Distribution of *Enneacanthus obesus* (Banded Sunfish) in the Central Pine Barrens of Long Island

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ABSTRACT

Enneacanthus obesus, Banded Sunfish, are freshwater fish which inhabit the slow moving and highly vegetated rivers, lakes, and ponds of Long Island, New York. They are currently listed as a threatened species in the state of New York. A total of 10 bodies of water (Andy, Block, Cheney, Grassy, Punzi South, Railroad, Swan, Sweezy, and two Unnamed Ponds) were assessed. Seine and dip nets were used for fishing. The water chemistry was measured using a Yellow Springs Instrument probe and a Multi-Parameter PCSTestr 35™. A total of 172 BS and 124 predators were collected from the surveyed ponds. A ruler and a measuring tape were used to measure the collected banded sunfish samples and their lengths ranged from 12- 86 mm. The optimum water parameters were a pH range of 4-5, temperature range of 25-35°C, low conductivity, and low dissolved oxygen. More banded sunfish were collected in areas that contained vegetation such as Bladderwort, Sweet Pepper Bush, and Decodon. Although there were differences in the mean number of collected samples over the years in these ponds, these differences were of no statistical significance. There is a correlation between the population size and the presence of predators in all of the surveyed ponds: where there were more predators, there were less banded sunfish. The adverse factors that appear to influence the decline in the banded sunfish population are: absence of certain protective vegetation such as, Bladderwort, Sweet Pepperbush, and Decodon, these harbor the banded sunfish from predators, and the presence of 'foreign invasive plants' along with the presence of predators, and high conductivity. In order to increase the BS population the above listed factors have to be addressed.

Materials & Methods

The study team gathered the following items: an all weather spiral notebook, buckets, dip nets, life vests, paper towels, pens, rulers, seine nets, sled, a Yellow Springs Instrument probe, Multi-Parameter PCSTestr 35 ™, a Global Positioning System (GPS), and waders. All of these items were brought with the study team to the surveyed ponds. Before entering the ponds, the study team wore waders and life jackets. Other materials were loaded onto the sled for transportation to the pond. In the pond, the Yellow Springs Instrument probe was used to measure the water chemistry (pH, conductivity, water temperature, dissolved oxygen (D.O.), and air temperature) and the general appearance of the pond was evaluated. The data was recorded in an all weather spiral notebook. The aquatic vegetation was identified and recorded as well. The fish were collected using seine and dip nets. Fishing was done along the shoreline and around vegetation such as bushes. The collected sunfish were removed from the nets and placed in a bucket filled with water until they were processed. Processing consisted of counting and measuring the length of the fish using a ruler. The measurements were recorded in the all-weather spiral notebook. After processing was complete, the fishes were returned back into the pond at the location where they were captured. Prior to leaving each body of water and at the end of the day an anti-bacterial agent was employed to clean the gear. A maximum of three ponds per field day were assessed.

Results

The study began on June 22, 2011 and was concluded on July 28, 2011. Each pond contained banded sunfish except Unnamed Pond #2 and Andy's Pond.
Conductivity varied from 0.5 – 115 µS/cm , dissolved oxygen was from 0.3 – 6.4 mg/L, and the pH ranged from 3.76 – 7.21. Water temperature was from 23.3– 32 °C while the air temperature ranged between 22– 28 °C. The predominant vegetation found in most of the bodies of water was bladderworts and water lilies. It was observed that areas that lacked vegetation, such as bladderwort, had little or no banded sunfish. Other vegetation that was observed was Button Bush, Decodon, Purple Bladderwort, Reeds, Sedges, Sweet Pepperbush, Water Shields, White Water Lily, and Yellow Water Lily. The waters' of the surveyed ponds were either brown or black in color with very poor visibility.
A total of 172 BS were collected from the ten ponds. The largest amount (34 %) of fish were collected from Railroad Pond and the smallest amount (0.05%) of fish were from Swan Pond. The longest and largest specimen measured 86 millimeters while the shortest sample was 12 millimeters. The samples were divided into 3 groups based on their length measurements: 1-25 mm in length were referred to as immature, 26 -50 mm as growers, and longer than 50 mm were classified as adults. The total number of immature specimens that were collected was 78. 79 growers along with 15 adults were collected as well. The total number of predators collected was 124. The predators consisted of Golden shiners, Largemouth bass, Chain pickerels, and Rock bass. To view the locations of the surveyed ponds on a map, a Geographic Information System (GIS) was used (Fig.2).

Fig. 1 Banded Sunfish

Discussion

Although the overall observation of this study corresponds to that of earlier studies on *Enneacanthus obesus,* certain differences were identified. The observation that more BS are netted in ponds with low conductivity, low dissolved oxygen, and low pH agrees with the report of O'Riordan [5] and BS can tolerate temperatures ranging from 22-32 °C [6].
The current study observed that generally more BS were captured in vegetated areas of the pond. The above observation agrees with the statement that "Where there's bladderwort, there are Banded Sunfish" (Timothy Green, personal communication). In areas where bladderwort was not present, no BS were captured. The observation on the blackish and brown color of the ponds agrees with reports from previous surveys on the BS habitat. This color of the pond water offers protection to the fish [1]. The fluctuating water level may affect the BS distribution as seen in the observed ponds. A decrease in water level results in a decrease of dissolved oxygen in the pond. This may serve as an advantage to BS since they are able to survive in bodies of water with a low level of dissolved oxygen. Also there is evidence of a direct relationship between the number of BS and the number of predators. In this study, ponds containing no predators had the greatest number of BS while those with a high number of predators had fewer BS.

CONCLUSION

Total catch for 2008 and 2011 was 160 and 172 respectively. Although there are differences in the mean number of collected samples, these differences are of no statistical significance ($P \geq 0.05$). In order to increase the banded sunfish population, factors such as predators have to be controlled or completely eliminated, protective vegetation in and around the ponds have to be cultivated, and the introduction of foreign plant species has to be minimized.

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INTRODUCTION

The threatened *Enneacanthus obesus*, banded sunfish, is the smallest sunfish in New York State [2]. The average adult size is about 50-75 mm in length [1] and are found on Eastern Long Island in the Peconic drainage [5] which consist of lakes, ponds, and bogs within the Central Pine Barrens of Long Island [3]. Banded sunfish prefer shallow, slow moving water with an abundance of vegetation and water with high temperatures, low dissolved oxygen levels, and acidic conditions[5]. Currently, banded sunfish are listed as a threatened species due to its dwindling population levels because of its vulnerability to environmental catastrophes. As a result it is important to restore their population to prevent them from being moved to the endangered species list [4]. The primary aim of the current study is to compare 2011 distribution of banded sunfish in the Central Pine Barrens of Long Island with previous years' (1994-2010) surveys conducted by the New York Department of Environmental Conservation and to determine if there is a change in the distribution of banded sunfish. Thereafter possible suggestions can be made that may enhance the ongoing restoration efforts by New York State and Brookhaven National Lab.

Results (cont.)

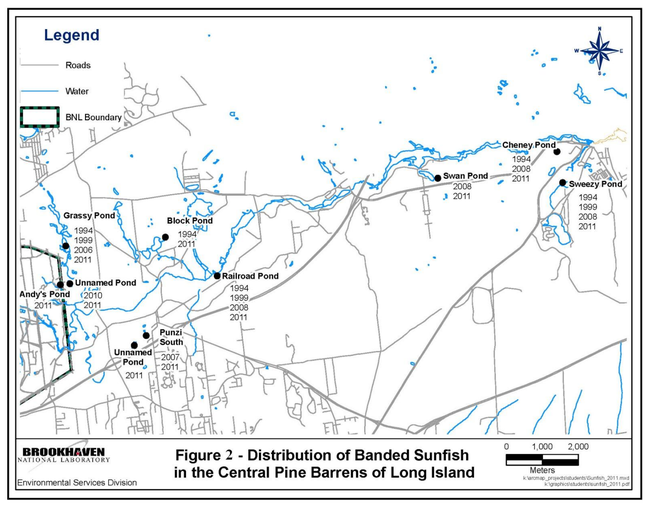

Figure 2 - Distribution of Banded Sunfish in the Central Pine Barrens of Long Island

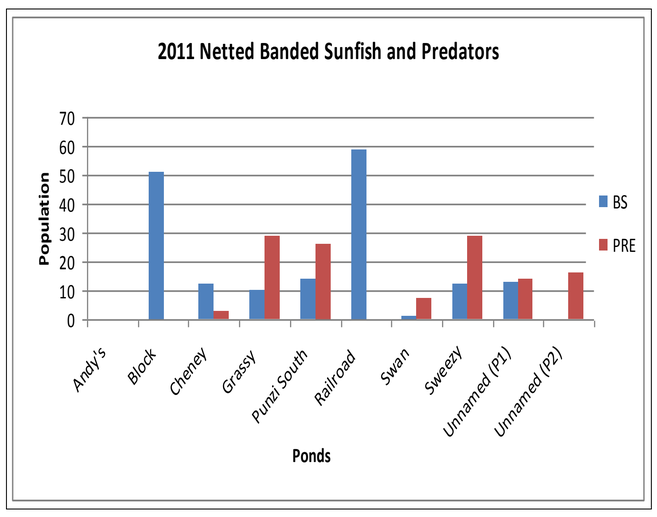

Figure 4 Banded Sunfish and Predators Collected in 2011

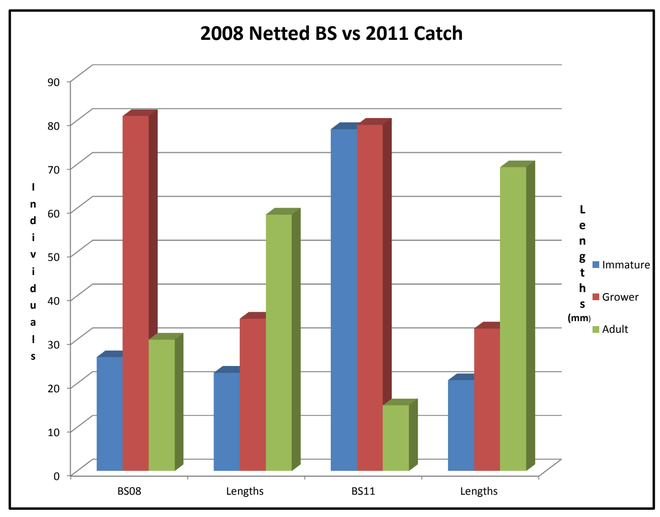

Figure 5 Banded Sunfish Captured and Their Lengths in 2008 & 2011

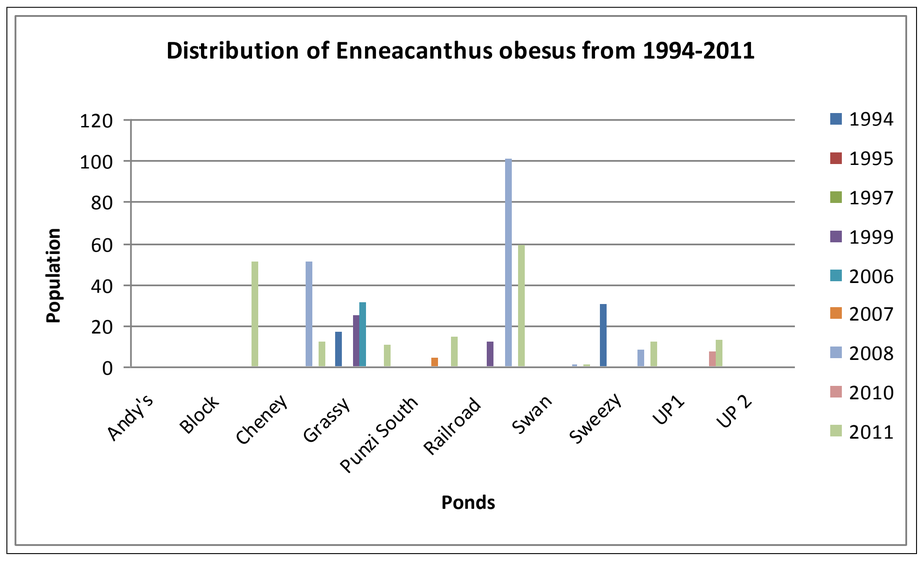

Figure 6 Distribution of *Enneacanthus obesus* from 1994-2011

FACTORS	Less Banded sunfish	More Banded sunfish
High conductivity	✓	
Dissolved oxygen (0.3 mg/L)		✓
Fluctuating water level		✓
High water temperature		✓
Low pH		✓
Predators	✓	
Protective vegetation		✓

Table 1 Factors vs BS Population

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