



Long term fish monitoring and Preliminary Results of the 2008 High Flow Experiment (HFE) Electrofishing

R. S. Rogers, A.S. Makinster, S. R. Hurteau and W. R. Persons
Arizona Game and Fish Department
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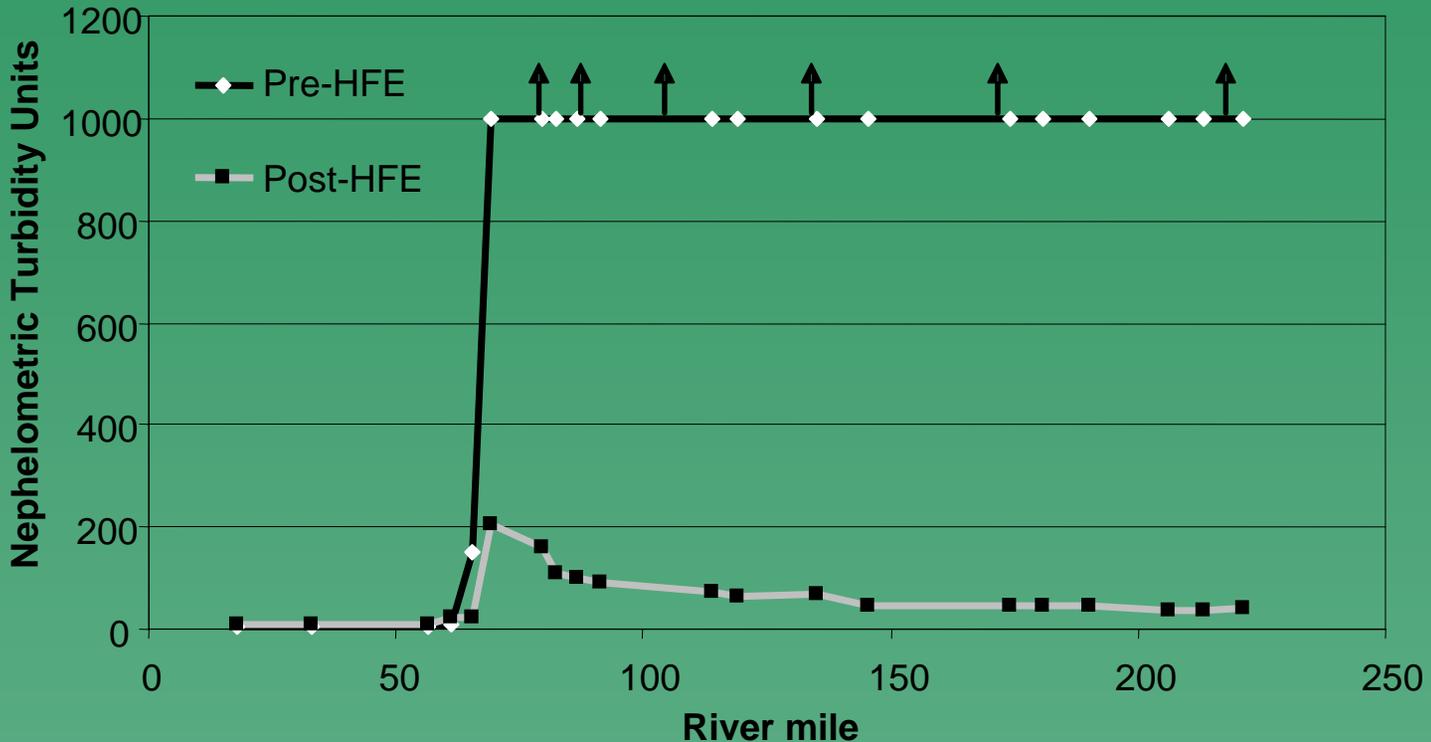


Long-term monitoring and experimental (HFE) protocol

- **Sampling followed long-term monitoring protocols**
- **Same sites visited during both sampling events (pre- and post-HFE).**
- **Lees Ferry**
 - **pre-HFE: 2/28 – 3/2/2008**
 - **post-HFE: 3/18 – 3/21/2008**
- **Grand Canyon**
 - **pre-HFE: 2/5 – 2/24/2008**
 - **post-HFE: 3/27 – 4/16/2008**



Turbidity pre- and post-HFE



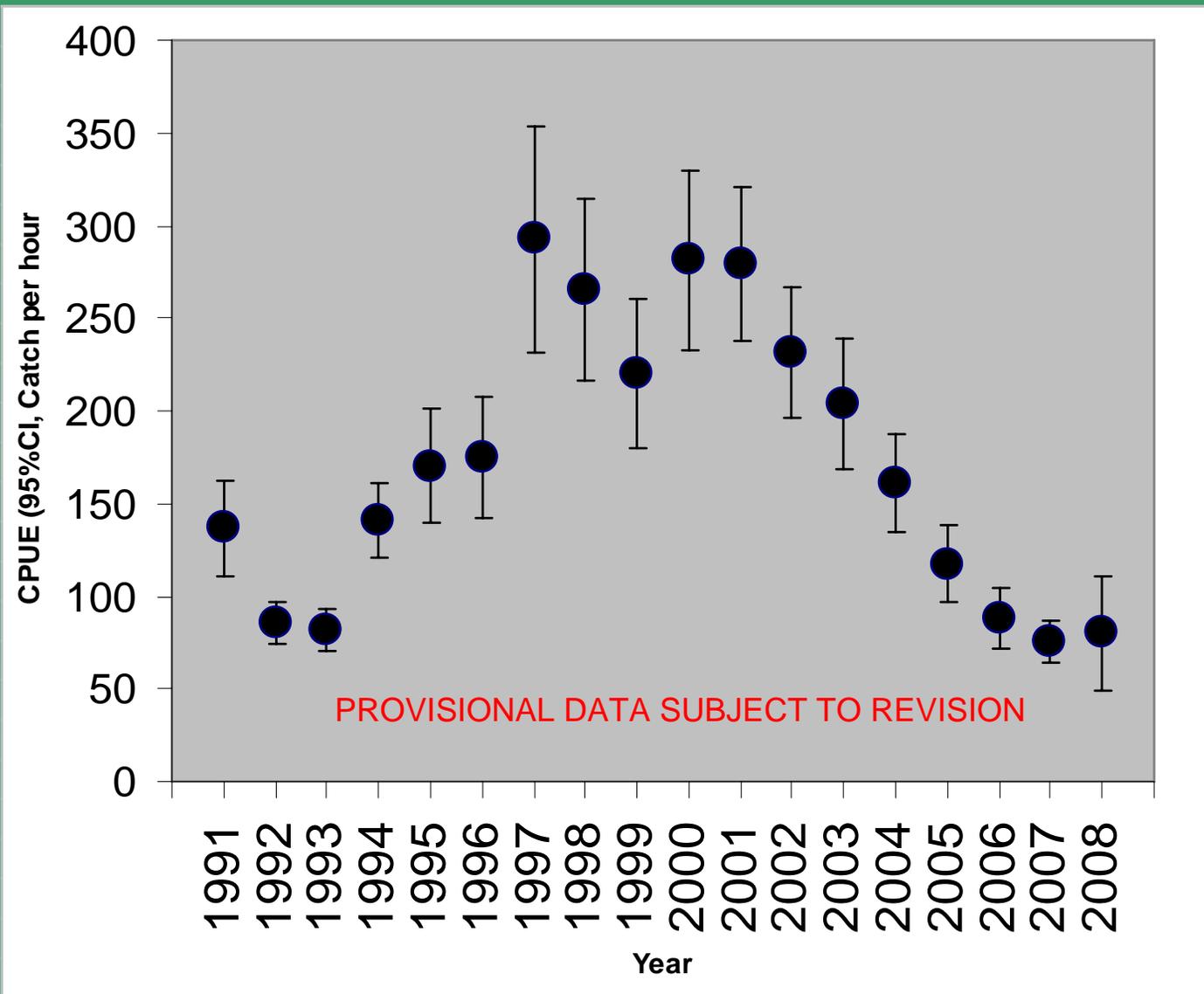
Turbidity reduces the capture probability of trout and the relationship between turbidity and capture probabilities of other fish is unknown in the Grand Canyon.

Turbidity downstream of the Little Colorado River (LCR) was much higher during the pre-HFE and confounds any inferences on catch rates downriver of river mile 62.

Trout densities are highest upriver of the LCR (reaches 1 and 2) where turbidity was similar and low during pre- and post-HFE sampling trips.

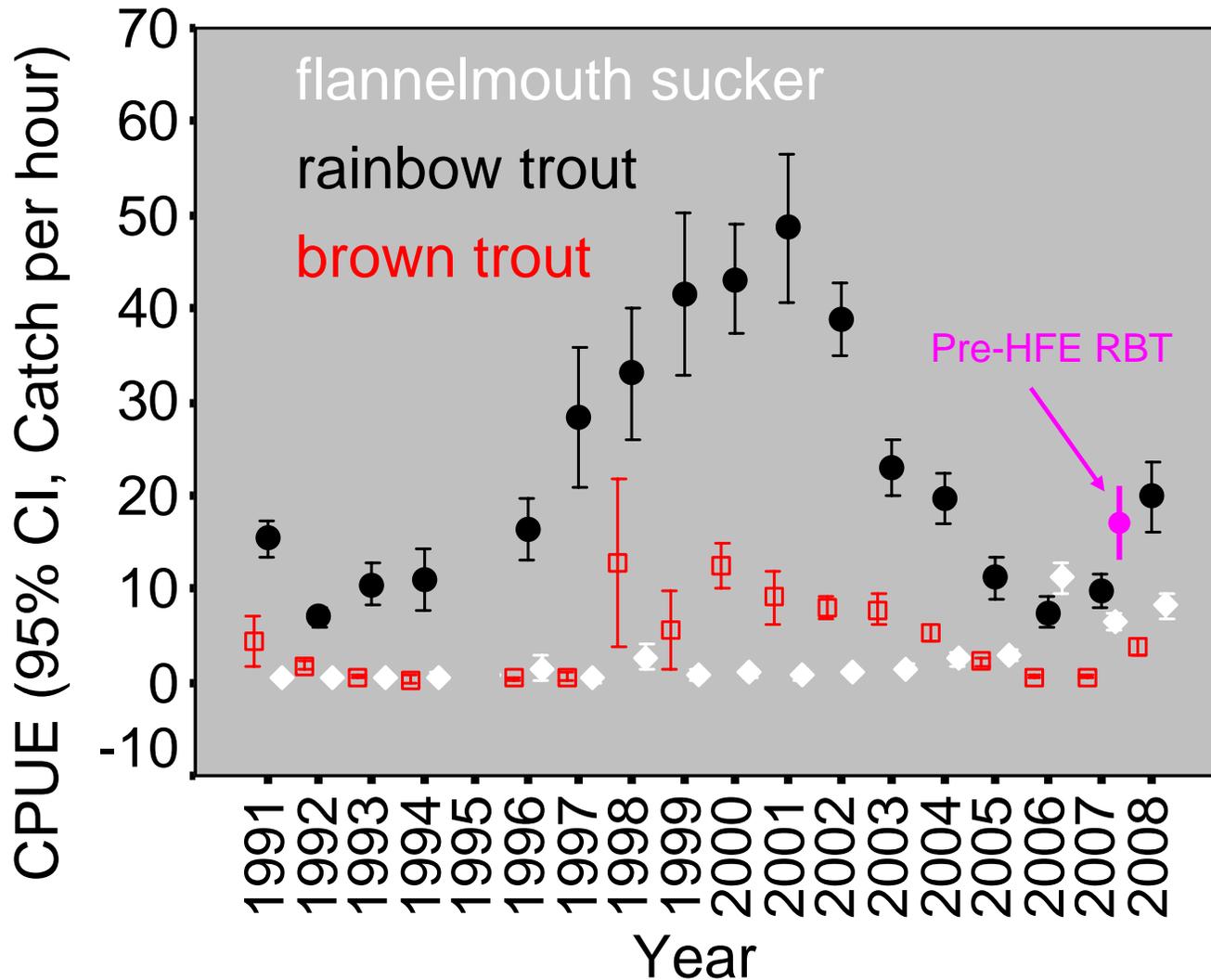


Relative abundance of rainbow trout in the Lees Ferry reach (RM -15 to 0, 1991-2008)





Relative abundance of flannelmouth sucker, rainbow trout and brown trout in the Grand Canyon (RM 0-225, 1991-2008)



PROVISIONAL DATA SUBJECT TO REVISION

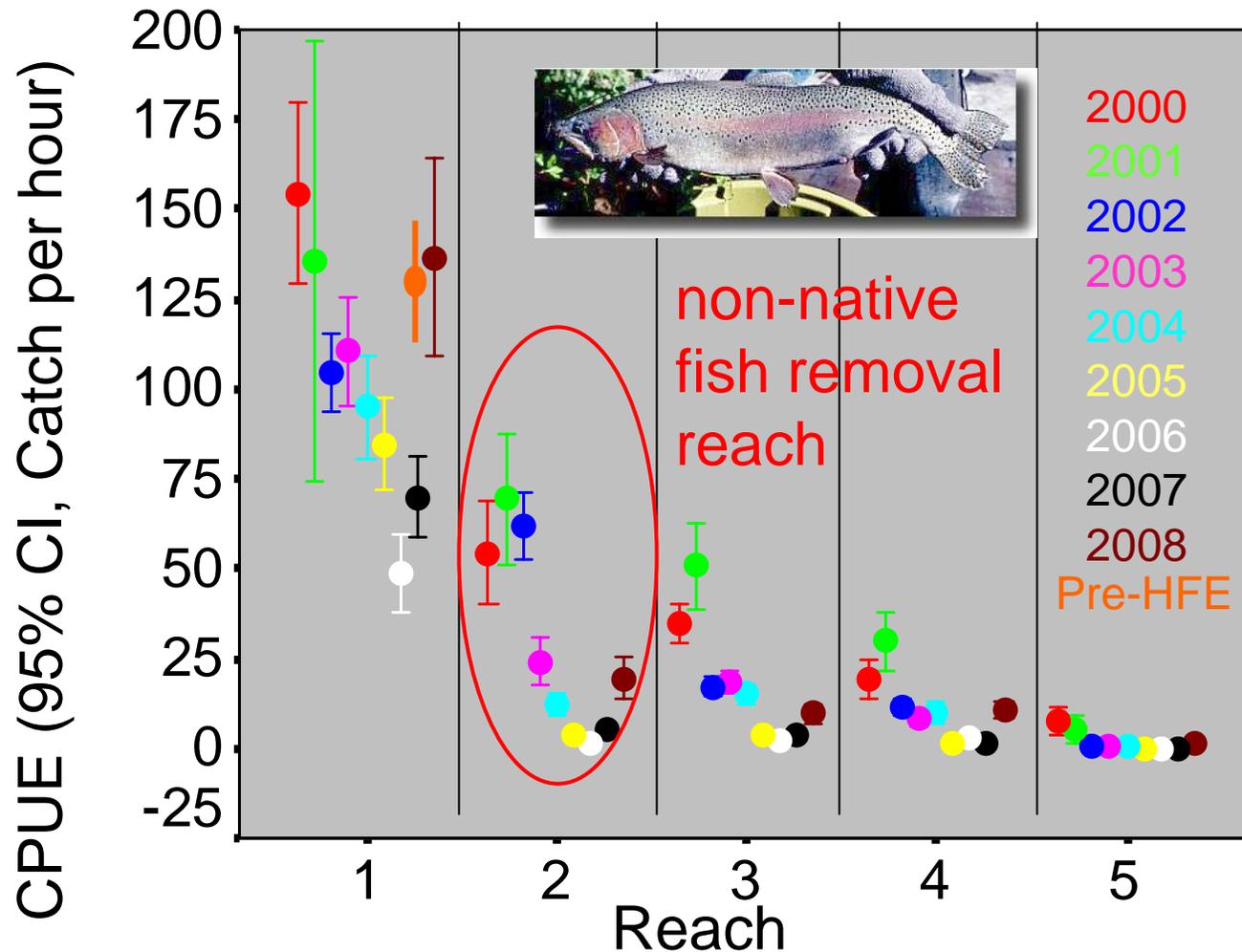


GRAND CANYON SAMPLE REACHES

- **Reach 1 Lees Ferry to Kwagunt (RM 0-56)**
 - Highest densities of rainbow trout in GRCA
 - Low turbidity on pre- and post-HFE
- **Reach 2 Kwagunt to Tanner (RM 56.1 - 69)**
 - Non-native fish removal reach
 - Centered around the confluence of the LCR
 - High turbidity on pre-HFE downriver of the LCR
- **Reach 3 Tanner to Shinumo (RM 69.1 - 109)**
 - Includes Bright Angel Creek and the highest densities of brown trout
- **Reach 4 Shinumo to Lava Falls (RM 109.1 - 179)**
 - Highest densities of flannelmouth sucker
- **Reach 5 Lava Falls to Diamond Ck (RM 179.1 - 226)**
 - High densities of flannelmouth sucker



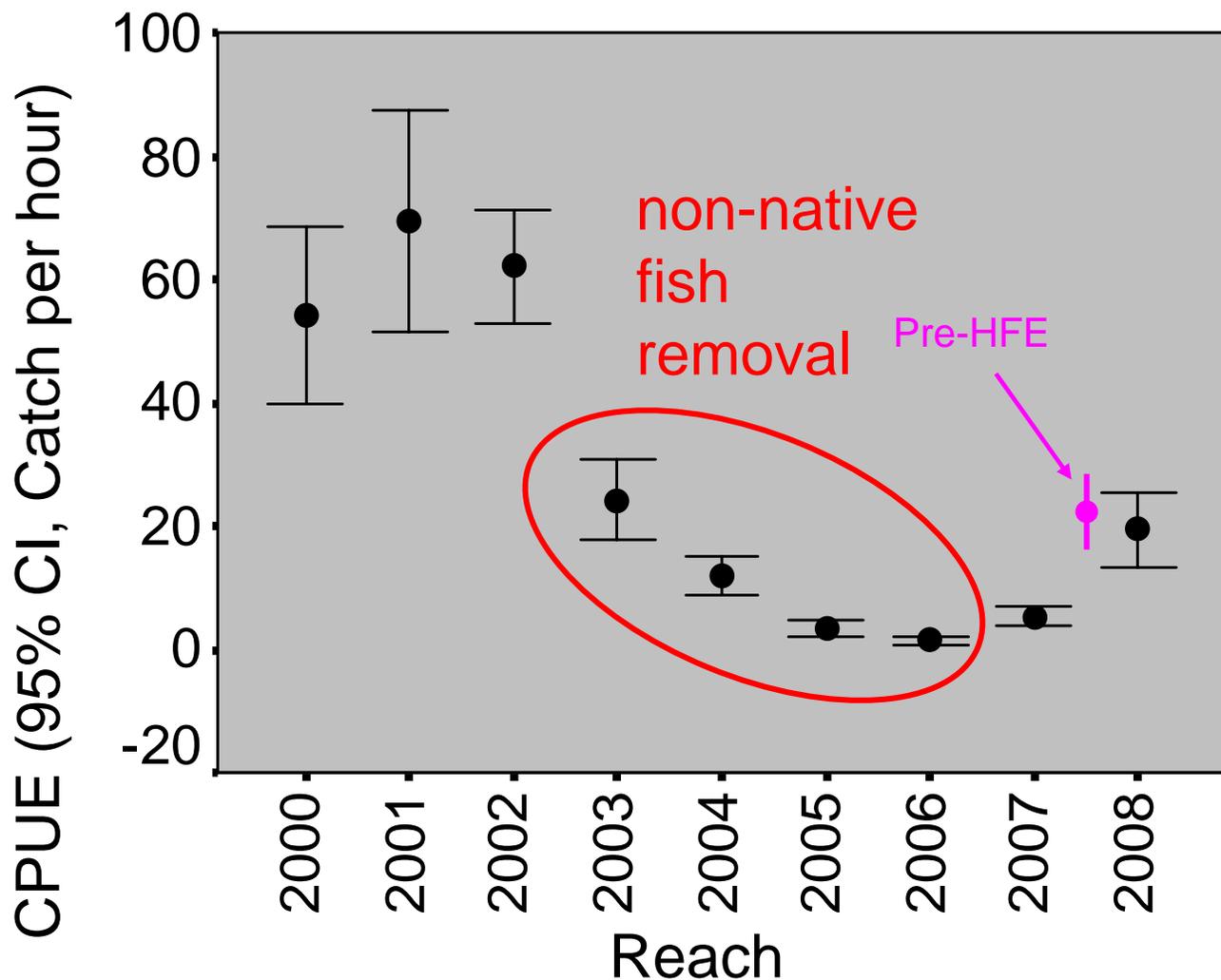
Relative abundance (CPUE) of rainbow trout by Grand Canyon reach and year (2000-2008)



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Relative abundance (CPUE) of rainbow trout in the non-native fish removal reach (reach 2) (RM 56 – 69, 2000-2008)

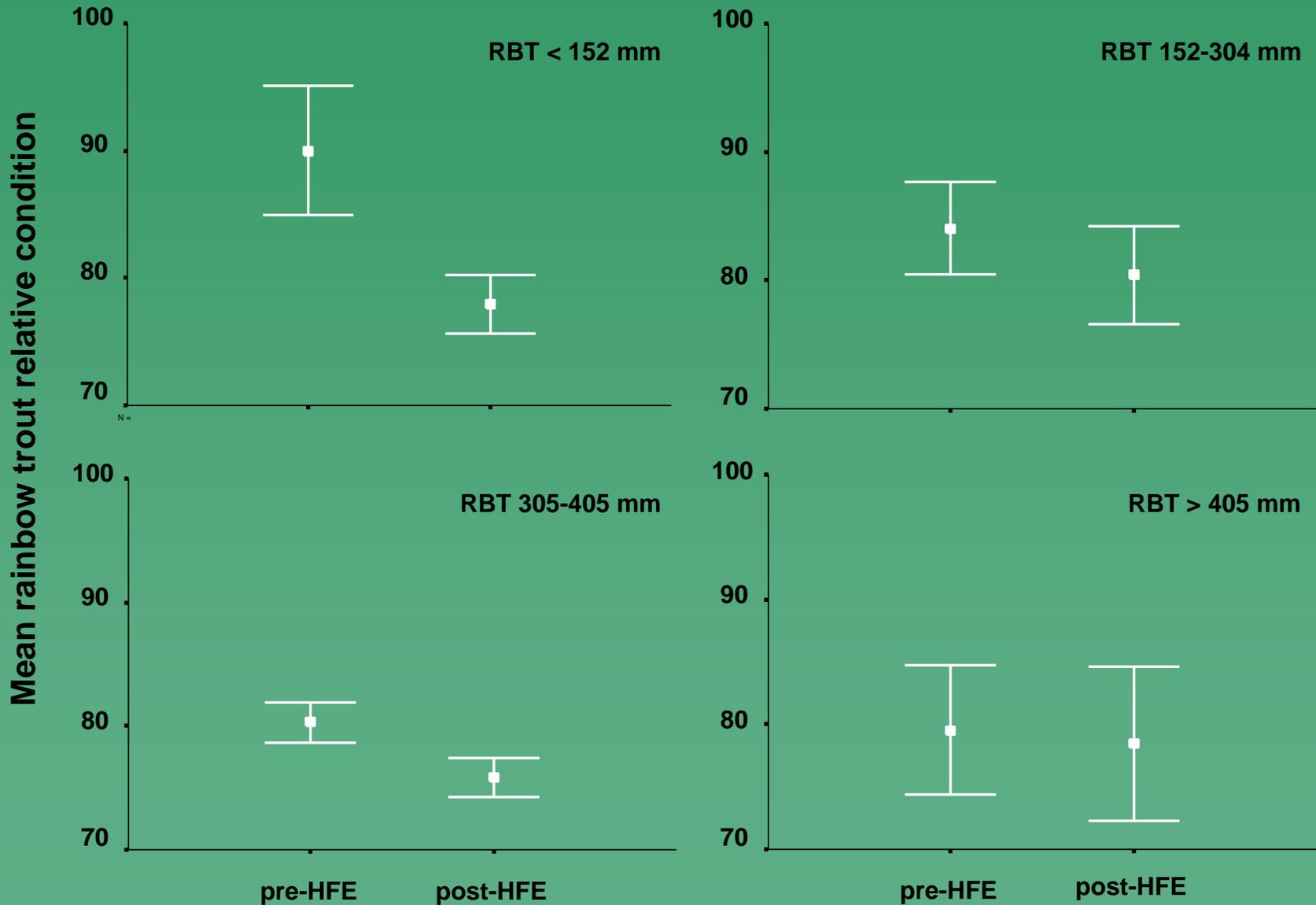


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Lees Ferry rainbow trout relative condition before and after HFE

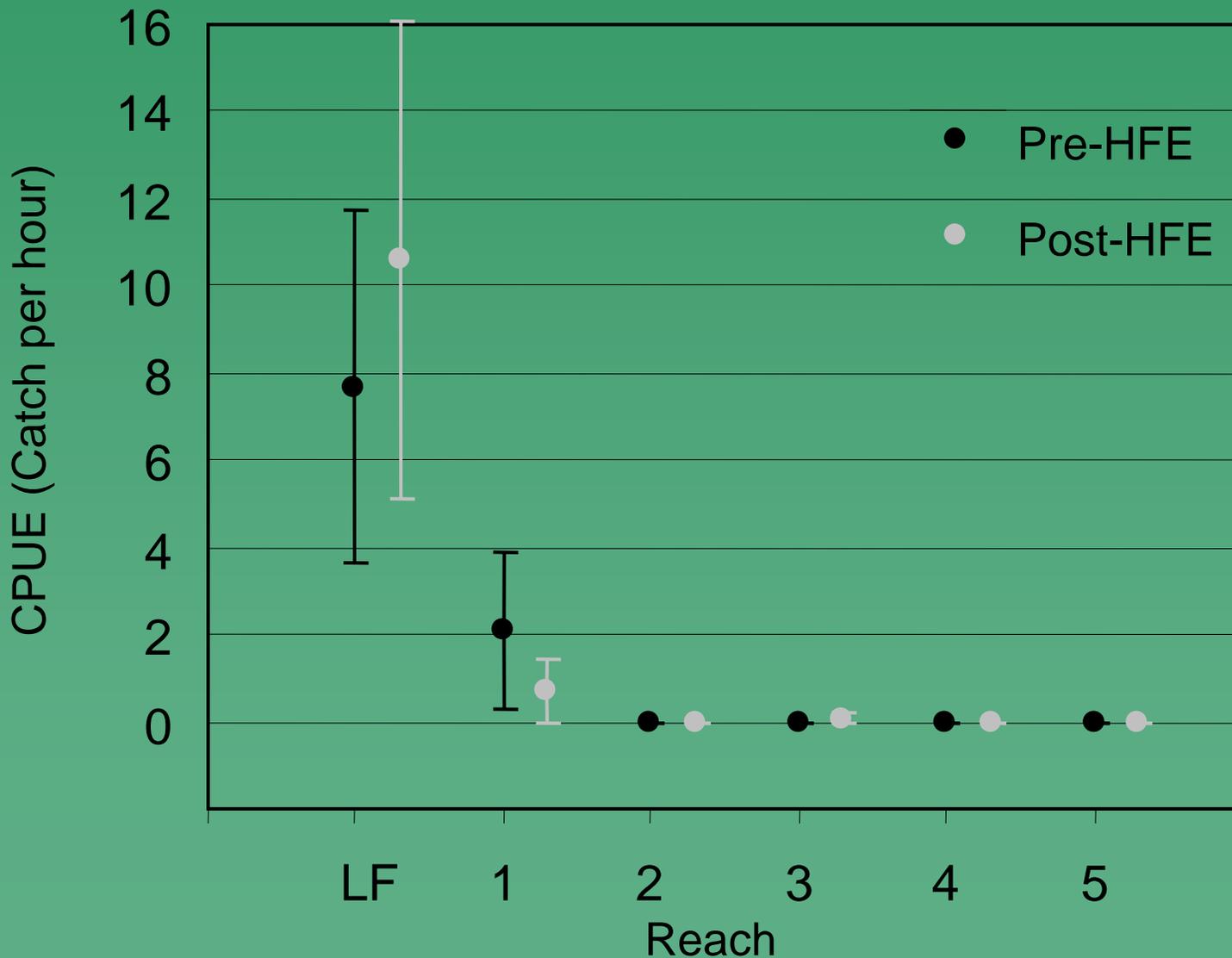
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Mean (95% CI) rainbow trout (<100mm) CPUE before and after the HFE (RM -15 to 226)

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Conclusions

Long-term monitoring

- Catch rates of rainbow and brown trout decreased dramatically between 2000 and 2006.
- We observed significant increases in 2008 for both rainbow and brown trout catch rates.
 - Brown trout catch rates increased predominantly in reach 3.
 - Rainbow trout catch rates increased predominantly in reach 1 and catch rates are similar to 2001.
 - Rainbow trout catch rates also increased in reach 2 (non-native removal reach) and catch rates in 2008 are similar to 2003 and 2004.
 - Catch rates are now at about 30% of those observed in 2002 (prior to non-native removal).
- Flannelmouth sucker catch rates have increased over most recent years.
 - The most dramatic increase occurred in 2006.
 - The highest catch rates are in reaches 4 and 5 (lower river).



Conclusions

HFE (preliminary results)

- Rainbow trout (0-152 mm and 305-405 mm) relative condition was lower in the Lees Ferry reach during the post-HFE than during pre-HFE sampling.
- All inferences on catch rates downriver of the Little Colorado River (reaches 3-5) are confounded by changes in turbidity and likely changes in capture probabilities between the pre- and post-HFE sampling trips.