



Using Acoustic Telemetry to track Bluefish (*Pomatomus saltatrix*) in the

Great Bay/Mullica River Estuary

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Abstract

The purpose of this project is to determine if it is feasible to track acoustically tagged adult bluefish (*Pomatomus saltatrix*) in the Great Bay and Mullica River estuarine system in southern New Jersey. Out of the six fish we tagged, five survived. We found fish #80 several times via active telemetry, and we were able to monitor fish #72's movements via passive telemetry. We also saw that the fish swam away rapidly after release, which could be a possible fallback response from the tagging. Using striped bass as a comparison, bluefish are fast and difficult to track using smaller Lotek tags.

Introduction

Bluefish are one of the most sought after recreational species along the Atlantic coast due to their aggressive feeding habits and spirited fight. They are a migratory species, spending winters offshore between Cape Hatteras and Florida, and spending summers between Maine and Cape Hatteras. Bluefish are one of dominant marine piscivores along the Atlantic Coast. In estuaries bluefish demonstrate rapid growth rates that are fueled by high food consumption rates. Most estuary studies of bluefish focus only on YOY bluefish, even though adult bluefish have also been seen in similar habitats. To see if bluefish could be studied using acoustic telemetry, we attempted to track adult bluefish movements in the Great Bay/Mullica River estuarine system using active and passive telemetry. Both of these methods have been successful in ongoing striped bass research at the site (www.stripertracker.org). We looked for fish health affects, including fallback response, patterns of detection between gear, and patterns of estuarine use.

Tracking Methods

Bluefish movements were observed using a series of moored wireless hydrophones (Passive Telemetry) placed at crucial entry points into the estuary and throughout the bay and up the river (see Fig. 1 and Pic. 1), and also by following the fish on small boats with directional mobile hydrophones (Active Telemetry) while recording physical environmental parameters using a YSI, DGPS and fathometer. The tags emit individually coded acoustic (76.8 KHz) pulses (2 or 5 bursts s⁻¹). A mobile directional hydrophone, LPH (Lotek Wireless, Inc.) and receiver (SRX_400 W9, both Lotek Wireless, Inc.) deciphers codes by their identification number and signal power.

Active telemetry constituted listening for a distinctive clicking noise of a tag over wide areas. Upon detection, we closed on fish until the receiver could discriminate the tag code the tag at a high power of 120 at a gain lower than 20. This gives us good estimate of the location of the fish.

When tagged fish were released we immediately began tracking their movements to observe any fallback response for as long as we could stay on the fish. Once a week we looked for all the tagged species following a series of fixed location points throughout Great Bay and Mullica River ("spot tracking"). On days which we didn't tag a fish we tried to locate and follow the movements of a single fish for 3-4 hours, or until we lost the fish.

Results

We tagged and released 6 bluefish during the study (Fig. 3). One fish, Code 114, either died or dropped the tag soon after release. Most of the fish were lost to tracking within 15 minutes of their release, so only 1 or 2 data points could be taken at that time. Out of the 5 fish that are believed to have survived, we only relocated one fish using mobile tracking, Code 80 (see Fig. 4). During the last time Code 80 was found, it was swimming with a large school of surface feeding bluefish, which showed how well he recovered from the surgery. Each time #80 was spotted at the mouth of the Mullica River, the tide was ebbing, suggesting that bluefish may be feeding in that location mainly during ebb tide at this time of the year.

Another fish, Code 72, was seen on the hydrophone array immediately after release and for the next 2 days at several different hydrophones (see Fig. 2 and Table 1.), which showed how active bluefish are, showing that bluefish fleeing the scene could be a fallback response from the tagging.

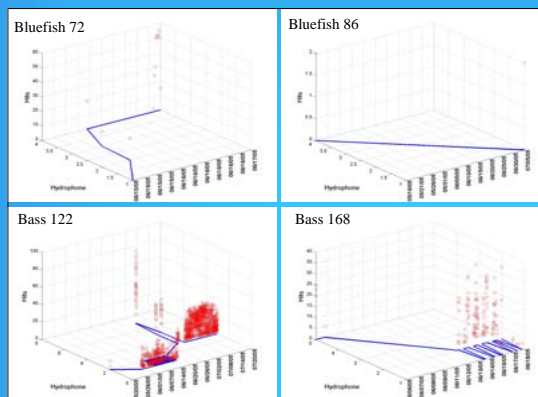


Fig. 2 A comparison of bluefish and striped bass activity on the hydrophone array. Notice how many more striped bass hits there are than bluefish hits.



Fig. 5. The SRX displaying bass code 186 at a power of 207, meaning the bass is very close!



Fig. 6. Bluefish and Striped Bass tags, from left to right model: CAFT8-5, CAFT11_2, CAFT16_3. The bigger the tag the stronger the signal.

Tag	Model	Burst rate (sec)	Acoustic Power (dB)	Life Expectancy (days)	Date Deployed	Expired
72 blue	CAFT8-5	5	149	39	6/15/2005	7/24/2005
62 blue	CAF18-5	5	149	39	6/6/2005	7/15/2005
80 blue	CAFT8-5	5	149	39	6/13/2005	7/22/2005
86 blue	CAFT11_2	2	150	50	6/14/2005	8/3/2005
47 blue	CAFT8-5	2	149	39	7/17/2005	8/25/2005
114 blue	CAFT11_2	5	150	83	6/22/2005	9/13/2005
122 bass	CAFT16_3	5	161/162	723		
168 bass	CAFT16_3	5	161/162	723		

Table 2. The model, burst rate, power and life expectancy of the bluefish and striped bass tags.

Fish	Days Detected	# of Hits	Hits/ 15 min interval
Blue 86	1	4	2
Blue 72	2	429	33
Bass 122	61	24648	15
Bass 168	12	1922	13

Table 1. The number of hits and days detected seen in Fig. 2. The large difference between hits shows how difficult bluefish can be to detect.



Fig. 1. A hydrophone buoy.

Fig. 1 A map of the study site and numbered buoys of the hydrophone array.

Tagging Methods

The bluefish were caught using hook and line with reduced or barbless hooks. Only healthy age 1+ specimens were used. Once caught, the fish was immediately anesthetized in water containing MS222. The sterilized acoustic tags were implanted inside of the peritoneum but outside of the stomach. The incision was closed with biodegradable sutures. The fish then received an injection of Liquamycin® (0.1 mg/kg fish) to prevent infection. See Pics. 2-4.



Fig. 3. Closing Envy's incision.



Fig. 4. Houdini swimming away just after release.

Fig. 3. Alicia holding up Envy during surgery.

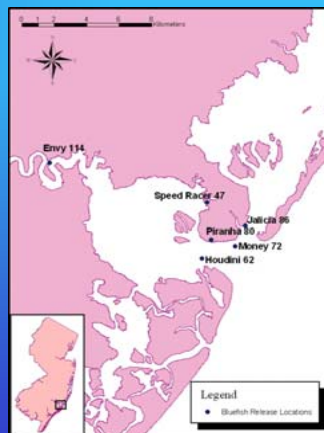


Fig. 3 A map of the release locations for all the bluefish tagged in the study.



Fig. 4 A map of all of Code 80's sighting during mobile tracking.

Tracking Difficulties

We found that bluefish are much harder to track than the striped bass that are also being monitored in the Great Bay/Mullica River system. Bluefish are very active during the day, and rarely sit in one spot for long so it is hard to get a strong power reading from the SRX. The tags used for bluefish are also much smaller than striped bass tags, and produce a much weaker signal (Table 1, 2). The weaker signals were often overridden by nearby bass tags so much so that the bluefish codes couldn't be decoded by the receiver (Pic. 5, 6).

Discussion

Although the bluefish were difficult to track with the Lotek equipment, tracking bluefish is feasible with some modifications. Temperatures in the late-season may have limited estuarine habitat use by bluefish, so an earlier start might have produced more contacts and more opportunities to tag fish. Because it turned out that bluefish moved so fast, we should not have stopped to collect hydrography data at each data point, because by the time we were finished recording the data the bluefish would be gone. It may require 2 boats to track and record the data at each point and not lose the fish.

Only two of the six fish from this period showed up on the hydrophone array, which could mean that the current fixed hydrophone orientation, which maximizes downward coverage, may not be sufficient for tracking surface swimming bluefish with quieter tags. There are other ways in and out of the system that are not covered by the hydrophones, so it may be that the bluefish are using these other paths.

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