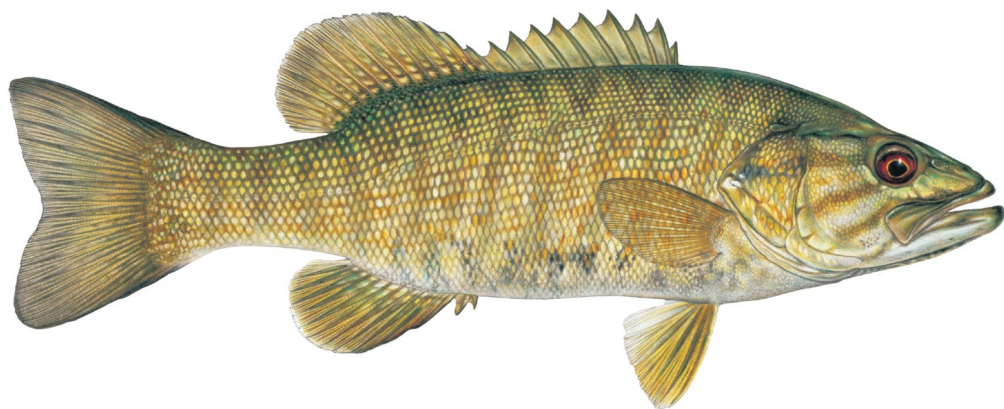


Status of Smallmouth Bass and Future Plans



Drew Eppheimer

US Geological Survey, Southwest Biological Science Center,
Grand Canyon Monitoring and Research Center

AMWG
May 15, 2024

Acknowledgements

With lots of help

Including:

Charles Yackulic, Kim Dibble, Maria Dzul, Brian Healy, Tom Gushue

Melissa Trammell, Emily Omana Smith, Jeff Arnold, Kurt Shollenberger, Laura Tennant

Matt O'Neill, Katherine Tucker, Bryce Mihalevich

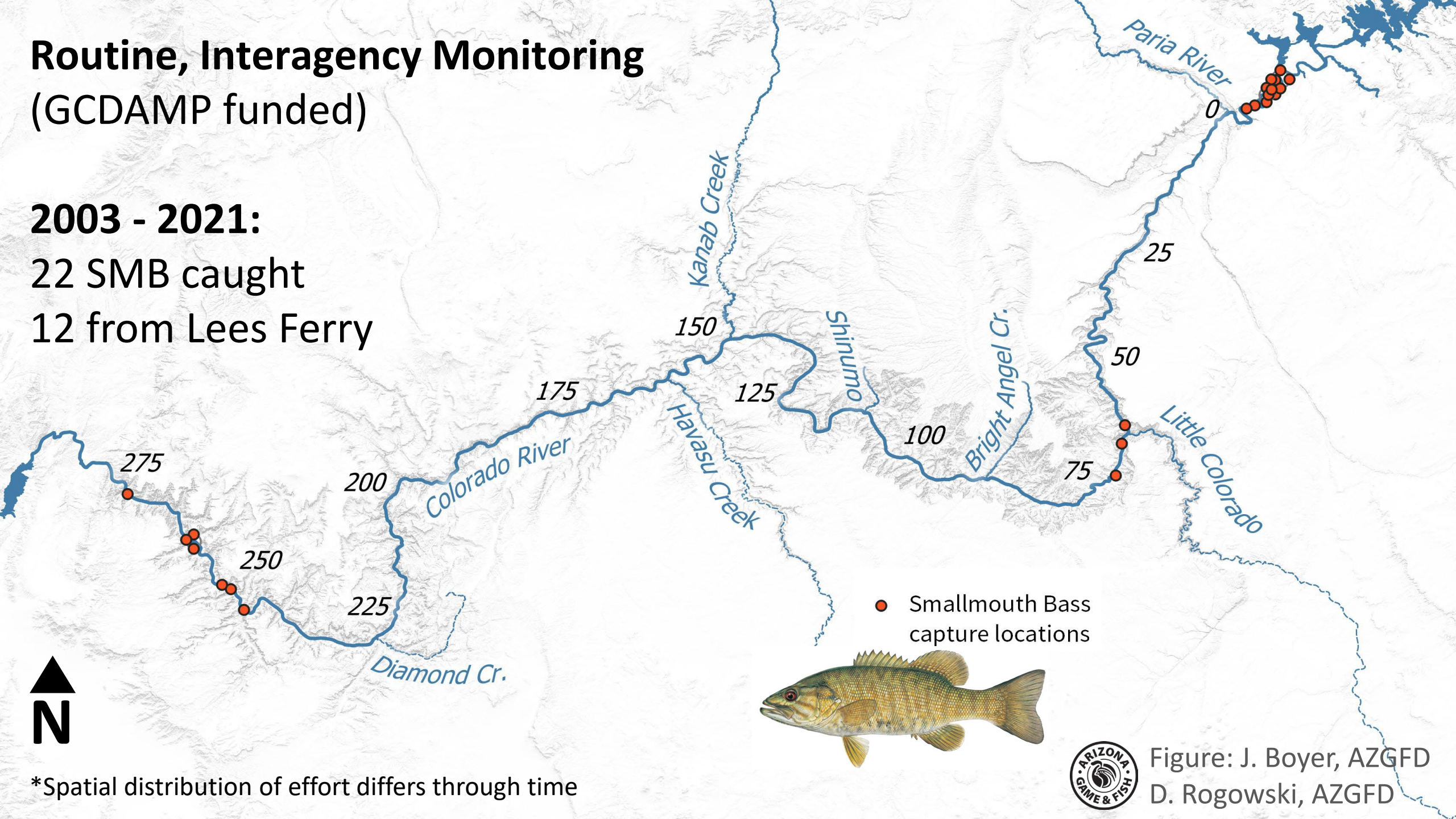
Pilar Rinker, Dale Fonken, John Fennell



— BUREAU OF —
RECLAMATION

Routine, Interagency Monitoring (GCDAMP funded)

2003 - 2021:
22 SMB caught
12 from Lees Ferry



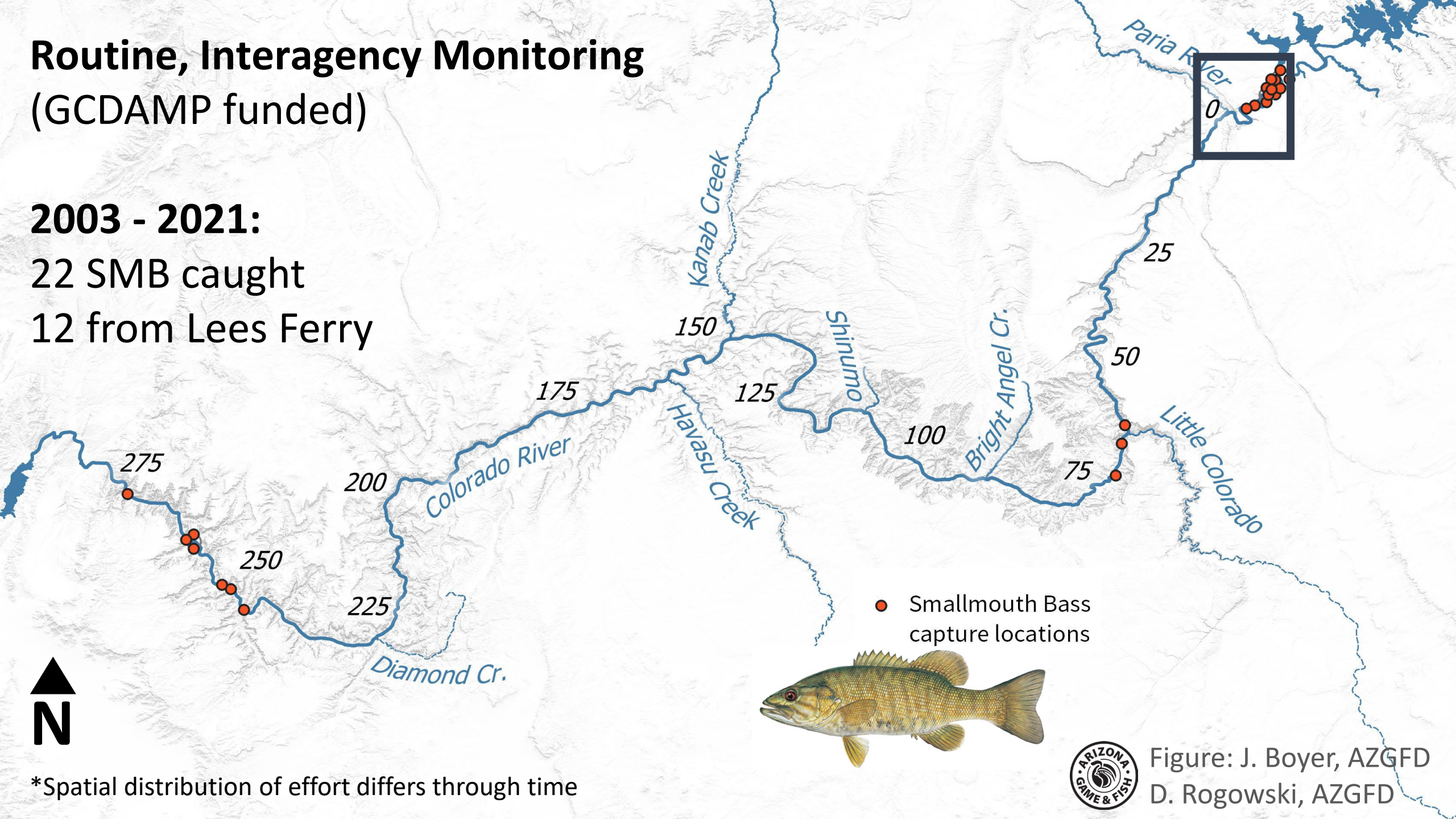
*Spatial distribution of effort differs through time



Figure: J. Boyer, AZGFD
D. Rogowski, AZGFD

Routine, Interagency Monitoring (GCDAMP funded)

2003 - 2021:
22 SMB caught
12 from Lees Ferry

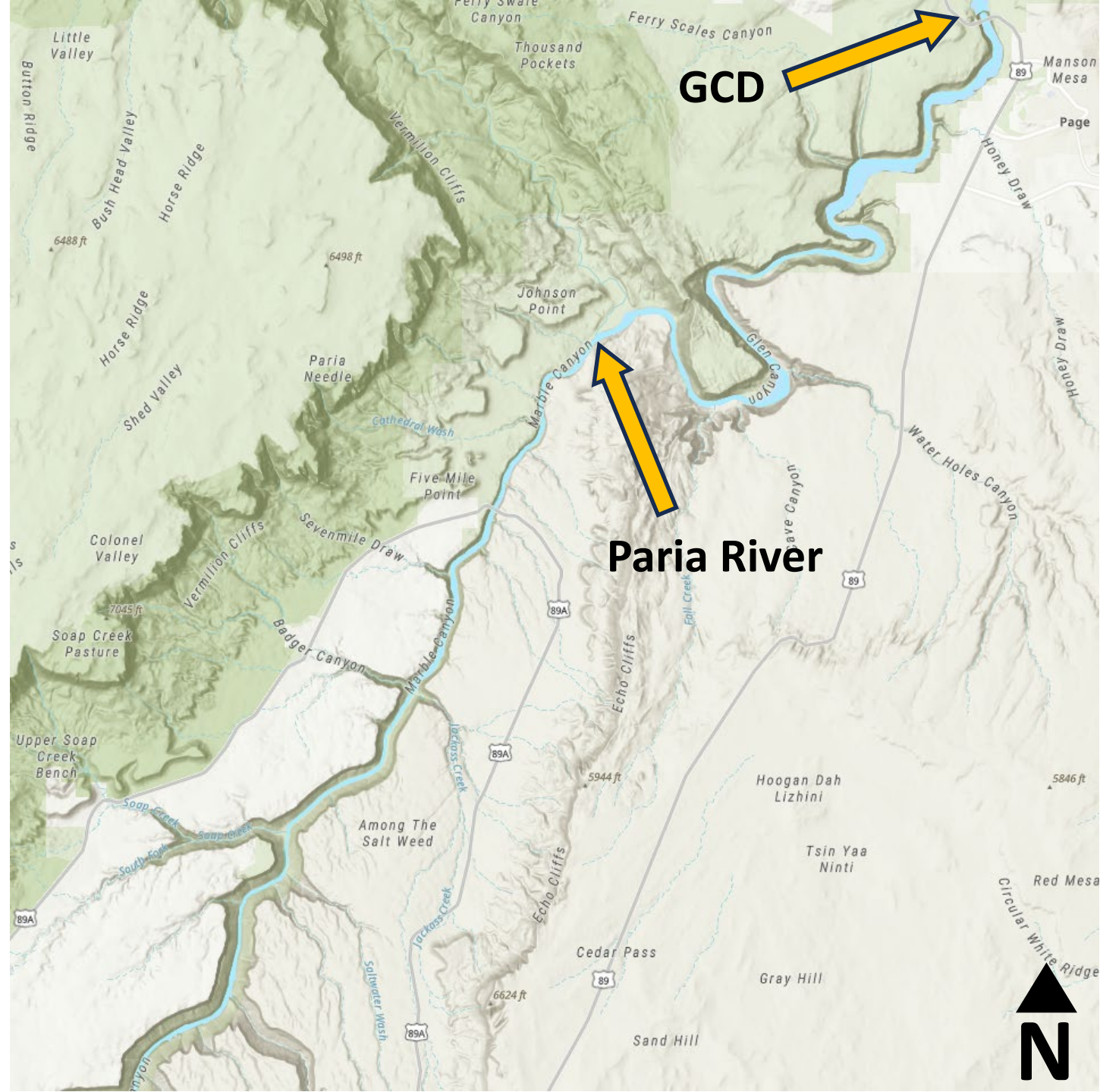


*Spatial distribution of effort differs through time

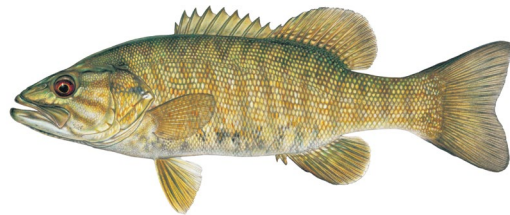


Figure: J. Boyer, AZGFD
D. Rogowski, AZGFD

Figure: K. Tucker, BOR; T. Gushue, USGS



2021 Smallmouth Bass Captures



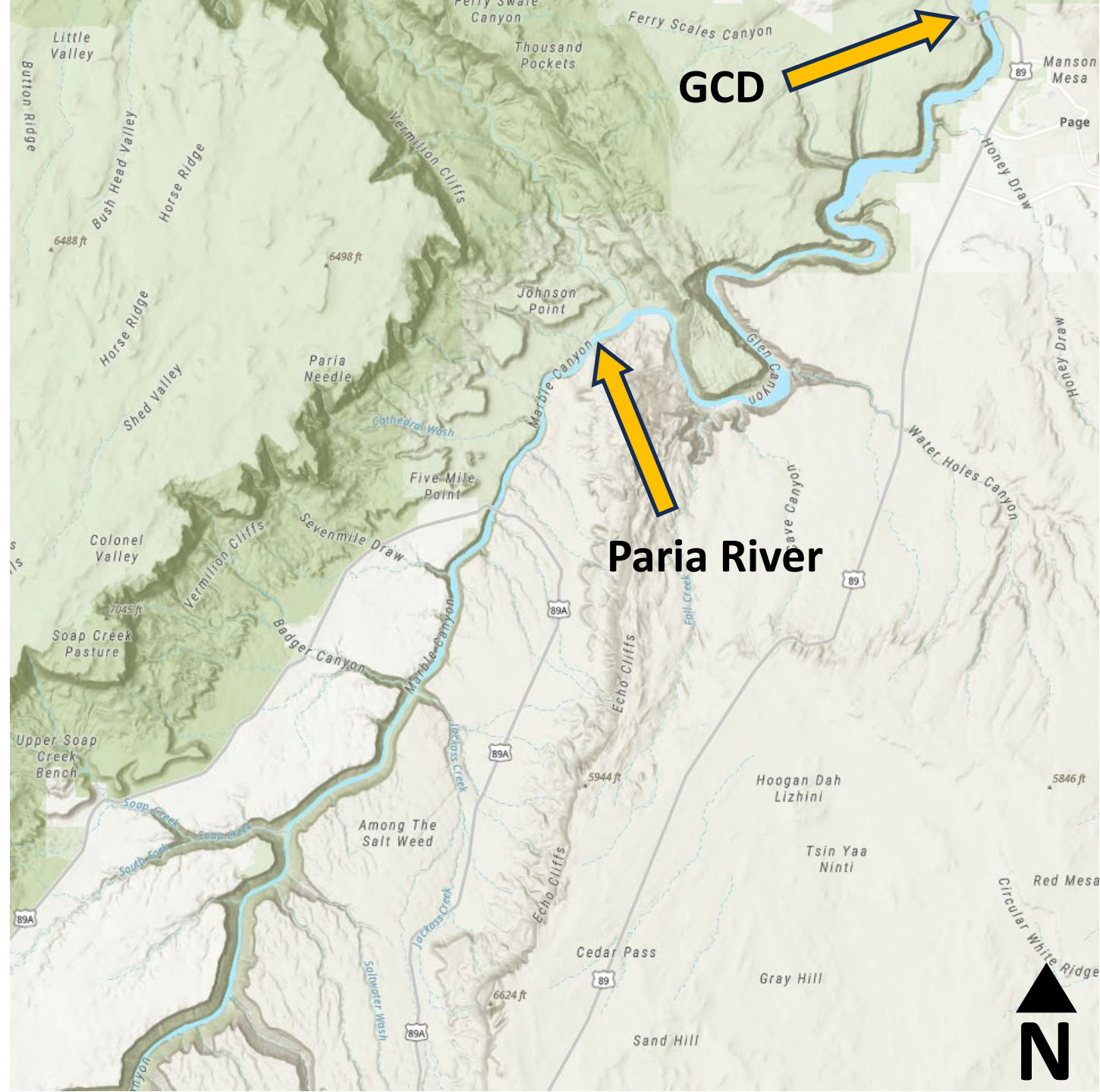
Total = 0

(1 adult SMB captured at RM 272)

Figure: K. Tucker, BOR; T. Gushue, USGS

*Spatial distribution of effort differs through time

Preliminary data, subject to change, do not cite



2022 Smallmouth Bass Captures

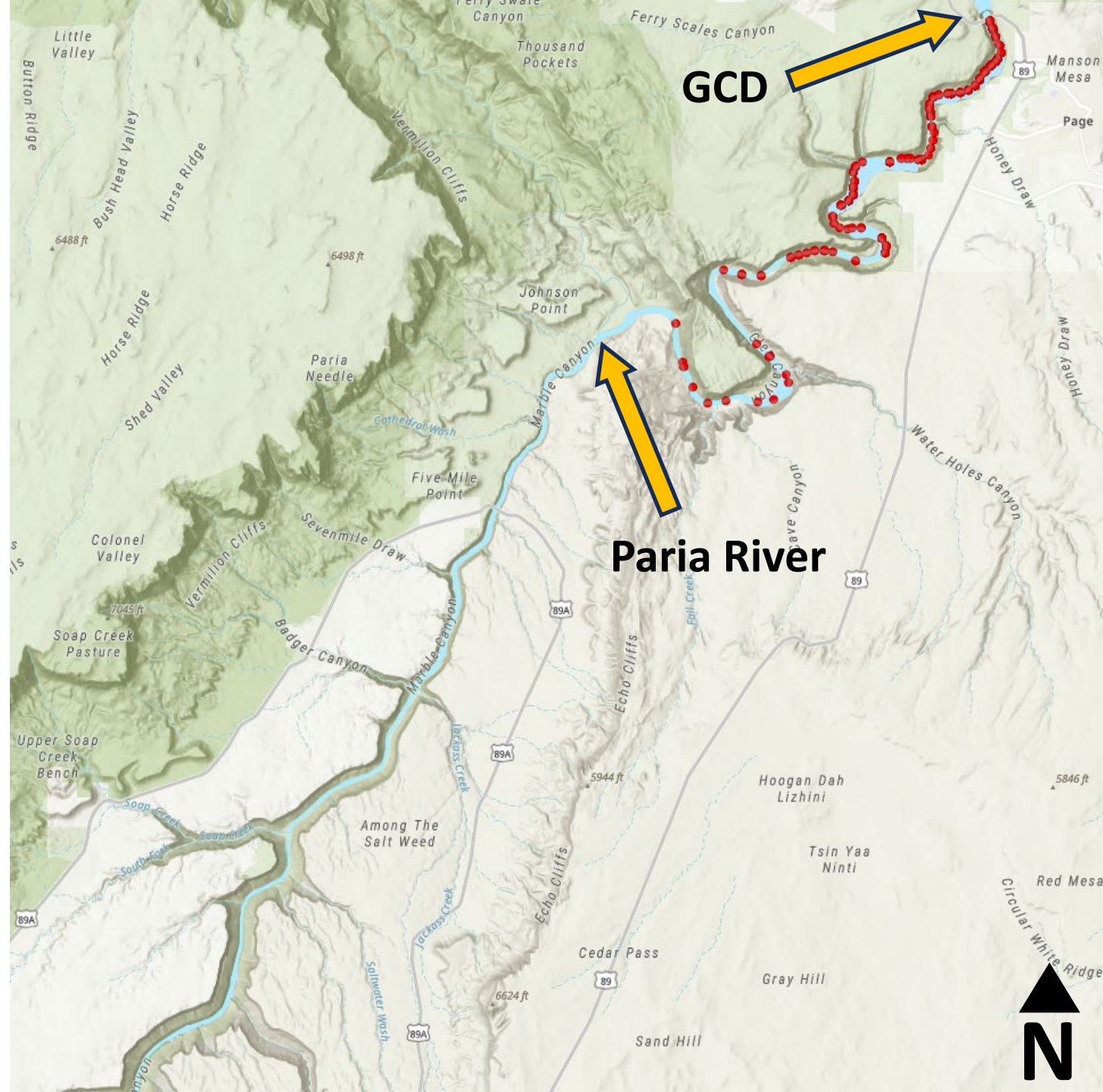


Total = 368

Figure: K. Tucker, BOR; T. Gushue, USGS

*Spatial distribution of effort differs through time

Preliminary data, subject to change, do not cite



2023 Smallmouth Bass Captures

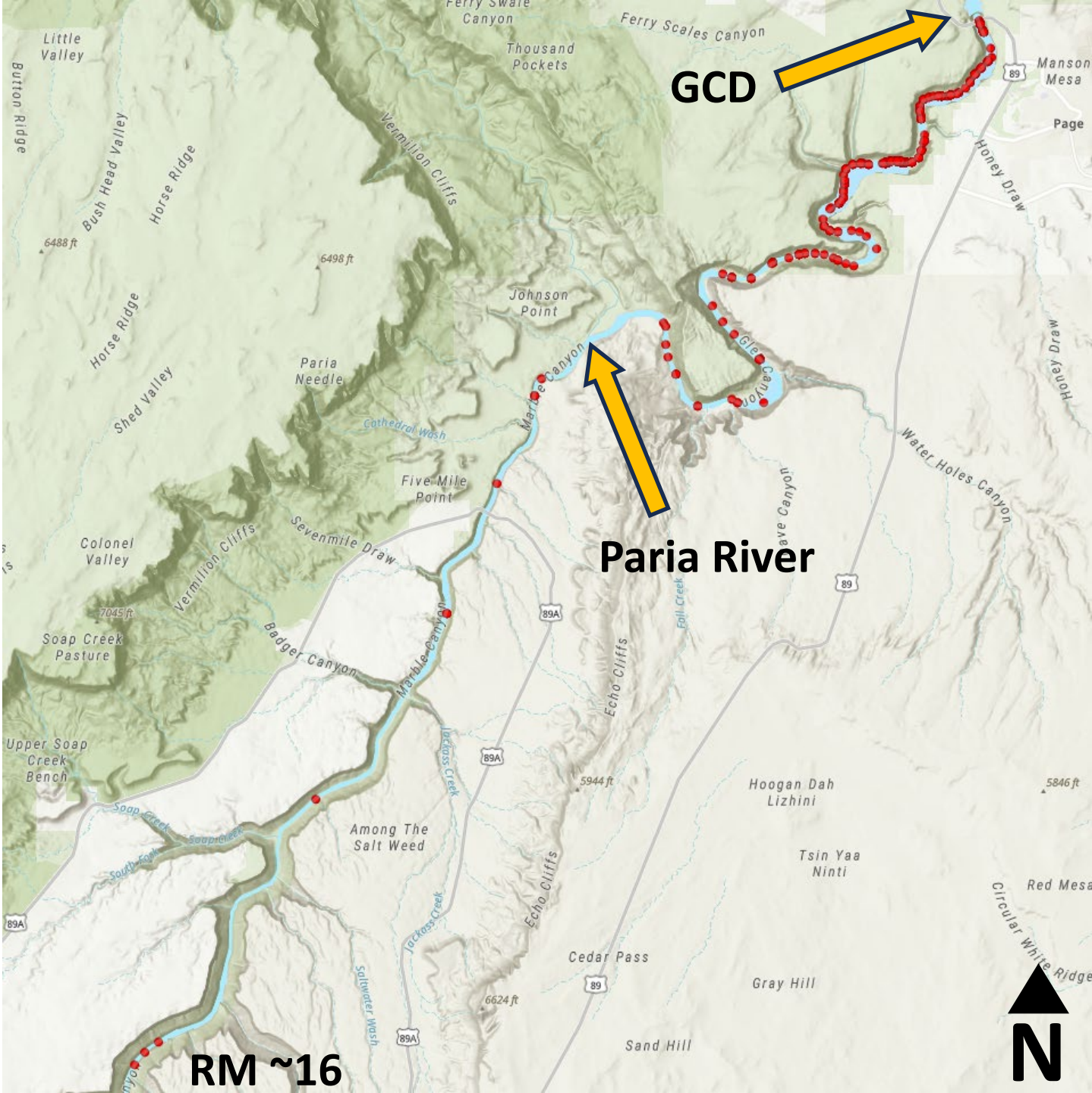


Total = 1,273

Figure: K. Tucker, BOR; T. Gushue, USGS

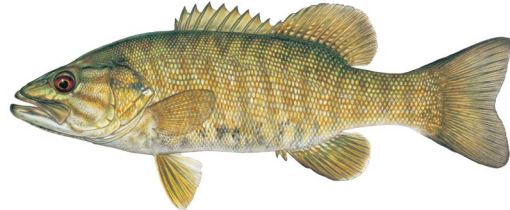
*Spatial distribution of effort differs through time

Preliminary data, subject to change, do not cite



RM ~16

2024 Smallmouth Bass Captures (so far)



Total = 17

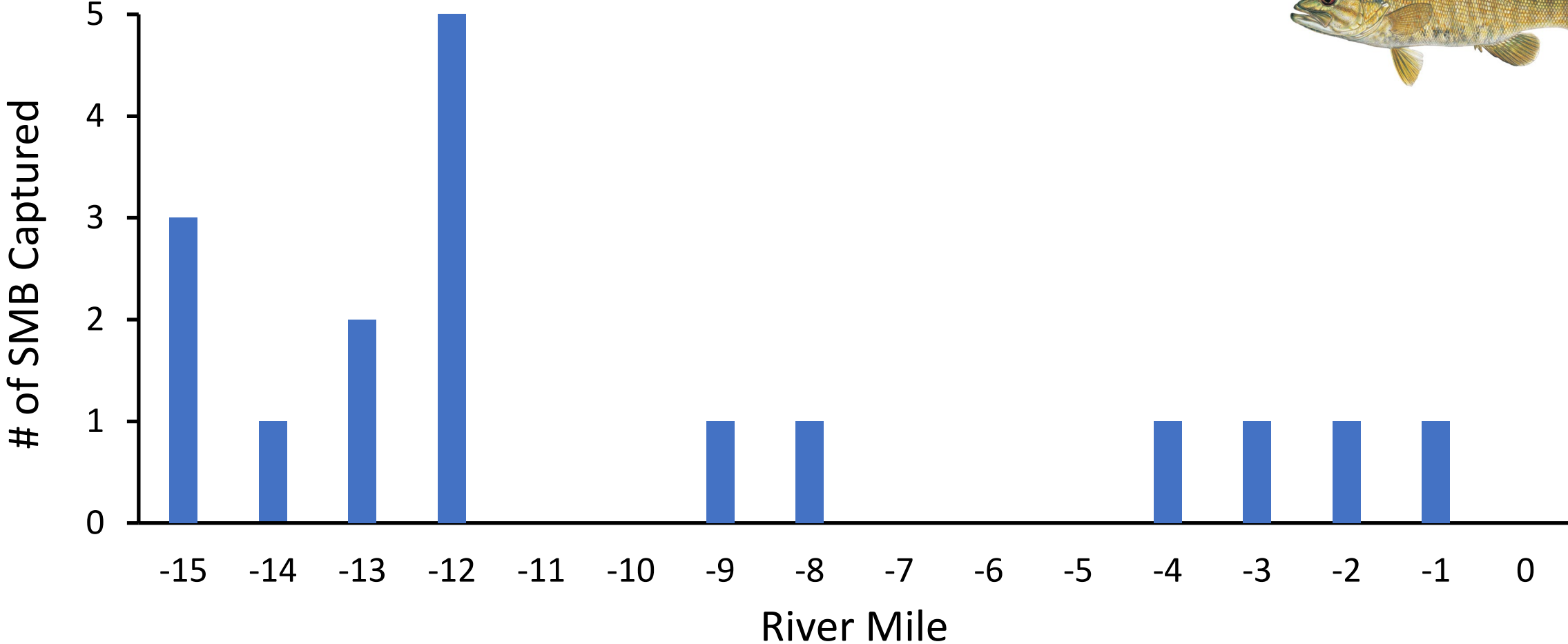
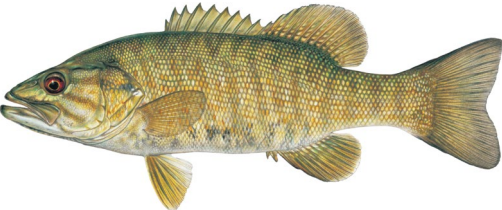
Table: M. Trammell, NPS

*Spatial distribution of effort differs through time

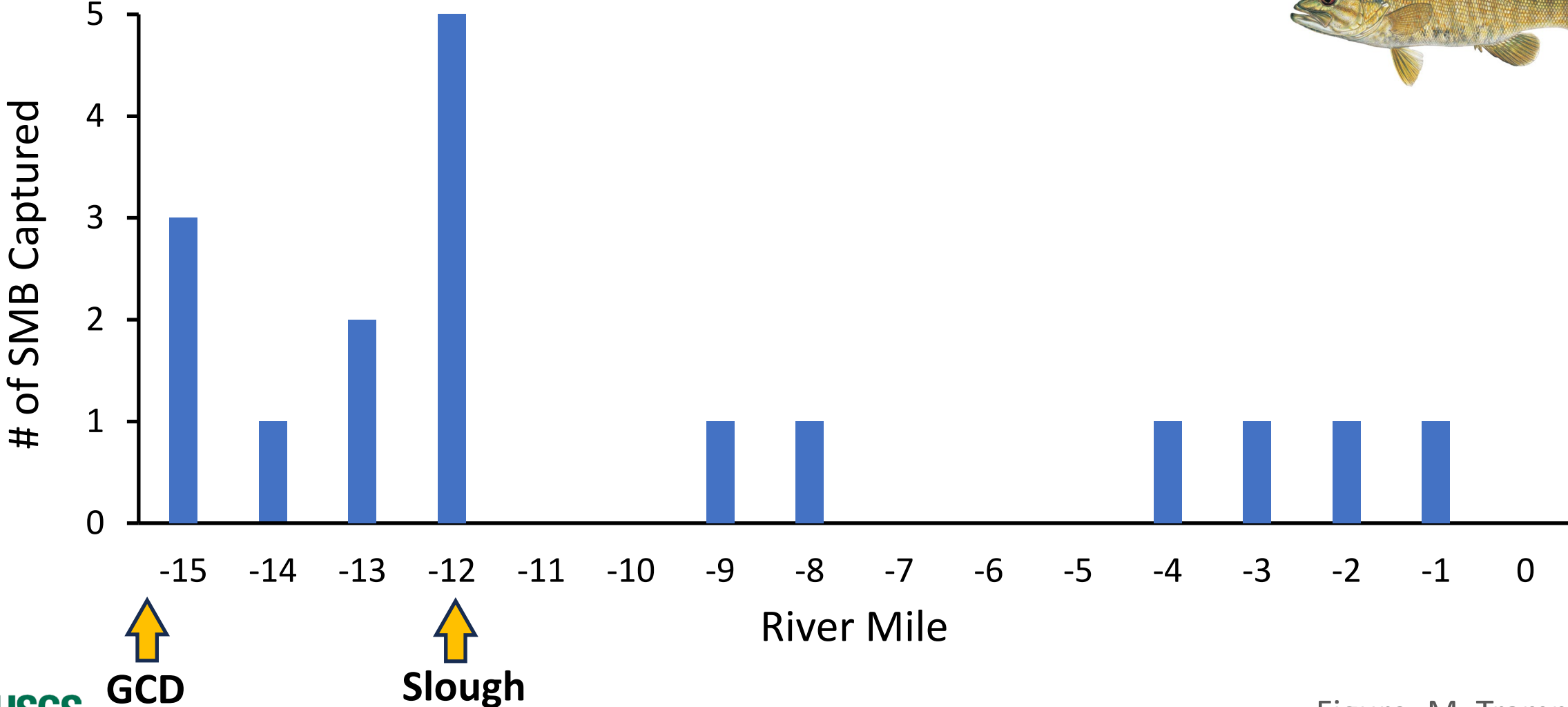
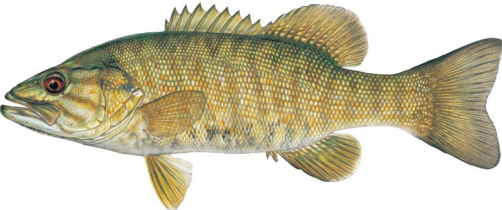
Preliminary data, subject to change, do not cite

Launch Date	Reach	Description	# of SMB
25-Jan	Lees Ferry	USGS TRGD	7
5-Mar	Lees Ferry, Slough	GLCA Netting/EF	0
11-Mar	Lees Ferry	AZGFD Lees Ferry	0
21-Mar	Lees Ferry	GLCA Netting/EF	1
1-Apr	Lees Ferry	GLCA EF Removal	5
3-Apr	Downstream	AZGFD EF	0
4-Apr	Lees Ferry	USGS TRGD	2
8-Apr	Lees Ferry, Slough	GLCA Netting	0
9-Apr	PBR	GRCA Seining	0
15-Apr	Lees Ferry	GLCA EF Removal	2
16-Apr	Little Colorado River	USFWS LCR HBC	0
22-Apr	Lees Ferry, Slough	GLCA Netting	0
23-Apr	Downstream	USGS JCM	0

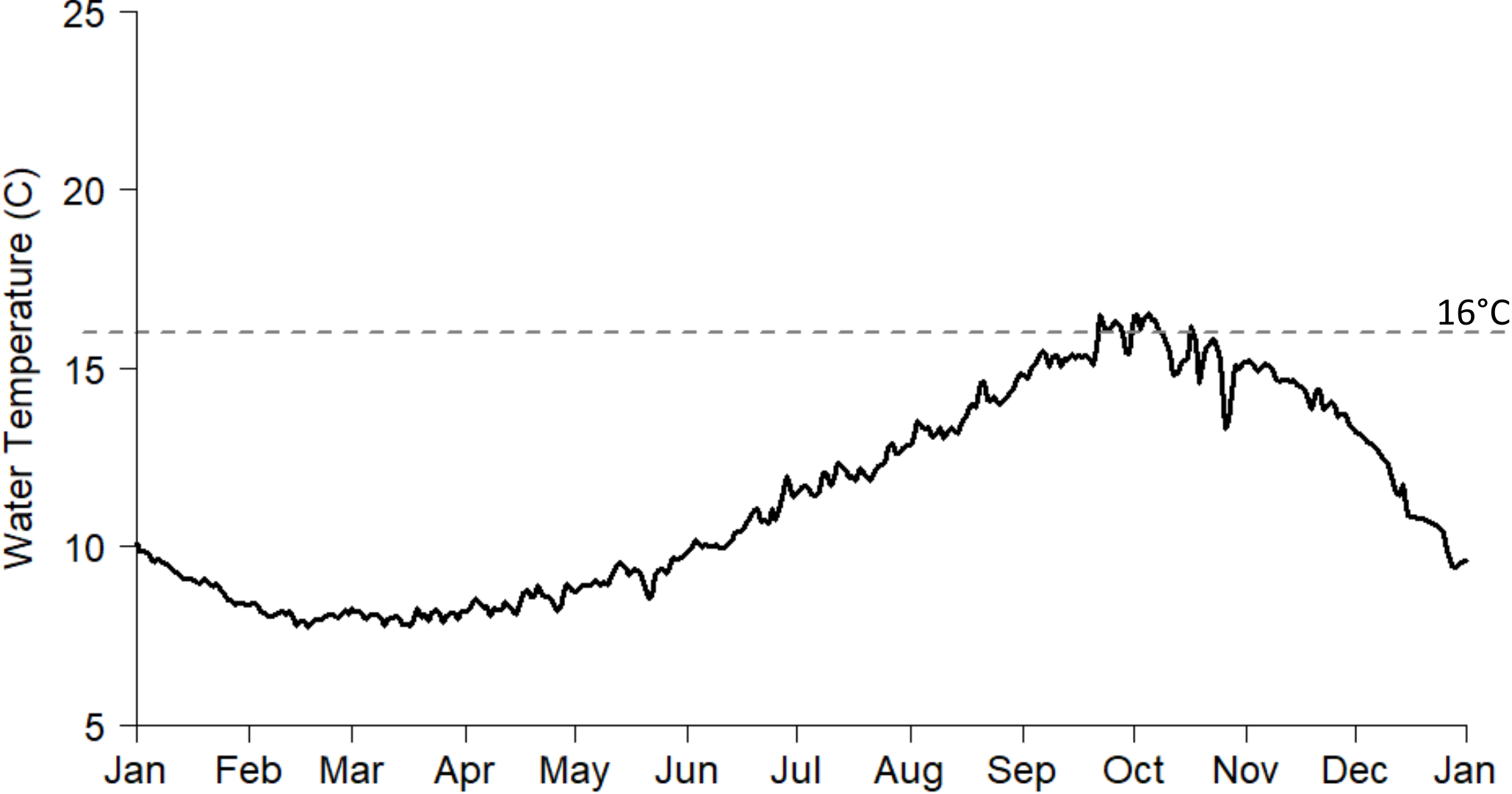
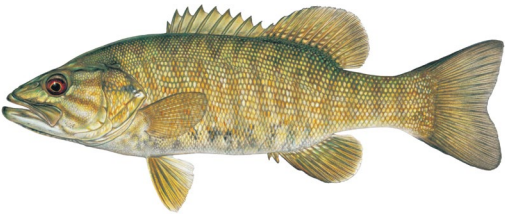
2024 Smallmouth Bass Captures (so far)



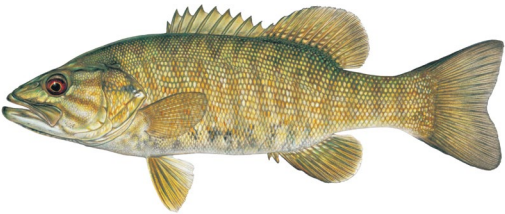
2024 Smallmouth Bass Captures (so far)



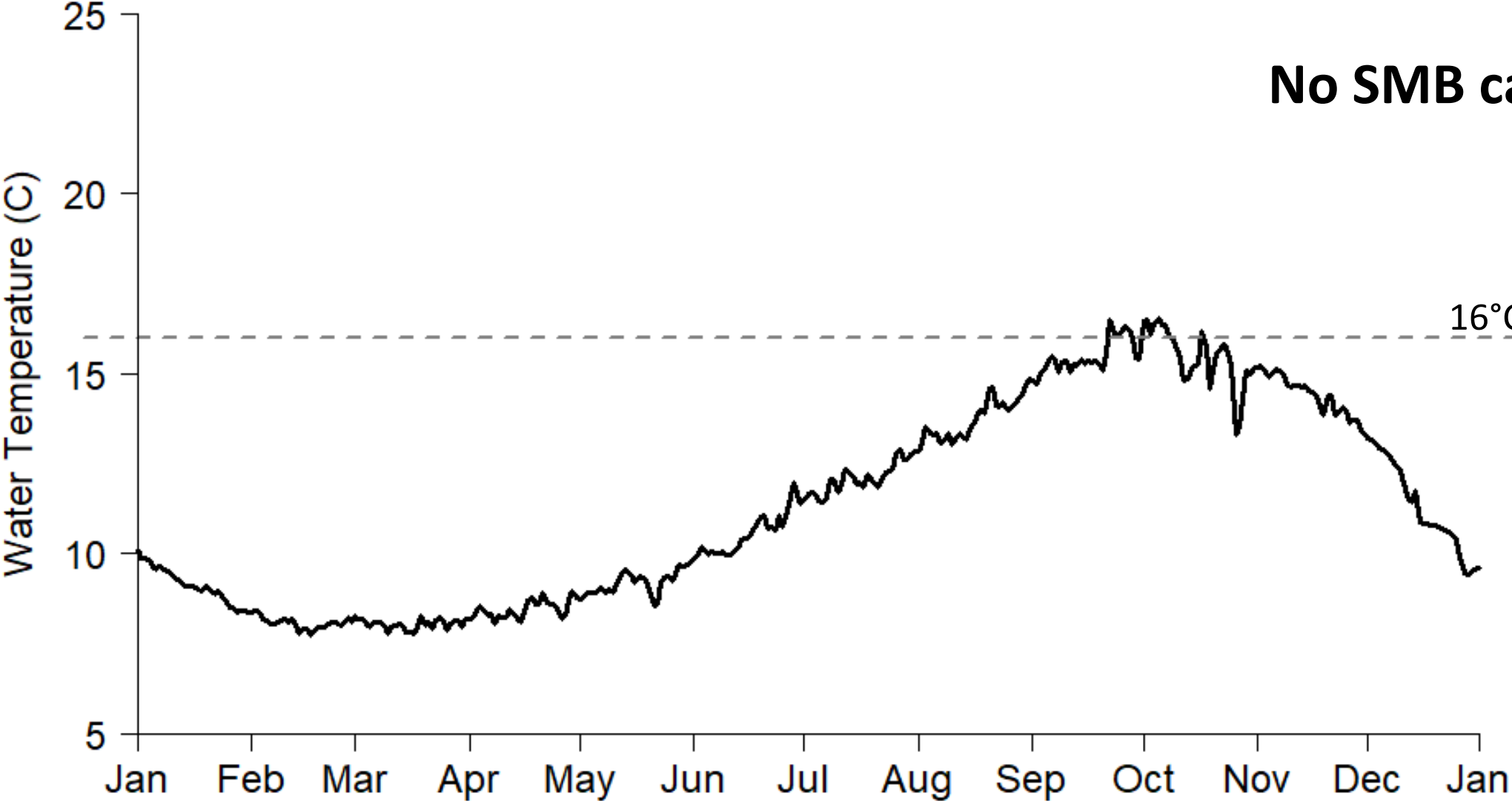
2021 GCD Release Temps



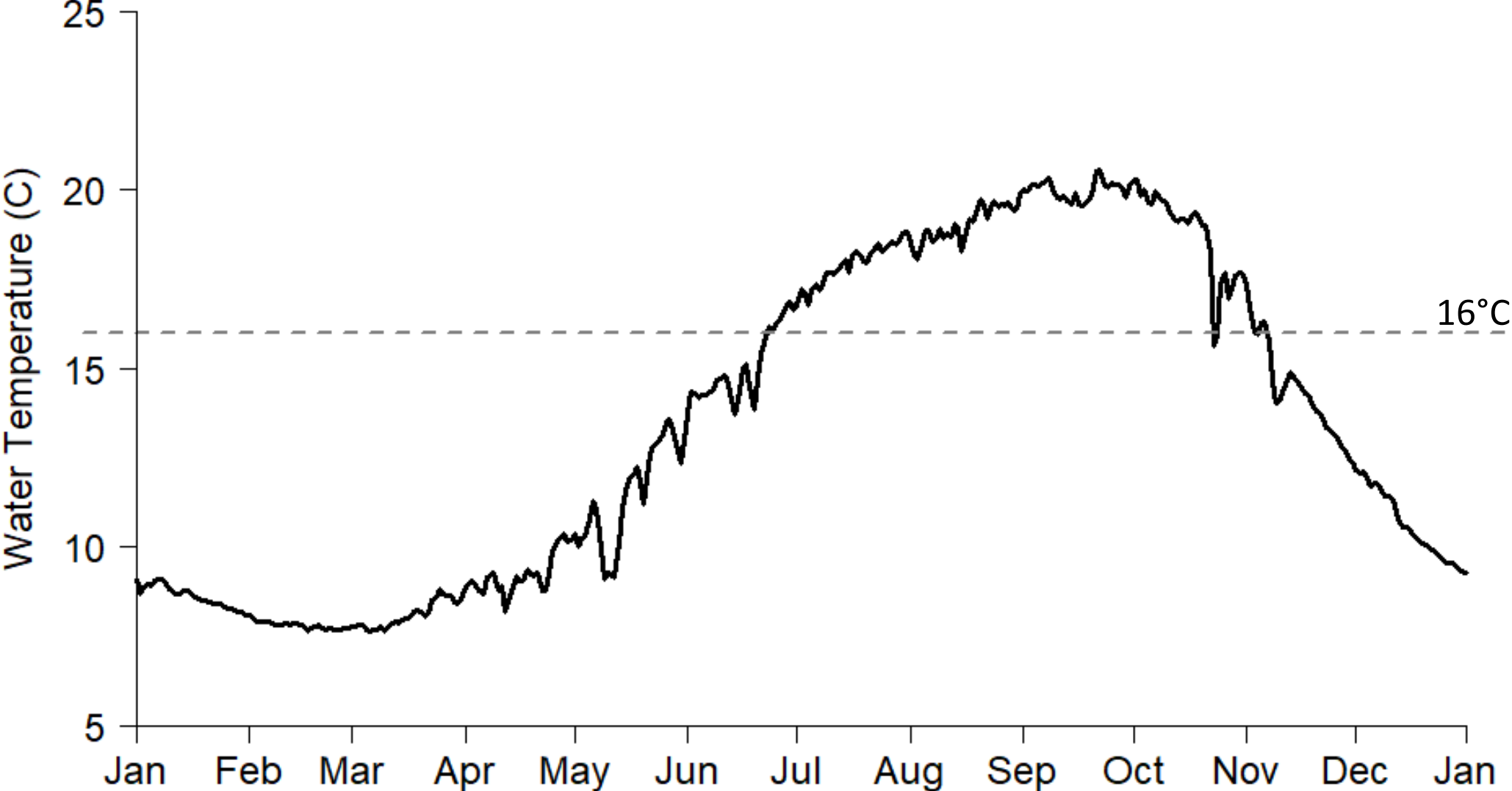
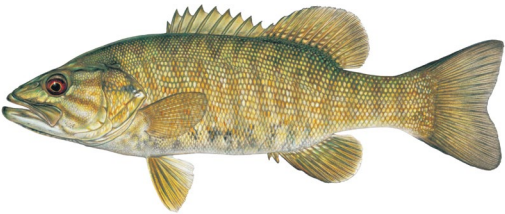
2021 GCD Release Temps



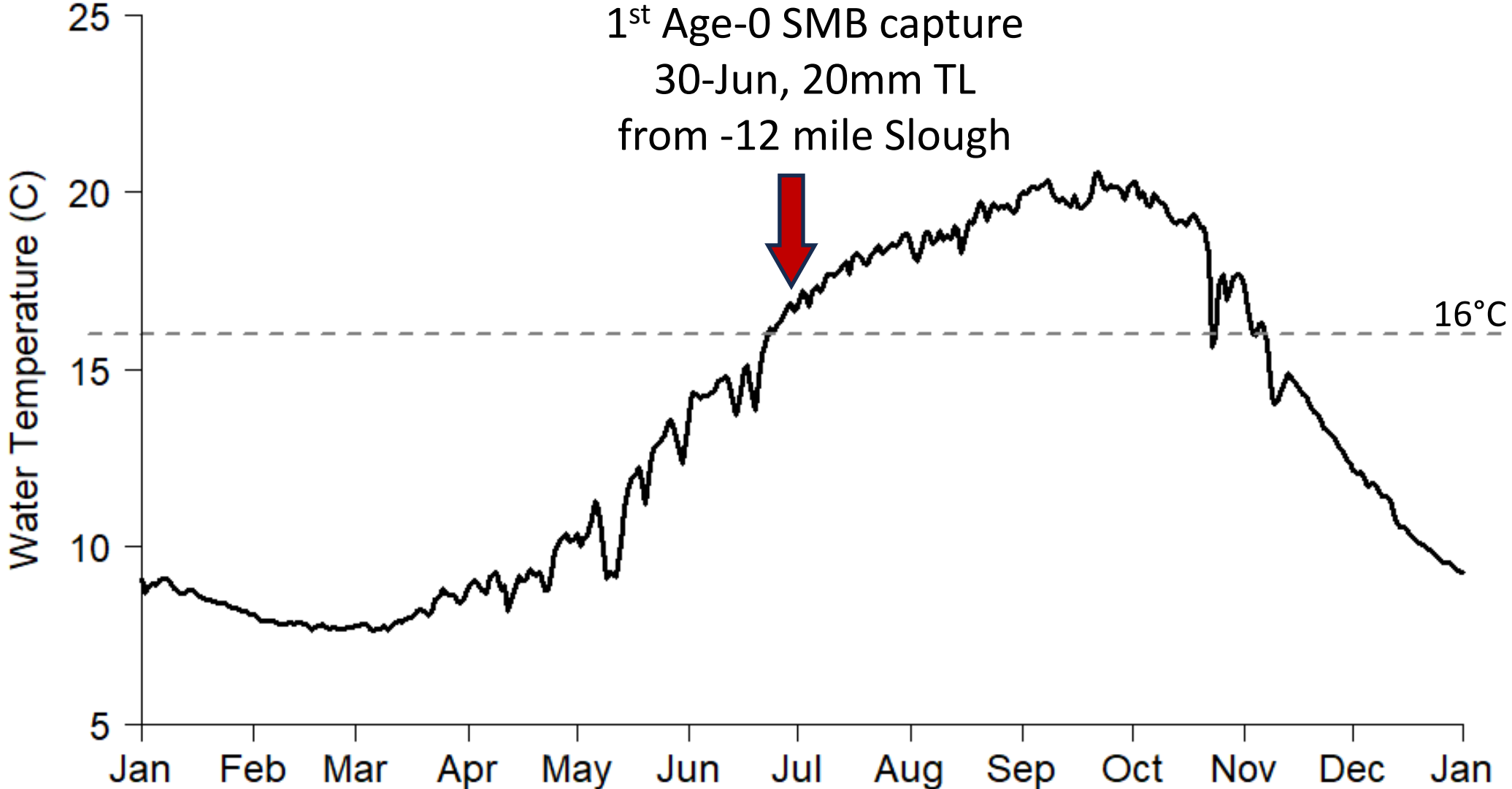
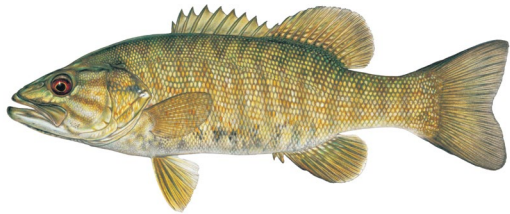
No SMB captured in LF



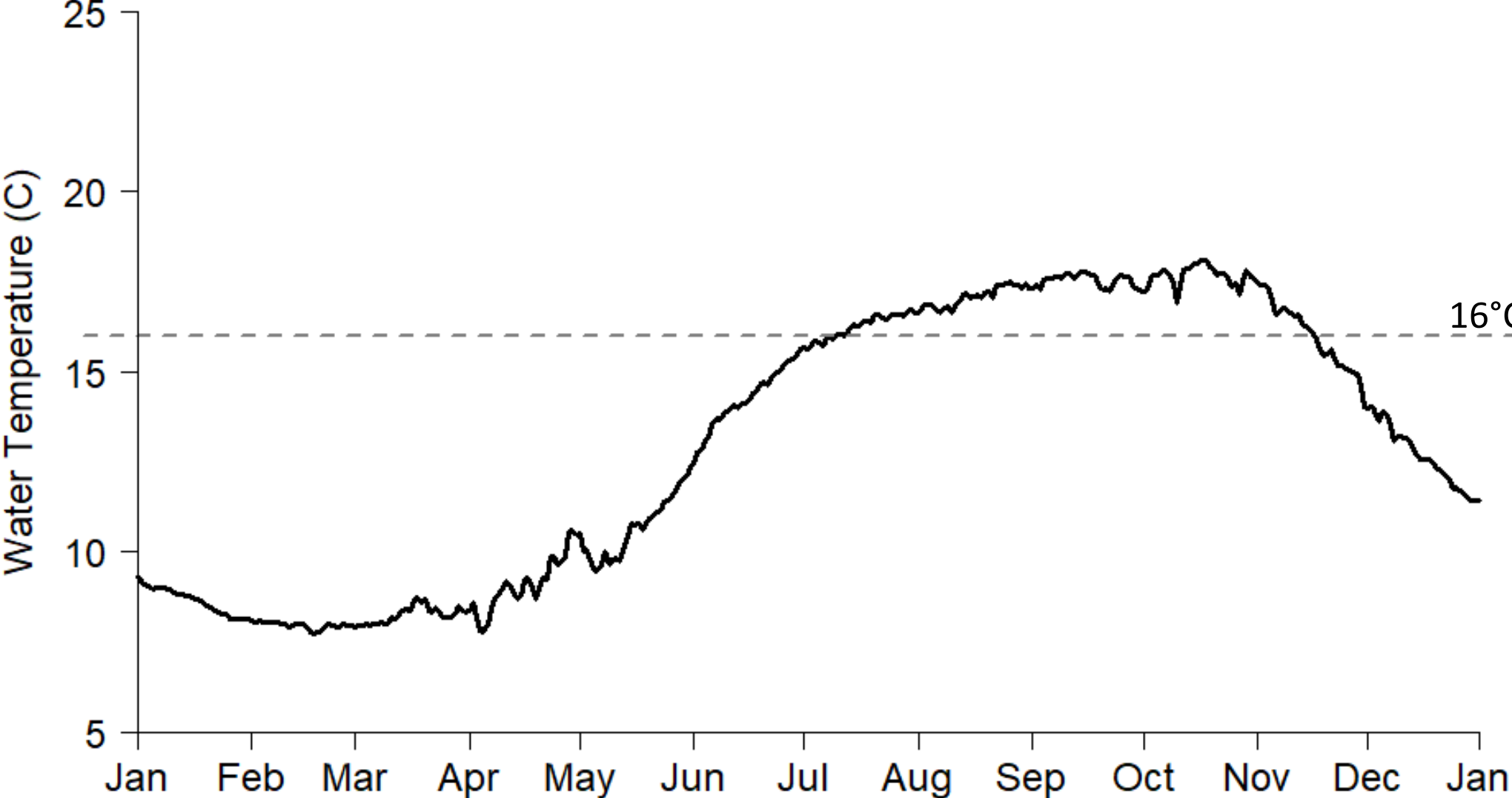
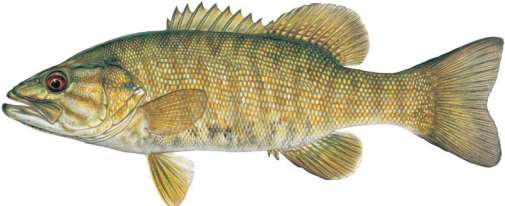
2022 GCD Release Temps



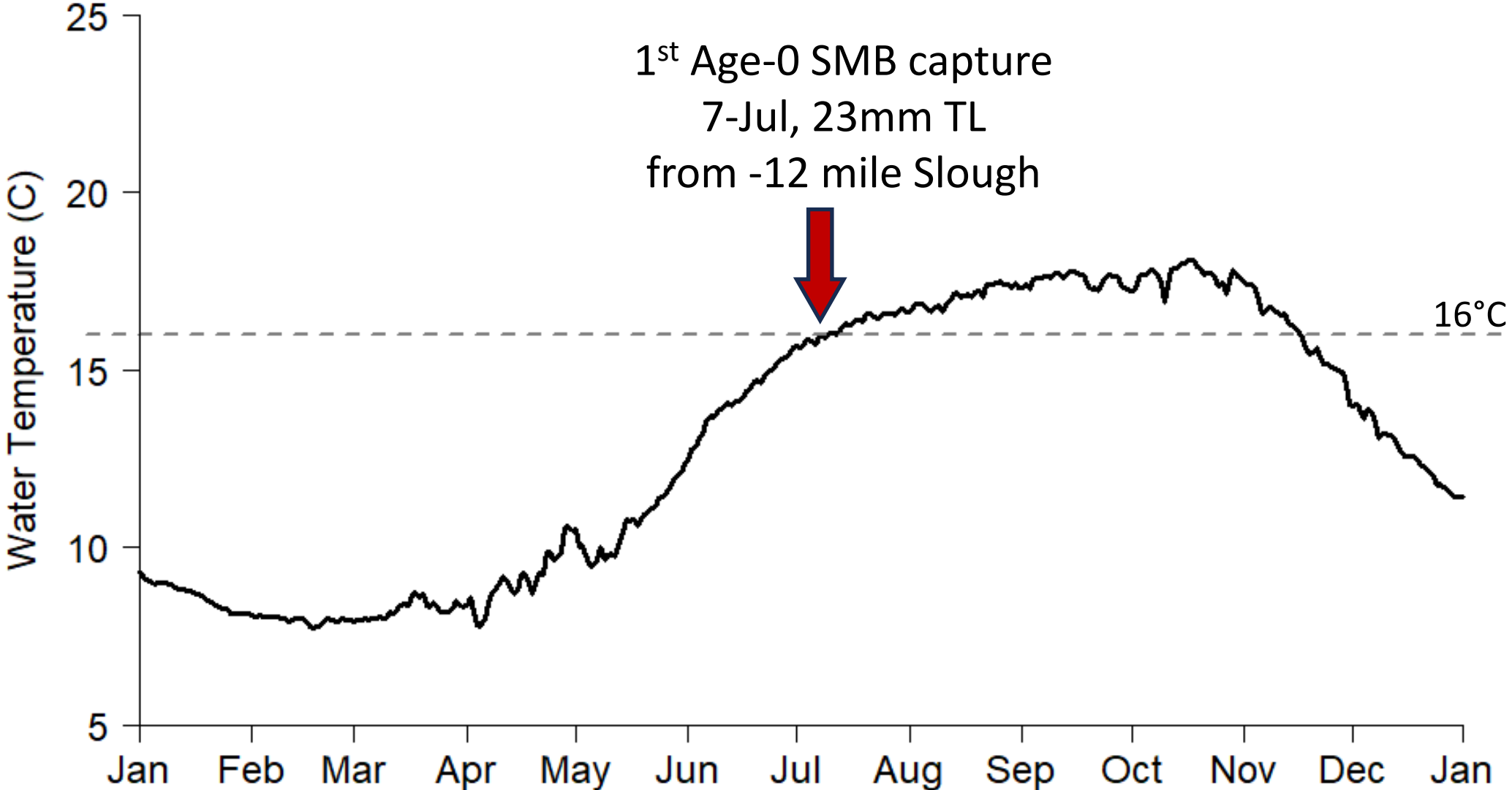
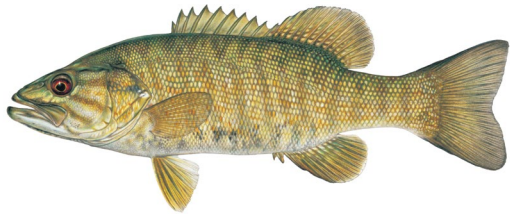
2022 GCD Release Temps



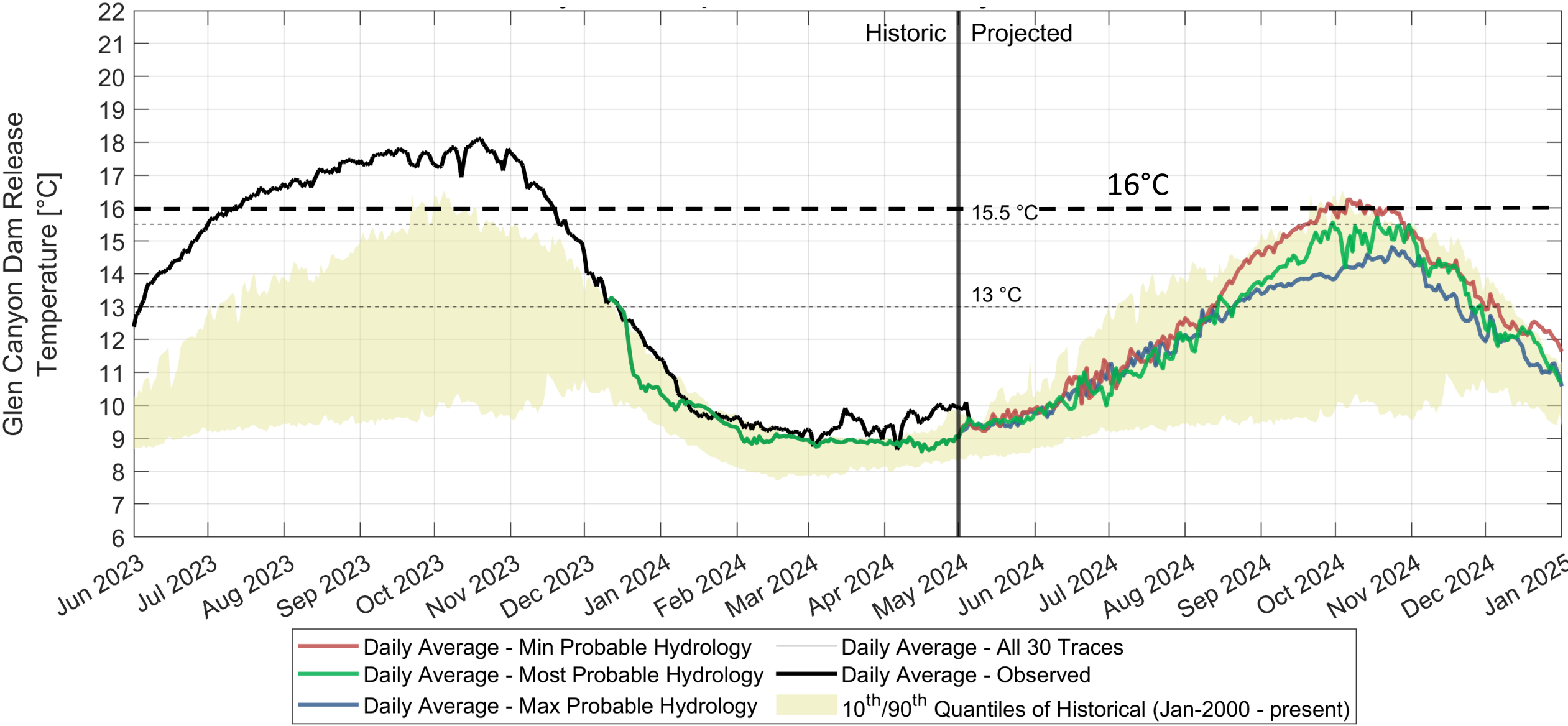
2023 GCD Release Temps



2023 GCD Release Temps



2024 Projected GCD Release Temps (May 2024 forecast)



Lower Slough Water Temps: Mar 6 – Apr 30, 2024

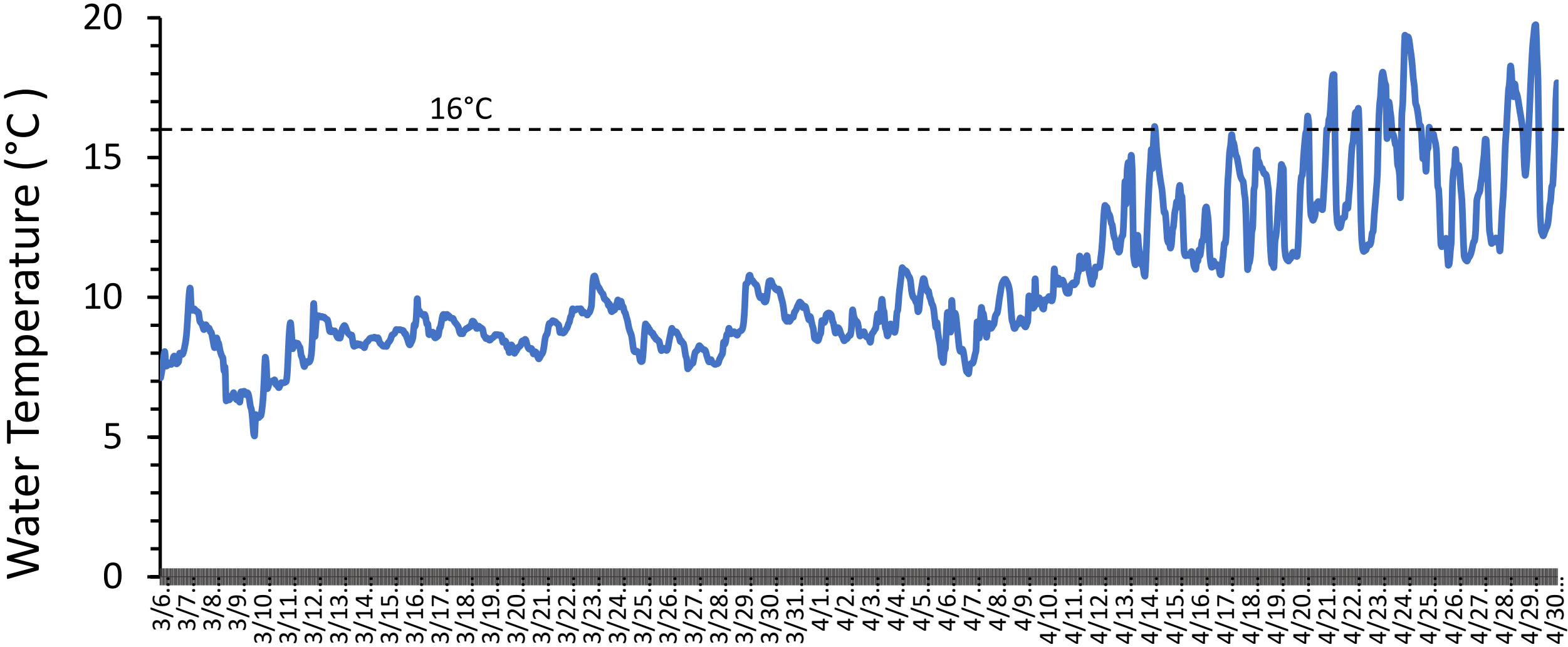
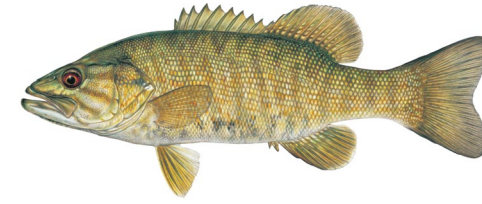
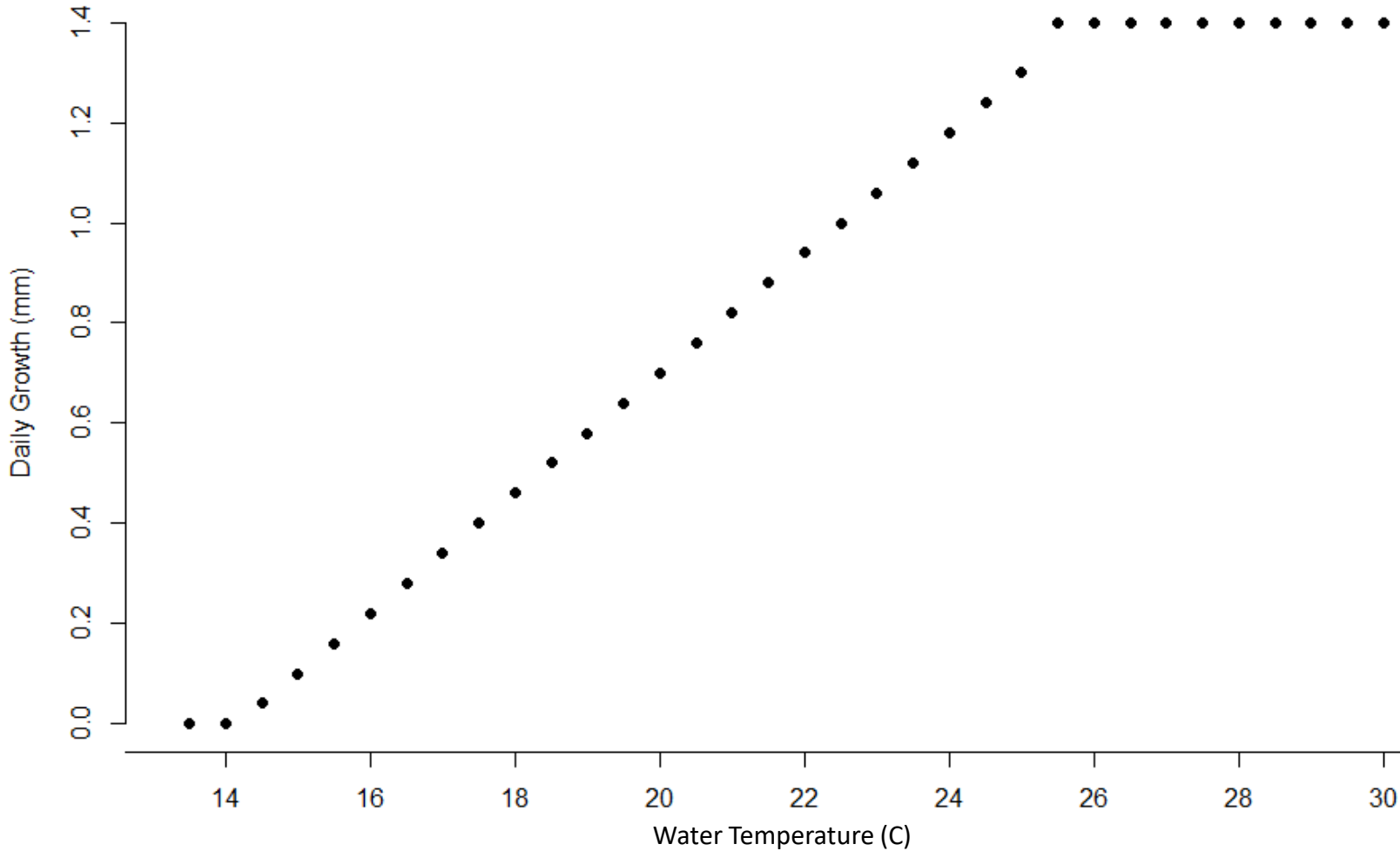


Figure: J. Arnold, NPS; M. Trammell, NPS

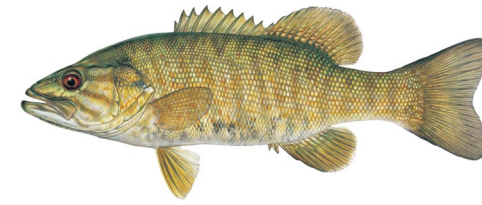
Smallmouth Bass and Temperature



Age-0 Smallmouth Bass Growth

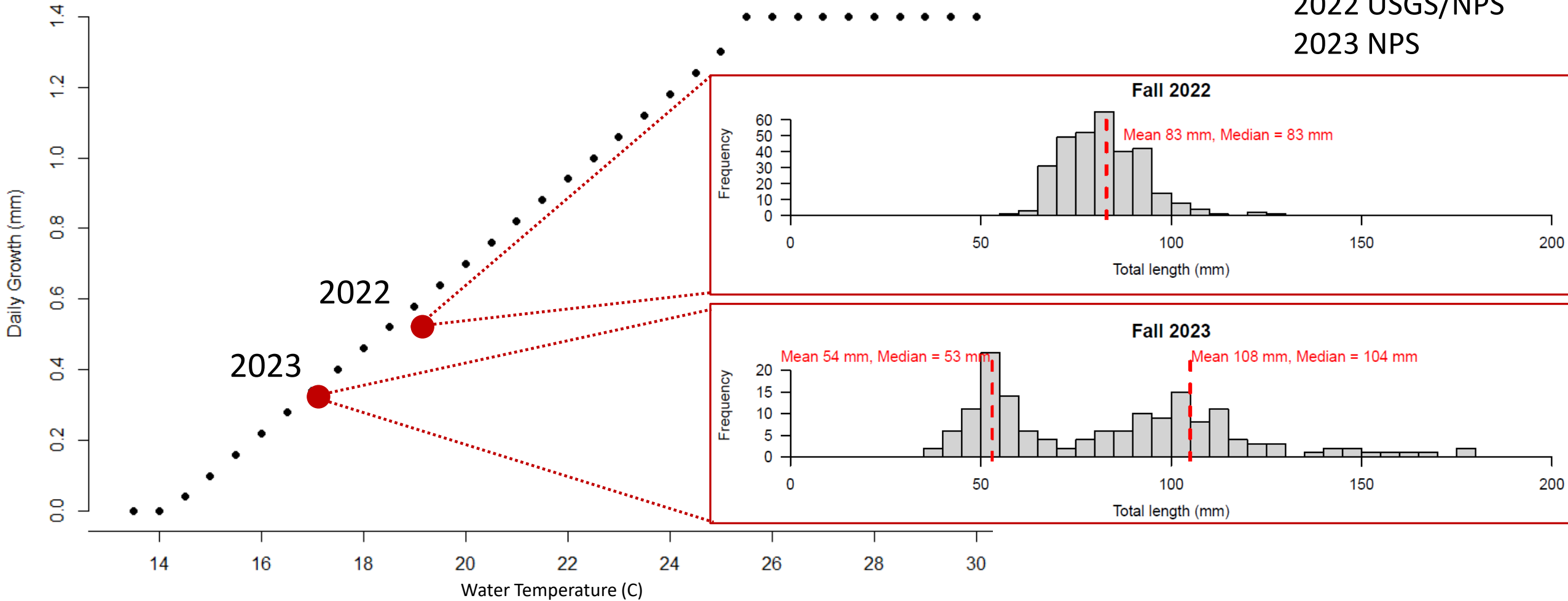


Smallmouth Bass and Temperature



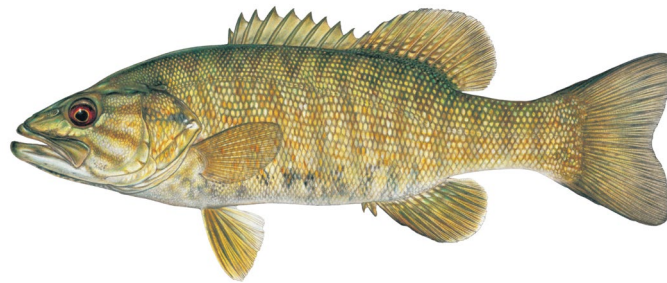
SMB Data:
2022 USGS/NPS
2023 NPS

Age-0 Smallmouth Bass Growth



2024 Science Plan Outline

High-Risk Nonnative Species Monitoring and Research



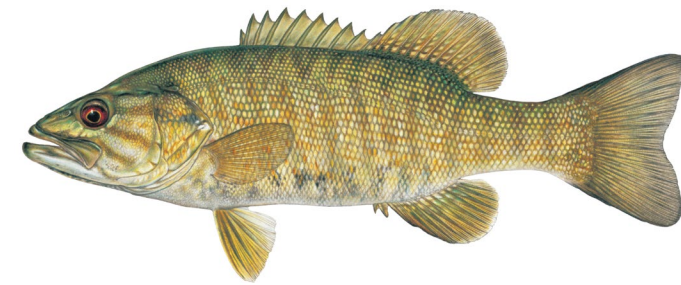
Overview

2024 sampling effort to monitor Smallmouth Bass (SMB) and other high-risk nonnative fish species in the Colorado River from Glen Canyon Dam (RM -15.7) to Badger Rapid (RM 7.5).

Context:

Ongoing SMB sampling/removal

Potential GCD experimental flows



Questions

Note: not all questions will be addressed with the same certainty

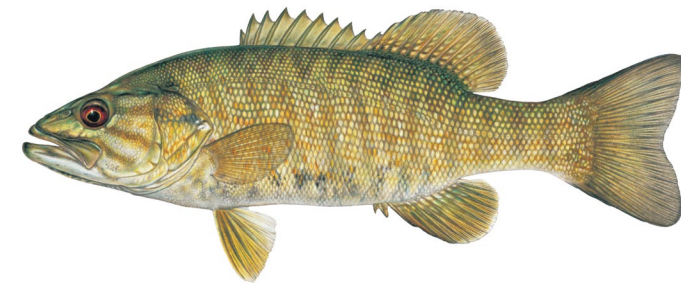
1. *Distribution/Dispersal:*

How are SMB distributed throughout the sampled area?

2. *Reproduction:*

Is there *in situ* SMB spawning?

- a. Where is it occurring? Hotspots?
- b. When did it occur?
- c. Can we use close-kinship analyses to differentiate entrainment vs local reproduction?
- d. Is reproduction leading to recruitment of age-1 SMB? (next year sampling)



Questions

Note: not all questions will be addressed with the same certainty

3. *Abundance/Catch:*

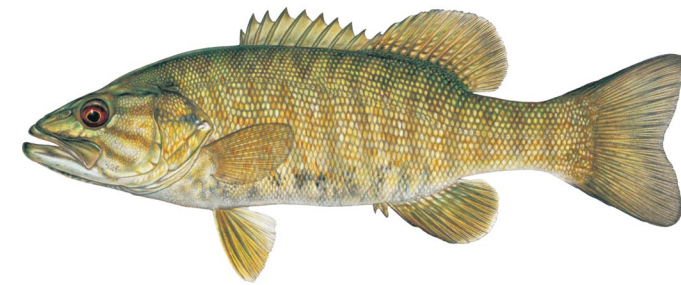
Is SMB Catch Per Unit Effort (CPUE) stable, increasing, or decreasing?

Can we estimate SMB abundance with reasonable confidence?

4. *Growth:*

What are the growth rates of SMB?

- a. Is variation mostly attributable to temperature or are other factors playing a role (e.g., changes in turbidity/prey densities)?
- b. Does growth rate slow under experimental flows?



Questions

Note: not all questions will be addressed with the same certainty

5. Diet:

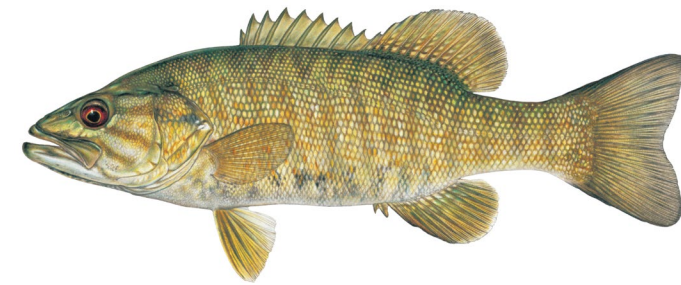
What are SMB eating in different locations at different life stages?

- a. What are rates of piscivory as a function of SMB size?
- b. Are there longitudinal relationships with stomach fullness or biomass?

6. Capture Efficiencies:

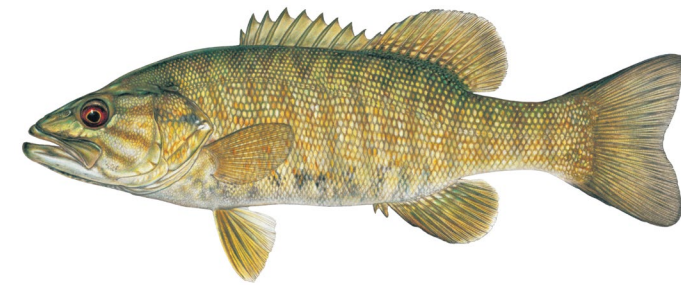
How efficient are different approaches to capturing SMB?

- a. Are there better approaches to catch different life stages?
- b. Are there better approaches to finding SMB nests/spawning areas?



Measurable Goals/Objectives

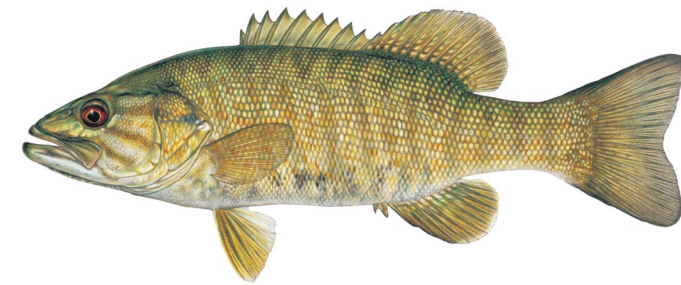
- Determine CPUE by life stage. Distribution and size structure of SMB.
- Collect and preserve individuals to investigate kinship/relatedness and potential nest origin with genetics, diet, and potential otolith analysis.
- Determine growth by life stage using modal progression analysis and potentially through otolith analysis.
- Test other approaches for surveillance and capture of different life stages of SMB.



NPS Led Effort

Glen Canyon: GCD to Lees Ferry

- a. Boat electrofishing (biweekly)
 - i. Fixed sites
 - ii. Random sites
 - iii. Targeted hotspots
- b. Targeted hotspots
 - i. -12 mile Slough barrier install and sampling/removal
 - ii. Fyke and hoop nets (biweekly)
 - iii. Artificial spawning beds (8 sites, weekly checks)
 - iv. Side scan sonar monitoring for spawning beds (pilot study)
- c. Temperature monitoring
 - i. HOBO loggers
- d. GCD forebay sampling
 - i. Gillnets



NPS Led Effort

Grand Canyon: Paria Beach to Badger Rapid (PBR)

- a. Boat electrofishing (every 3 weeks)
 - i. Dynamic sites
 - 1. Includes 3 pass depletion
- b. Targeted hotspots
 - i. Backwater sampling
- c. Temperature monitoring
 - i. HOBO loggers
- d. Environmental DNA sampling
 - i. Backwater sampling, and other hotspots



Routine, Interagency Monitoring

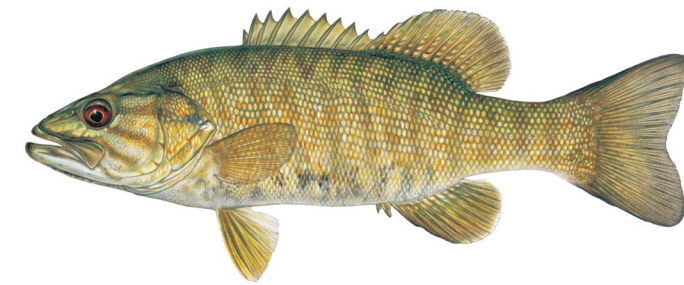
AZGFD: GCD to Lees Ferry sampling

- a. Boat electrofishing
 - i. 3 trips: Mar, Jul, Oct
 - ii. Stratified random sites (upper, middle, lower)



USGS: GCD to Lees Ferry, TRGD

- a. Boat electrofishing
 - i. 4 trips: Jan, Apr, Jun, Nov
 - ii. Fixed sites (1A, near RM -13, 1C, near RM -4)



Downstream Trips

AZGFD:



System-wide sampling

- a. Apr, May, (potential for Fall trip)

USGS:



JCM East, JCM West

- a. Apr/May, Jul, Oct

USFWS:



Aggregations

- a. Aug/Sep

Backwater sampling

- a. Jul/Aug

NPS:

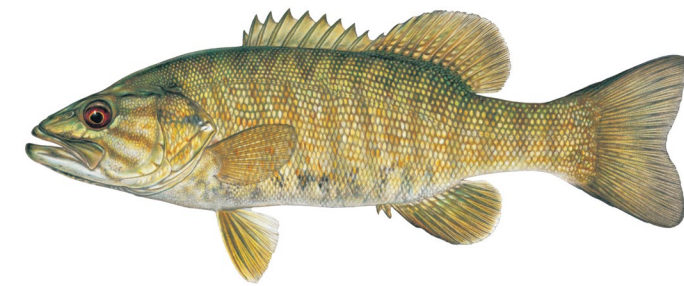


System-wide sampling

- a. Jun

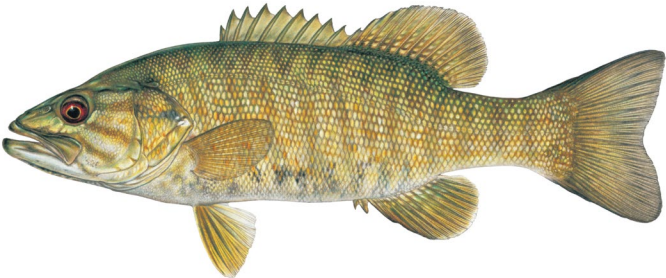
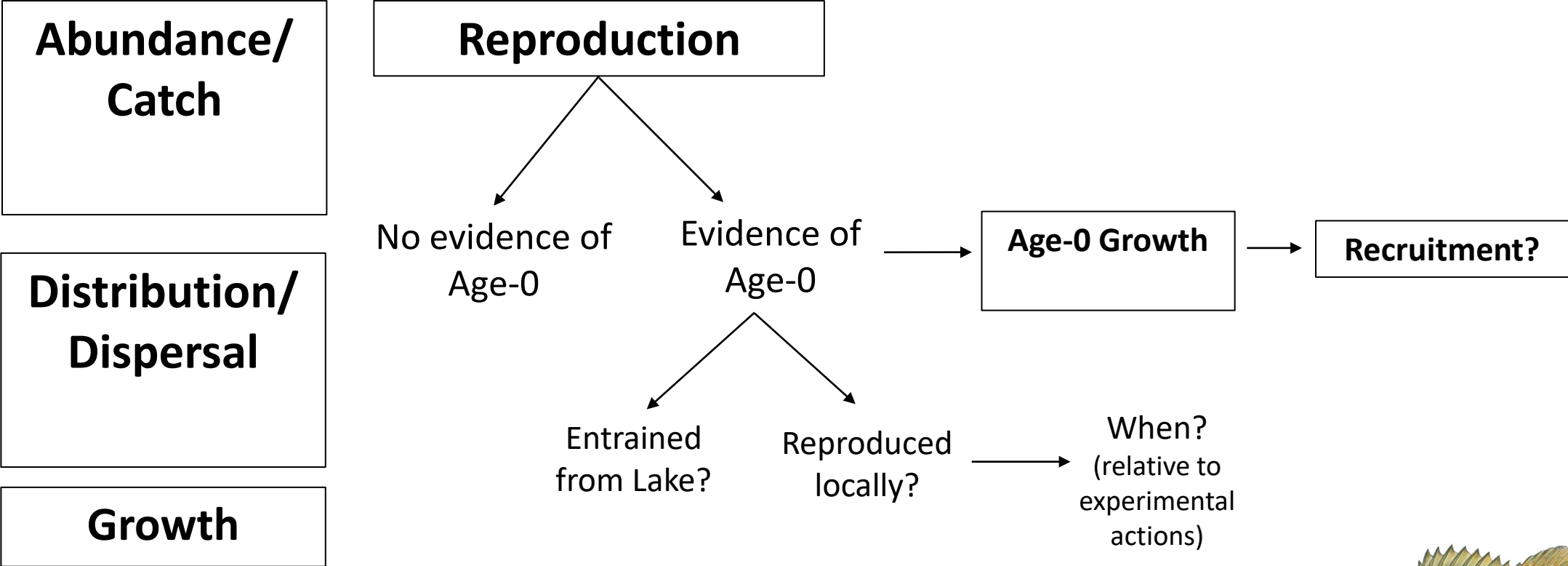
Upper half sampling

- a. Sep/Oct, Oct/Nov



SMB Research and Monitoring

Determining the effectiveness of removals & potential flow experiments



SMB Research and Monitoring

Determining the effectiveness of removals & potential flow experiments

**Abundance/
Catch**

**Distribution/
Dispersal**

Growth

Reproduction

No evidence of Age-0 Evidence of Age-0

Entrained from Lake? Reproduced locally?

Age-0 Growth

Recruitment?

When?
(relative to experimental actions)

**SMB
Modeling**

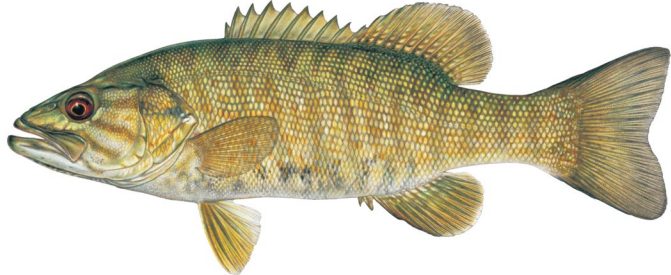


Photo Credit: Richard McLeish

Drew E. Eppehimer
deppehimer@usgs.gov

