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DEPARTMENT OF NATURAL RESOURCES
WILDLIFE RESOURCES DIVISION

Tim Bonvechio & Region IV Fisheries Management Section

Satilla River Flathead Catfish Removal Spring 2013 Update

Where did all the Rooster Reds go from the Satilla River?

Summary of Problem

- The first confirmed flathead catfish (*Pylodictis olivaris)* from the Satilla river was caught in June, 1996
- Tied back to initial 1994 year-class with lapilla otoliths (Age-14 fish found in 2008)

Impacts & Objectives

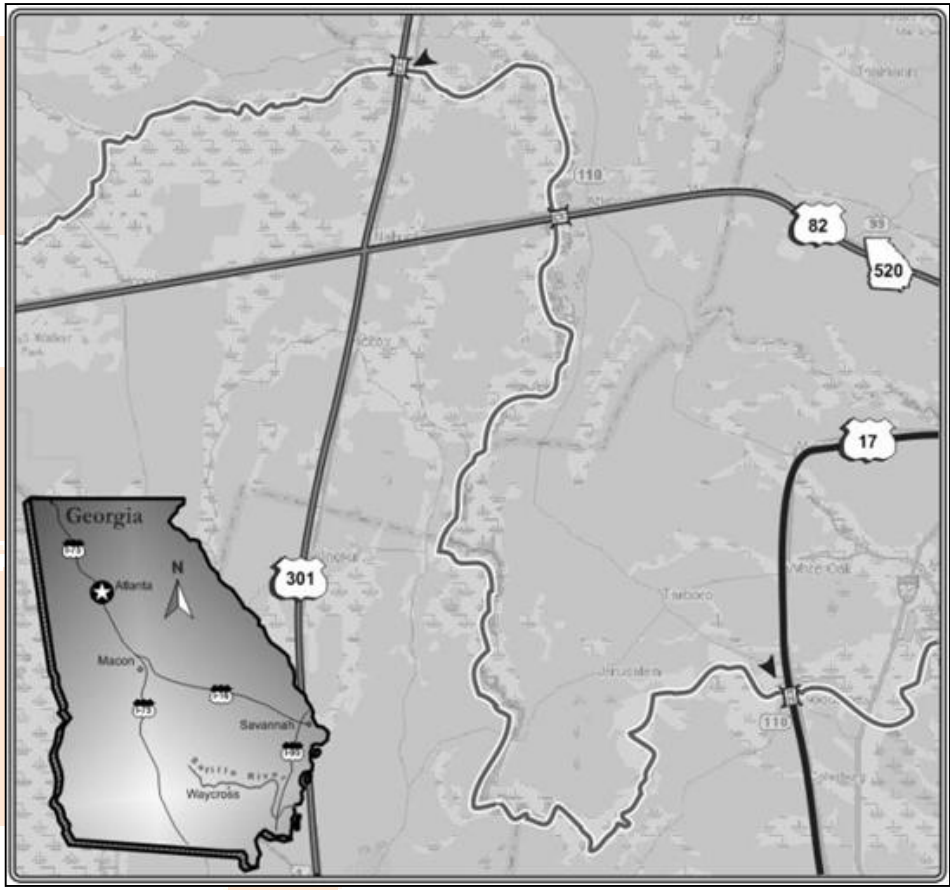
- Impacts on natives have occurred and been documented in peer reviewed pubs:
  - *2009 Proc. Ann. Conf. Southeast Assoc. Fish and Wildlife Agencies* 63:133-139*;*
  - *American Fisheries Society Catfish Symposium* 77:395-407-2011.
- Evaluate the effects of electrofishing removals on the annual survival, biomass, condition, relative abundance, size and age structure of flatheads in the Satilla River, Georgia

Regulations, Research & Action

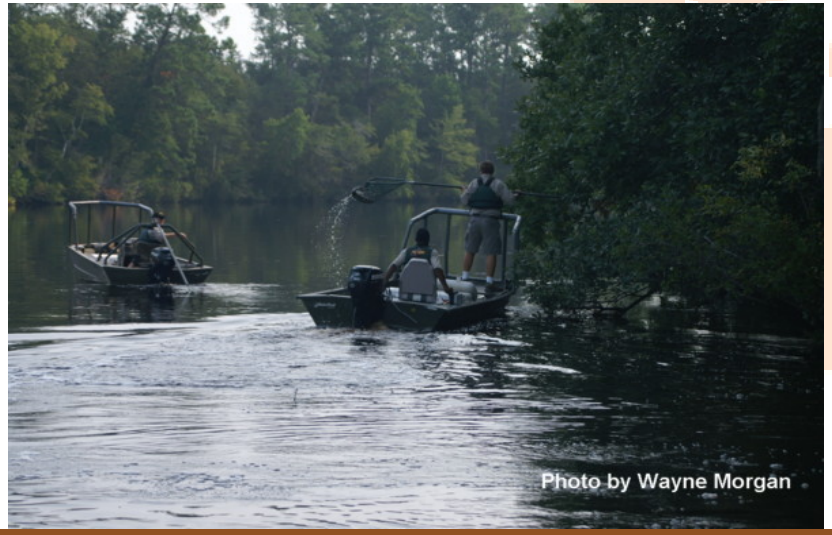
- No Regulations in place
- Sakaris et al. (2006) predicted a 75% reduction in the number of preferred size fish (I.e., 710mm TL) at a 26% exploitation rate
- As a result of these simulations, a strong public sentiment to rid the Satilla river of flathead catfish, a full-time crew was assembled by the GA DNR in fall of 2006.

Study Area

- The Satilla river originates in Southeast Georgia near Fitzgerald Georgia and flows 225 miles to the Atlantic Ocean
- Surrounded by cypress swamps, lowlands & planted pine ecosystems, as a result is a tannic-acid blackwater stream with a low pH (4.5-6.0)
- Primary substrate is sand with scattered sandstone and rubble patches
- The electrofishing is broken down into 11 river stretches encompassing a total of 129 river km.



METHODS



- Flathead catfish are captured using boats rigged with low amperage pulsed-DC electrofishing.

- The electrofishing boat operator travels slowly downstream followed by another person or two operating a chase boat that maneuvers to net flathead catfish as they come to the surface.

- Large Flathead Catfish are easily stunned by the very low-amperage pulsed DC.

- Larger boats are used in the lower river section where the river is larger.

Photo by Wayne Morgan

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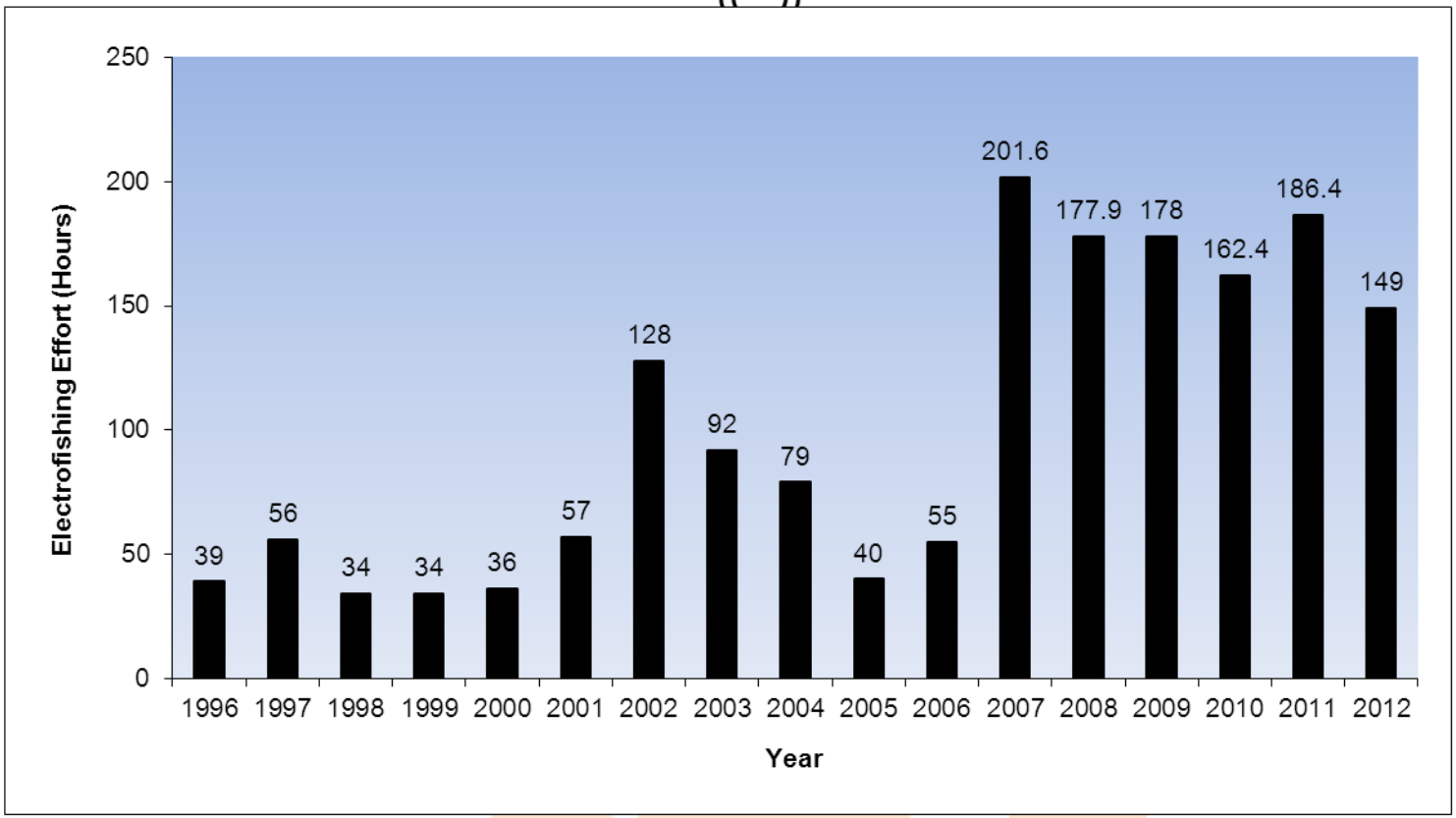
Results



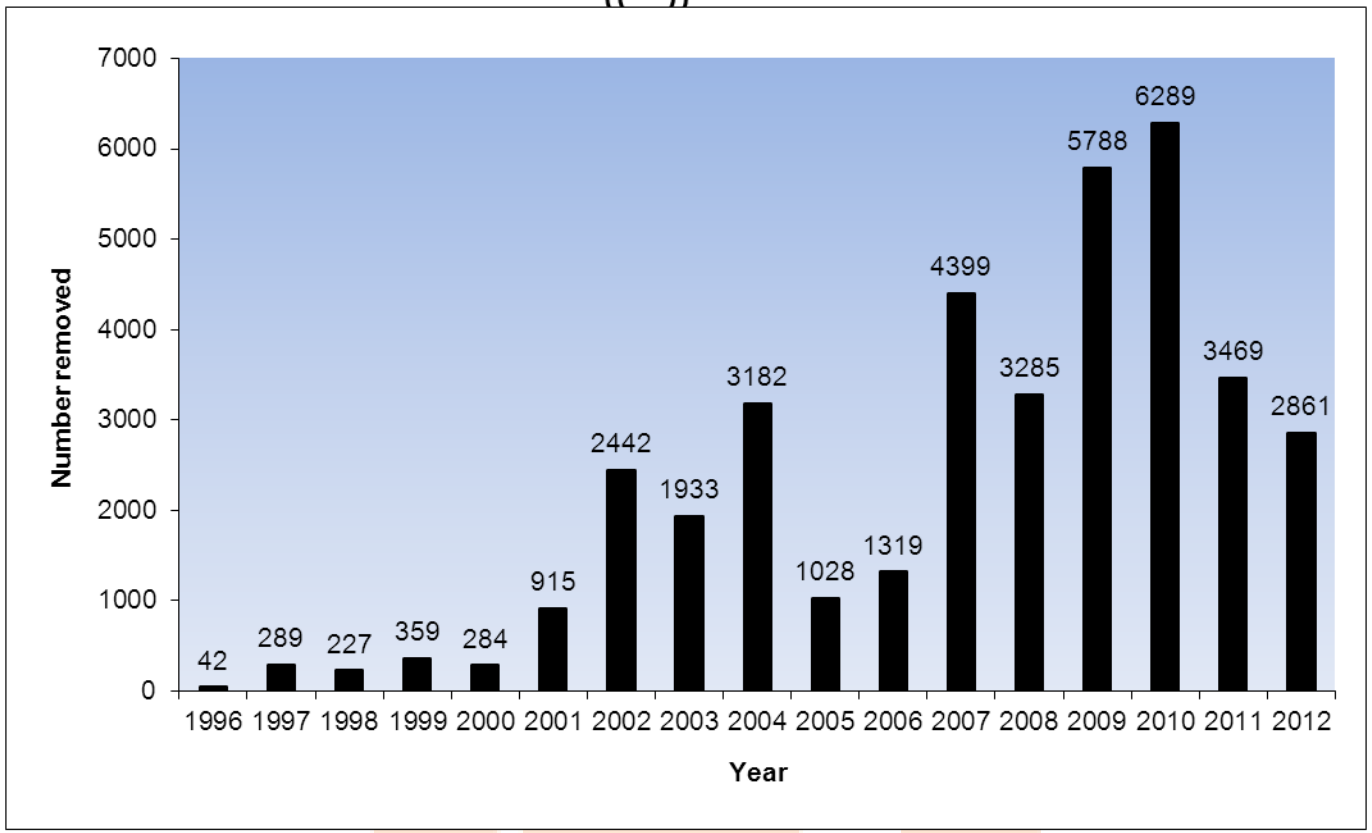



Effort



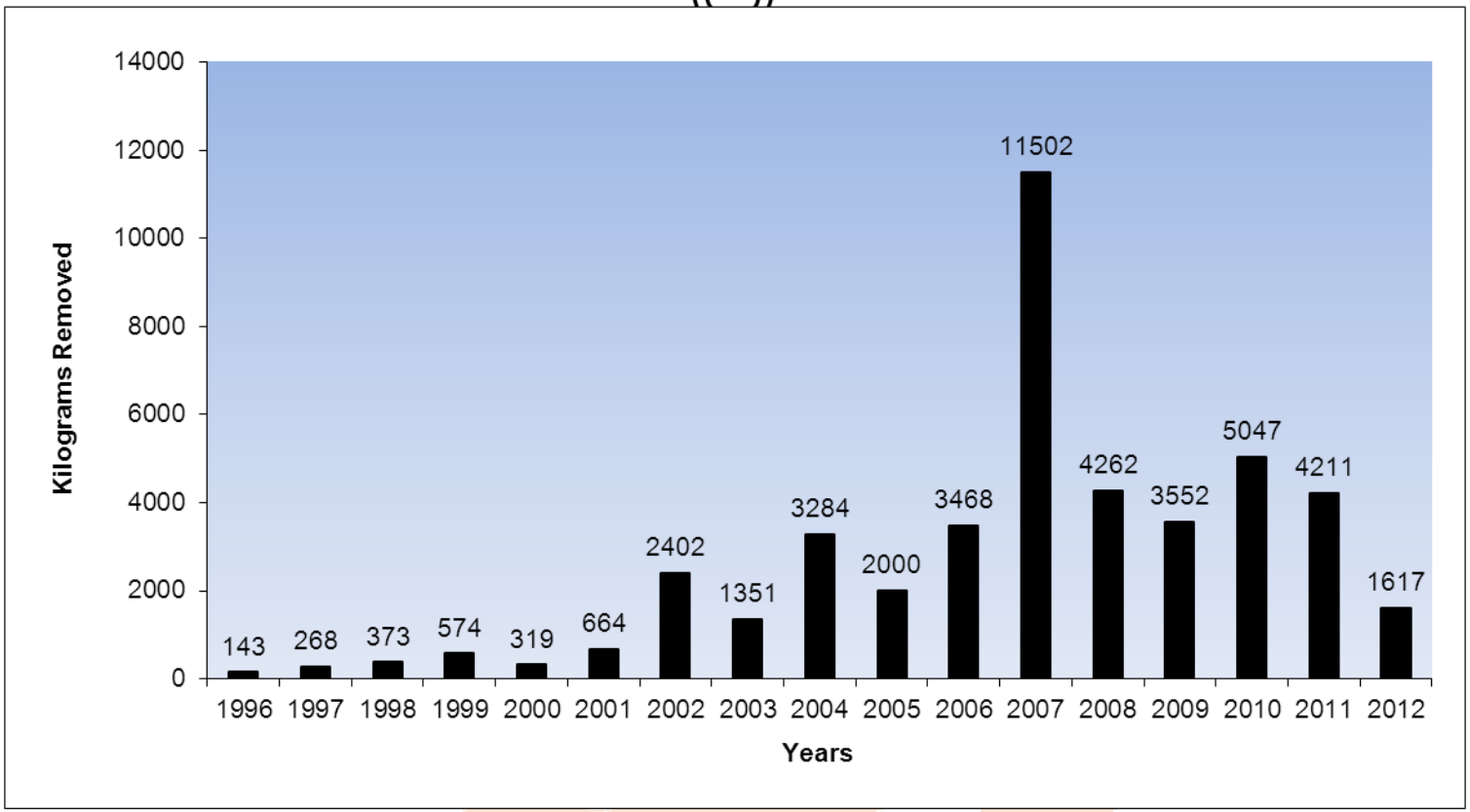
- Effort has remained fairly constant for the past 6 years, although this year we only did 4 complete passes on the 11 sections of the river.
- Due to time we did away with a 5th and 6th pass in the lower river.

Number Removed



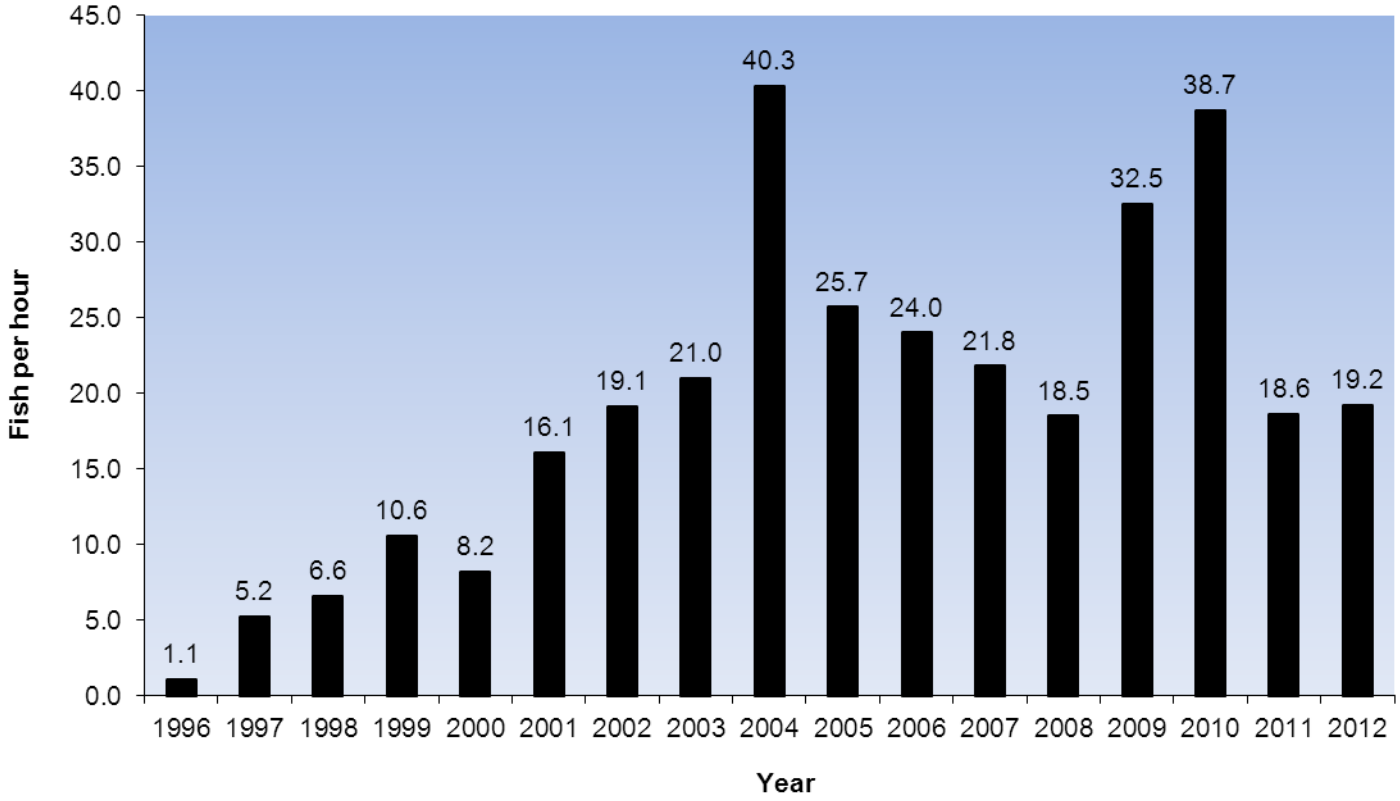
- 12,020 fish removed from 1996-2006 (11 years)
- 26,091 fish removed from 2007-2012 (6 years)

Weight Removed



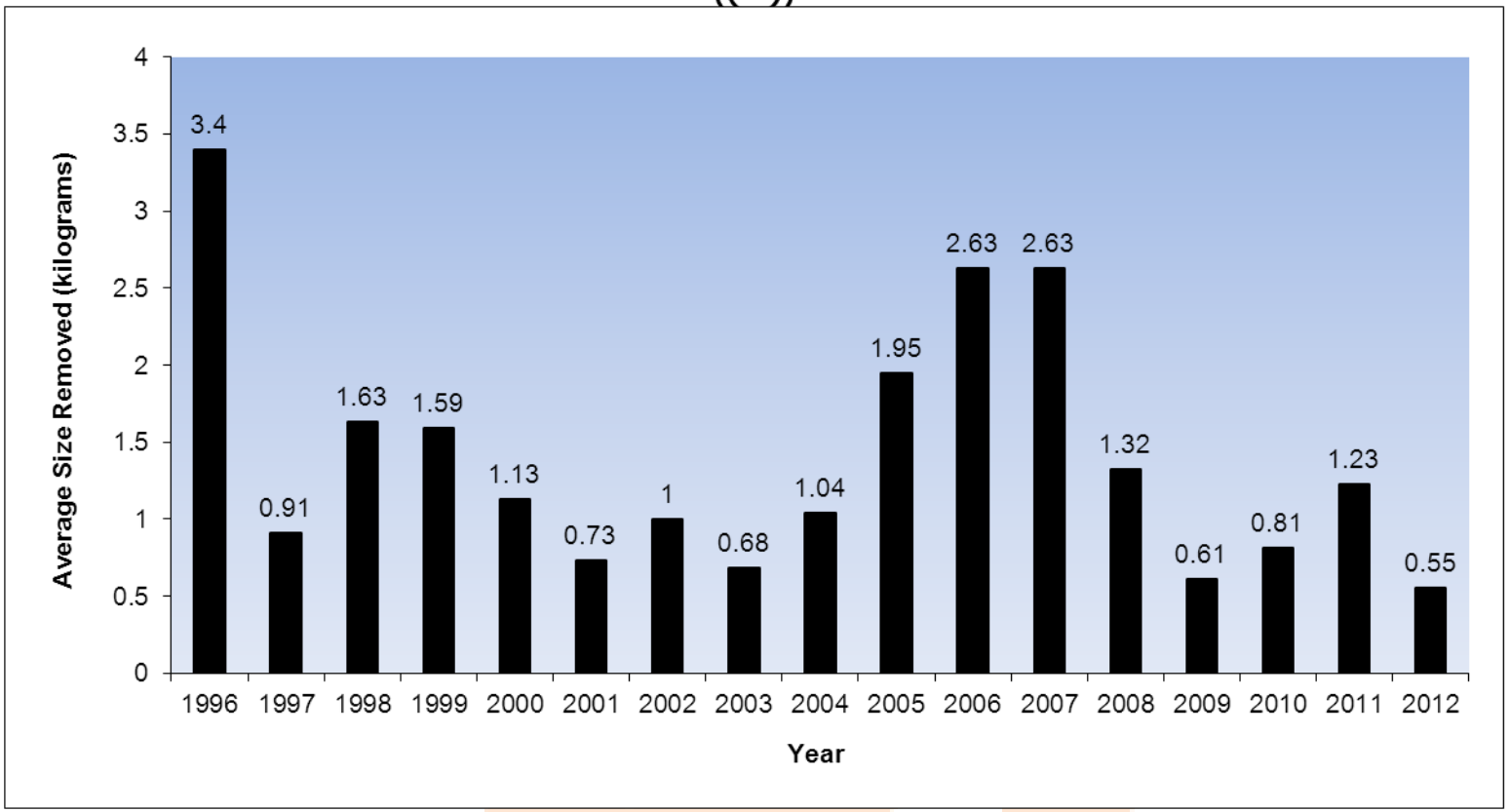
- To date over 45,043 kgs have been removed from the river from 1996 to 2012. That's over 99, 223 pounds!

Relative Abundance



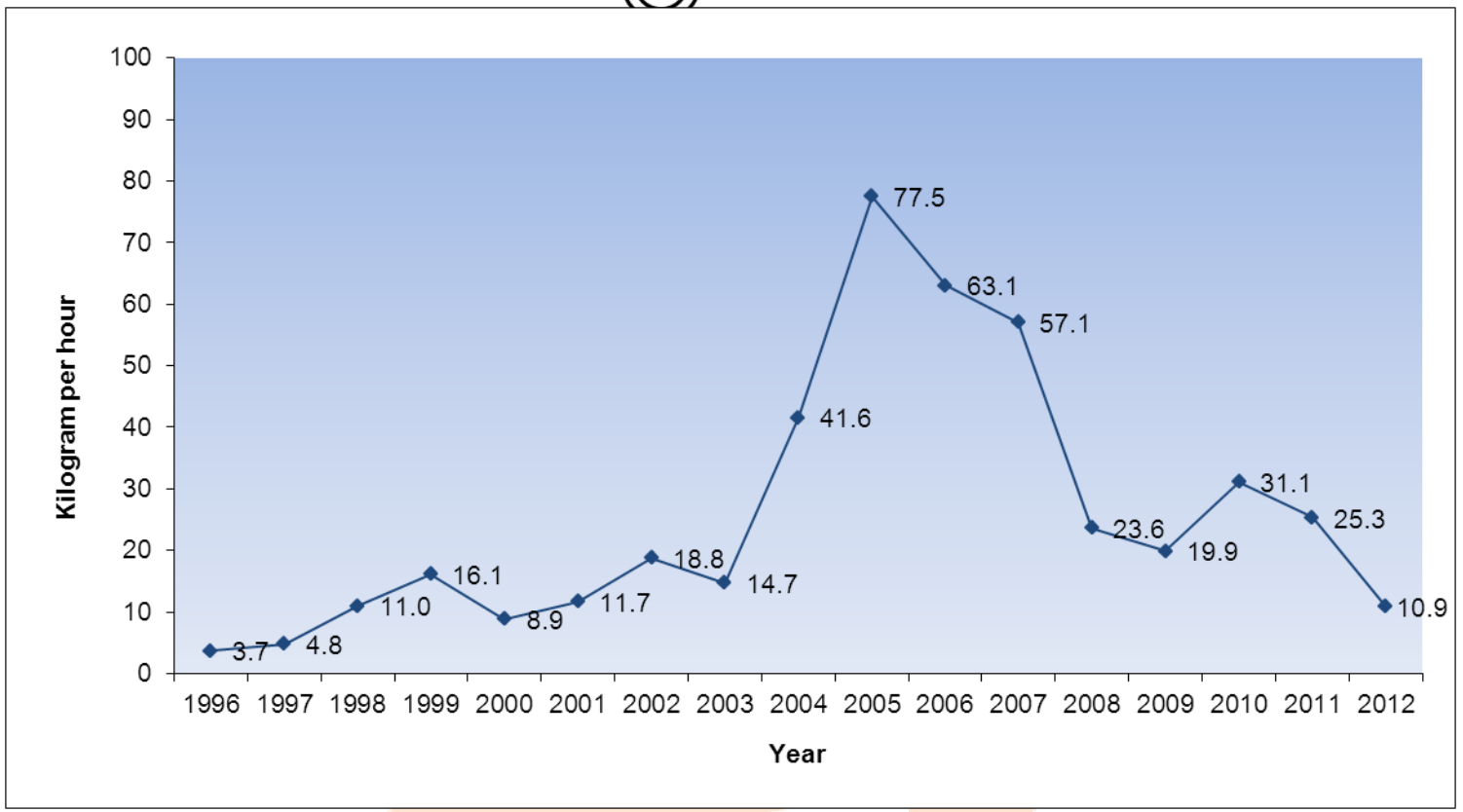
- **Electrofishing catch rate was similar to 2008, & 2011.**
- **Is catch rate affected by water level (CFS), since the FHC population has been reduced?**

Average Size Flathead Removed



- The average size of flathead harvested decreased from 2.6 kg in 2007 to 1.3 kg in 2008, to 0.6 kg in 2009, but increased to 0.8 in 2010 to 1.23 in 2011 and 0.55 in 2012.

Biomass per Effort

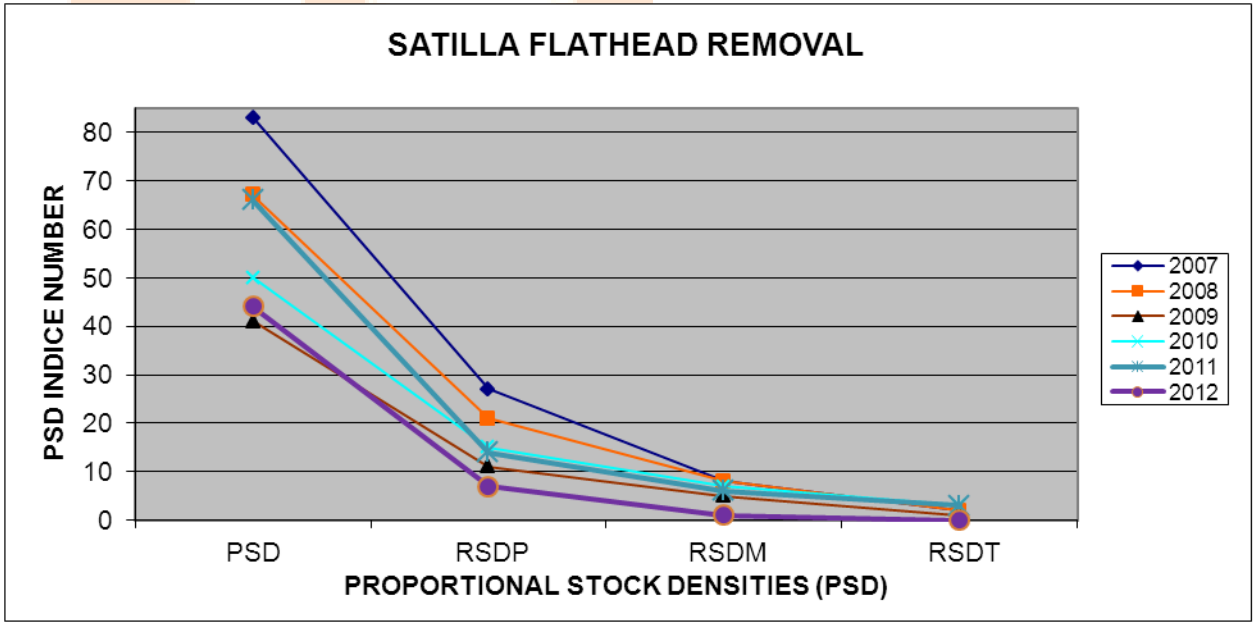


- **Total biomass per effort (kg/hr) peaked in 2005 @ 77.51 kg/hr, but has declined down to a manageable 10.9 kg/hr.**

Proportional Stock Densities (PSD)'s

2007	2008	2009	2010	2011	2012
$PSD_{(510)}$ = 83	$PSD_{(510)}$ = 67	$PSD_{(510)}$ = 44	$PSD_{(510)}$ = 50	$PSD_{(510)}$ = 65	$PSD_{(510)}$ = 44
$RSD_{P(710)}$ = 27	$RSD_{P(710)}$ = 21	$RSD_{P\ (710)}$ = 11	$RSD_{P\ (710)}$ = 15	$RSD_{P\ (710)}$ = 13	$RSD_{P\ (710)}$ = 7
$RSD_{m(860)}$= 8	$RSD_{m(860)}$= 8	$RSD_{m(860)}$= 5	$RSD_{m(860)}$= 7	$RSD_{m(860)}$= 5	$RSD_{m(860)}$= 1
$RSD_{t(1020)}$= 2	$RSD_{t(1020)}$= 2	$RSD_{t(1020)}$= 1	$RSD_{t(1020)}$= 3	$RSD_{t(1020)}$= 2	$RSD_{t(1020)}$= 0

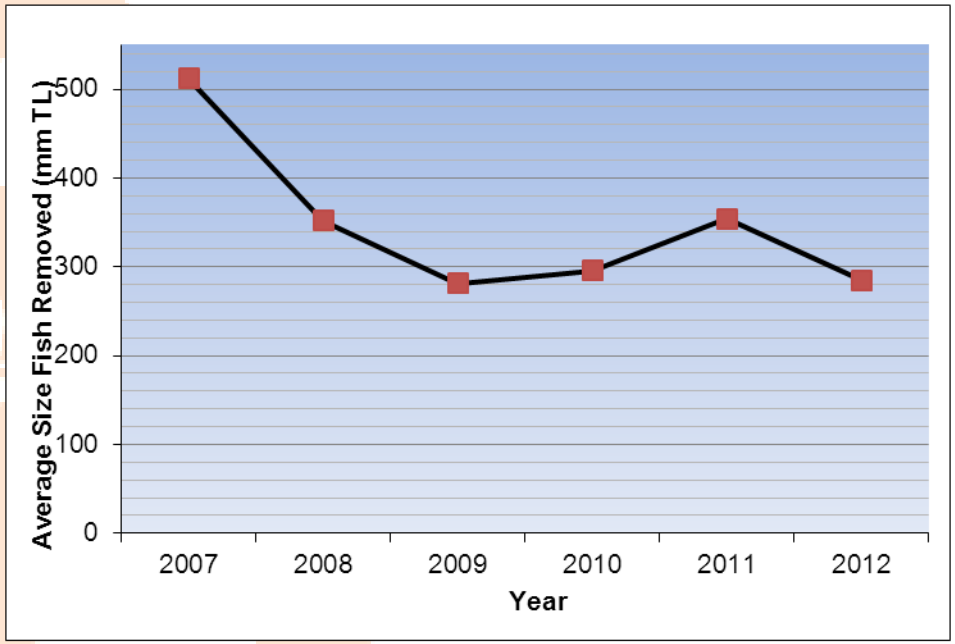
All PSD categories had declined significantly from 2007 through 2009 but increases in all categories were noted for 2010 and some increased in 2011 but all have declined in 2012.



Size Structure

- Mean length of capture appears to be declining

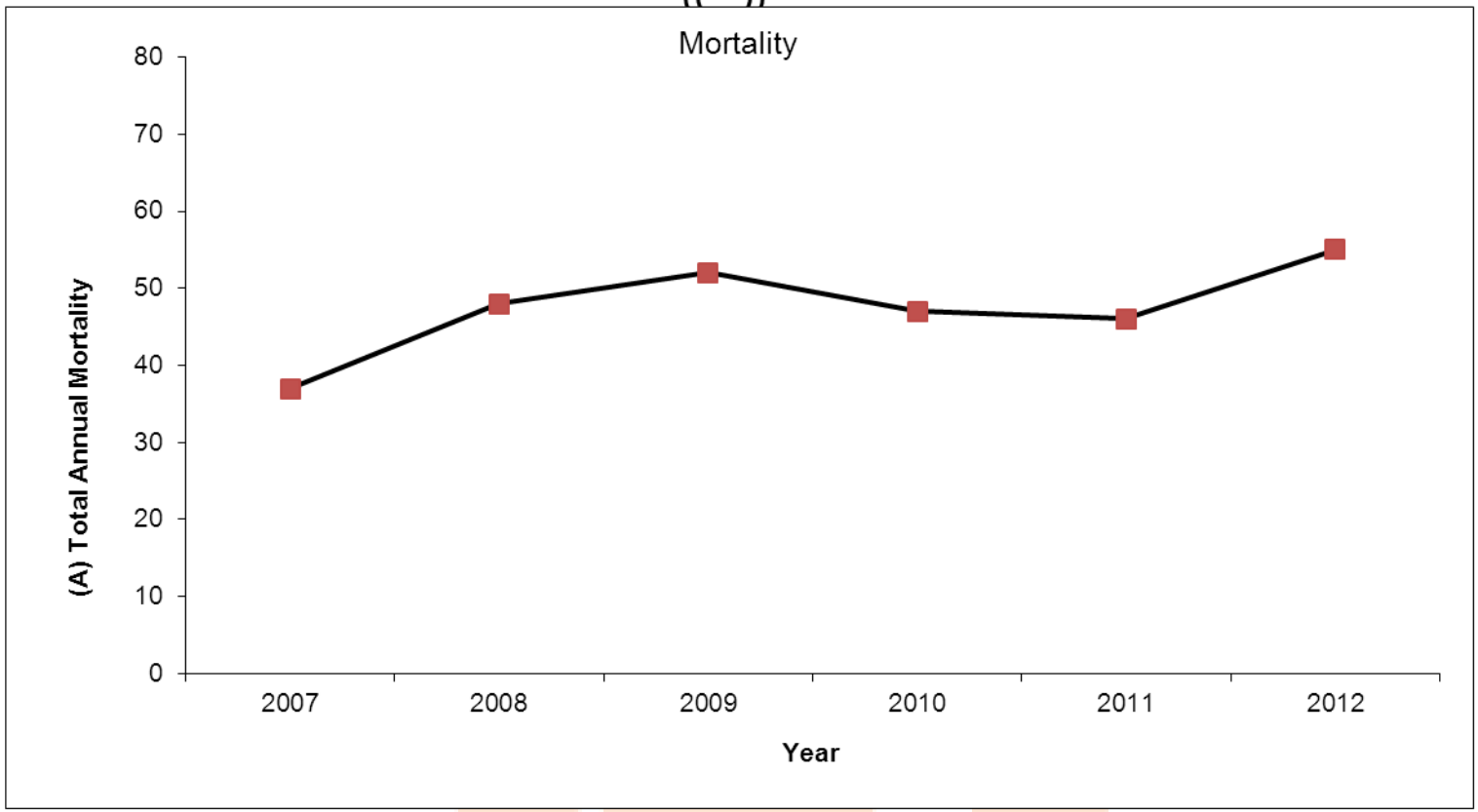
- 2007- 512 mm TL (20 inches)
- 2008- 352 mm TL
- 2009- 281 mm TL
- 2010- 296 mm TL
- 2011-354 mm TL
- 2012-285 mm TL (11 inches)



Aging

- 26,091 fish were removed from 2007-2012
- Size and weight of individual flatheads ranged from 60 to 1192mm TL and 0.001 to 25.8 kg, respectively
- 1,908 lapillae otoliths were extracted from 2007-2012
- Fish were aged up 14+ (1994 year-class, 2008 sample)

Mortality



Total annual mortality estimates (*A*) from catch curves have been estimated at 0.37, 0.48, 0.52, 0.47, 0.46 and 0.55 from 2007-2012.

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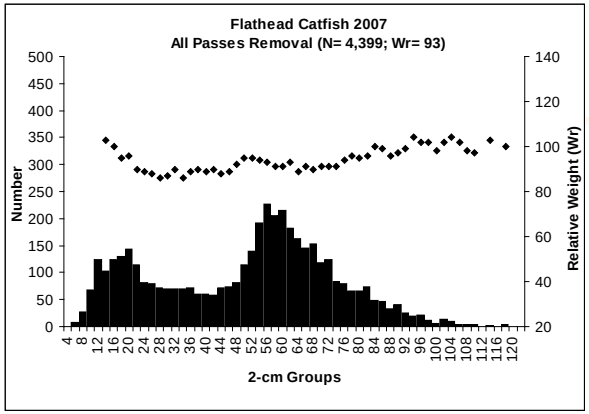
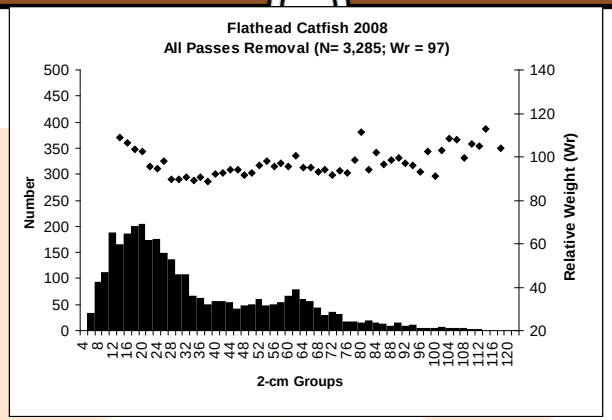
Length Frequencies from Removal



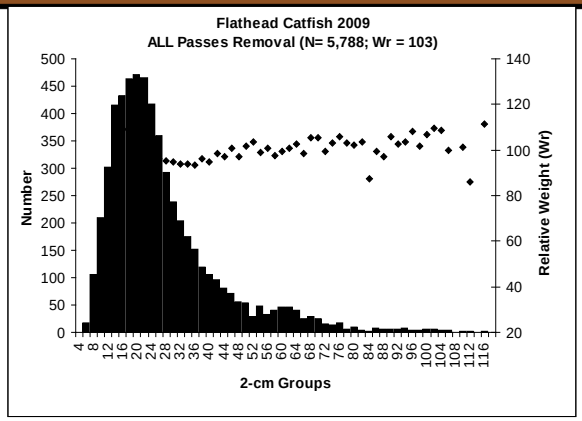
2007

N= 4,399



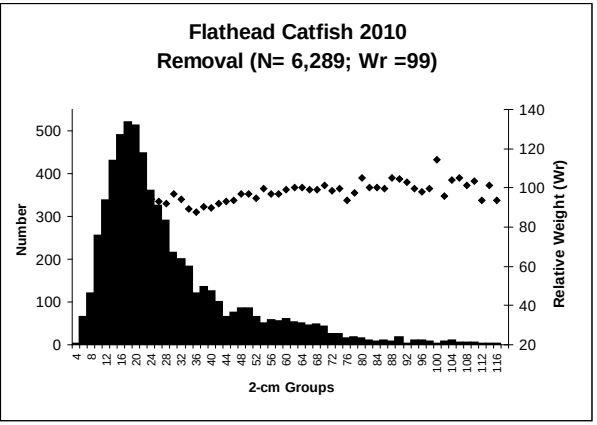
2008

N= 3,285



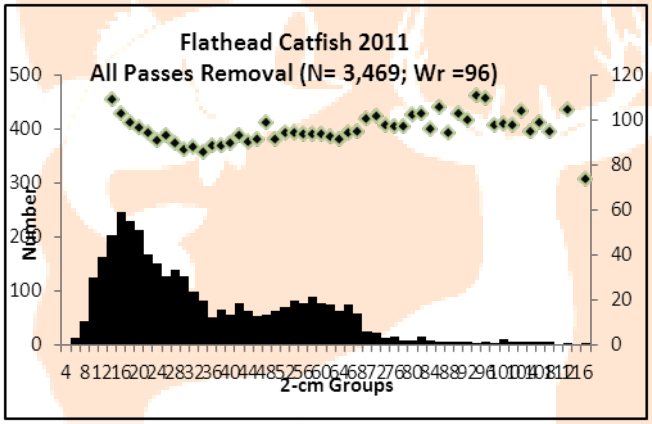
2009

N= 5,788



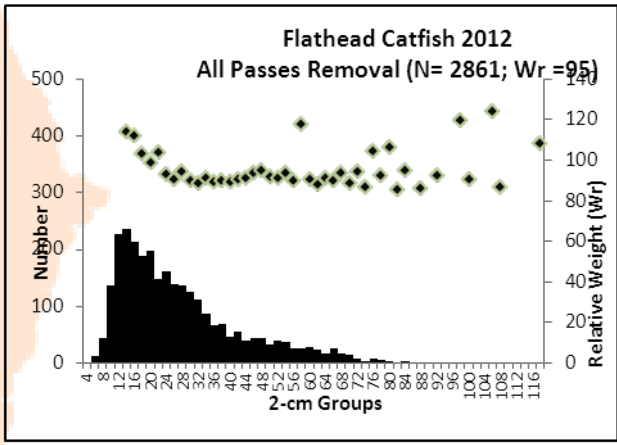
2010

N= 6,289



2011

N= 3,469



2012

N= 2,861

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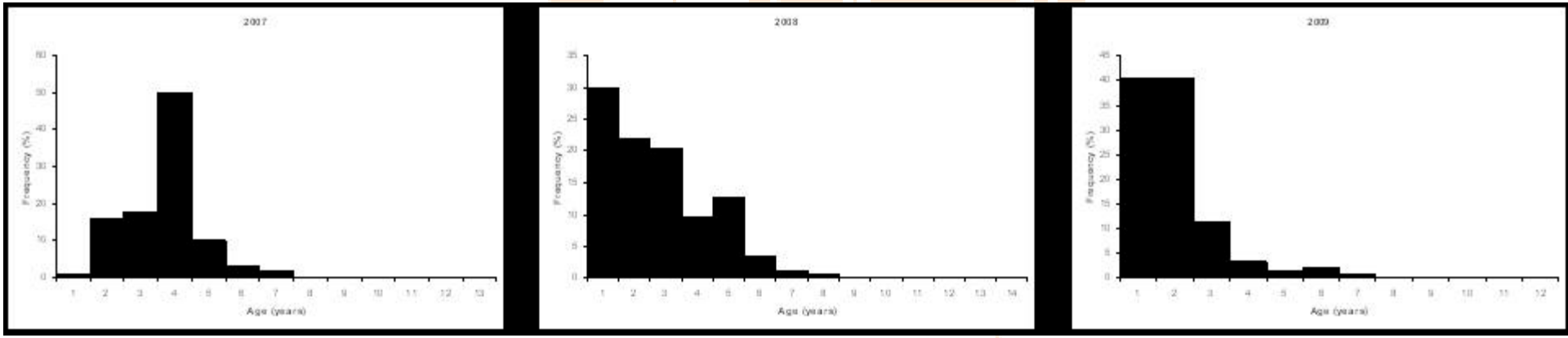
Age Structure Data 2007-2009

- Age structure data according to the catch-curve was very similar in shape to the length-frequency distributions among the 5 years (2007-2011)
- In 2007, 15% of population was made up of age-1 & age-2 fish, and it was dominated by a strong 2003 year-class of age-4 fish (50%), and 5% of sample consisted of fish Age-6 or older
- In 2008, the strong 2003 year-class of now Age-5 fish was still present and made up 13% of the sample and the same amount of older fish (>age-6) still comprised 5% of the sample, but the population began to show signs of being heavily exploited, because 50% of the catch was now age-1 & age 2 fish.
- In 2009, the age-structure data revealed a typical population that has received high exploitation, characterized by a large numbers of small fish (<356mm TL), with over 80% of the fish being age-1 or age-2 and only 3% of the sample was age-6 or older, including that once strong 2003 year class.

2007 **2008** **2009**



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Age Structure Data 2010-2012

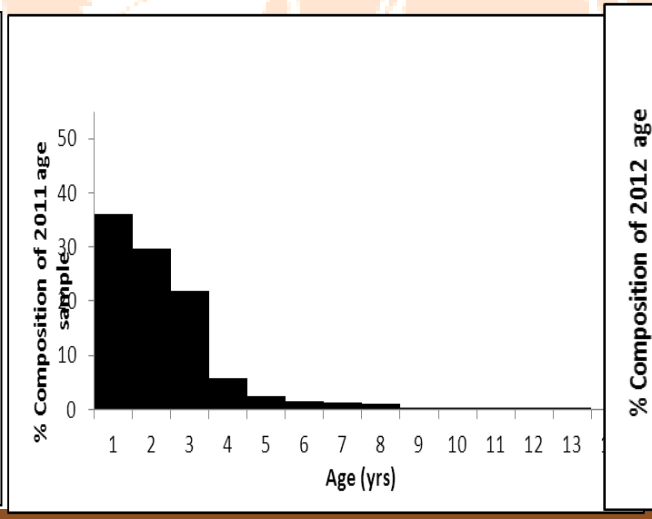
Again in 2010, the age-structure data revealed a typical population that has received high exploitation, characterized by a large numbers of small fish (<356mm TL), with over 80% of the fish being age-1 or age-2 and only 4% of the sample was age-6 or older, including that once strong 2003 year class.

In 2011, the age-structure appears to be rebuilding some with only 66% of the fish being age-1 or age-2 fish and 22% of fish being age-3, and 12% of the fish were age-4 or better.

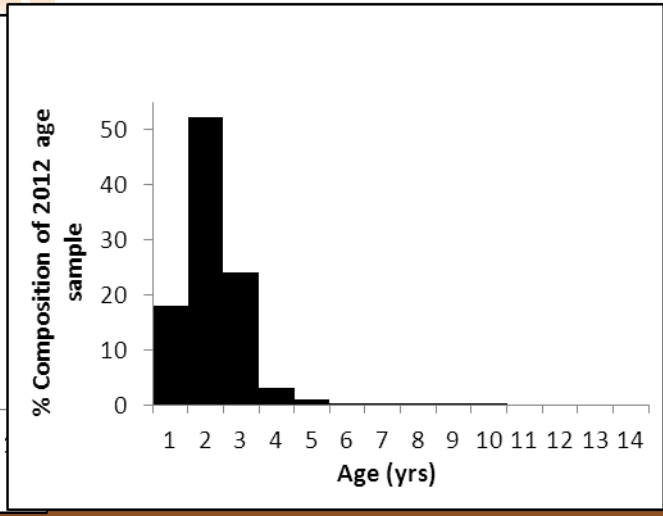
In 2012, the age structure continued to show some evidence of rebuilding but still 75% of the fish are age-1 or age-2 fish and 20% of fish being age-3, and less than 5% of the fish were age-4 or better.

2010

2011



2012



Huh?

251 mm TL,

0.137 kg

5-24-2007

200 mm TL,

0.084 kg

4-7-2008

236 mm TL,

0.142 kg

6-14-2012

- Gravid, turning Age-2 females were found ranging in size from 200 to 251 mm TL
- A few more of these young, gravid fish have been found each year.
- Literature states flatheads become sexually mature between the ages of 2 and 5 and between 290 mm TL and 750 mm TL.
- There appears to be shift in sexual maturity due to over a decade of increased exploitation
- Compensatory mechanism going on for sure.

Predation event

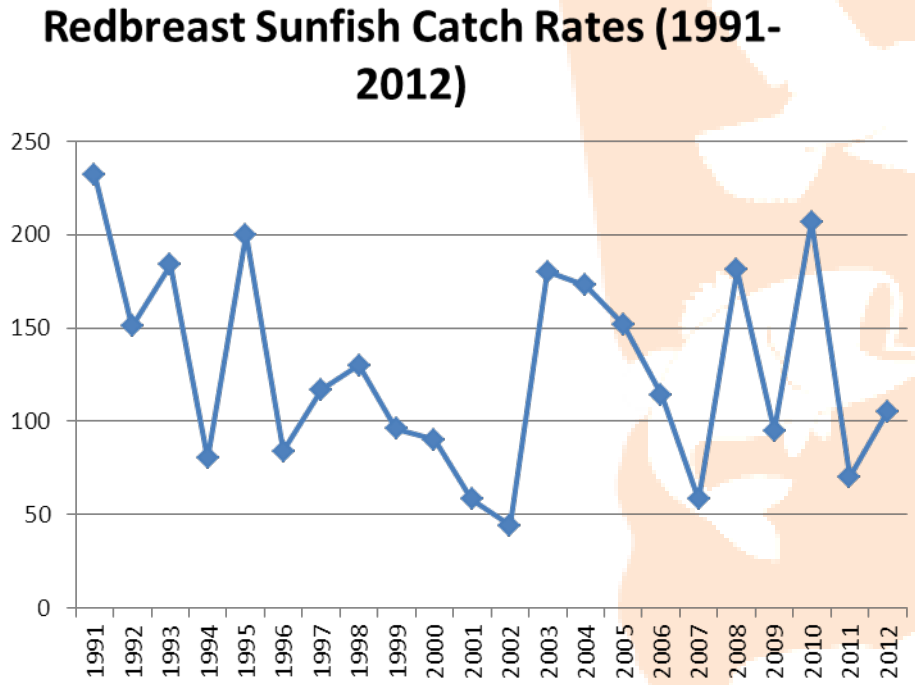
- On June 9, 2010, we found a partially digested, but well intact juvenile Atlantic Sturgeon *Acipenser oxyrhincus* (159mm TL, 17g) in the stomach of a flathead catfish (382mm TL, 575g) removed from the Satilla River.
- This is the first field observation of flathead catfish predation on a sturgeon of any species
- Potential increased funding to fight exotic flatheads because of this finding?
- *Transactions of the American Fisheries Society* 140:250-252, 2011

Blue Catfish in the Satilla

- A total of 7 blue catfish were recovered in 2011 ranging in length from 360 mm TL to 492 mm TL and in weight from 0.337 to 1.044 kg.
- Distinguishing characteristics included the unique two-vessel swim bladder and a straight anal fin-ray margin with a anal fin-ray count of 31, which lies within the documented range of 30 to 36 (Boschung and Mayden 2004).
- *Southeastern Naturalist* 11/2, 2012
- **Zero found in 2012!**

So what about the redbreast sunfish ?

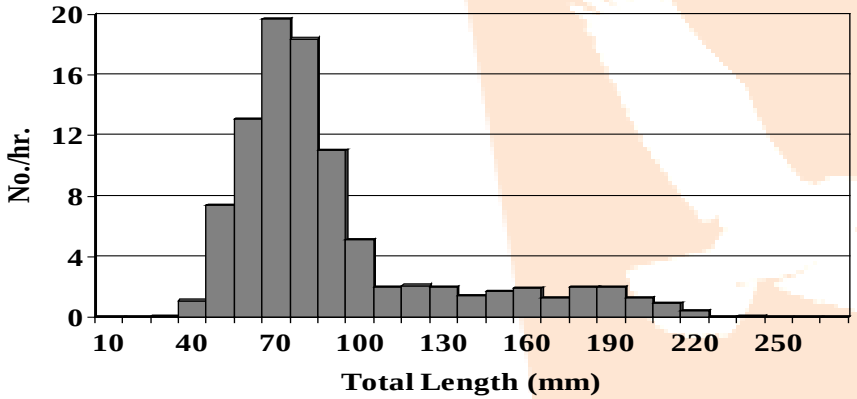
Catch rates are not too bad!



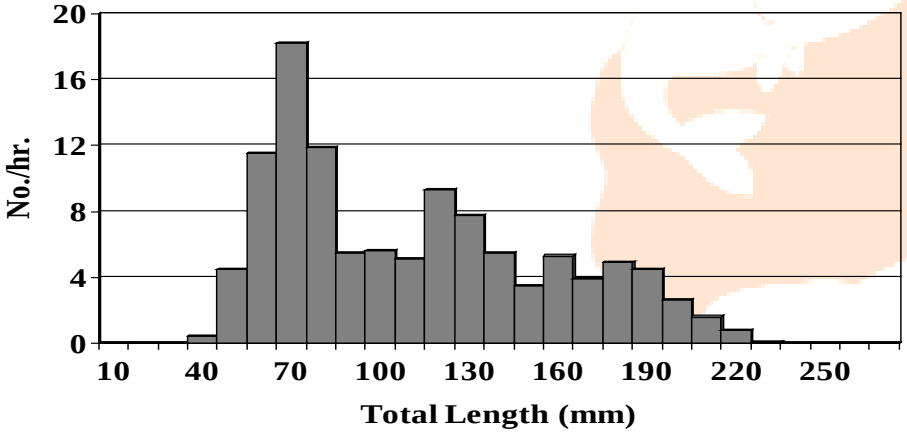
- Maximum 232 fish/hr in 1991 (pre-flatheads)
- Minimum 44 fish/hr in 2002 (during flathead invasion)
- Average across 22 year time series (127 fish/hr)
- 2012: 105 fish/hr
- 2010: 207 fish/hr-high H^20

So what about the redbreast sunfish?

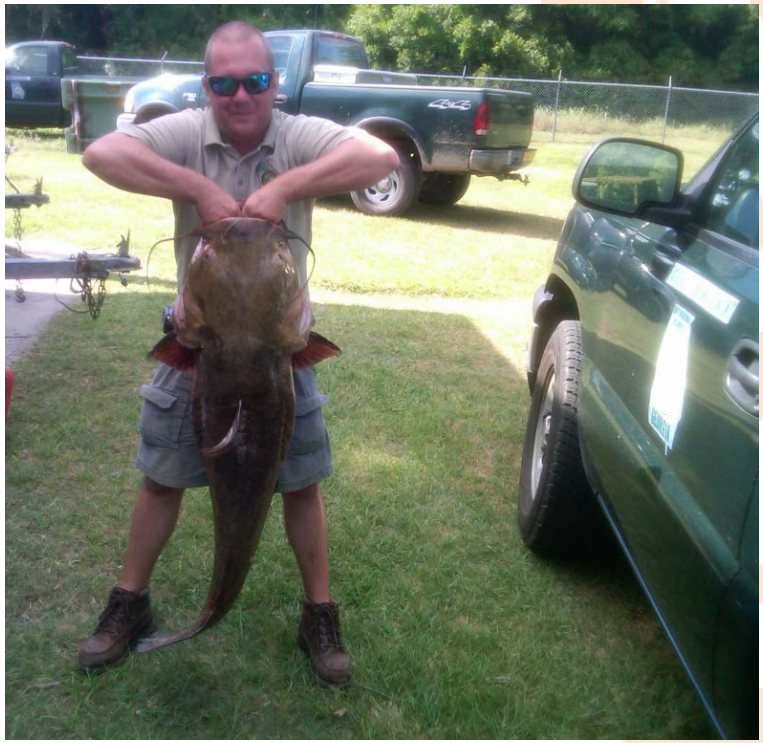
Spring 2012 RBS Length Frequency (lower half of river)



Spring 2012 RBS Length Frequency (upper half of river)



Conclusions



- Maintenance control of flathead catfish in the Satilla River is possible given our reported extreme changes in the biomass, size and age structure.

- Our estimates of total annual mortality (*A*) are high (37 to 55%) relative to most other published estimates and may have caused substantial fishing mortality on the flathead population

Conclusions

- Despite the dramatic changes demonstrated in the biomass, age and size structure, there was evidence for higher recruitment and earlier maturation, which would require intense harvest to be maintained to prevent the population from rebuilding within 2-5 years

- Considering the life history of the flathead catfish, being a long-lived species that presumably cannot withstand excessive rates of exploitation (I.e. greater than 25% U), it's amazing the resiliency that this population has demonstrated.

Conclusions

- Our results indicate that an electrofishing removal program is a reasonable management option for state agencies where this apex predator has been introduced, but continual removal may be required to maintain a low biomass of fish present

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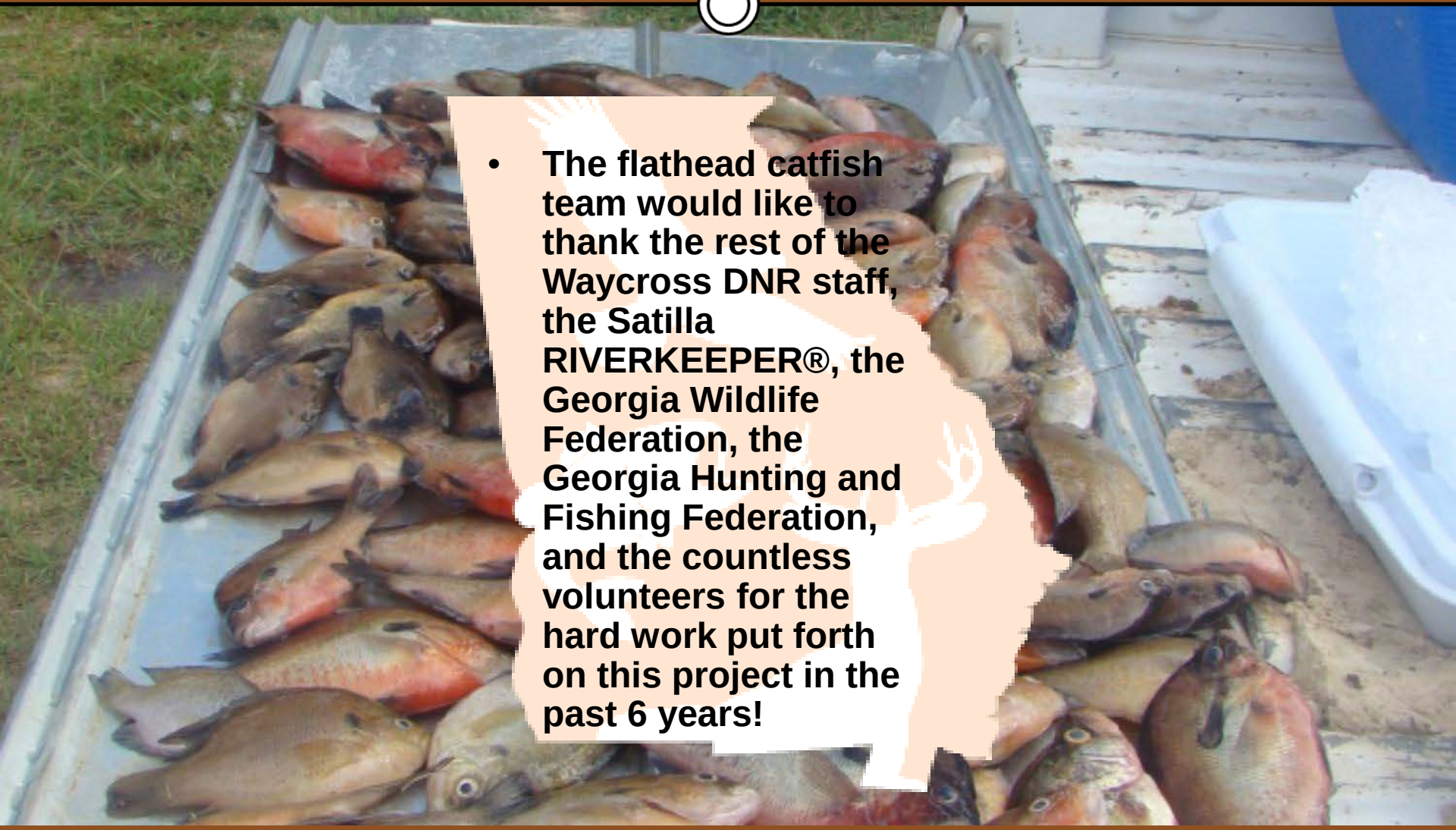
ACKNOWLEDGEMENTS



- The flathead catfish team would like to thank the rest of the Waycross DNR staff, the Satilla RIVERKEEPER®, the Georgia Wildlife Federation, the Georgia Hunting and Fishing Federation, and the countless volunteers for the hard work put forth on this project in the past 6 years!

PDF's of publications are available upon request