Humpback chub (*Gila cypha*) that spawn in the Little Colorado River: status and potential drivers

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U.S. Department of the Interior
U.S. Geological Survey
Quick review of Chub Life History Basics
Basics of Chub Life History around the Little Colorado River (LCR)

- Majority of chubs recruitment in the Little Colorado River.
- Some proportion of juvenile chub leave Little Colorado River, 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 River to spawn, small proportion of adults appear to live year-round in Little Colorado River.

- Juvenile chub growth thought to be driven primarily by temperature. Juvenile chub survival thought to be affected by trout.
Chub that grow up in the Colorado River take much longer to reach maturity (cold water).

**Graphs:**

- **Colorado River**
  - 2009: Red bars
  - 2012: Blue bars

- **Little Colorado River**
  - 2009: Red bars
  - 2012: Blue bars

*Preliminary data. Do not cite.*
Outline

- Recruitment in Little Colorado River
- Juvenile survival and growth in the Colorado River
- Subadult growth in Little Colorado River & Colorado River
- Adult Chub

USGS
preliminary data. Do not cite.

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Outline

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HBC juvenile abundance in Colorado study site

preliminary data. Do not cite.
Annual juvenile chub (40-99 mm) survival in Colorado River, much of the variation in survival can be attributed to changes in the size structure within this range.
Mini-multistate

- Small (40 – 59 mm), medium (60 – 79 mm), large (80-99 mm) juveniles.
- Survival increases with size, growth declines
- Correlates of survival:
  - Trout (-)
  - # of days with Turbidity greater than 50 FNU (-)
- Correlates of growth:
  - T>12 °C (+)
  - # of days with Turbidity greater than 50 FNU (+)
A year with less days turbidity over 50 FNU at the gauge at Phantom Ranch

A year with more days of turbidity over 50 FNU at the gauge at Phantom Ranch

preliminary data. Do not cite.
Temperature seems to act like a threshold. When it gets dirty, chub start growing (but they also start getting eaten)
Outline

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Subadult Abundance chub in Colorado River study site

Abundance of subadult chub in the Colorado River Study Site (x1000)

Year

Smaller subadults (100-149 mm)
Larger subadults (150-199 mm)

preliminary data. Do not cite.
Subadult Abundance chub in Colorado River study site

Abundance of subadult chub in the Colorado River Study Site (x1000)

- Smaller subadults (100-149 mm)
- Larger subadults (150-199 mm)

Year:
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015

preliminary data. Do not cite.
Best Colorado River model: temperature and turbidity duration
Best Little Colorado River model: temperature and food availability
Outline

- Recruitment in Little Colorado River
- Juvenile survival and growth in Colorado River
- Subadult growth in Little Colorado River & Colorado River
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preliminary data. Do not cite.
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Year


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Larger subadults (150-199 mm)

preliminary data. Do not cite.
preliminary data. Do not cite.
So what happened this spring in the Little Colorado River?
Little Colorado River – Annual Survival

Annual Interval (Sept. to Sept.)

Annual Survival

- Red: Smaller adult
- Blue: Larger adult

Preliminary data. Do not cite.
Colorado River – Annual Survival

Annual Interval (Sept. to Sept.)

Annual Survival

- Smaller adult
- Larger adult

preliminary data. Do not cite.
Proportion of Colorado River fish moving into Little Colorado River during spring

Annual Interval (Sept. to Sept.)

provisional data. Do not cite.
Condition Factor

- Determined by comparing the ratio of observed weights of individuals fish to the predicted weight based on their total length. Predictions are based on a regression of the log of weight as a function of the log of length. Values over 1 indicate fish that are fatter than predicted, values under 1 indicate fish that are skinnier.
Adult chub condition – fat or skinny?
Adult chub condition – fat or skinny?

preliminary data. Do not cite.
Drift Biomass (mg/m³)

Year - month

preliminary data. Do not cite.
Summary

- Highly variable juvenile recruitment in the Little Colorado River
  - this can override variation in survival over short time scales

- Temps over 12 °C with turbidity lead to juvenile growth in Colorado River.

- Turbidity and trout lower juvenile survival in the Colorado River.

- Adult chub appear stable, but skinny and may not spawn in great numbers in 2016.
Acknowledgements

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- Glen Canyon Adaptive Management Group
- Bureau of Reclamation
- Navajo Nation Department of Fish and Wildlife

[Image of river]