Is there a spatial separation in adult and sub-adult striped bass populations?

**INTRODUCTION**

The striped bass is a keystone species in the Mullica River-Great Bay estuary. Although they are not commercially harvested in New Jersey, the mid-Atlantic striped bass commercial catch has shown vulnerability to the mismanagement of spawning and nursery habitats. Recreational fishing for striped bass impacts local economies through the sale of fishing tackle and equipment, boat rentals, and meals and restaurants. As an important striped bass spawning and nursery habitat, the coastal rivers of New Jersey make a significant contribution to the mid-Atlantic striped bass stock. A considerable research interest in this species has focused on describing the movements of adult striped bass within an estuarine study area (Tupper & Able 2000). Consequently, there is a large amount of data available for comparative analysis. Young striped bass are frequently observed in shallow, close-to-shore locations (Ng, 2006). To examine the possibility and cause of age-segregated movements, we used a system of stationary wireless hydrophones located strategically throughout the Mullica River-Great Bay estuary as well as mobile hydrophones to track the movements of acoustically tagged fish (Grothues et al. 2005) (Fig. 2).

**METHODS**

**Tagging:** We caught six sub-adult striped bass by hook and line. Each fish was placed in a tank containing the anesthetic aminobenzoic acid ethyl ether. We surgically implanted an ultrasonic transmitter (Fig. 3) into the peritoneal cavity of each fish and closed the incision with three sutures (Fig. 4). An injection of oxytetracycline (Liquamycin) was administered into the dorsal musculature to guard against latent infection. The fish were marked with external tags to alert anglers of their status and then released.

**Tracking:** We tracked the fine scale movements of tagged fish from a boat using a portable hydrophone at pre-set points. For this, we employed a baffled hydrophone coupled with an SRK-400 receiver/processor (Fig. 6). Contacts were recorded and used to map the locations of individuals. This data was compared to previously collected data for adult striped bass. Our mobile data complements that collected from an array of fixed hydrophones used for examining coarse-scale movements in serial fashion (Fig. 7).

**RESULTS**

There was minimal movement of the tagged sub-adult striped bass. After release, sub-adults were most frequently detected in an upstream location of the estuary. Tagged adult striped bass also moved very little after release, residing primarily in an open water bay portion of the estuary. Figures 8 and 9 shows this age segregation of the adult and sub-adult populations. This spatial separation of the two populations shows no clear preference for either water temperature or salinity (Fig. 10). Water temperature data indicate no age related preference. Salinity data exhibit adult and sub-adult clusters, but with no discernible pattern.

There seemed to be no similarity in adult and sub-adults striped bass’s movements. The sub-adults were found farther up stream while the adults were more often found out in the bay (Fig. 11).

**DISCUSSION**

The spatial separation by age with this species seems unrelated to water temperature or salinity. Of examined environmental factors, geography (i.e., river, estuary) appears to be the most important factor related to age segregation. This suggests a behavioral, rather than physiological explanation of the age separation, in which older, larger fish exclude, smaller, younger fish from prime feeding habitats. Such competitive exclusion based on dominance of prime territory by adults would effectively separate the species into two habitat utilization patterns based on age. Given that the diet of younger bass differs from that of adults and that only after two years are striped bass considered fully piscivorous, spatial separations could have diet related variable as well. Further investigation is warranted.

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**REFERENCES**


**Figures**

- **Fig. 1** Striped Bass (Morone saxatilis)
- **Fig. 2** Stationary and mobile hydrophones
- **Fig. 3** Acoustic transmitter, measuring 13X30mm
- **Fig. 4** Implanting a transmitter into an anesthetized fish. A) making a incision using a sterilized surgical scalpel. B) suturing closed incision after implantation
- **Fig. 5** Release of acoustically tagged sub-adult striped bass.
- **Fig. 6** A portable hydrophone (A) coupled with an SRK-400 receiver/processor (B) was used from a boat to track the fine scale movements of sub-adult striped bass.
- **Fig. 7** Stationary telemetric infrastructure in the Mullica River-Great Bay estuary.
- **Fig. 8** Time vs. hydrophone graph showing which stationary hydrophone the fish were at over time
- **Fig. 9** Time vs. hydrophone graph showing which stationary hydrophone the fish were at over time
- **Fig. 10** Temperature vs. salinity graph, showing the environment in which the fish were found
- **Fig. 11** Locations where large fish (blue dots) and small fish (red dots) were detected by portable hydrophones. Locations of the points routinely checked by portable hydrophone (red).