Distribution of telemetered smooth dogfish, *Mustelus canis*, in a southern New Jersey estuary

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Abstract

Prior to a larger study of smooth dogfish, *Mustelus canis*, exploratory studies are needed to gain an initial understanding of the specie's habitat use and movements. Through this exploratory study, spatial distribution of individuals in an estuary of southern New Jersey were examined in relation to environmental parameters. These first documented patterns can lead to future hypothesis testing studies. We relocated 80% of individuals tagged with acoustic transmitters with mobile tracking, and 100% with both mobile tracking and stationary hydrophones. We found individuals had fairly limited home ranges to the bay channels and remained in their general locations throughout an upwelling event. Potential questions for further study found through this project are: Does *M. canis* respond to oceanographic events such as upwelling? What is the scaling of adult home ranges and do these ranges overlap? What is the estuary smooth dogfish population overturn/residence time?

Introduction

- *Mustelus canis* is a shark species within the family Triakidae. Adults range in size from 80 – 130 cm are are important predators in estuaries (Rountree and Able 1996).
- Estuaries are a known nursery ground for young of year of this species and it is possible that adults use estuaries as a parturition ground (Rountree and Able 1996).
- Seasonal migrations range from the Georges Bank (summer) and the Great South Channel (winter) along the mid-Atlantic Bight (Able and Fahay 1999, Able 2005).
- Large-scale movements correlate with temperature changes below 10 – 12 ºC (Bigelow and Schroeder 1948).
- Adult smooth dogfish are observed to leave the study area estuary in mid-July, currently there is no hard data on this observation (Rountree and Able 1996).
- Understanding of predator habitat usage and movements is important but expensive. Pilot scaling studies are therefore necessary to guide further research.
- Preliminary questions include: Does *M. canis* respond to oceanographic events? What is the scaling of adult home ranges? What is the estuary population overturn/residence time?

Figure 1: Smooth dogfish, *Mustelus canis*.

Figure 2: Dogfish post surgery with closed incision.

Materials and Methods

Study Area

- The Great Bay/Mullica River is located in the Jacques Cousteau National Estuarine Research Reserve (JCNERR) in southern New Jersey.

Tagging

- *M. canis* were caught by hook and line (Figure 1).
- Catch location, depth, surface temperature, salinity, total length and sex of individuals were recorded.
- An ultrasonic transmitting tag (11 x 55 mm, Lotek Wireless, Inc.) was inserted into the peritoneal cavity through a 30 mm incision in the ventral surface (Figure 1).
- Incision was closed with surgical sutures (Figure 2).
- Dogfish were externally marked with a T-Bar tag along the base of dorsal fin and released.

Mobile Tracking

- Study area was surveyed by boat at preset points (Figure 3) approximately three times weekly over five weeks using an LPH-1 baffled hydrophone coupled with an SRX-400 receiver/processor (Lotek Wireless, Inc.).
- Contacts were triangulated until signal strength exceeded 115 dB at a gain of 15 and recorded.
- Salinity, temperature, depth, and time were recorded for dogfish positions.

Stationary Buoy Array

- Eight long-term stationary hydrophones with a 0.5 km radius range in the study area supplemented mobile tracking data (Figure 3).

Data Analysis

- Movements were examined for segregation, localization, and reaction to physical events.

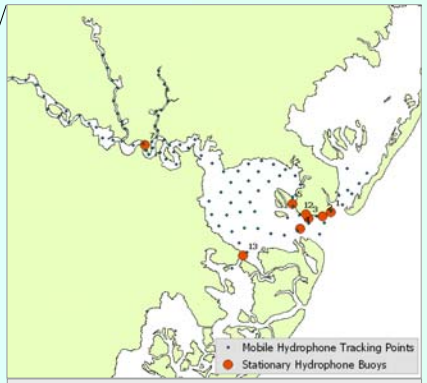

Figure 3: Map of Great Bay-Mullica River estuary with mobile tracking points and stationary buoy locations.

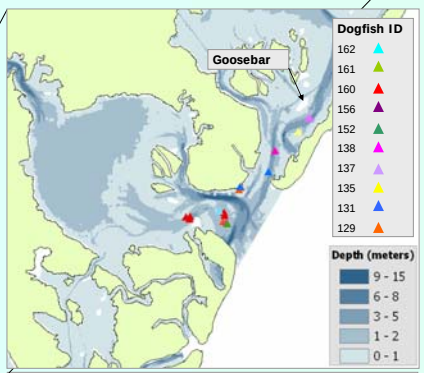

Figure 4: Map of Great Bay with mobile tracking contacts of smooth dogfish with arrow indicating important location for stationary hydrophone buoy.

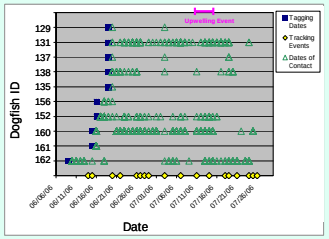

Figure 5: Timeline graph of individual dogfish tagging, mobile and stationary contacts, and tracking events.

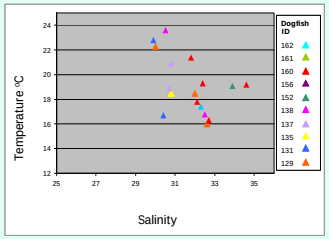

Figure 6: Salinity vs. Temperature graph from mobile tracking contacts.

Results

1. We relocated 8 dogfish 17 times over 18 tracking events.
2. 80% of tagged dogfish were relocated with mobile tracking (Figure 4).
3. Sharks moved mainly within the channels in the bay (Figure 4).

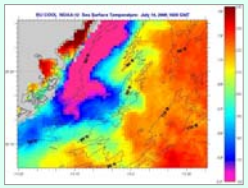

Figure 7: Upwelling image outside of estuary 7/14/06

4. Maximum displacement for dogfish relocated more than 3 times (n=2) was 1.5 km (Figure 4).
5. 100% of tagged dogfish were relocated with mobile tracking and stationary hydrophone array combined (Figure 5).
6. Low standard error (0.9 for temperature, 1.2 for salinity) of individual means ($\overline{T}$ = 19.0, $\overline{S}$ = 31.7) showed individual home ranges were of similar hydrography.
7. Dogfish remained in the estuary throughout the upwelling event (Figure 5 and 7).
8. Dogfish were still being relocated through stationary hydrophone array through the end of the study period (7/25/06) (Figure 5).

Discussion

We found that smooth dogfish, *Mustelus canis*, have fairly limited home ranges. These areas where individuals were contacted through both mobile tracking and stationary hydrophone array show overlapping distributions spatially and temporally. These findings will allow future calculations of home ranges over the life of the tag.

M. canis individuals remained in their general locations in the estuary inlet throughout the upwelling event, which pushed colder more saline waters into the mouth of the estuary. Upwelling did not trigger a large scale migration of *M. canis* from the estuary. Individuals remained within the study area until the study was ended in late July.

This pilot study has identified Goosebar Sedge (Figure 4) as an important place for an additional stationary hydrophone buoy to monitor smooth dogfish movements.

Mobile tracking in the Great Bay estuary of southern New Jersey.

Acknowledgements: Thank you to the National Science Foundation and Rutgers University Institute of Marine Sciences for funding and organizing the RIOS program. Special thanks for help in the field to Paul Clerkin, Greg Henkes, Clare Ng, Paige Roberts, and Jay Turnure.

References: Available upon request.