

Humpback Chub Aggregations Update (6.1)



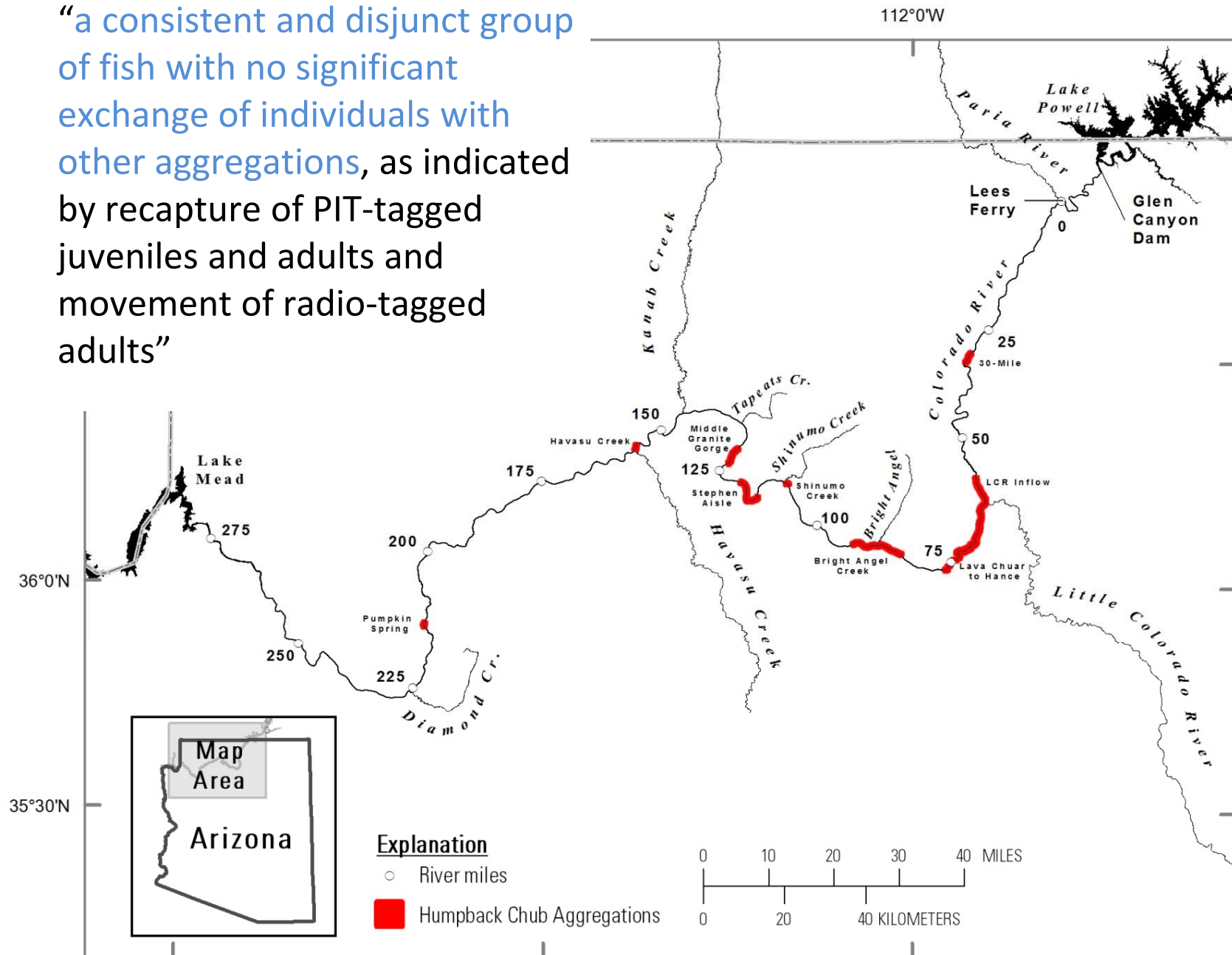
Kirk Young, Mike Dodrill, Randy VanHaverbeke & Mike Pillow
TWG Annual Reporting January 25, 2017

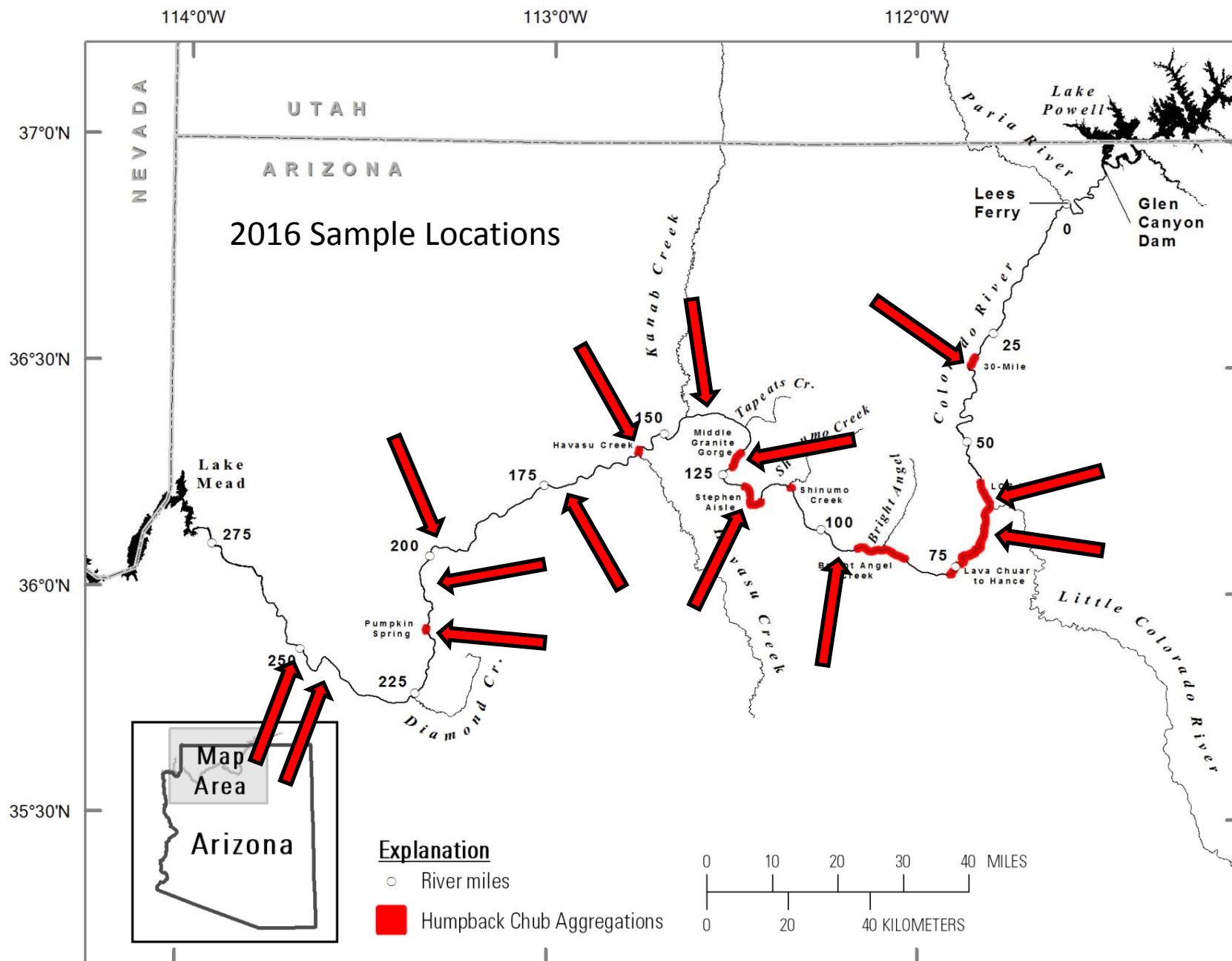


Today

- Quick Summary 2016 HBC Agg Survey Results
- Closer Look at West GC HBC Expansion
- Explore Immigration & Temperature Role

“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”

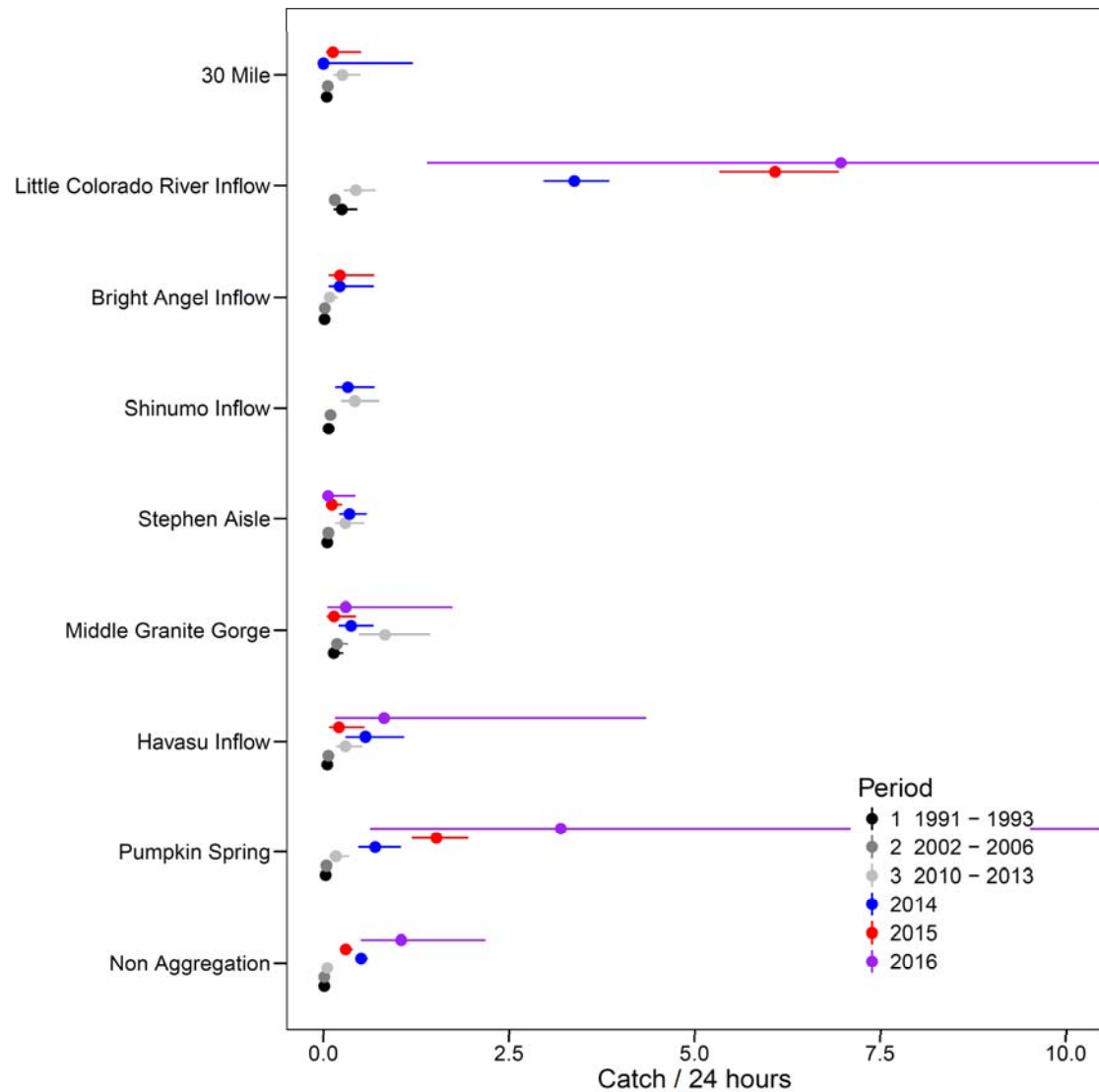




CPUE

High Catch Rate at:

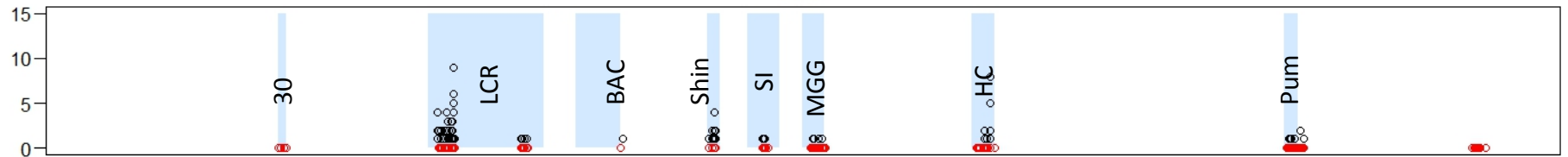
- LCR
- Pumpkin Spring
- Non Aggregation



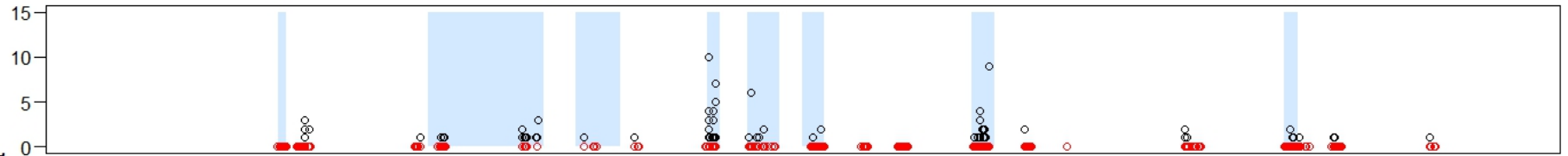
Preliminary data; do not cite

Humpback Chub

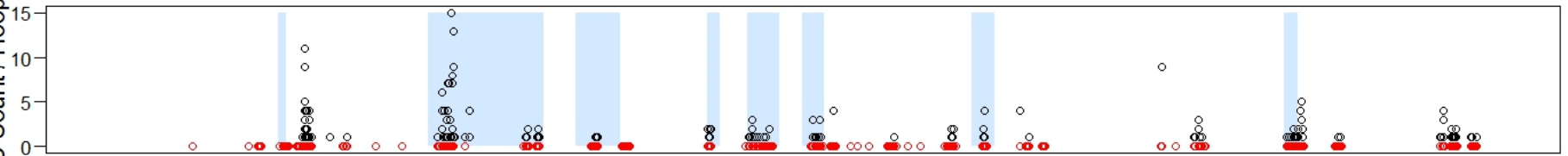
2012



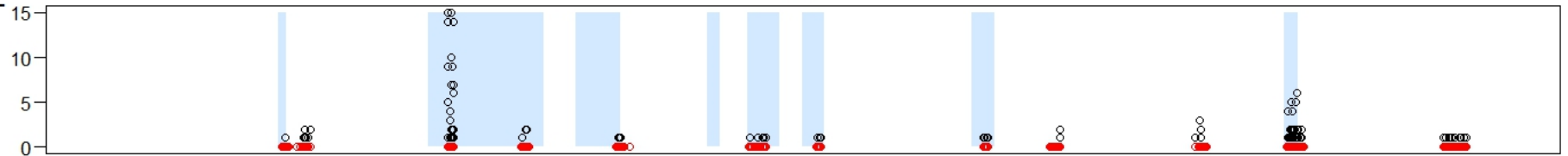
2013



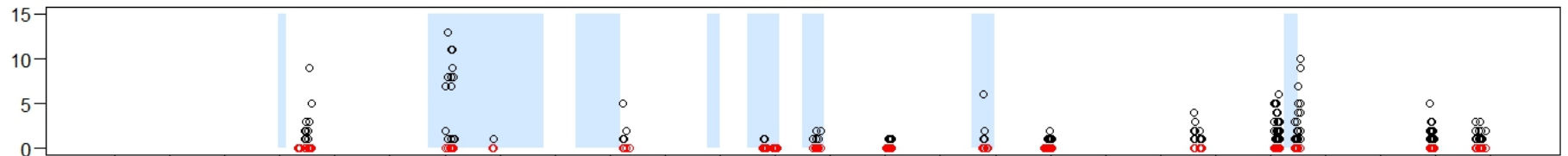
2014



2015



2016



HBC Count / Hoopnet

River Mile

HBC Capture TL/Freq since 2010

- 7 sites, Havasu and Below

LCR HBC Size @ Age (Aug/Sept)

YOY – 40-60

Age I – 113-122

Age II – 160-175

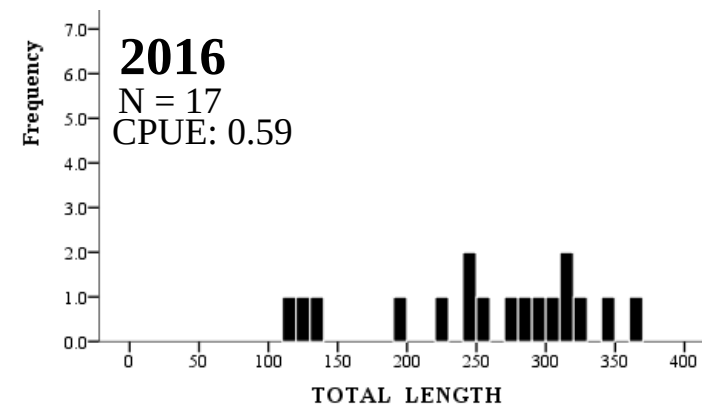
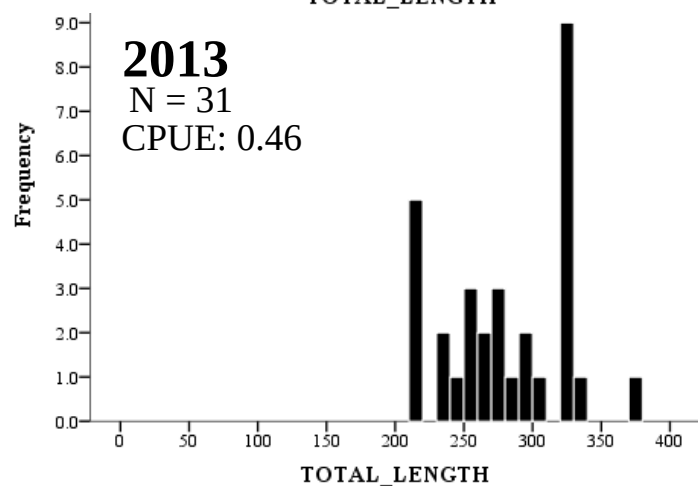
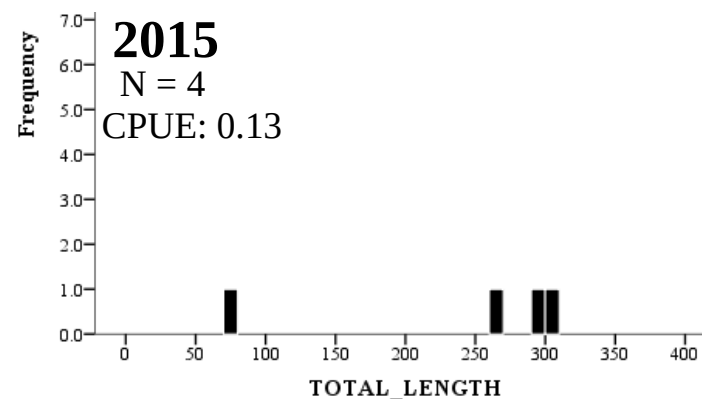
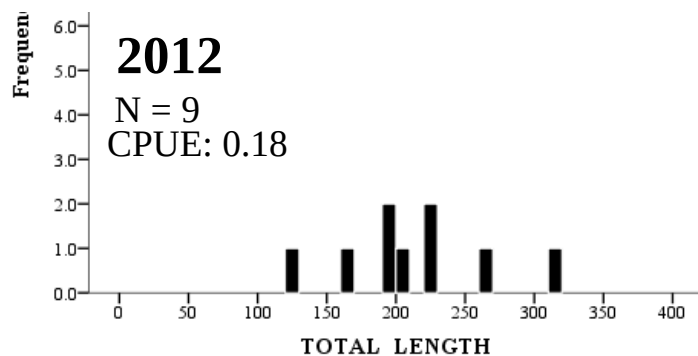
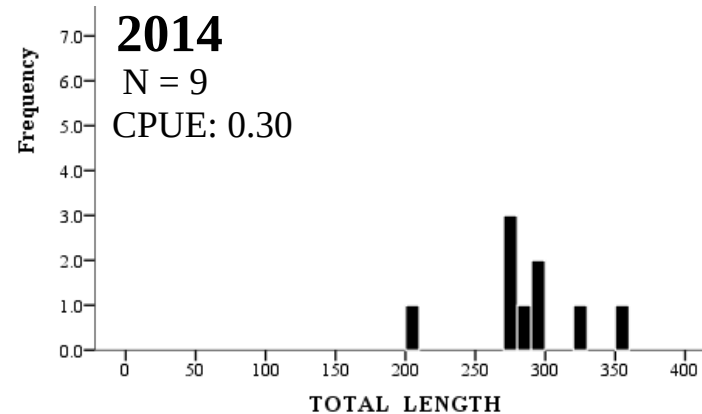
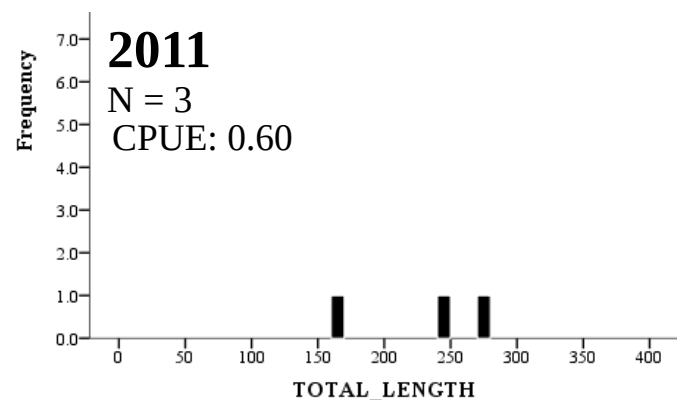
(Robinson & Childs 2001)

***2010: 36 net sets, 0 HBC**

Havasu Creek

RM 157-160

Humpback Chub

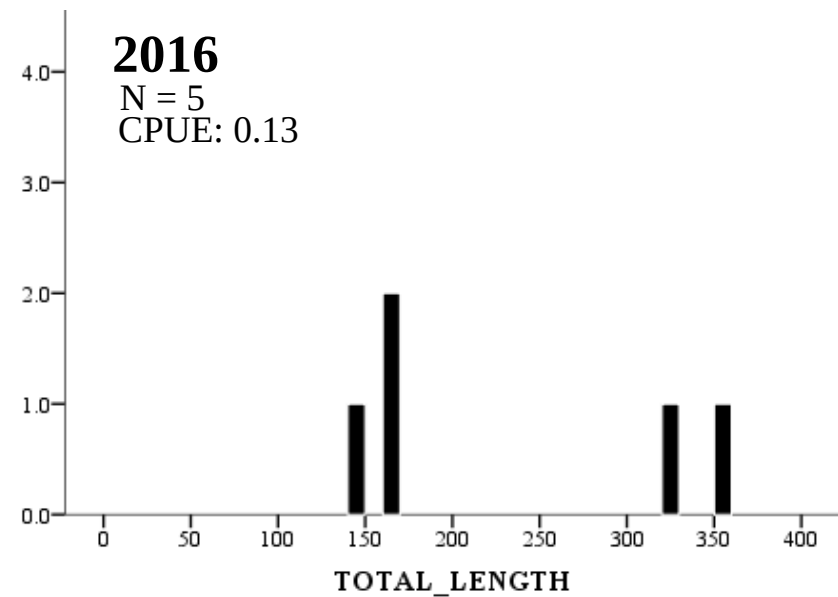
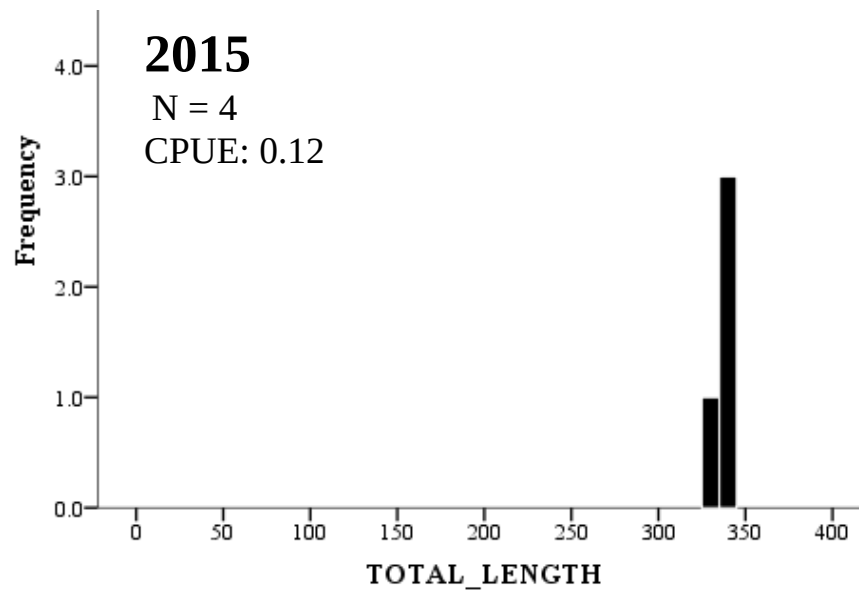


Preliminary data; do not use

Fern Glen - Stairway

Humpback Chub

RM 168.5 - 172.9



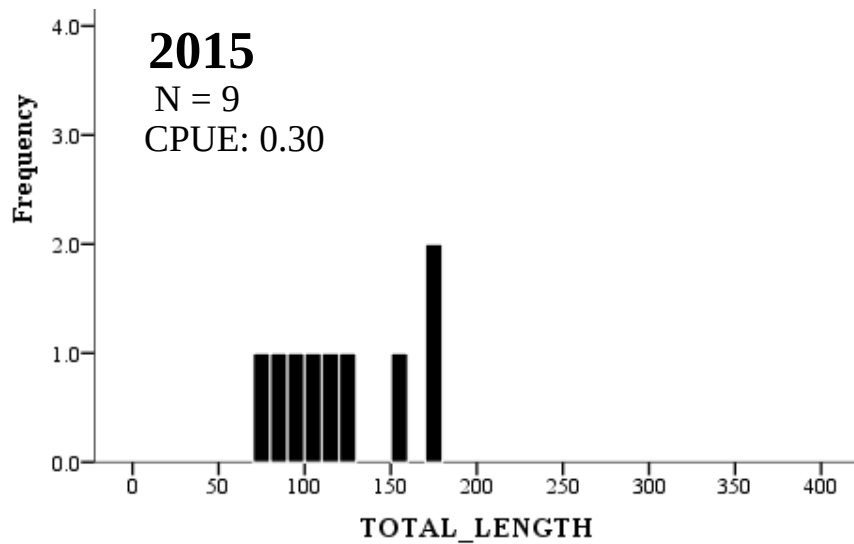
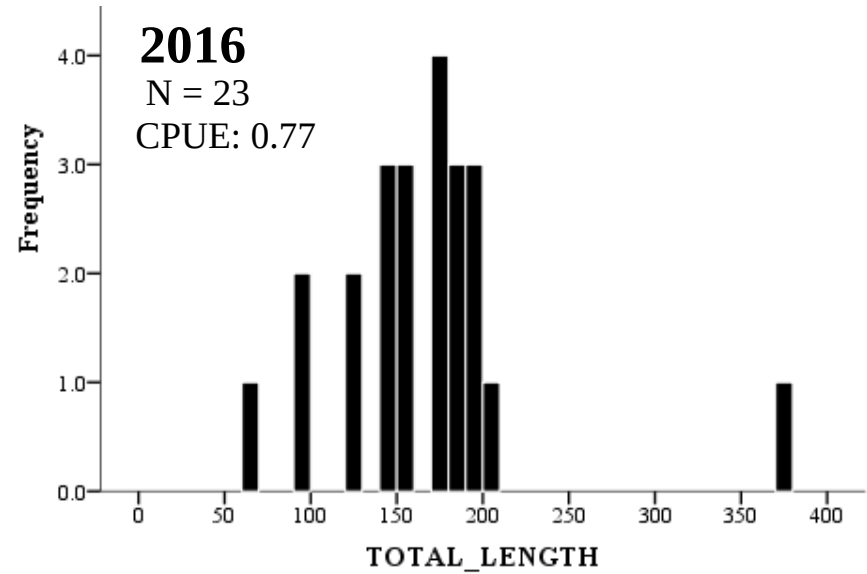
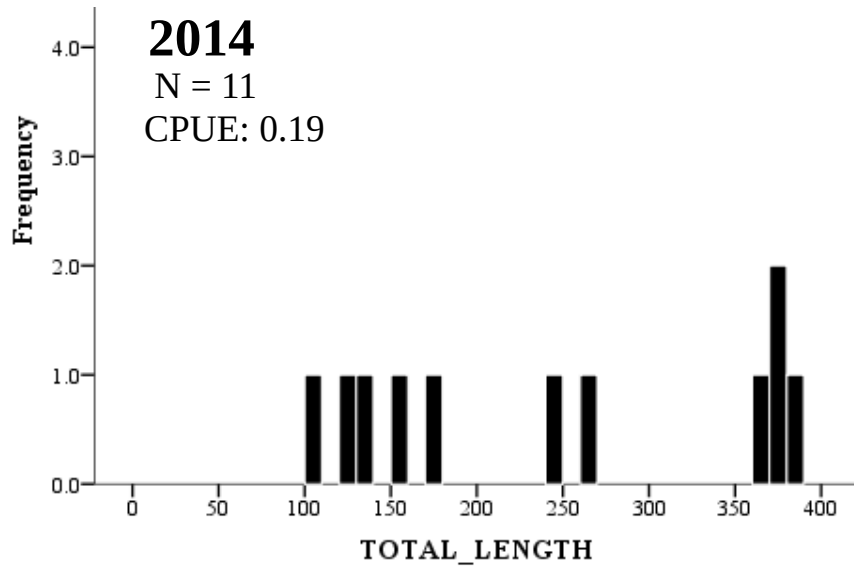
***2014: 0 HBC**

Preliminary data; do not cite

Froggy Fault

RM 196-198.5

Humpback Chub



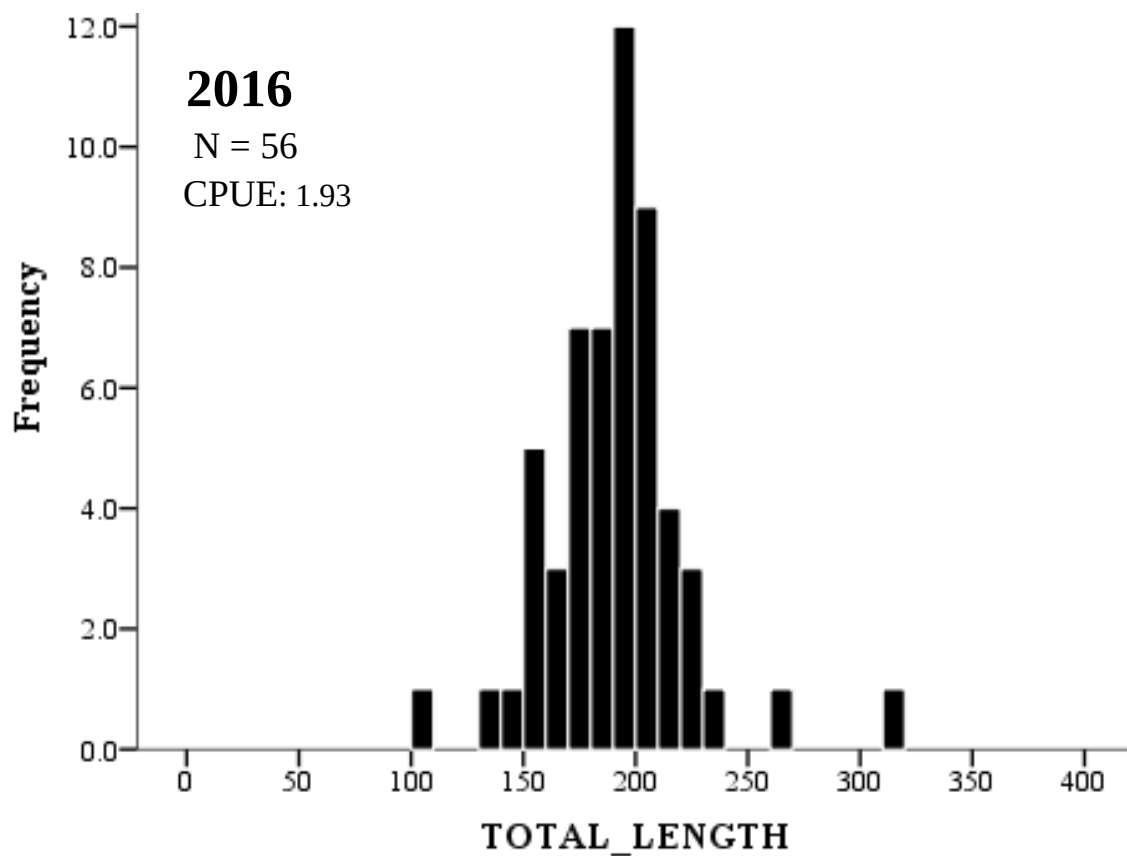
***2013: 0 HBC**

Preliminary data; do not cite

Fall Canyon

RM 210 - 212

Humpback Chub

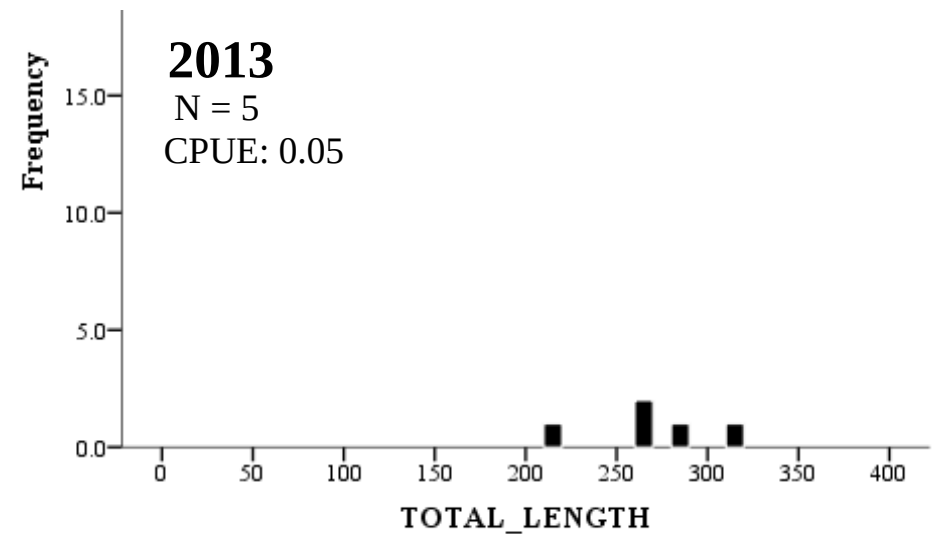
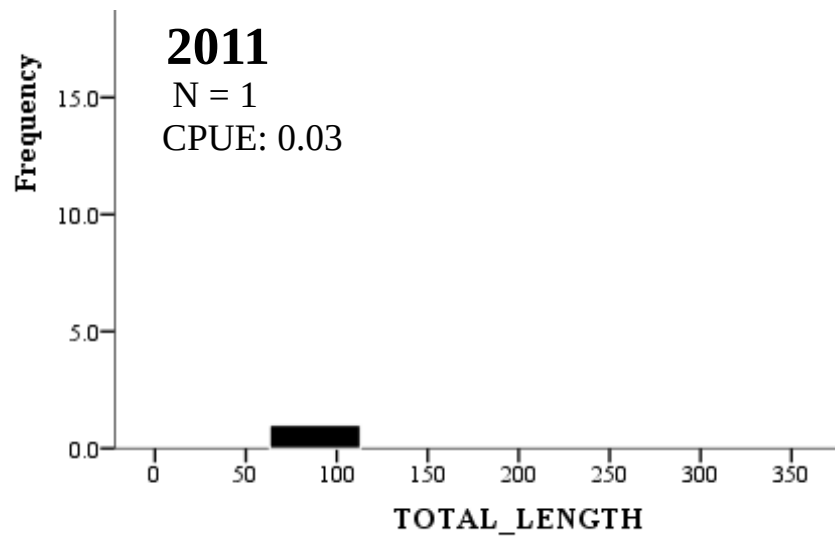
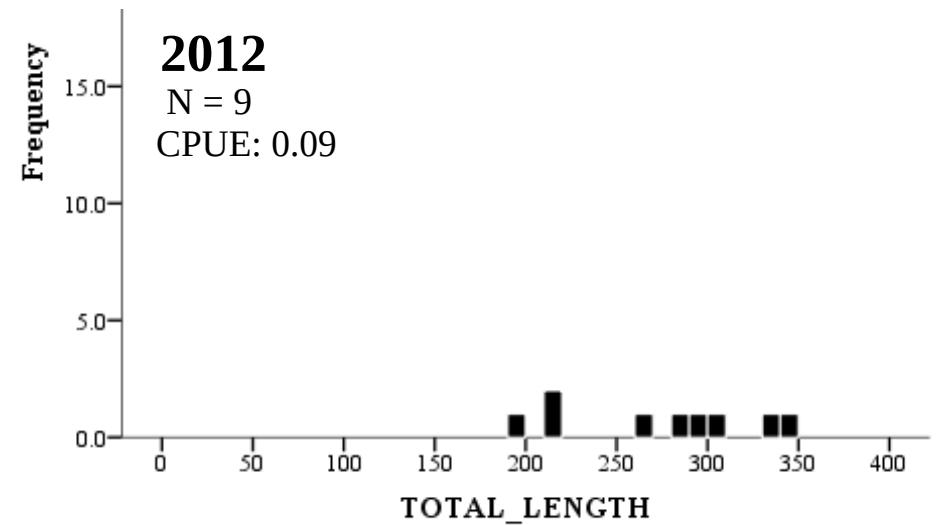
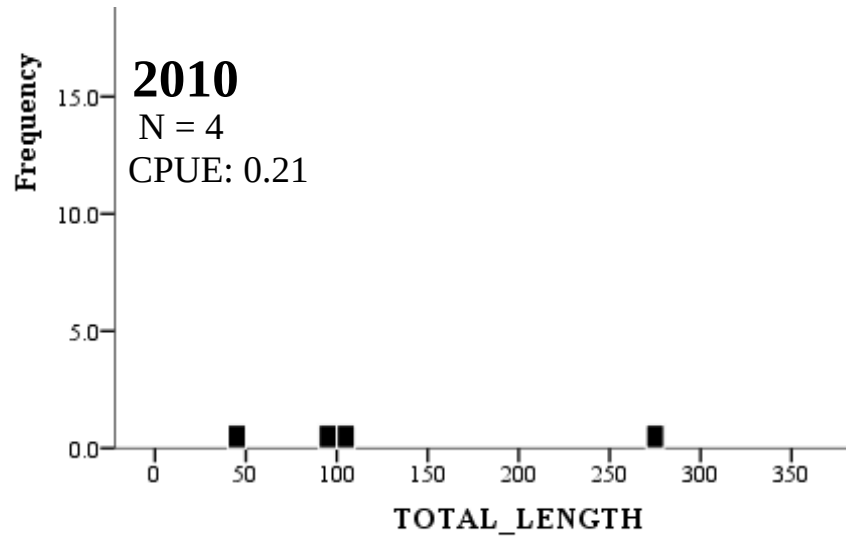


Preliminary data; do not cite

Pumpkin (2010-2013)

RM 212.5 – 216

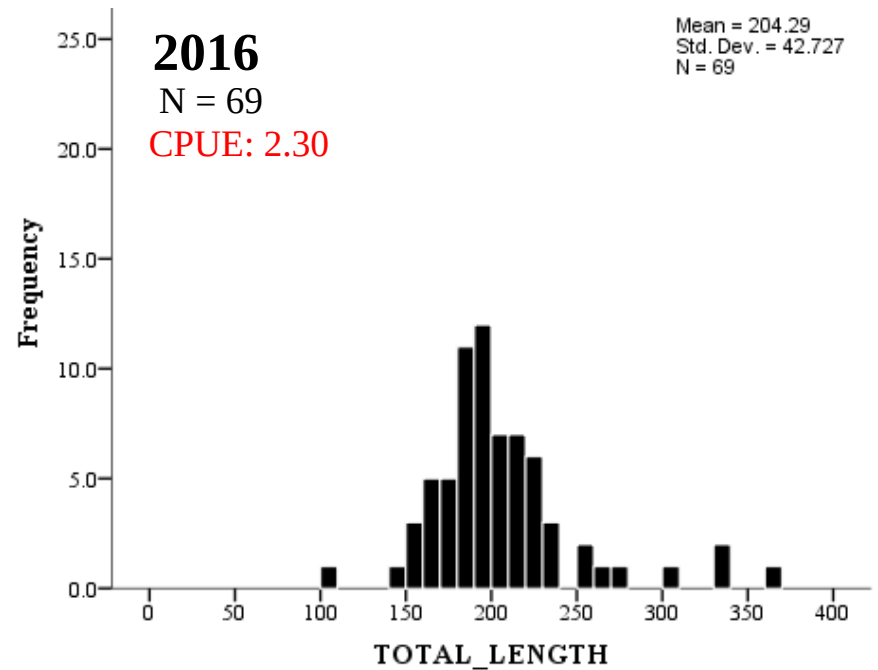
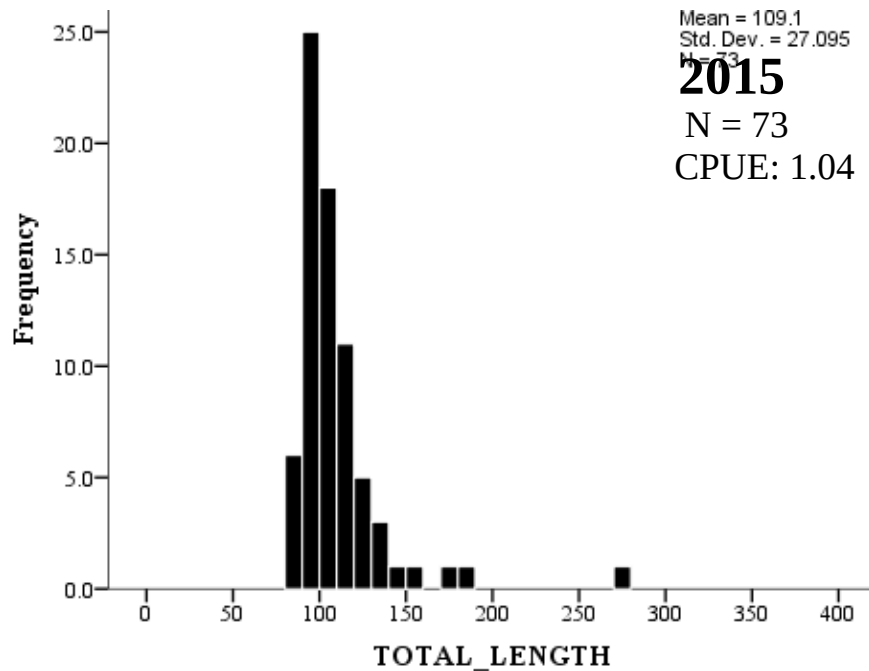
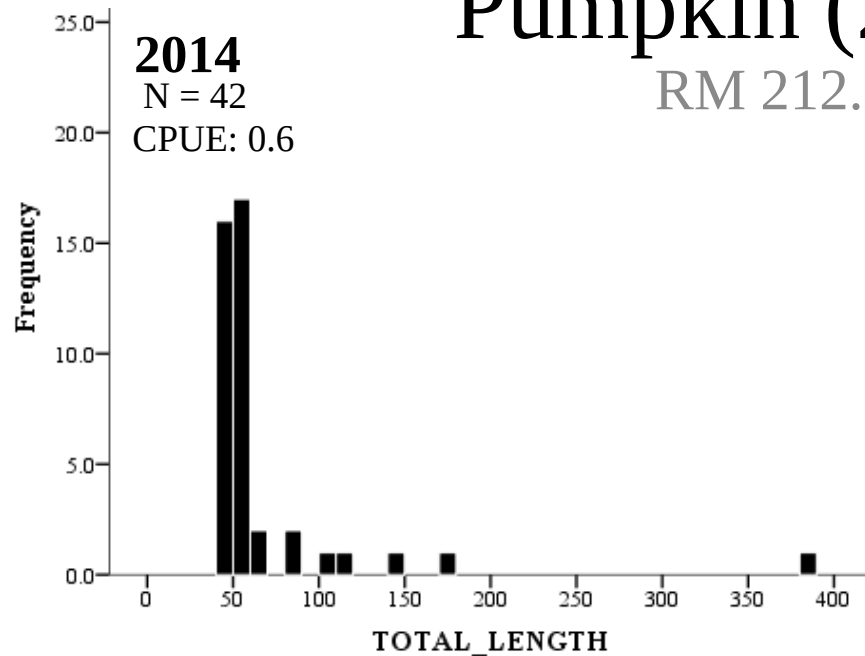
Humpback Chub



Preliminary data; do not cite

Pumpkin (2014-2016)

Humpback Chub

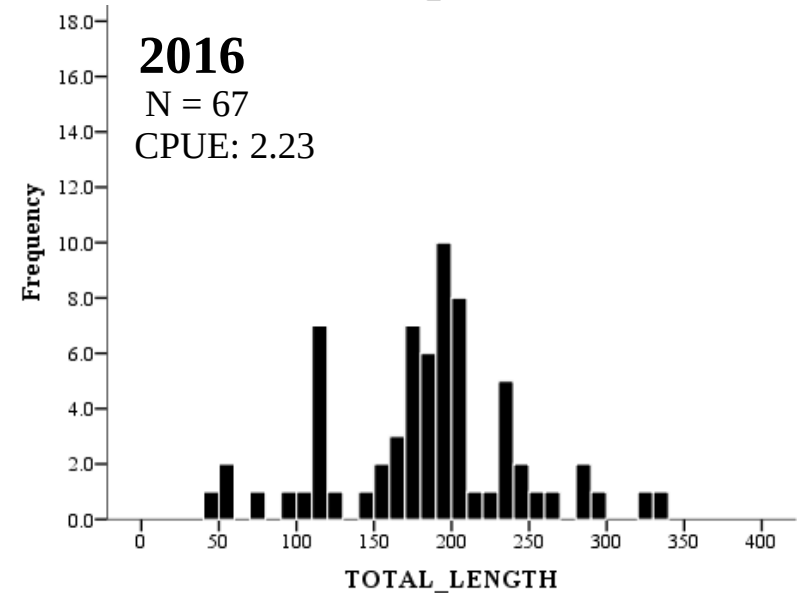
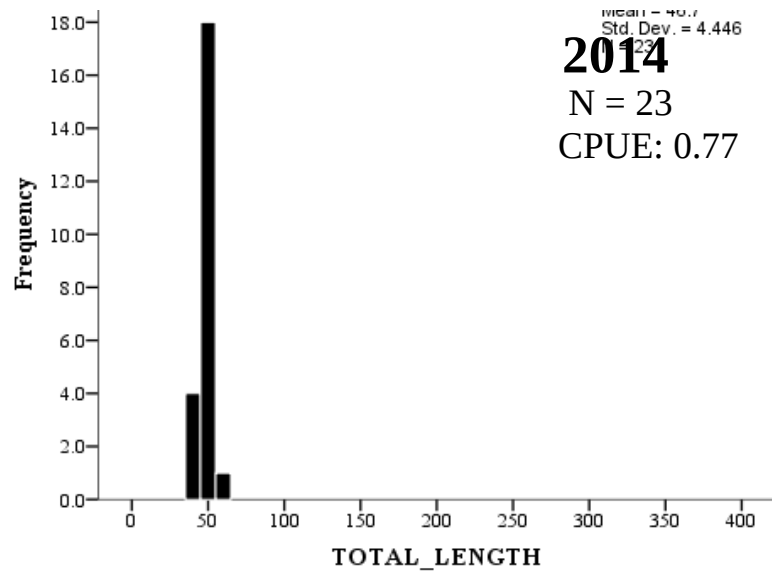
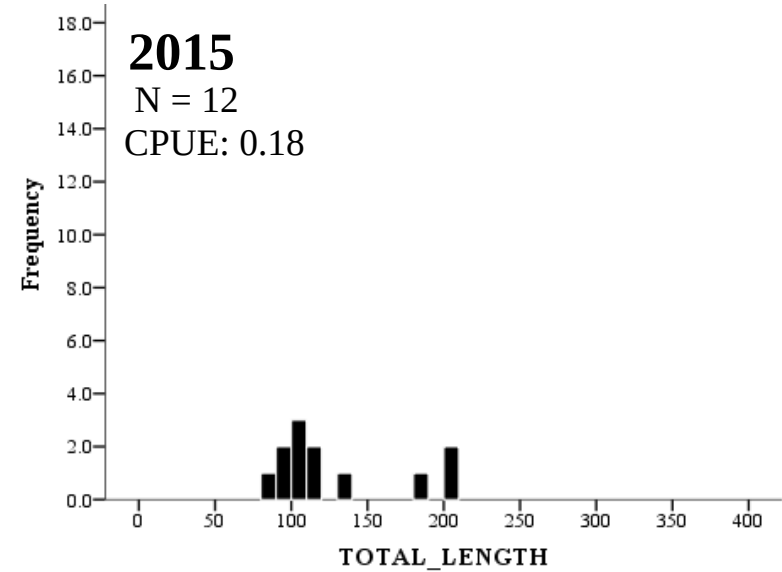
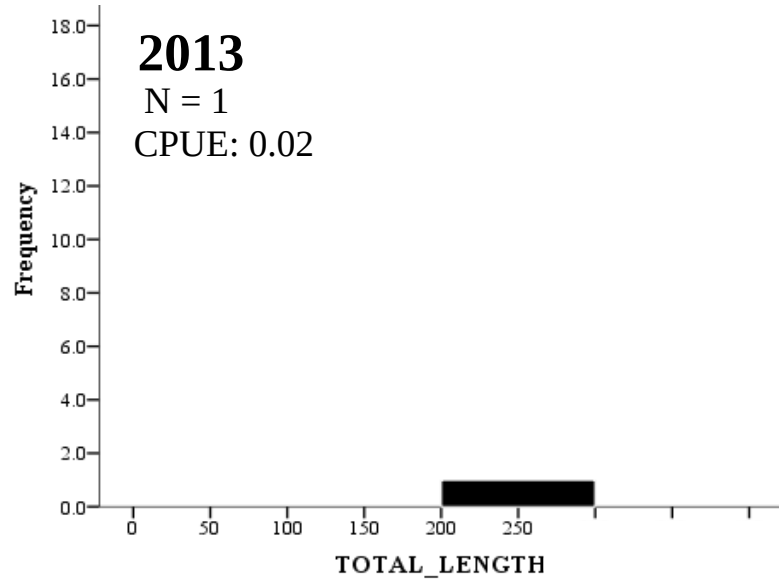


Preliminary data; do not cite

Bridge City

RM 237 - 244

Humpback Chub

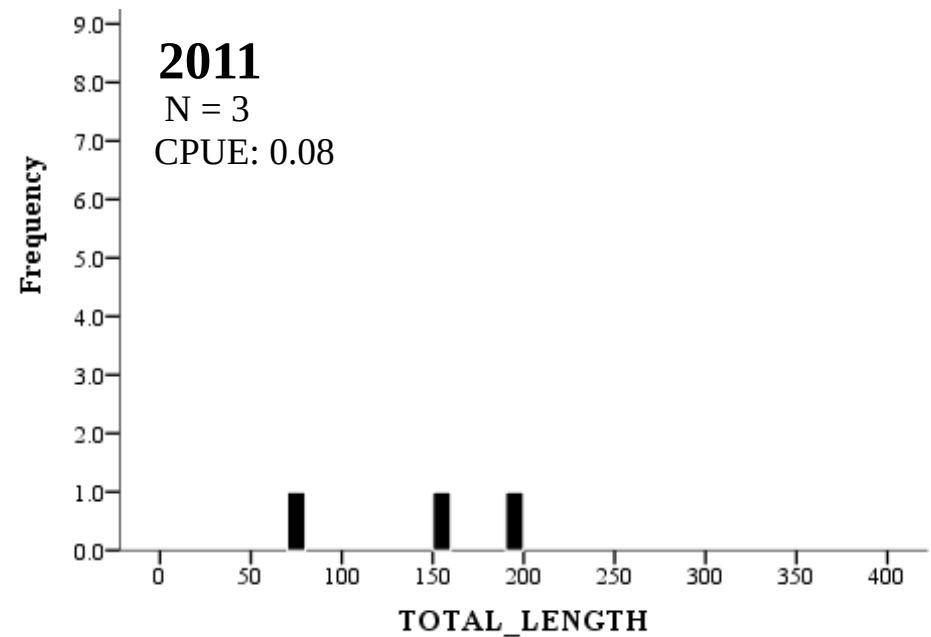
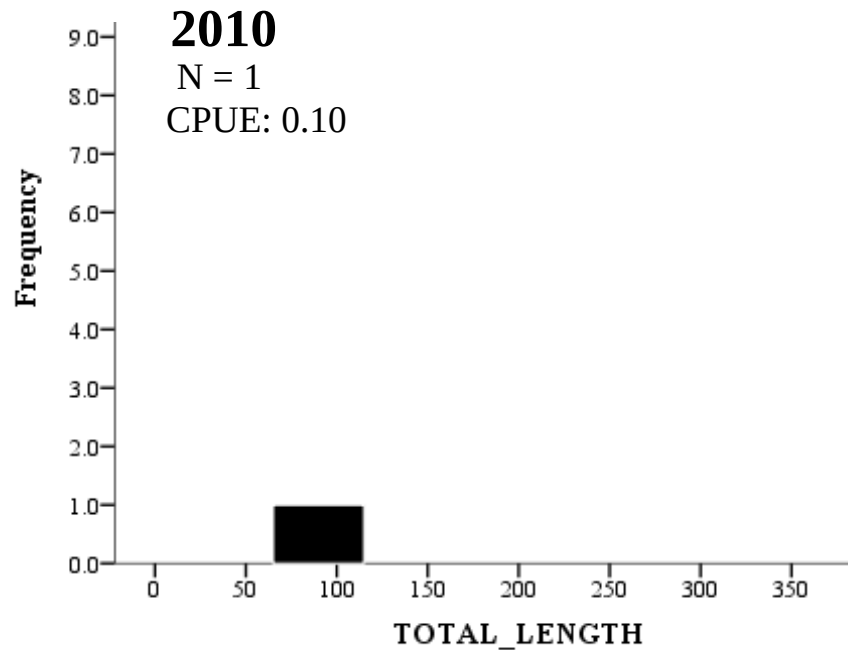


Preliminary data; do not cite

Spencer & Surprise (2010-2011)

Humpback Chub

RM 245 - 249.5



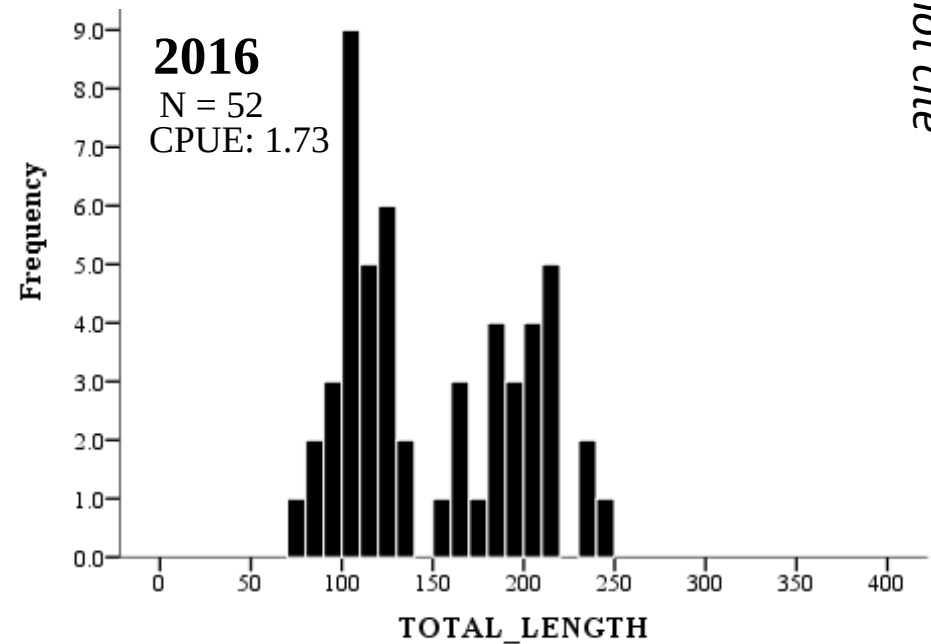
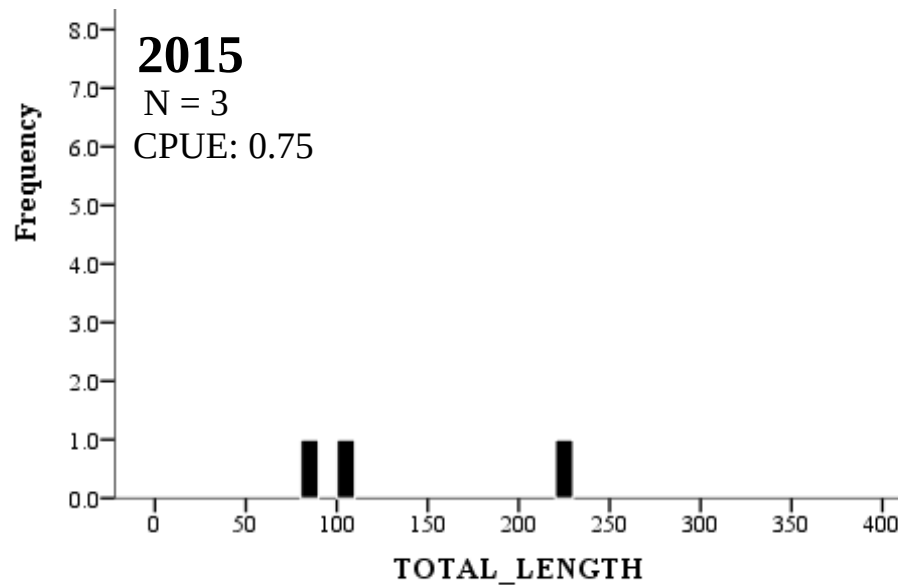
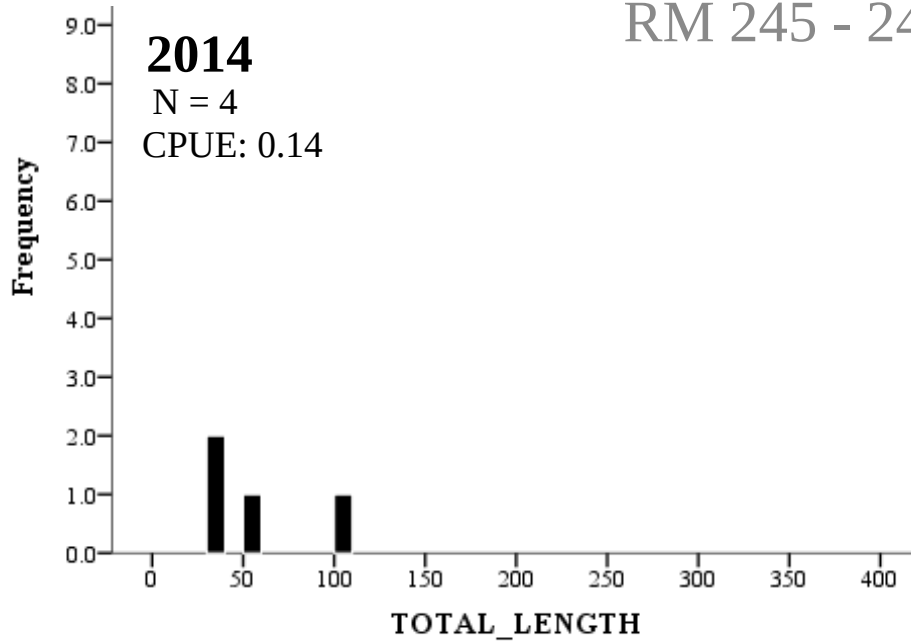
***2012: 0 HBC**

Preliminary data; do not cite

Spencer & Surprise (2014-2016)

Humpback Chub

RM 245 - 249.5



Preliminary data; do not cite

Immigration?
Temperature?

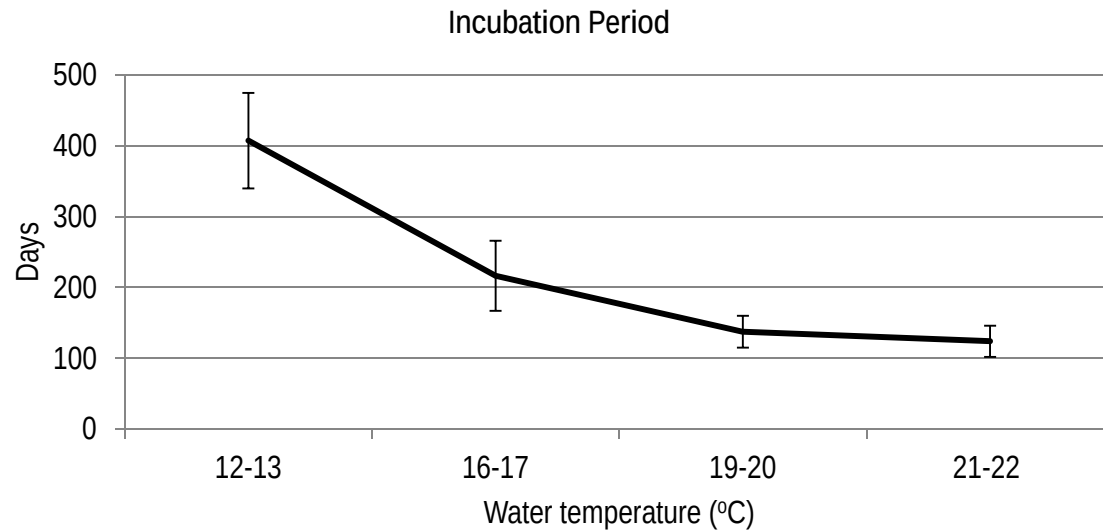
Immigration

Of 79 recaptures, Havasu & below:

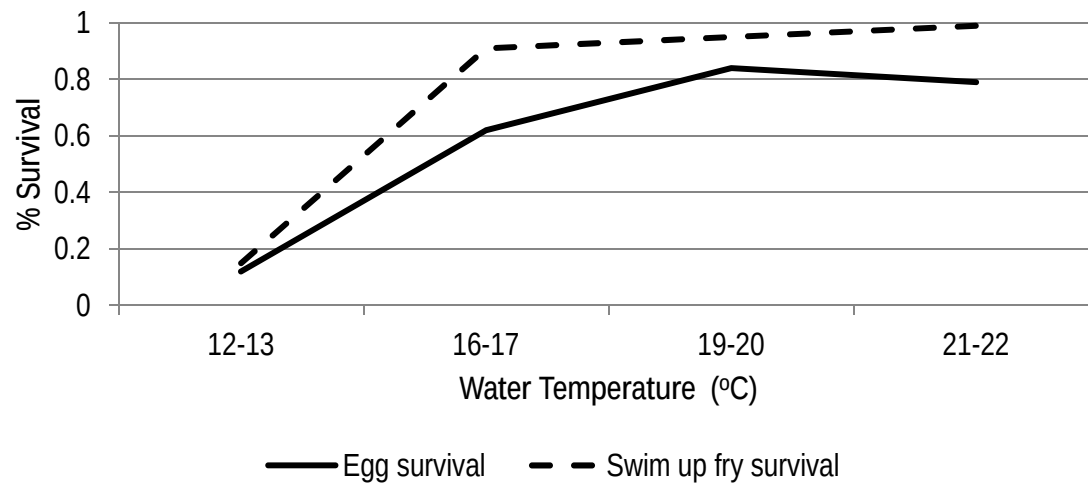
- 8 moved down from Havasu
(3 Pumpkin; 5 Fern Glen)
- 5 moved up from Pumpkin
(3 Froggy; 2 Fall Canyon)

2014-2016

Temperature (review)



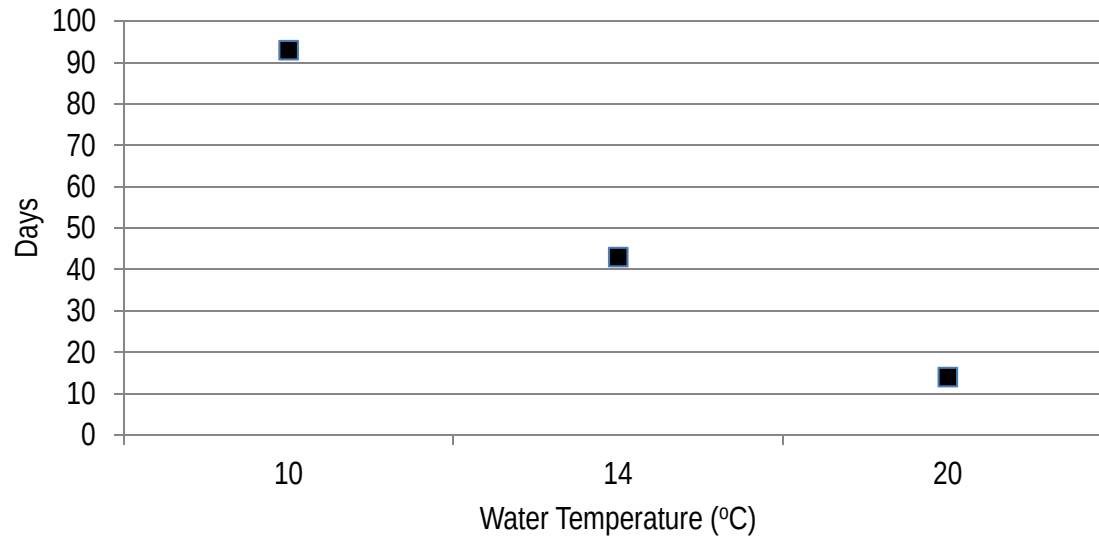
Incubation period of HBC in relation to water temperature (Hamman 1982).



Egg survival and swim-up fry survival of HBC in relation to temperature (Hamman 1982).

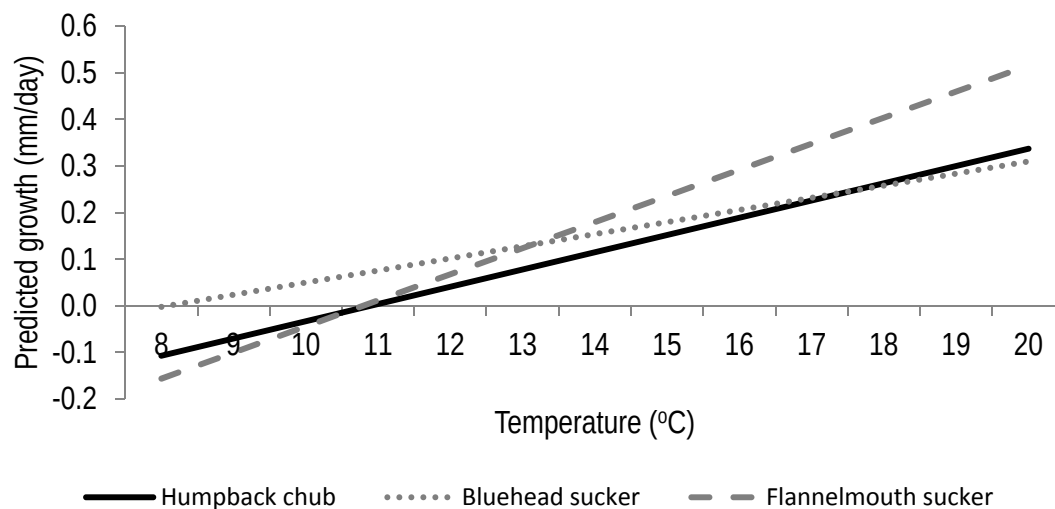
Temperature (review)

Larval to juvenile transition time

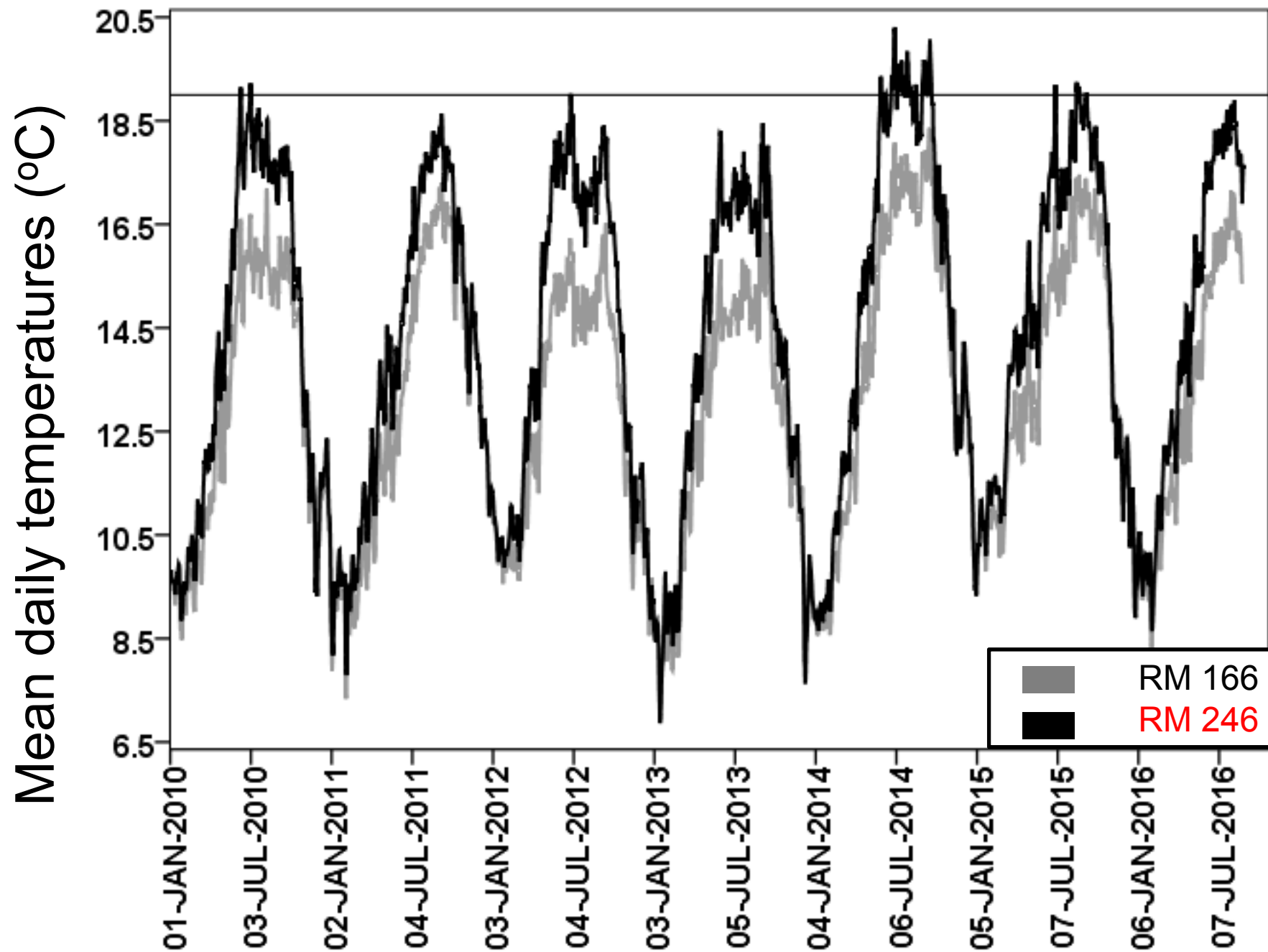


Number of days that larval HBC took to grow larva to juvenile stage at different water temperatures (Clarkson & Childs 2000).

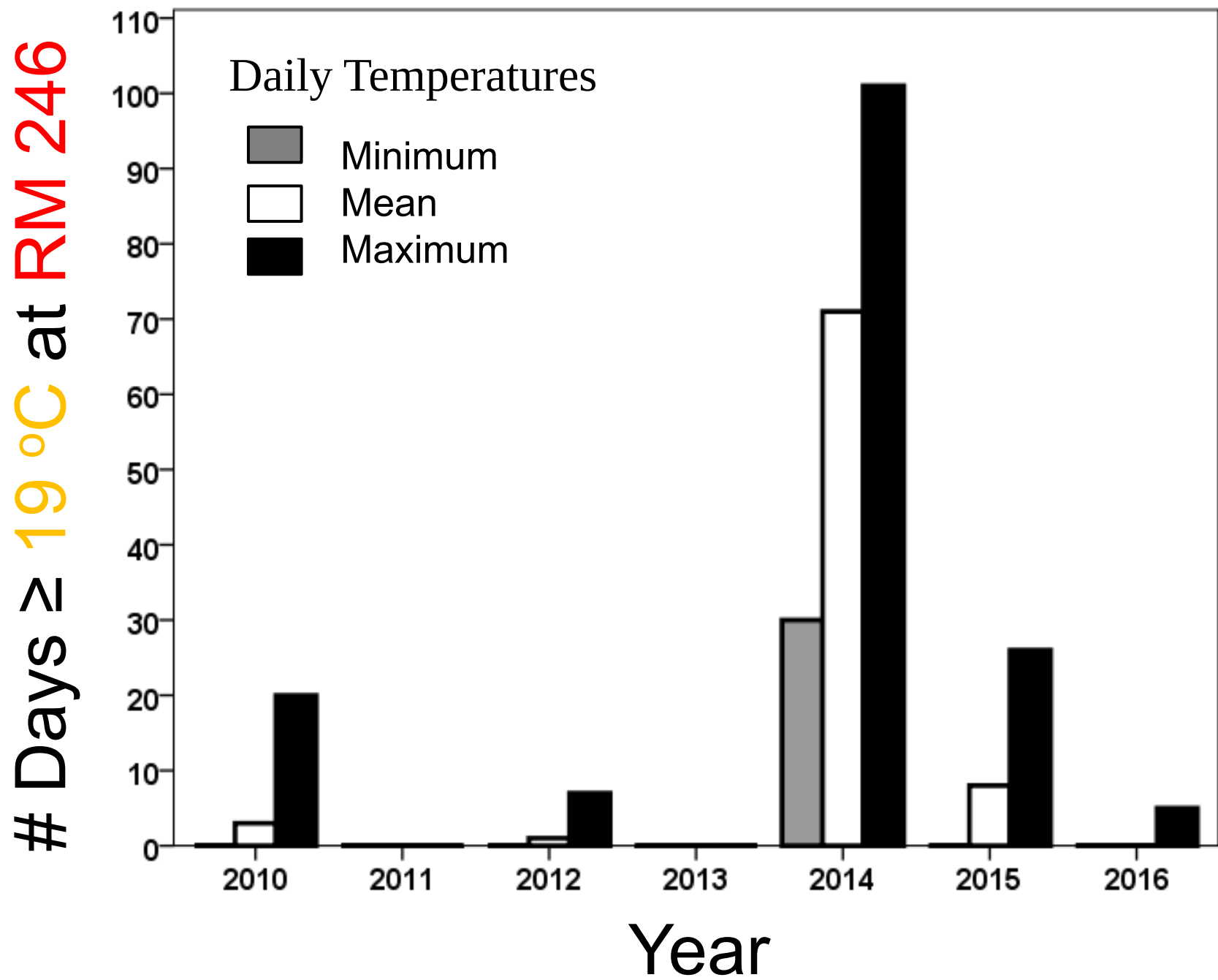
Temperature - Growth Relationship



Association between temperature and growth (mm/day) for hatching to Age I of HBC ($r = 0.98$, $P < 0.001$), bluehead sucker ($r = 0.78$, $P = 0.005$) and flannelmouth sucker ($r = 0.98$, $P < 0.001$) (constructed from Robinson and Childs 2001).

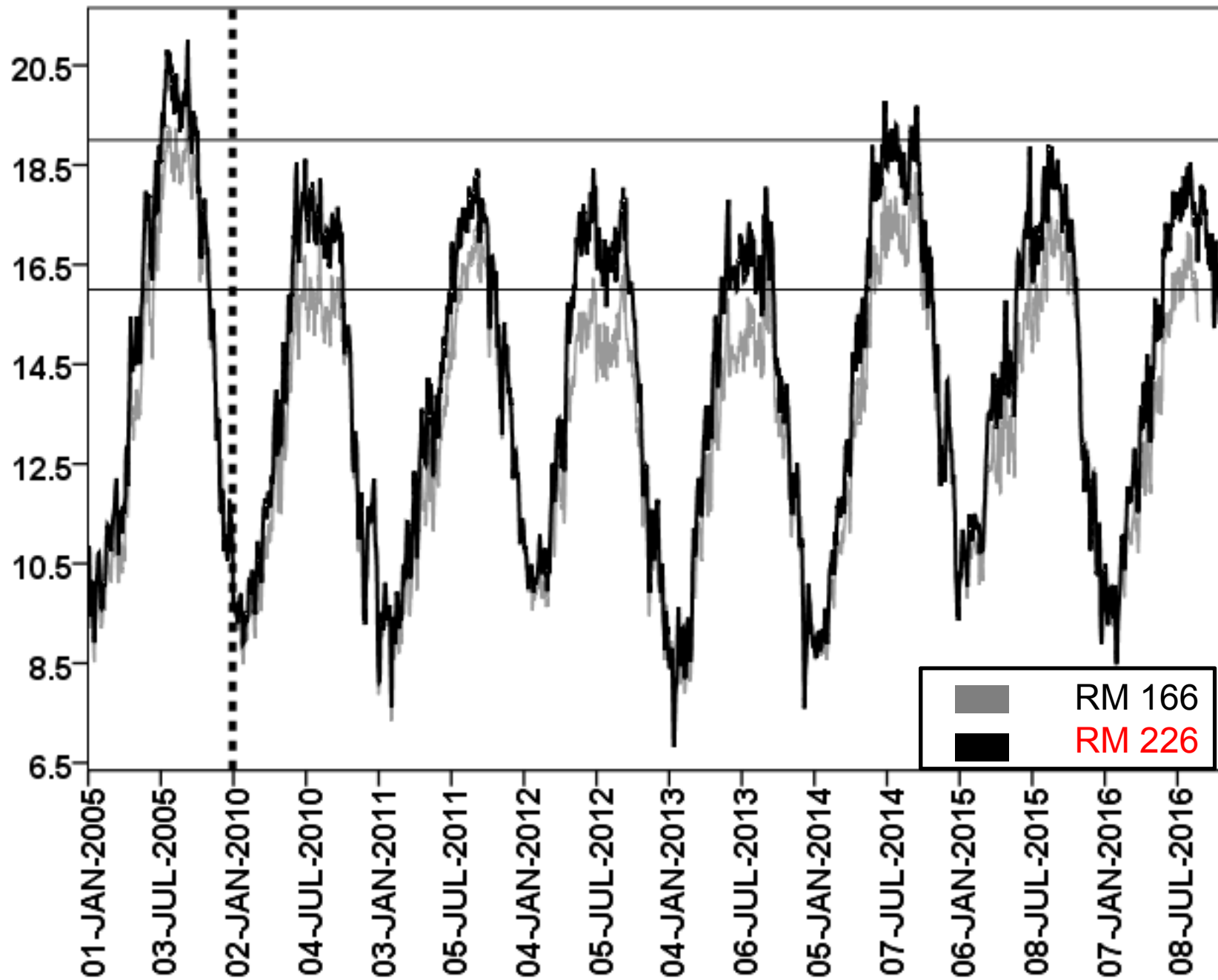


Preliminary data; do not cite



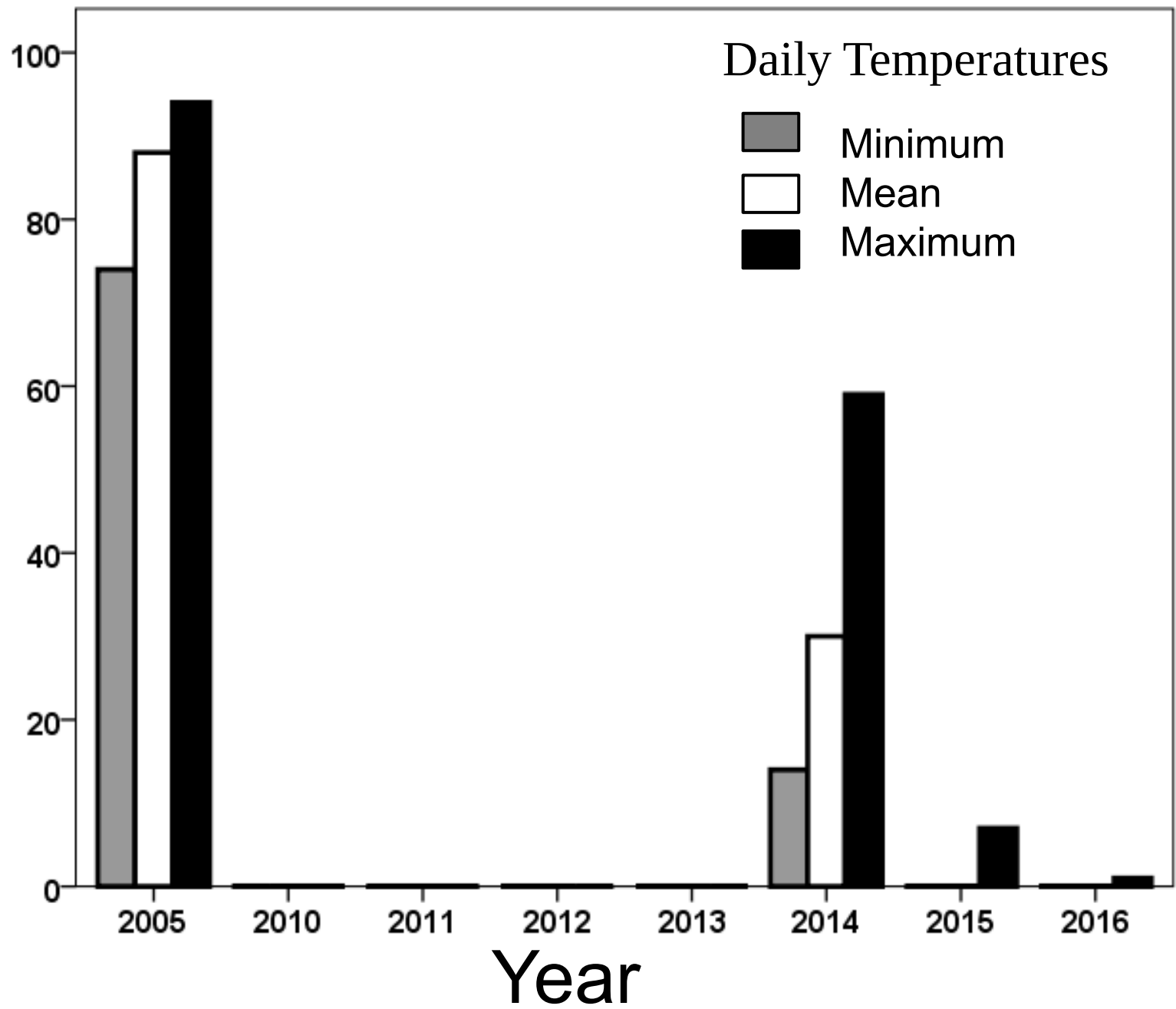
Preliminary data; do not cite

Mean daily temperatures (°C)

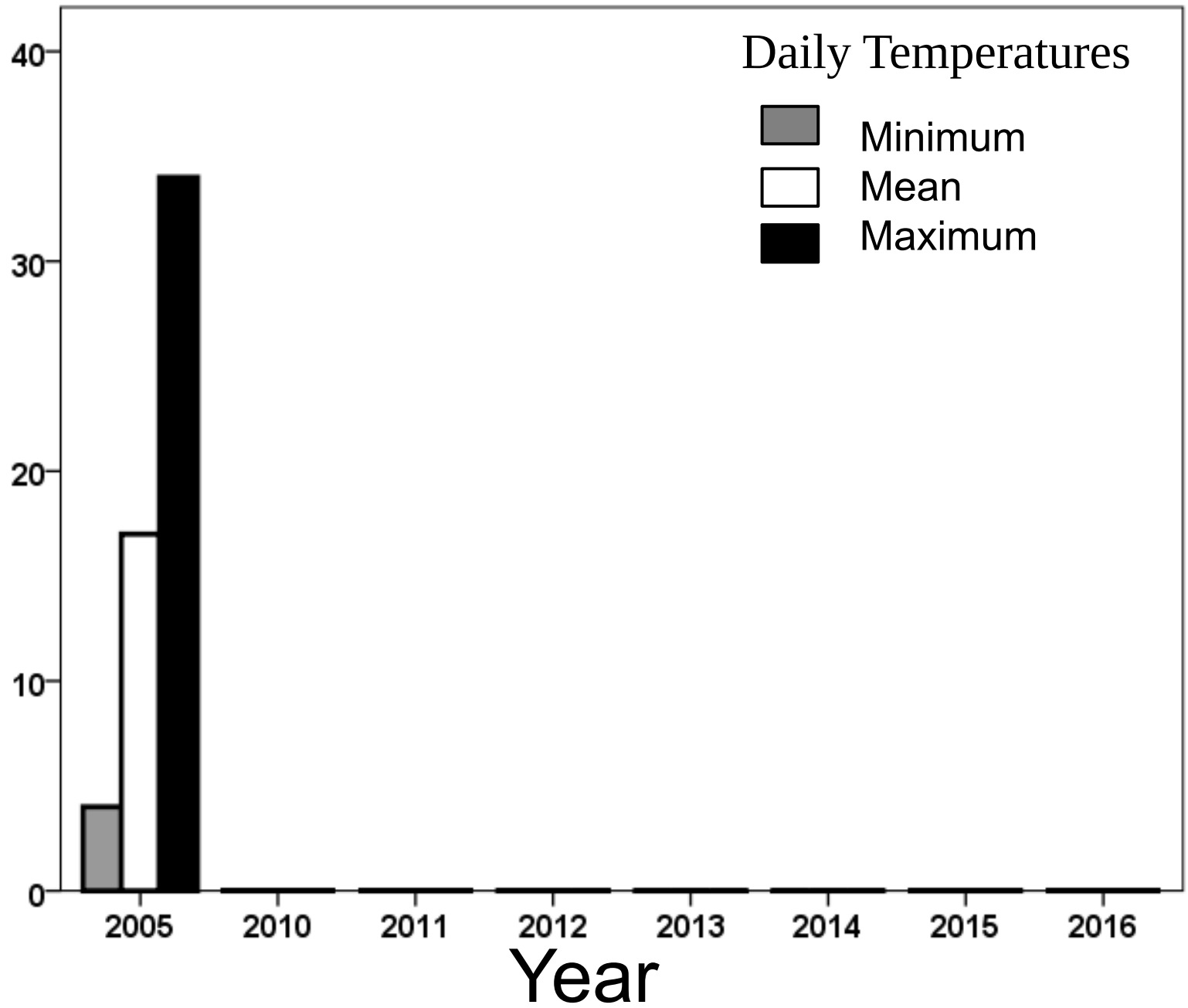


Preliminary data; do not cite

Days $\geq 19^{\circ}\text{C}$ at RM 226

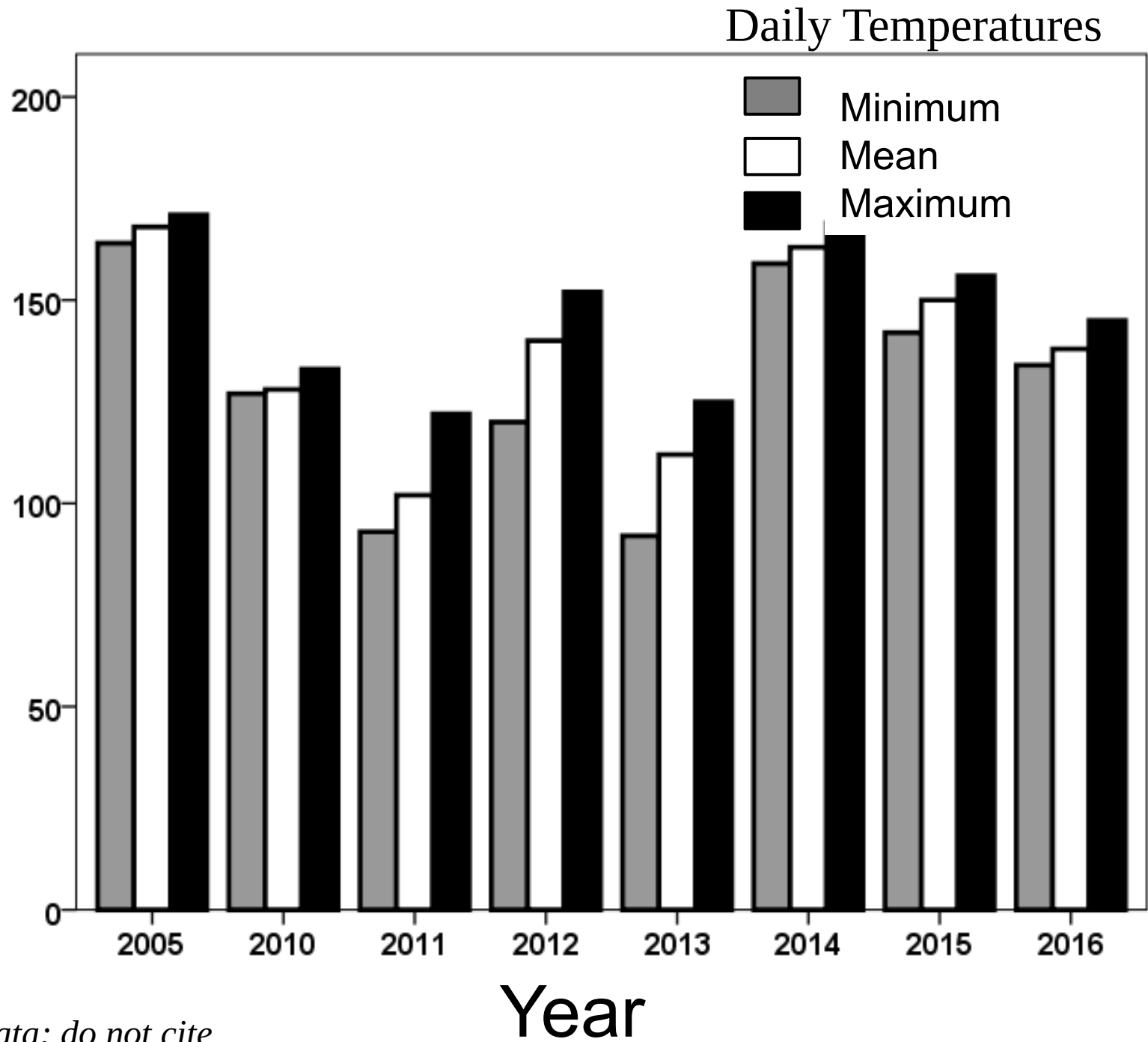


Days $\geq 19^{\circ}\text{C}$ at RM 166



Preliminary data; do not cite

Days $\geq 16^{\circ}\text{C}$ at RM 226



Preliminary data; do not cite



WGC HBC Recruitment & CPUE  since 2014

Temp ≥ 19

Population critical mass

Food/Habitat/Translocations

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Effort

Year	N	Hoop Net Set Times by Year (hours)				
		Mean	SE	SD	Min	Max
2010	65	19.73	0.26	2.09	17.22	27.23
2011	140	18.93	0.14	1.67	6.42	21.68
2012	202	19.04	0.21	2.94	15.50	29.98
2013	228	19.18	0.15	2.28	16.23	23.27
2014	231	16.91	0.06	0.86	15.28	19.97
2015	234	17.17	0.12	1.78	14.98	24.00
2016	216	16.94	0.06	0.82	15.37	19.12

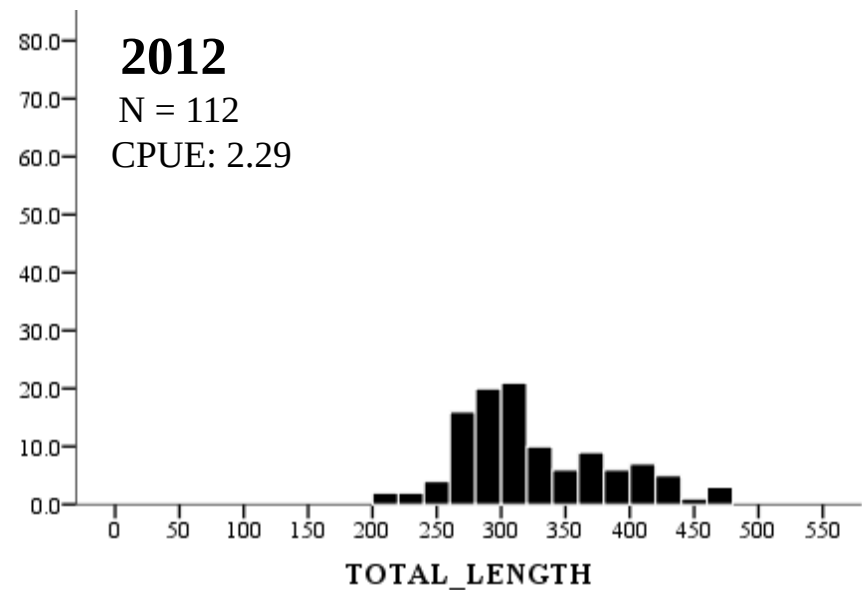
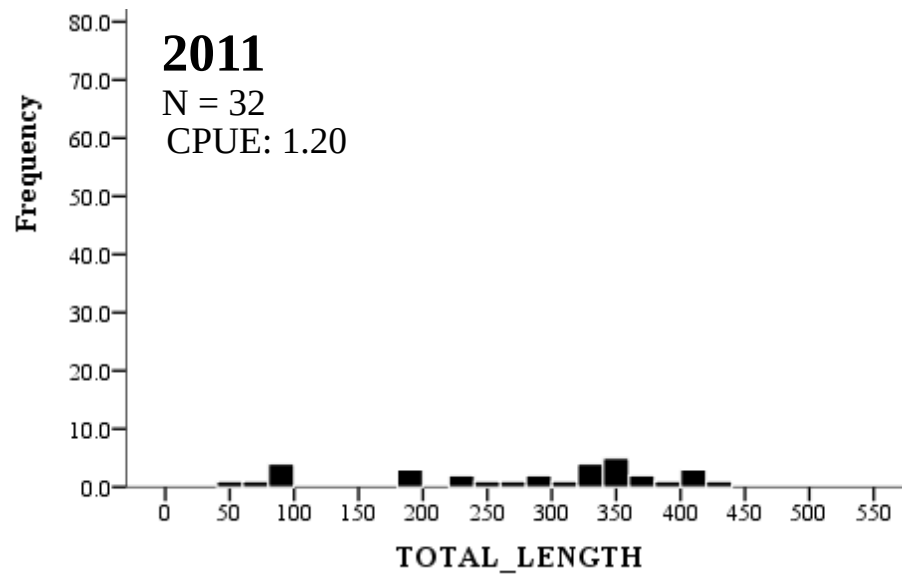
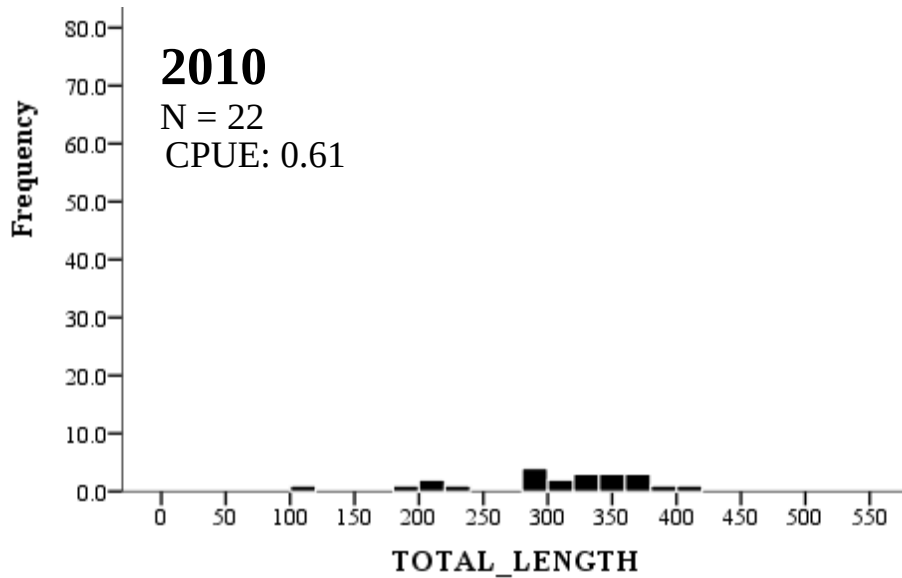
$$\text{CPUE} = \text{Fish} / \text{Net Set}$$

Preliminary data; do not cite

Havasu Creek (2010-2012)

RM 157-160

Flannelmouth Sucker

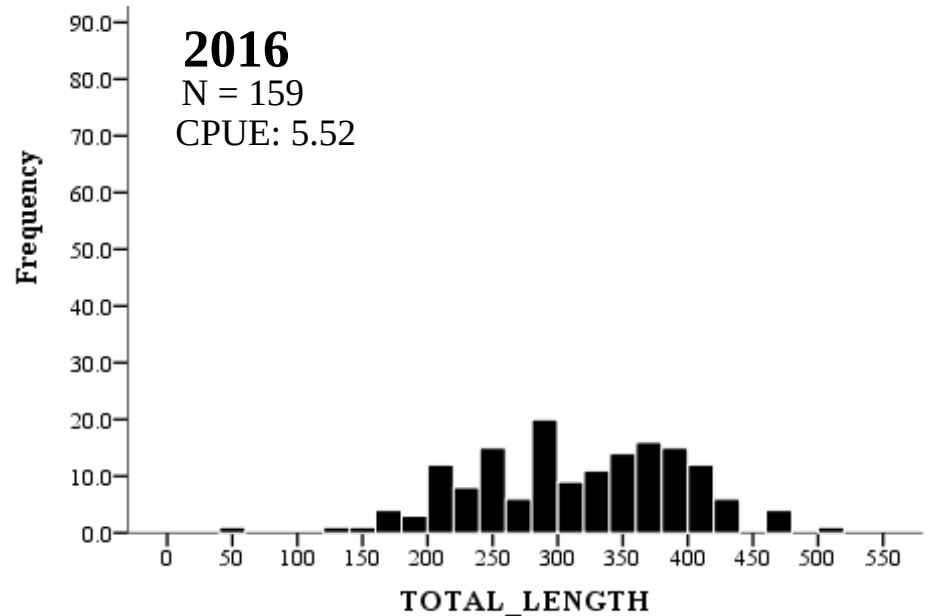
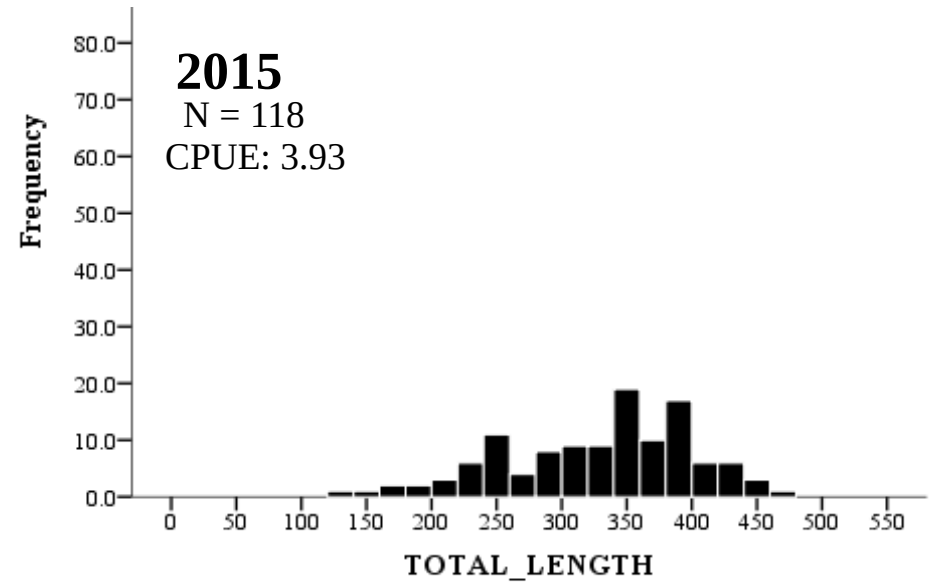
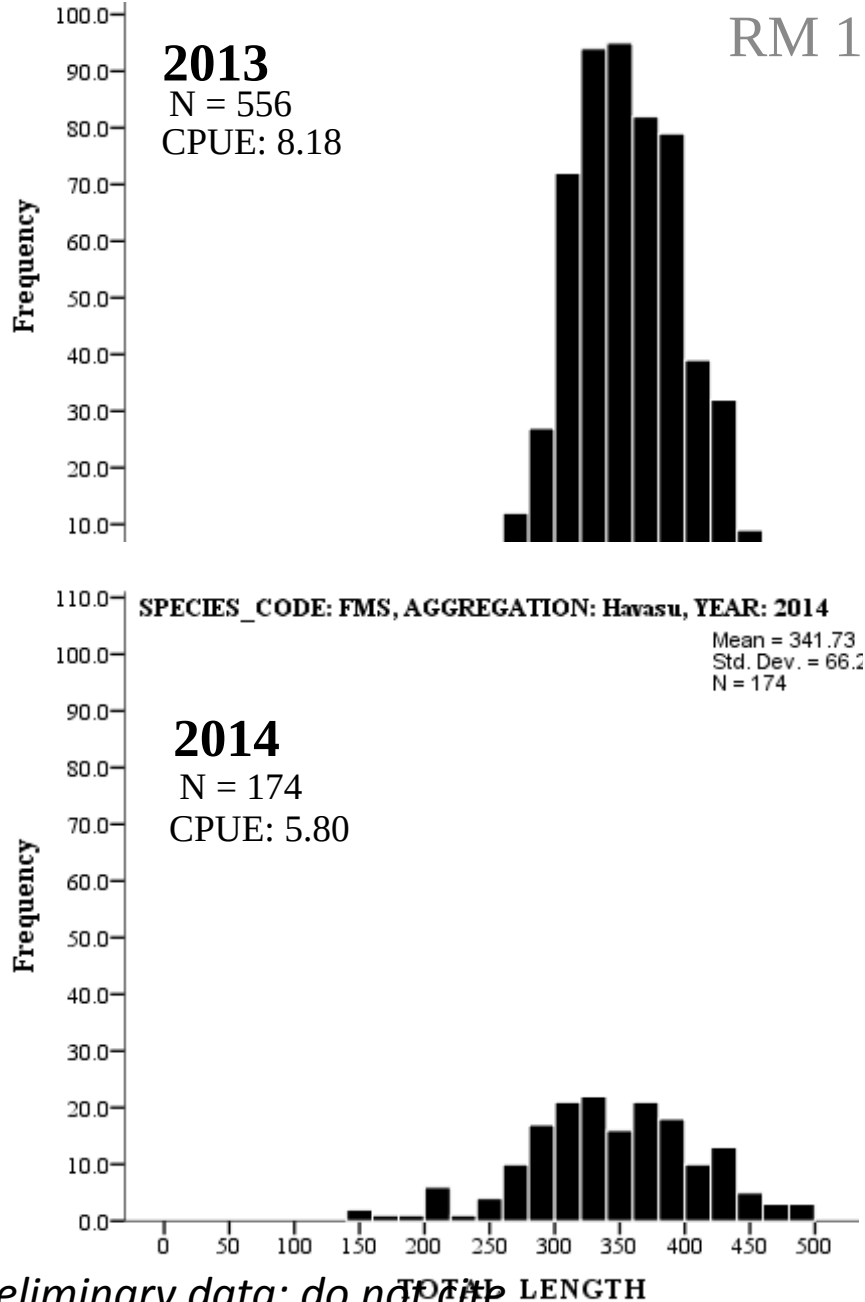


Preliminary data; do not cite

Havasu Creek (2013-2016)

Flannelmouth Sucker

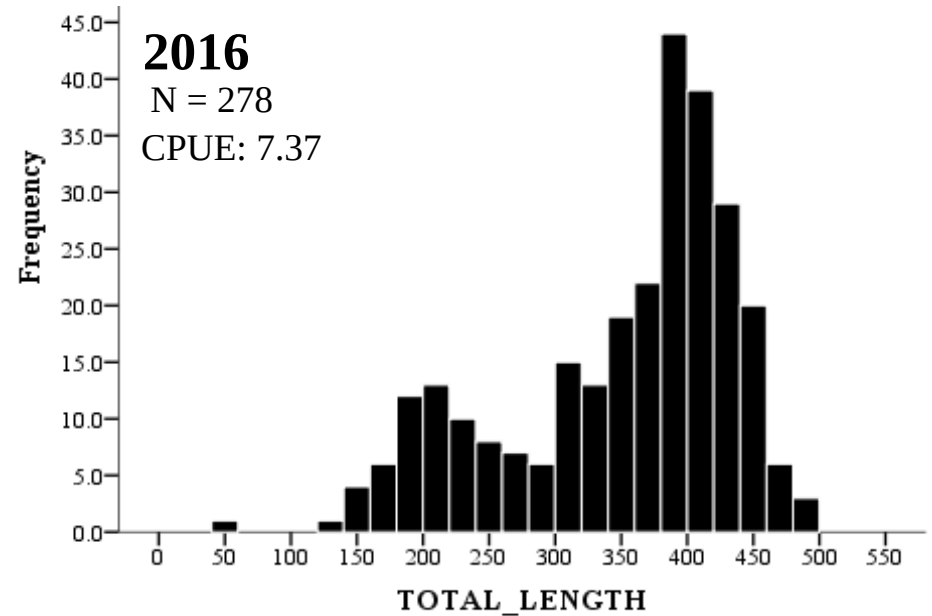
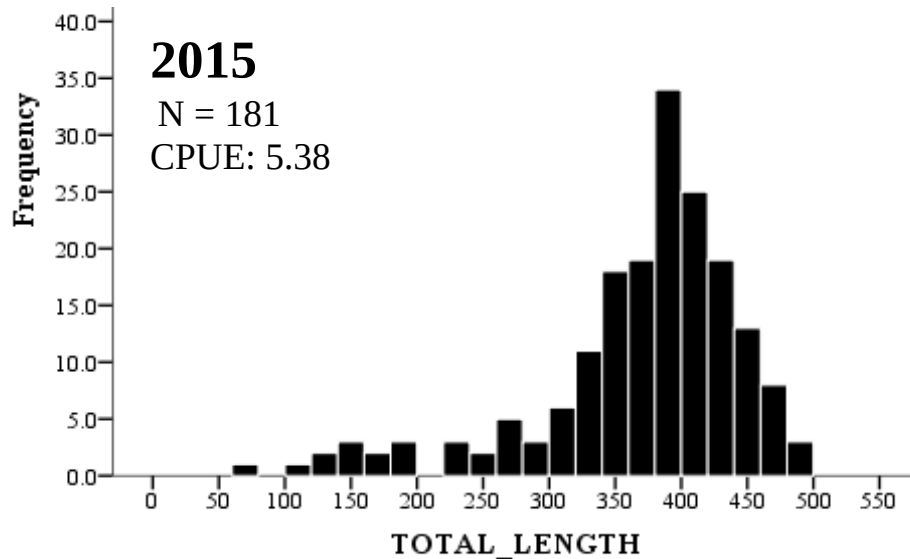
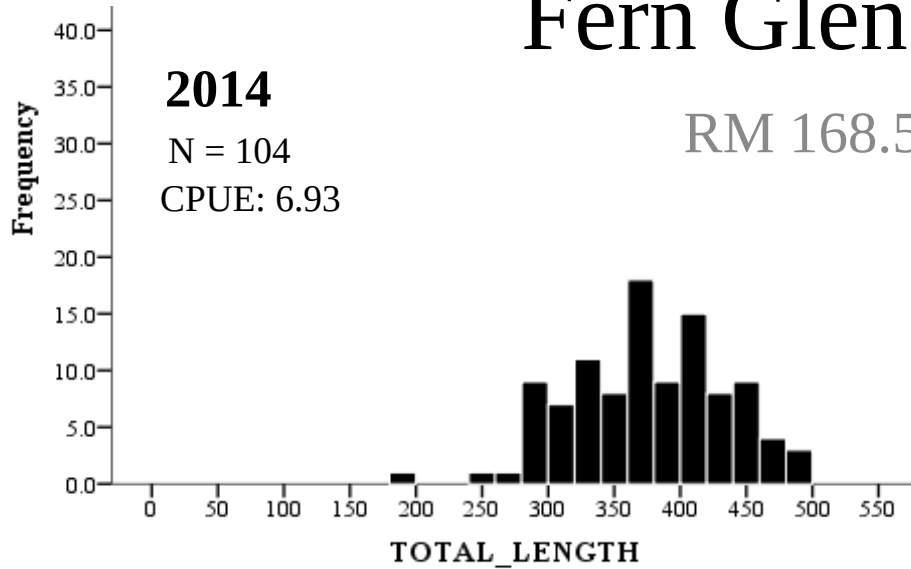
RM 157-160



Preliminary data; do not cite

Fern Glen - Stairway

Flannemouth Sucker

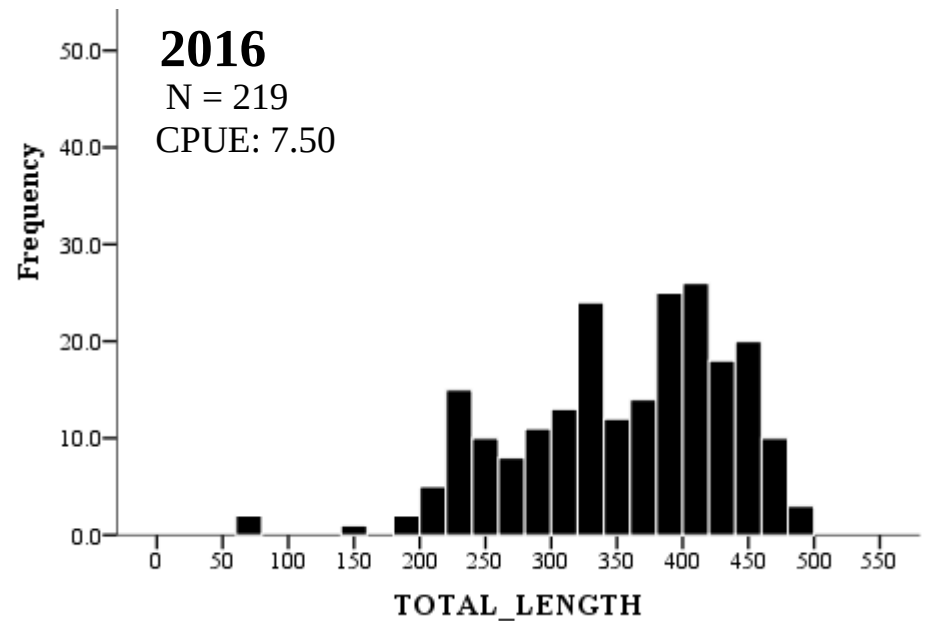
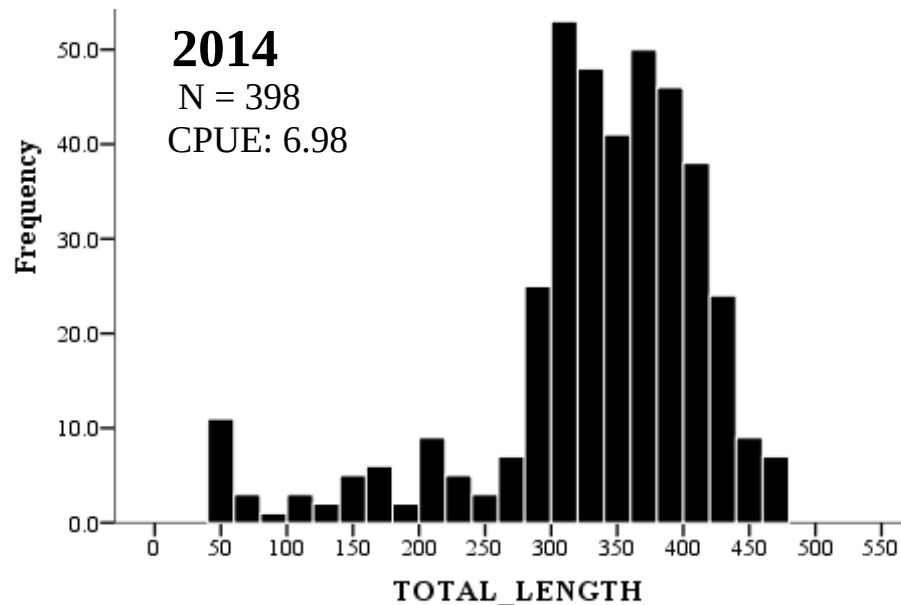
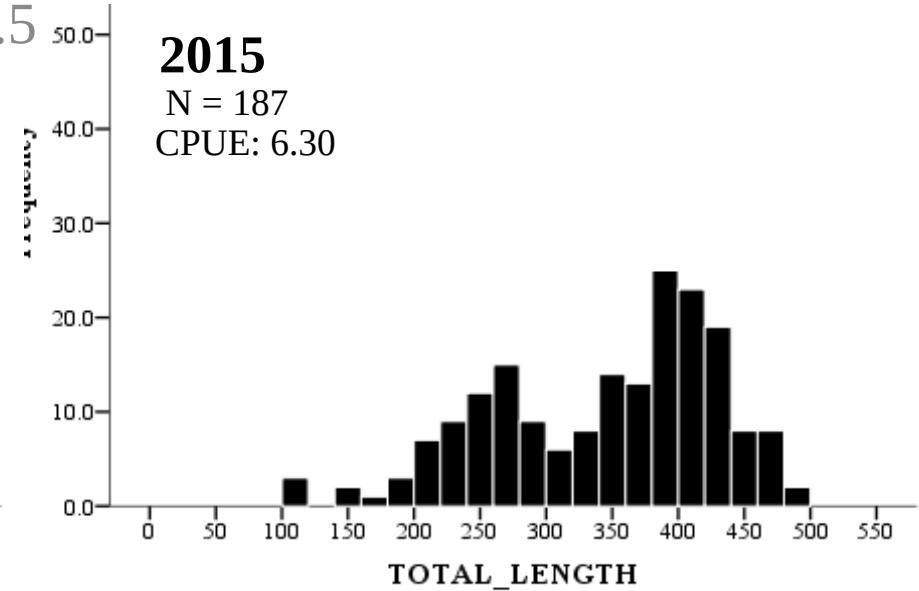
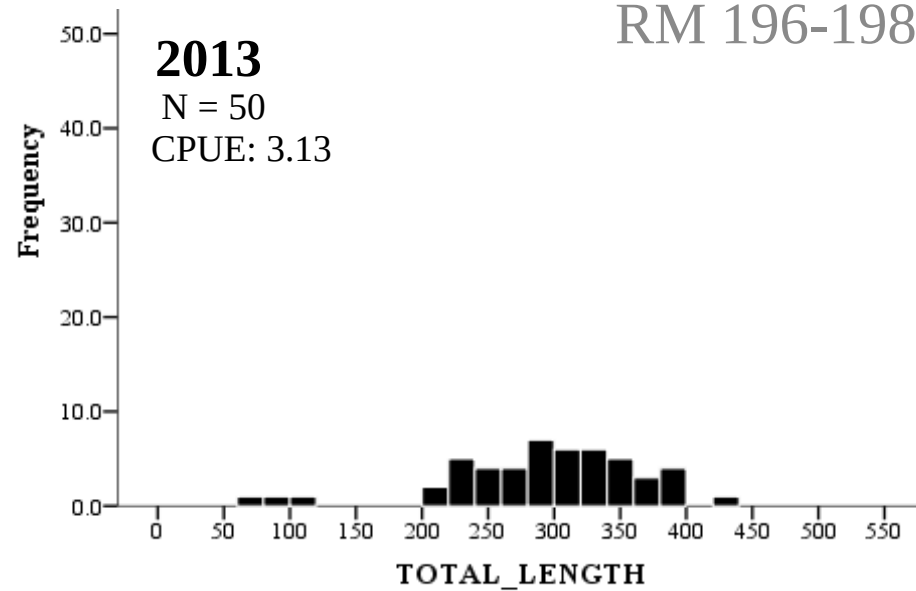


Preliminary data; do not cite

Froggy Fault

Flannemouth Sucker

RM 196-198.5

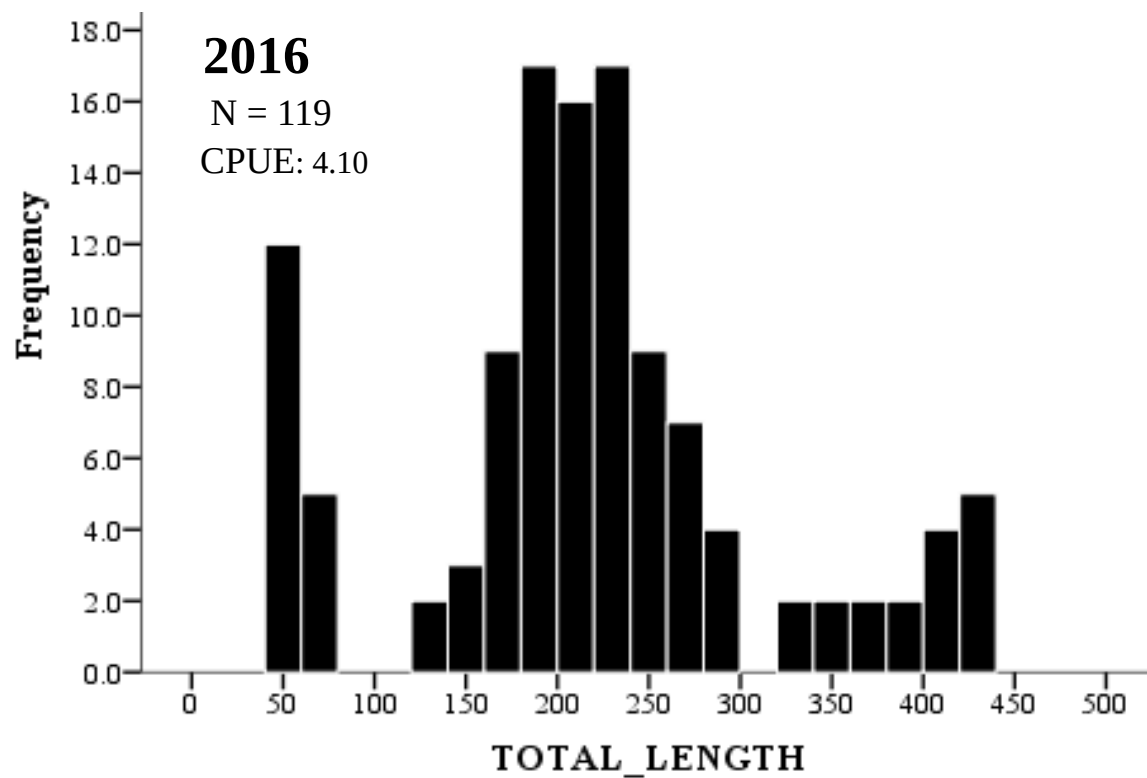


Preliminary data; do not cite

Fall Canyon

RM 210 - 212

Flannelmouth Sucker

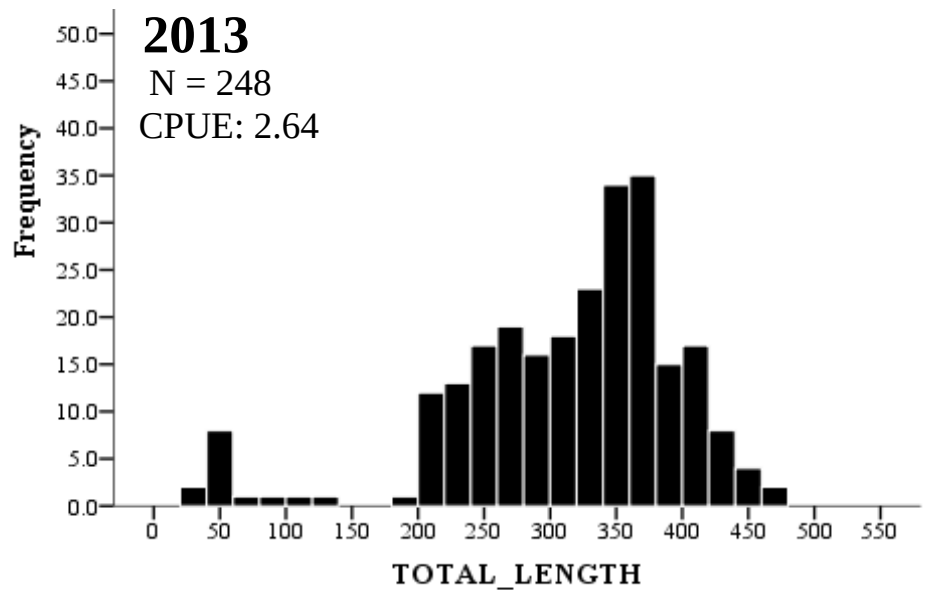
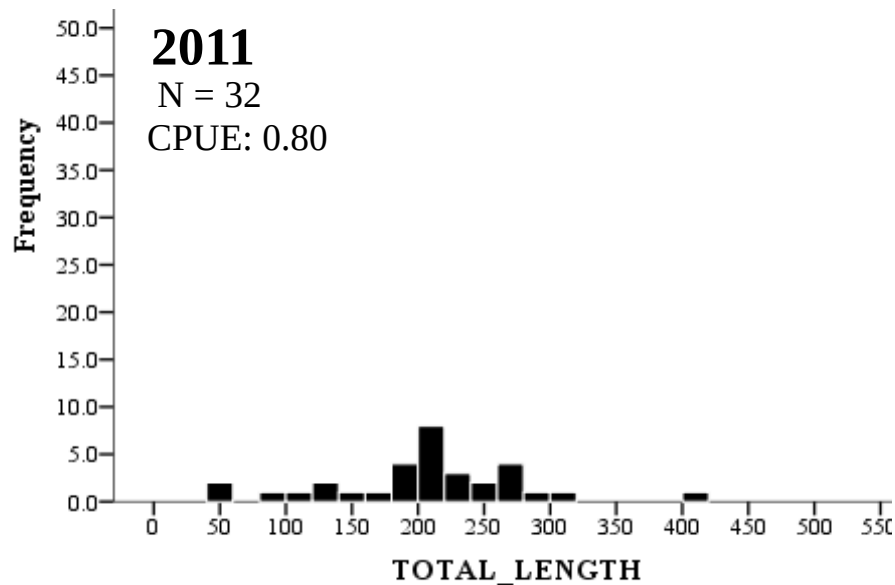
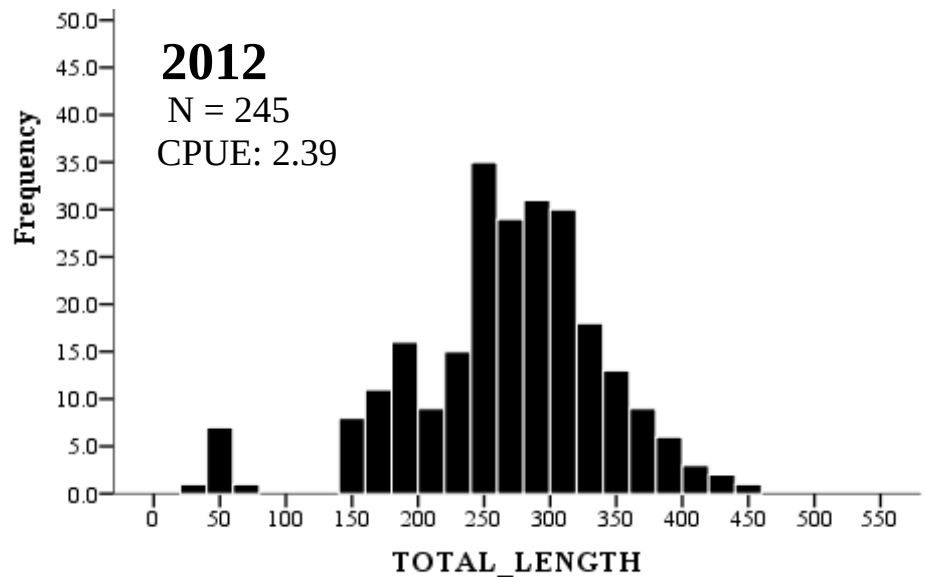
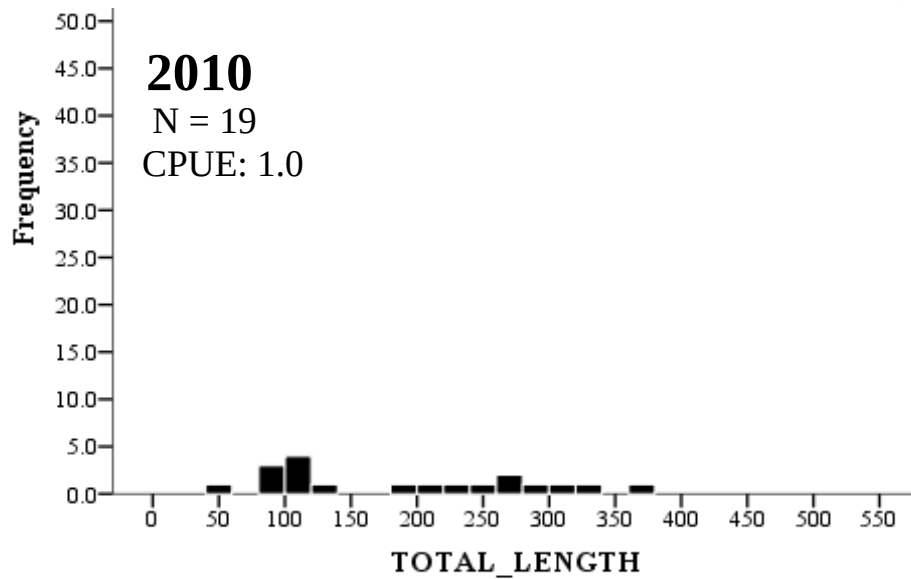


Preliminary data; do not cite

Pumpkin (2010-2013)

RM 212.5 – 216

Flannemouth Sucker

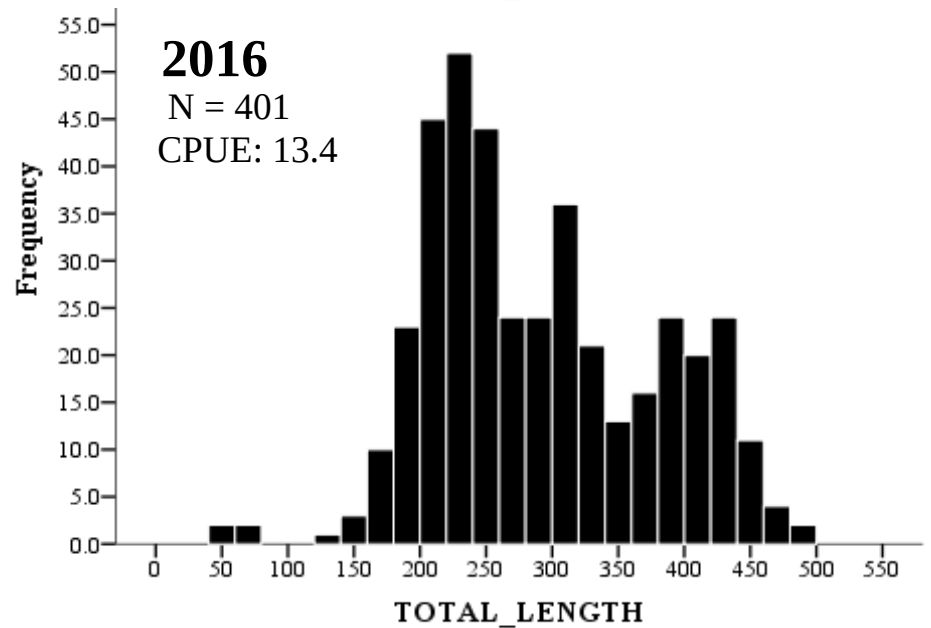
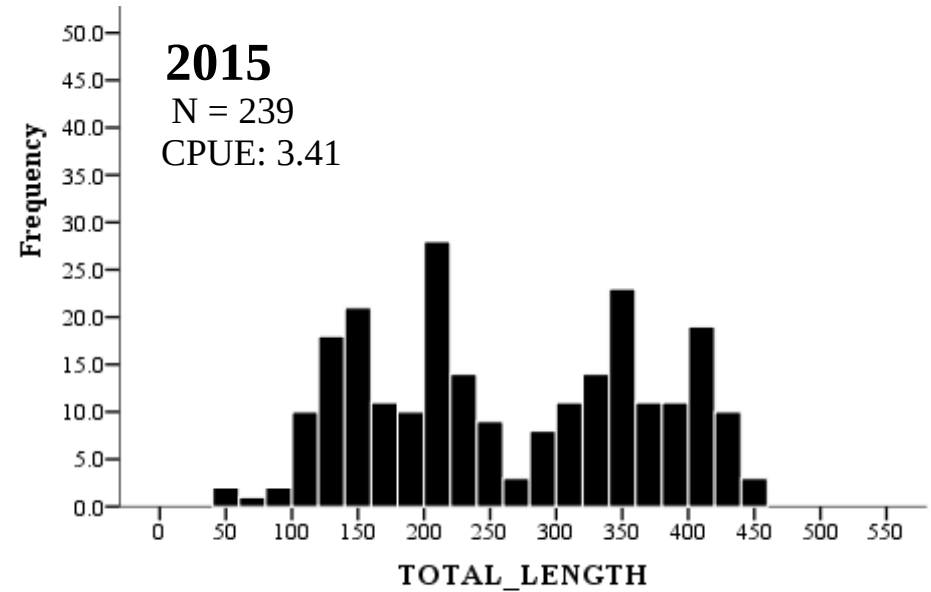
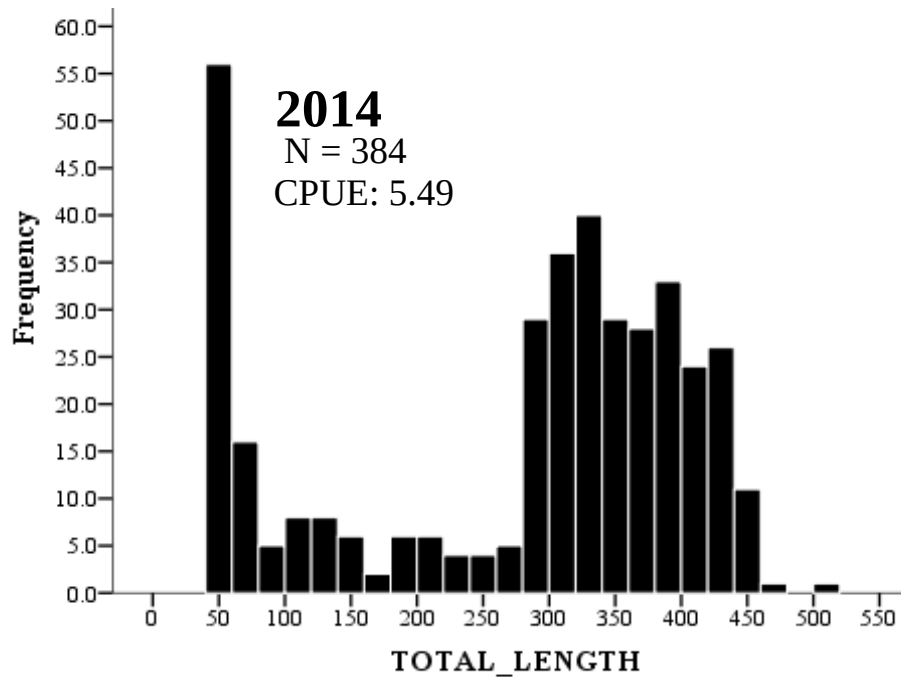


Preliminary data; do not cite

Pumpkin (2014-2016)

Flannemouth Sucker

RM 212.5 – 216

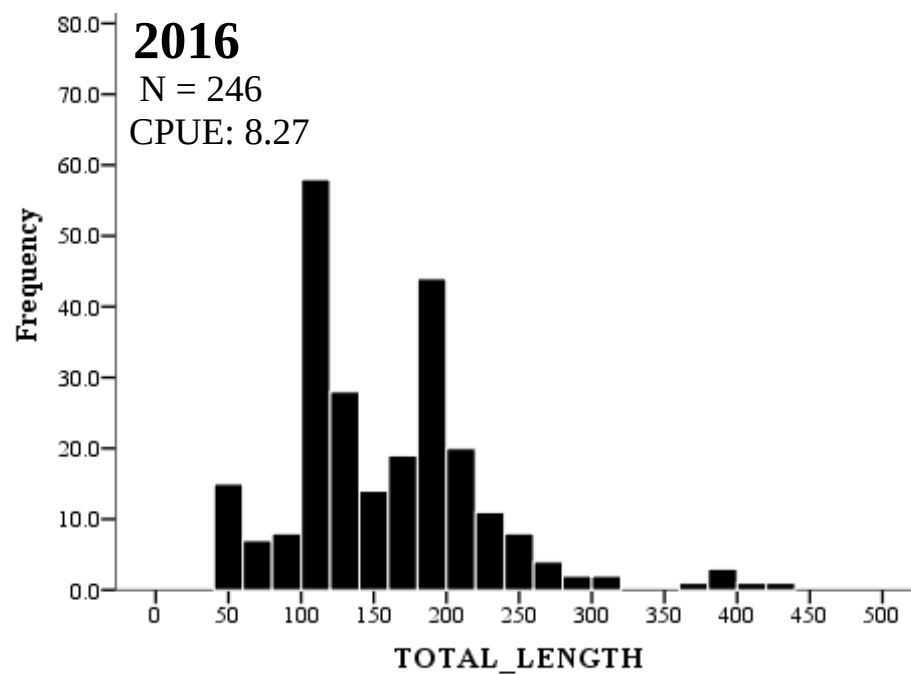
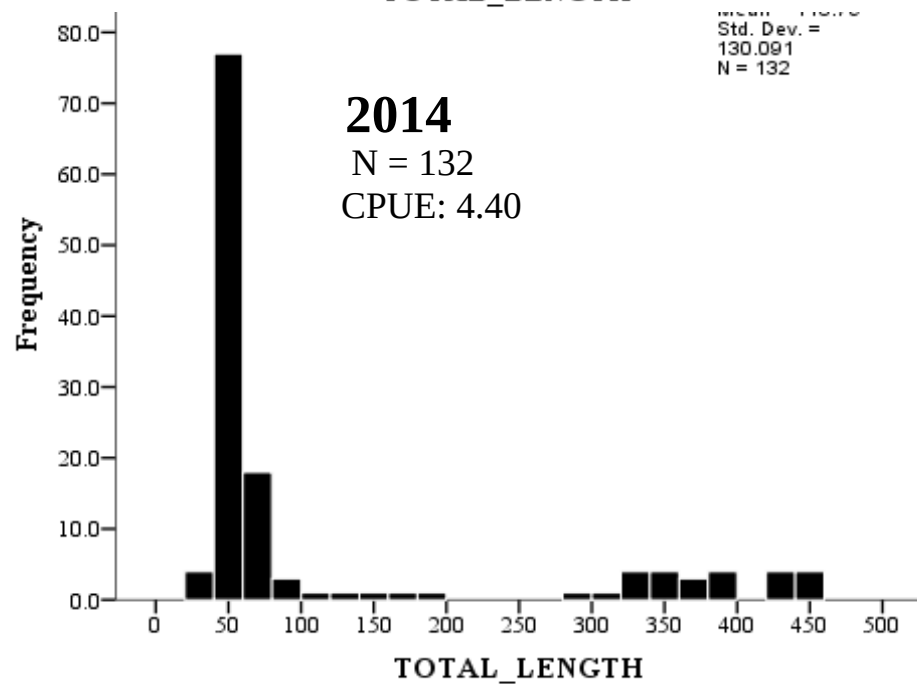
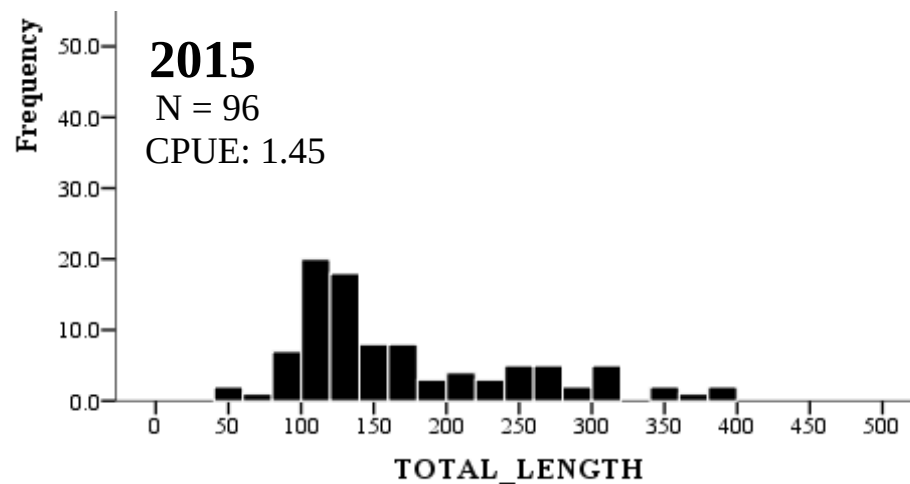
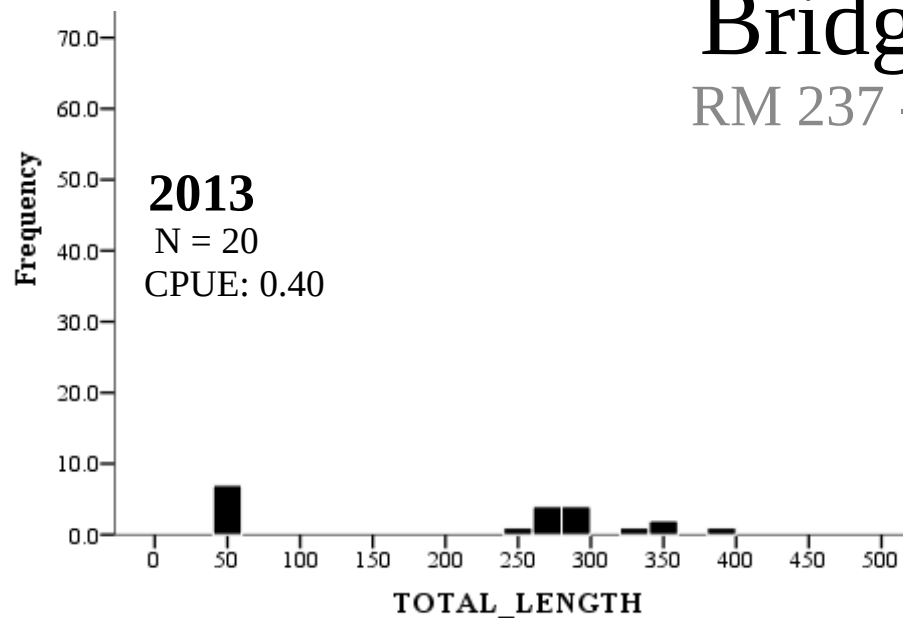


Preliminary data; do not cite

Bridge City

RM 237 - 244.99

Flannemouth Sucker

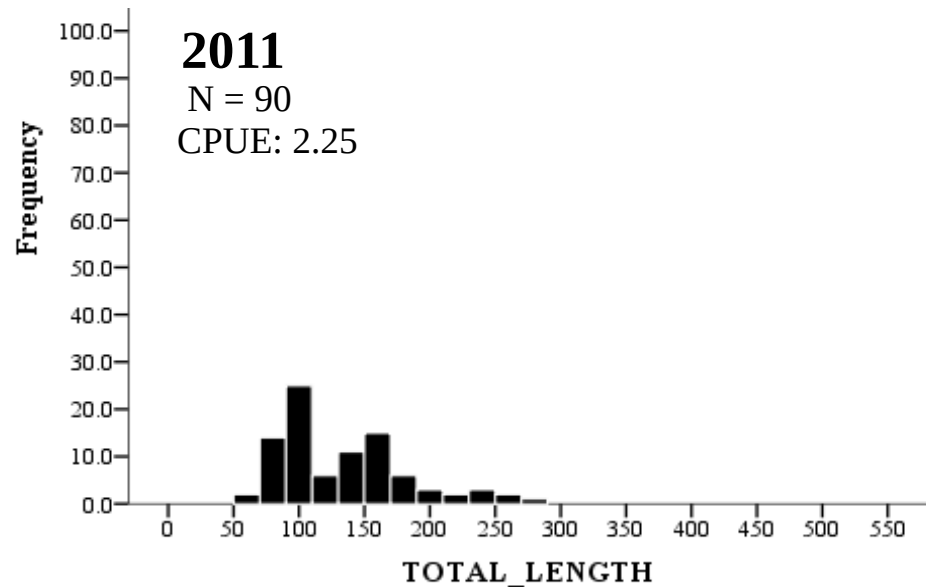
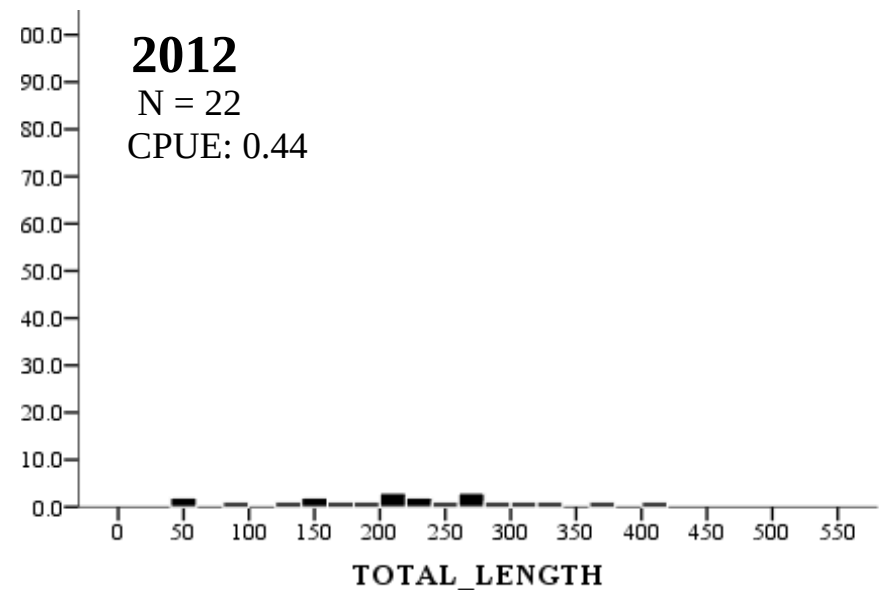
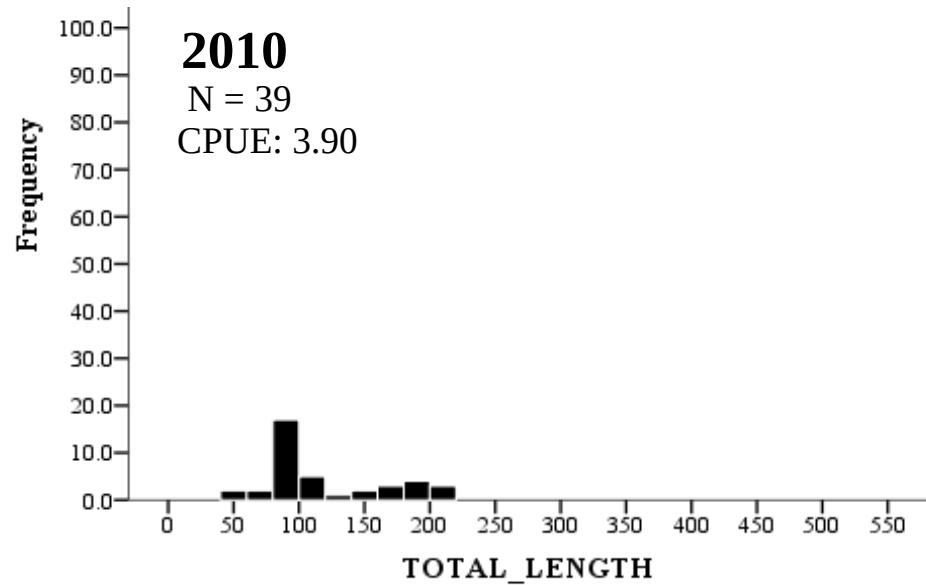


Preliminary data; do not cite

Spencer & Surprise (2010-2011)

RM 245 - 249.5

Flannemouth Sucker

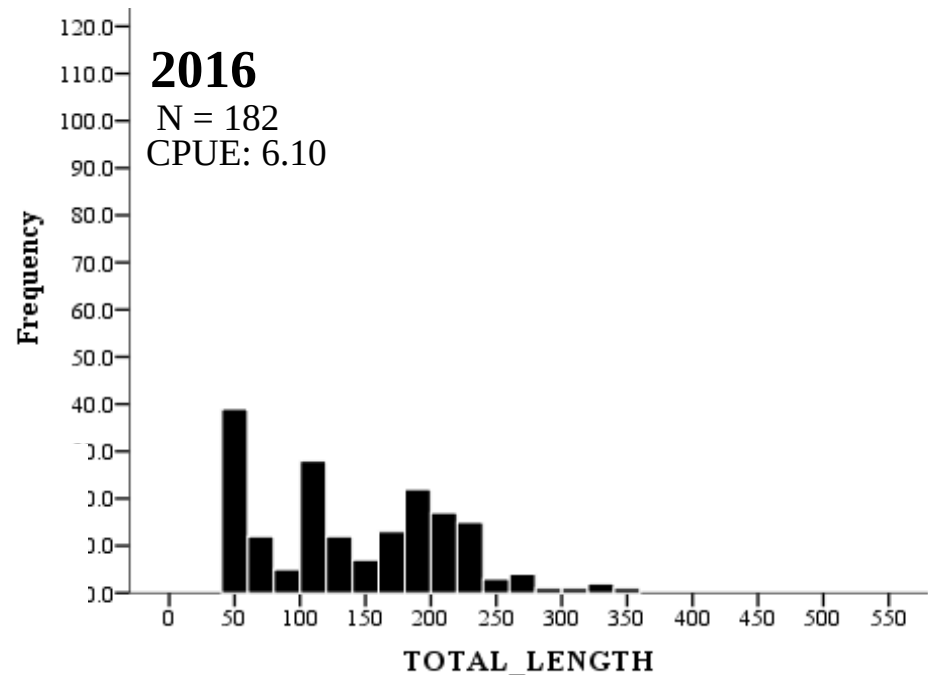
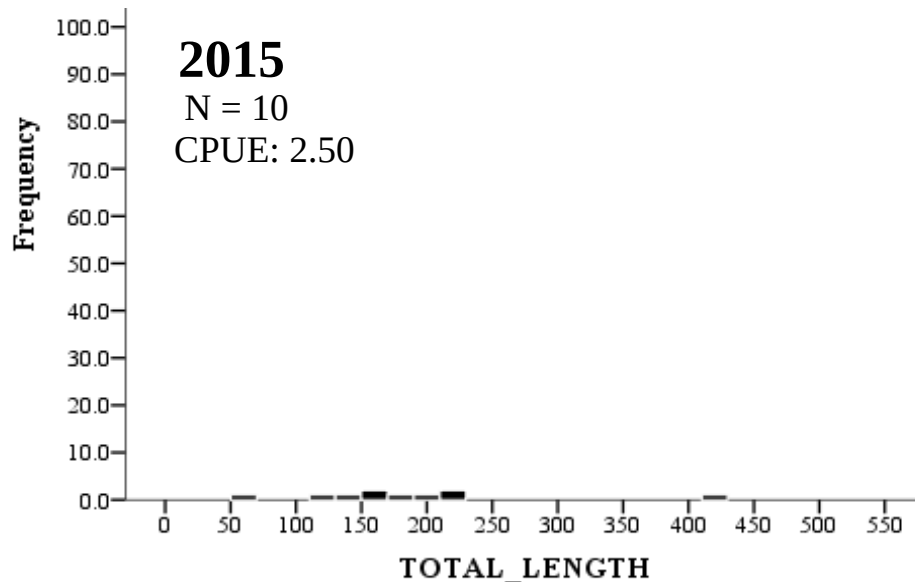
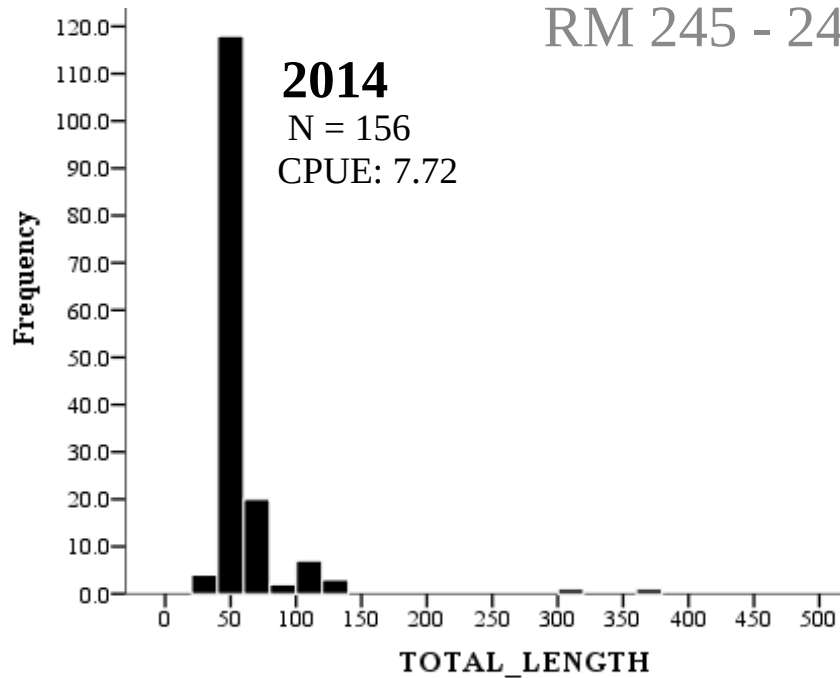


Preliminary data; do not cite

Spencer & Surprise (2014-2016)

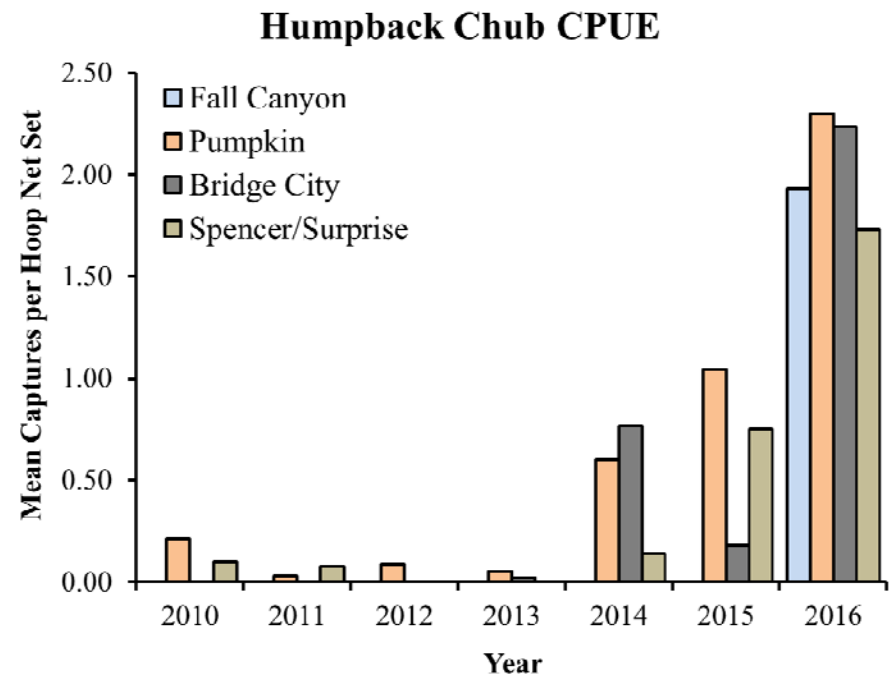
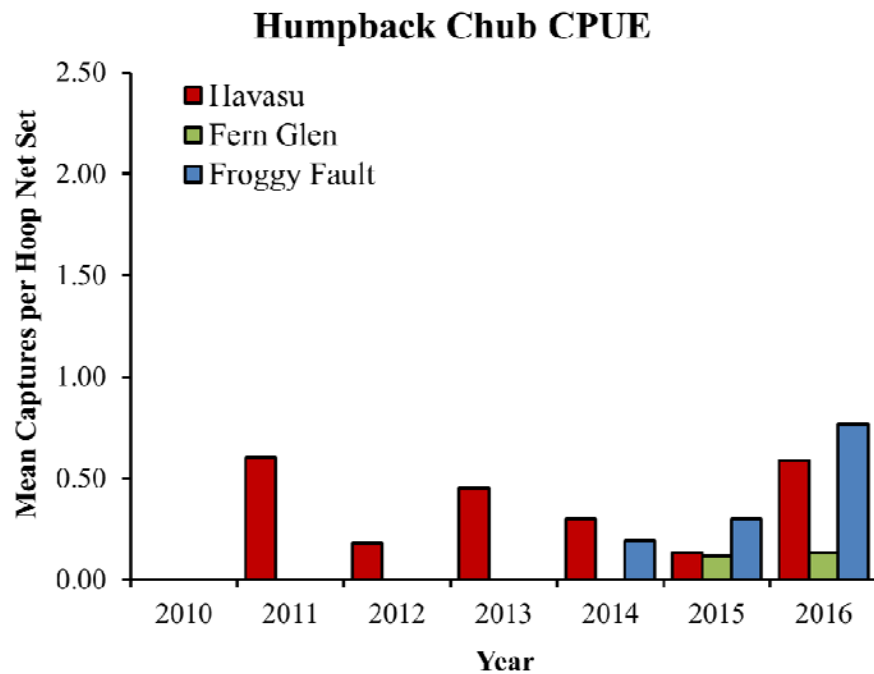
Flannemouth Sucker

RM 245 - 249.5



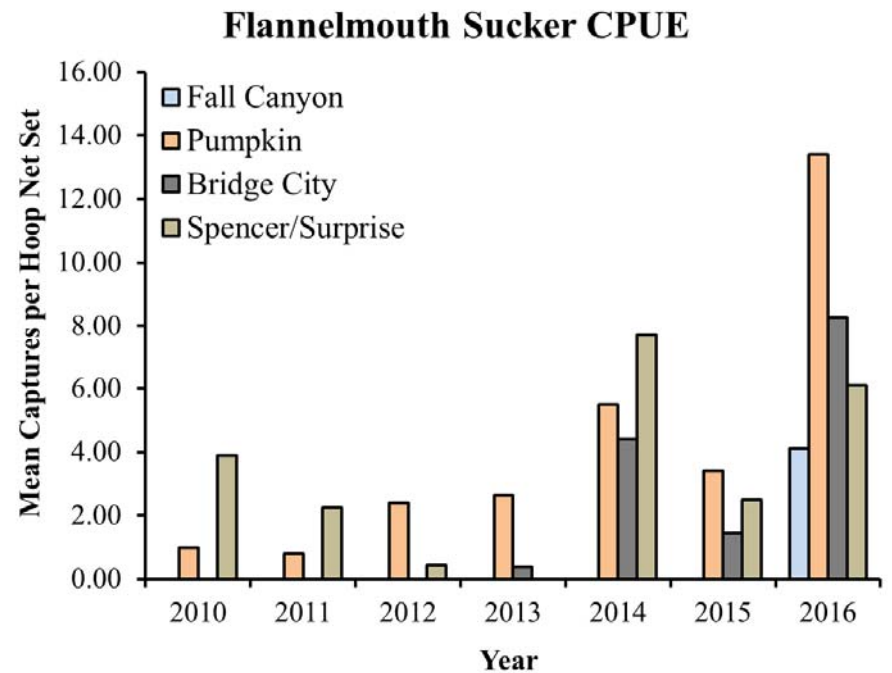
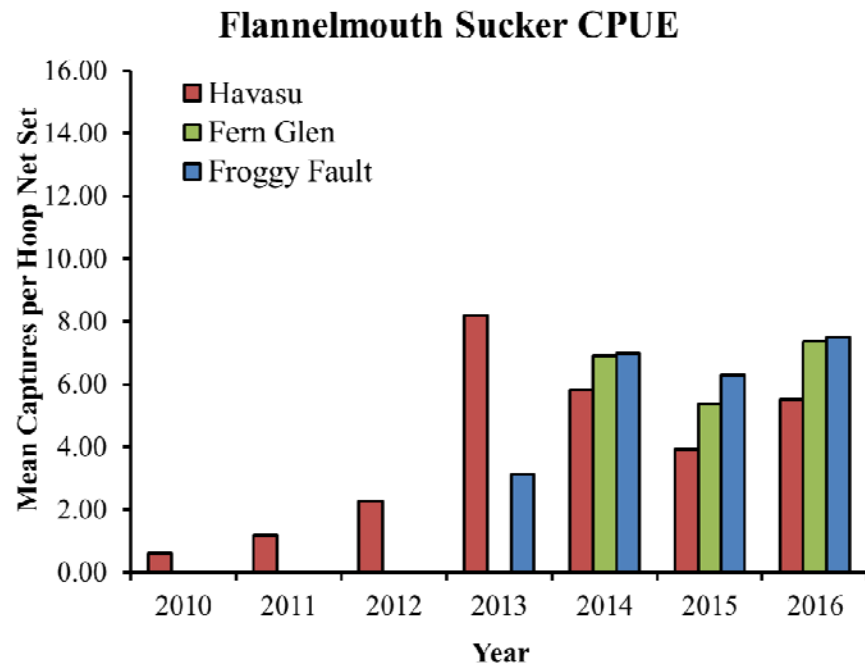
Preliminary data; do not cite

Humpback Chub CPUEs



Preliminary data; do not cite

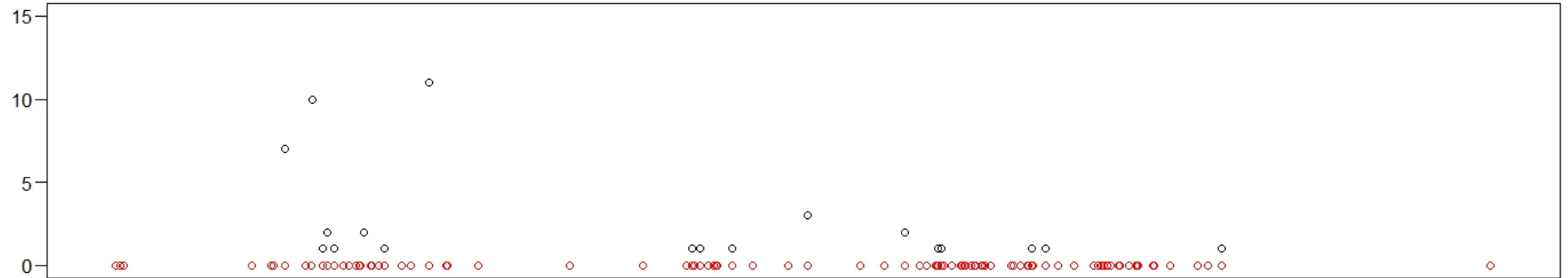
Flannemouth Sucker CPUEs



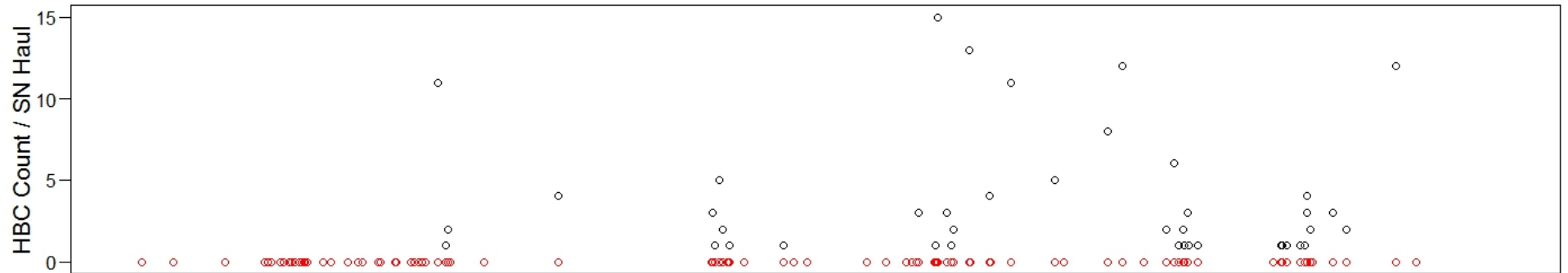
Preliminary data; do not cite

HBC Catch

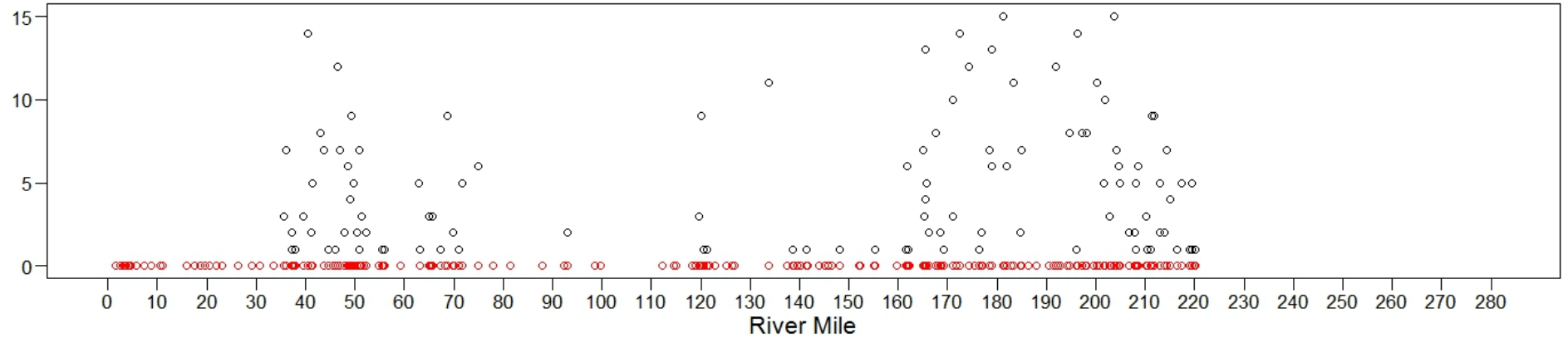
2009



2015

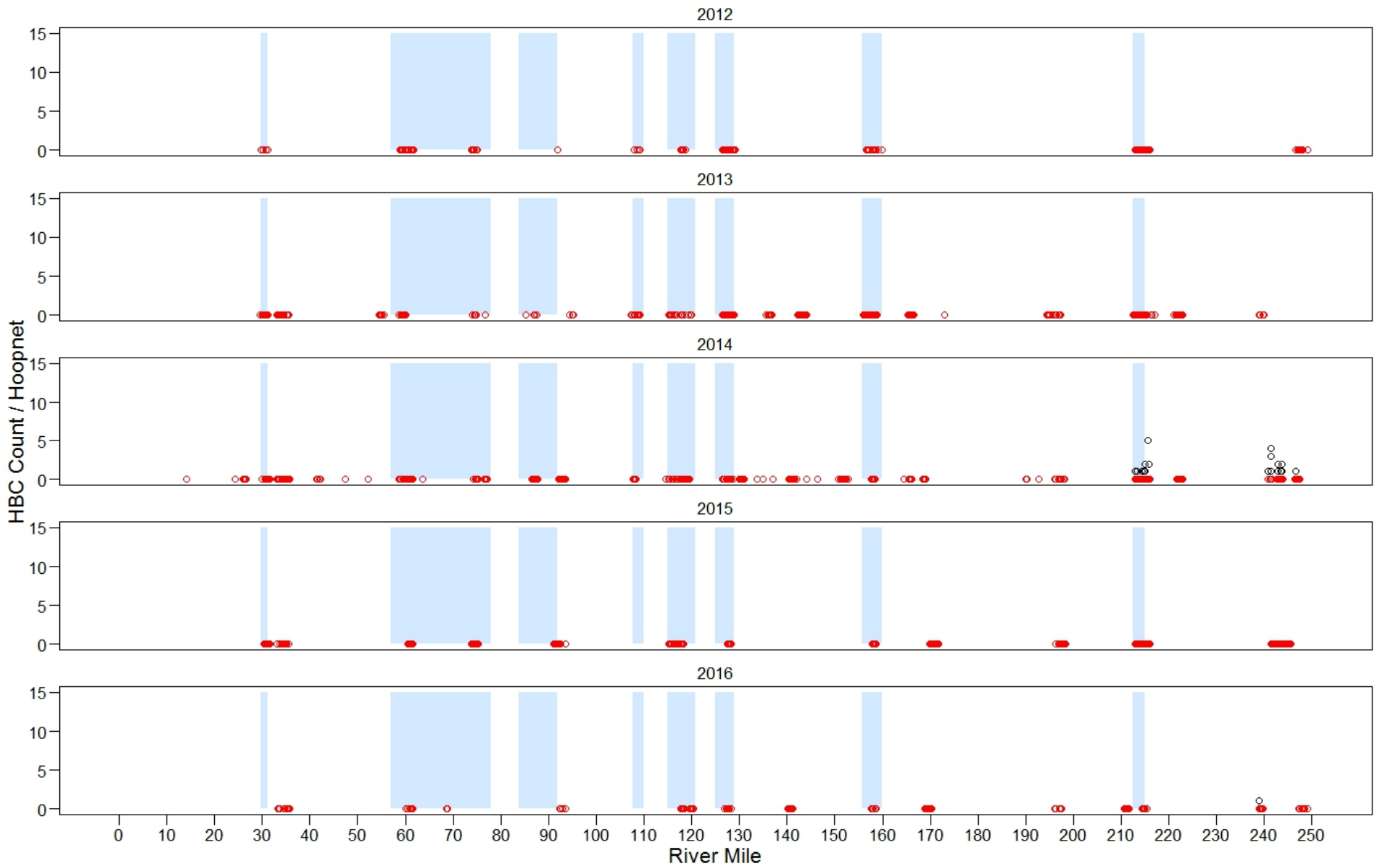


2016

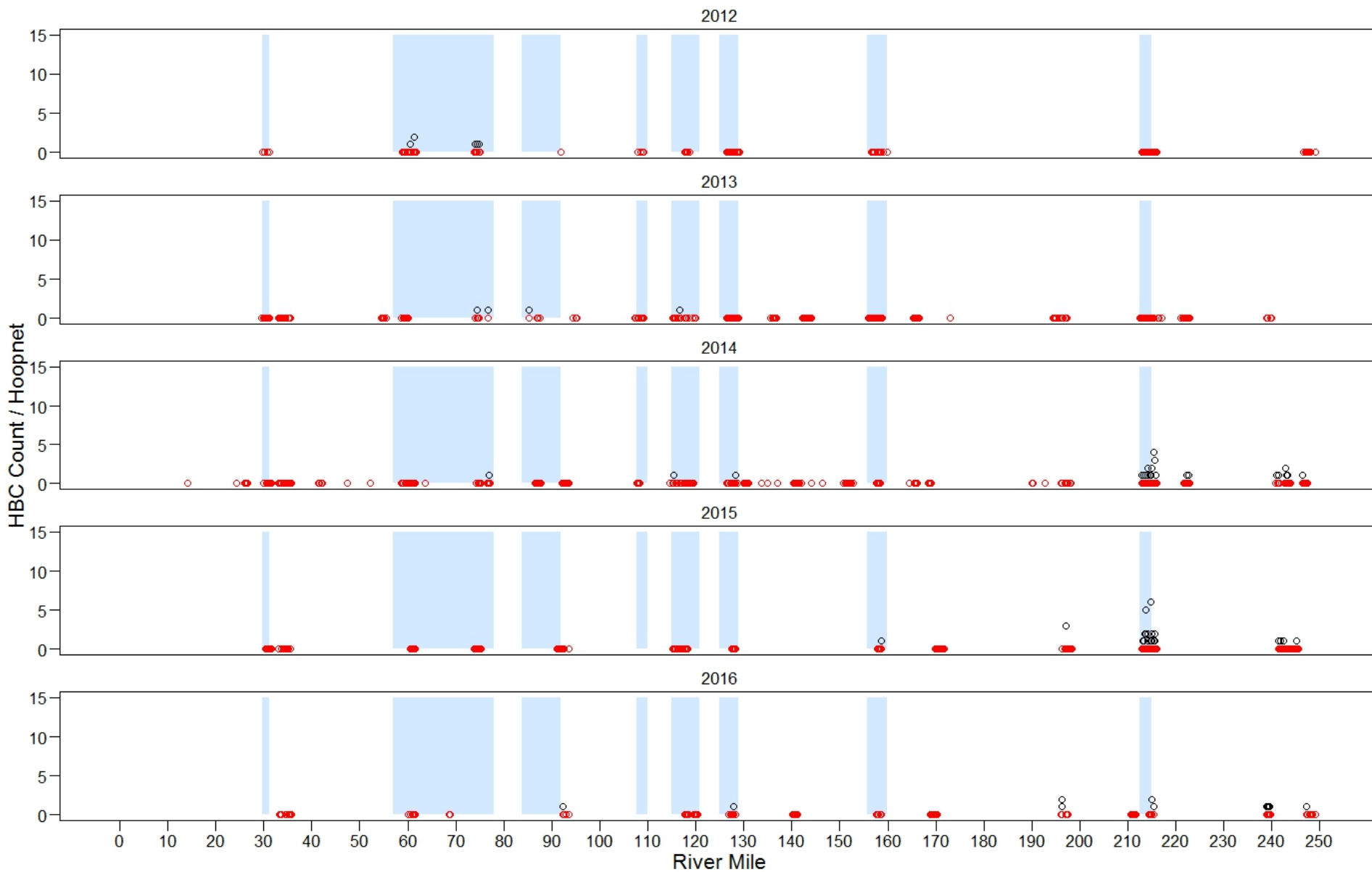


Preliminary data; do not cite

HBC Catch < 50 mm

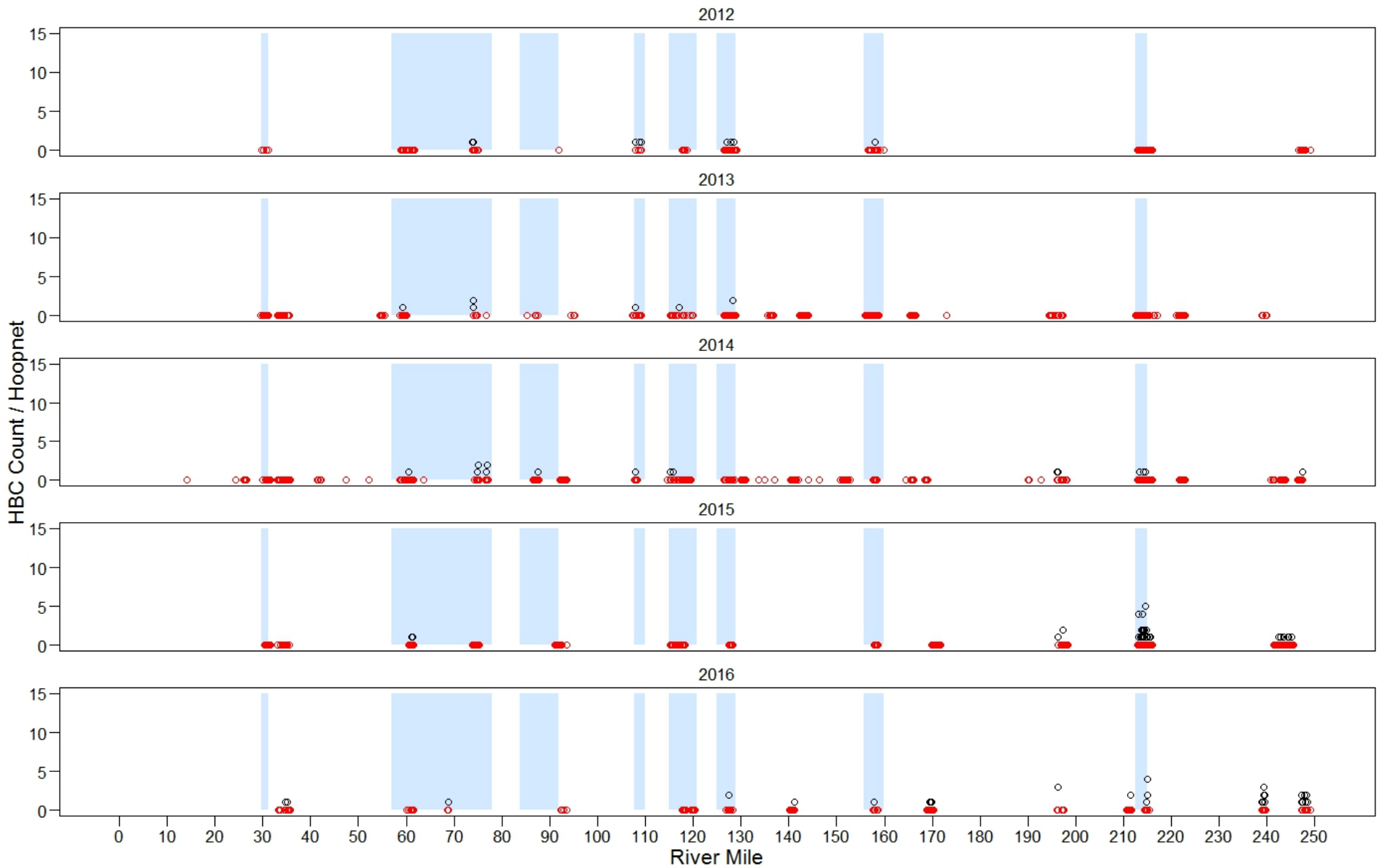


HBC Catch 50 - 100 mm



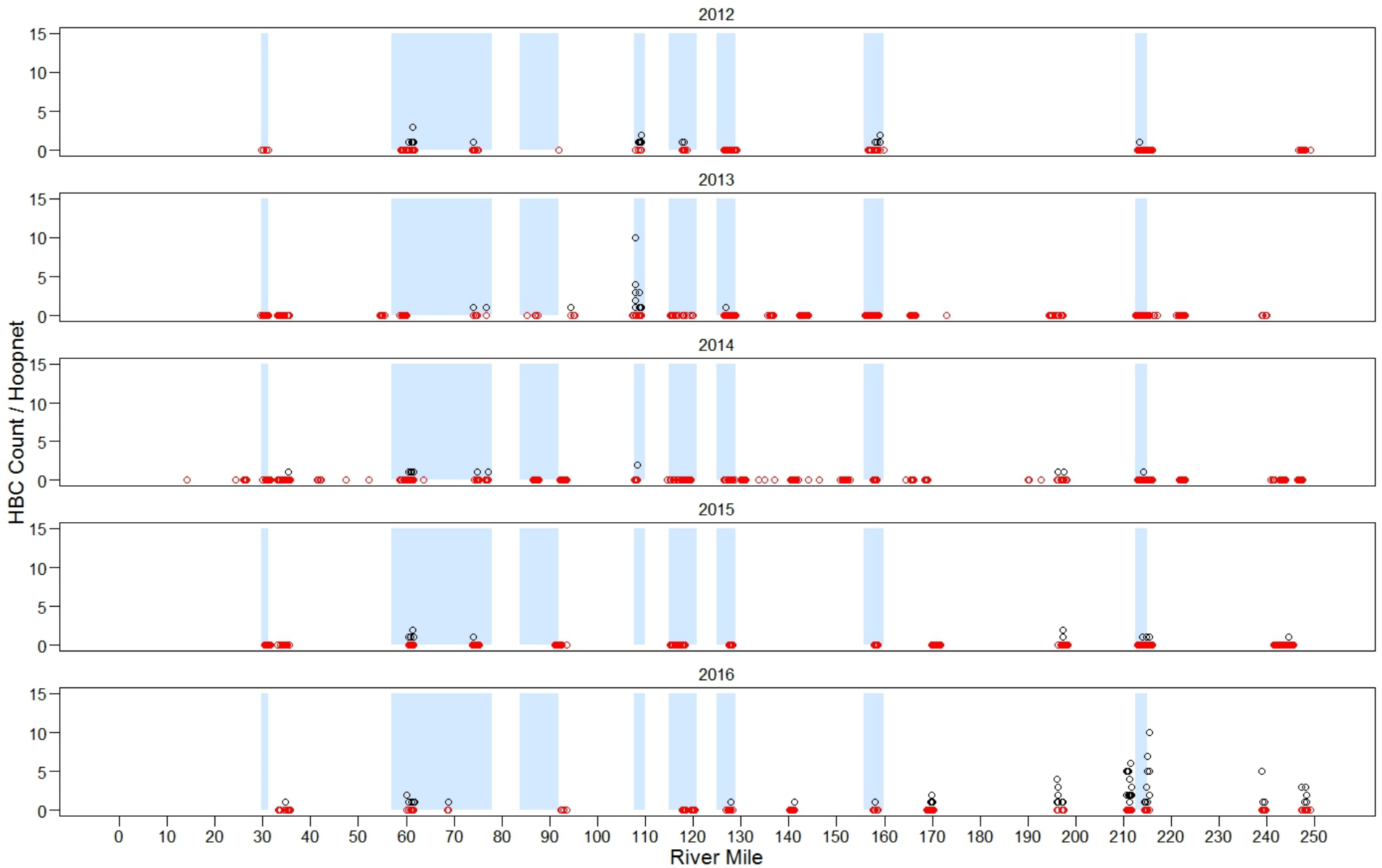
Preliminary data; do not cite

HBC Catch 100 - 150 mm



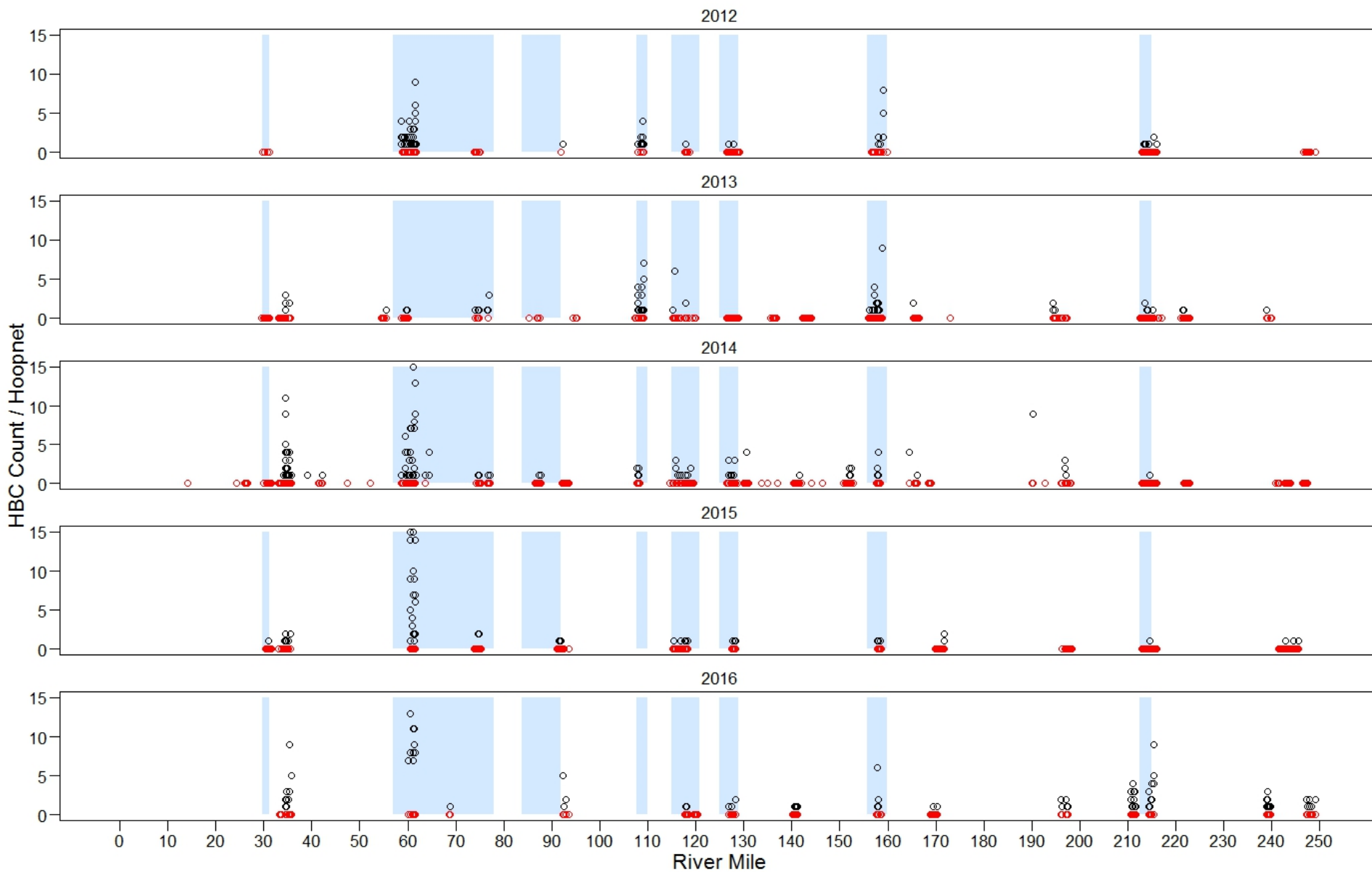
Preliminary data; do not cite

HBC Catch 150 - 200 mm



Preliminary data; do not cite

HBC Catch > 200 mm



Preliminary data; do not cite