

The Population Assessment of Threatened *Enneacanthus obesus* in Zeke's  
Pond Between 2005 to 2011

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## Abstract

The Population Assessment of Threatened *Enneacanthus obesus* in Zeke's Pond Between 2005 to 2011

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The banded sunfish, *Enneacanthus obesus*, is currently listed as a threatened species in the state of New York due to a significant diminution in population expressed over the past six years. The natural habitat of *E. obesus* consist of heavily vegetated and slow moving water such as ponds, lakes, and rivers. In 2004, 200 banded sunfish were relocated as a result of cleanup operations of the Peconic River to Zeke's Pond, an area of about 281 432 square feet, located on the property of Brookhaven National Laboratory (BNL), Long Island, New York. An assessment study conducted on these banded sunfish population a year later counted 101 800 (number probably not accurate; Tim Green's personal communication) individuals. Unfortunately, shortly after this assessment, a drought almost wiped out this banded sunfish population and only few fish were rescued from the pond. A population study conducted in 2007 yielded only 4 027 banded sunfish. The current study estimated the banded sunfish population in 18 251.5 square feet area of the pond using seine and or dip nets. A total of 417 banded sunfish and 5 predators were captured. Each sample was measured with a ruler or measuring tape and their lengths ranged from 8 mm – 71 mm. The study also revealed fewer banded sunfish where there were more predators. The current estimated total population of banded sunfish in Zeke's Pond is 6 430 and 77 predators. This study has shown that the 2011 population has relatively increased over 2007 population but remains significantly lower (6%) than that of 2005. There is evidence that more predators have resulted in fewer banded sunfish. There are more immature banded sunfish and growers in the pond for all the years assessed than adults suggesting that something is preventing these fish from reaching adult stage. A further investigation is necessary to document the drastic reduction in the adult population of the *E. obesus*.

Banded sunfish (*Enneacanthus obesus*) are currently listed as an endangered species in the state of New York. Belonging to the family, Centrarchidae, *E. obesus* are a group of freshwater fish that are established on the Atlantic coastal region from New Hampshire south to central Florida [4].



**Figure 1.** Adult Banded sunfish

A desirable habitat for *E. obesus* is primarily slow moving lakes, ponds, and river's consisted of heavy aquatic vegetation and relatively low acidity ( $< 4$  pH). The adult *E. obesus* grow to 76 mm (3 inches). They are the smallest species of sunfish in the state of New York. These carnivorous fish eat other aquatic life forms such as microcrustaceans and insects. The banded sunfish is of biological and ecological importance because of their ability to consume mosquito larvae thereby reducing the mosquito population near bodies of water they inhabit [1]. New York populations of banded sunfish are vulnerable to environmental catastrophes because their location in nine interconnected waters of eastern Long Island, and their dwindling population they are considered and listed as threatened [3].

In the recent years of 2005 and 2007 Zeke's Pond has been the most prominent water body for population analysis studies of banded sunfish for BNL's Environmental Protection Division. Previous studies from those years illustrated a significant decrease of

the *E. obesus* population in Zeke's Pond. Zeke's Pond is located on latitude 681818.33m E (X axis) and longitude 4527635.29m N (Y axis) on the property of Brookhaven National Laboratory (BNL) in Long Island, New York. The average temperature of the pond is 28.5 °C, with a conductivity of 37.8 µS/cm, and average pH of 4. This stagnant body of water serves as a unique breeding ground for *E. obesus*. It is heavily condensed with White water lily (*Nymphaea odorata*), Bulrush (*Scirpus atrovirens*) and Bladderwort (*Utricularia vulgaris*), in which the sunfish tend to hide in to prevent them from being eaten by local predators such as catfish and pumpkinseed sunfish.

Approximately 200 *E. obesus* were relocated to Zeke's Pond in 2004 in an effort to extricate sunfish from the Peconic River prior to cleanup operations. However, in 2005 (shortly after the first assessment) drought conditions nearly wiped the *E. obesus* population and only few fish were rescued. In 2005, the population of *E. obesus* before the drought was estimated to be from 101 800 in Zeke's Pond [2]. However, the survey conducted in 2007 estimated a total population of 4 027 banded sunfish in Zeke's Pond, a substantial decrease which raises questions on the validity of the first assessment. It is hypothesized that there will be no significant difference between the current population and that of 2007. A population assessment study has not been performed at Zeke's Pond in four years. Therefore, the main goal of this study is to conduct a population assessment of banded sunfish in Zeke's Pond. The banded sunfish population is expected to increase.

## **Materials and Methods**

The study personnel arranged buckets, a Multi-parameter PCSTestr<sup>™</sup> 35, dip and seine nets, rulers, and ice chest into a water sled that was used to transport all materials while performing assessments in the pond. Waders, life jackets and drinking water for the personnel were also used. At the pond, all personnel wore waders and life jackets before entering the pond. The sled with its contents was dragged into the pond so as to allow for easy transportation of fishing gear across the pond. In the pond visual observations of the surrounding area such as water level on the trees at the shore line was done while water parameters were being taken. The parameters measured and recorded are water conductivity, pH, and temperature. We noticed the presence or absence of aquatic vegetation and those present were identified.

The study personnel comprised of a minimum of three persons, two of them to operate the seine net while the third person used the dip net and pulled the sled along. Both individuals walked along the shore line with the seine net, dragging it swiftly just above the bottom of the pond for 45- 60 seconds, followed by a rapid lifting of the net completely out of the water. The content of the net was screened for netted fish which were removed and put into the bucket pre-filled with clear pond water in the sled for later analysis. The content of the net was screened for netted fish which were removed and put into the bucket pre-filled with clear pond water in the sled for later analysis. Continuous fishing was done for about 15 minutes after which the fish were measured with a ruler and or measuring tape in the open water or at the shore line. When done at the shore line, a separate bucket is filled with pond water and each analyzed fish was put into this

second bucket until all the fish had been measured. At the end of the analysis, the fish were returned into the pond close to the site of capture. If analyzed on open waters, the fish were released back into the pond individually. All information was then documented.

While dip nets were utilized, however, a seine net was most applicable and used due to its capability of capturing a greater amount of fish at once. To obtain best catching results, areas containing bladderwort were seined efficiently and the collected information was documented in a weather spiral booklet for future reference. A total of five visits were made to the pond. Fishing expeditions started at around 9:00- 9:30 AM and lasted till 3:00- 3:30 PM before the team came back to the laboratory. Numerous seine runs were done on an area of 18 252 square feet. The 2005 and 2007 survey results were compared to that of 2011.

## Results

The pond surface was covered with lily pads and flowers (Fig. 2) and the bottom was muddy with a lot of dead and dying vegetation.

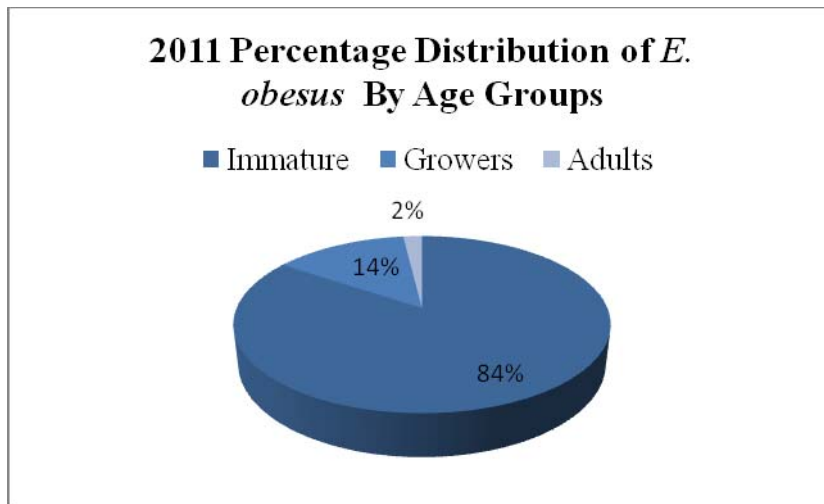


The shoreline was filled with rotten vegetation and different water marks on the trees with fallen tree trunks in the pond. Shrubs like sweet pepperbush and reeds were

**Figure 2.** White water lily's in Zeke's Pond

noticed shrubs such as sweet pepperbush and reeds were noticed on some areas of the shore line and bladderworts, water lily were observed in the open water. The roots of these two aquatic plants made it difficult to wade through the pond.

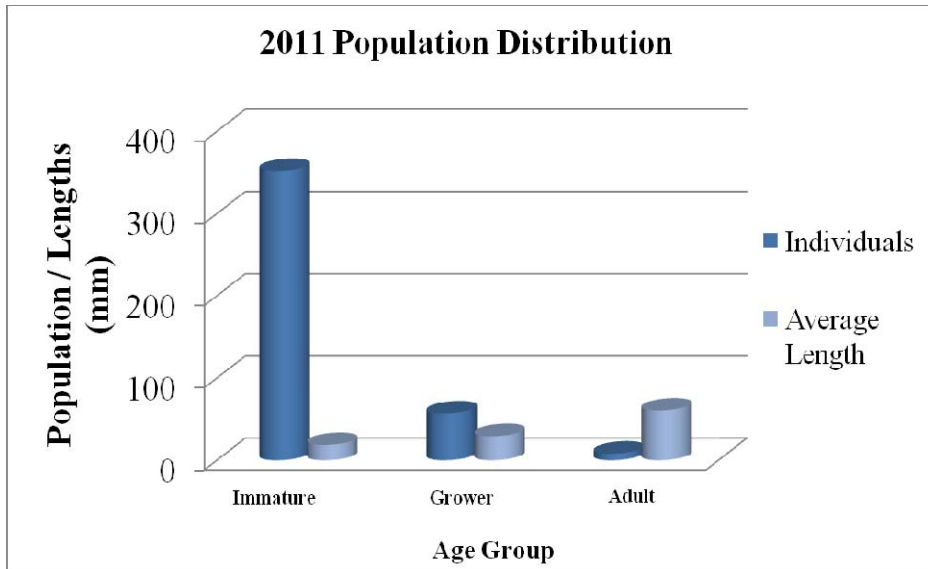
The measured pond water conductivity ranged from 36.0- 39.2  $\mu\text{S}/\text{cm}$ ; pH from 4.6- 4.9; and the water temperature ranged from 26.3- 31.9°C. Based on length, the fish were categorized into three groups: immature, growers, and adults. The length size of the immature sunfish ranged from 1- 25 mm, growers from 26- 50 mm, and 51mm and above for adults. The total number of fish netted in 2011 was 5 predators (mainly catfish) and 417 banded sunfish; 352 (84%, Fig. 3) immature, 57 (14%) growers, and 8 (2%) adults.



**Figure 3.** 2011 Percent Distribution of Banded Sunfish age groups.



The average length of the immature banded sunfish was 18.62 mm; average length for the growers was 29.25 mm, and that of the adults was 60.5 mm (Fig. 4).

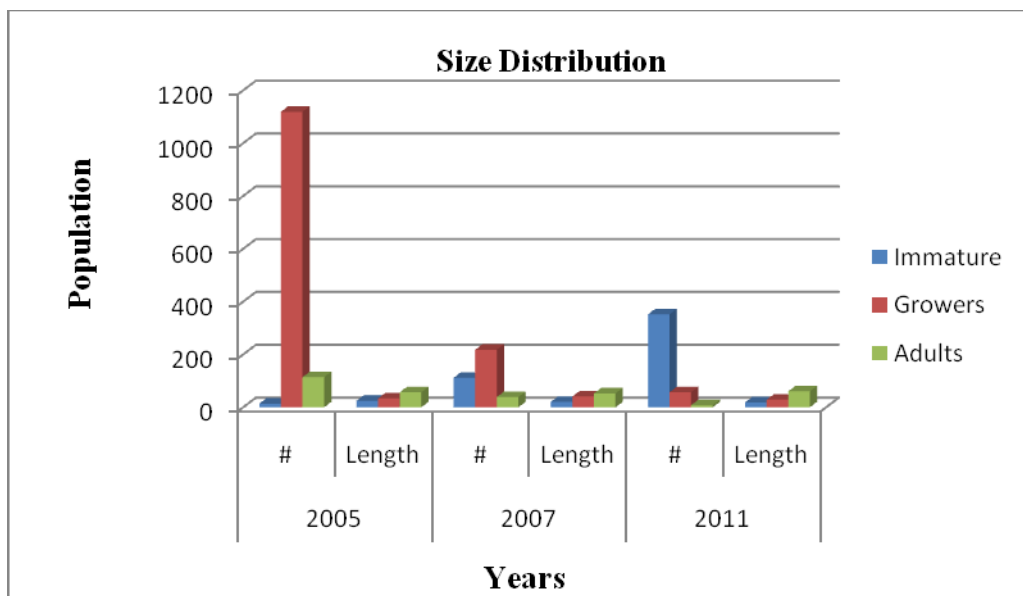


**Figure 4.** More immature individuals.

The 2011 estimated population was 77 predators and 6 430 *E. obesus*. The estimated population data for 2005 and 2007 were compared with 2011 data. In 2005, 1% of the population was immature, 89% growers and 9% adults. In 2007, immature individuals rose to 30%, growers decreased to 59% while the adults increased. In 2011, the immature sunfish increased greatly to 84%, growers decreased tremendously to 14%, and the population decreased significantly to about 2% adults. There is no significant difference in the length of the different age groups (Table 1, Fig. 5).

	2005		2007		2011	
	#	Length	#	Length	#	Length
<b>Immature</b>	14	24.71	112	20.59	352	18.62
<b>Growers</b>	1119	33.74	218	41.06	57	29.25
<b>Adults</b>	114	56.86	39	52.67	8	60.5

**Table 1.** Number vs. Size Distribution

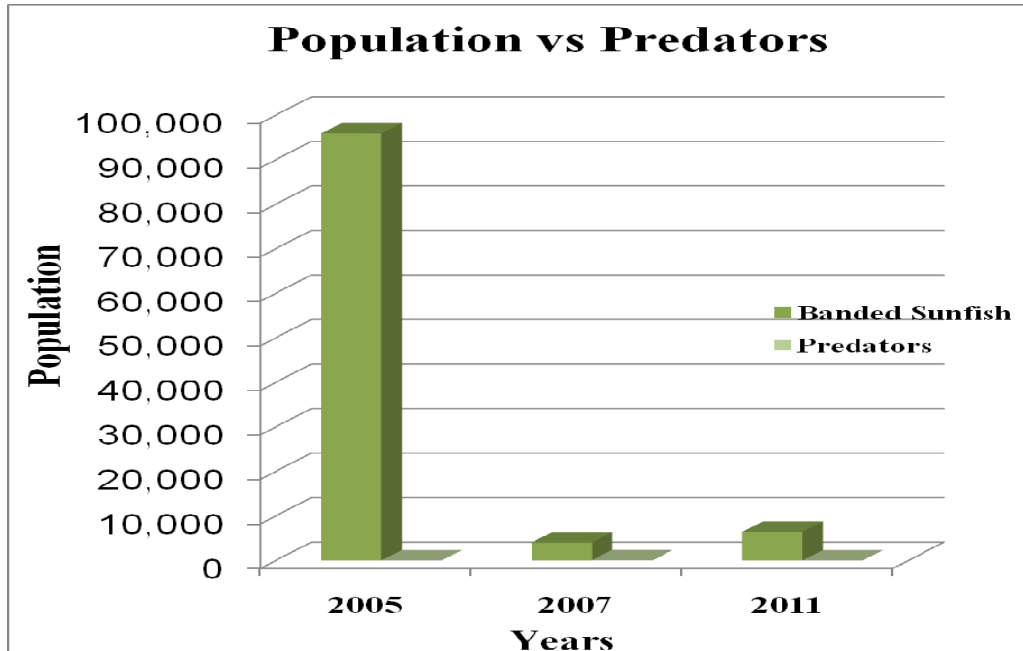


**Figure 5.** Average Size of the Three Age Groups by the Years

Figure 6 shows the correlation between the population and predators. In 2005, there were 101 800 banded sunfish with just 20 predators, in 2007, the final number of fish decreased to 4 027 while the predators increased to 79 in number and by 2011, the population has increased to 6 430 but the predators remained 77 (Table 2 and Fig. 6). The 2007 and 2011 population is just 4% and 6% that of 2005.

	2005	2007	2011
Banded sunfish	101 800	4 027	6 430
Predators	20	79	77

**Table 2.** Banded sunfish and Predators Collected from 2005 to 2011



**Figure 6.** Banded Sunfish Population vs Predators

## Discussion/ Conclusion

The population of the Banded Sunfish has relatively increased being that the last actual study was done four years ago in 2007. In 2005, the reported final population for this pond was 101 800 banded sunfish. The current study is of the opinion that the above figure might have been exaggerated. This observation coincides with that of Tim Green (personal communication). By comparing the 2007 and 2011 assessments to that of 2005,

the population is just 4% and 6%, which is still relatively low. Even though the seining methods (square feet covered, timing) may have been different, compared to those done in previous years, the number of *E. obesus* captured was accurate.

The population may have increased; nonetheless, certain ecological factors such as are still contributing and supporting the decline of the *E. obesus* community. For instance, fifteen consecutive seine runs were performed for a total of 6 576 square feet, resulting in zero banded sunfish being captured. We observed in this furthestmost western region of Zeke's Pond, the absence of bladderworts as well as white lily pads. Nearby trees in this area also indicated high water marks (approximately 2.5 feet), and the water level had dropped significantly (approximately 1.8 feet in depth). Banded sunfish are fond of hiding from predators within bladderworts. Bladderwort has been reported to hide the banded sunfish from predators (O'Riordan, 2010). The absence of this vegetation in some areas of the pond may expose the immature sunfish, smaller *E. obesus* (slower swimmers) are more prone to being eaten by predators while swimming in the open water, so they aren't found there.

In the population survey in 2005, it was noted that the adult sunfish were more often found in open water than the smaller ones, and that the seine runs that were performed in the center (open water) of the pond had more adults than the shoreline runs. The seining of mainly the shoreline by the current study may explain the low number of caught adults. Also, the adults are faster swimmers, and personnel operating the seine might not have moved fast enough to capture adults.

With only 352 (84%) immature sunfish, 57 (14%) growers, and 8 (2%) adults being captured this year, it is most likely that these immature *E. obesus* are being

inhibited from growing to mature adults possibly due to these factors. A further investigation is necessary to document the drastic reduction in the adult population of the *E. obesus*, and the banded sunfish adaptation to fluctuating water levels and water chemistry in Zeke's Pond.

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