

# Influence of presence of fish on breeding efforts of amphibians in a field experiment in central Illinois

J. Brian Towey

Dept. of Biological Sciences, Eastern Illinois University, Charleston, IL 61920

## Introduction:

Introduced species often have negative impacts on populations of native taxa. The presence of introduced predatory fish may reduce breeding success of native amphibians. A management strategy of eliminating predatory fish from breeding ponds may promote native amphibian populations. This study examines amphibian communities at four neighboring woodland ponds in central Illinois before and after extermination of introduced fish populations from two of those ponds.



## Methods:

Warbler Woods Nature Preserve is a recently established forest reserve managed by the Illinois Department of Natural Resources. There are four neighboring ponds on the reserve which are all used by amphibian species as breeding sites. The ponds have been monitored since May 2000 using screen wire drift fences and pit trap arrays. Traps are located on both sides of the fence, spaced 7.5 m apart. I monitored traps every 2 to 3 days throughout the activity season of local amphibians. I toe-clipped all new animals to indicate the year of initial capture and released them on the opposite side of the fence.



## Fish Removal:

In December 2001, IDNR officials applied Rotenone™ to ponds B and C to eliminate the fish species from those two ponds (*Ameiurus melas* from B and *Lepomis machrochirus* and *L. cyanellus* from C). The application appears to have been successful for the eradication of centrarchids in pond C. However, several live *Ameiurus* have been noted in pond B since application, though markedly fewer individuals than noted prior to Rotenone application.



## Ponds:

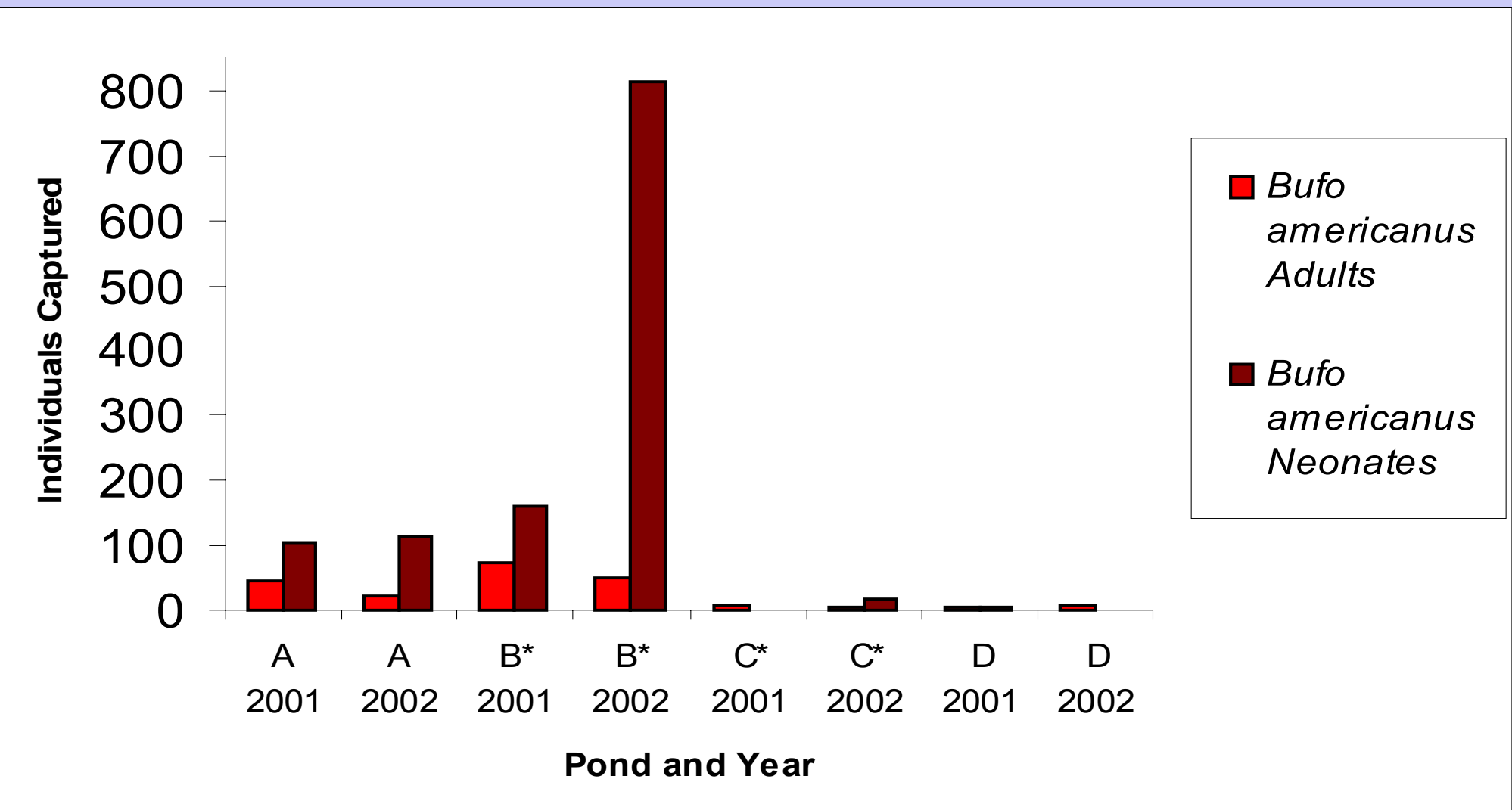
- “A” No history of inhabitation by fish.
- “B” Contained introduced Black Bullhead Catfish (*Ameiurus melas*) until Rotenone™ application in December 2001.
- “C” Contained introduced Bluegill and Green Sunfish (*Lepomis machrochirus* and *L. cyanellus*) until Rotenone™ application in December 2001.
- “D” No history of inhabitation by fish. Ephemeral.

## Results:

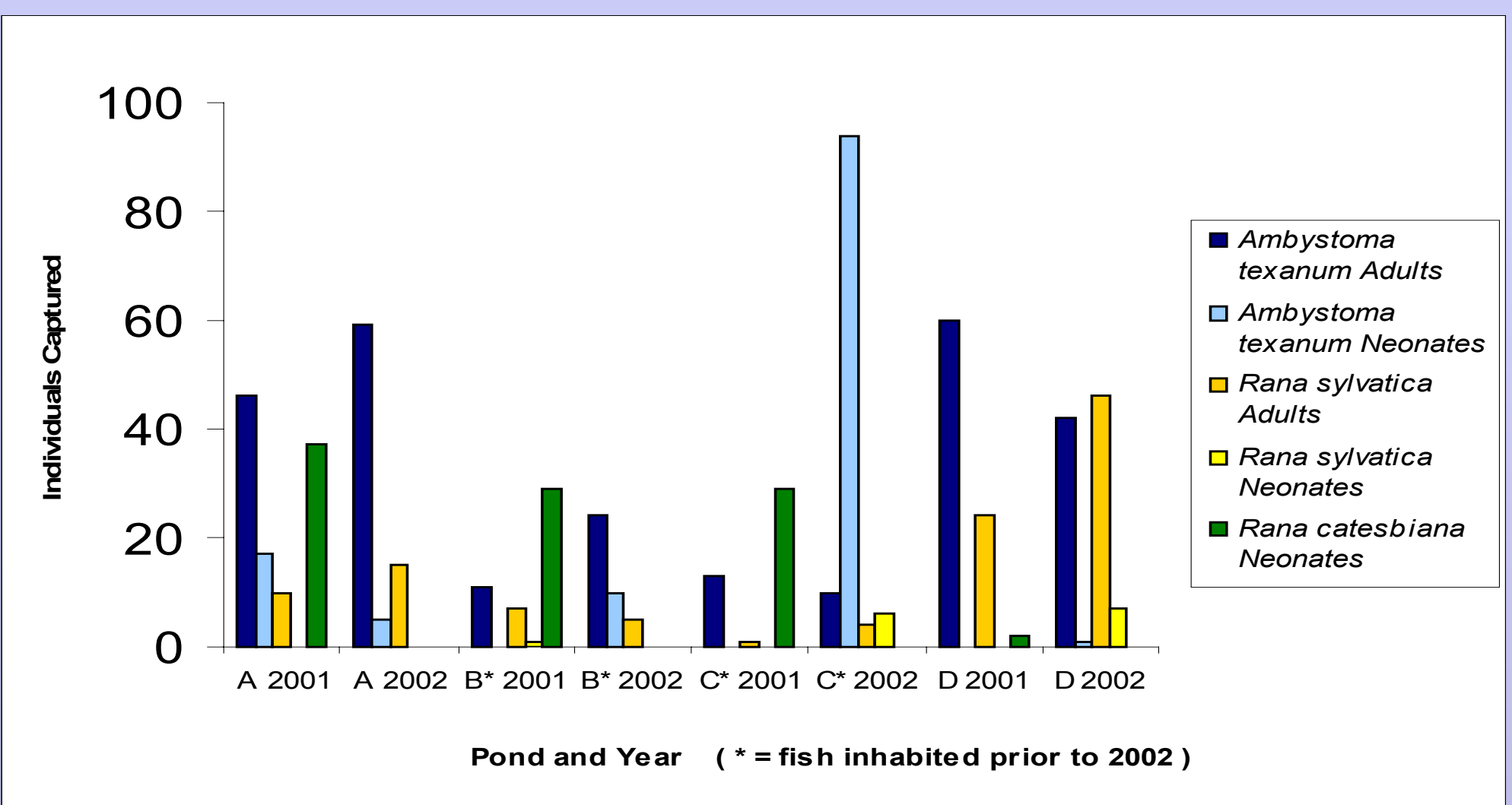
Fisher’s exact tests by life history stage (Breeding adult / Neonate) and year of capture revealed differences in *Ambystoma texanum* numbers between treatment years at ponds A ( $P = 0.005$ ), and C ( $P < 0.001$ ) and in *Bufo americanus* numbers between treatment years at ponds A ( $P = 0.002$ ), B ( $P < 0.001$ ), and C ( $P < 0.001$ ). Differences between treatment years in most other cases were not apparent due to low sample sizes.

**Table 1:** Numbers of adult and neonatal individuals captured by species, pond and year.  
(\* indicates ponds containing fish.)

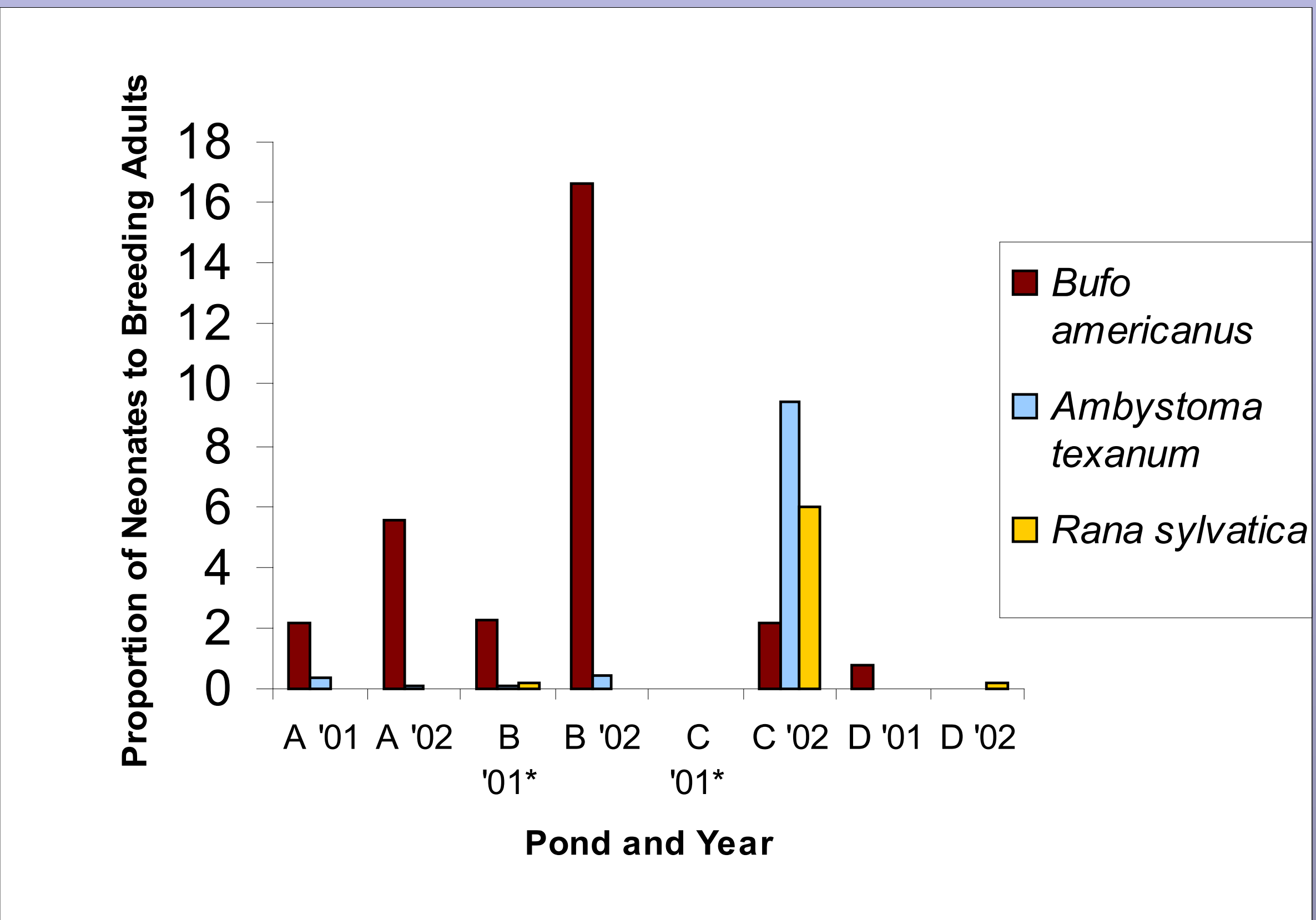
	Pond A 2001	Pond A 2002	Pond B* 2001	Pond B 2002	Pond C* 2001	Pond C 2002	Pond D 2001	Pond D 2002
<i>Ambystoma texanum</i> Adults	46	59	11	24	13	10	60	42
<i>Ambystoma texanum</i> Neonates	17	5	0	10	0	94	0	1
<i>Rana sylvatica</i> Adults	10	15	7	5	1	4	24	46
<i>Rana sylvatica</i> Neonates	0	0	1	0	0	6	0	7
<i>Rana catesbiana</i> Neonates	37		29		29		2	
<i>Bufo americanus</i> Adults	47	21	72	49	8	3	4	7
<i>Bufo americanus</i> Neonates	103	116	160	813	0	17	3	0



**Figure 1:** Number of breeding season adults and emerging neonates.



**Figure 2:** Number of breeding season adults and emerging neonates.



**Figure 3:** Reproductive success as a proportion of emerging neonates to breeding adults.

## Conclusions:

- Prior to removal, *Ameiurus melas* had a negative impact on *Bufo* reproduction.
- Prior to removal, presence of centrarchid predators (*Lepomis* spp.) had a negative impact on *Ambystoma* reproduction.
- Bufo americanus*, *Ambystoma texanum*, and *Rana sylvatica* are capable of successfully hatching and completing metamorphosis in ponds treated with Rotenone™.
- Amphibian species may benefit from eradication of fish from breeding ponds by pesticide application.

## Acknowledgements:

I would like to thank the following individuals and institutions for their technical, financial, and / or moral support and guidance during the course of this study: Dr. Stephen J. Mullin, Dr. Robert U. Fisher, Dr. Kipp Kruse, and Dr. Scott Meiners, Eastern Illinois University Biological Dept.; Robert Szafoni and Michael Mountz, Illinois Dept. of Natural Resources; Aubrey Leffel; James Wachtel; Daphne Kampinga; Danial Cox; Erin Casey; C. Drew Foster; Jennifer M. Fish and Rev. Paul Hampton.