



Objectives

- Obtain relative abundances (CPUEs) of humpback chub (HBC) at aggregation sites and compare to former years.
- Provide HBC length frequencies and other information.
- Investigate utility of PIT antennas, seining, and e-fishing.

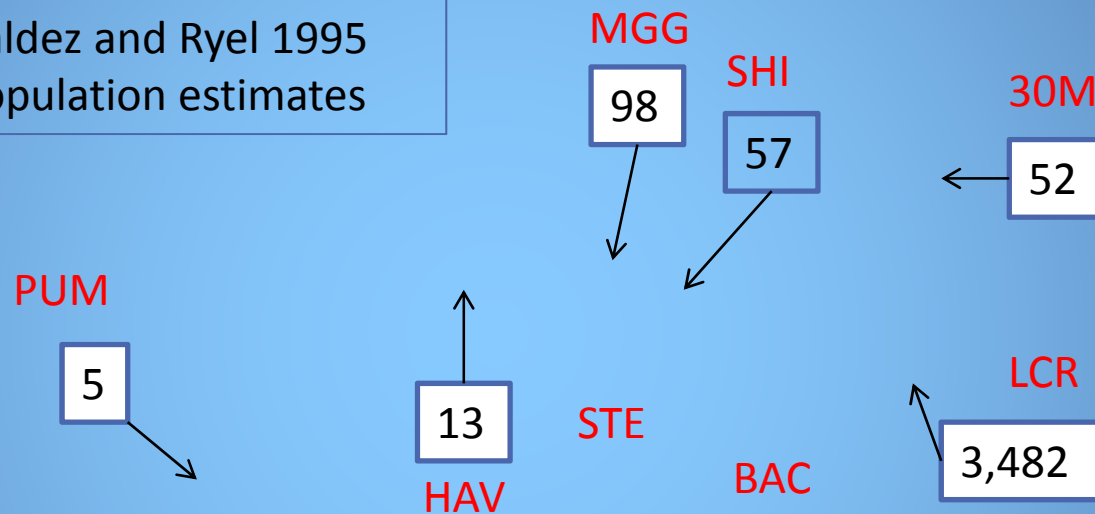
In addition:

- Only study that focusses on HBC throughout the mainstem.
- Helps to monitor other recovery actions (translocation).
- Information for recovery purposes.

Aggregation

“a consistent and disjunct group of fish with no significant exchange of individuals with other aggregations, as indicated by recapture of PIT-tagged juveniles and adults and movement of radio-tagged adults” (Valdez and Ryel 1995).

Valdez and Ryel 1995
Population estimates



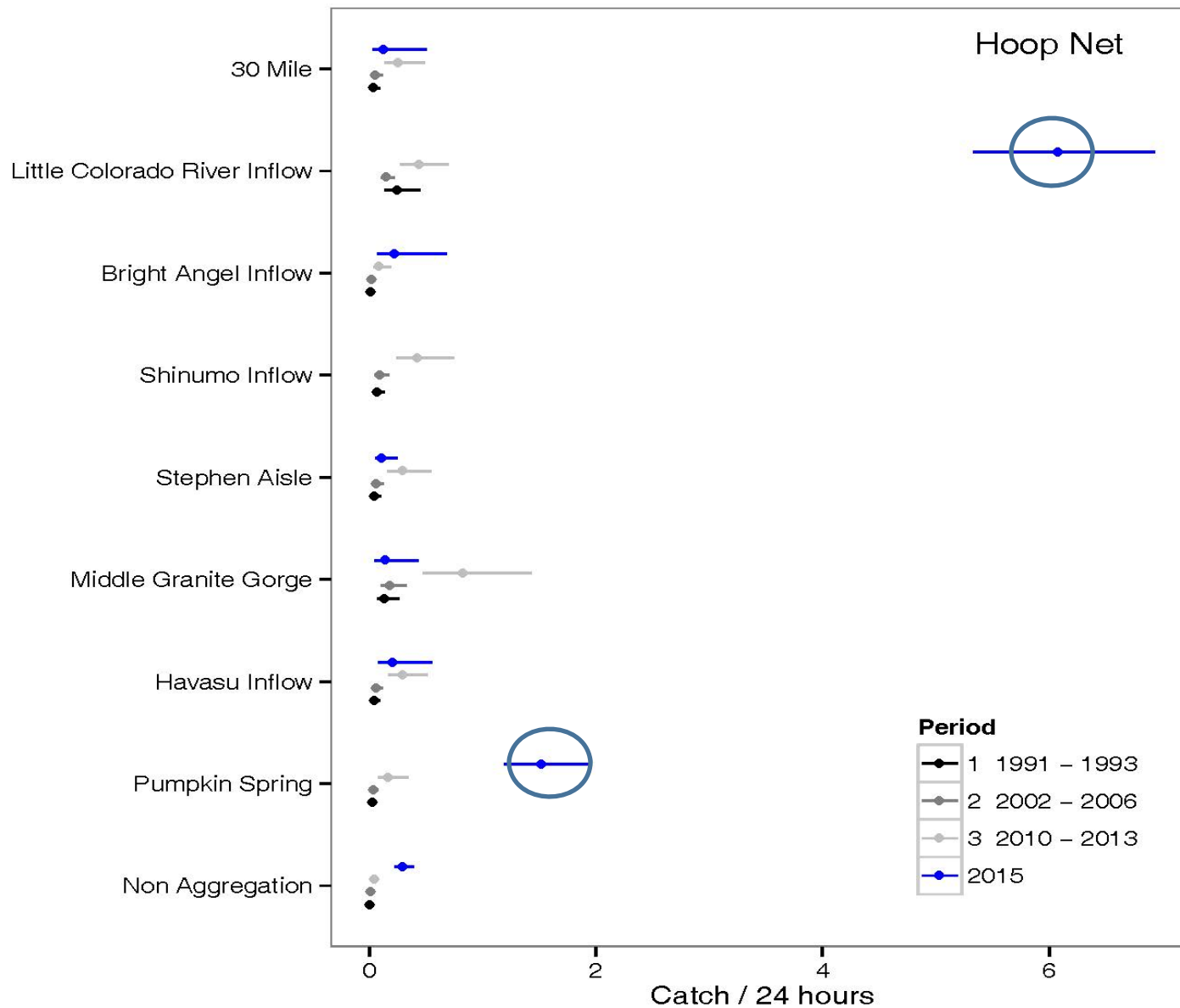
Map courtesy of Tom Gushue, GCMRC

Methods

- Period 1 (1991-1993) - Mostly trammel netting (Bio-West, Valdez and Ryel 1995).
- Period 2 (2002-2006) - Trammel netting AND baited hoop netting (SWCA, Ackerman 2008).
- Period 3 – (2010-2014) Trammel netting and baited hoop netting (USGS and USFWS, Persons et al. *in review*).
- 2015 – Continued baited hoop netting, minimized trammel netting, added investigation of seining, remote antennas, and e-fishing.

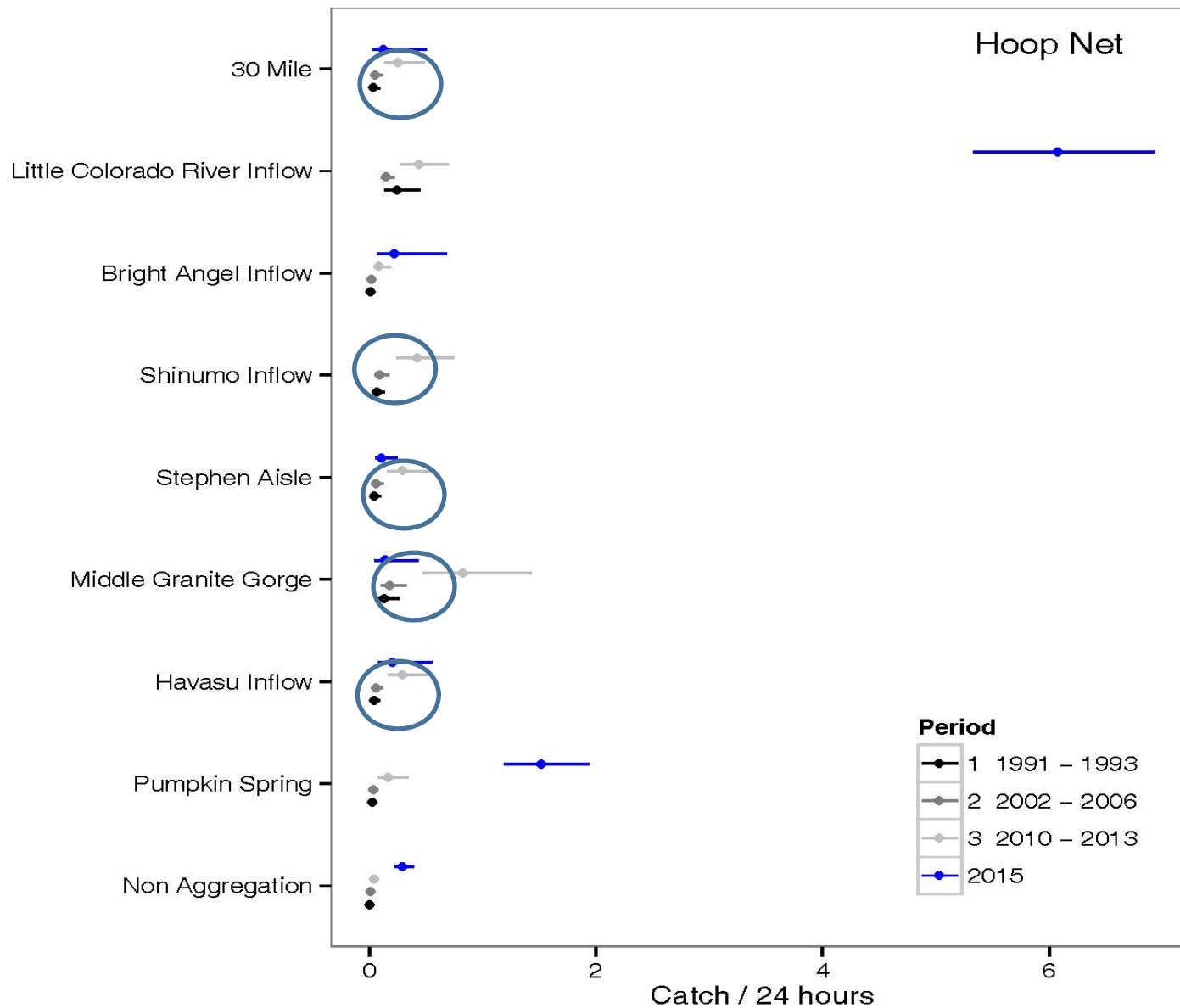
Hoopnet CPUE by 3 Periods and 2015

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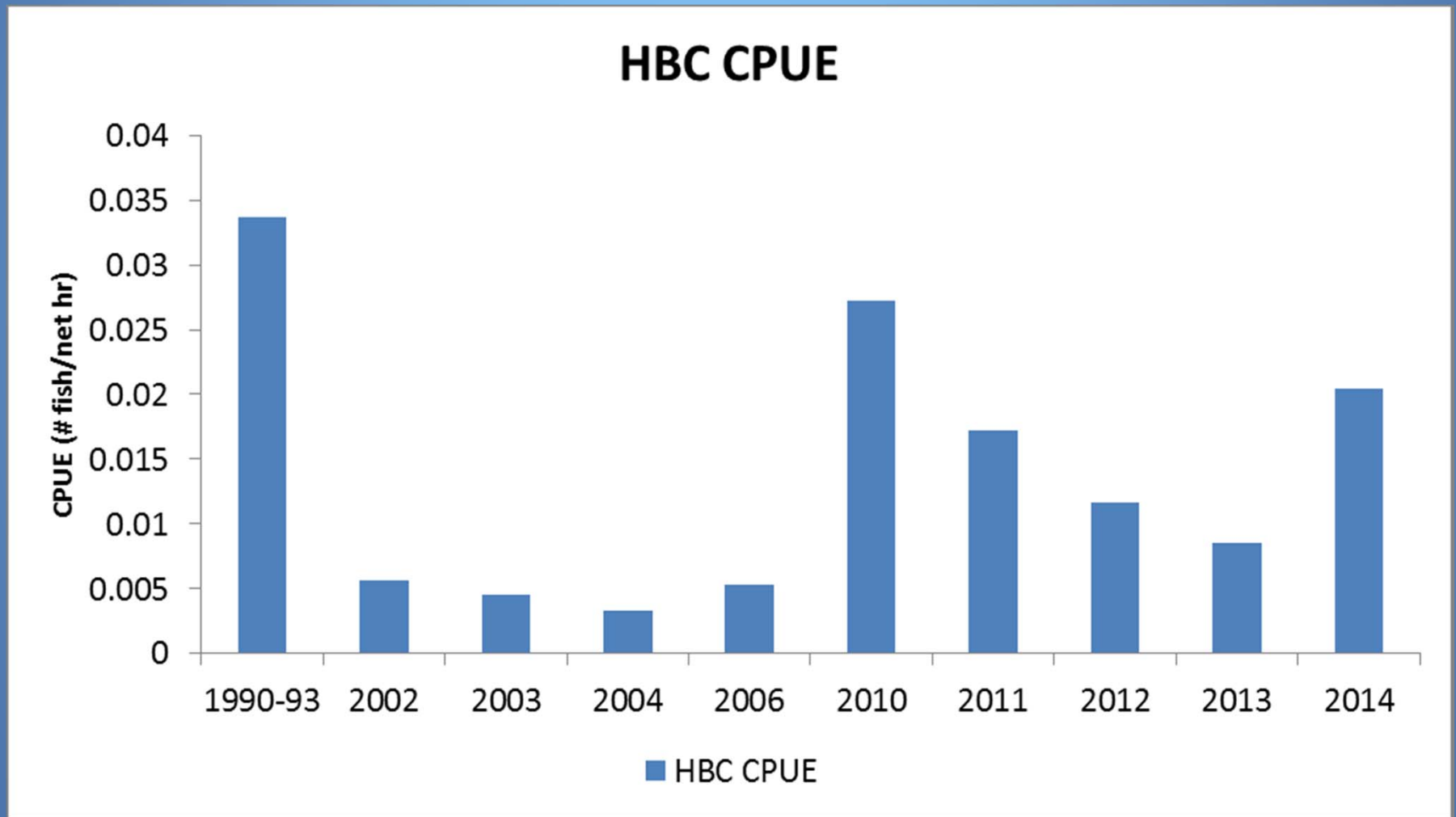


Hoopnet CPUE by 3 Periods and 2015

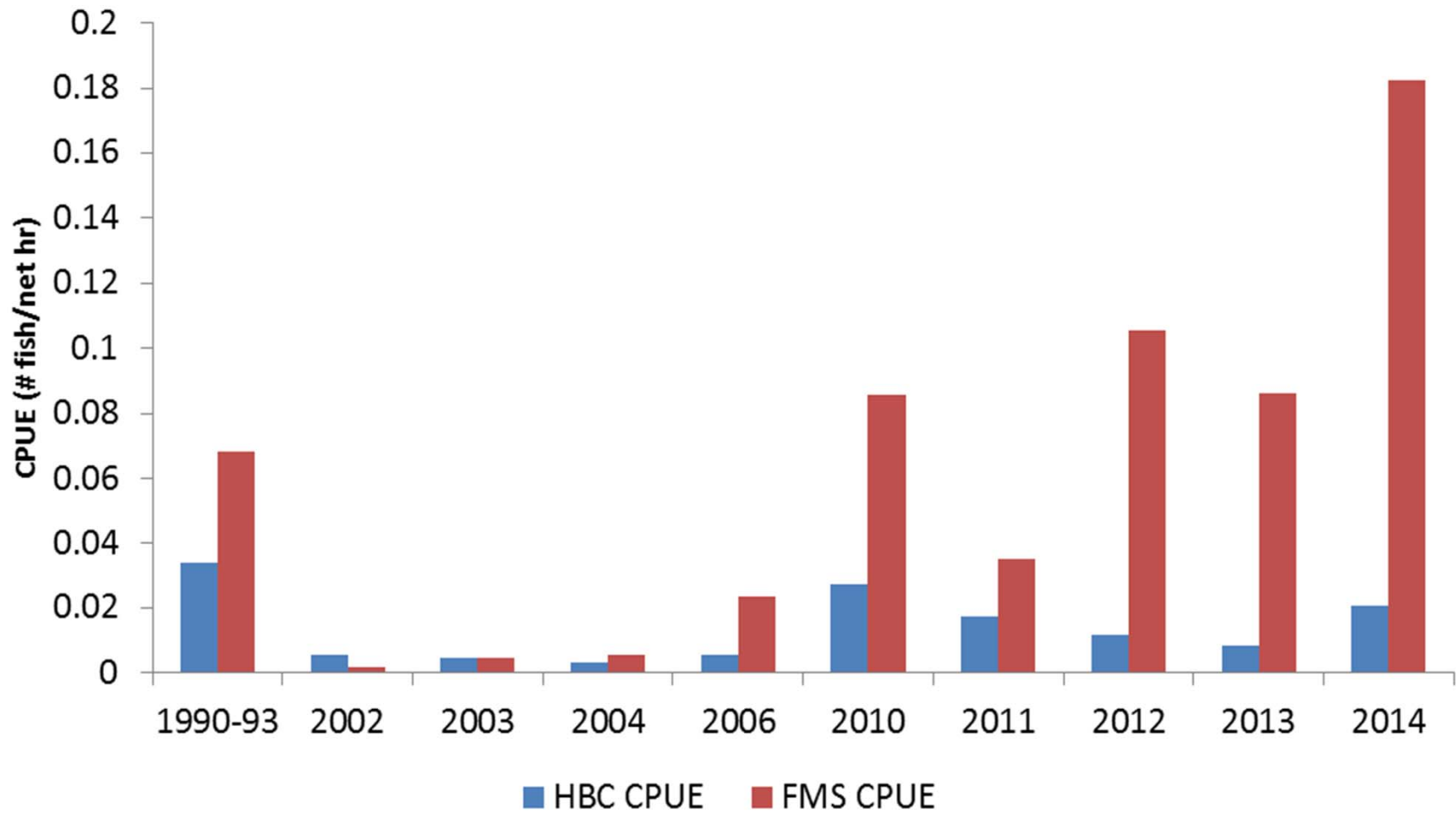
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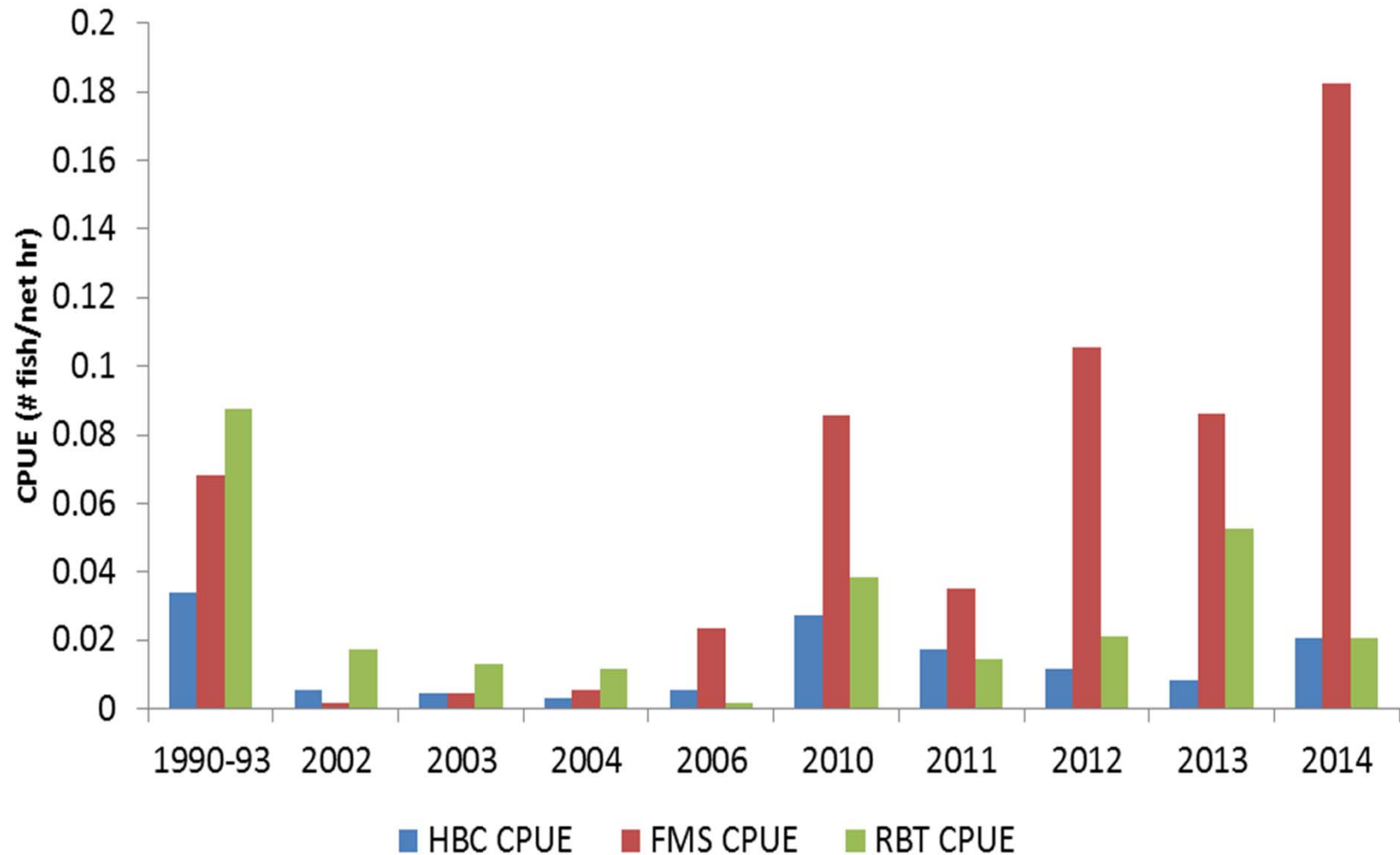
HBC Aggregation Hoop & Trammel CPUE combined by year (excluding LCR aggregation)



HBC & FMS Aggregation CPUE combined by year Hoop & Trammel (excluding LCR aggregation)



HBC, FMS & RBT Aggregation CPUE combined by year Hoop & Trammel (excluding LCR aggregation)



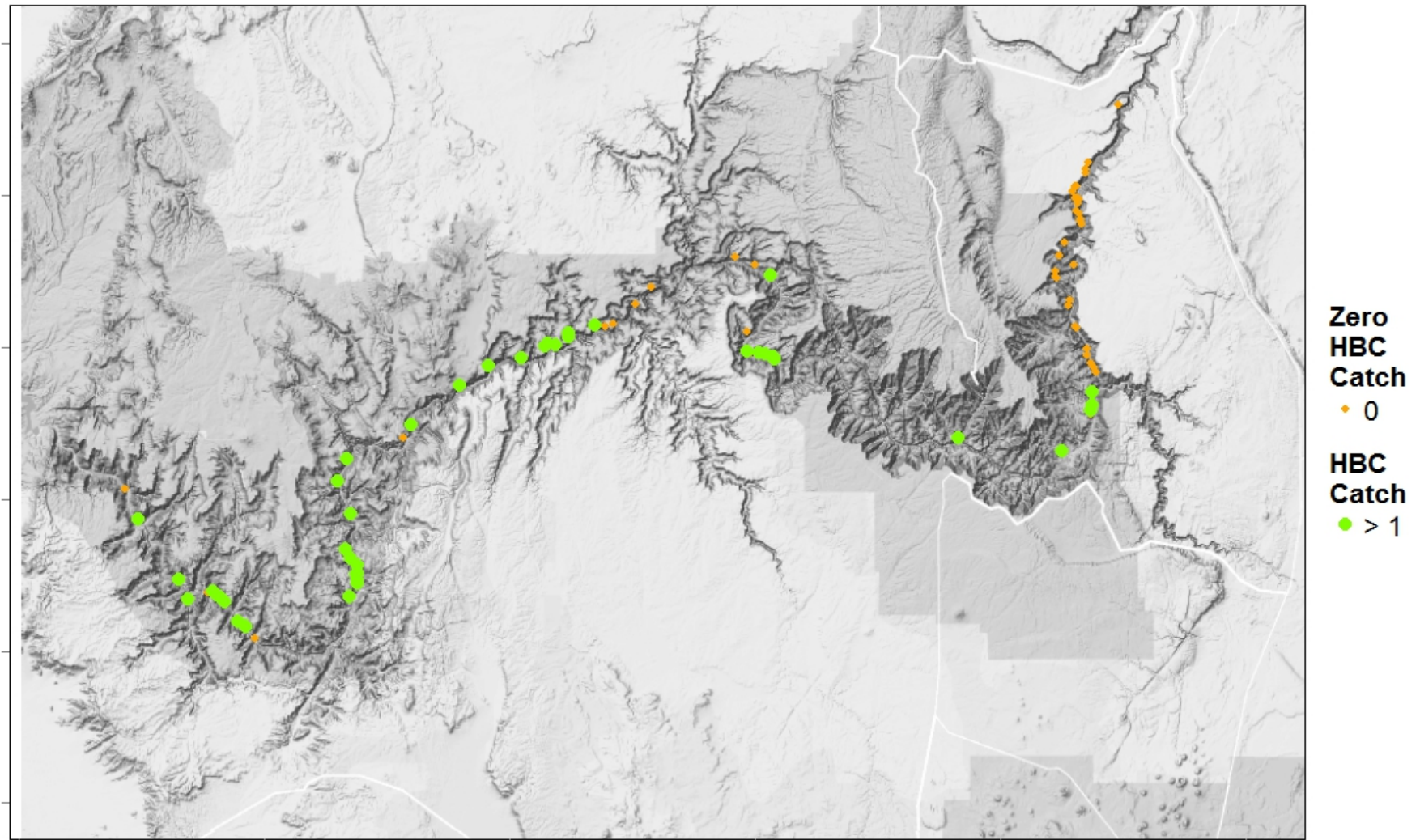
Observations from CPUE

- Hoopnet CPUEs for HBC generally increased in the aggregations post- 2009 timeframe.
- The significant increase of 2015 CPUE for LCR aggregation suggests unusually strong export from LCR (i.e., may be related to 2015 low LCR abundance).
- Significant increase in 2015 CPUE at Pumpkin.

Seining



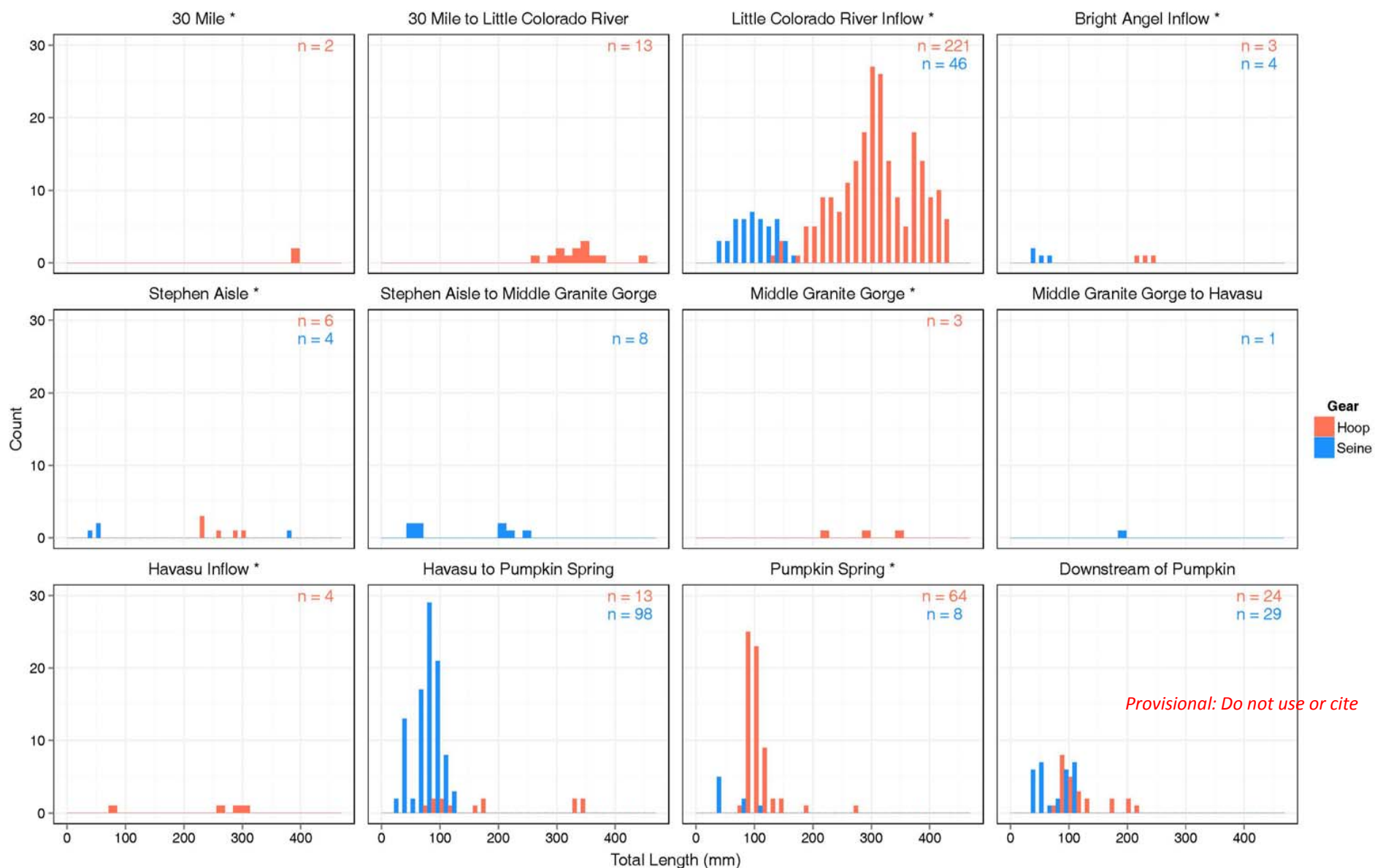
Spatial Look at Seining Results



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2015 length frequencies of HBC by size (TL)

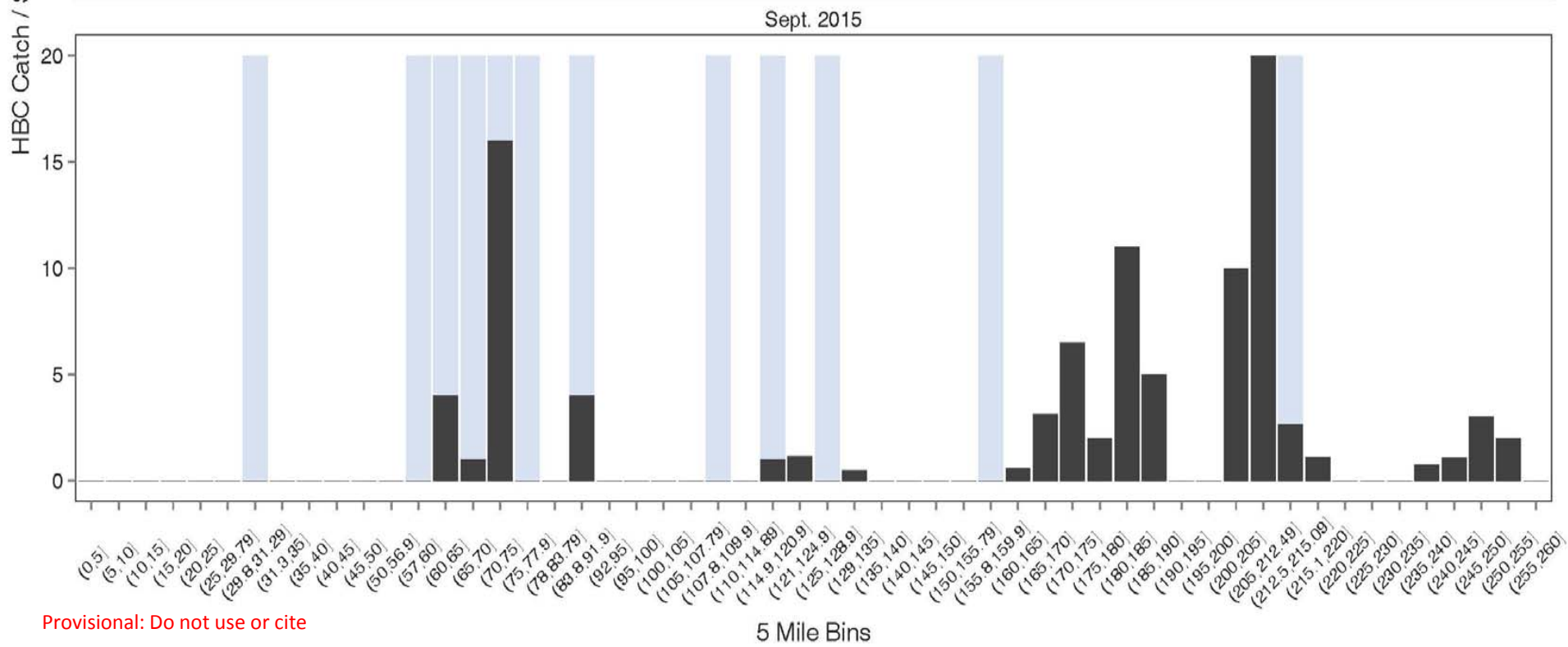
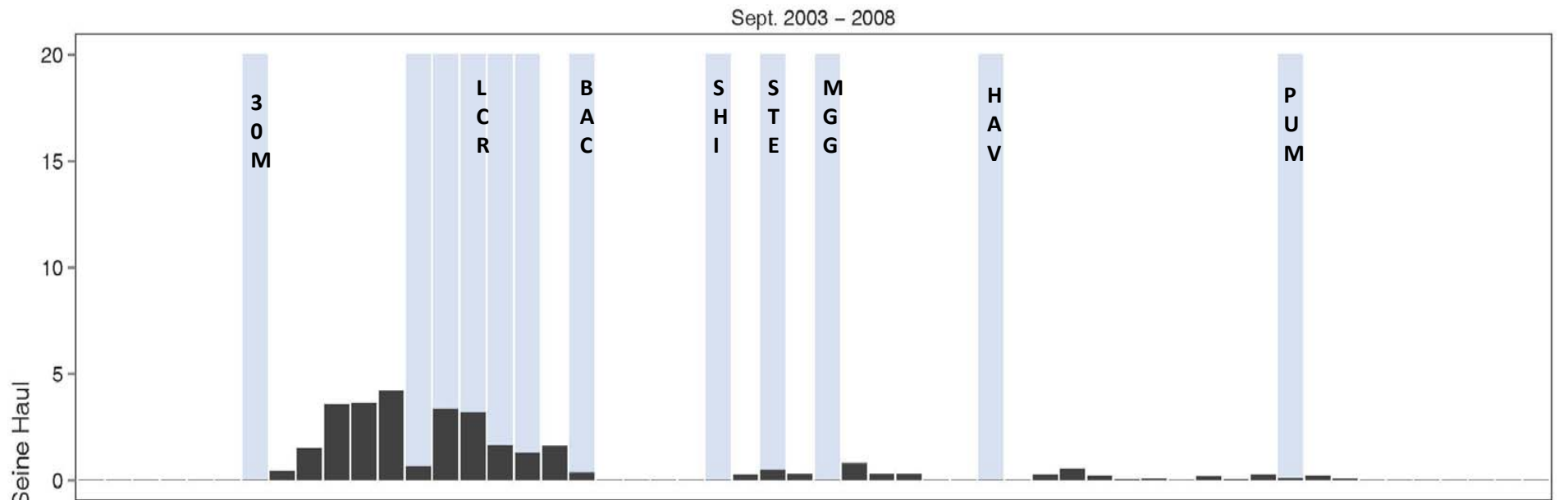
Hoop netting (red) and seining (blue)



Large adult HBC from 34 mile (Little Redwall dripping springs area)



Photo by D. Van Haverbeke



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5 Mile Bins

Observations from 2015

Hoop Net & Seining

- Large group of adult HBC ≥ 200 mm near 34 mile (N = 300, CI = 109-491, estimated from 2014 closed mark-recapture).
- Many HBC in the LCR aggregation – possible export from LCR.
- Very few age-0/juvenile HBC seen until below Havasu (~80 miles downriver) suggesting: 1) not via LCR export, and 2) spawning in or below Havasu.
- Age-0/juvenile HBC also seen again well below Diamond Creek – suggesting local mainstem spawning in western Grand Canyon.

Submersible antennas



ANTENNA

- Marsh & Associates Antenna
- 1.0m x0.6 m rectangular antennas (multi - sizes available)
- 7.4 v Li-ion Removable Battery
 - 38-60 cm detection
 - 10+ days battery life (~12 hr scan)
- $\leq$ ~10 m depth
- \$2,400 each



September 2015 Antennas (7)

Combined with hoop net data, Recaptures:

Captures & Detections of Unique Recaps Only (PITTAG_RECAP = Y)							
Species	Antenna Only		Hoopnet Only		Both		Total
	n	% of total	n	% of total	n	% of total	
BNT	2	100.0	0	0.00	0	0.0	2
CRP	2	66.7	1	33.3	0	0.0	3
FMS	219	42.5	255	49.5	41	8.0	515
FRH	0	0.0	1	100.0	0	0.0	1
HBC	274	57.9	173	36.6	26	5.5	473
RBT	9	100.0	0	0.0	0	0.0	9
UNK	42	100.0	0	0.0	0	0.0	42
Total	548	52.4	430	41.1	67	6.4	1045

2015 Agg Trip Catches by Gear

Species	Gear				Totals
	Hoop	Seine	E-fishing	Antenna	
Bluehead Sucker	5	74	5	0	84
Brown Trout	1	1	0	2	4
Channel Catfish	0	1	0	0	1
Common Carp	7	4	0	1	12
Fathead Minnow	2	183	4	0	189
Flannelmouth Sucker	1991	1642	97	259	3989
Humpback Chub	<u>353</u>	<u>210</u>	<u>3</u>	<u>299</u>	<u>865</u>
Plains Killifish	0	6	0	0	6
Rainbow Trout	23	22	1	5	51
Red Shiner	0	33	0	0	33
Speckled Dace	257	1304	148	0	1709
Unidentified Sucker	0	23	0	0	23
Unknown species	0	0	0	49	49
Totals	2639	3503	258	615	7015

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Future directions

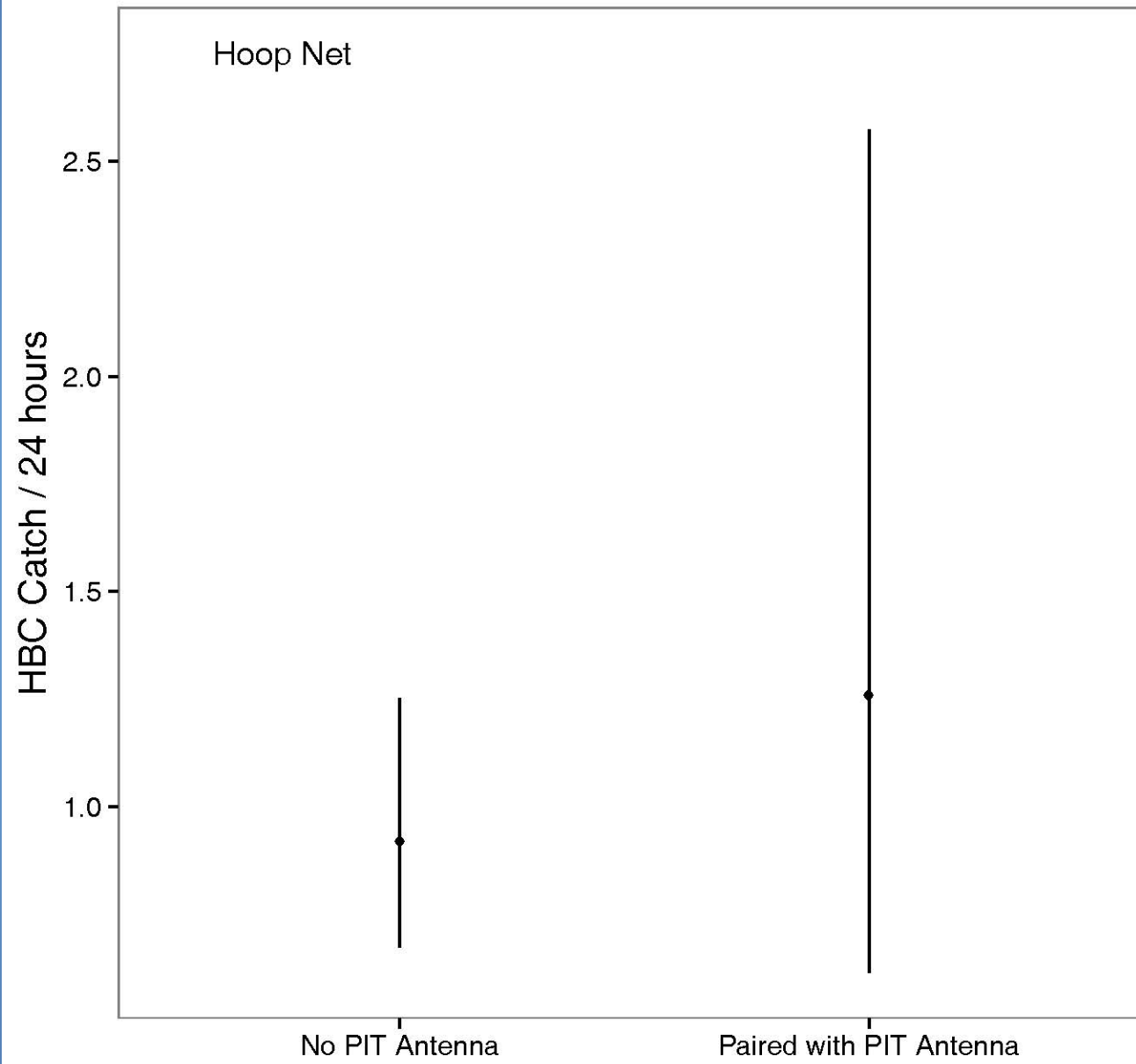
- Continue hoop netting, seining, and remote antennas. Minimize or eliminate trammel nets.
- Eliminate e-fishing. Very few chub captured (only 3), logistically complex, safety factor.
- If abundance estimates are desired, an absolute minimum of 2-trips/year would be needed for open robust model (more likely 3 trips or more, as in Westwater/Black Canyon).
- Interest in release and tracking of sonic tagged adult HBC in western Grand Canyon (spawning sites, movements?).

Thank You



Photo by D. Van Haverbeke

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September 2015 Antennas (7)

Combined with hoop net data total capture (ant. detections, hoop detections and new PIT tags):

Species	Hoop Net Only		Antenna Only		Both		Total (n)
	Captures	% of Total	Contacts	% of Total	Cap/Contact	% of Total	
BHS	5	100%	0	0%	0	0%	5
BNT	1	33%	2	67%	0	0%	3
CRP	5	83%	1	17%	0	0%	6
FMS	1799	90%	209	10%	50	2%	2008
FRH	5	100%	0	0%	0	0%	5
HBC	323	54%	273	46%	26	4%	596
RBT	0	0%	5	100%	0	0%	5
UNK	0	0%	49	100%	0	0%	49
TOTAL	2138	80%	539	20%	76	3%	2677