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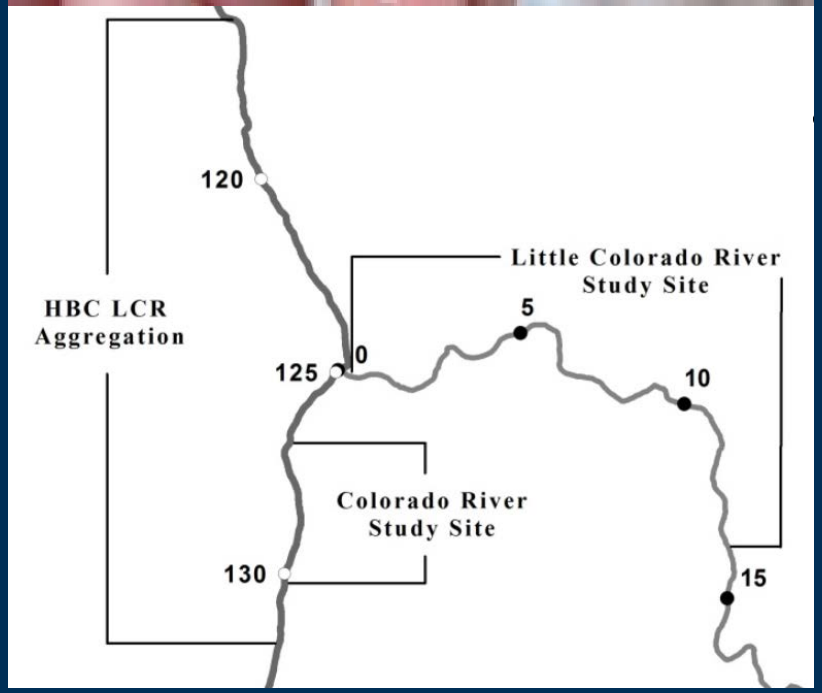
Early life history of humpback chub: patterns and potential drivers



Annual Reporting for FY14
January 21, 2015

Charles B. Yackulic* (*U.S.G.S. – GCMRC) and*
Maria Dzul (*U.S.G.S. – GCMRC)*
** Presenter – email: cyackulic@usgs.gov*

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

Outline

- JCM survival
- Early life history in the Little Colorado River
- Survival and growth in the Colorado River

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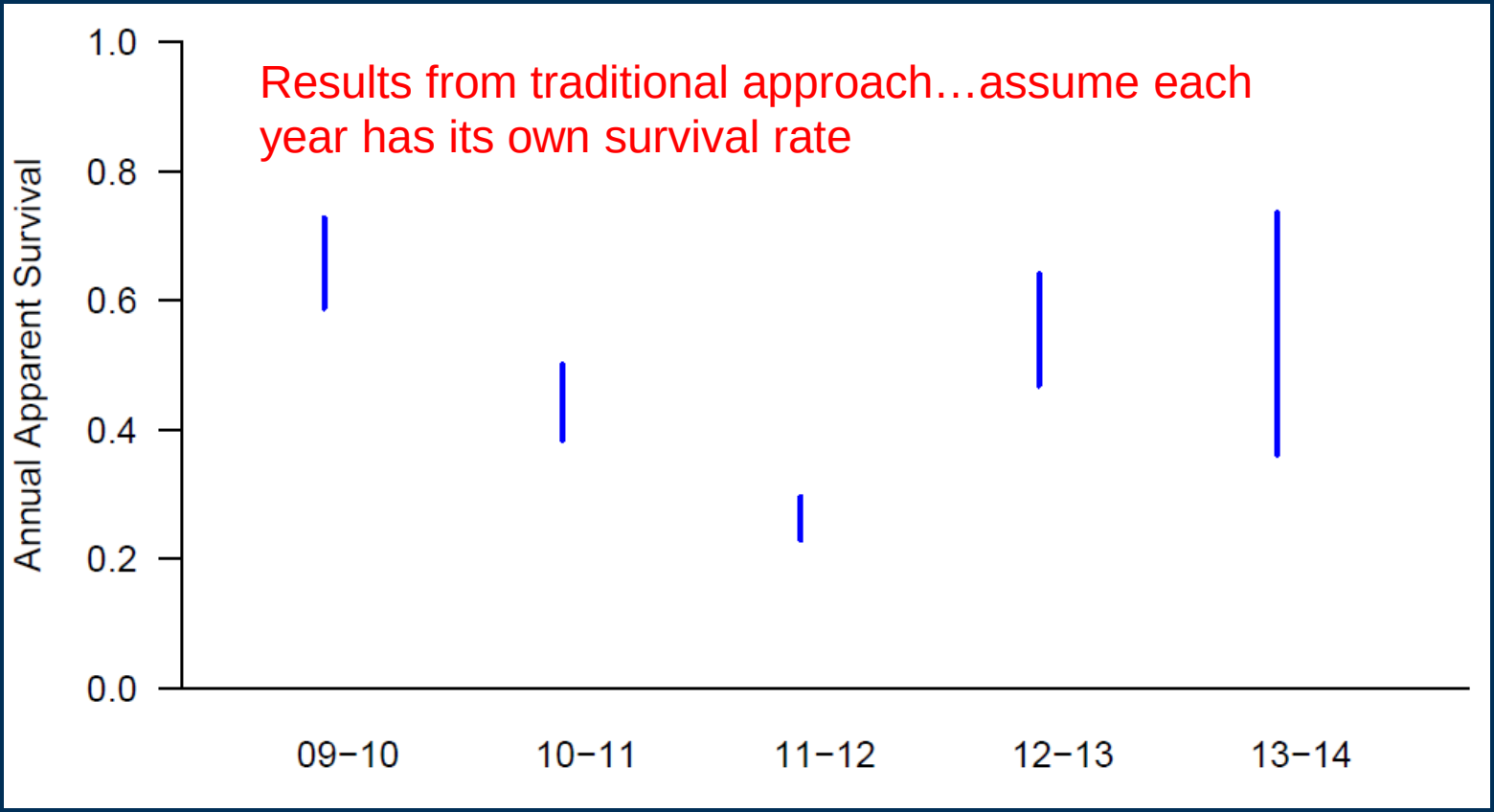
HBC survival in JCM reach



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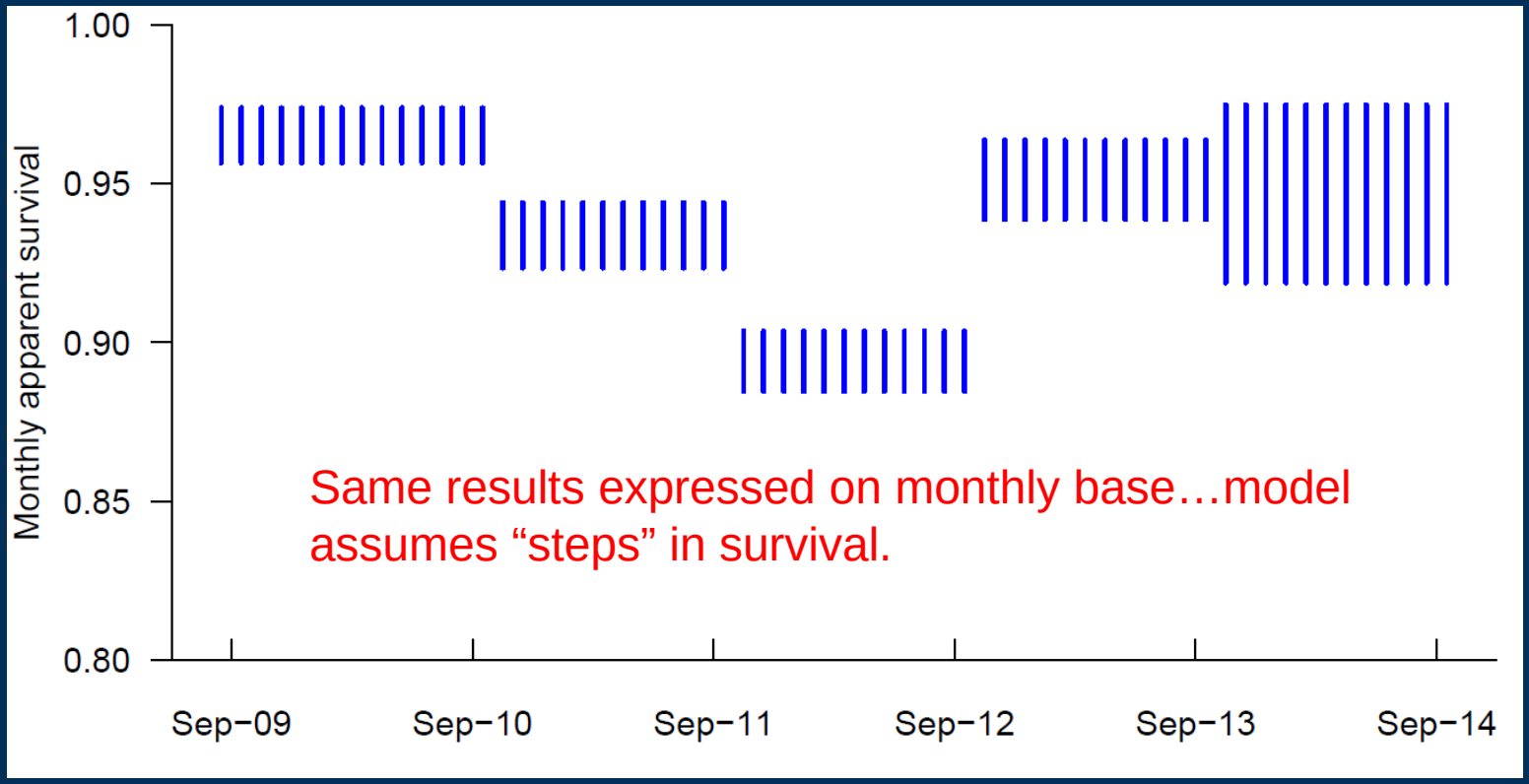
Preliminary Data Do Not Cite

HBC survival in JCM reach



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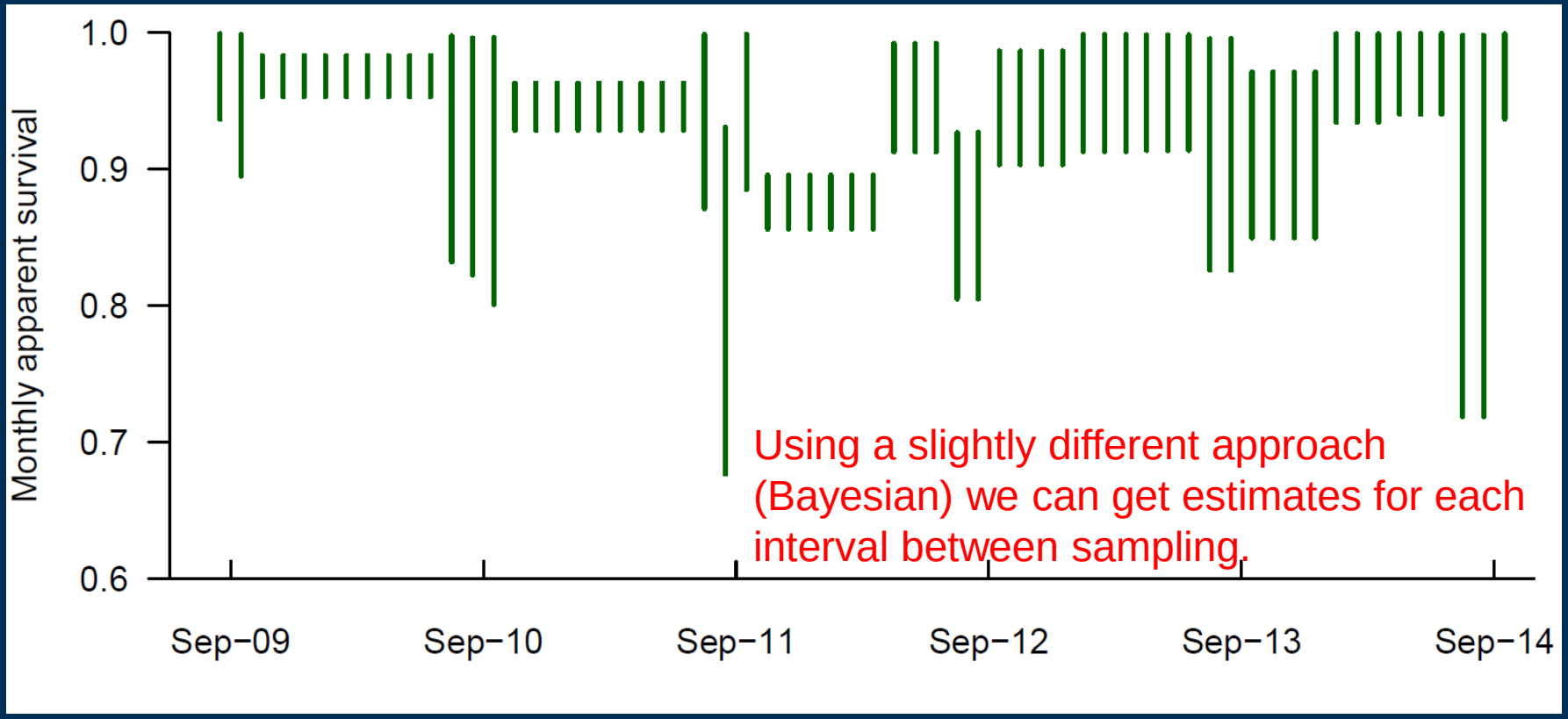

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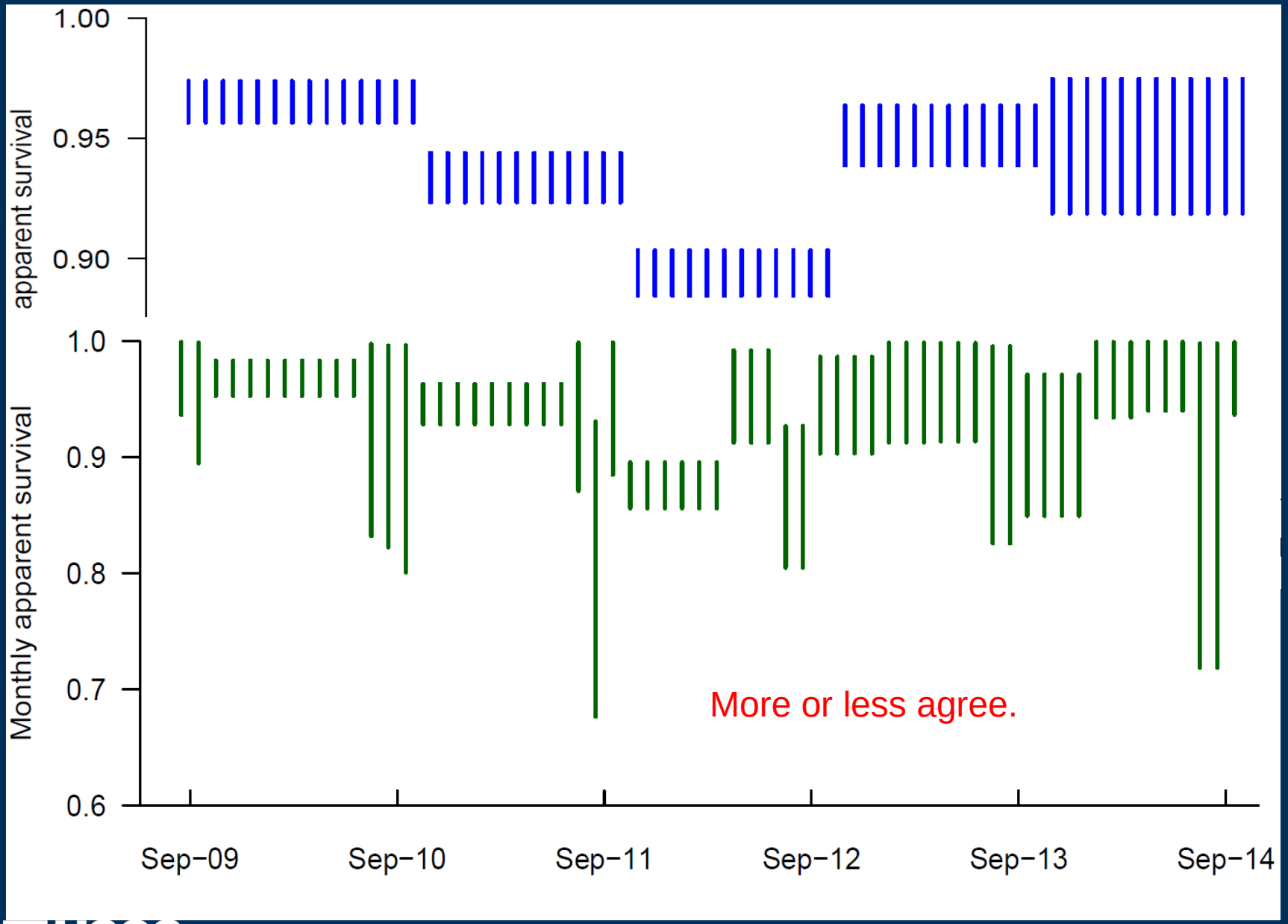

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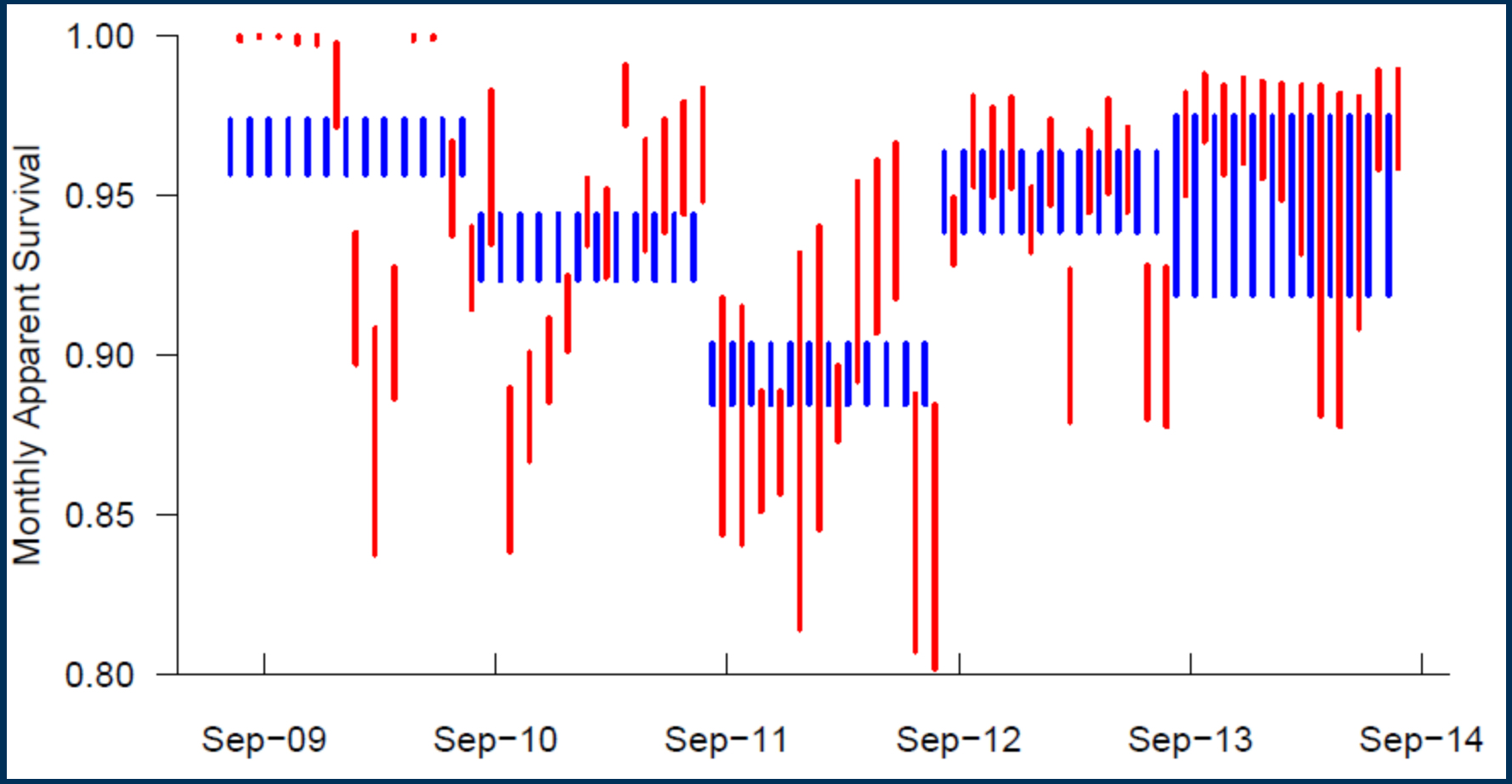

If we model survival based on covariates, there is quite a bit more variation.

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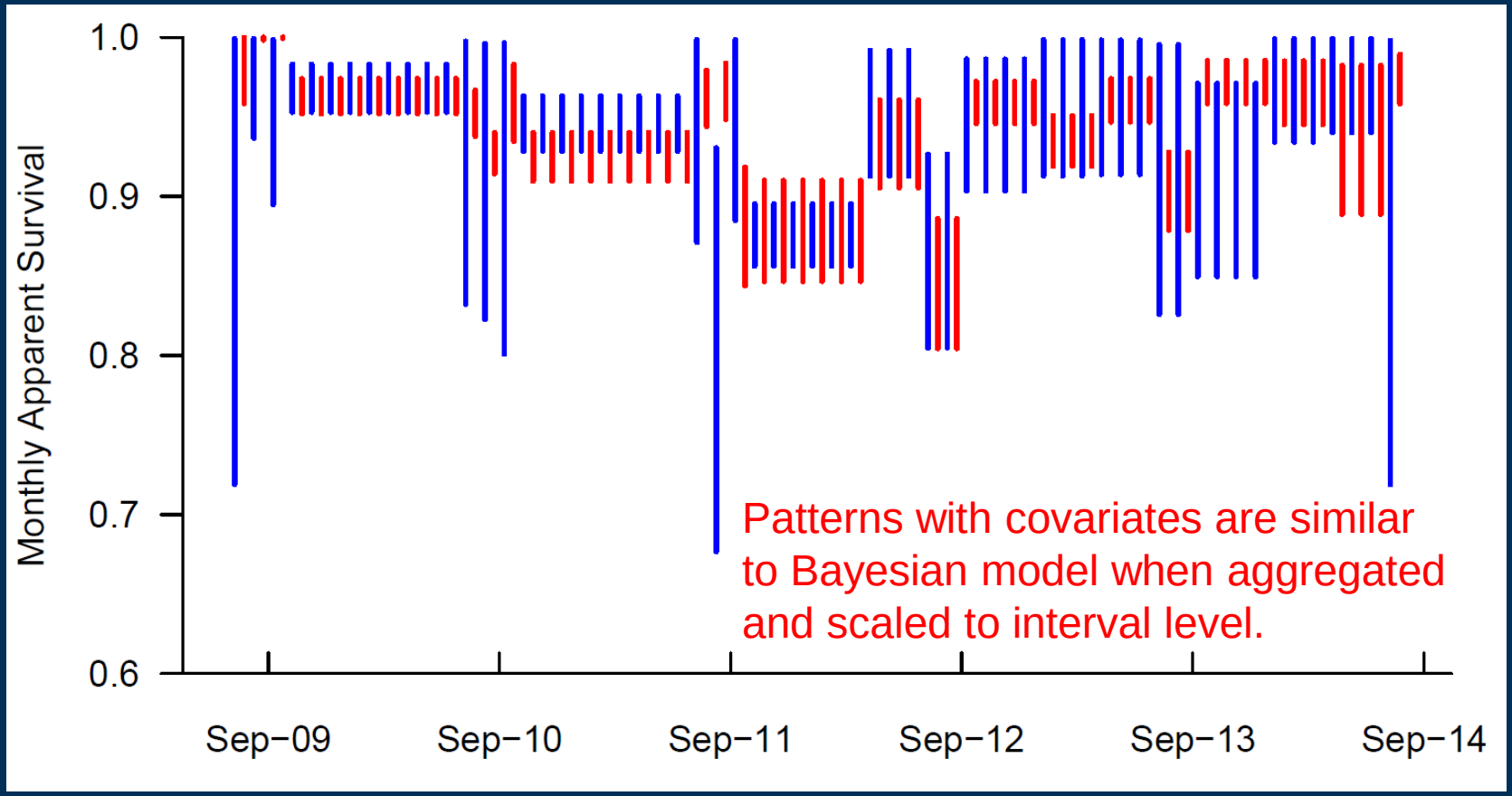
HBC survival in JCM



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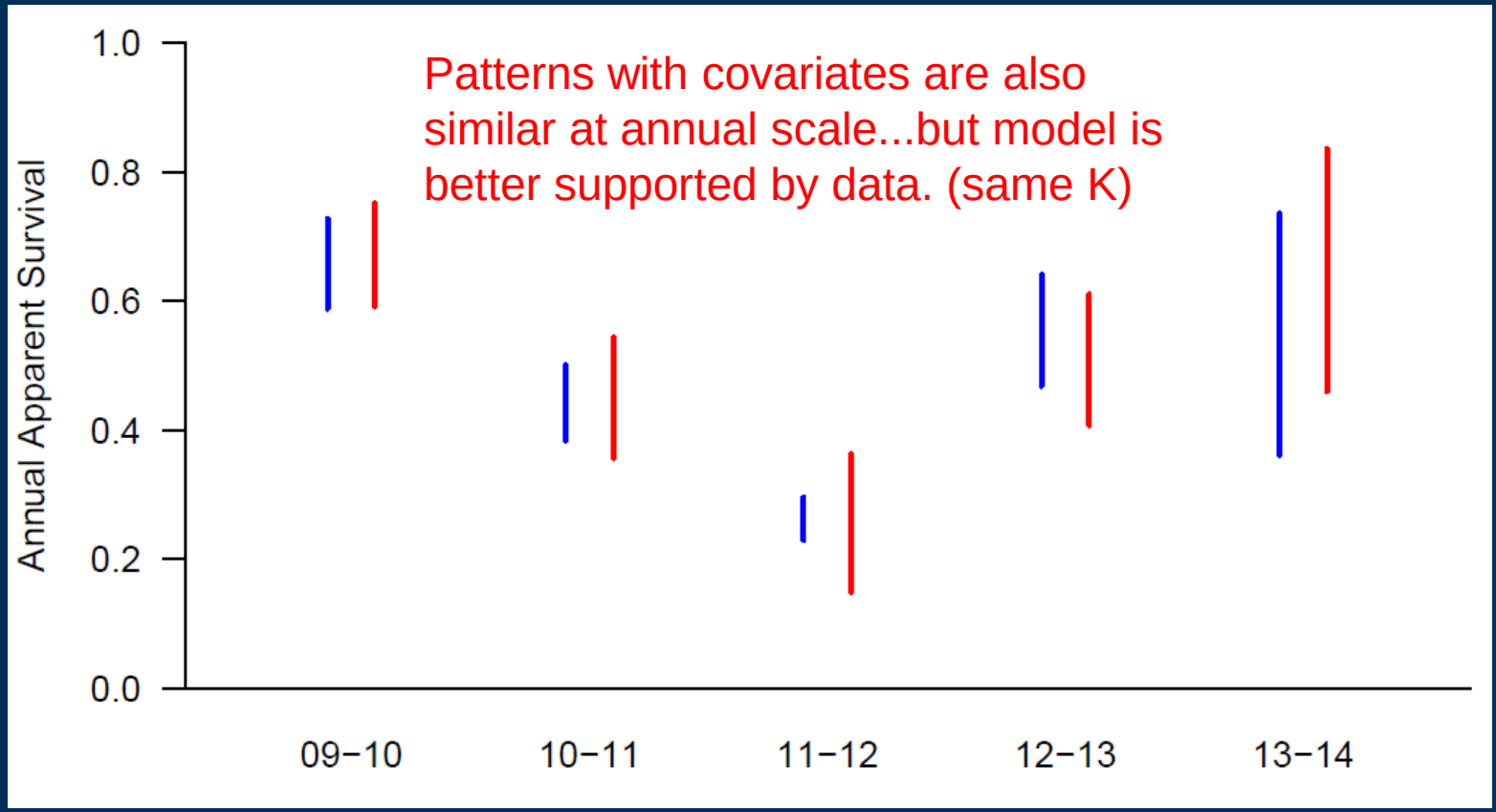

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Preliminary Data Do Not Cite

Drivers of HBC early life history

- In the LCR – flooding and intrinsic factors
  - Production
  - Emmigration rate
  - Growth

- CR – potentially many factors
  - Immigration
  - Trout?
  - Temperature?
  - Turbidity?
  - Discharge?
  - Growth

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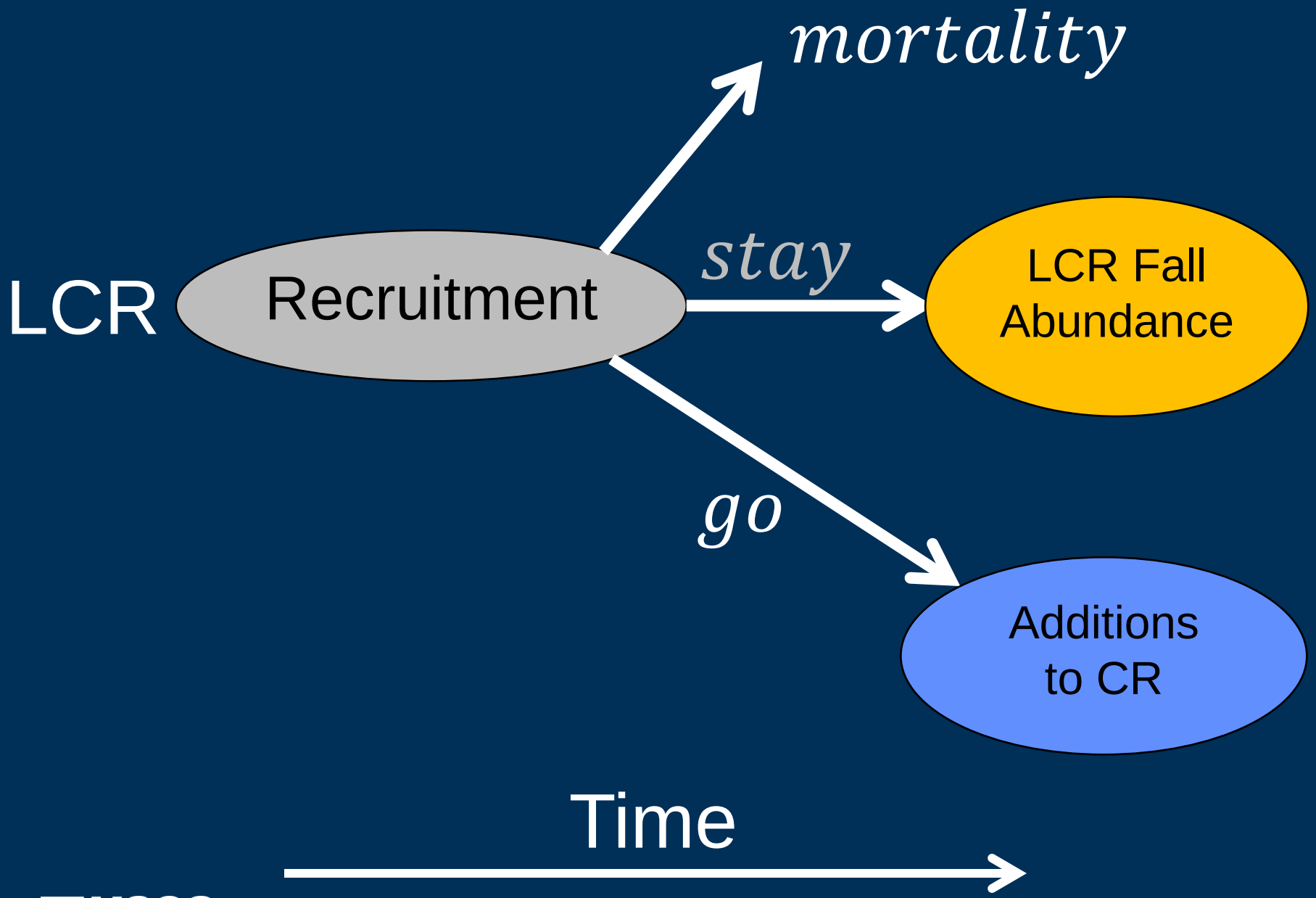
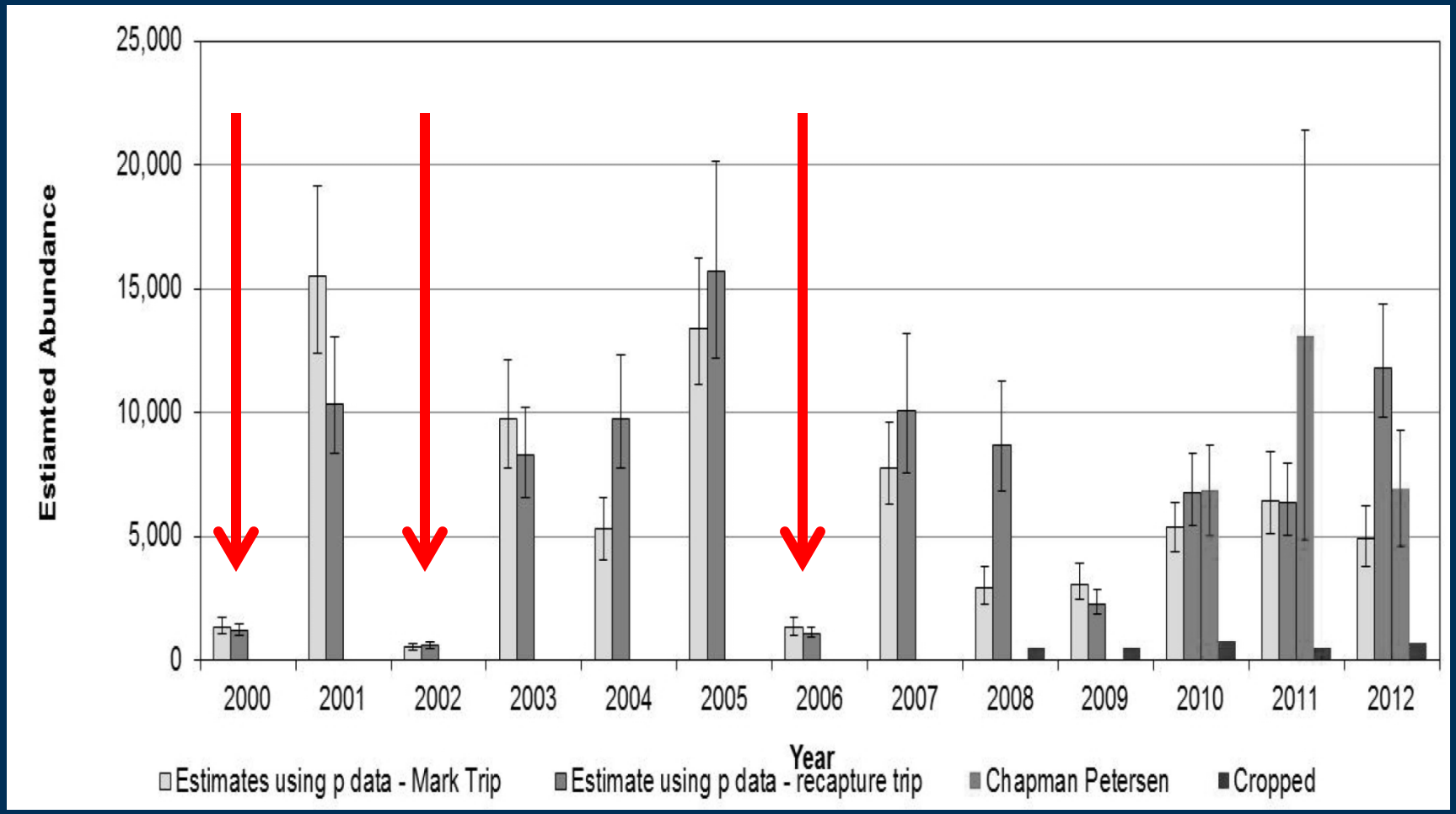

mortality
LCR
Recruitment
stay
LCR Fall Abundance
go
Additions to CR
Time

Fall HBC abundance in the LCR



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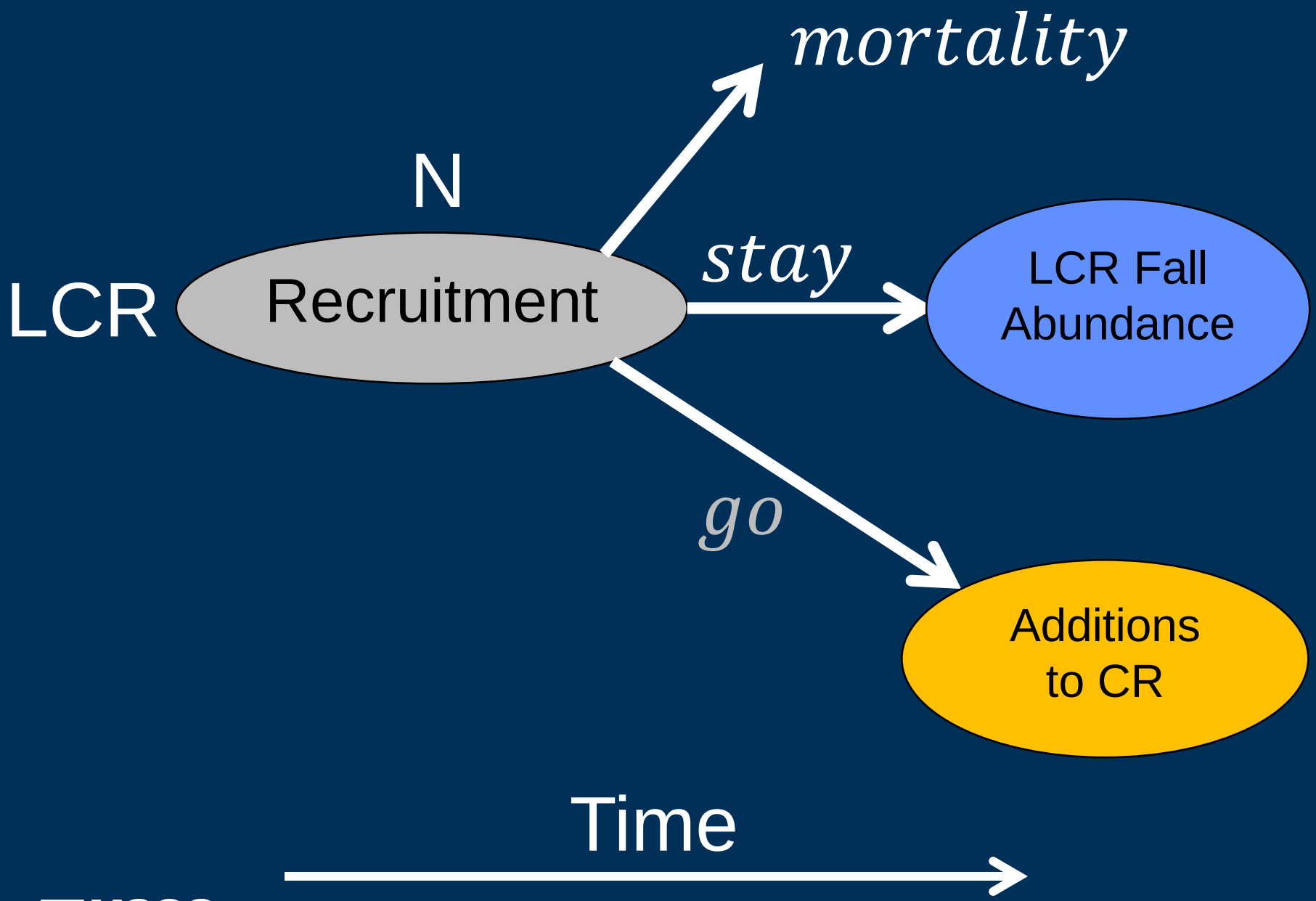
Preliminary Data Do Not Cite

Modified from Van Haverbeke *et al. (Annual Reporting 2013)*


mortality
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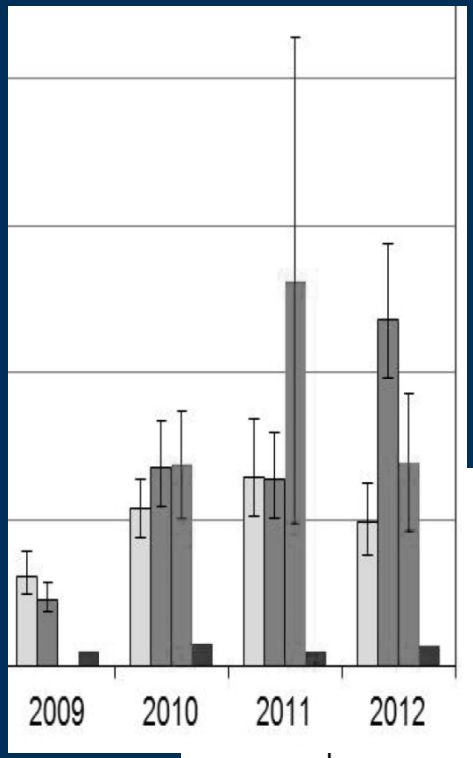
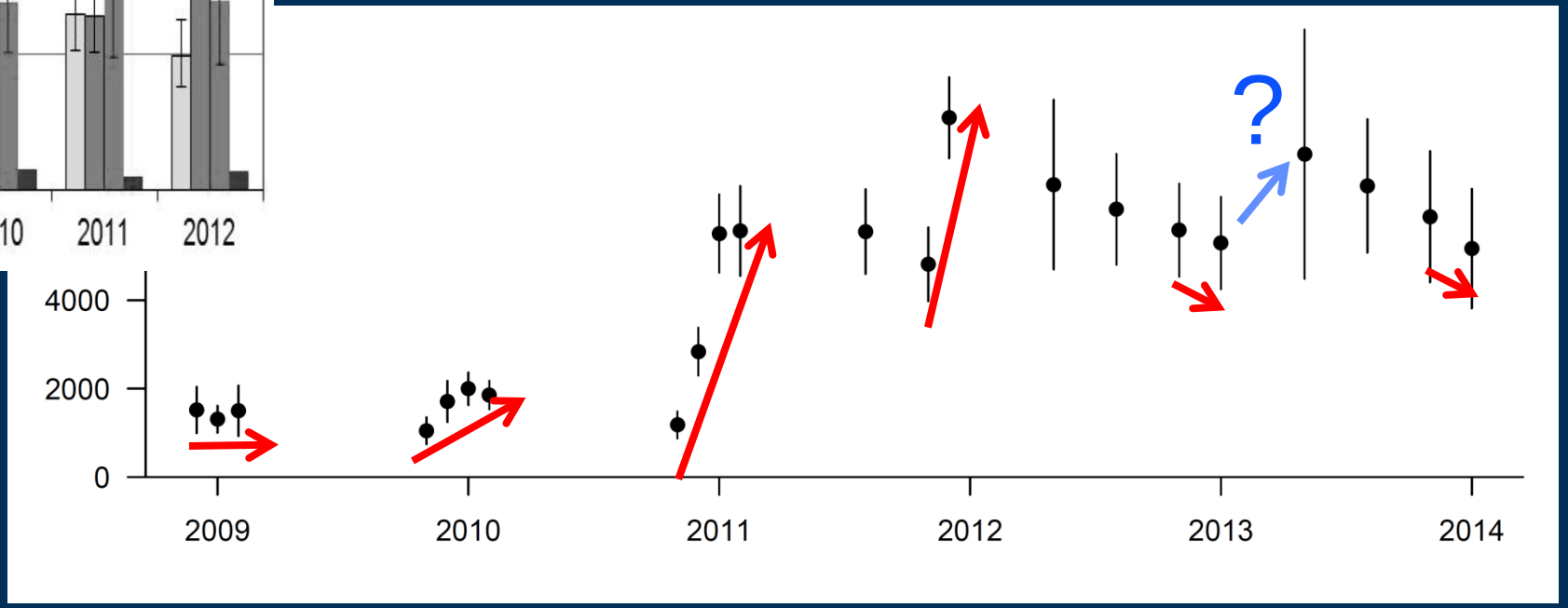


Analyzing abundances suggests highly variable export, which appears related to fall abundances in LCR.



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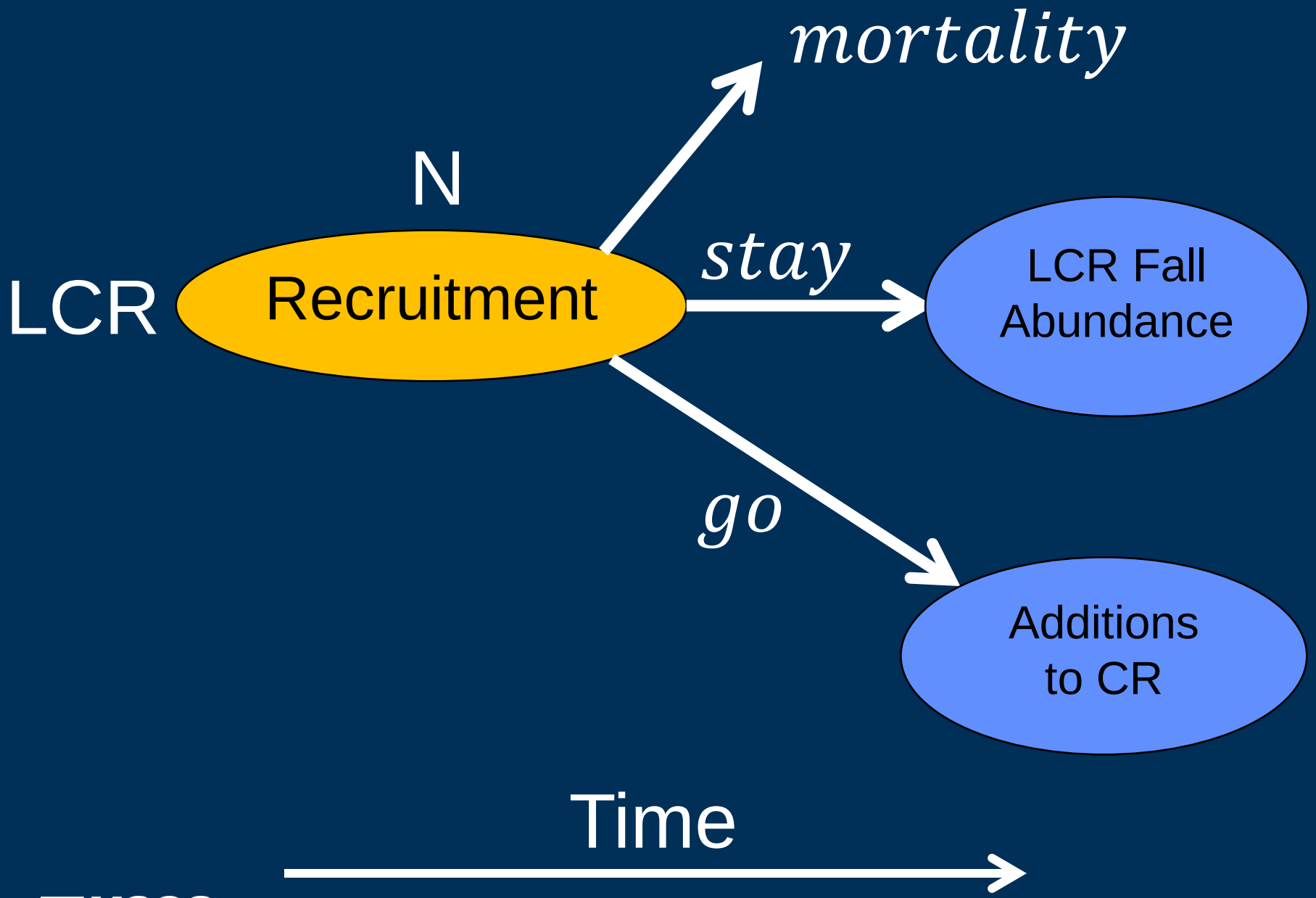
mortality
N
LCR
Recruitment
stay
LCR Fall Abundance
go
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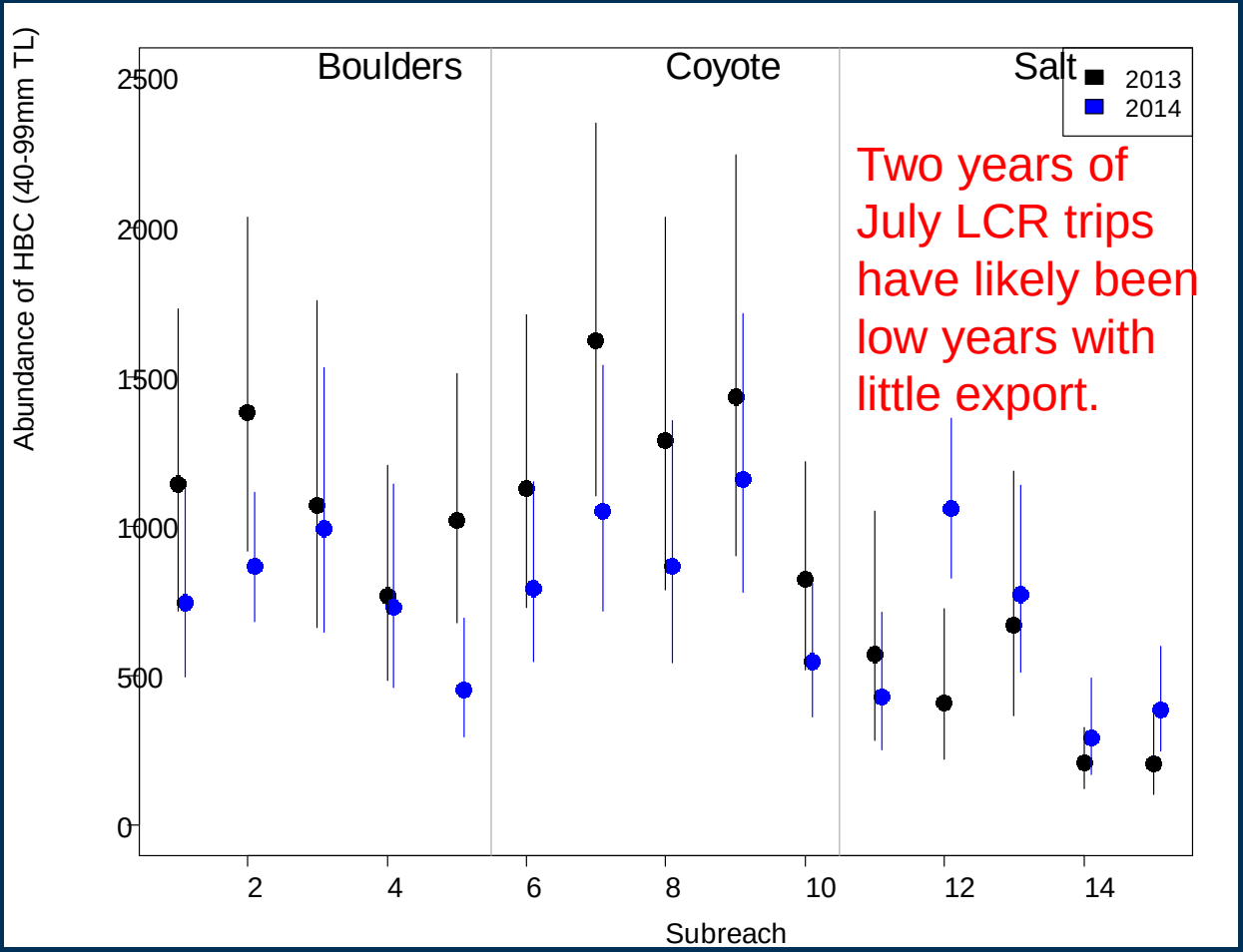
July LCR juvenile HBC abundance estimates:

2013: 14,000 (95% CI: 11,000-17,000)

2014: 11,000 (95% CI: 9,500-13,000)



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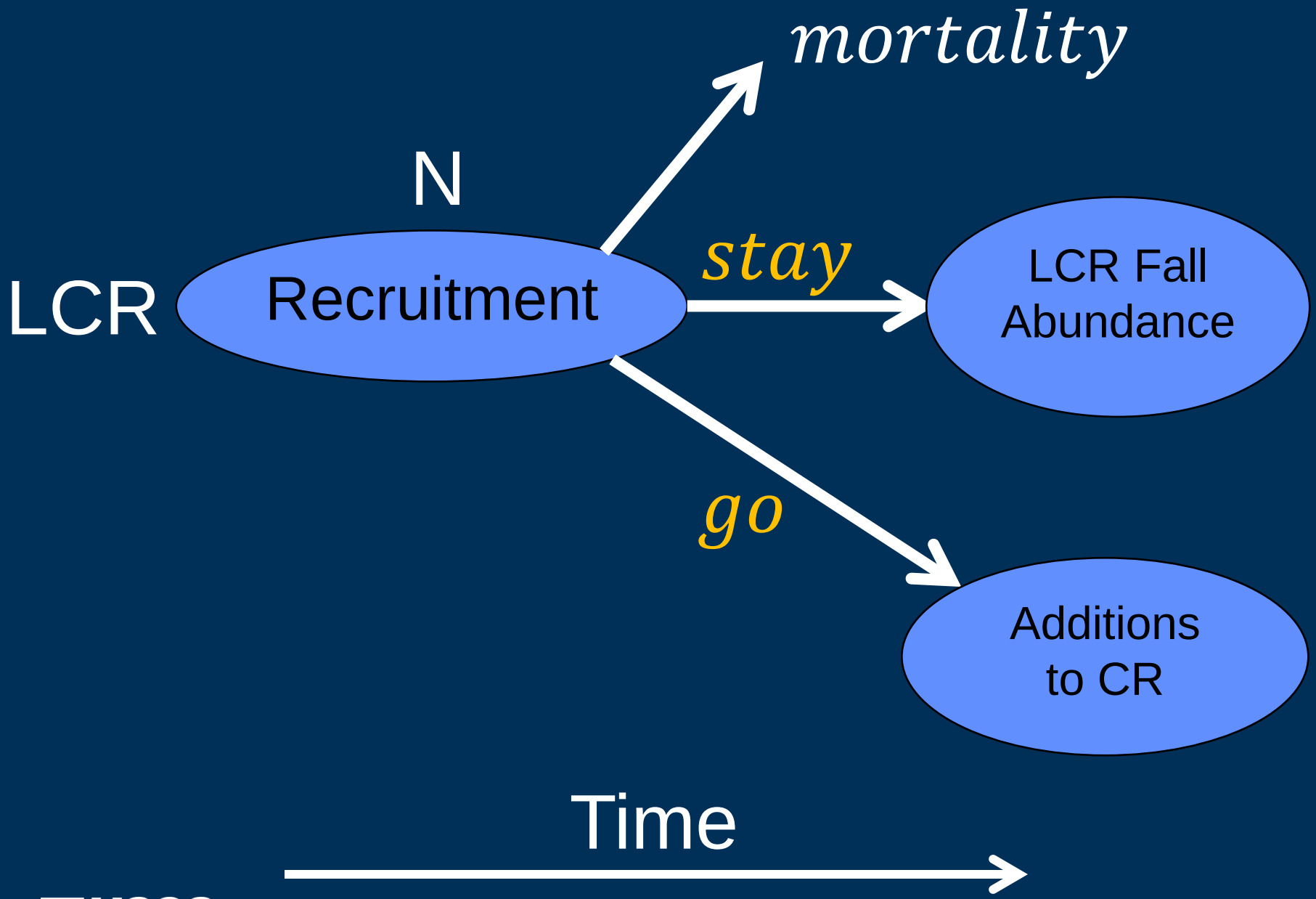
mortality
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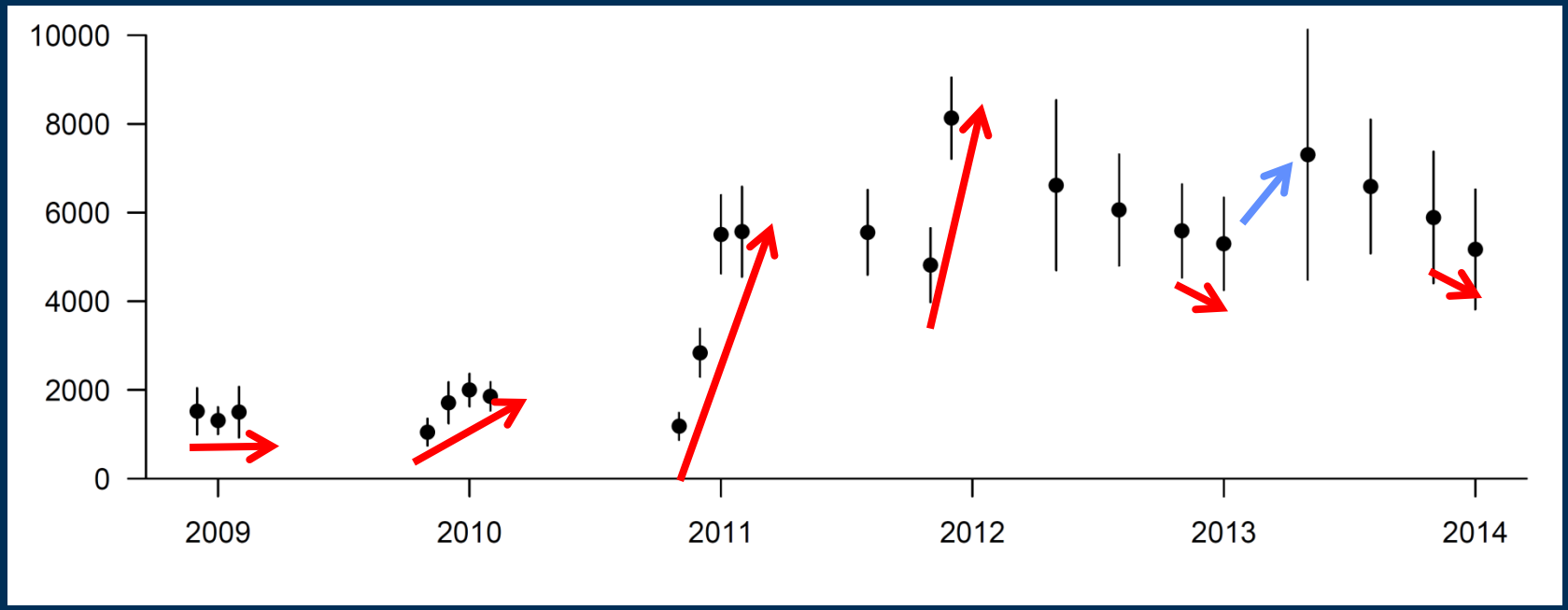
Estimates of emigration seem to line up more or less with increases in abundance



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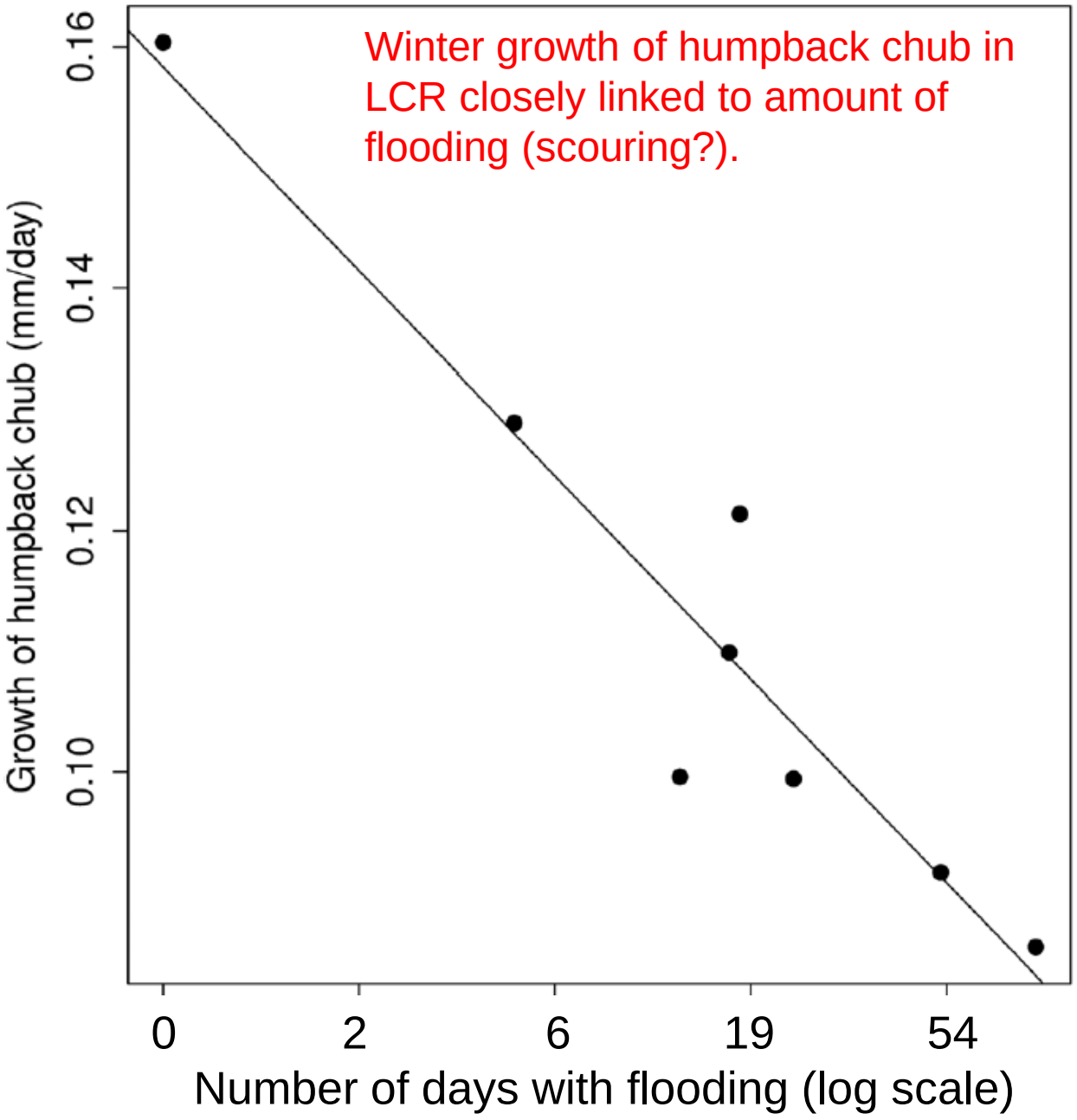

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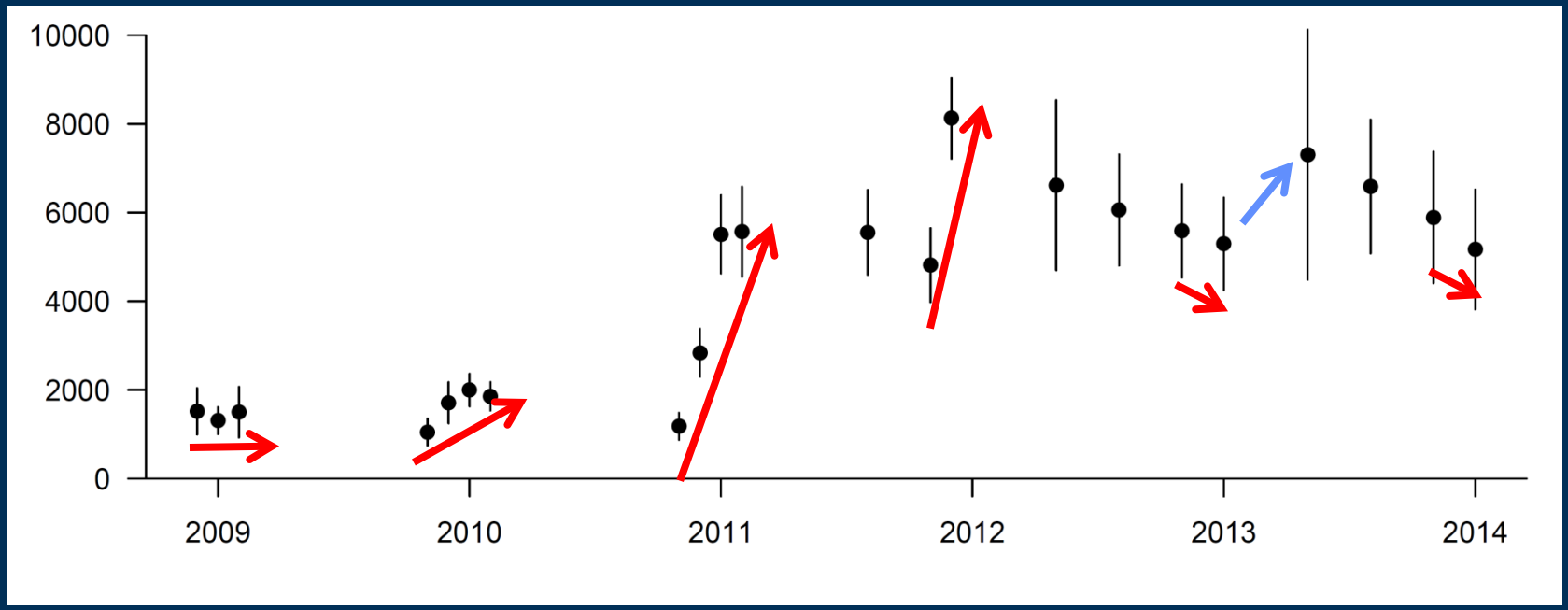
Dzul et al., available online

Growth effects size of humpback chub when they emigrate from LCR and could explain winter emigration.



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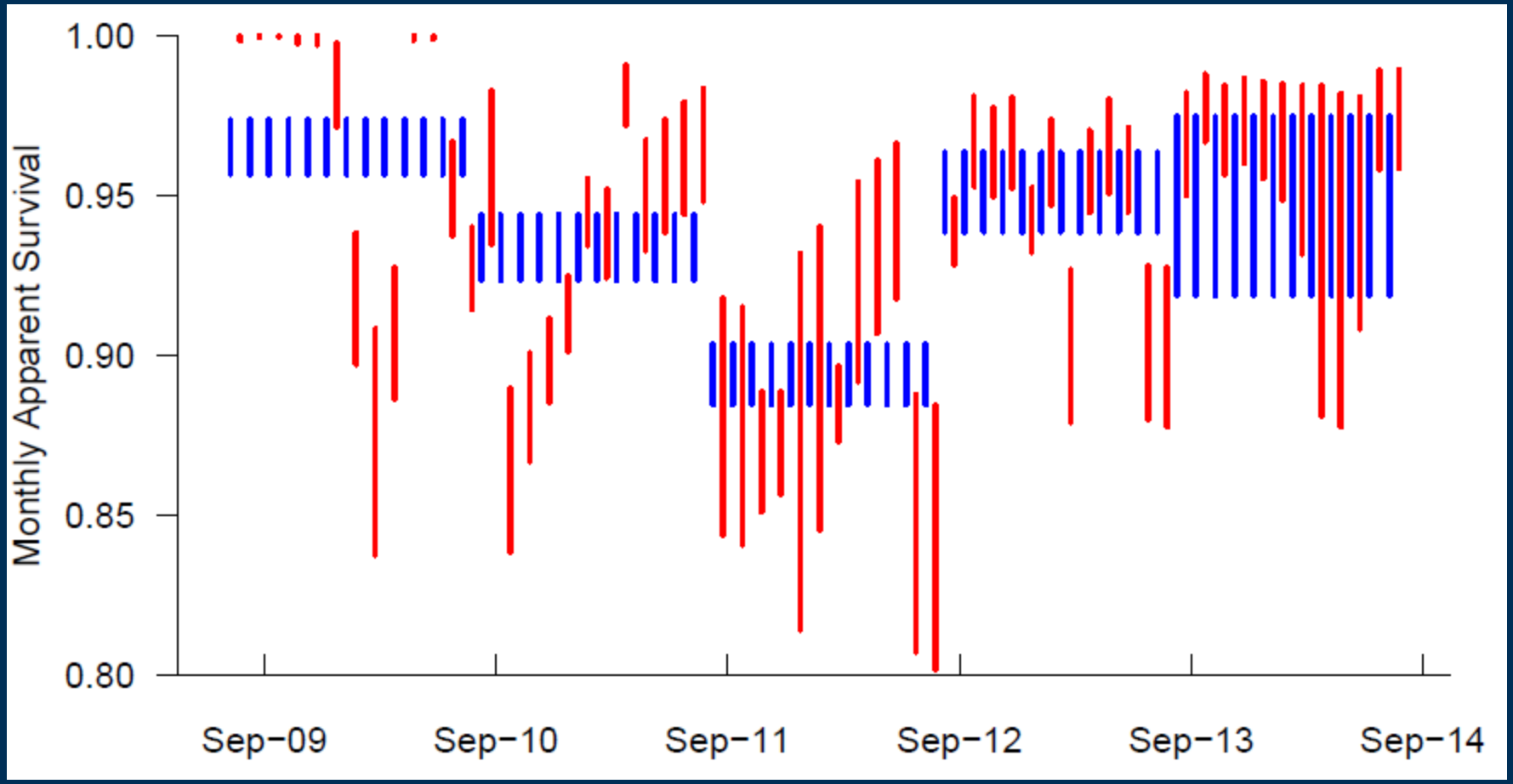

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Potential monthly covariates considered

mini-multistate - 2012 – 2014

Growth and Survival

- Temperature
- Turbidity
  - > 10 NTU
  - > 50 NTU
  - >100 NTU
- Stage
  - Average
  - Standard Deviation
- Size
- Interactions

CJS - 2009 – 2014

- Estimates of trout N
- Temperature
- Proportion of juveniles > 80 mm
- Turbidity
  - > 10 NTU
  - > 50 NTU
  - >100 NTU
- Stage
  - Average
  - Standard Deviation
- Interactions

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mini-multistate - 2012 – 2014

Survival

- Size(+)
- Turbidity (>10 NTU) (-)

Growth

- Temperature (+)
- Average Stage (Discharge) (+)
- Size (-)

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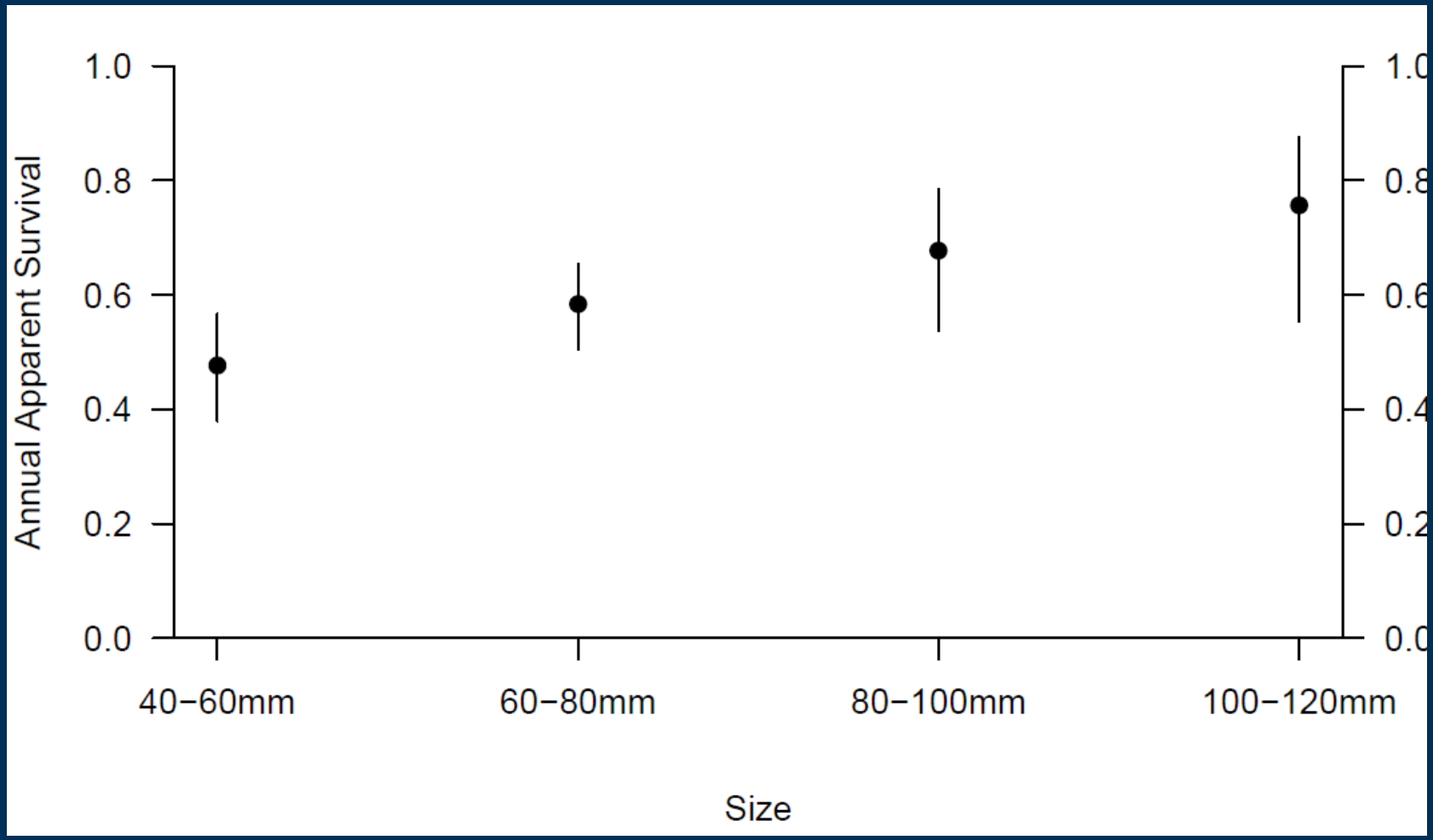
HBC survival in JCM reach



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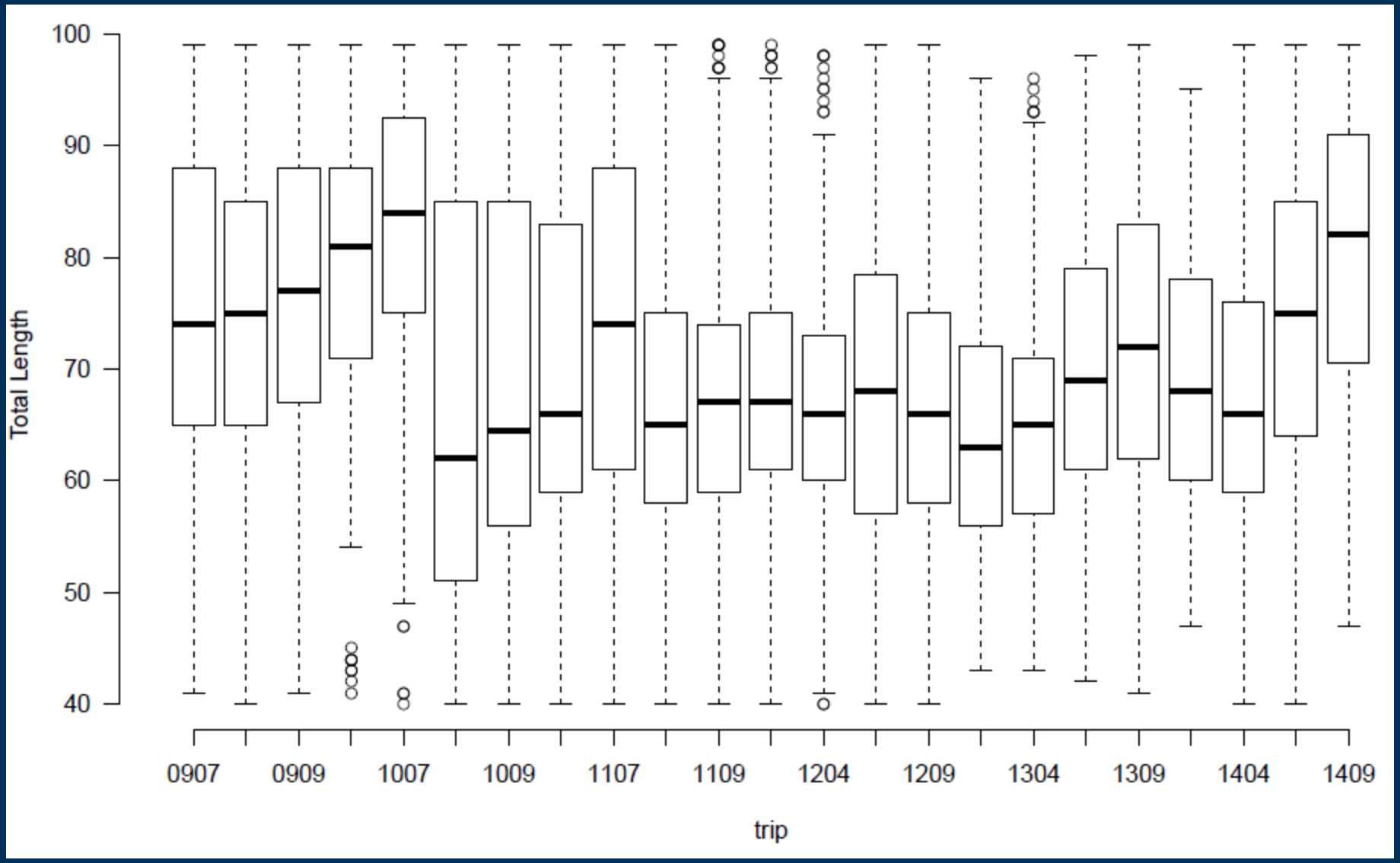
Preliminary Data Do Not Cite

HBC length frequency in JCM reach



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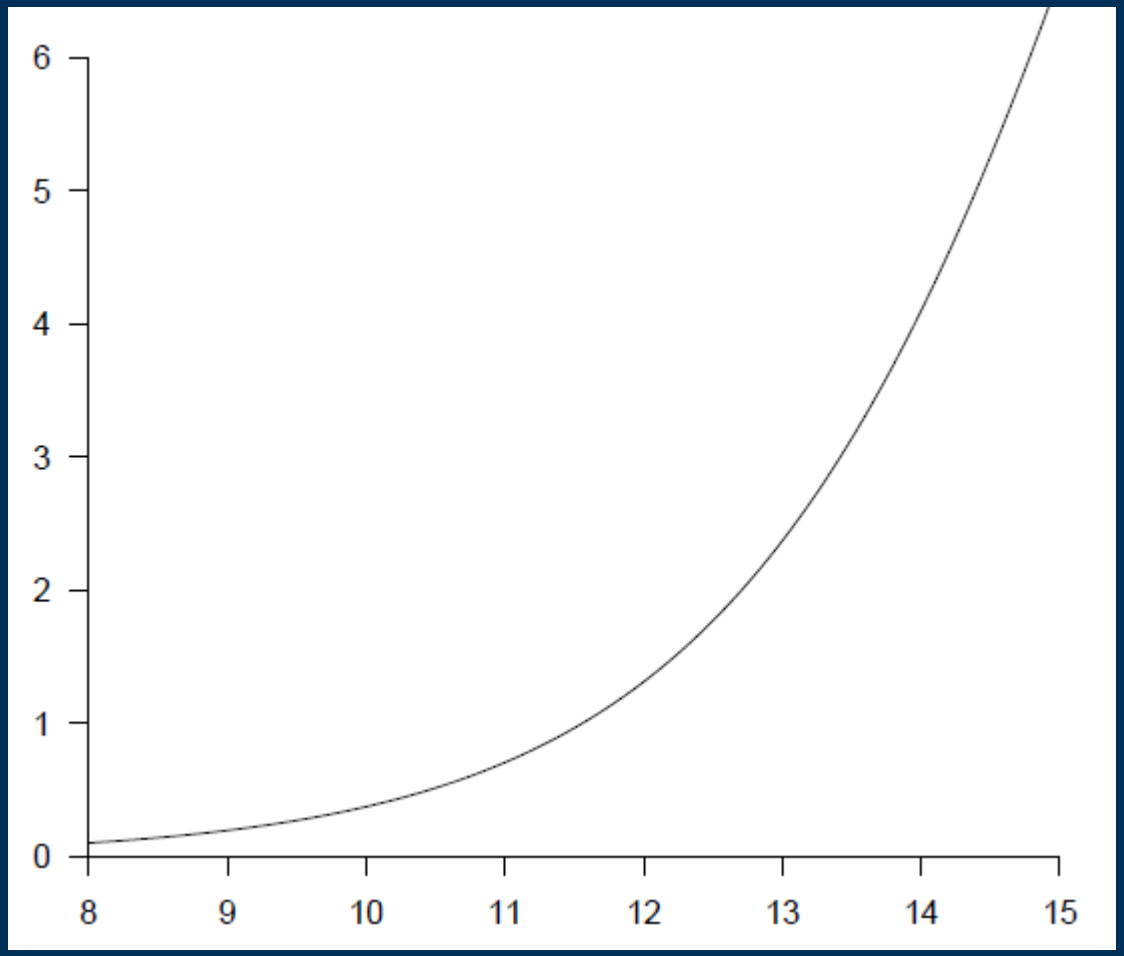

Monthly growth of a 60-80 mm humpback chub

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mini-multistate - 2012 – 2014

Survival

- Size(+)
- Turbidity (>10 NTU) (-)

Growth

- Temperature (+)
- Average Stage (Discharge) (+)
- Size (-)

CJS - 2009 – 2014

- Proportion of larger juveniles (+)
- Estimates of trout N (-)
- Turbidity (> 10 NTU) (-)
- Interaction between Turbidity and Trout (+)

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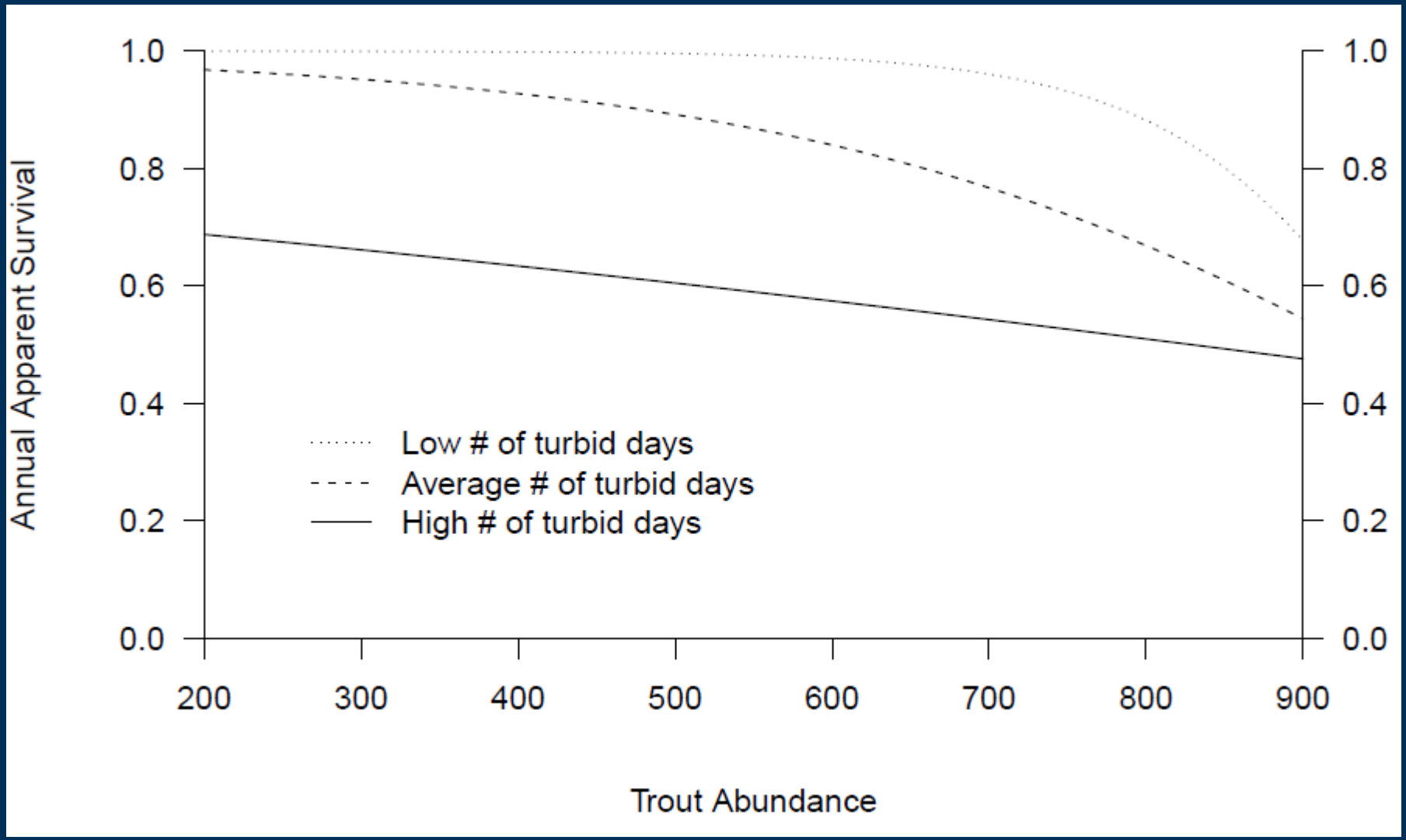
HBC survival in JCM reach



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Juvenile chub take home messages

- Flooding in the LCR plays a critical role in production, outmigration and growth.
- Growth in the Colorado River primarily driven by temperature, but may also be affected by monthly volumes / stage.
- Survival appears to be a function of fish size, trout and turbidity.

USGS

Acknowledgements

- Mike Yard , Josh Korman
- US Fish and Wildlife Service
- Near Shore Ecology Group
- David Ward, Luke Avery, Michael Dodrill and others involved with July LCR
- Glen Canyon Adaptive Management Group
- Bureau of Reclamation
- Navajo Nation Department of Fish and Wildlife
- National Park Service

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