Evaluation of Fish Community Structure in *Trapa natans* Beds in the Middle Hudson River Estuary

A Final Report of the Tibor T. Polgar Fellowship Program

Jacqueline R. Anderson

Polgar Fellow

SUNY College of Environmental Science and Forestry
Environmental Forestry and Biology
Syracuse, NY 13210

Project Advisor:
Wayne R. Gilchrest
Dutchess Academy of Environmental Studies
Dutchess County BOCES
Poughkeepsie, NY 12601

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Abstract

We collected original data regarding fish community structure within three different European Water Chestnut (*Trapa natans*) beds in the Middle Hudson River Estuary. The beds sampled were at Norrie Point (River Mile 85, east shore), Vanderburg Cove (River Mile 87, east shore), and Esopus Meadows, (River Mile 87, west shore). Fish were collected using pop nets inside the water chestnut beds, beach seines along the unvegetated shallows near the water chestnut beds, and by trawling along the unseinable margins of the water chestnut at the Norrie Point and Esopus Meadows Bed.

Two patches were also cleared within the water chestnut at Norrie Point, one isolated in the vegetation and one with a corridor cleared between it and the main river. These patches were sampled every other week by pop netting. We found no significant difference in species composition between the cleared patches and the interior patches at Norrie Point, although age stratification was noticed. Both the interior and cleared patches were dominated by tessellated darters (*Etheostoma olmstedi*), while the beach seine data for Norrie Point found centrarchids to be the most common family. This generally agrees with previous work at Norrie Point, although pop net data were slightly less consistent. 1997 data indicated that Tessellated Darters were an important species, as was also found in 2003; however, the most common 1997 species were not caught in abundance in 2003. Trawling revealed a different community to be using the edge of the water chestnut, this community being dominated by striped bass (*Morone saxatilis*) at Norrie Point and alewife (*Alosa pseudoharengus*) at Esopus Meadows. Banded killifish (*Fundulus d. diaphanus*) were most common in beach seines at Esopus Meadows and Vanderburg Cove while spottail shiners (*Notropis hudsonius*) dominated pop nets at these two sites.

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Introduction

Tidal wetlands provide many vital natural functions for the environment. They serve as buffer zones between the forces of the ocean and the topography and use of the land, they provide nurseries for fish fry, hunting grounds for higher predators, areas of high bioactivity and nutrients, habitats for many species of waterfowl and other animals, as well as scenic enjoyment (Mitsch and Gosselink 1993). However, these valuable resources are highly dynamic. Tidal wetlands, those of the Hudson River being no exception, are subject to many changes as a result of both natural forces and human impacts (Pinet 2000). All of the components within tidal wetland ecosystems are intimately related. A decrease in the population of one species may lead to higher numbers of species that were competing with or preyed upon by the first, as well as habitat changes brought on by changing plant communities (Smith and Smith 2001).

European water chestnut (*Trapa natans*), an exotic, invasive species, has become a large factor in Hudson River tidal wetlands communities since the 1860's. Its sweeping effects on habitat structure have undoubtedly created a force to be contended with by fish communities.

The purpose of this study was to more fully understand the dynamics and structure of fish communities in water chestnut beds. This research was designed to add on to the base of knowledge regarding this subject, and was engineered with the intent of making it easy to compare to similar studies. This survey was especially important in light of recent observations on Hudson River tidal wetlands fish community structures. In studies conducted by Gilchrest (1998) and Schmidt et al. (2002), results depicted a dramatic change in fish community structure within Tivoli South Bay, transitioning in relative abundance from fourspine sticklebacks (*Apeltes quadracus*) and common carp (*Cyprinus carpio*) in Gilchrest's 1998 study, as well as other surveys cited in his paper (Pelczarski and Schmidt 1991, Hankin and Schmidt 1992), to the most abundant species being goldfish (*Carassius auratus*) in the 2002 study (Schmidt et. al. 2002), with the fourspine sticklebacks almost entirely gone (Gilchrest 1998, Schmidt 2002, Schmidt personal communication). This information, as well as its implications for environmental change, warranted a serious investigation into the continuing change of fish communities as well as possible causes of this change. This information was particularly alarming because while water chestnut beds represent a dynamic environment, such drastic changes in community structure over such a small amount of time, compared to an otherwise stable previous community, implied something out of the ordinary, and required a re-evaluation of our ideas concerning the stability of these communities.

It is likely that fish community structure in Hudson River tidal wetlands would change as the environment was altered by shifting plant dominance, filling in of the wetlands, and other factors which make the habitat suitable for more adaptable species that may then be able to out-compete less adaptable species. Another interesting factor in the case of Hudson River tidal wetlands is that we have a better idea of the changing fish community structure than we do of what is causing this change. Although we may not currently be directly observing the environmental factors that are causing such dramatic changes, we know that fish community structure changes are not an effect without a cause. The changing fish community structures of Hudson River tidal wetlands are acting as an indicator for some sort of environmental change outside of those we have identified and understand.

Although last years' findings may be attributable to the mild 2001-2002 winter, and persisting springtime drought in the already relatively abnormal environment of Tivoli Bays, we believed that these changes in community structure and decreasing biodiversity would be perceptible in 2003 as well, albeit most likely in a less dramatic nature from 2002. Although the data collected this summer supports the idea that last years results represented some sort of strange dip, after which the populations of certain fish, mentionably fourspine sticklebacks seem to be recovering, other noteworthy phenomena were noticed regarding fish communities in the water chestnut beds studied this summer. Since the water chestnut has become a dominant factor in Hudson River tidal wetlands, we hypothesized that selective removal of these plants would cause a perceptible change in community structure. We also believed that there would be a strong edge effect along the water chestnut beds, as there is a mixing of open water communities and those that exist within the water chestnut. We also hypothesized that different communities would develop in clear areas that are isolated within the water chestnut from those that would develop in cleared areas that are connected to the open water outside of the water chestnut beds.

One of the main goals of this study was to identify if the changes documented last year were to persist this year. This is a particularly important goal in that fish community changes may imply that environmental changes outside of the normal dynamics of the system have already occurred or are still occurring. It also was, and will continue to be, critical to evaluate how human activities fit into this web of environmental factors and changes, so that we can better understand from an ecological perspective, what consequences our actions have on the environment which we so heavily depend upon.

Methods and Materials

We sampled fish community structure at two representative Hudson River tidal wetland sites on a biweekly basis (Norrie Point and Vanderburg Cove), and also at Esopus Meadows three times during the summer, between 16 June and 13 August, 2003. These sites were sampled with quantitative pop netting within the water chestnut beds and with seining along the edges of the beds to investigate gradients in the community due to edge effects. We sampled the exterior interface between the water chestnut and the open water along the entire length of the Norrie Point and Esopus Meadows beds, using a trawl loaned by Dutchess County BOCES with the help of Sea Tow Mid Hudson. These data were excellent in terms of mapping the populations of fish that use the water chestnut beds less directly and go towards further understanding the ecotone that Anderson and Schmidt (1989) described between water chestnut and its surroundings. This project sampled from June 16 through August 13, 2003. We acquired a total of fourteen pop net data sets at Norrie Point (four in the clear isolated patch, four in the clear patch with the corridor, and six sets at interior sites); four sets at Vanderburg Cove; and three at Esopus Meadows.

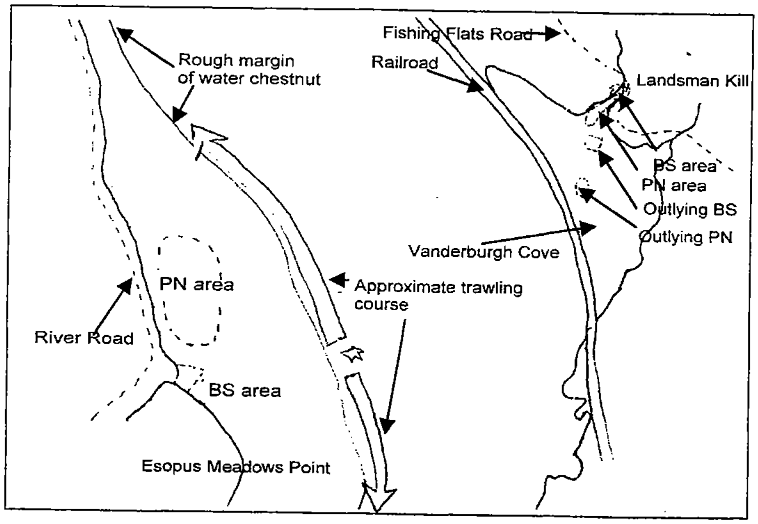
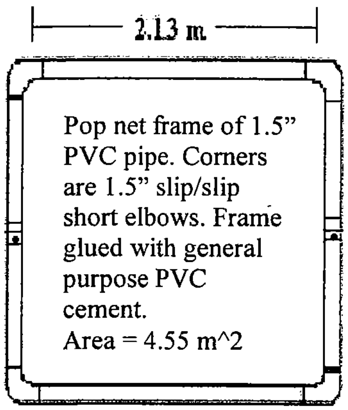
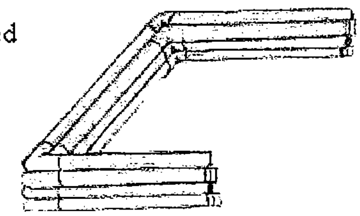


Fig.1: The Sample Sites: Shown above are the Esopus Meadows (EM) and Vanderburg Cove (VBC) sites. The areas within the sites are labeled according to sampling type conducted. Areas shown represent approximately where sampling occurred. Large arrows along the rough margin of the water chestnut bed at EM indicate approximate trawling course. The star indicates Esopus Meadows Lighthouse.

Upon finding two other pop netting projects to cooperate with this summer, Jeremy Frenzel's Polgar Fellowship and Bob Schmidt's continuing studies in Tivoli South Bay, a new pop net was built following the design of Gilchrest (1998) and Schmidt (2002), but modifying it in such a way as to make it collapsible (Fig. 2). This feature allowed it to fit safely and easily into a pick-up truck for transport between storage at Norrie Point and the three sampling sites. The modifications made to the original design left the fully assembled, ready-to-sample net identical to pop nets used in previous studies, thus allowing comparability of these data to those of previous studies. This congruity made it possible to follow trends and to know that discrepancies found in this study were not due to different sampling techniques. Randal Anderson engineered and developed a floating "*Trapa* Sled" made of PVC pipe to facilitate the transportation of the pop net and other gear through the water chestnut (Fig. 3). We used a 25m by 1.5m seine from the Norrie Point Environmental Center to sample around the edges of the water chestnut beds and a 5m trawl from Dutchess County BOCES to sample the unseinable length of the water chestnut beds at NP and EM. Smith (1985) was used to identify species. Species that were still uncertain were confirmed by Wayne Gilchrest and/or Bob Schmidt.



Thin slice taken out of top and bottom frame on both sides and ends capped. One capped side of each part glued into two way union. Hole drilled through union and bolt and wingnut used to hold together when in using position. When being transported, bolts removed, unglued side slipped out of union and entire apparatus folded in half.



Frame during transportation (netting not shown)

Fig. 2: Pop Net Design: The image on the left shows the frame in the ready to sample position. Its interior area and everything else is identical to previous pop net designs. The image on the right shows the frame folded up into its transport position.

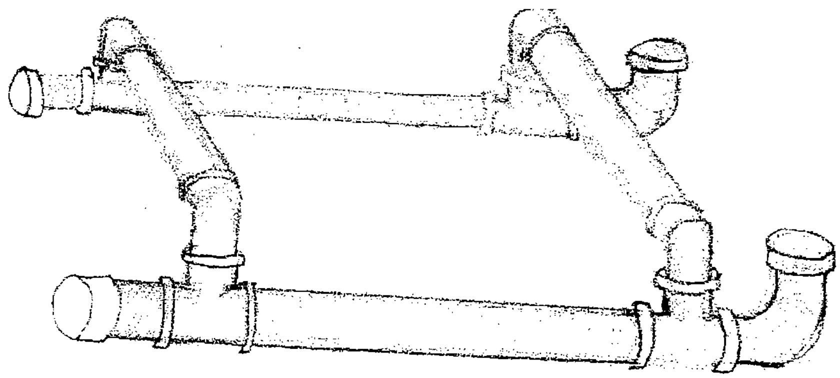


Fig. 3: "*Trapa* Sled" Design: The "*Trapa* sled" was Constructed out of four inch triple wall HDPE PVC pipe and glued with PL-2000 brand glue. The pop net was placed over the rungs on the top of the sled and pulled by a rope attached around the elbows at the first rung.

Sampling was conducted at randomly chosen interior sites at Norrie Point and Vanderburg Cove every other week. The pop net was set at low tide, with care taken to make sure that nothing would snag the net as it popped or otherwise prevent it from rising to the surface fast enough. Initially, weighting the net was a problem, as when it was set, the entire apparatus would float to the surface with the triggers still in place. The use of steel tent stakes proved effective at Vanderburg Cove and Esopus Meadows; however, the loose mud at Norrie Point required the additional weight of several iron slabs on the corners of the net (Fig. 4).

After the net was weighted and set at low tide, it was left undisturbed until two hours after high tide, when the net was popped, approximately eight hours later. To sample the fish in the pop net, a seine was constructed using leftover net material from construction of the pop net. We found that some fish would escape out of the bottom of the seine and back into the pop net before the team was able to bring the net up. This problem was solved by sewing a hula-hoop into the bag of the net. This allowed the net to function as a seine as it was pulled around the pop net, and as a large dip-net when brought up so that it could be brought up bottom-first, and no fish could escape. Seines were pulled around the pop net after clearing the water chestnut from inside and around the net, first clockwise, then counterclockwise, until five consecutive empty seines were pulled. On sampling days, at least one beach seine was pulled at two hours after low tide along the seineable margin of the bed. This was difficult at Vanderburg Cove, where there is little shoreline that is not guarded by a dense mat of emergent vegetation. In most cases, we ended up seining from different points on the marsh side of the Landsman Kill tributary up to the only accessible shoreline (Fig.1). On one occasion, a particularly low tide allowed us to seine in a loop across the tributary and through a pool approximately 70 m in front of the railroad causeway and to land the net on a mudflat.

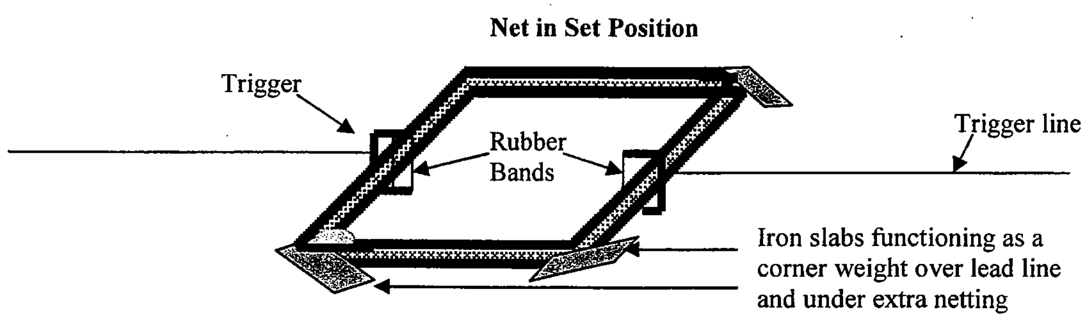


Fig. 4: Weighting the Net: Flat pieces of iron were placed on the corners of the lead line to hold it down while the net was set. Great care had to be taken to avoid laying the iron on the netting that was bunched up at the bottom as this would prevent proper popping of the net.

At Norrie Point, two 3 x 3m patches were cleared and maintained within the water chestnut beds. We pulled the water chestnut as necessary (necessity ranged from only about every week and a half earlier in the season to every few days later in the season). These two areas were marked with floating buoys made of old bottles and clothesline rope anchored to bottles filled with sand, or bricks. One patch was cleared and left isolated within the water chestnut, while the other cleared patch had a corridor of cleared area extending between it and the open water. These cleared patches were sampled every other week in the same manner as the interior sites. Although this was also important while sampling the interior sites, we took care to pop the net as un-invasively as possible, as the cleared patches afforded much greater visibility.

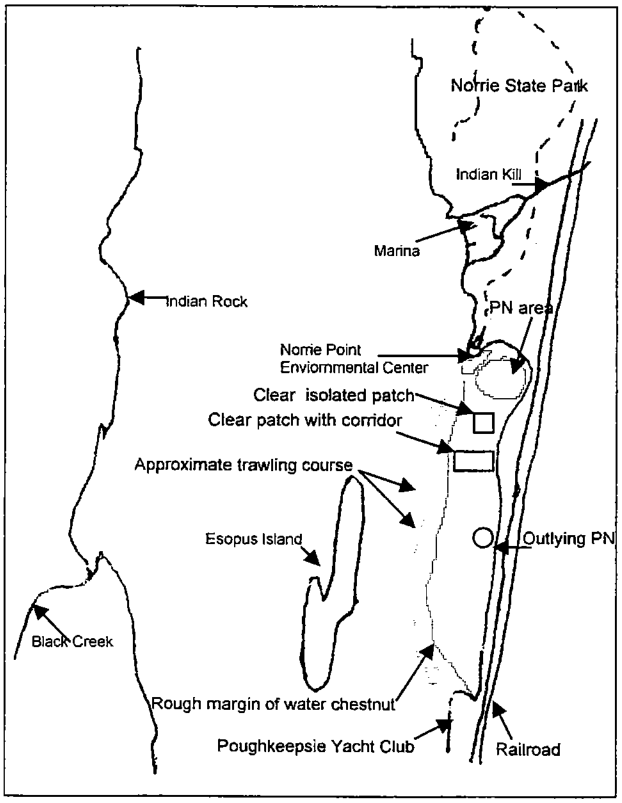


Fig. 5: Norrie Point Site: The approximate area where most pop net samples were taken is shown. The approximate beach seine area is outlined on the leftmost margin of the PN area. The approximate location of the clear isolated patch and the clear patch with the corridor are also shown. The approximate location of the most outward pop net sample is also shown. The rough margin of the water chestnut is also outlined, as is the approximate trawling course.

Results

This project yielded 27 species of fish representing 12 families. We found that at Norrie Point, in the interior sites, tessellated darters were the most dominant species at 32.4% of the total catch, followed by bluegill sunfish (*Lepomis macrochirus*)(18.5%) and carp and goldfish (*Cyprinus carpio* and *Carassius auratus*) with a combined percentage of 27%. Carp and goldfish were grouped together when calculating relative abundance at the Norrie Point interior site because on several occasions throughout the month of July many larval specimens of both species were collected and we were unable to identify them with certainty as one or the other, even with the use of a microscope. July was the only month when either species was caught at the Norrie Point interior site. Most of the bluegill sunfish that were caught in pop nets at Norrie Point were caught in one sample set (40 out of 41 were caught on 10 Aug. 2003). Gilchrest's 1997 data found brown bullhead (*Ameirus nebulosus*) to be the most abundant at 32.4% of the total catch, followed by redbreast sunfish (*Lepomis auritus*) (13.7%) and spottail shiner (*Notropis hudsonius*)(12%). Tessellated darter ranked fourth in relative abundance at 11.9% of the total catch (Gilchrest 1998). Brown bullhead was the most abundant in 1997, but ranked seventh in 2003 at 3.6% of the total catch. Also, in the context of the 2002 fourspine stickleback population crash in Tivoli South Bay, it is interesting to note that one individual was caught at Norrie Point on 28 July 2003. In addition, two individuals were caught in the clear patch with the corridor on 9 August 2003.

The isolated clear patch at Norrie Point was found to have banded killifish (*Fundulus d. diaphanus*) as the most abundant species (46.7%); however, all were caught in only the 8 August 2003 sample set and none were caught at any other times. Tessellated darter was the next most abundant species, comprising 30% of the total catch and being caught far more consistently with a catch frequency (CF) of 75% of the sets.

The clear patch with the cleared corridor at Norrie Point had blueback herring (*Alosa aestivalis*) as the most abundant species (60.1%), however all were larval fish under two cm in total length without pigmentation. Furthermore, these 86 individuals were all caught in the same sample set (28 June 2003). Tessellated darter was the next most abundant species (11.9 %) with a CF of 100%, followed by Banded Killifish (9.8%)

with a CF of 75%. It was found that there was not a significant difference in the community structures of the cleared patches vs. the interior patches at Norrie Point when the data was adjusted to exclude this set of larval fish. Table one shows both adjusted and unadjusted data. Fish caught in the clear patches were generally smaller that the fish caught in the interior. This is exemplified by our catch of the 86 larval herring; however a great deal of the other fish caught were also juvenile. It was also noted while weeding the corridor that juvenile shiner species were consistently observed within the top few inches of water. The clearing of these patches was also an interesting opportunity to observe the replacement community that occurs after the removal of water chestnut, although these results must take into consideration that the patches and the corridor were being disturbed on a weekly basis to maintain the absence of water chestnut. We found mostly big duckweed (*Lemna major*) and Eurasian water millfoil (*Myriophyllum spicatum*), the later not appearing until late August.

At Vanderburg Cove, the most abundant species was spottail shiner with a relative abundance of 28.1% and a CF of 75%, followed by banded killifish (24.7%; CF= 50%) and tessellated darter (14.6%; CF=25%). Seven fourspine sticklebacks were caught on 29 July 2003. This particular sample set was the closest sampling conducted near the center of the cove. These data hint that perhaps if more sampling were conducted in this part of the cove, rather than further up the Landsmans Kill where we were mostly able to sample, that fourspine sticklebacks may have been caught more consistently. Even with the use of the "*Trapa* Sled," it was very difficult to get close to the center of the cove to sample, mostly due to weather concerns. On several occasions the team was concerned about an afternoon thunderstorm blowing in and did not want to be so far out into the cove as to not have a quick escape from the water. On the occasion that we were able to sample in the interior of the cove, it took more than half an hour to get to the site and the same amount of time to get back. It did not seem prudent on any other occasion to attempt sampling this area.

At Esopus Meadows, the most abundant species was also found to be spottail shiner with a relative abundance of 38.9%, followed by pumpkinseed sunfish (31.1%) and blueback herring (16.7%). However, one must remember that this site was only sampled a total of three times throughout the summer so any anomalies in the data will most likely not have been evened out and relative abundance measures are not as accurate.

Table 1: Summary of Catch by Location and Sample Method: NP= Norrie Point; NPINT= NP interior; NPCC= NP clear patch with corridor; NPCI=NP clear isolated patch; VBC=Vanderburg Cove; EM=Esopus Meadows; BS=Beach Seine; PN=Pop Net.

Location	Method	# Fish	Adj. # Fish	Mean fish/ sample	# of Species	# of Families
NP	BS	1752	1065	59.2	26	12
NPINT	PN	222	222	37.0	11	6
NP	Trawl	92	92	30.7	4	3
NP	Total	2066	1379	55.2	27	12
NPCC	PN	143	57	35.8	8	8
NPCI	PN	30	30	7.5	6	6
VBC	BS	115	115	28.8	9	5
EM	BS	137	137	34.3	12	8
EM	PN	90	90	30.0	8	6
EM	Trawl	47	47	23.5	5	4
EM	Total	274	274	30.4	17	10

Table 2: Total Interior Pop Net Data: RA= relative abundance (%); EM=Esopus Meadows; VBC=Vanderburg Cove; NPINT=Norrie Point interior site (2003 adj.)1997 NPRA from Gilchrest (1998)

Species	Location	EM #fish	EM RA	VBC #fish	VBC RA	NPINT #Fish	NPINTRA 2003	NPRA 1997
Anguilla rostrata	American Eel	1	1.1	2	2.2	4	1.8	5.5
Alosa aestivalis	Blueback Herring	15	16.7	0	0.0	0	0.0	0
Carassius auratus	Goldfish	0	0.0	0	0.0	14	6.3	0
Cyprinus carpio	Common Carp	0	0.0	0	0.0	46	20.7	4.6
Notemigonus crysoleucas	Golden Shiner	4	4.4	5	5.6	8	3.6	1.4
Notropis hudsonius	Spottail Shiner	35	38.9	25	28.1	5	2.3	12.8
Ameirus nebulous	Brown Bullhead	0	0.0	6	6.7	8	3.6	32.4
Fundulus d. diaphanus	Banded Killifish	2	2.2	22	24.7	0	0	4.1
Apeltes quadracus	Fourspine Stickleback	0	0.0	7	7.9	1	0.5	0
Morone americana	White Perch	0	0.0	1	1.1	0	0.0	0
Morone saxatilis	Striped Bass	2	2.2	0	0.0	0	0.0	0
Ambloplites rupestris	Rock Bass	0	0.0	2	2.2	0	0.0	0
Lepomis gibbosus	Pumpkinseed Sunfish	28	31.1	1	1.1	4	1.8	7.3
Lepomis macrochirus	Bluegill Sunfish	3	3.3	0	0.0	41	18.5	.9
Micropterus salmoides	Largemouth Bass	0	0.0	0	0.0	19	8.6	2.7
Lepomis auritus	Redbreast Sunfish	0	0.0	1	1.1	0	0	13.7
Rockbass/Pumpkinseed Hybrid		0	0.0	1	1.1	0	0	0
Unidentifiable YOY Sunfish		0	0.0	3	3.4	0	0	0
Etheostoma olmstedi	Tessellated Darter	0	0.0	13	14.6	72	32.4	11.9
	Total	**90**	**100.0**	**89**	**100.0**	**222**	**100.0**	**100.0**

At Norrie Point, beach seining showed that pumpkinseed sunfish (*Lepomis gibbosus*) was the most abundant species, comprising 26.2% of the total catch and being caught in 94% of the seine hauls. The second most abundant species in the adjusted data was the white perch (*Morone americana*) with 13.4% of the total catch and a catch frequency of 39%. The beach seine data had to be adjusted to exclude some of the data in the 8 August and 9 August 2003 sample sets. During both of these sets, the seine became clogged with green filamentous algae and prevented a school of juvenile alewife (*Alosa pseudoharengus*) and golden shiners (*Notemigonus crysoleucas*) from escaping the net, as they were small enough to do so were the algae not present. On 8 August, 69 juvenile alewife were caught, compared to the 9 that were caught in all other seines, and 299 juvenile golden shiners were caught, compared to the 38 caught at all other times. On 9 August, 57 alewife were caught and 60 golden shiners were caught. Making the adjustment of disqualifying these data changed the golden shiner from the most abundant species at 22.7% of the total catch, to the ninth species at only 3.6% of the total catch. Alewife went from ranking fifth with 7.7% of the total catch to 12th at 0.9%. Gilchrest encountered a similar problem in 1997 with a school of juvenile spottail shiners at Norrie Point (Gilchrest 1998). Table 3 shows his adjusted data. It is also interesting to note that six fourspine sticklebacks were caught at Norrie Point in August (9 August 2003 and 8 August 2003). These were the seines that became clogged with filamentous algae; however, these specimens appeared to be large enough that they would have been retained in the net without the algae. Also, on 8 August 2003, a mirror carp (*Cyprinus carpio var.*) was caught at Norrie Point, and on 28 July, a spotfin shiner (*Cyprinella spiloptera*) was caught. These fish were later examined and verified by Bob Schmidt and the spotfin shiner was sent to the New York State Museum.

Beach Seines at Vanderburg Cove showed banded killifish to be the most abundant species, comprising 29.6% of the total catch and being caught in 100% of the seines. Banded killifish composed the entirety of the 12 July seine through a pool near the center of the cove. Spottail shiners were the next ranking species at 27.8% of the total catch with a CF of 75%.

At Esopus Meadows, banded killifish made up 52.6% of the total catch, followed by golden shiner with a relative abundance of 15.3%. Largemouth bass *(Micropterus salmoides)* ranked third at 6.6%.

Table 3: Total Beach Seine Data. RA= Relative Abundance (%); Adj. Data = data adjusted to exclude anomalous data for juvenile fish trapped in algae. NP 2003 mean catch per seine was 97.3 fish unadjusted and 59.2 fish adjusted; NP 1997 mean catch per seine (mc/s) was 181.4 fish unadjusted and 40.3 fish adjusted; EM mc/s was 34.3 fish; VBC mc/s was 28.8 fish.

		NP #fish	NPRA 2003	NPAdj. Fish Caught	NPAdj. RA 2003	VBC #fish	VBC RA	EM # fish	EM RA	NP # fish 1997	NP RA 1997 (adj.)
Anguilla rostrata	American Eel	4	0.2	4	0.38	0	0.0	0	0.0	1	0.4
Alosa aestivalis	Blueback Herring	1	0.1	1	0.09	0	0.0	0	0.0	89	31.6
Alosa pseudoharengus	Alewife	135	7.7	9	0.85	0	0.0	0	0.0	17	6.0
Alosa sapidissima	American Shad	0	0.0	0	0.00	0	0.0	0	0.0	6	2.1
Dorosoma cepedianum	Gizzard Shad	3	0.2	3	0.28	0	0.0	0	0.0	0	0.0
Carassius auratus	Goldfish	7	0.4	7	0.66	4	3.5	0	0.0	0	0.0
Cyprinus carpio	Common Carp	2	0.1	2	0.19	0	0.0	0	0.0	6	2.1
Cyprinus carpio var.	Mirror Carp	1	0.1	1	0.09	0	0.0	0	0.0	0	0.0
Notemigonus crysoleucas	Golden Shiner	397	22.7	38	3.57	12	10.4	21	15.3	26	9.2
Luxilus cornutus	Common Shiner	0	0.0	0	0.00	0	0.0	0	0.0	19	6.7
Notropis hudsonius	Spottail Shiner	64	3.7	64	6.01	32	27.8	0	0.0	24	8.5
Cyprinella spiloptera	Spotfin Shiner	1	0.1	1	0.09	0	0.0	0	0.0	0	0.0
Catostomus commersoni	White Sucker	4	0.2	4	0.38	0	0.0	1	0.7	1	0.4
Ameirus catus	White Catfish	1	0.1	1	0.09	0	0.0	0	0.0	0	0.0
Ameirus nebulosus	Brown Bullhead	37	2.1	37	3.47	0	0.0	1	0.7	2	0.7
Strongylura marina	Atlantic Needlefish	0	0.0	0	0.00	0	0.0	0	0.0	1	0.4
Fundulus d. diaphanus	Banded Killifish	82	4.7	82	7.70	34	29.6	72	52.6	14	5.0
Labidesthes sicculus	Brook Silverside	2	0.1	2	0.19	0	0.0	0	0.0	0	0.0
Apeltes quadracus	Fourspine Stklbk.	6	0.3	6	0.56	0	0.0	0	0.0	0	0.0
Morone americana	White Perch	143	8.2	143	13.43	16	13.9	6	4.4	1	0.4
Morone saxatilis	Striped Bass	5	0.3	5	0.47	0	0.0	1	0.7	3	1.1
Ambloplites rupestris	Rock Bass	0	0.0	0	0.00	2	1.7	0	0.0	0	0.0
Lepomis auritus	Redbreast Sunfish	67	3.8	67	6.29	0	0.0	2	1.5	7	2.5
Lepomis gibbosus	Pumpkinseed	279	15.9	279	26.20	0	0.0	3	2.2	35	12.4
Lepomis macrochirus	Bluegill Sunfish	113	6.4	113	10.61	5	4.3	0	0.0	1	0.4
Lepomis spp.	Unidentifiable YOY sunfish	202	11.5	0	0.00	0	0.0	0	0.0	0	0.0
Micropterus dolomieu	Smallmouth Bass	87	5.0	87	8.17	0	0.0	0	0.0	0	0.0
Micropterus salmoides	Largemouth Bass	39	2.2	39	3.66	1	0.9	9	6.6	27	9.6
Pomoxis nigromaculatus	Black Crappie	1	0.1	1	0.09	0	0.0	0	0.0	0	0.0
Etheostoma olmstedi	Tessellated Darter	50	2.9	50	4.69	9	7.8	9	6.6	1	0.4
Perca flavescens	Yellow Perch	16	0.9	16	1.50	0	0.0	5	3.6	1	0.4
Trinectes maculatus	Hogchoker	3	0.2	3	0.28	0	0.0	7	5.1	0	0.0
	Total	1752	100.0	1065	100.00	115	100.0	137	100.0	282	100.0