

Harvester Response to Changes Due to Invasive Species: Asian Carp in the MS and IL Rivers

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Lake Placid, New York
September 13, 2006

Asian Carp – Upper Mississippi Invasive Species

- Asian carp
 - Bighead carp (*Hypophthalmichthys nobilis*)
 - silver carp (*Hypophthalmichthys molitrix*)
- First appeared in Illinois in early 1990's
- Now dominant in many parts of the Mississippi River system



Photo courtesy Andy Whitcomb

Asian carp – negative impacts?



photo courtesy IL Natural History Survey

- Evidence of diet overlap with native fishes (buffalo, paddlefish)
- Competition for habitat?
- Gaps in our knowledge of the type and magnitude of the effects on river ecology and commercial fish production

Analyzing Harvest Data

- Goal: analyze how Asian carp have affected the commercial river fishery in Illinois
 - regression analysis of a long time series of harvest data
- What additional research questions could be addressed with such data

Illinois Commercial Catch Statistics

- Illinois Department of Natural Resources has kept commercial catch statistics for river fisheries in Illinois since 1950
- Mostly paper copies – we are beginning to digitize the data for analysis

Illinois Commercial Catch Statistics

Records contain information on:

- Species
- Location
 - river and navigation pool
- Effort
 - fishermen, amount of gear
- Wholesale fish prices



Researchers at the INHS Great Rivers Field Station sample bighead and silver carp in the Mississippi River with trammel nets.

photo courtesy IL Natural History Survey

Commercial River Fishery in Illinois

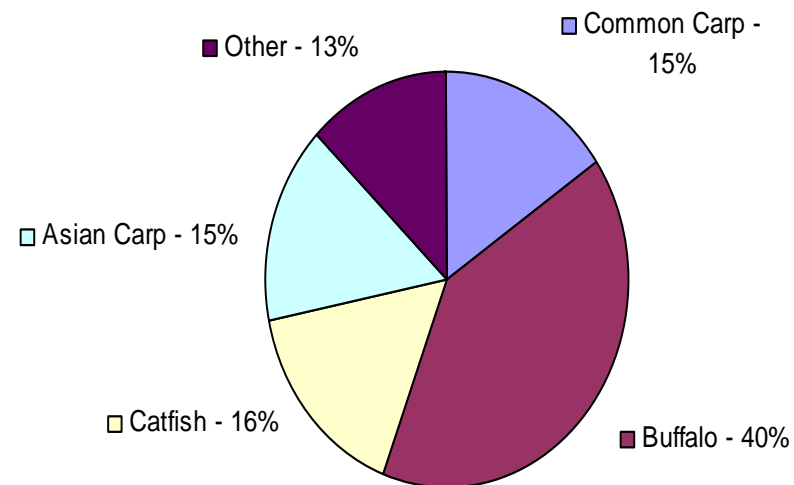
2003 harvest

- 6.3 million pounds
- \$1.33 million

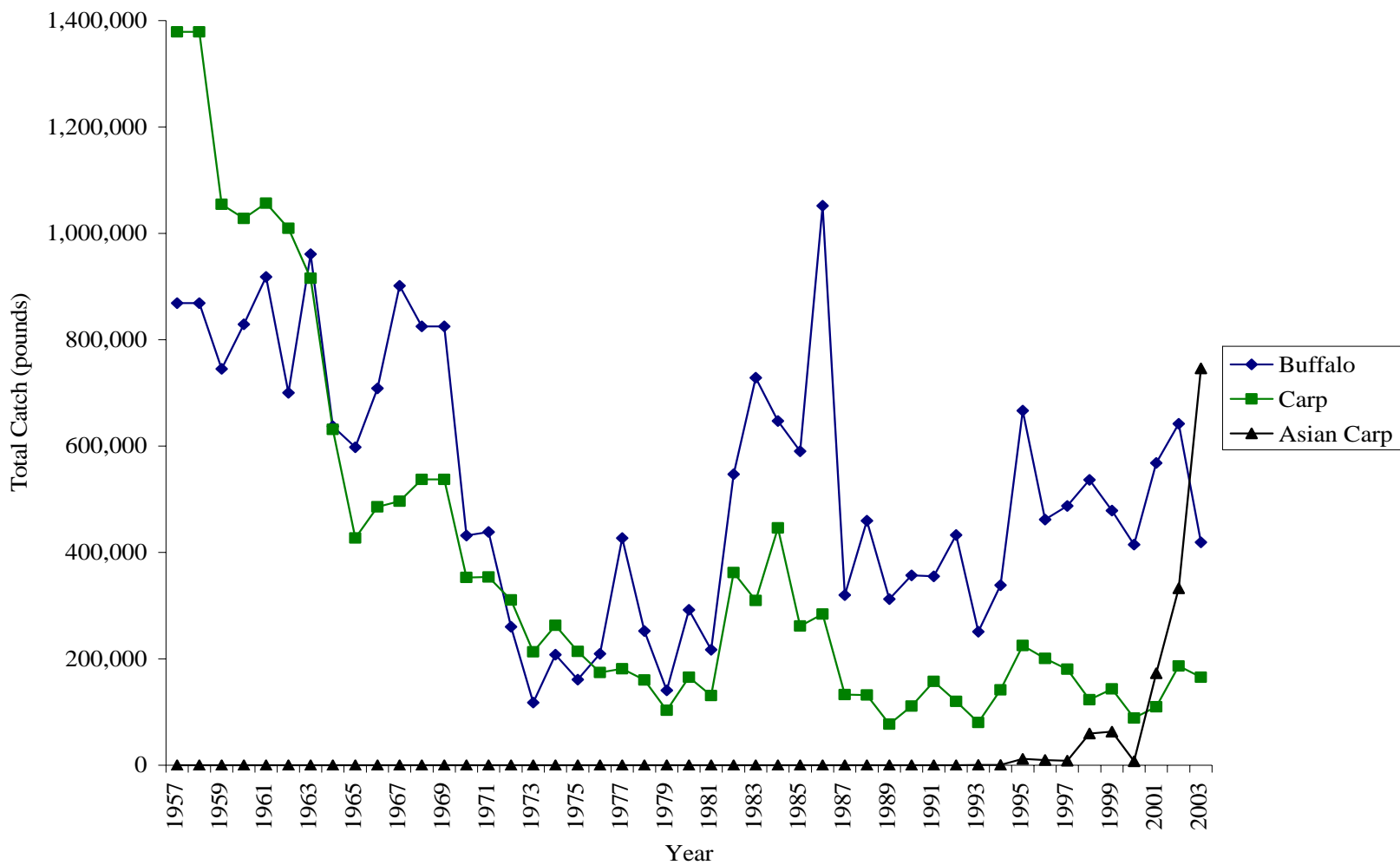
2003 prices

- Buffalo \$0.22
- Catfish \$0.43
- Asian carp \$0.11

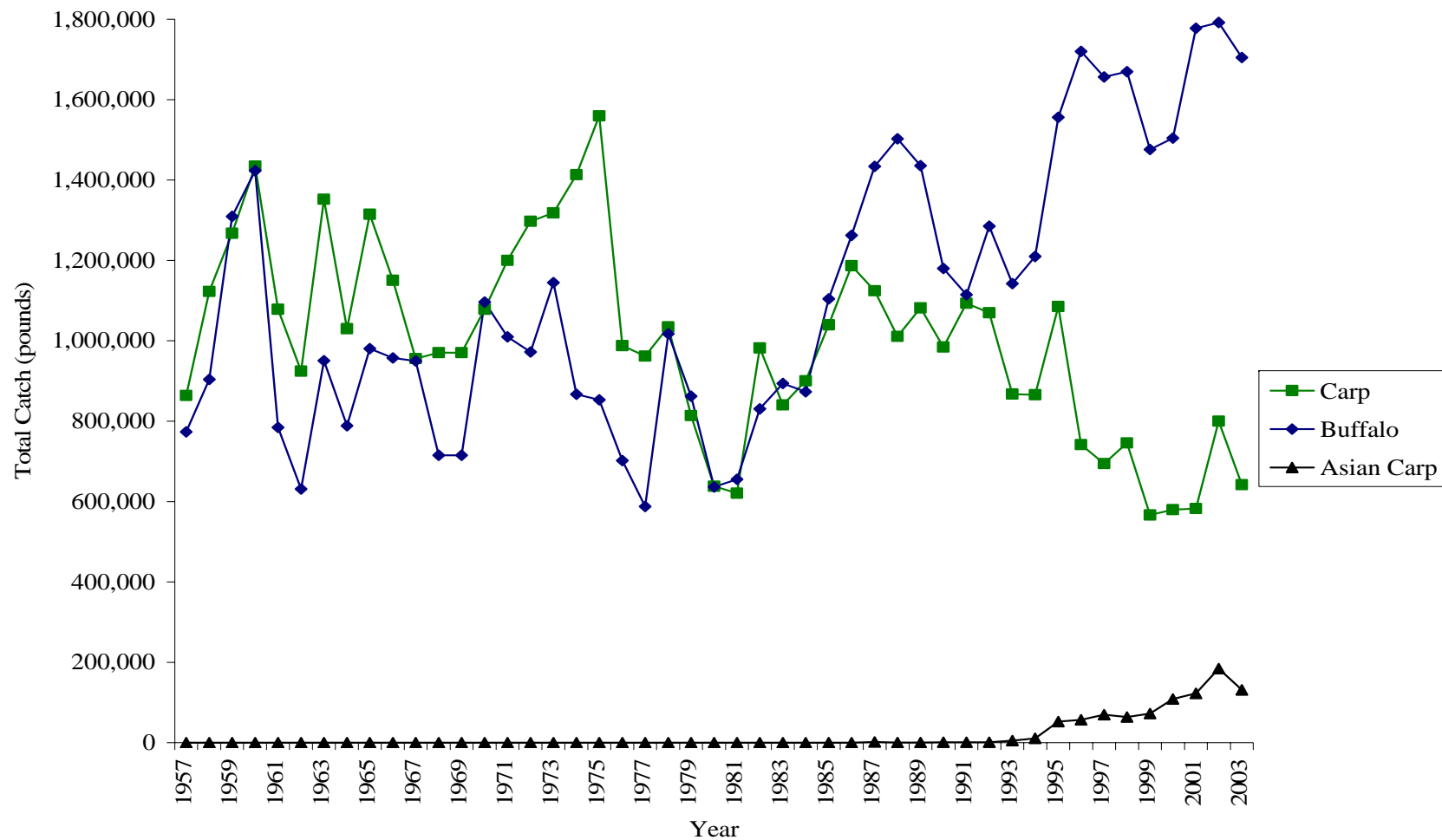
2003 Proportion of Harvest



Commercial Harvest – Illinois River



Commercial Harvest – Mississippi R.



Have Asian carp affected the harvest of native species?

- Regression analysis – estimate buffalo harvest as a function of Asian carp harvest using 45 years of data
- Pool level analysis – fixed effects regression

Navigation Pools



source: USGS

Regression Analysis – pool level

$$B_{t,i} = B_{t-1,i} + AC_{t,i} + CC_{t,i} + P_t + D1 + D2 + D3 + T + \varepsilon$$

+ *Illinois River interaction terms*

- $B_{t,i}$ = buffalo harvest in year t, pool i
- $AC_{t,i}$ = Asian carp harvest in year t, pool i
- $CC_{t,i}$ = common carp harvest in year t, pool i
- P_t = average statewide buffalo price in year t
- D = dummy variables for reporting requirements
- T = time trend
- ε = error term

Regression Analysis – pool level

	Estimated coefficient	Significance (p-value)
<i>Asian carp</i>	3.15	0.000
<i>Asian carp * IL river term</i>	-3.16	0.026
<i>Buffalo_{t-1}</i>	0.51	0.000
<i>Buffalo price</i>	-1390.26	0.974
<i>Common carp</i>	0.22	0.000

Discussion

- Increased buffalo harvest is correlated with increased Asian carp harvest in the Mississippi River
- No such correlation exists in the Illinois River
- Why?
 - biological explanation
 - economic/technological/behavioral explanations
 - missing variables

Discussion and Future Direction

Research Questions

- Do Asian carp affect the harvest of native species?
- If so, do Asian carp affect native species harvest via an ecological effect or some production relationship?
- Is commercial harvest an effective control strategy?
- What policies might induce greater commercial harvest?