



Fisheries Review: Annual Reporting FY2023

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with help from

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

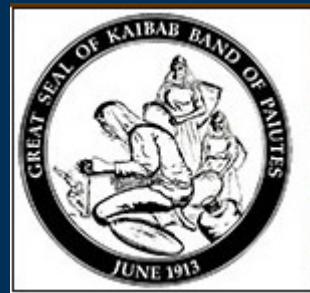
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Thank you!

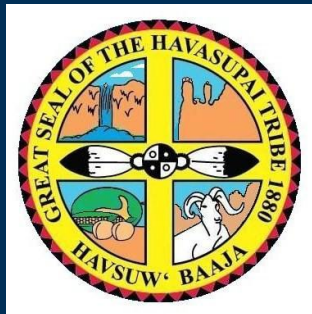


Numerous biologists, volunteers, logistics crew, boatmen, database managers

Glen Canyon Dam Adaptive Management Program



Thank you to the
Grand Canyon
Native American
Tribes!



In this presentations: all fish illustrations by Joe Tomelleri

Presentation outline

- **Non-native species**



- **Smallmouth Bass (SMB) in Glen Canyon**



- **Brown Trout (BNT) in Glen Canyon**

- **Rainbow Trout (RBT) fishery**



- **Growth, abundance in Glen Canyon**

- **Angler catch**

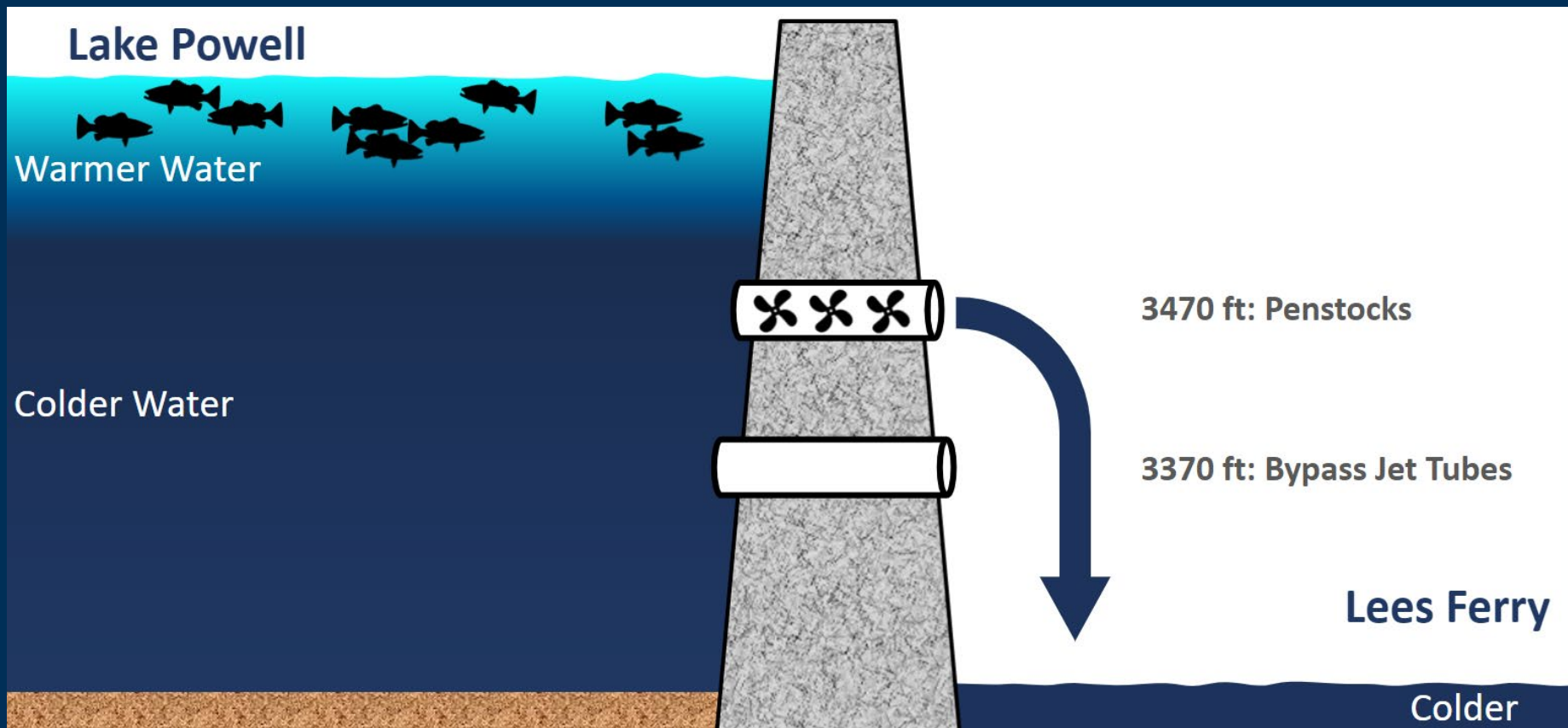
- **Humpback Chub (HBC)**



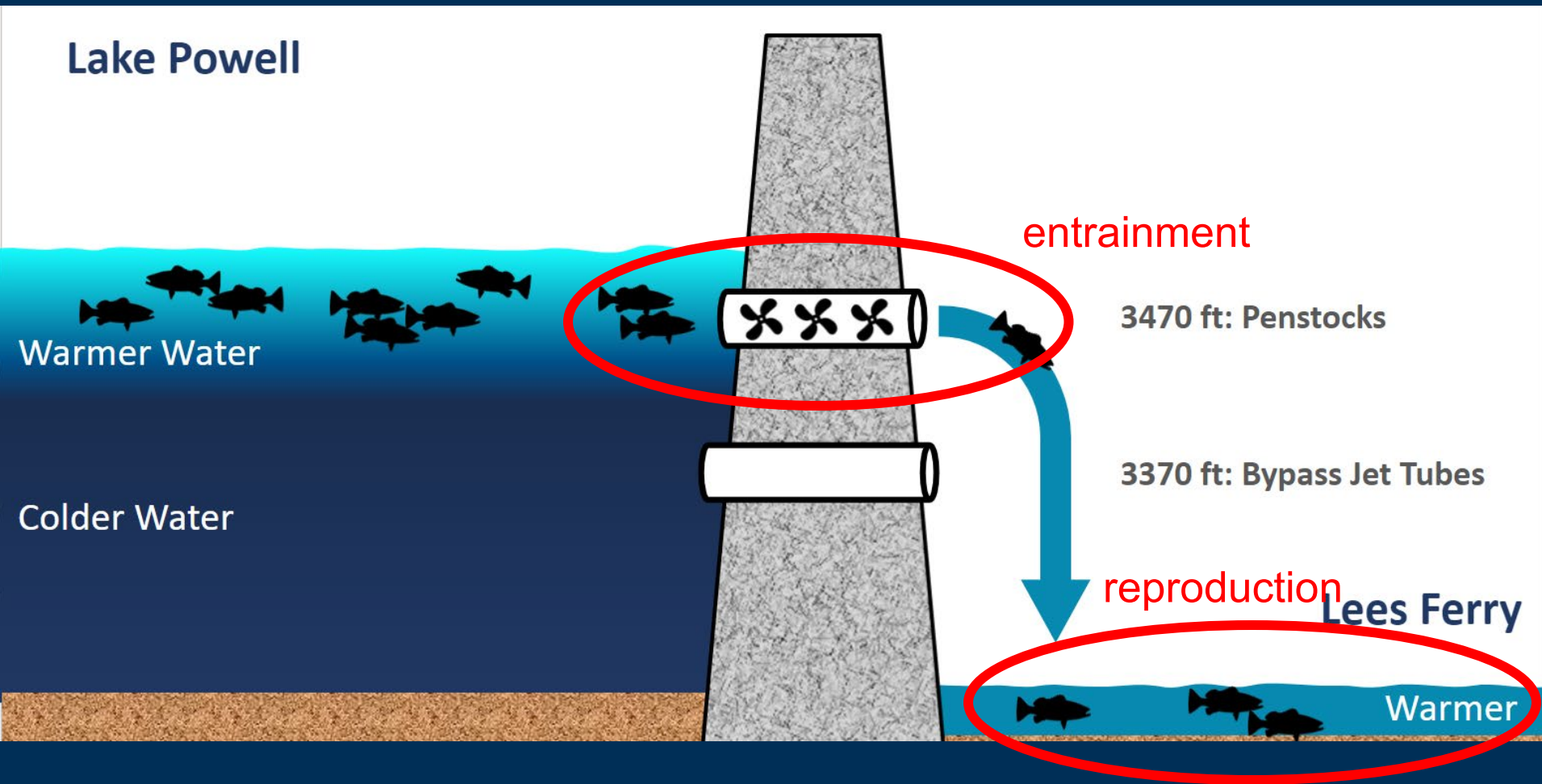
- **Abundances**

- **Triggers (see 2016 BiOp)**

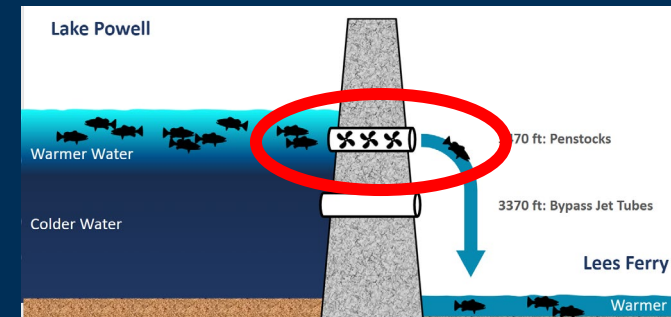
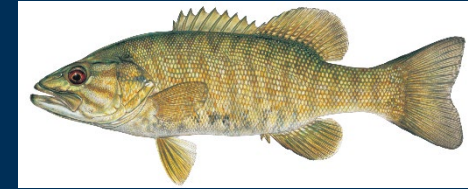
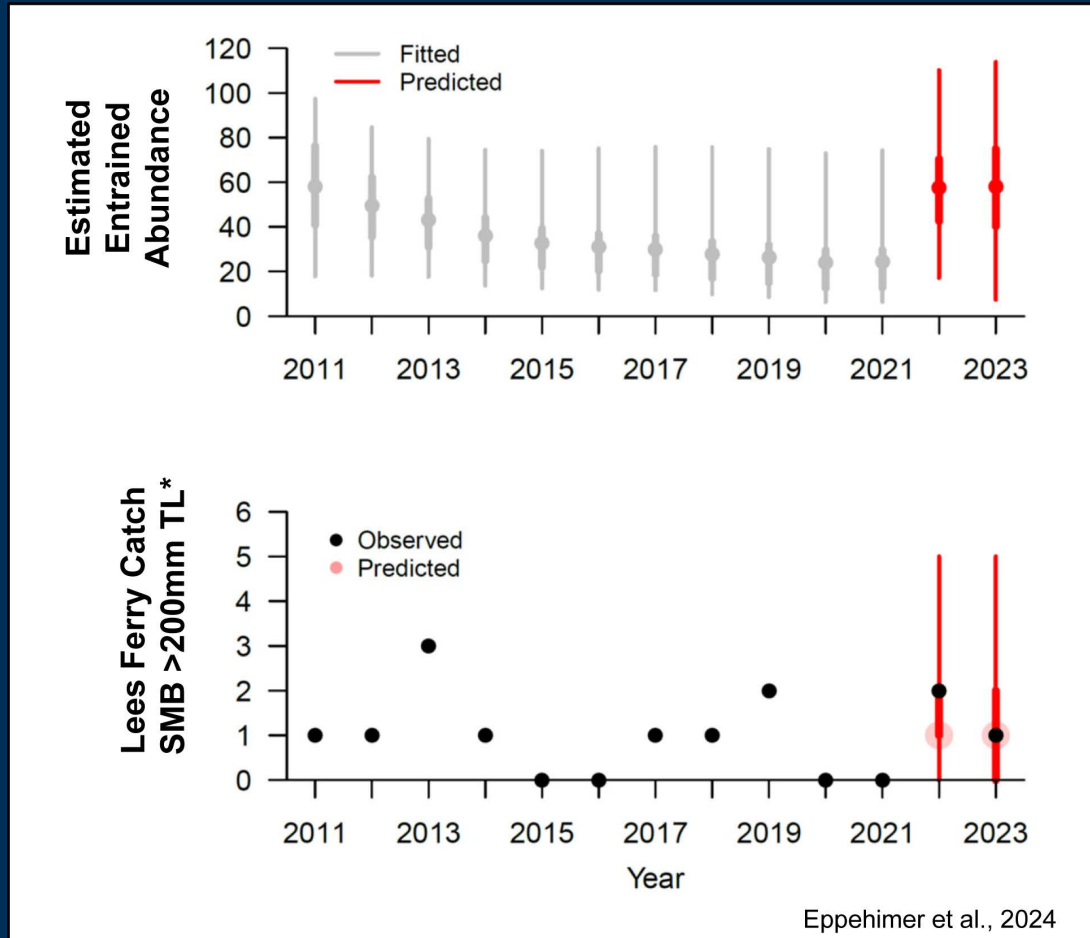
Non-native species: SMB background – when Lake Powell is high



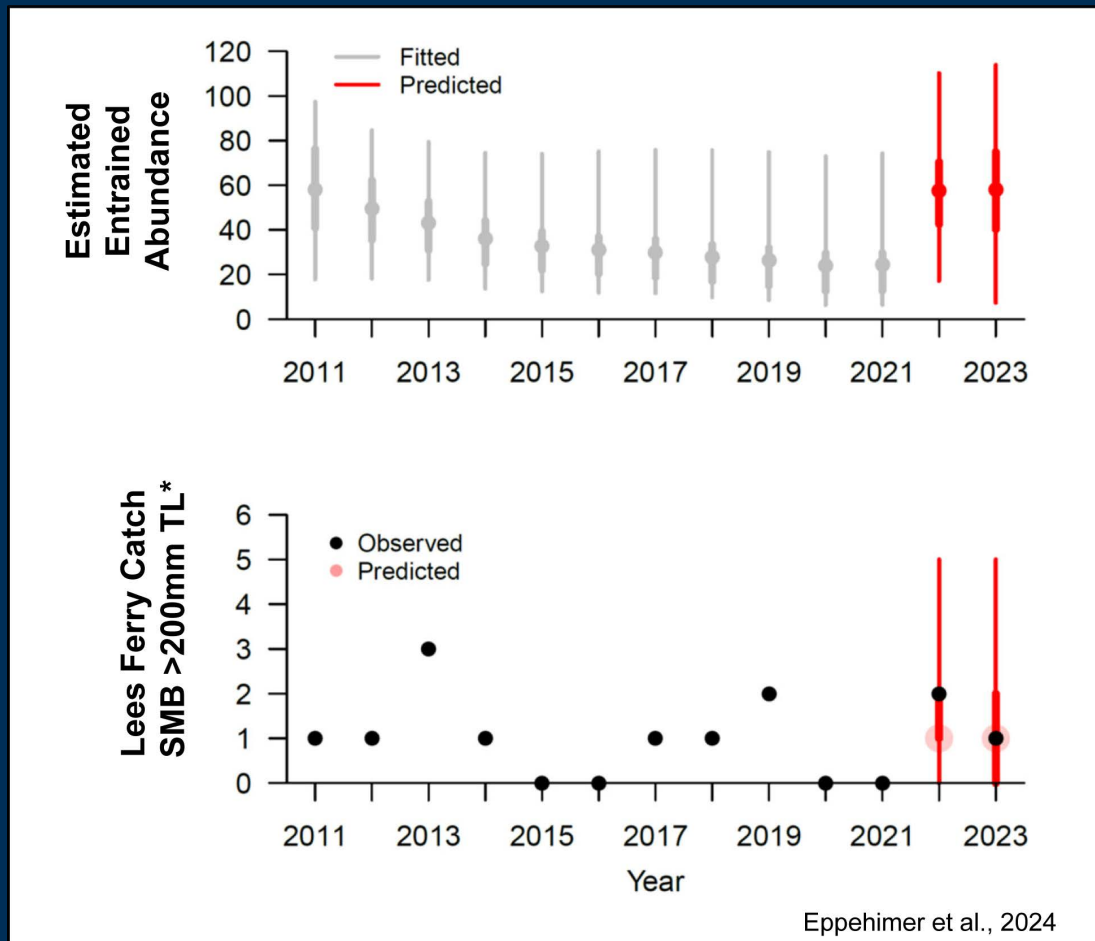
Non-native species: SMB background – when Lake Powell is low



Non-native species: Models suggest adult SMB entrainment is low



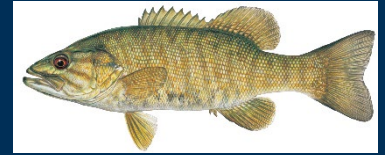
Non-native species: Models suggest adult SMB entrainment is low



Models suggest only **modest entrainment of adult SMB** in 2022 and 2023

Modeling suggests **greater entrainment at Lake Powell elevations <3,525 ft.**

Non-native species: Models suggest some potential for SMB population growth in 2024



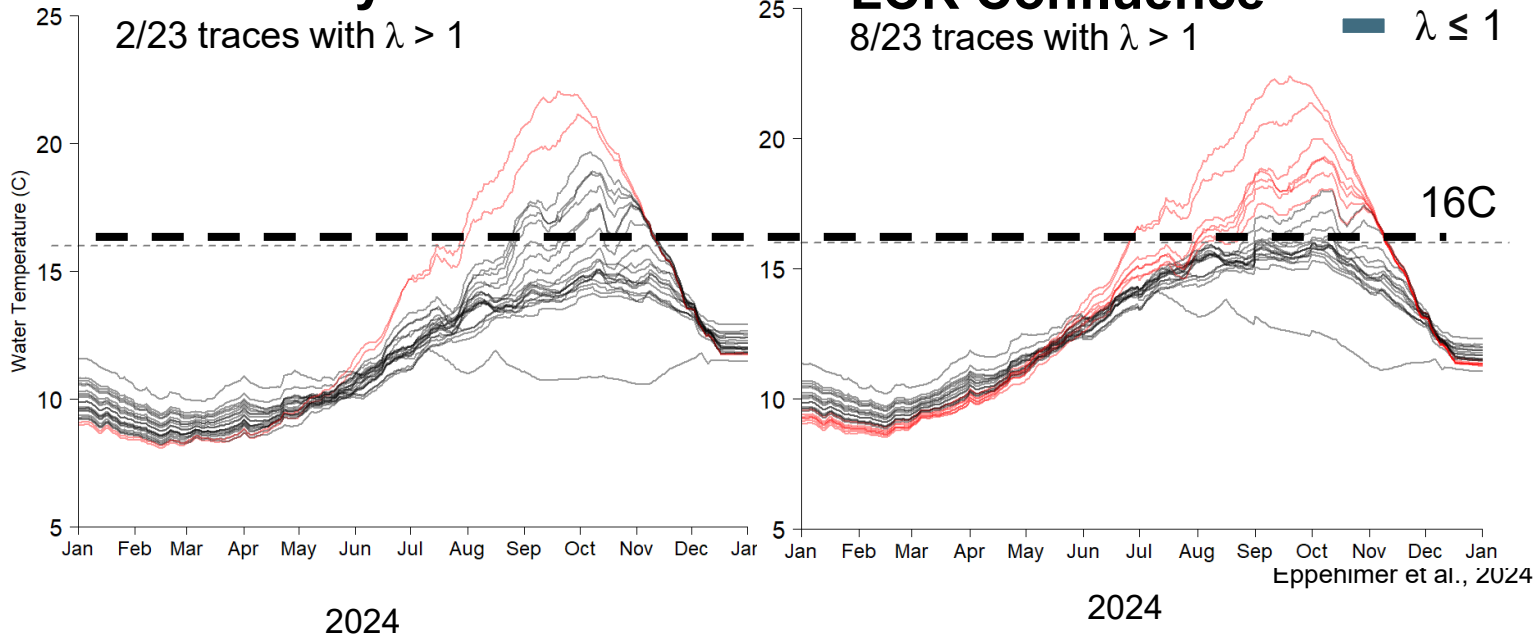
Using historic inflows from 2000-2022

Lees Ferry

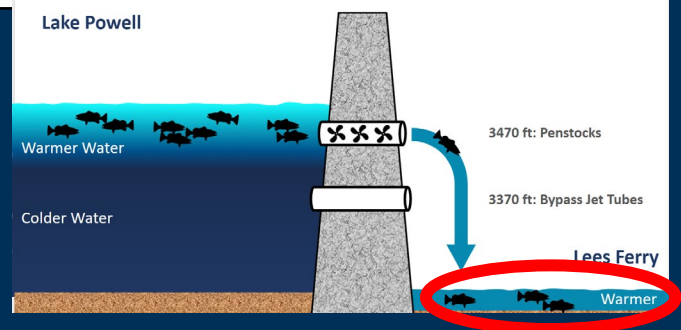
2/23 traces with $\lambda > 1$

LCR Confluence

8/23 traces with $\lambda > 1$

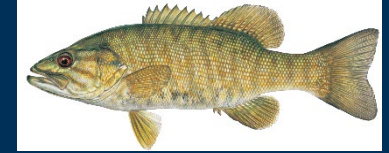


Population growing
Population stable or declining

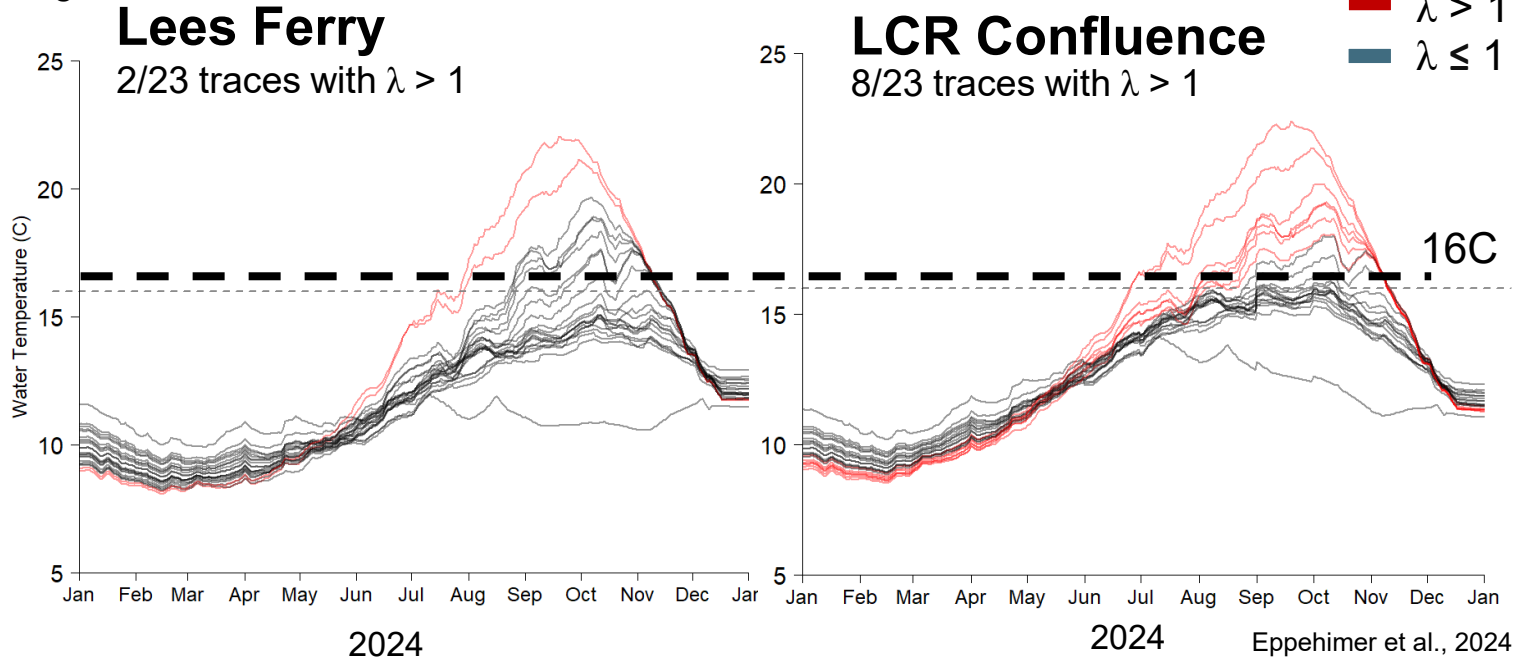


Non-native species:

Models suggest some potential for SMB population growth in 2024



Using historic inflows from 2000-2022



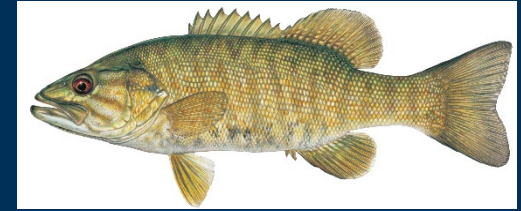
Predictions for 2024:

- Water temp likely $>16C$ in Lees Ferry but SMB success will be limited because: 1) temp $>16C$ late in year, 2) only slightly $>16C$

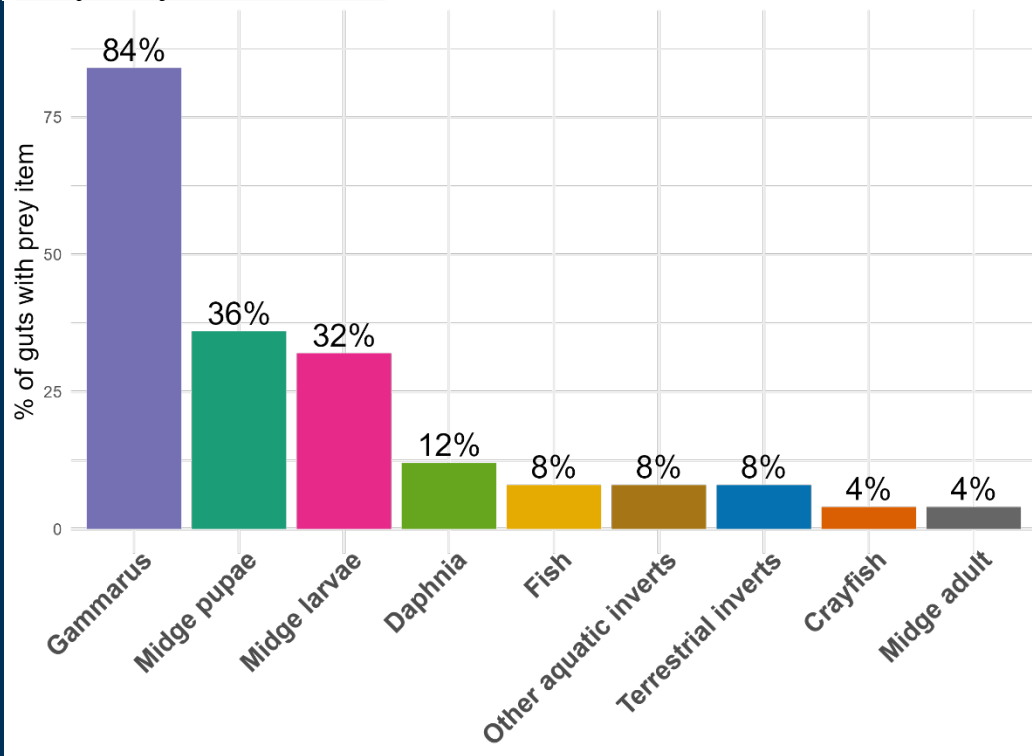


- If -12 mile slough remains in current condition, temperatures will likely be suitable for SMB reproduction in Lees Ferry.

Non-native species: Juv. SMB are eating a wide variety of food items



Frequency of occurrence



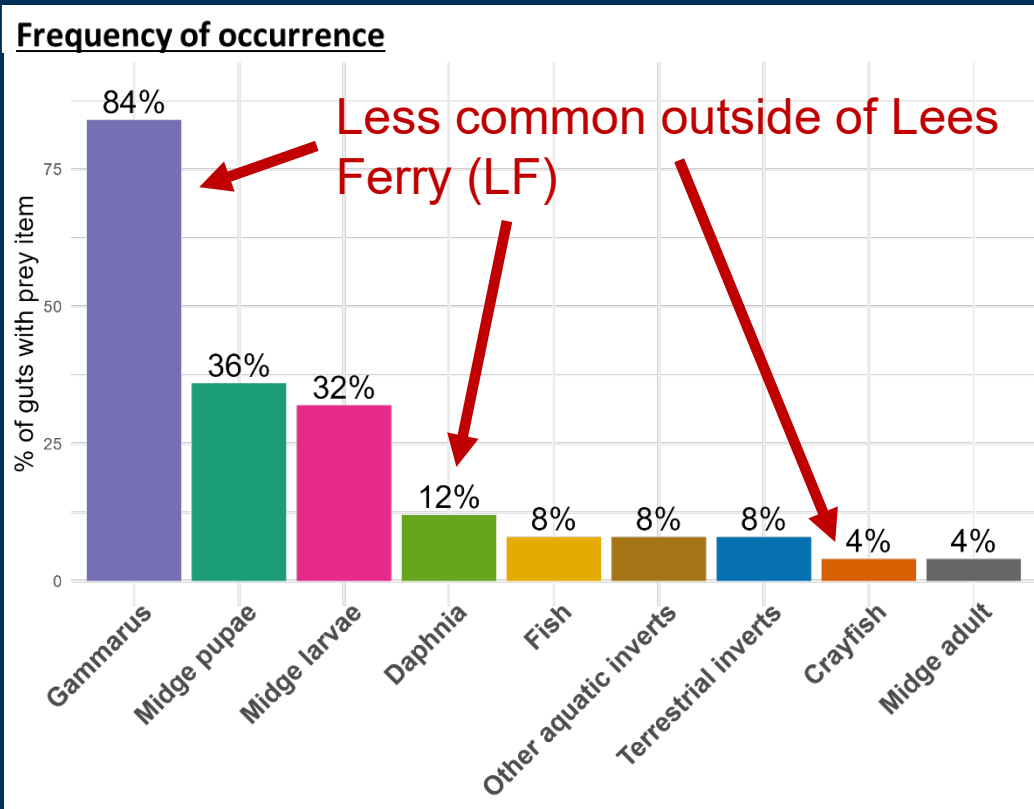
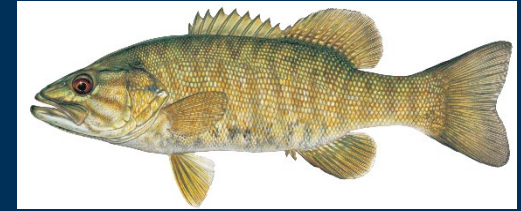
**2023 Summer Juvenile
SMB from the mainstem**

Total n=42

Non-empty n=25



Non-native species: SMB are eating a wide variety of food items



**2023 Summer Juvenile
SMB from the mainstem**

Total n=42

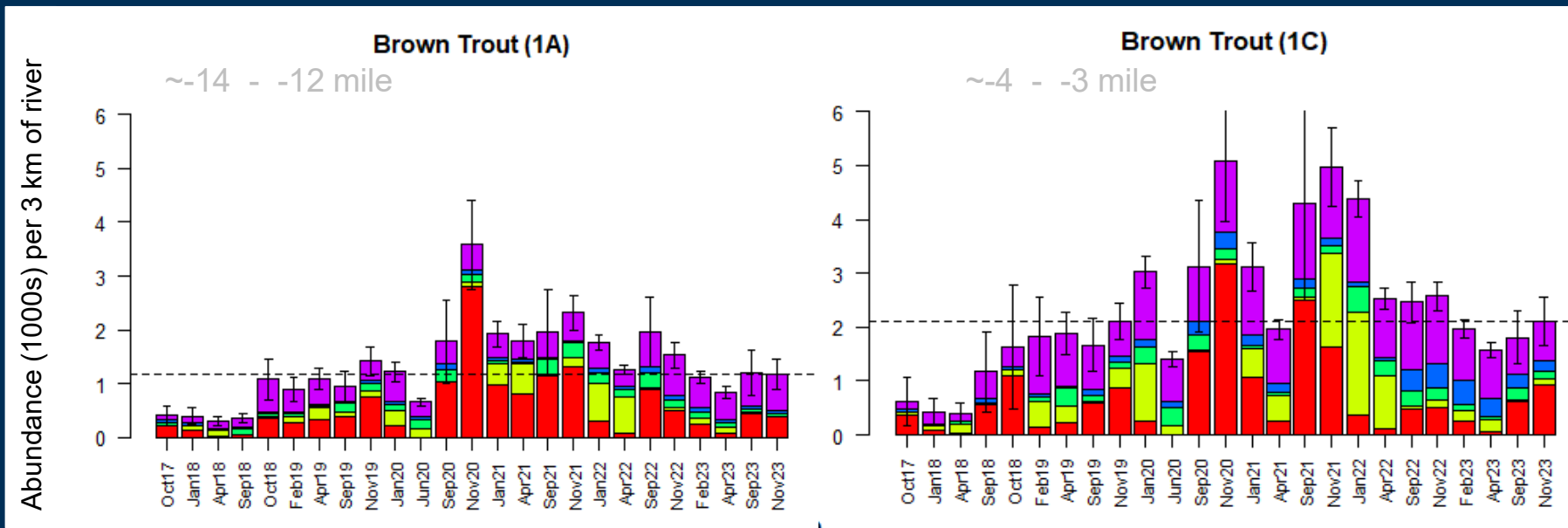
Non-empty n=25

**SMB are eating some prey
items common only in LF,
but they are also eating
prey found throughout the
CRe**





Non-native species: BNT in Glen Canyon have stabilized since peak in 2020-2021

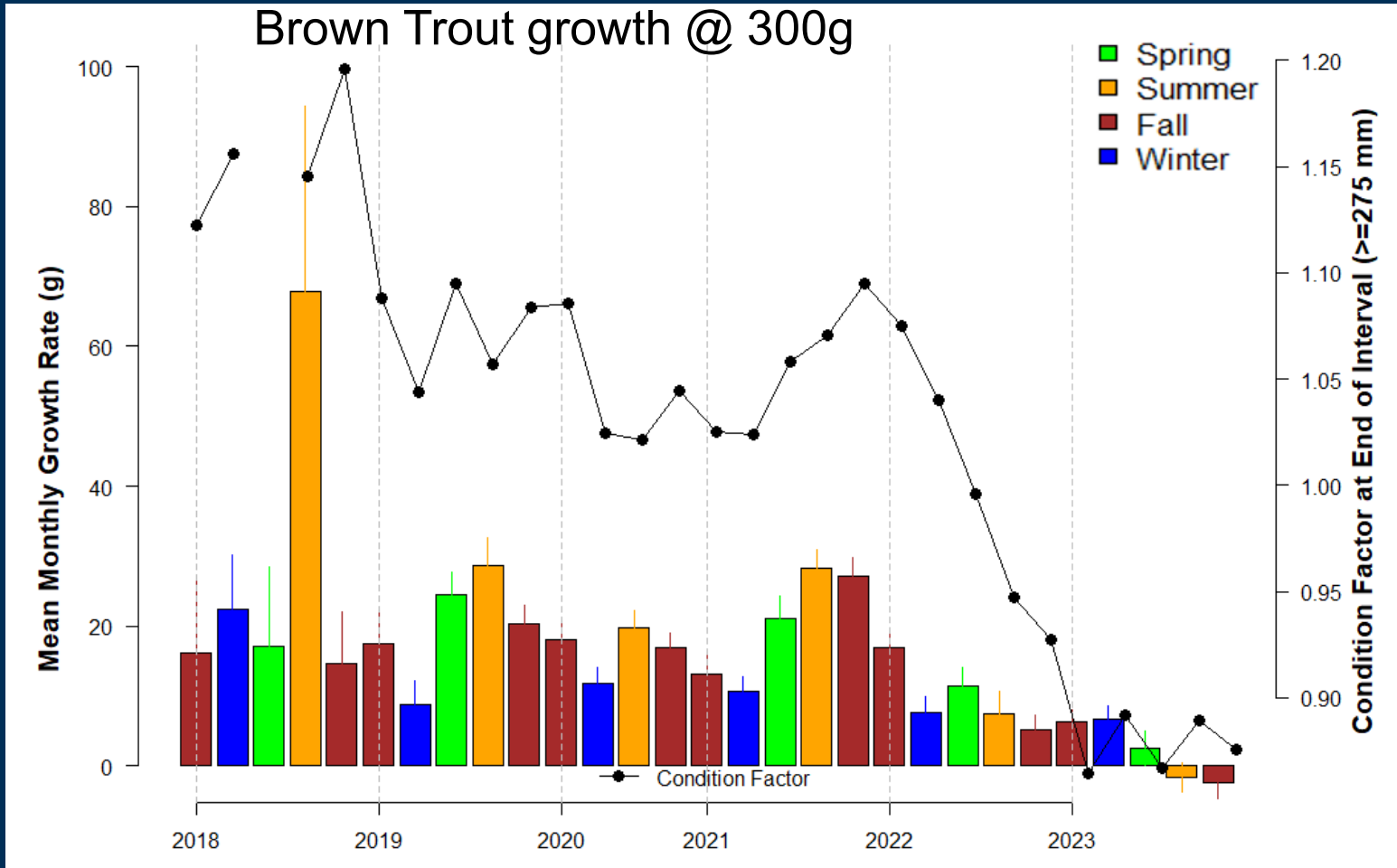


Size Class (mm FL)

- ≥ 275
- 225-274
- 175-224
- 125-174
- 75-124

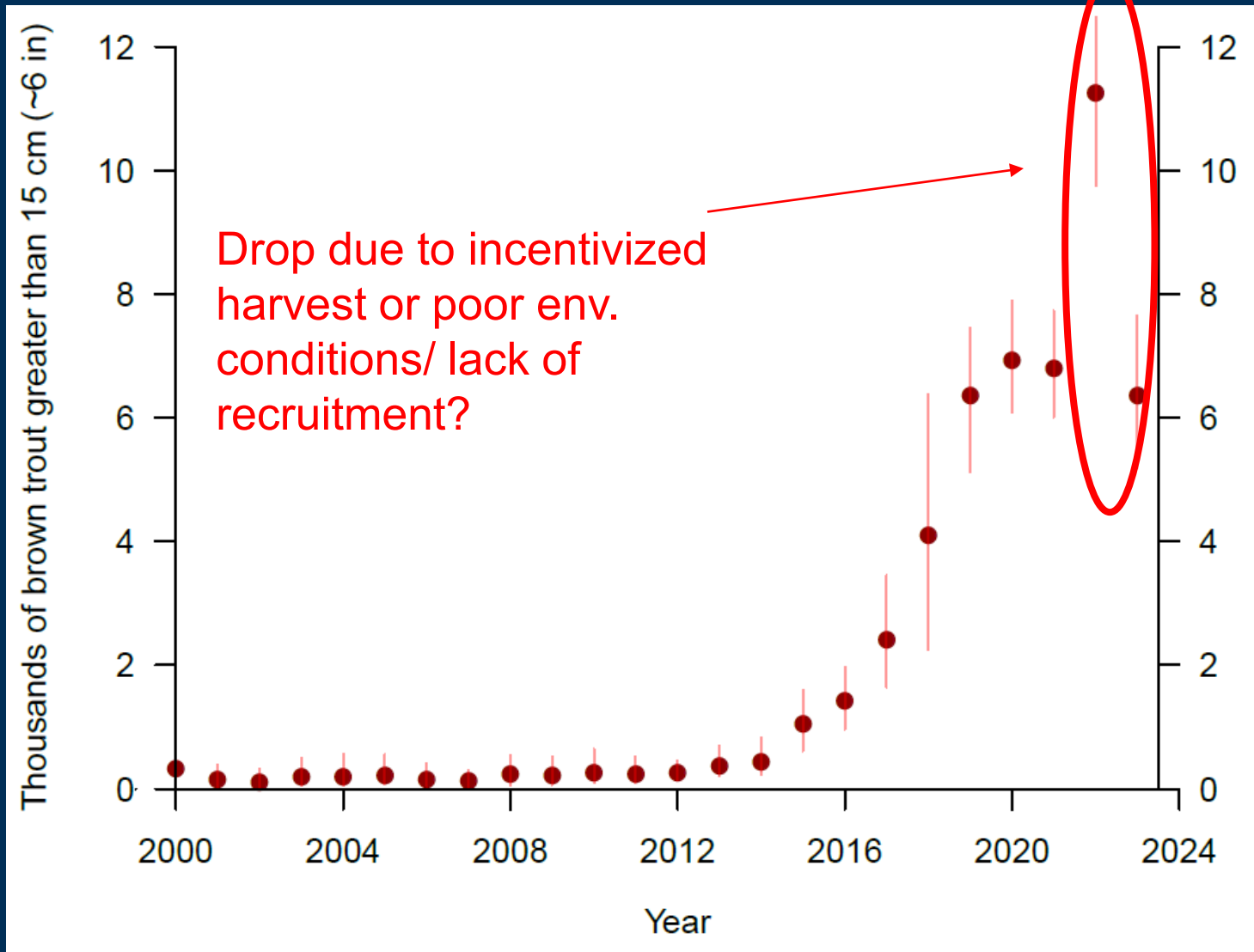
Non-native species:

BNT in Glen Canyon had low condition/slow growth in 2023



Growth/condition is low even in spring 2023 when temp & dissolved oxygen were favorable – prey limitation?

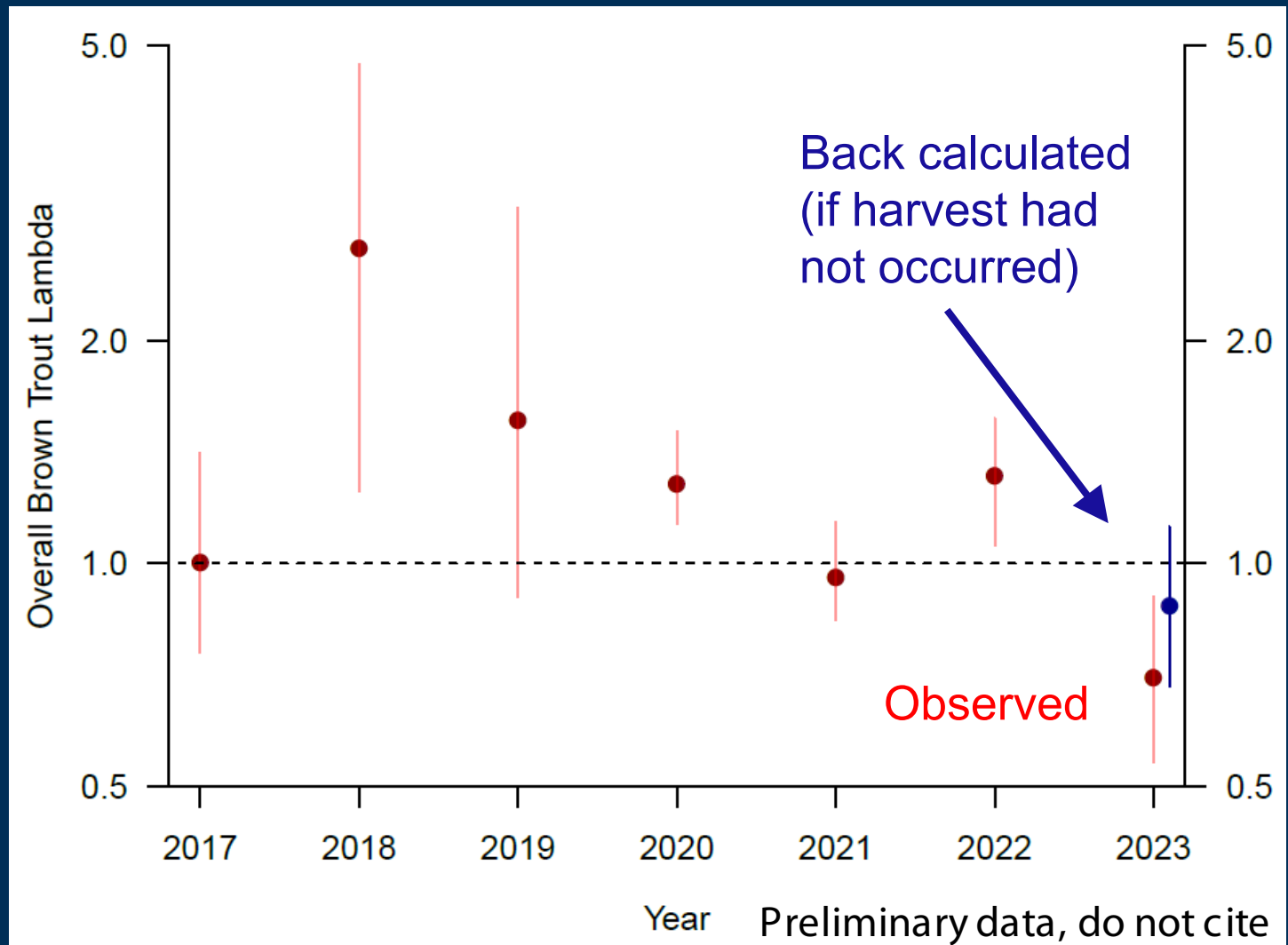
Non-native species: Brown trout declined in 2023



Preliminary data, do not cite.

Non-native species:

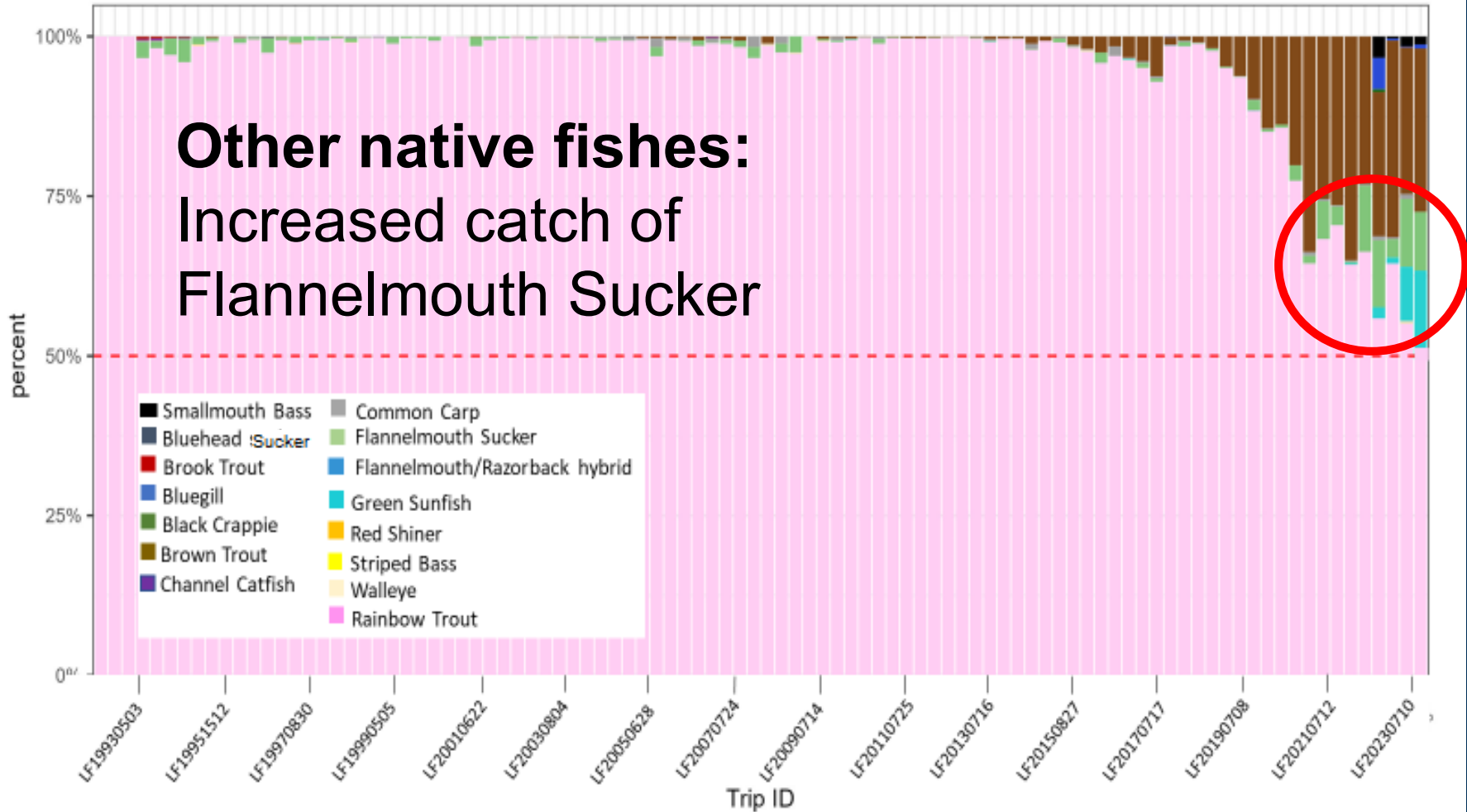
BNT declined mostly due to poor env. conditions, but incentivized harvest helped



Non-native species: Increased catch of Green Sunfish

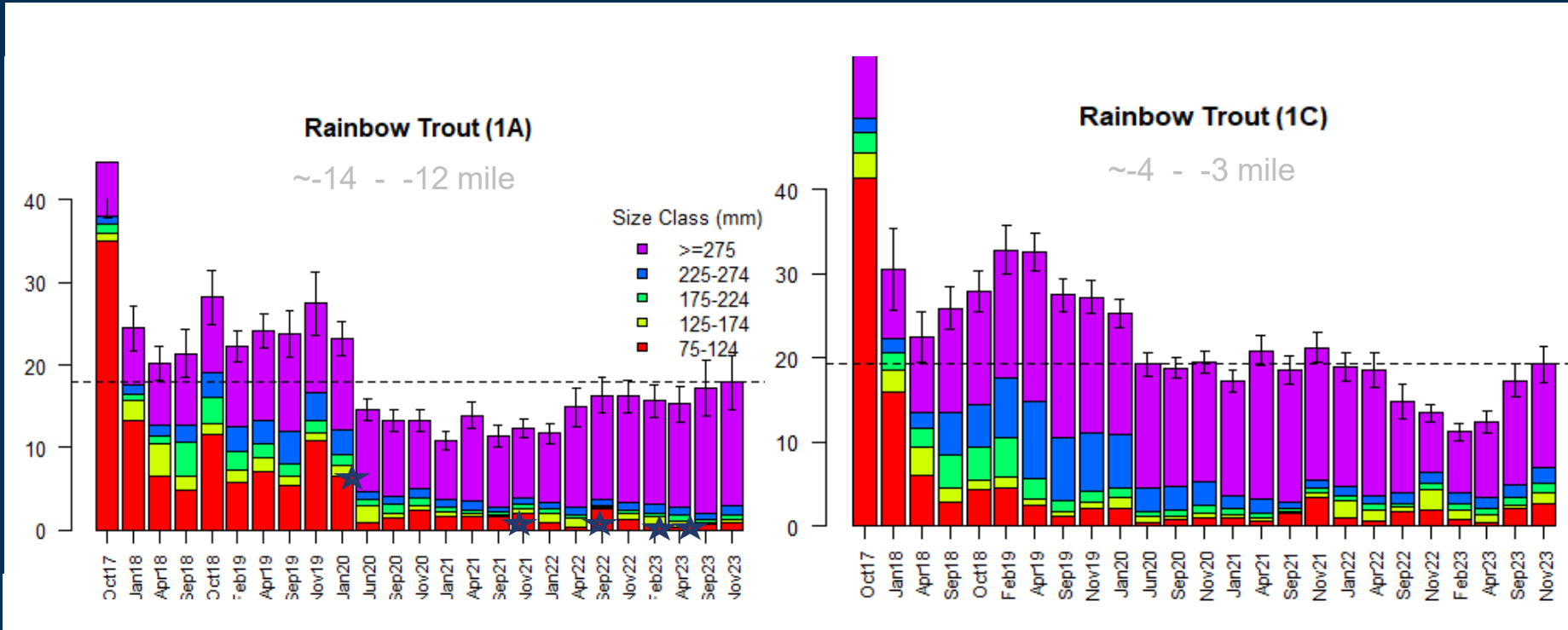


**Other native fishes:
Increased catch of
Flannemouth Sucker**



RBT fishery:

Poor RBT recruitment over last few years



Size Class (mm FL)

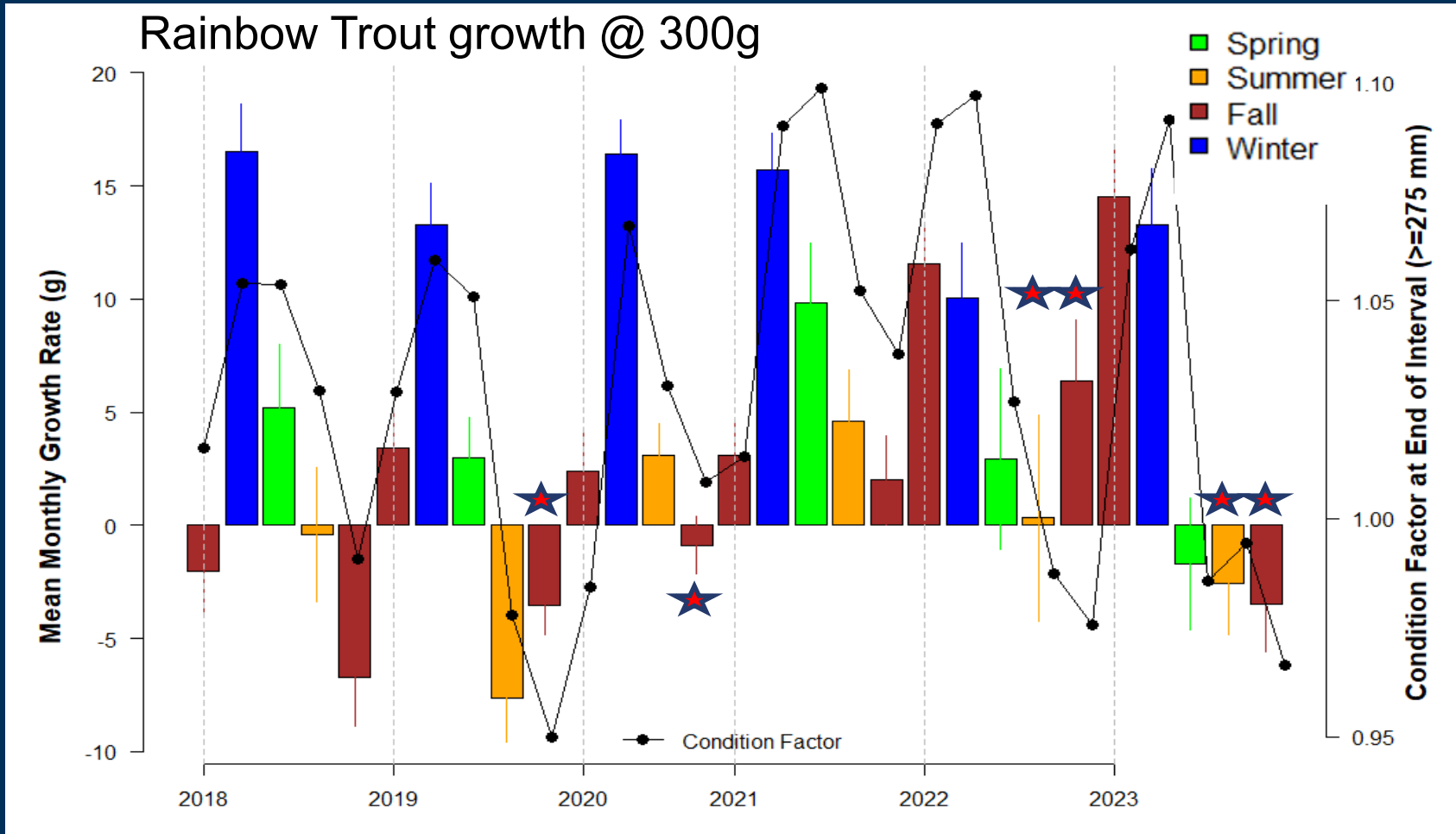
- >=275
- 225-274
- 175-224
- 125-174
- 75-124

No spring increase in RBT
despite spring HFE and steady
and high balancing flows
(differs from 2008 & 2011)

No population collapse
despite low dissolved oxygen/high
temperature in summer
& fall

RBT fishery:

Poor growth/condition of RBT – but we've seen this before



Summer-growth/condition is poor
Winter- good for RBT; allows for recovery

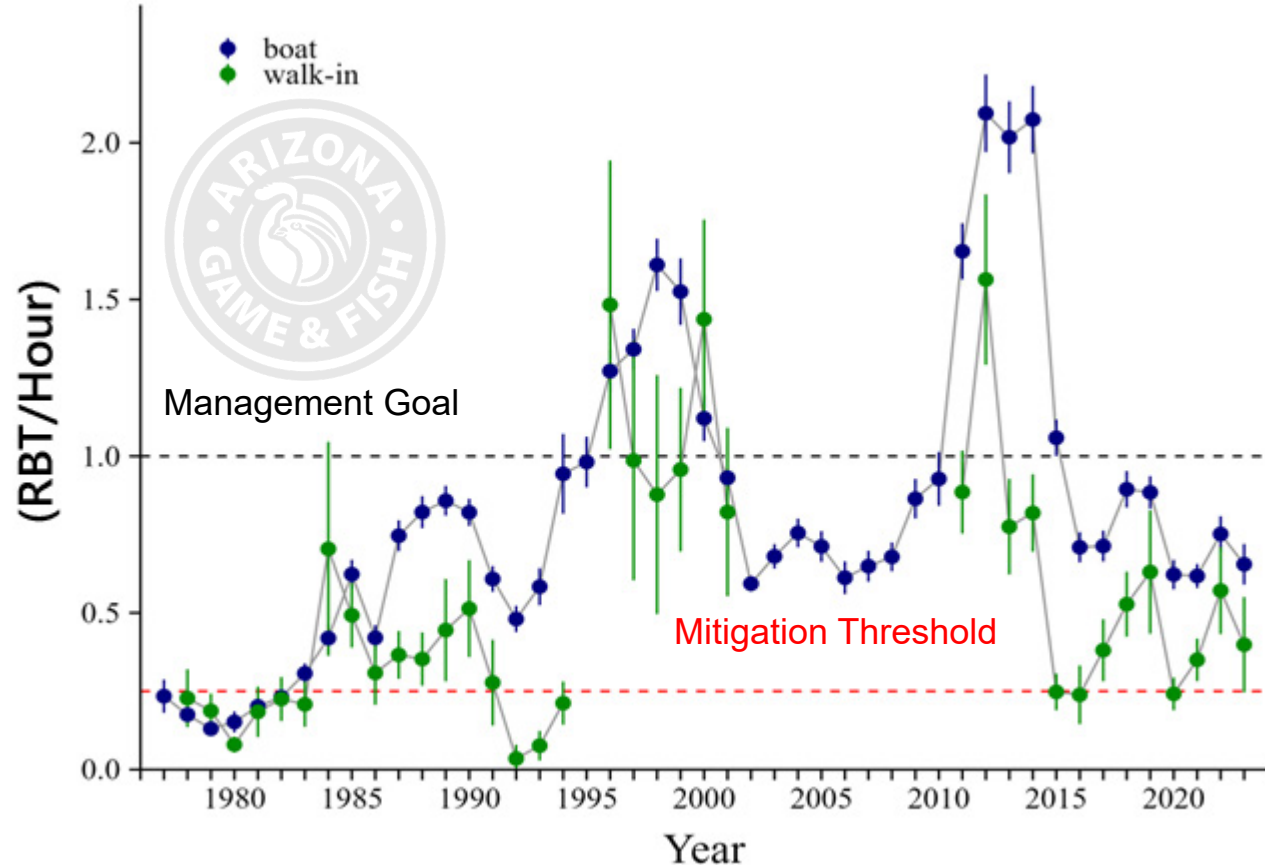


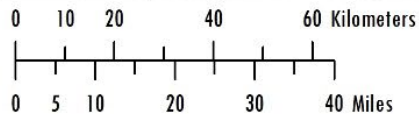
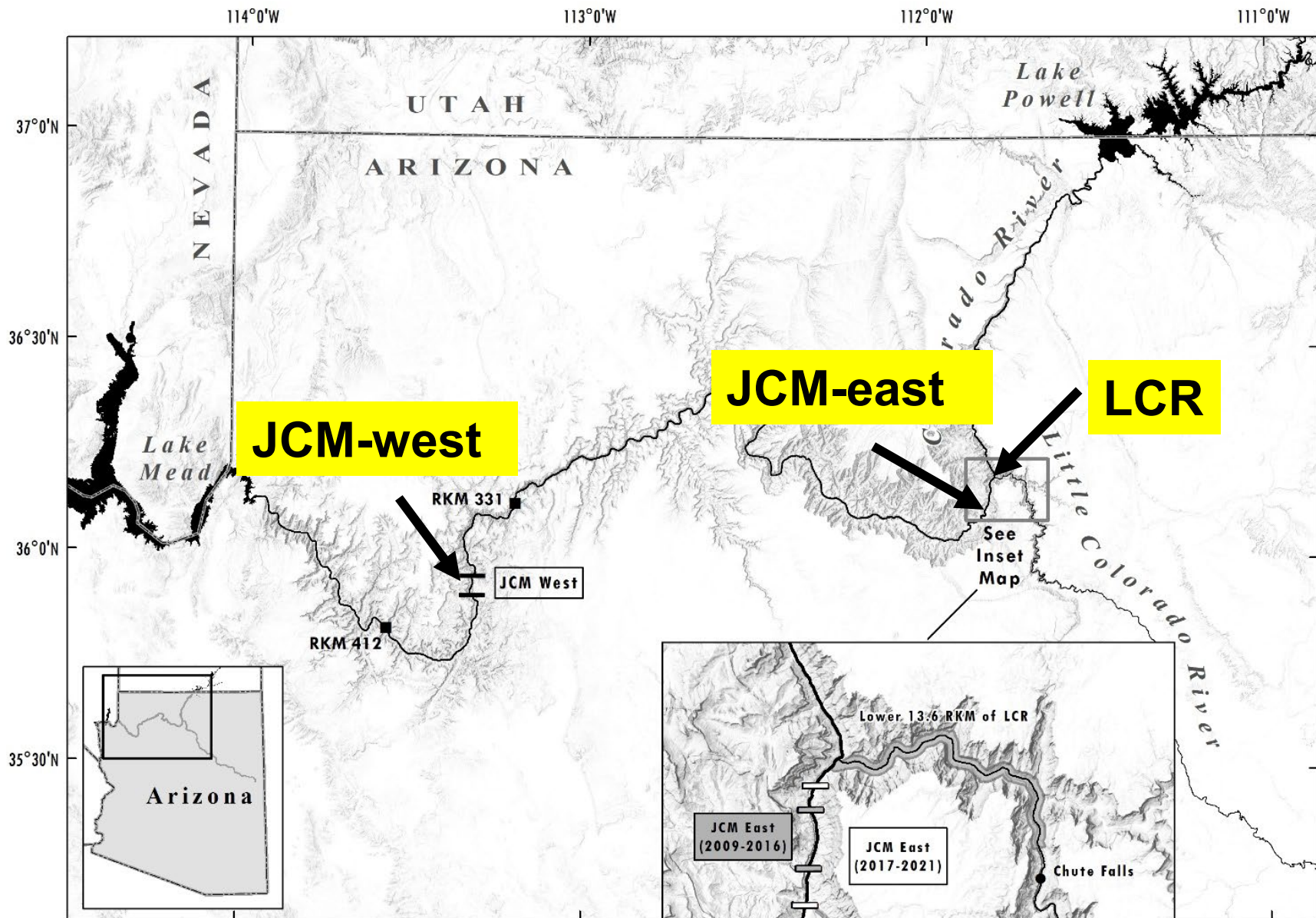
RBT fishery: Angler catch is low, but above mitigation threshold

Angler Surveys (creel)

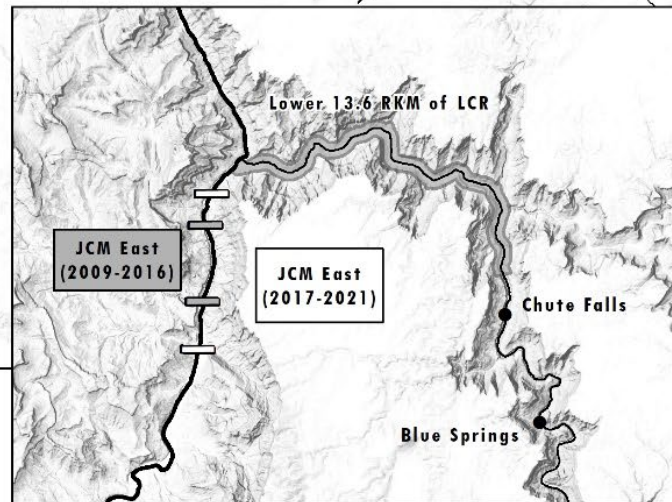
2023 Data:

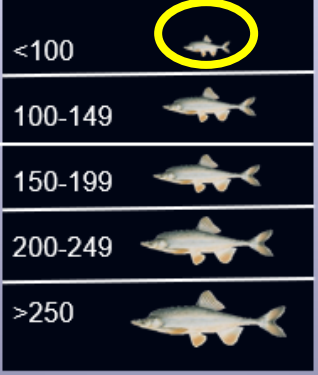
- Walk-in Area (n=151)
- Boat Ramp (n=717)





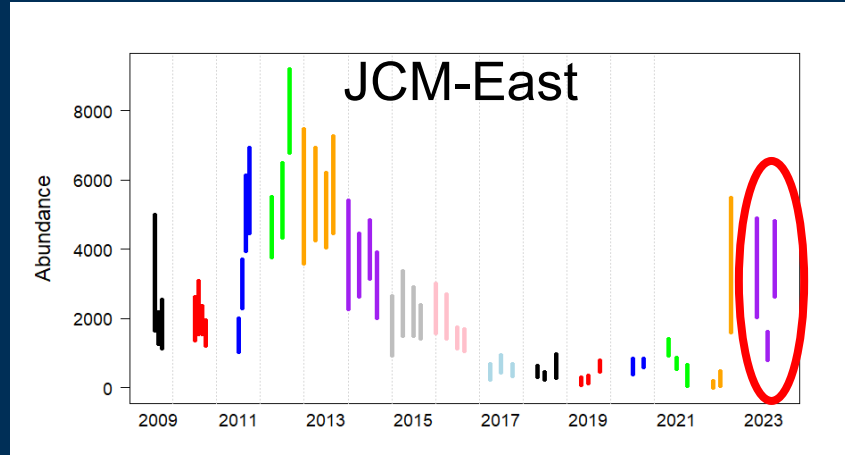
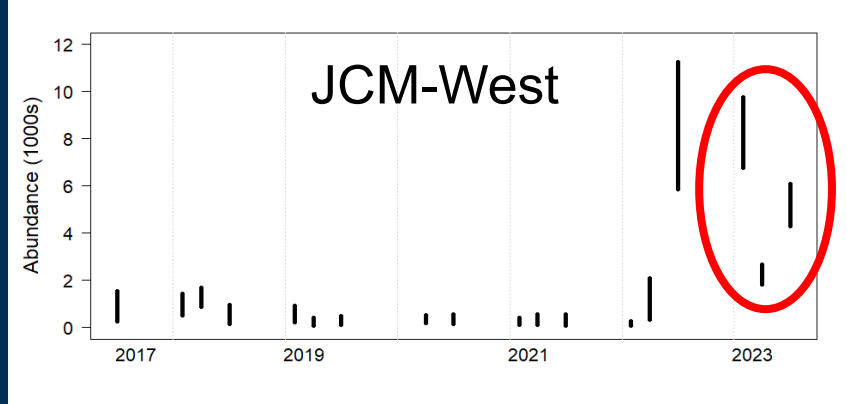
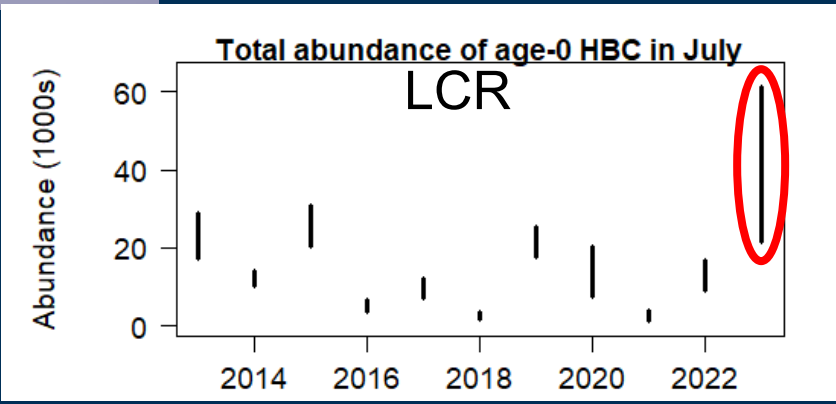
Explanation
 ■ Kilometers from Dam



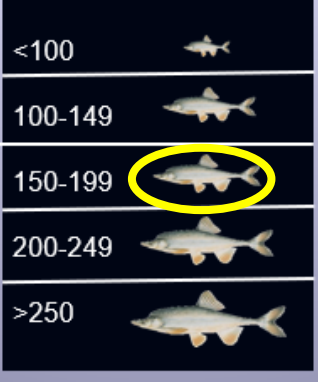


Humpback Chub:

Juvenile HBC are high in the LCR, JCM-East, and JCM-West



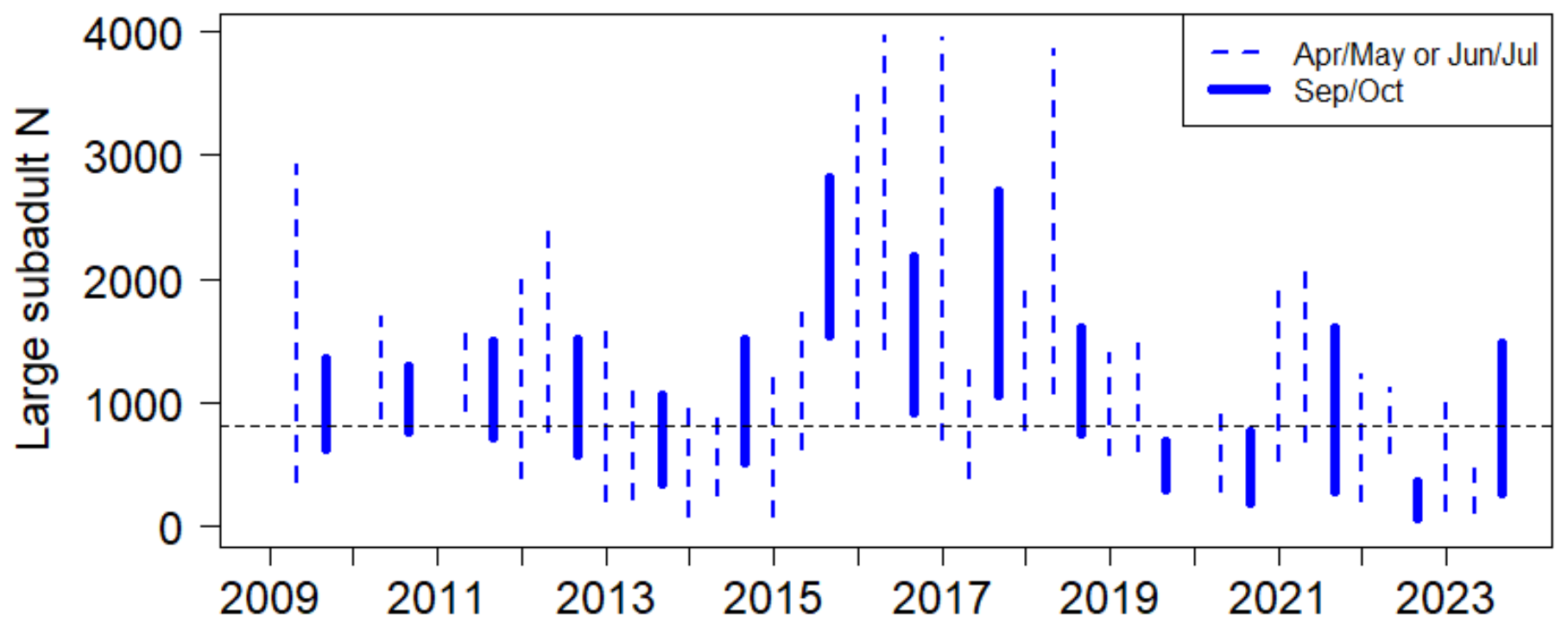
* Abundance estimate from 2020 is based on expanding from a small proportion of the spatial area (near the confluence) and may not be fully representative

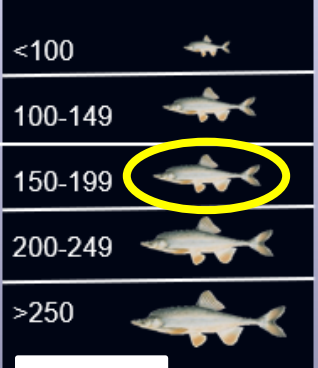


Humpback Chub:

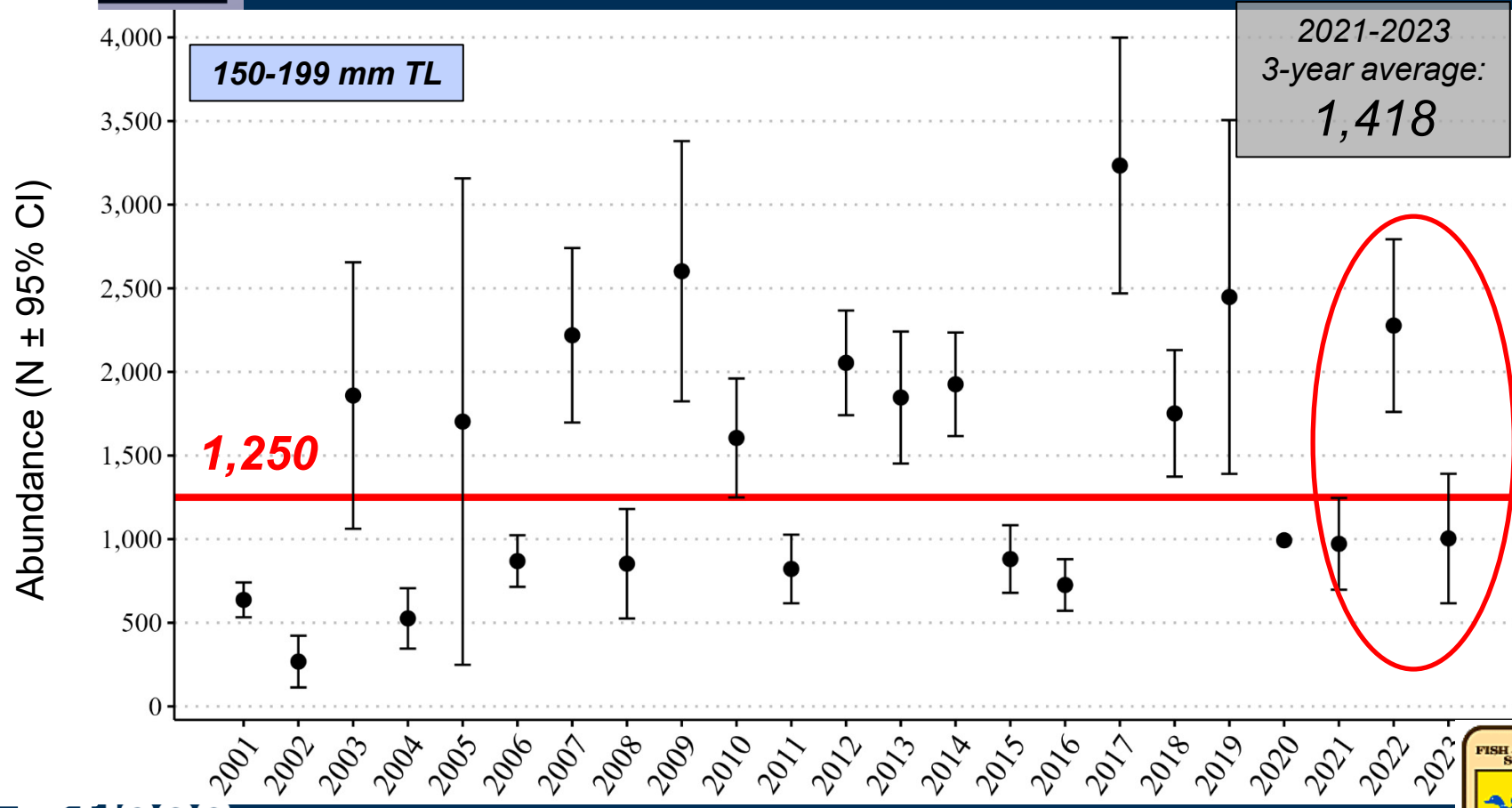


Large subadult HBC in JCM-East are below the trigger in 2023



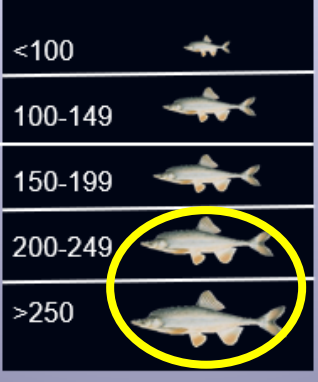


Humpback Chub: Spring abundances of large sub- adult HBC in lower LCR remains above the trigger



Preliminary Information – Data from USFWS, Michael Pillow, Subject to Revision. Not for Citation or Distribution.



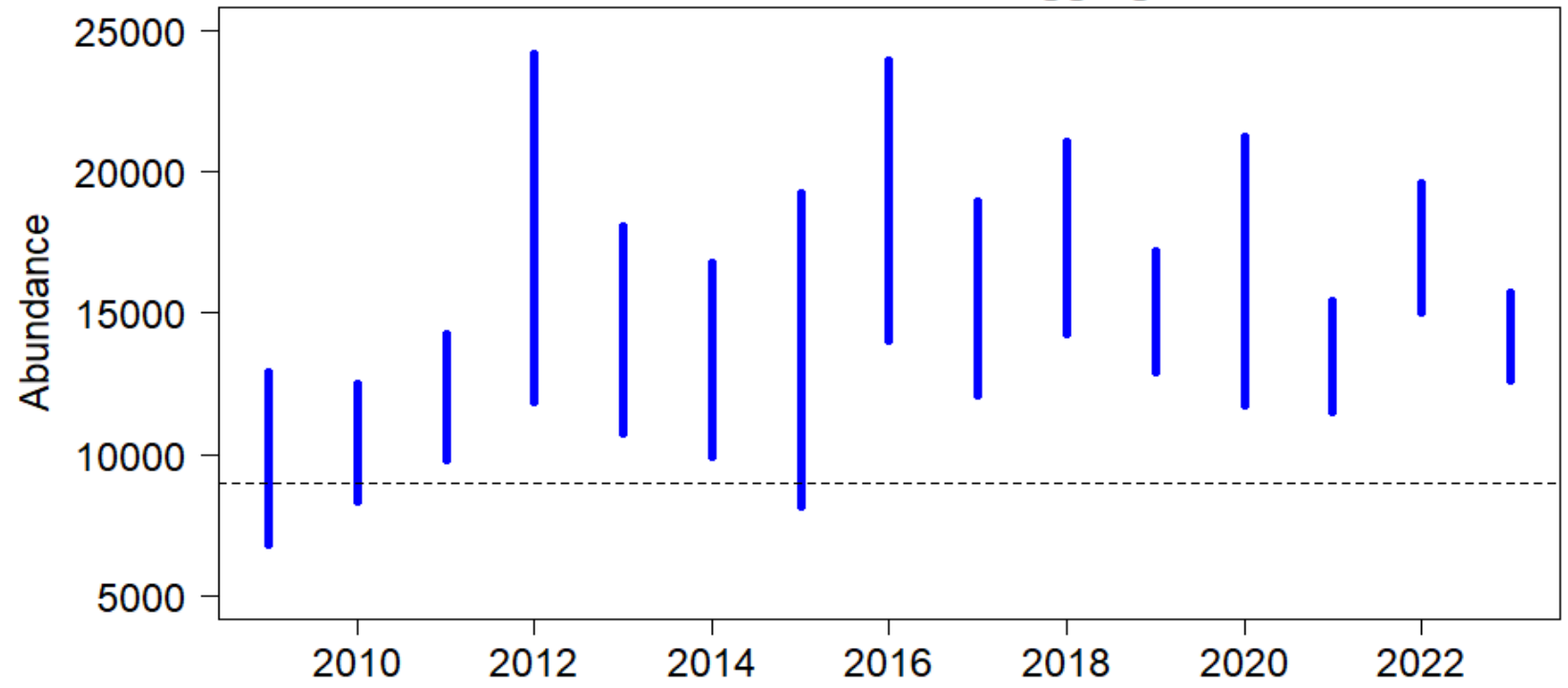


Humpback Chub:

Adult abundances in the LCR aggregation are above the trigger



Adult abundance in LCR aggregation

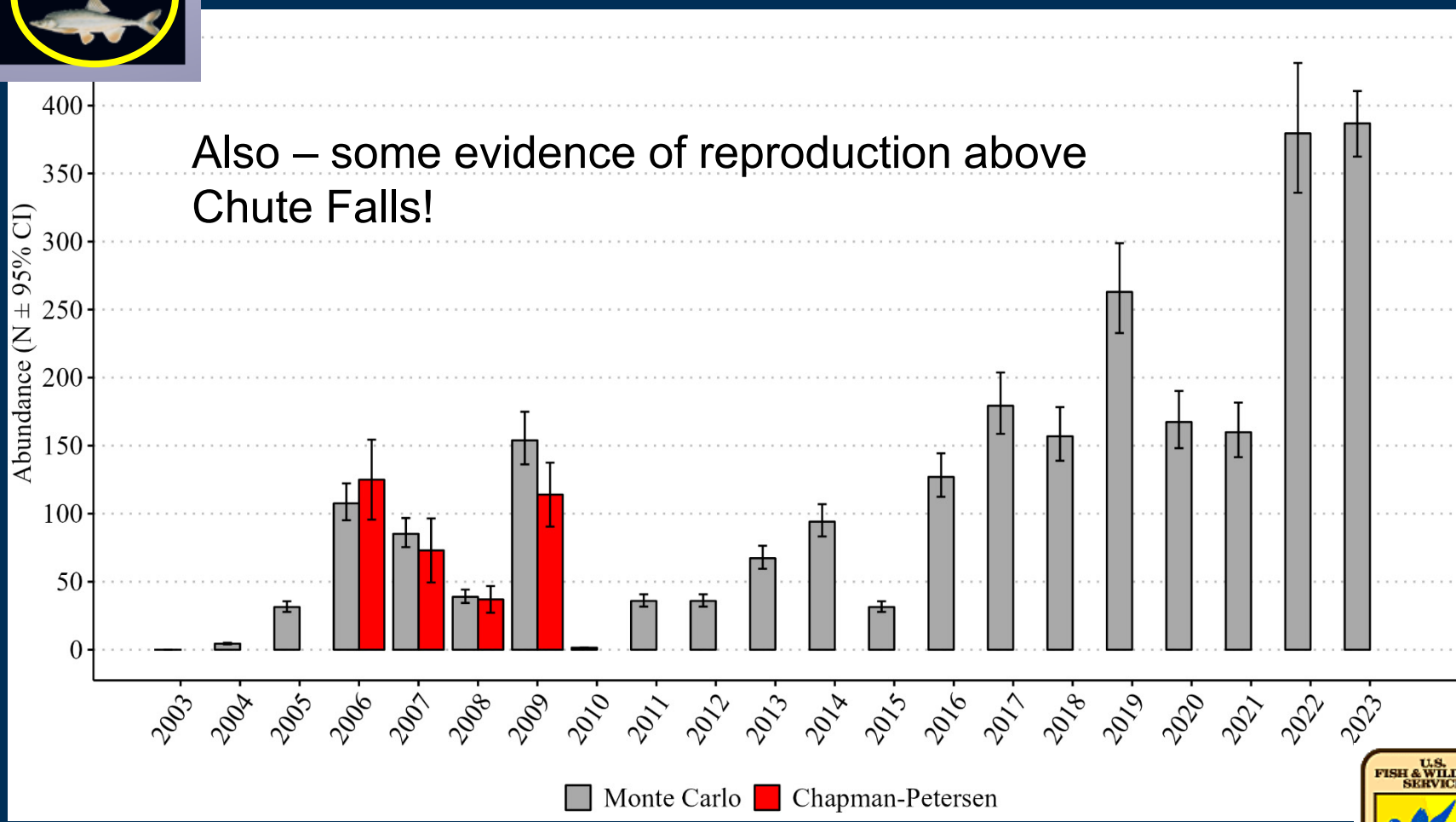
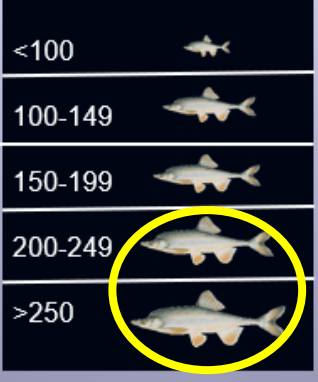


Preliminary Information - Subject to Revision. Not for Citation or Distribution.



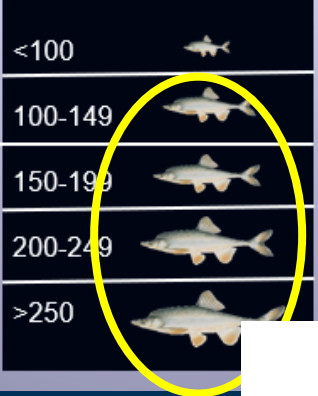
Humpback Chub:

Adult abundance is high above Chute Falls

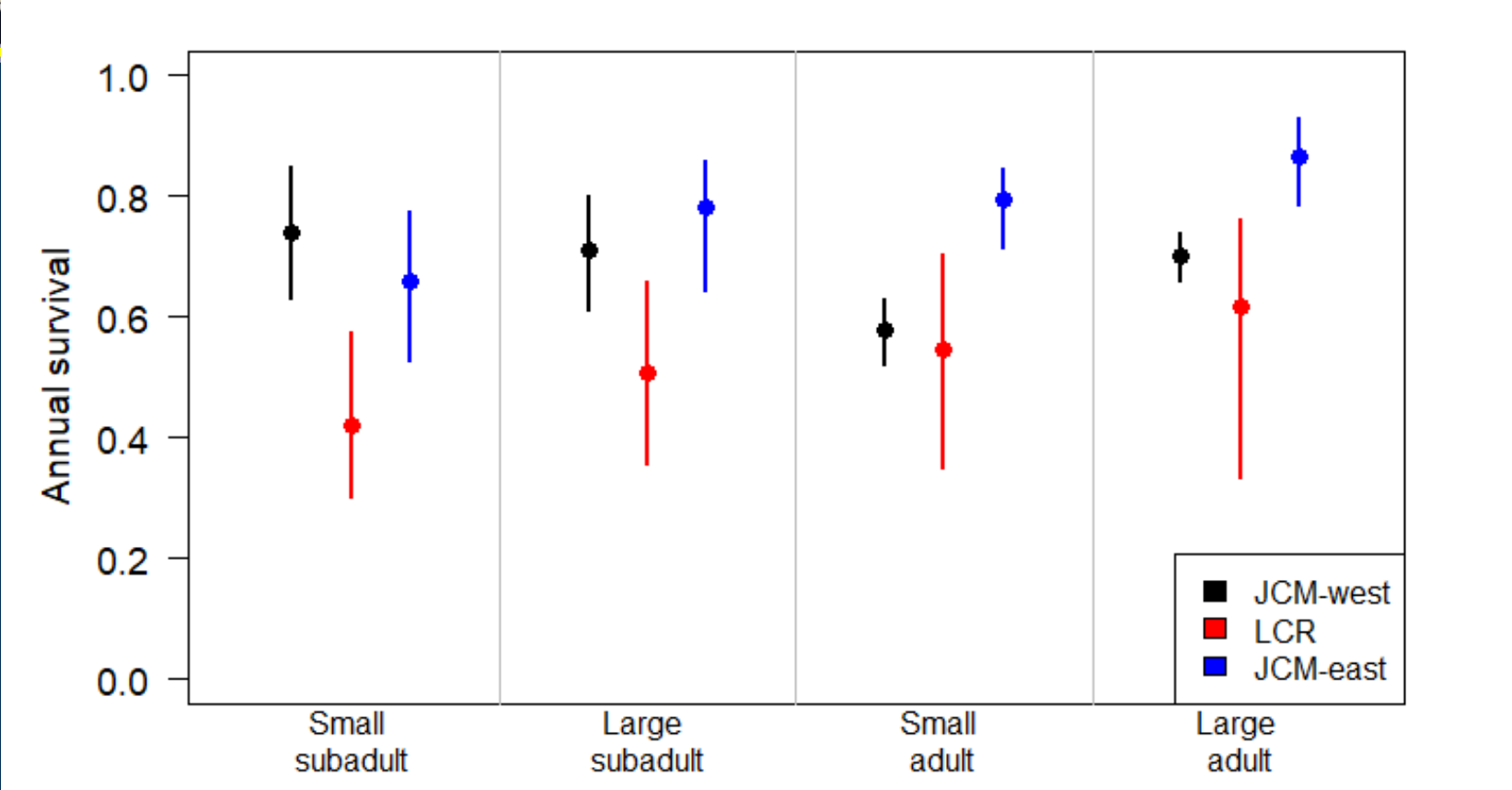


Preliminary Information –Data from USFWS, Michael Pillow, Subject to Revision. Not for Citation or Distribution.





Humpback Chub: Uncertainty about adult survival in western Grand Canyon



Apparent survival = probability of survival and not emigrating from the study site



Map by Tom Gushue

114°0'W

113°0'W

112°0'W

111°0'W

UTAH

ARIZONA

Lake Powell

Colorado River

Little Colorado River

NEVADA

Western GC

37°0'N

36°30'N

36°0'N

35°30'N

Lake Mead

RKM 331

JCM West

RKM 412

See Inset Map

Arizona

JCM-west

Lower 13.6 RKM of LCR

JCM East (2009-2016)

JCM East (2017-2021)

Chute Falls

Blue Springs

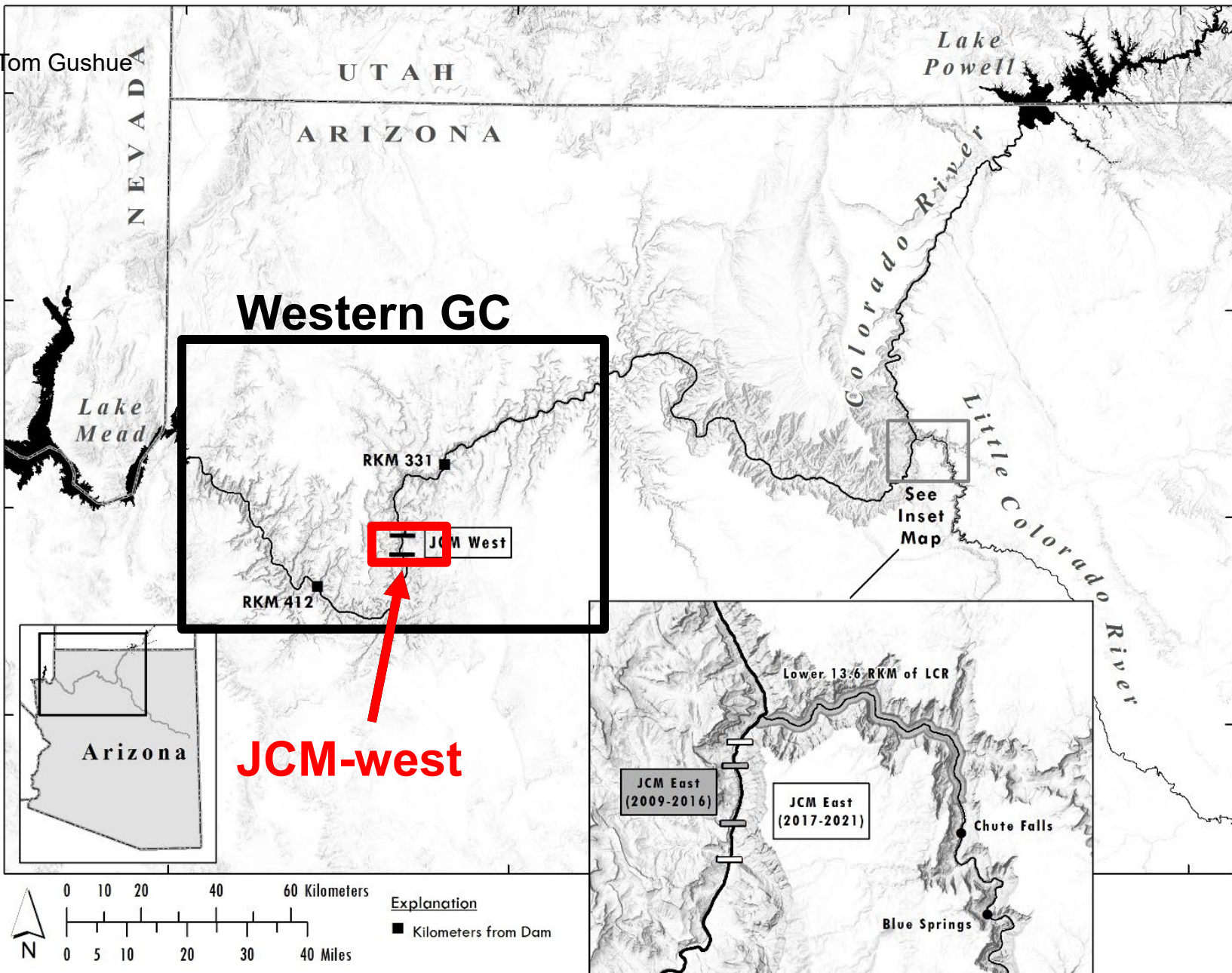


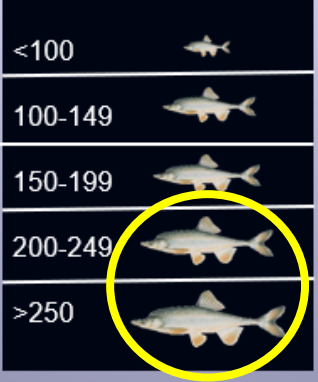
0 10 20 40 60 Kilometers

0 5 10 20 30 40 Miles

Explanation

■ Kilometers from Dam

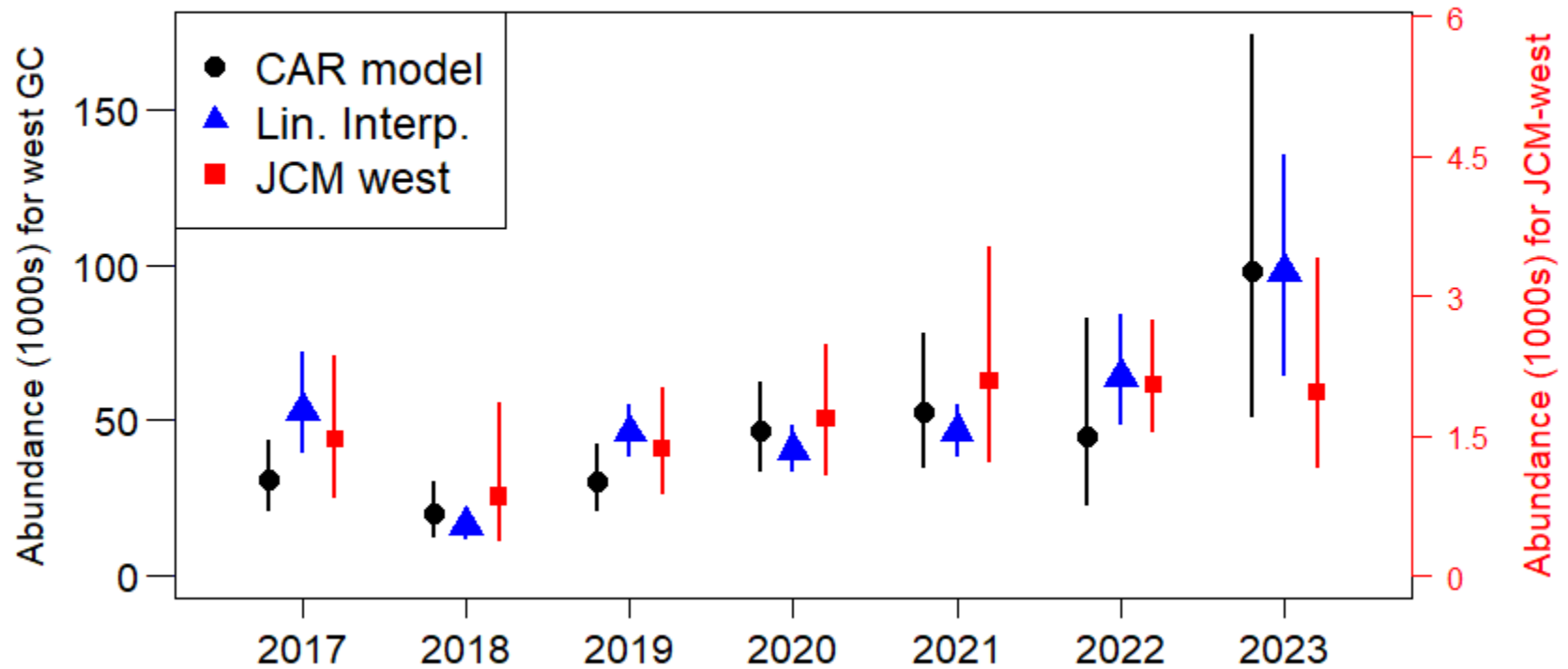




Humpback Chub: Stable/increasing adult abundance in western Grand Canyon & JCM-West



Total HBC adult (>199mm TL) abundance in western GC vs. JCM-west



Preliminary Information - Subject to Revision. Not for Citation or Distribution.



Summary

- **Non-native species**

- **Smallmouth Bass (SMB)**

- Low entrainment of adults
 - Forecast for 2024: likely colder water temps = less SMB pop. growth
 - slough = warmwater refugia
 - SMB are eating a lot of different food items

- **Brown Trout (BNT)**

- Slowest growth/lowest condition seen yet
 - Poor env. conditions & lack of recruitment

Summary (cont'd)

- **RBT fishery**

- Little production (future pop crash?)
- Adult population stable
- Angling could be better, could be worse

- **Humpback Chub**

- 2023 was a good year for age-0 production through Grand Canyon
- Adult abundance is high near LCR & in western GC