

**A Distribution Survey of the New York State Threatened Banded Sunfish,
(*Enneacanthus obesus*) in the Peconic River Drainage on Long Island, NY**

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August 15, 2008

Prepared in partial fulfillment of the requirements of the Office of Science, U. S.
Department of Energy Science Undergraduate Laboratory Internship (SULI) Program
under the direction of Timothy Green in the Environmental & Waste Management
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Abstract

The New York State threatened banded sunfish (*Enneacanthus obesus*) inhabit rivers, lakes, and ponds along the Atlantic coast. Because the banded sunfish is a voracious predator of mosquito larvae, they provide a biologically efficient means of controlling the mosquito population. Previous population assessments completed in Zeke's Pond and the Peconic River has suggested that the fish's populations are at risk of declining. In order to formulate a plan to promote the growth of the species, a distribution study of the sunfish was performed in Zeke's Pond, the Peconic River, and the Peconic River Drainage. The study began by observing and identifying the aquatic vegetation in each pond along with documenting the location of each pond with a Global Positioning System (GPS) unit. The next step was to seine and dip net in areas identified with vegetation favored by the banded sunfish. The fish and predatory species obtained were then measured, documented, and released. A rubric was devised to evaluate the correlation between the banded sunfish's distribution and the aquatic vegetation present in the seined areas. A total of twenty-seven bodies of water have been studied obtaining 321 individuals of various predatory species. Of the twenty-seven waterways, twelve bodies of water yielded 329-banded sunfish. Results of the distribution survey indicate a correlation between the banded sunfish and ponds with a higher density of bladderwort, white water lilies, and smartweed. Of the sites surveyed by this team, results revealed banded sunfish to be present in all of the ponds listed on the New York State Department of Environmental Conservation's (DEC) historic banded sunfish sites. This distribution survey was part of a larger ongoing survey that is being conducted by the DEC in preparation for developing a recovery plan for this species.

INTRODUCTION

Enneacanthus
obesus is a fresh water species of fish in the order of Perciformes and the family of Centrarchidae [1]. The genus is derived from two terms. The first part ‘*ennea*’ is a Greek term



Fig. 1. Banded Sunfish

that dates back to the year 1653 meaning nine. The second half of the genus ‘*canthus*’ is a Celt term, circa 1375, meaning rim of wheel. Thusly the genus *Enneacanthus* represents the nine spines extending from the dorsal fin; the anal fin has a set of three spines as well. The term ‘*obesus*’ dates back to a fifteenth century Latin term ‘*obesitas*’ meaning fatness or corpulence which describes the physical appearance of the fish’s body.

The banded sunfish is one of the smallest species of sunfish, with adults ranging in length from 40mm to 70mm. The fish is olive colored with purple, green, and gold iridescent specks covering its body (Fig. 1). *E. obesus* also has a distinguishing gill cover spot just behind the right eye that is larger than its pupil. An arched lateral line that ends just before the caudal fin, and an upturned mouth are distinct to the banded sunfish as well. Additionally, and most unique of all of the sunfish’s characteristics is the rounded shape of its pectoral and caudal fins, which are unlike any other sunfish species.

The banded sunfish's diet consists of submerged aquatic vegetation (SAV), (which it also uses for protection from predators) mollusks, crustaceans, and other fish. However, the main staple of the banded sunfish's diet occurs as a result of their being "a voracious predator of mosquito larvae which provides a biologically efficient means of controlling the mosquito population" [2]; which are easily accessible in the bodies of water the banded sunfish inhabit.

Banded sunfish inhabit small bodies of water such as rivers, lakes, ponds and bogs along the Atlantic coast; preferring the shady areas nearest the shoreline [3]. In New York the banded sunfish can be found inhabiting the Passaic and Peconic River drainages. The Peconic River Drainage consists of lakes, bogs, and ponds that are all interconnected to the Peconic River and are within the Long Island Pine Barrens.

The Peconic River, which is head-watered at Brookhaven National Laboratory, is Long Island's most historical and ecologically diverse river. The slow moving, mostly fresh water river, houses three cranberry bogs, a water mill, and an old iron forge in addition to being the home of many aquatic species. The Peconic River was the starting point of the survey. In order to formulate a plan to promote the growth of the species, a distribution survey of the sunfish was performed in the Peconic River Drainage along with Biologists from the Department of Environmental Conservation (DEC).

MATERIALS

Specific materials were required for collecting the banded sunfish. Fishing waders were worn for entering the water. Small and large mesh dip nets, and small and large mesh seine nets were used to collect the fish, while buckets were utilized to store the fish prior to processing. A boat was necessary for entering deeper bodies of water

along with life vests for boating safety. A Global Positioning System (GPS) unit was employed to map the coordinates of the twenty-seven ponds that were fished. Also, a Yellow Springs Instrument (YSI) probe was operated to measure the pH, turbidity, temperature, conductivity, and dissolved oxygen in each body of water. Finally an anti-bacterial agent was employed to clean the gear prior to leaving each body of water and at the end of the day.

METHODS

Upon reaching each body of water, the first step was to identify the aquatic vegetation in and on the water. Each identified plant was measured according to the rubric created (Tables 1, 2). One team member would then acquire the GPS coordinates while another would collect the water chemistry data using the YSI probe. Next two sets of teams of two entered the water. One team seined while each person on the other team utilized the dip net technique. Both teams carried buckets with water for the fish they caught. The teams would then go up the shoreline opposite of each other and using standard seine net and dip net methods, would fish for a predetermined period of time in an attempt to catch the banded sunfish. If no sunfish were caught in the time allotted the teams would move farther up the shoreline and fish again. Once fish were caught, they would be placed in the buckets for processing later. After the teams finished fishing, they would return to process the fish. Processing entailed counting and measuring each fish before returning the fish back to the water. Upon confirming the presence or absence of banded sunfish the teams would then gather all materials and clean the nets and waders with the anti-bacterial agent to prevent the spread of invasive species from one body of

water to another. A minimum of three ponds per field day was assessed for banded sunfish.

RESULTS

A total of twenty-seven water bodies were surveyed of which twelve yielded banded sunfish. The survey began on June 13, 2008 and was concluded on August 4, 2008. A total of 329-banded sunfish were captured along with 321 individuals of various predatory species. The bluegill, which is another species of sunfish, was the predominant predator captured during this survey period (Fig. 2). The results of the aquatic vegetation assessment indicated the water lily (*Nymphaea odorata*) [4] as the primary plant species found in the assessed waterways (Fig. 4).

The lengths of the fish ranged from 12mm to 78mm. The pond with the greatest number of fish surveyed was Railroad 1 west (RR1W) with 111 fish (Fig. 3). Fry were captured in Zeke's Pond, South of Horn Pond, and Woodchoppers Pond.

DISCUSSION/CONCLUSION

A correlation was observed between the habitat consisting of water lilies (*Nymphaea odorata*) and the presence of banded sunfish. Additionally, bladderwort (*Utricularia vulgaris*) represented a favorable habitat in which sunfish were obtained. Smartweed (*Polygonum hydropiperoides*) was also a plant species that was commonly used by banded sunfish as habitat.

A drought was observed during the period of surveying, noted by a decrease in water levels in some of the ponds. This in turn caused some of the waterways that were once interconnected to become enclosed or disconnected within a drainage system.

Due to the drought, waterways that were not connected to other bodies of water showed distribution of the banded sunfish. Whereas waterways that were interconnected indicated less of the banded sunfish distribution due to predatory threat. It can possibly be inferred that the disconnection of the pond to the original waterway prevented predators from entering areas of sunfish habitat.

Following the survey, the GPS points were mapped utilizing a Geographic Information System (GIS) to obtain an overall view of the surveyed sites (Fig. 5). Of the sites surveyed by this team, results revealed banded sunfish to be present in all of the ponds listed on the DEC's historic banded sunfish sites. This distribution survey was part of a larger ongoing survey that is being conducted by the DEC.

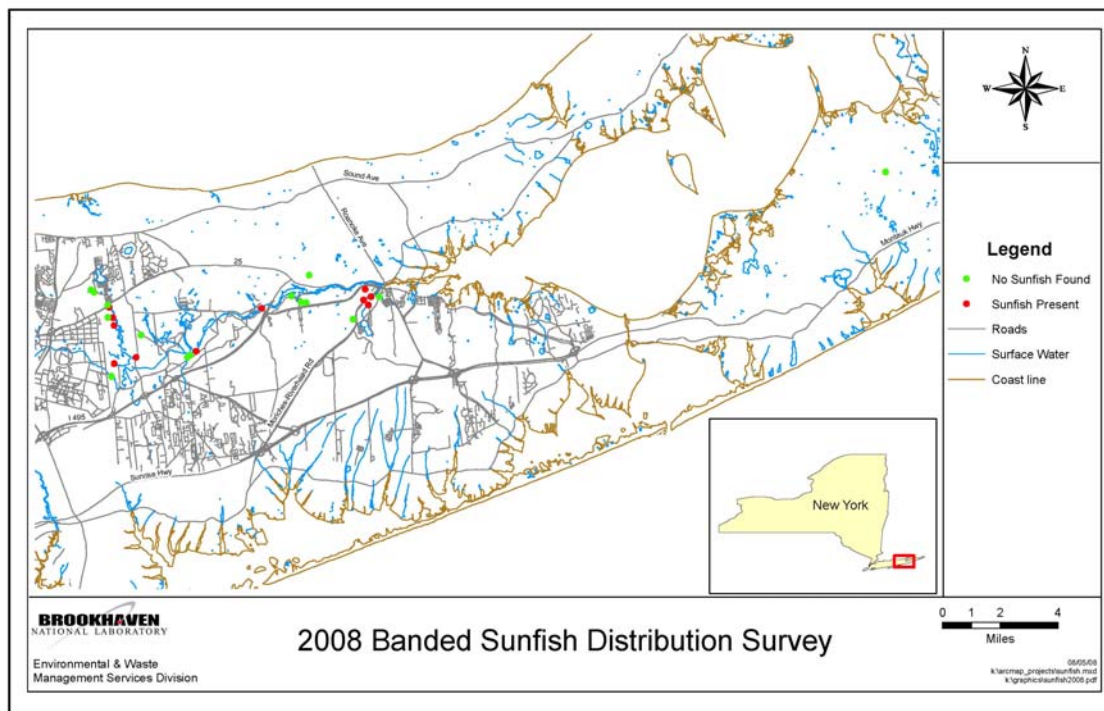


Fig. 5 Map showing Banded Sunfish distribution on eastern Long Island, NY

ACKNOWLEDGEMENTS

We would like to thank the Department of Energy, Brookhaven National Laboratory, Science Undergraduate Laboratory Internship (SULI) program, the Office of Educational Programs (OEP), Noel Blackburn and Kathy Gurski for facilitating us with this internship. Our gratitude goes out to Dr. Timothy Green, our team leader and mentor, and our professor and mentor Dr. Murty Kambhampati for their guidance. We sincerely appreciate the associates and staff of OEP and the Environmental Services Division of Brookhaven National Laboratory for their support and assistance. A special thank you goes out to the Department of Environmental Conservation, Heidi O’Riordan and Charles Vullo for their assistance in conducting the surveys. Lastly, we would like to thank Southern University at New Orleans for this educational opportunity.

Table 1 Rubric of Aquatic Vegetation

Level	Presence
1	Less than 20%
2	20%-40%
3	40%-60%
4	60%-80%
5	80%-100%

Table 2 Density of Banded Sunfish in Correlation to Aquatic Vegetation

Level 1	No banded sunfish found in aquatic vegetation
Level 2	1-3 Banded Sunfish found in Pond
Level 3	4-6 Banded Sunfish found in seined Pond
Level 4	7-10 Banded Sunfish found in Pond
Level 5	11 or more Banded Sunfish found in Pond

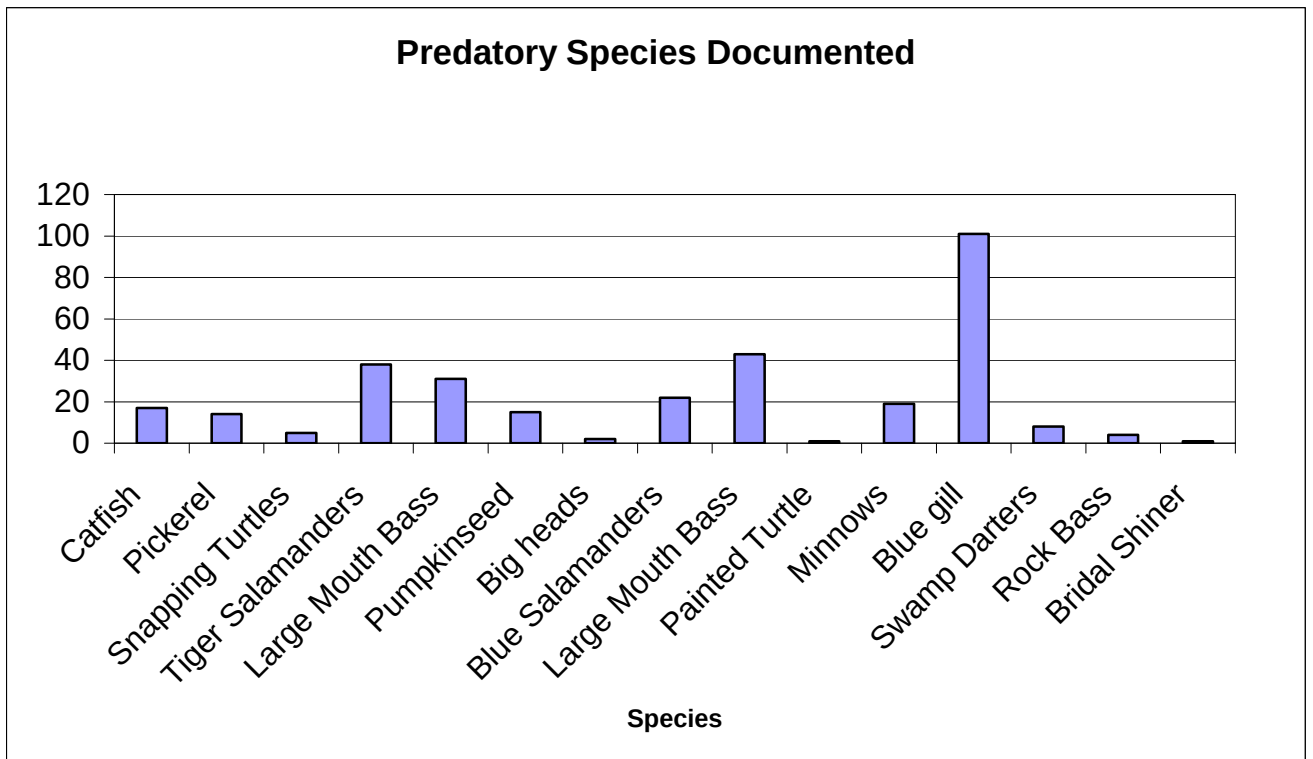


Fig. 2. Number and types of fish species other than banded sunfish documented during surveys.

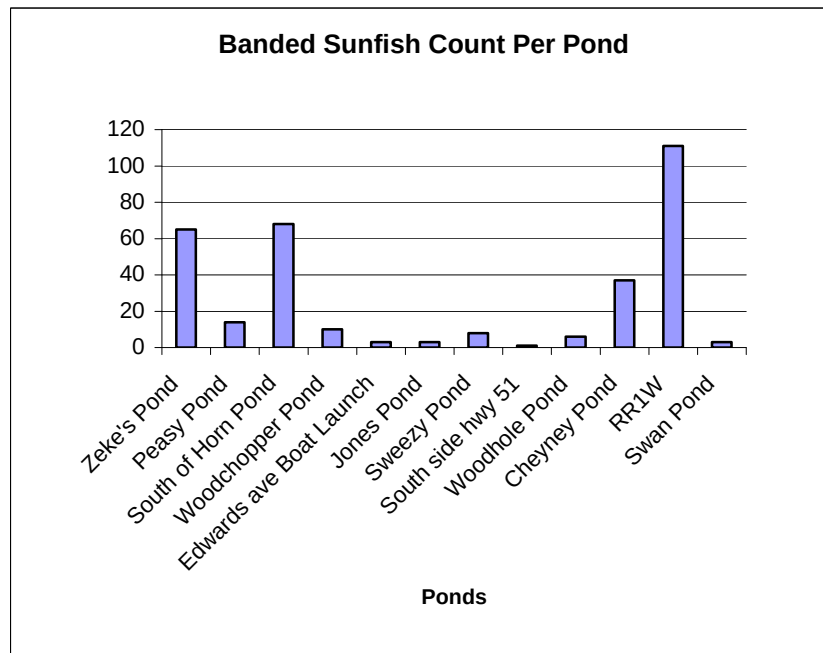


Fig. 3. Banded Sunfish counts for all ponds where documented

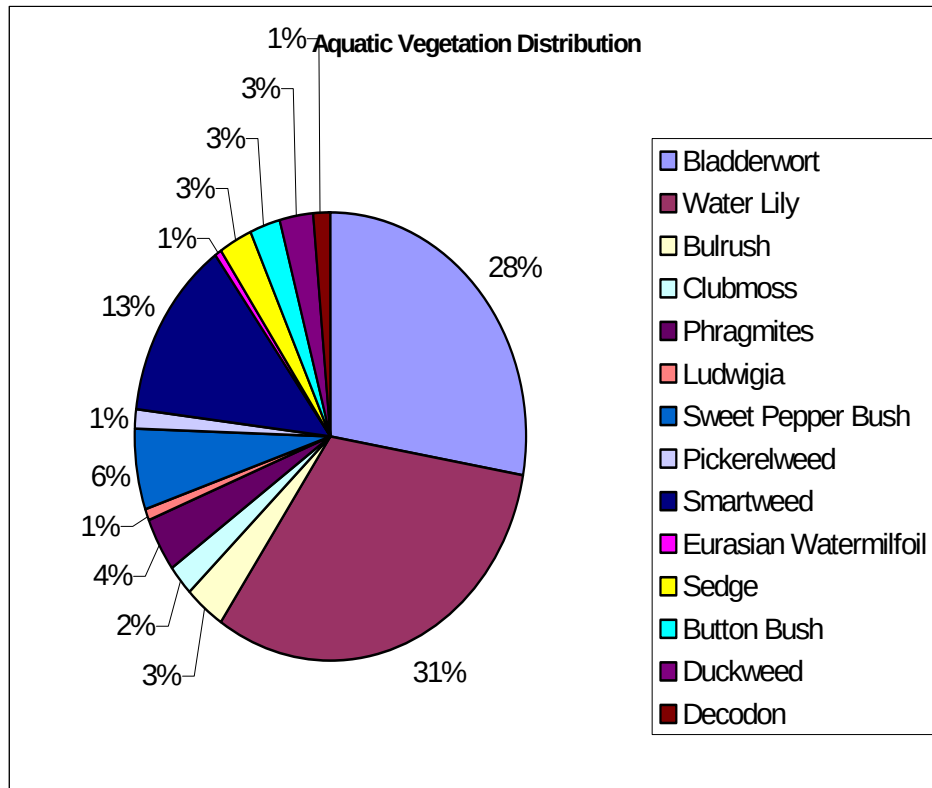


Fig. 4. Percent distribution of various aquatic plant species associated with banded sunfish habitat.

Literature Cited

1. SEMAC Banded Sunfish Project “ Developing a cost effective method to raise the Banded Sunfish in underutilized or seasonally “fallow” cranberry bogs.” [Online Document] [16 July 2008] Available HTTP:
<http://www.mbl.edu/aquaculture/sunfish/index.html>
2. New York State Department of Environmental Conservation, “Banded Sunfish Fact Sheet” [Online Document] [2008 August 05] Available HTTP:
<http://www.dec.ny.gov/animals/26043.html>
3. P. Rollo, “North American Native Fishes Association: Successfully Spawning and Raising the Banded Sunfish (*Enneacanthus obesus*),” [Online Document] 1994 fall, [1 August 2008] Available at HTTP://www.nanfa.org/articles/acbanded.shtml
4. Ralph W. Tiner , Jr., A Field Guide to Coastal Wetland Plants of the Northeastern United States, 1st edition ed. , Cushing-Malloy, 1987.