Nonnative trout removal in a tributary stream: does it benefit native fish in the mainstem Colorado River?

David L Rogowski
Brian Healy
Clay Nelson
Glen Canyon Dam

Lake Mead
Bright Angel Creel at the Confluence with the Colorado River

Photograph by Simius Falsus
Brown Trout distribution and TL

River mile

Total length
Bright Angel Creek

- Perennial stream
- Main spawning site for Brown Trout in the Grand Canyon

Brian Healy with Brown trout from Bright Angel Creek
NPS Trout Reduction Project

http://www.nps.gov/grca/learn/nature/trout-reduction.htm

Fish weir

PHOTOS BY: Michael Schennum/The Arizona Republic

G. Andrejko
AGFD monitoring

• Goal – representative sample of the fish community in the Colorado River from Lees Ferry to Lake Mead

• Methods
  – Random stratified sampling (Lees Ferry to Pearce Ferry)
  – 2 trips: spring/summer
  – Boat Electrofishing – near shore

Photo by George Andrejko, AGFD

Photo by G. Andrejko
Nonnative trout removal, does it benefit native fish?

- can we detect a:
  - change in fish community composition
  - change in CPUE
  - Change in length frequency of species
BNT removed
(from creek and inflow area)
Fish community at RM 80-90
Bright Angle Creek inflow reach

Fraction

Year
native nonnative
BNT percent of fish community

- \( \%BNT = \text{BNT.removed} + \text{BNT.CPUE.previous.yr} \) (Adj. \( R^2 = 0.37 \))

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BNT removal and CPUE in mainstem

BNT-CPUE (fish/hour)

BNT-removed

BNT removed (log_{10}(x+1))

Year

BNT-CPUE

BNT-removed

1999 2004 2009 2014

0 5 10 15 20 25 30 35 40 45

4.5

4.0

3.5

3.0

2.5

2.0

1.5

1.0
Predicting BNT CPUE

BNT CPUE (Fish/hour)

Year

1999 2001 2003 2005 2007 2009 2011 2013 2015
Predicting BNT - CPUE

- BNT.CPUE = -2.26 + 14.95(RBT.CPUE) + 0.0.495 (BNT.CPUE-1yr)-2.57(BNT.removed)
- $R^2 = 0.68$, Adj. $R^2 = 0.595$, n=15

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BNT length frequency graphs
RBT CPUE and RBT removed

Year

RBT-removed

RBT.CPUE (fish/hour)
Predicting RBT CPUE

RBT CPUE (Fish/hour)

Year

RBT.cpue
predicted.RBT.CPUE
Predicting RBT CPUE

- $RBT.CPUE = 0.642 + 0.0179(BNT.CPUE) + 0.0759(RBT.removed)$
- $R^2 = 0.503$, Adjusted $R^2 = 0.427$

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Conclusions

• We can model trout metrics and removal is an important component of those models
  • Fish community changed: nonnatives to native
  • Reduction in BNT CPUE
  • Length distribution of BNT has increased
  • Reduction in RBT CPUE

• Future
  – Refine model (incorporate fish size, …)
  – Include additional years
Acknowledgements

Humphrey Summit & Saint Judes Ltd.
- boatmen
All of the volunteers,
Past & present agency personnel