

# Smallmouth Bass Depletion Effort in Glen Canyon NRA

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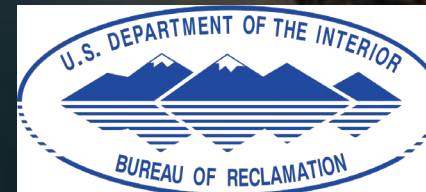
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Project Title:

## **Smallmouth Bass Science Proposal**

Project Elements

Project I.2 (Not funded in workplan)

Project Objectives

- Determine if multiple pass electrofishing depletions are effective at removing smallmouth bass
- Determine smallmouth bass distribution in GLCA (Glen Canyon)
- Determine hatch date and possible natal origin of smallmouth bass

Funding amount and Source

FY 23 - \$137,000 – IA with BOR through already existing AMP agreement

Cooperators

National Park Service, AZ Game and Fish,

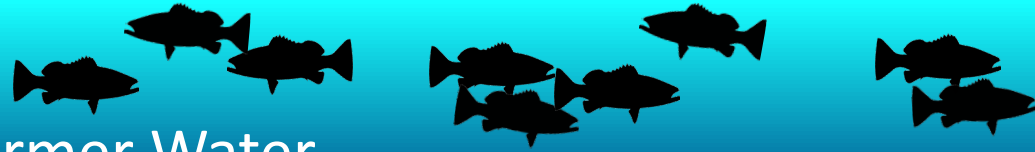
U.S. Fish and Wildlife Service, Bureau of Reclamation

LTEMP Resource Goals Addressed

Conserve and protect native fishes

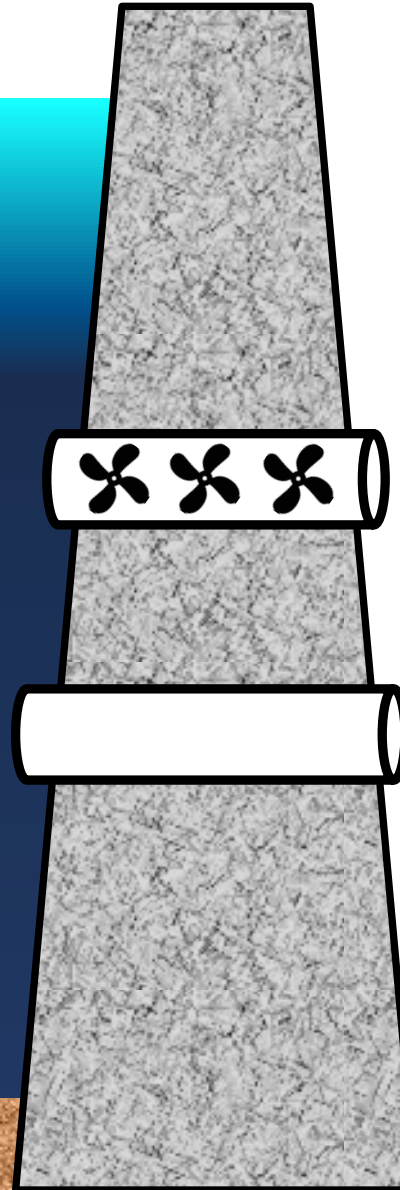
# Glen Canyon Dam

Lake Powell



Warmer Water

Colder Water



Lees Ferry

3470 ft: Penstocks

3370 ft: Bypass Jet Tubes

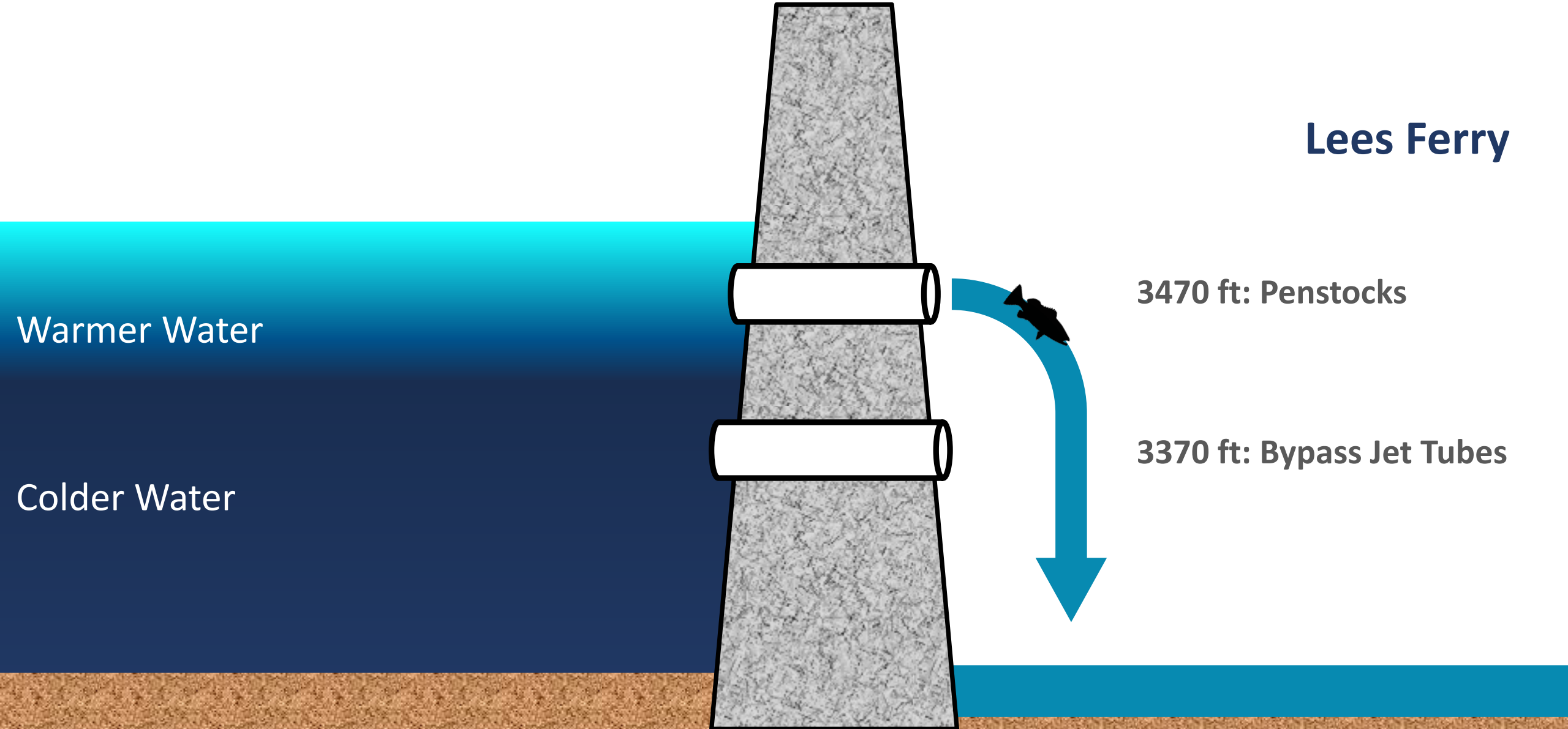
Colder

Slide Credit: Drew Eppehimer

# Glen Canyon Dam

Lake Powell

Lees Ferry



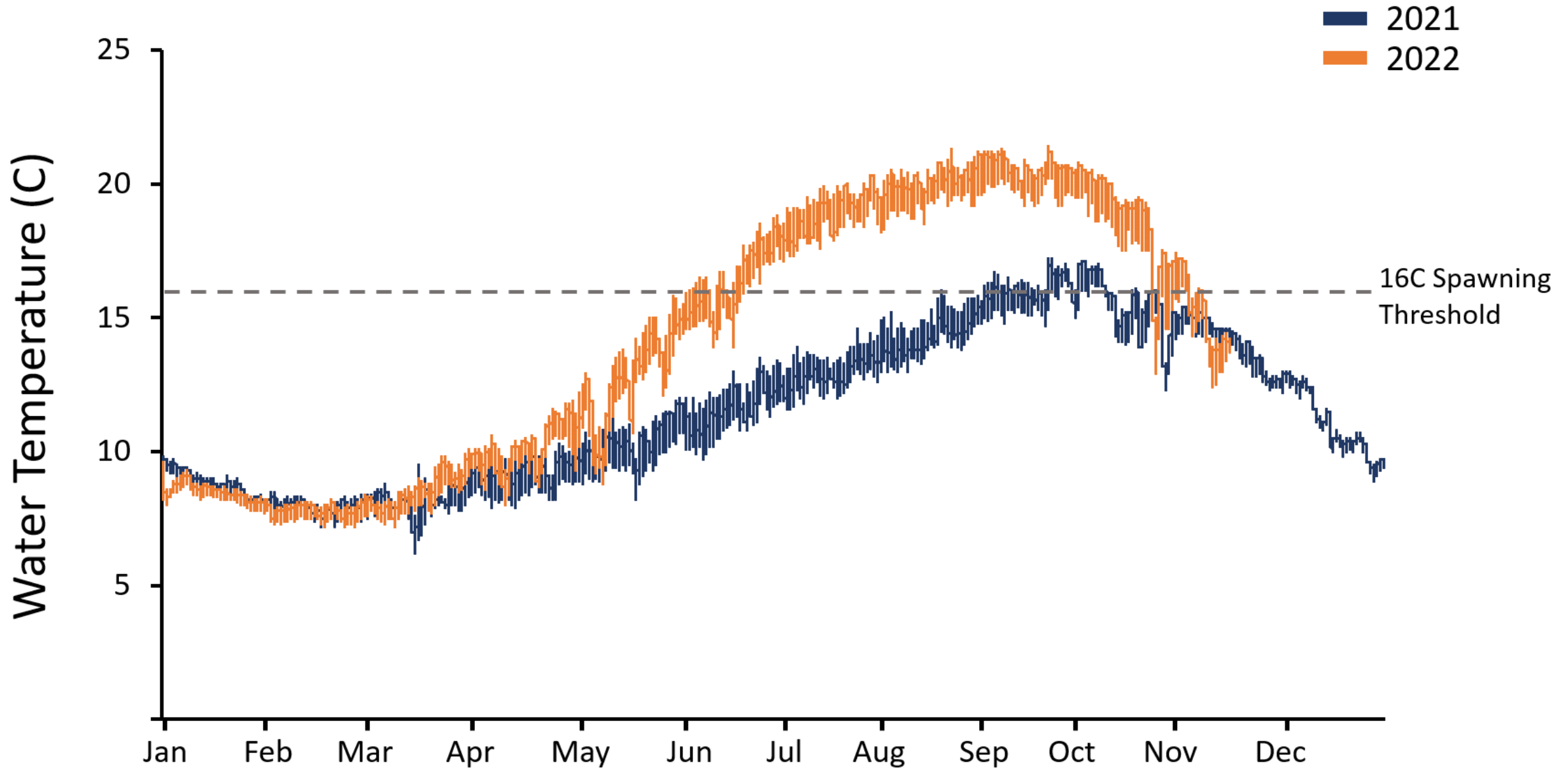
Warmer Water

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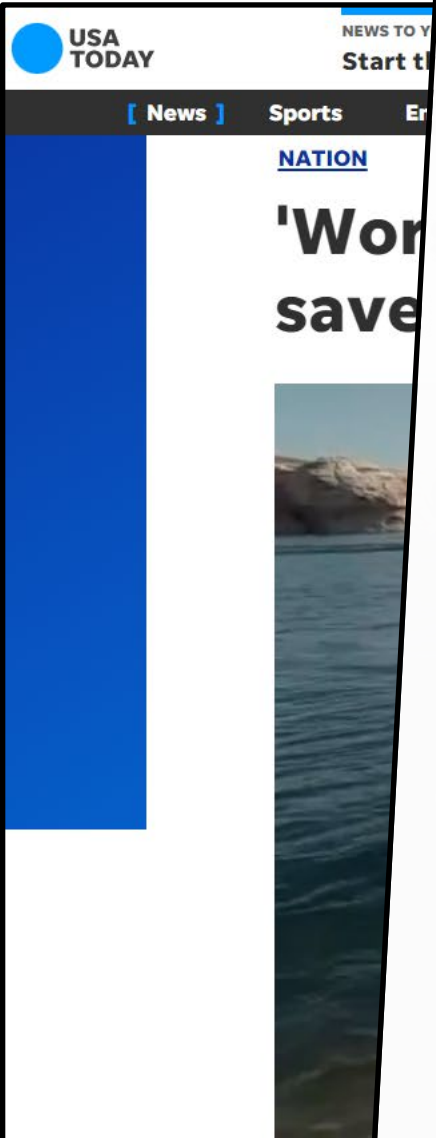
3470 ft: Penstocks

3370 ft: Bypass Jet Tubes

# Lees Ferry



# Smallmouth Bass Discovered in Slough at Lees Ferry



Slide Credit:  
Drew Eppheimer



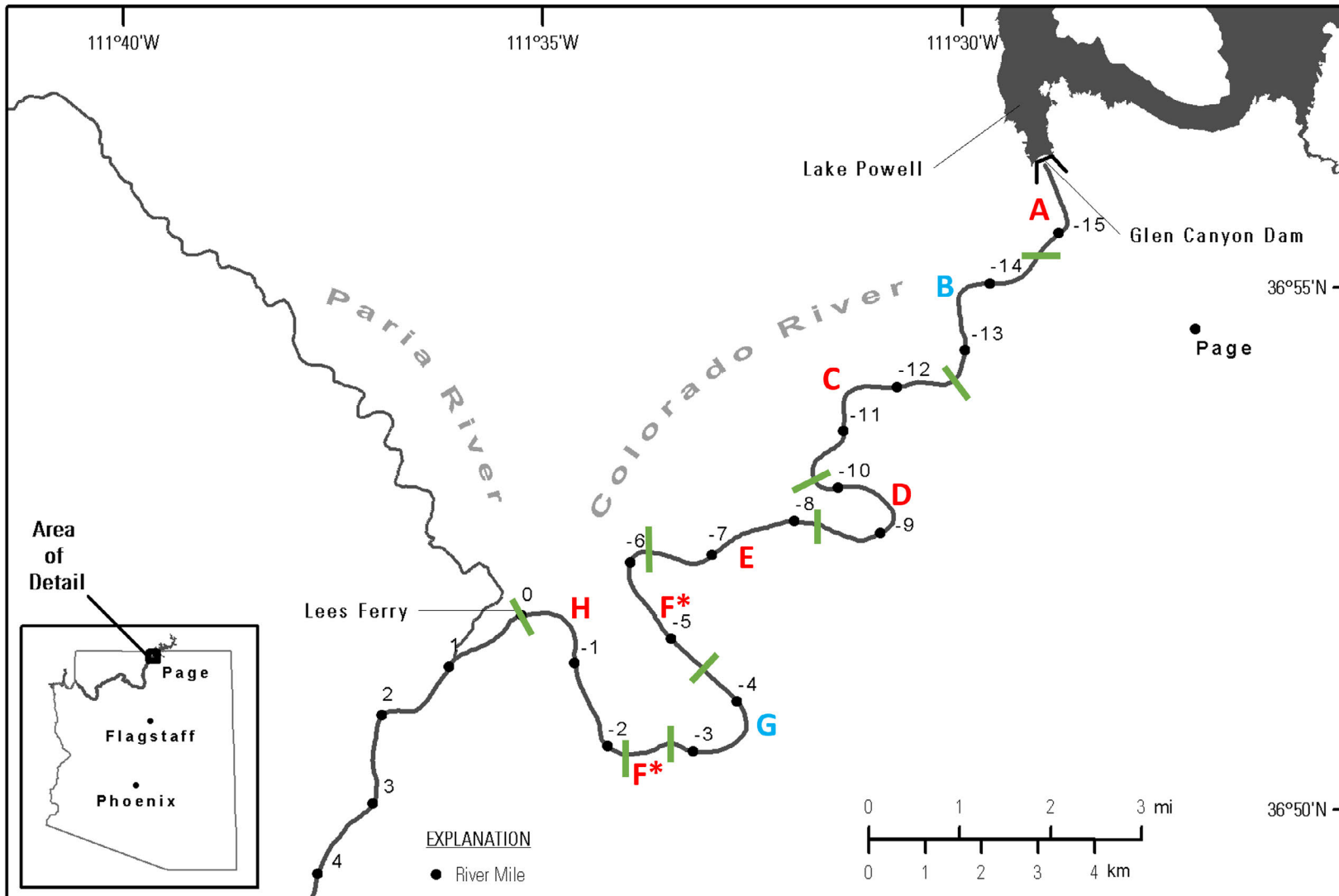




# Science Plan

- Hypothesis 1 – Mechanical removal via electrofishing can cause significant depletion in catch of young of year (YOY) smallmouth bass (SMB)
- Hypothesis 2 – SMB YOY are primarily distributed in the upper portions of GLCA (assumes nests present below dam)
  - Detections from Trout Recruitment & Growth Dynamics (TRGD; 2 sites)
  - Adults obs. near dam (RM -15.6)
  - Detection of juvenile SMB at slough (~RM -12.0)
- Hypothesis 3 – YOY SMB present in GLCA (2022) were hatched from  $\geq 1$  nest(s) in June

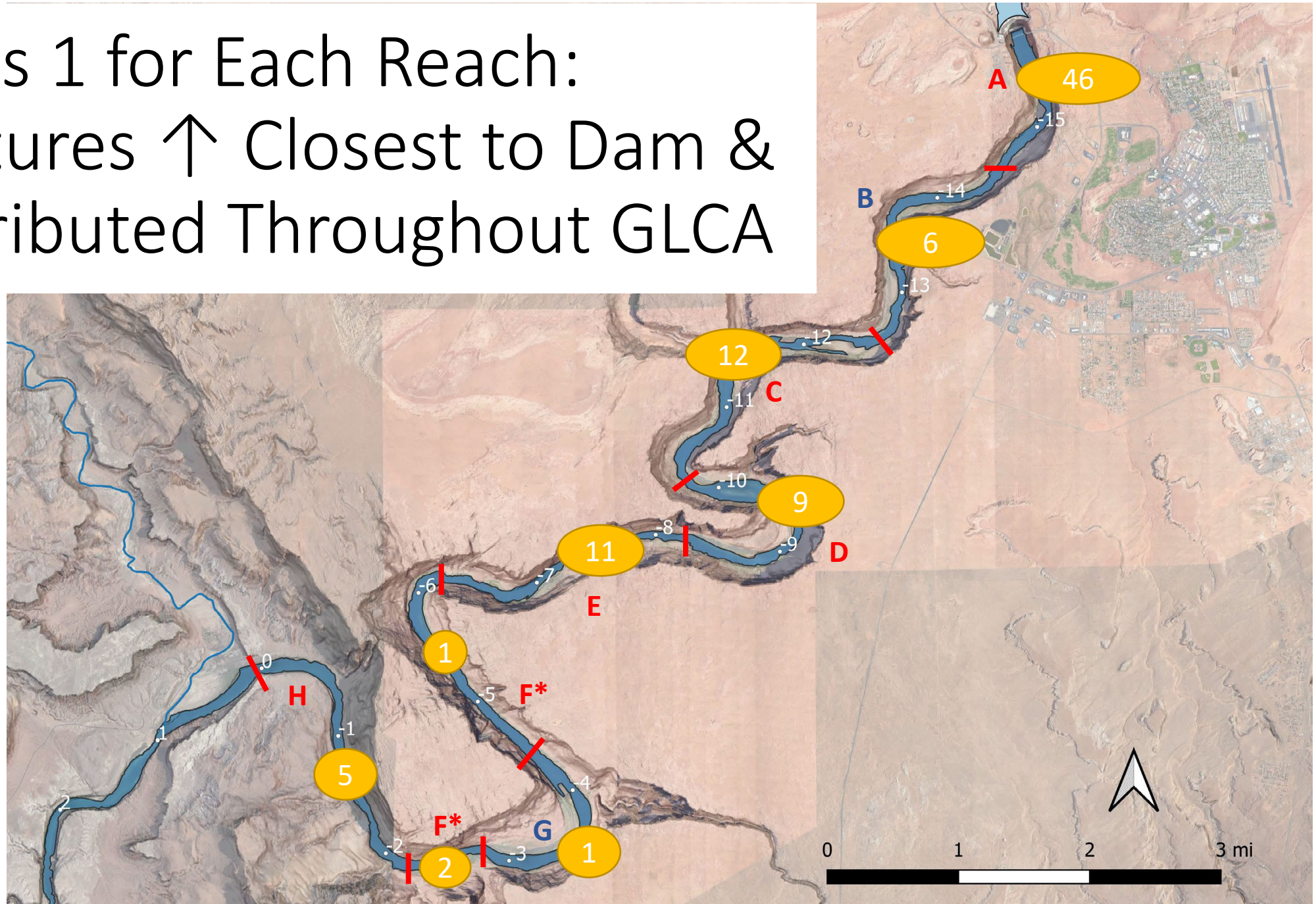
# Field Plan



- Depletion electrofishing in 8 designated reaches (dam -> LF)
  - EF pre-determined 250-m sample sites (both sides of river) w/in a reach
  - 10 to 15 sites/reach
- If capture
  - $\leq 4$  SMB, then move onto the next reach or
  - $\geq 5$  SMB, then complete another pass (identical sampling) until  $\leq 4$  SMB captured or 5 passes have occurred in that reach
- Potential Off-Ramp
  - If depletions were deemed ineffective (H1 rejected)
- Fish handling
  - Smallmouth Bass collected for otolith (H3) & diet analysis
  - Other warm water non-natives = preserved or beneficial use
  - Minimize impact to trout – aerators in buckets used; YOY and adults counted (DR vs. RA)



Pass 1 for Each Reach:  
SMB Captures  $\uparrow$  Closest to Dam &  
SMB Distributed Throughout GLCA



N = 93

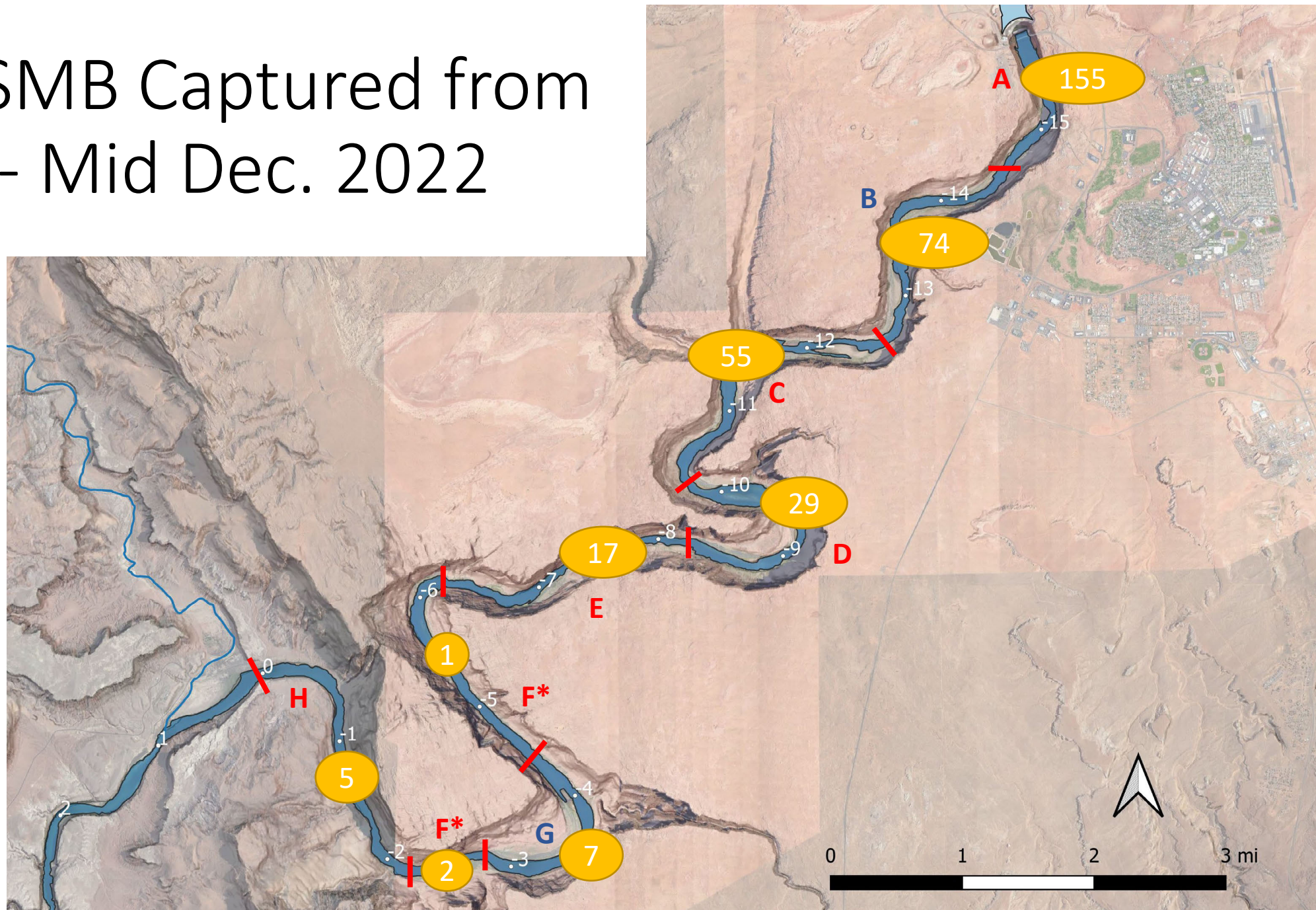


# N = 345 SMB Captured from Sept. - Mid Dec. 2022

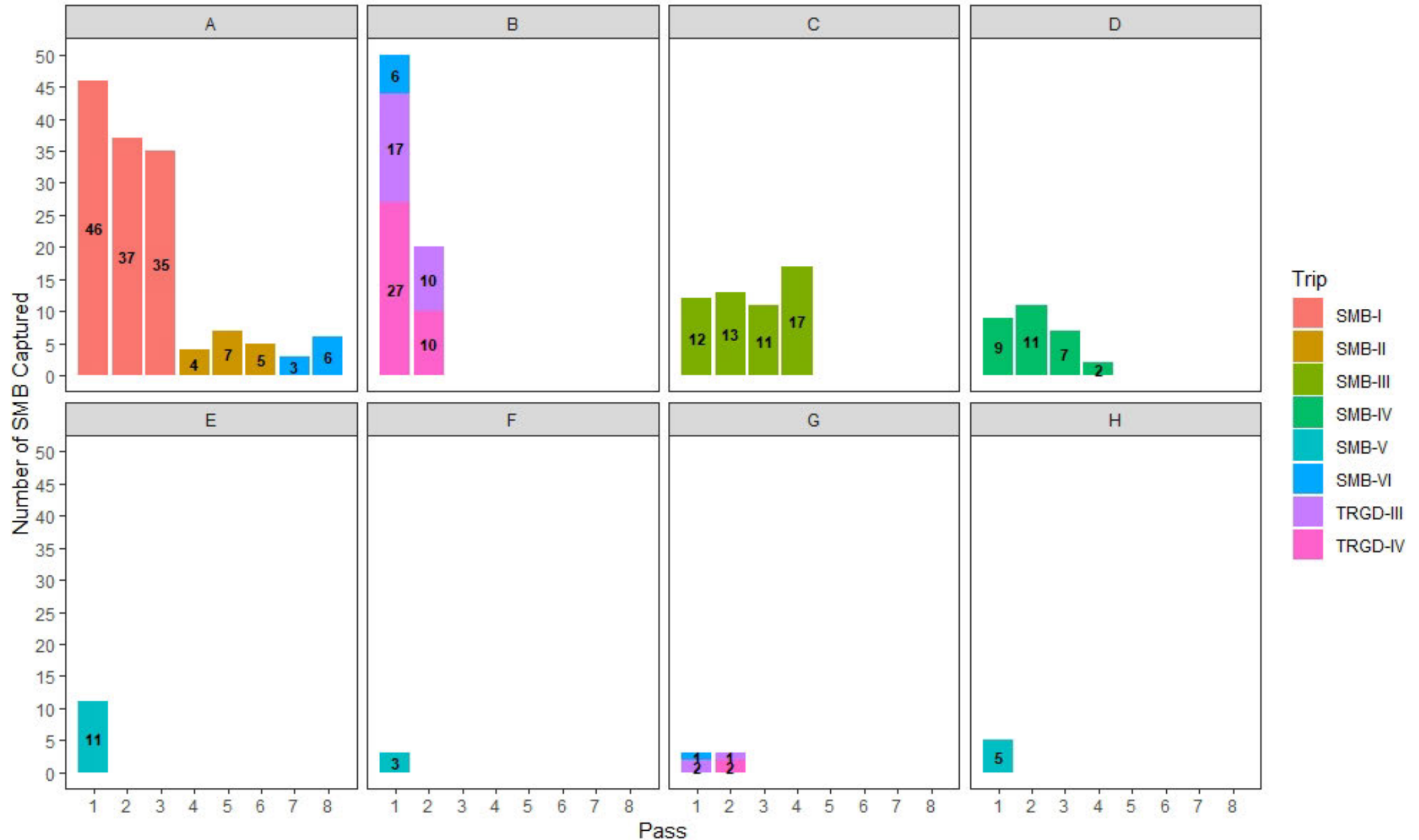
SMB trips (6 total)  
Oct. 25<sup>th</sup> – Dec. 15<sup>th</sup>  
N = 251

TRGD trips (2 total)  
Sept. 10<sup>th</sup> – 13<sup>th</sup>  
Nov. 3<sup>rd</sup> – 6<sup>th</sup>  
N = 69

AZGFD trips (1 total)  
Oct. 17<sup>th</sup>-20<sup>th</sup>  
N = 25

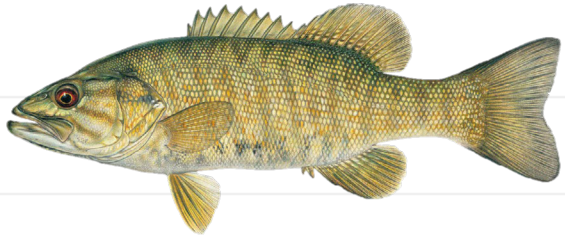
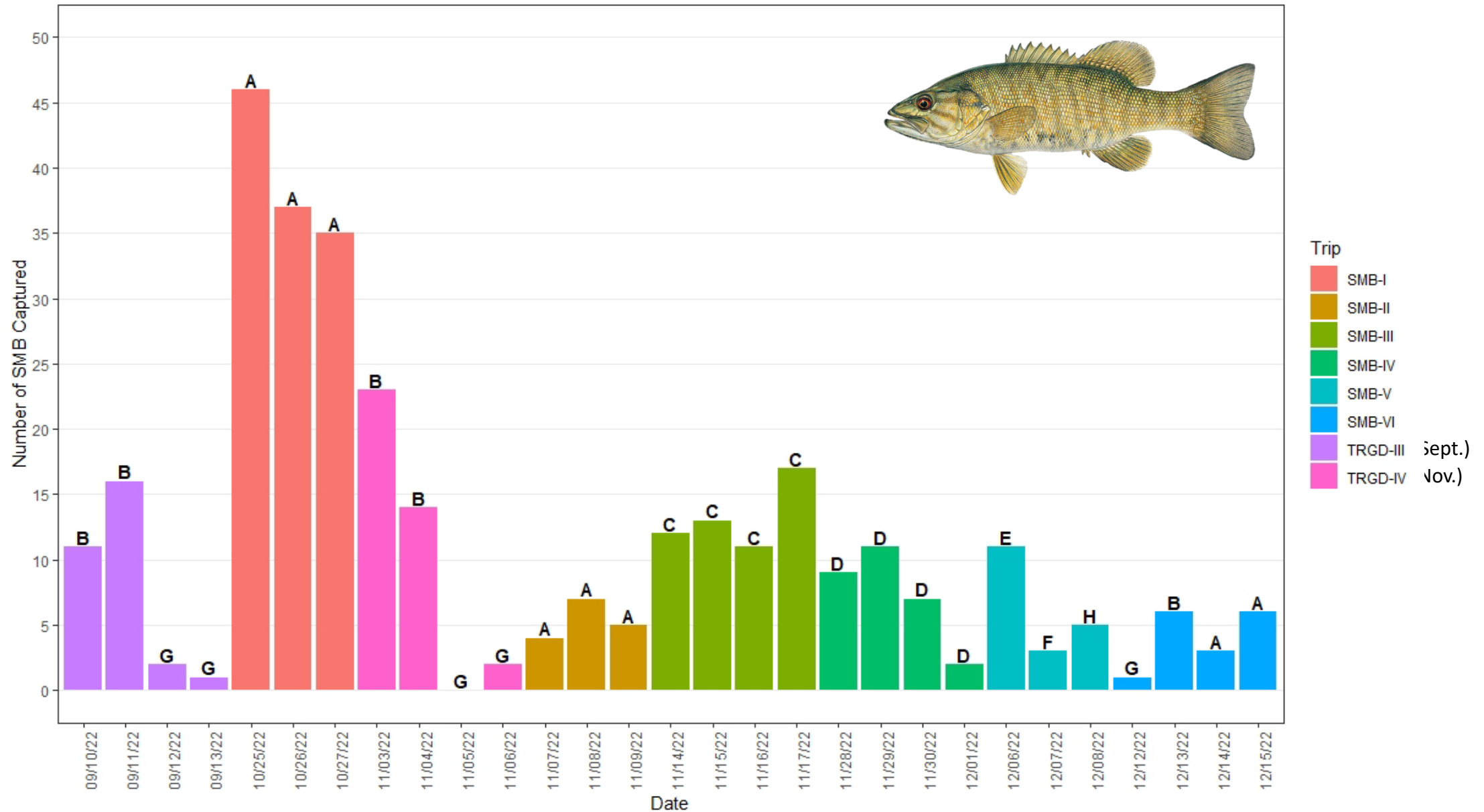


# # of EF Passes Varied by Reach & # of SMB Captured Varied by Pass



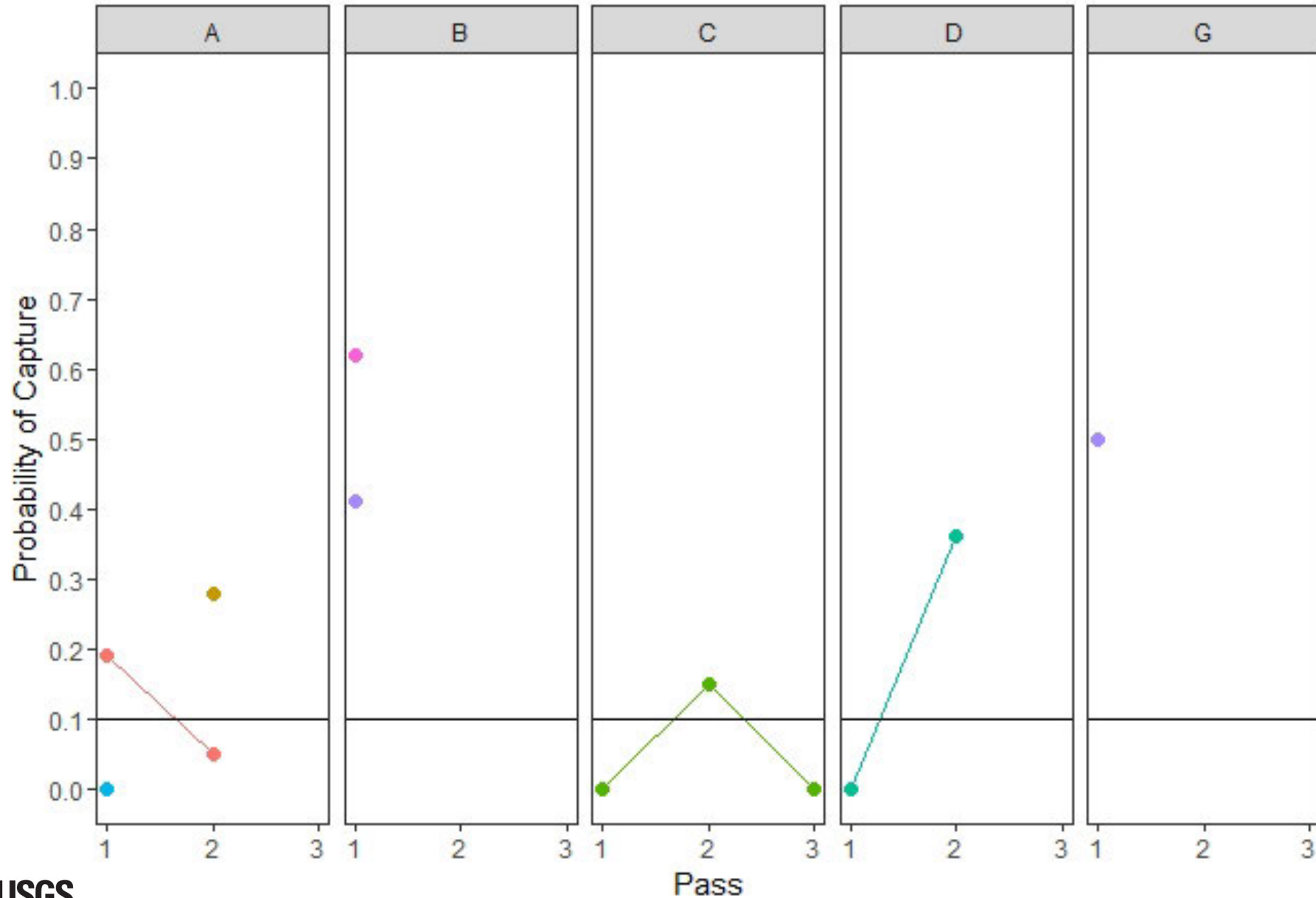


# Capture of SMB Generally Decreased Over Time



- Trip**
- SMB-I
  - SMB-II
  - SMB-III
  - SMB-IV
  - SMB-V
  - SMB-VI
  - TRGD-III (sept.)
  - TRGD-IV (Nov.)

# Variable Probability of Capture for SMB via Electrofishing



## Trip

- SMB-I (3 passes)
- SMB-II (3\* passes)
- SMB-III (4 passes)
- SMB-IV (4\* passes)
- SMB-VI (2 passes)
- TRGD-III (Sept.) (2 passes e/reach)
- TRGD-IV (Nov.) (2 passes e/reach)

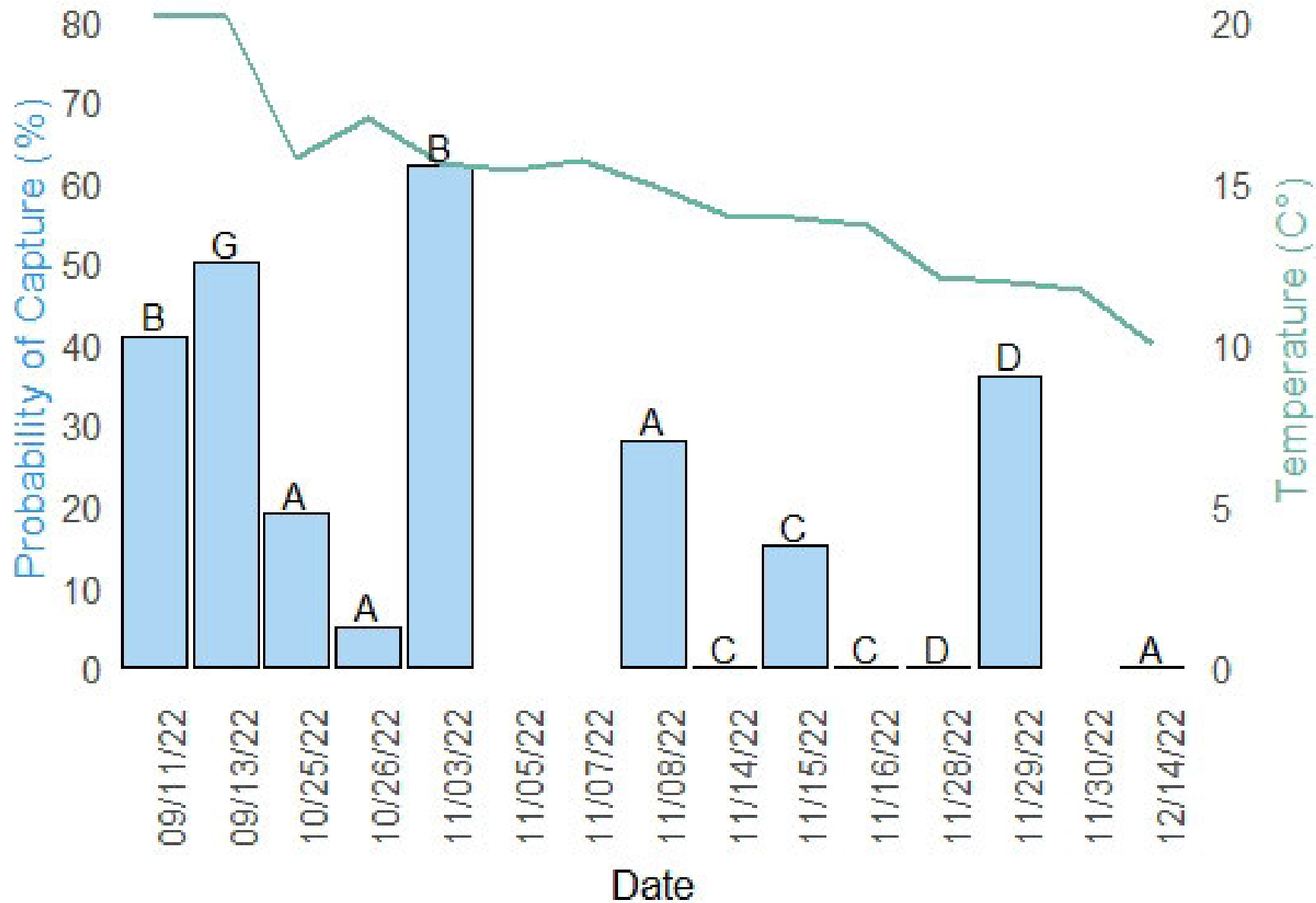
\*equipment malfunction on one pass

Note: Only single passes occurred in B, E, F, G, H by SMB trips

Preliminary data, subject to review, do not cite.

Unc

Temperature

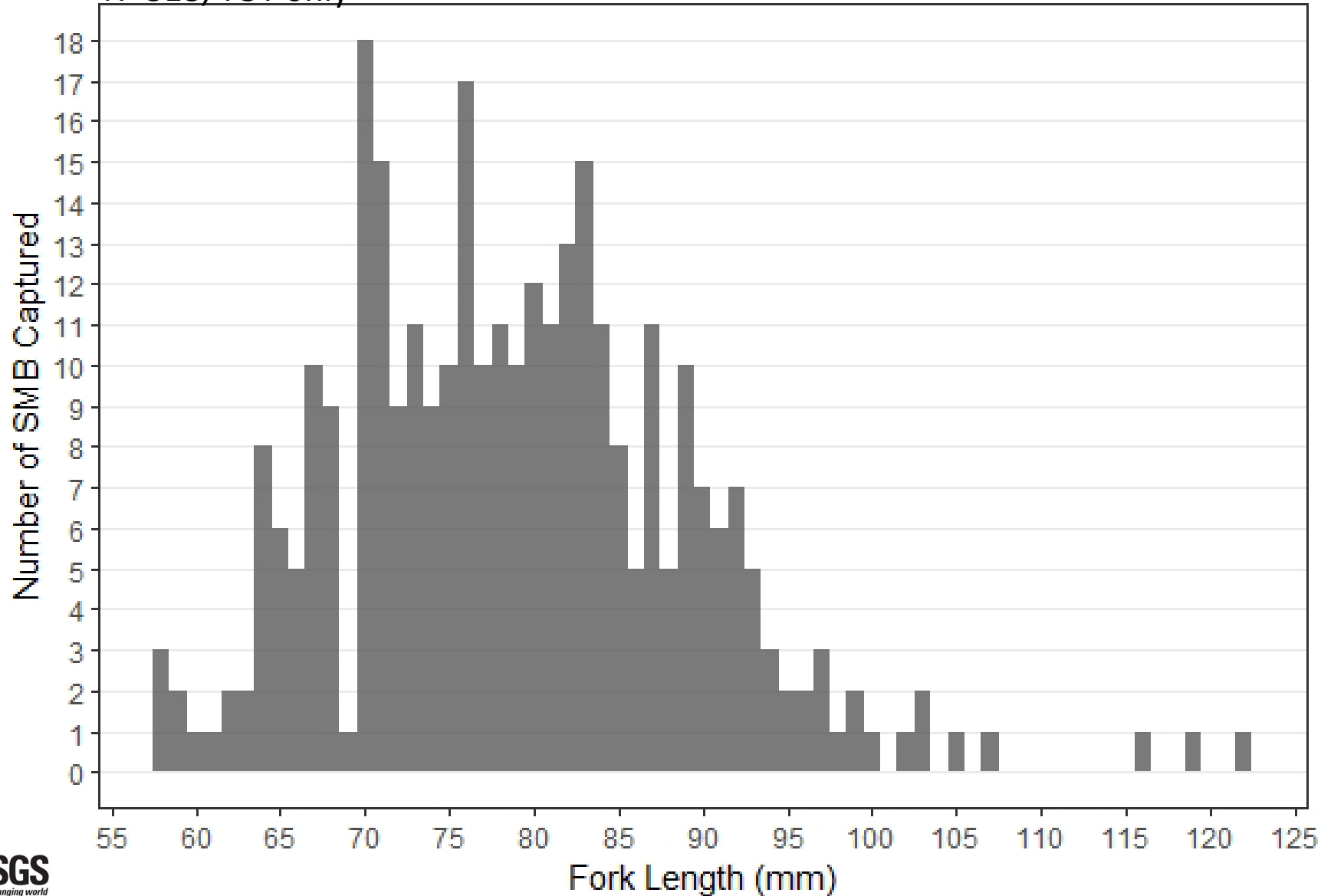


highest temp:  
20.2°C  
lowest temp:  
0.0°C



# Mean Size of SMB Captured = 80 mm FL

N=318, YOY only



YOY Size Range = 58 – 122 mm FL

Two adults captured in Reach A  
(not pictured in graph):

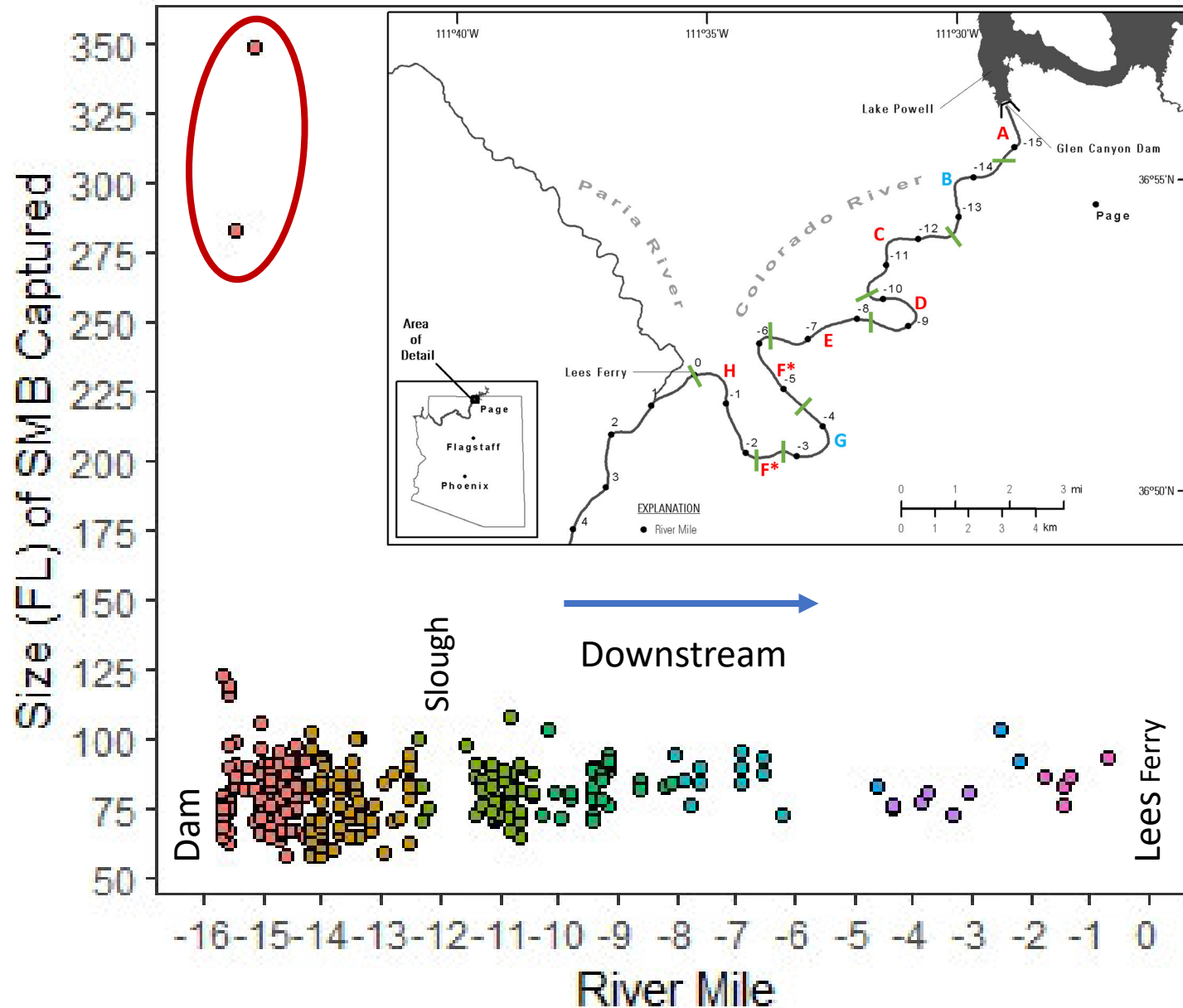
TL = 358, FL = 349

TL = 294, FL = 283

Note: This graph includes TRGD  
data.



# Largest SMB & Most SMB Captured Near Dam



## Reach

- A
- B
- C
- D
- E
- F
- G
- H

N=320, adults and YOY  
 Note: This graph includes TRGD data.

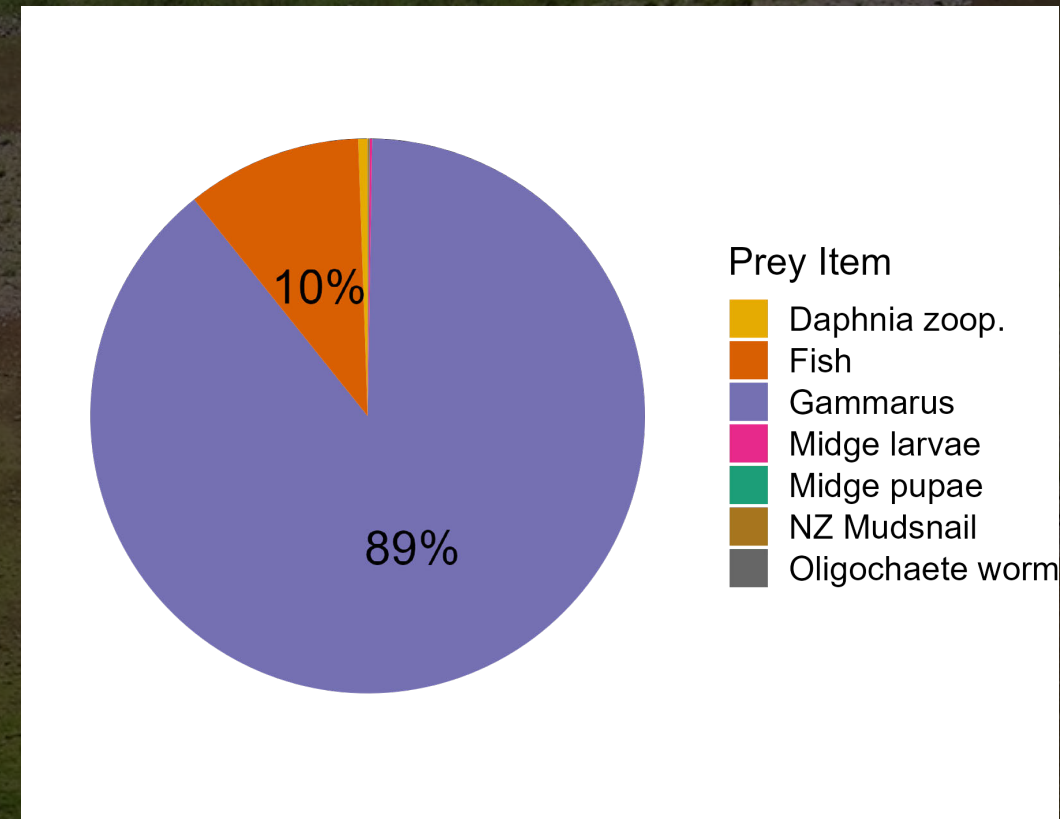
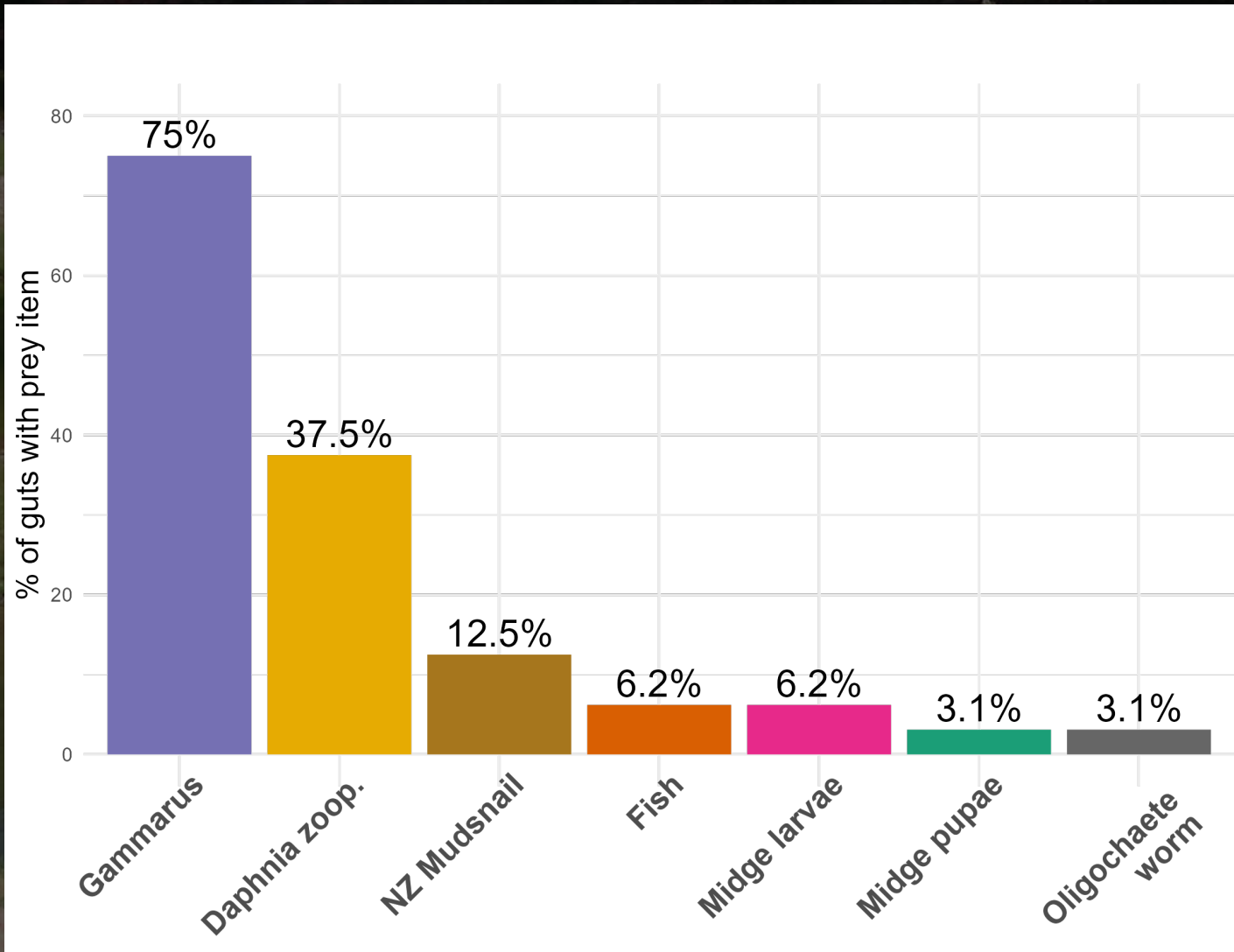
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# A snapshot look at Smallmouth Bass diets in Lees Ferry Reach

- Subset of fish collected during TRGD trip in Sept. (n=14), and depletion trip in Oct. (n=29)
- Examined contents of true stomach only.
- High percentage of fish had identifiable food items in the stomach, >74%.





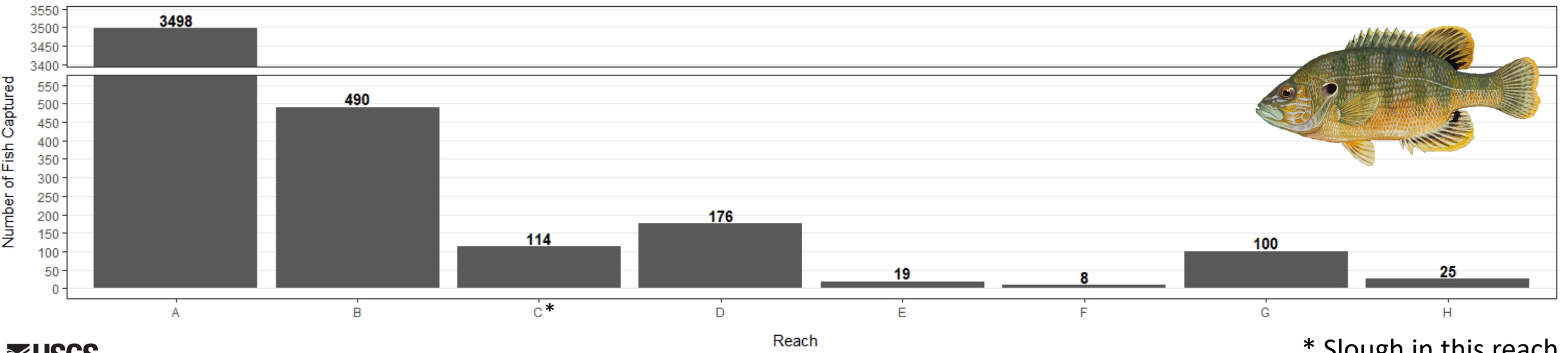
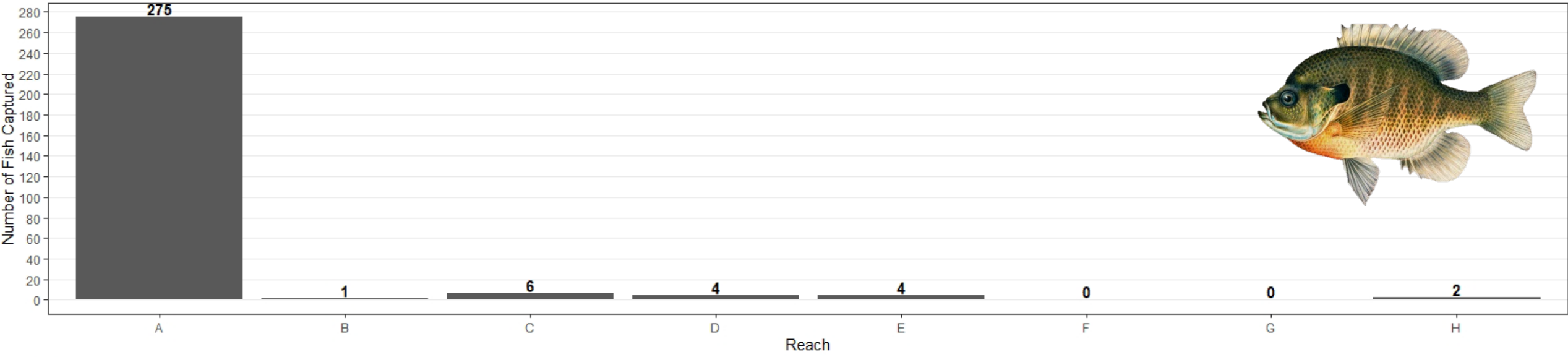


# Observations:

- Young-of-the-year Smallmouth frequently consumed tailwater-loving invertebrates (Gammarus & zooplankton).
- There was also evidence of piscivory in these young-of-the-year fish, starting at 64 mm FL of the consuming individual. Fish was the 2<sup>nd</sup> highest prey item by biomass.
- Gammarus tend to decline in abundance & biomass moving downstream. Gammarus prod.= 26% of total invert prod. @ Ferry vs. 1.6% of production @30 mile (Cross et al. 2013)



# Other Species of Concern



\* Slough in this reach

Preliminary data, subject to review, do not cite.



# Thoughts & Preliminary Conclusions

- We need to test multiple gear types to determine effectiveness of each in capturing SMB
- We currently have a rare situation when compared to other areas of the CRe (Colorado River ecosystem), with ↑ numbers of native fish and ↓ numbers of non-native in GRCA (Grand Canyon) – how do we preserve that?
- SMB not the only threat – other warmwater, piscivorous, non-native fish species are being entrained
- Consider strategies (thinking ahead/out of the box) and come to a consensus on what is feasible to implement because SMB entrainment will remain high so long as reservoir elevations are low, and SMB will reproduce and establish under current thermal conditions.