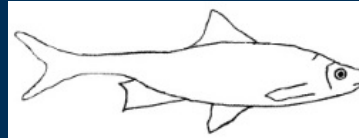


Preliminary data. Do not cite.

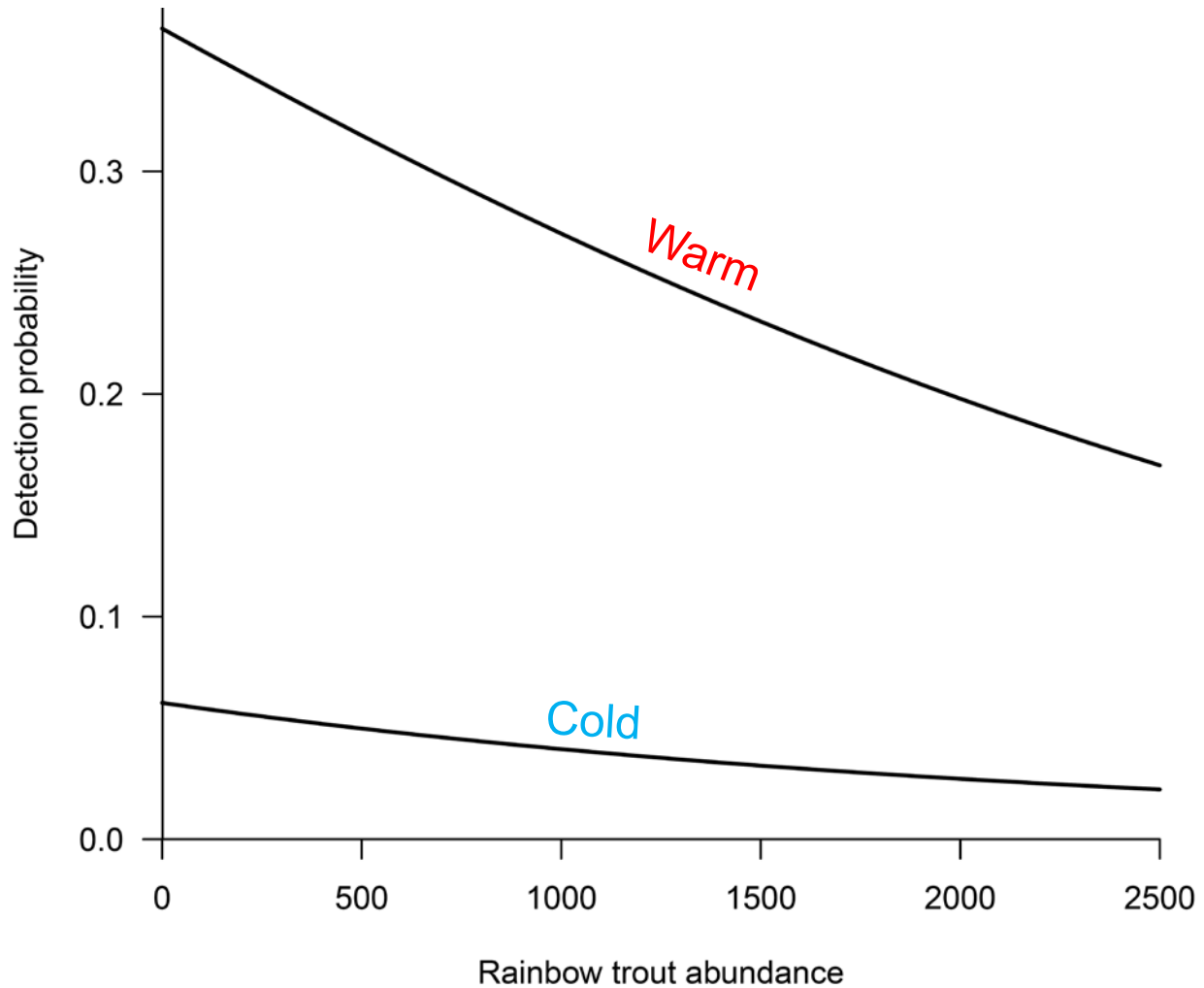


Juvenile humpback chub survival is negatively related to increased rainbow trout abundances. This is the most consistent relationship across years.





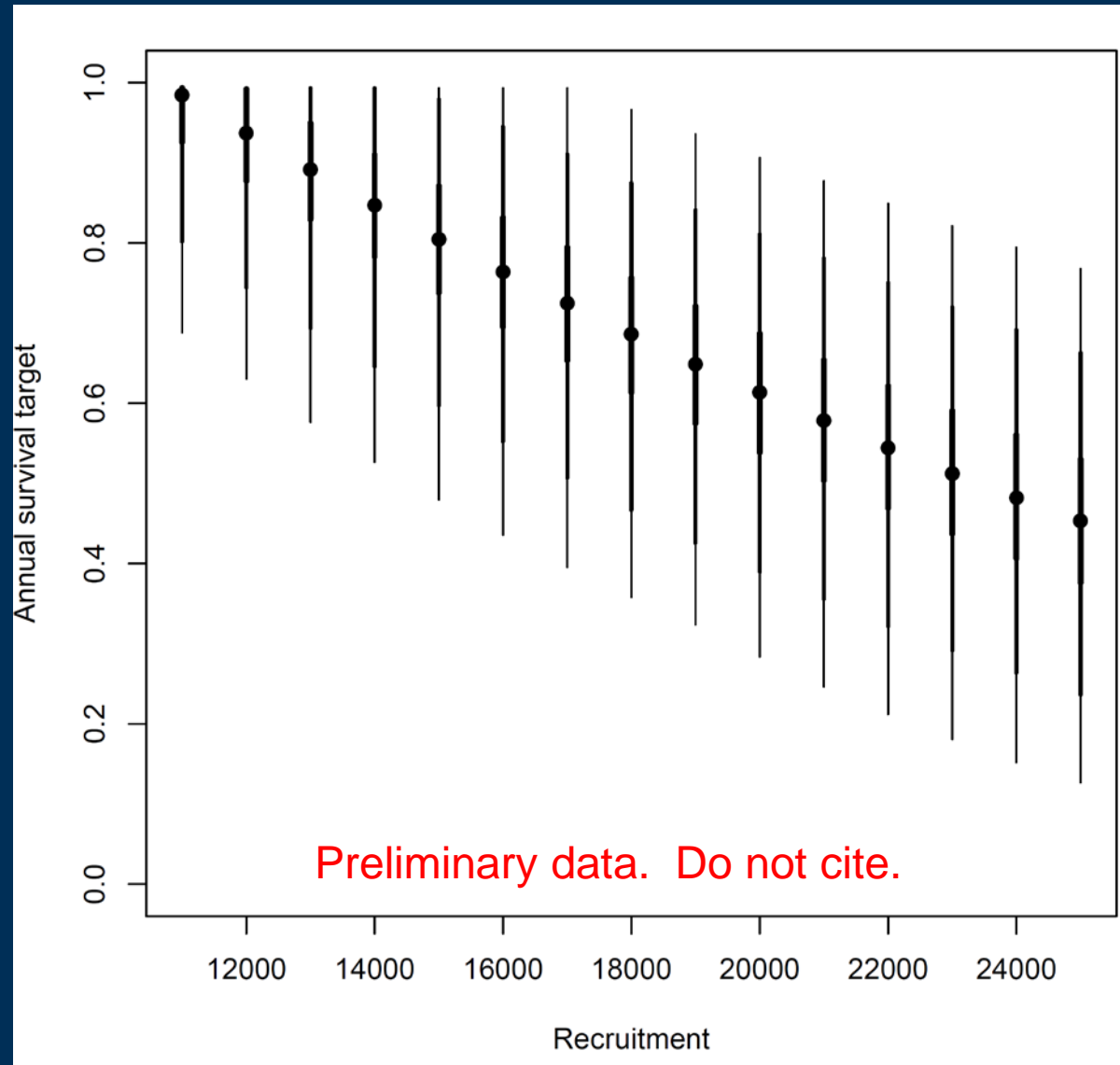
Temperature is the primary driver of juvenile chub detection probability, but rainbow trout also affect chub detection.



Outline

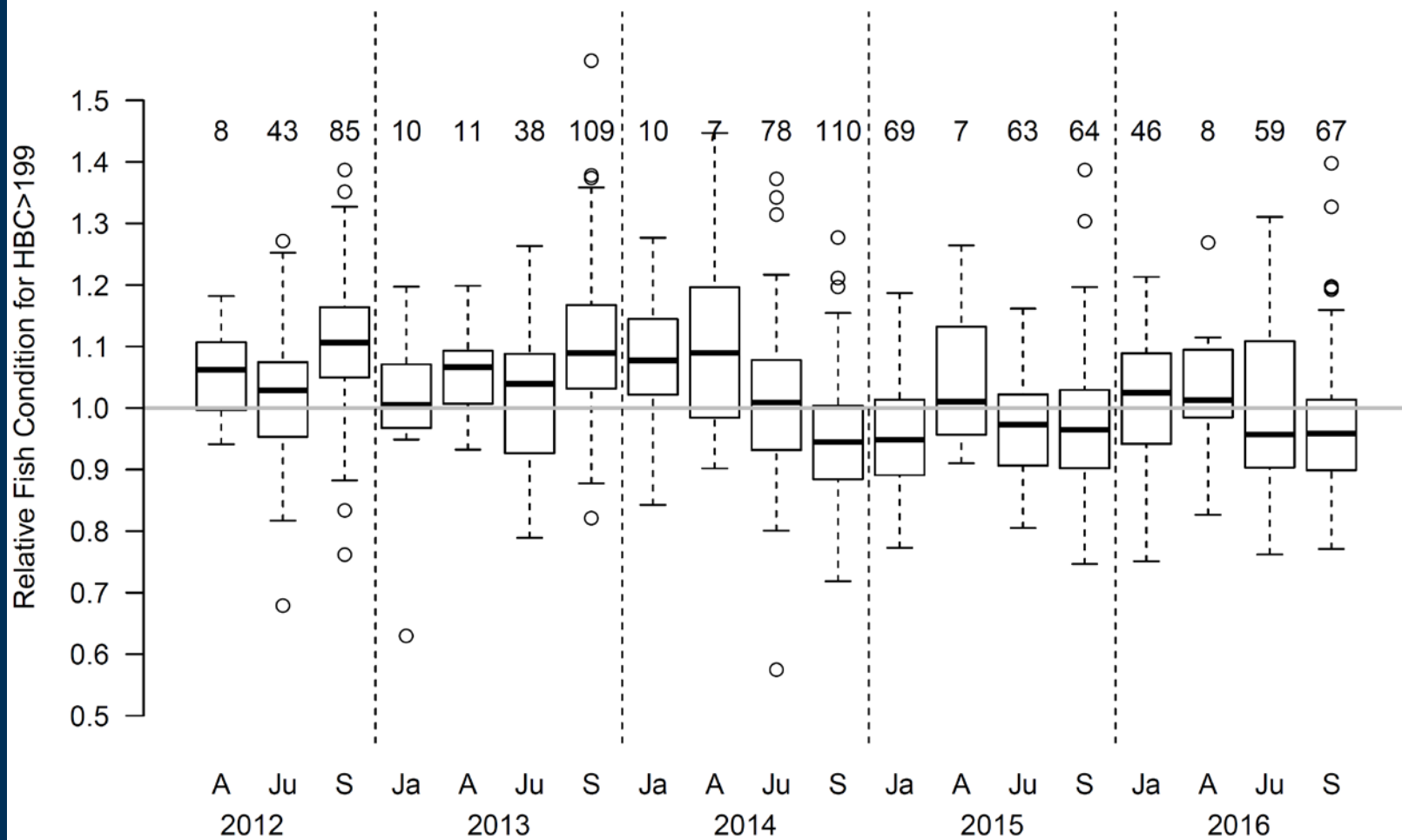
- Juvenile recruitment
- Juvenile rearing in the Colorado River
- **Setting a target**
- **Adult body condition and skip-spawning**
- **Future steps**

Given our understanding of HBC life-history (and associated uncertainty), what is the average annual juvenile survival required to maintain a population of 7000...and how does this also depend on juvenile recruitment estimates.

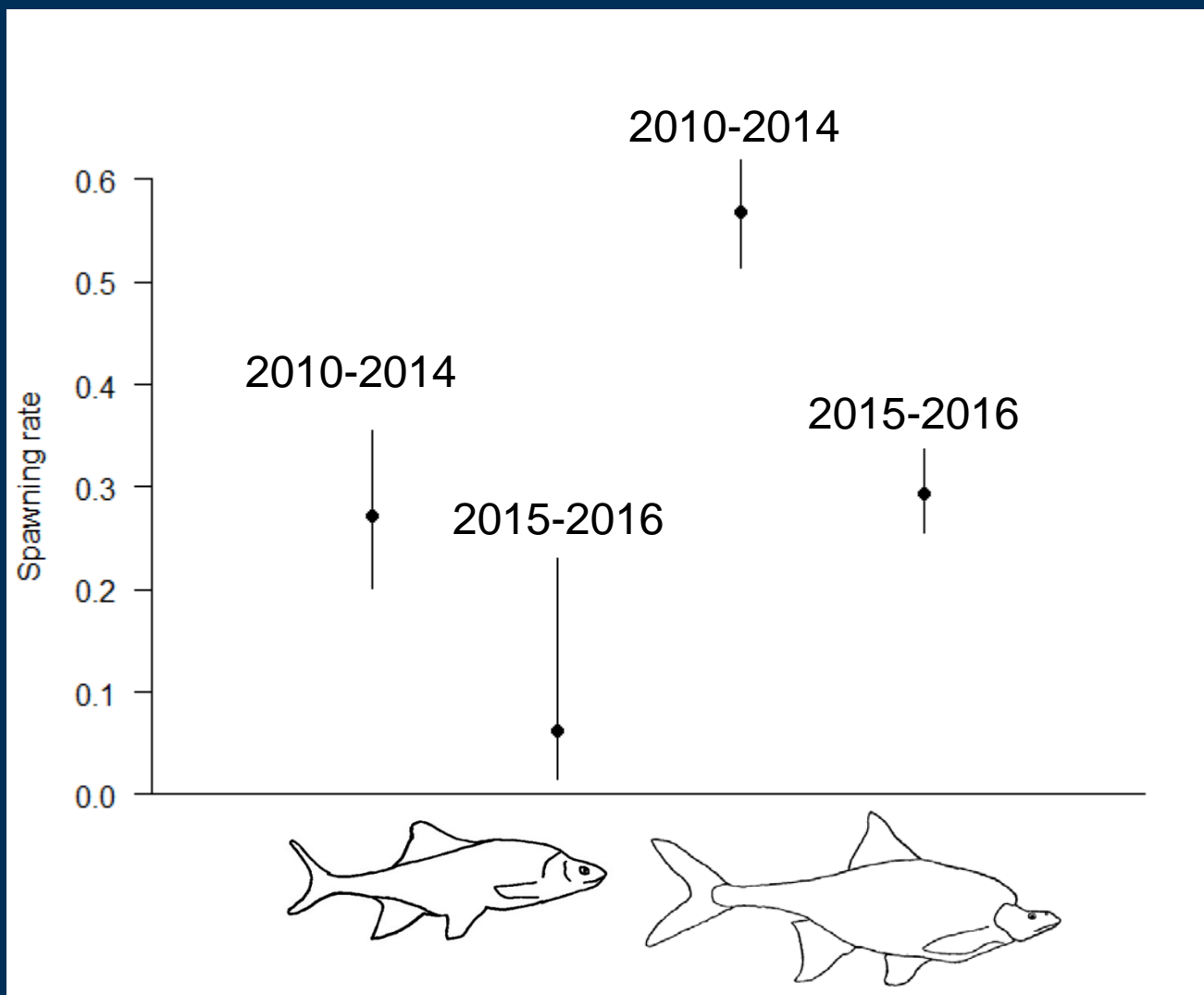


Outline

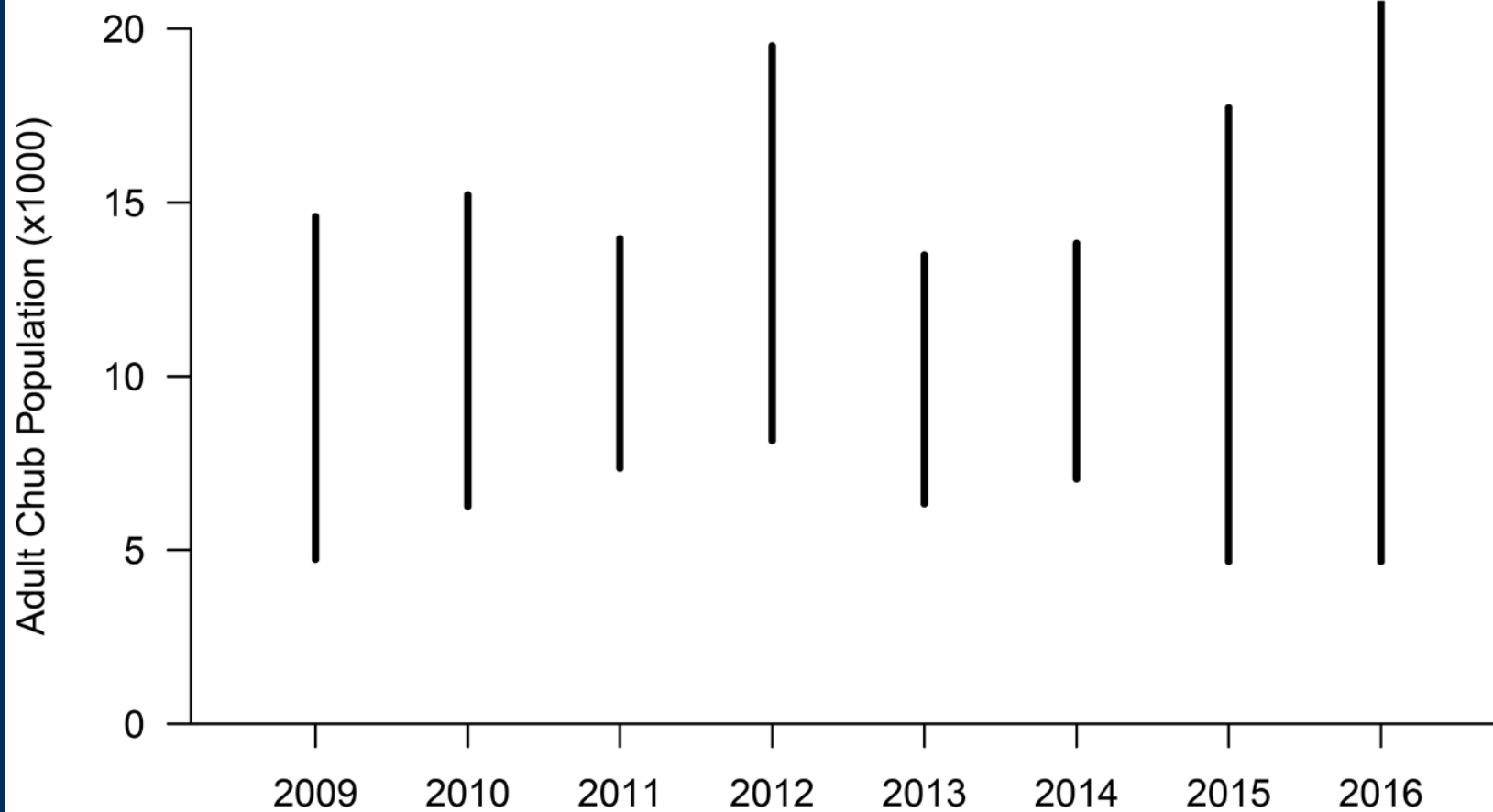
- Juvenile recruitment
- Juvenile rearing in the Colorado River
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- **Adult body condition and skip-spawning**
- Future steps



Both smaller and larger adults are spawning less frequently



Adult HBC numbers appear stable.



Take home messages

- Adult populations appear stable, however adults remain skinny and rates of spawning are low.
- Rainbow trout negatively effect juvenile chub survival, however, the effect is modest. They also affect chub detection.
- Temperature, turbidity, and density drive growth.
- Juvenile recruitment may determine whether rainbow trout management is necessary.

Outline

- Juvenile recruitment
- Juvenile rearing in the Colorado River
- Setting a target
- Adult body condition and skip-spawning
- **Future steps**

Future steps

- Continue HBC field sampling in LCR and CR, including juvenile recruitment estimation.
- Increase use of remote sensing array in both CR and LCR and integrate data into our population models.
- Explore feasibility of JCM-like sampling at a western Grand Canyon site.

Acknowledgements

- Mike Yard , Josh Korman, Ted Kennedy, Mike Dodrill, David Ward, Luke Avery, Scott Vanderkooi
- US Fish and Wildlife Service
- Near Shore Ecology Group
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- Glen Canyon Adaptive Management Group
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- Navajo Nation Department of Fish and Wildlife

