

Shelf-Estuary Connectivity of New Jersey Migrant Fishes: Analysis using Acoustic Telemetry

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Background: Ecological Importance & Monitoring Seasonal Migration

- The study area is New Jersey estuarine systems and the adjacent continental shelf
- Fishes use both habitats during certain life stages
- The connection between the habitats, is important for seasonal migration
- Stakeholders have a vested interest in fish migration and the effects of windfarm infrastructure



Methods: Estuary Hydrophone Array & Acoustic Internal transmitter deployment

- The Hydrophone array is placed in the mouth of the Estuaries
- Hydrophones are Vemco VR2W, acoustic tags V13-1x
- Fish are caught by hook and line and anesthetized.
 - A transmitter is placed internally, and the incision sealed with sutures
- Fish is placed in a recovery tank before being released into the ocean



Transmitter Detections

Species acoustically tagged	N of deployed tags	Detected tags
<i>Mustelus canis</i>	16	1
<i>Raja eglantera</i>	8	1
<i>Paralichthys dentatus</i>	41	8
<i>Gymnura micrura</i>	1	0
<i>Dasyatis say</i>	1	1
<i>Cynoscion regalis</i>	1	1
<i>Limulus polyphemus</i>	3	0
Other project tags	unknown	114

- The Detected fish were, weakfish (*Cynoscion regalis*), bluntnose stingray (*Dasyatis say*), clearnose skate (*Raja eglantera*), and summer flounder (*Paralichthys dentatus*)
- Little Egg Inlet hydrophones only detected our deployed tags
 - The proximity of tagging event and release location of fish was near the hydrophones

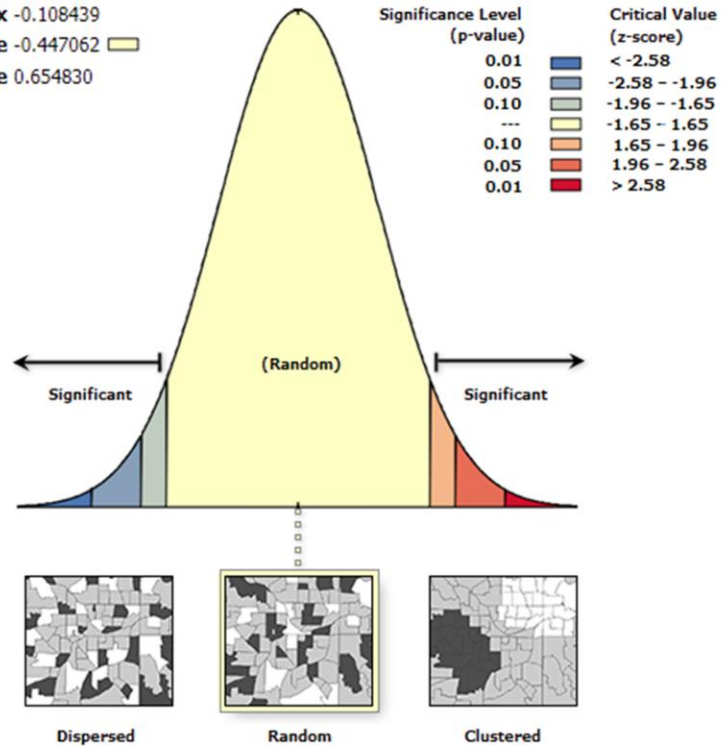
Detections By Inlet

- ArcGIS was used to create a HotSpot map of fish detections
 - Hydrophones in 3 locations were combined due to their proximity
- Most detections were in Hereford Inlet



Spatial Autocorrelation Report

Moran's Index -0.108439
 z-score -0.447062
 p-value 0.654830



Given the z-score of -0.447062, the pattern does not appear to be significantly different than random.

Global Moran's I Summary

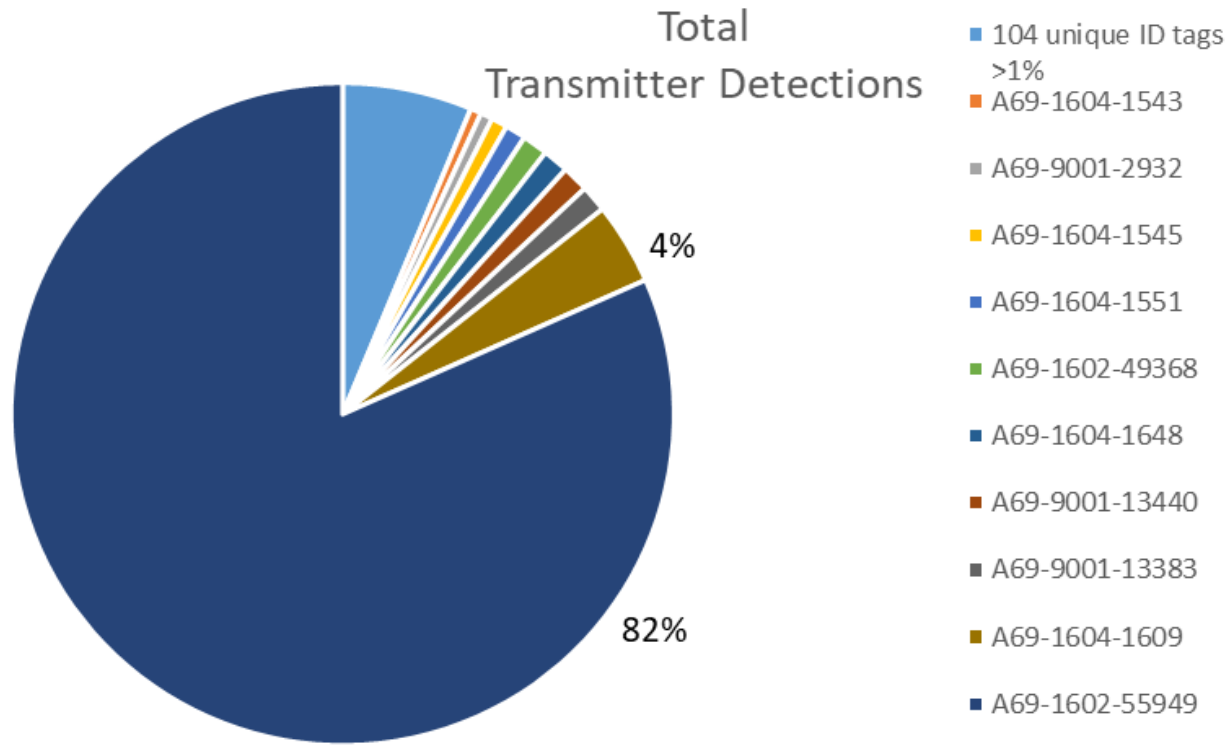
Moran's Index	-0.108439
Expected Index	-0.083333
Variance	0.003154
z-score	-0.447062
p-value	0.654830

Neighboring Estuary Influences

The Raw number of detections at an estuary was not spatial autocorrelated

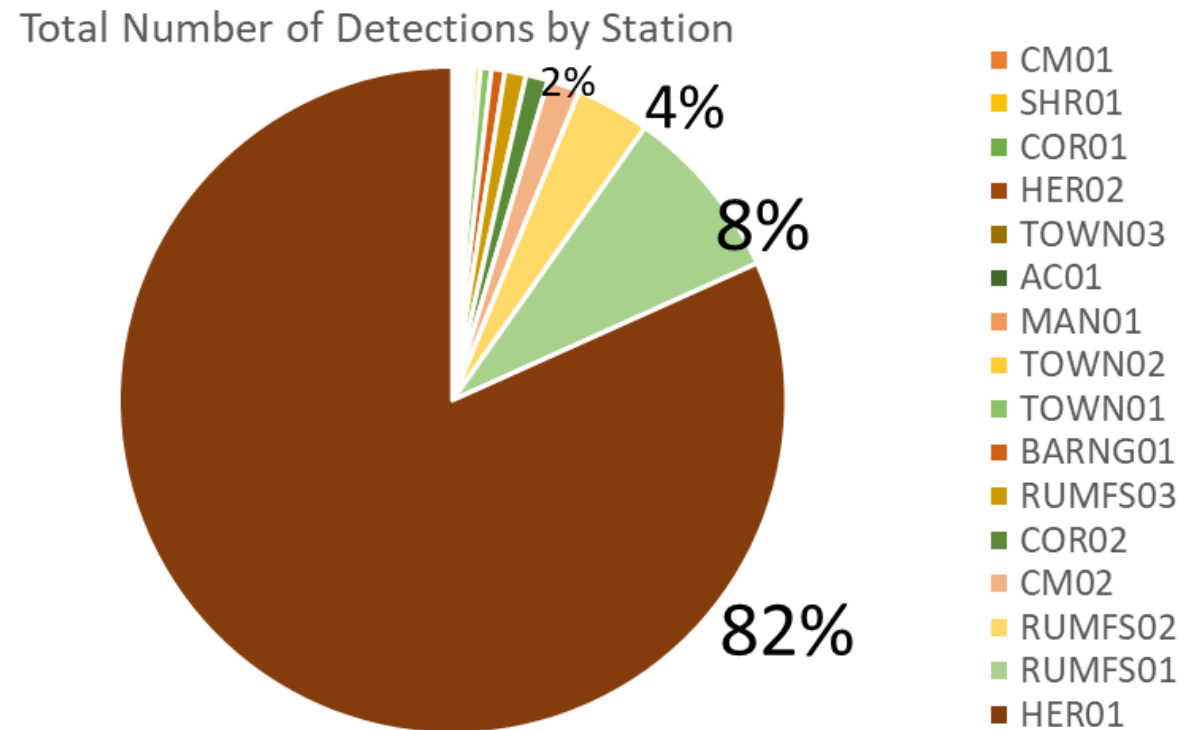
- The Southern part of Hereford Inlet saw plenty of use and passage through the inlet while, the northern Hydrophone did not detect as many fish
- One tagged fish was over represented in the raw data
 - An undocumented tag was detected consistently for about a month at a 2-minute detection intervals

Comparison of Detected transmitters and Hydrophone detections



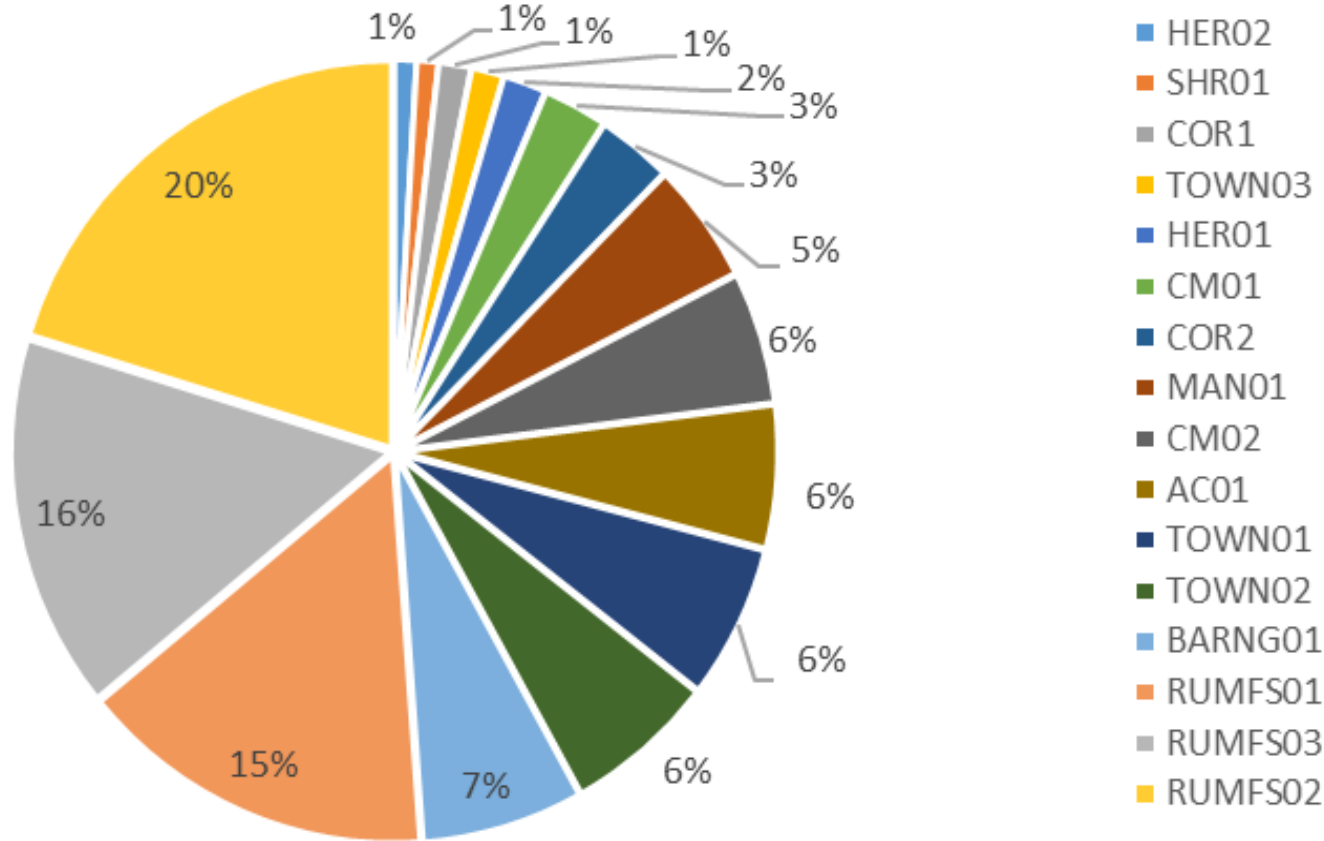
Transmitter A69-1602-55949 had 33692 detections

33729 detections by the Hereford Inlet-01 Hydrophone



Unique Transmitter codes

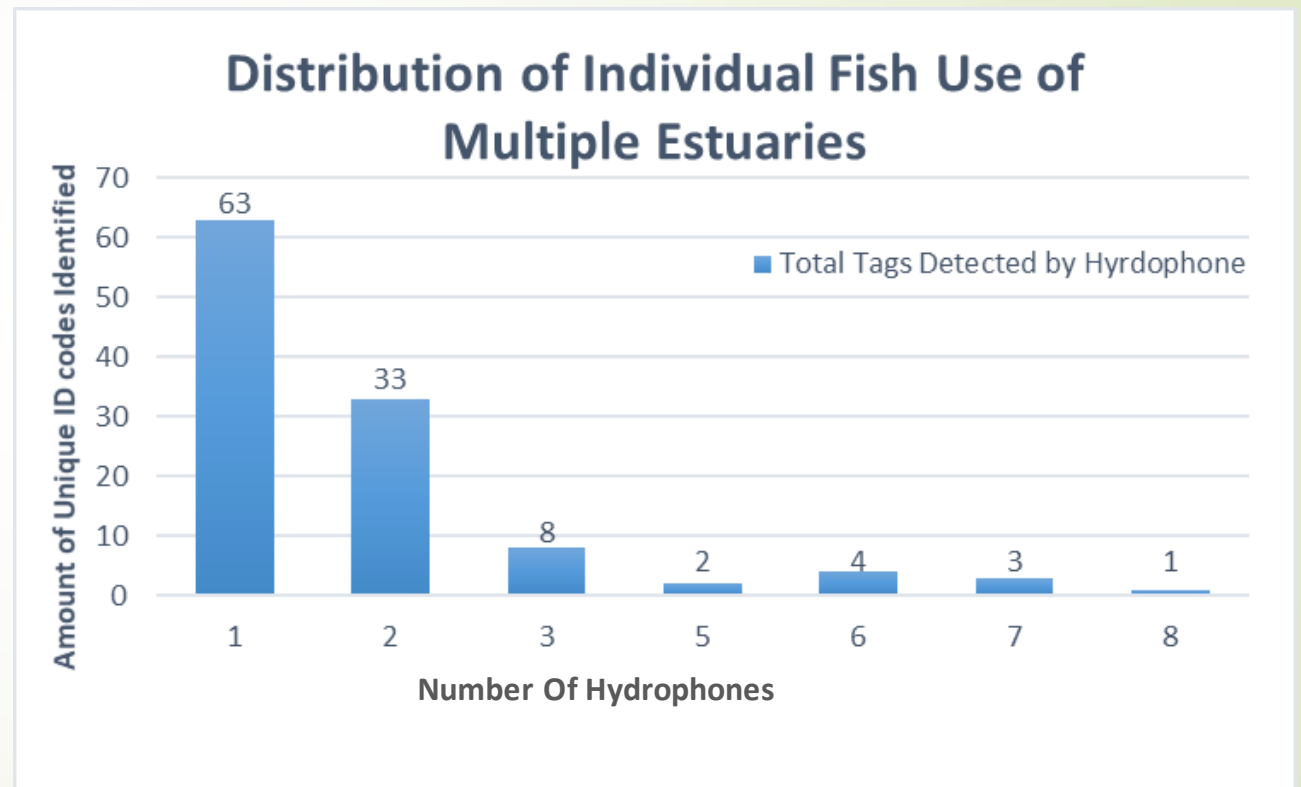
Number of Transmitters Detected by Estuary



Station	Number of Unique Transmitters
HER02	2
SHR01	2
COR1	3
TOWN03	3
HER01	4
CM01	6
COR2	7
MAN01	11
CM02	12
AC01	13
TOWN01	14
TOWN02	14
BARNG01	15
RUMFS01	33
RUMFS03	34
RUMFS02	44

Multiple Estuary Use and Detection of Tagged Fish

- Most tagged fish used 1 to 2 estuaries
 - Hydrophones in proximity shared unique ID codes
- Townsend, Corson, and Cape May Inlets also shared unique ID codes between estuary
- Unknown fish tag A69-1602-49387 used 8 estuaries



Hydrophone detections Between March and September

➤ 12 Hydrophones were deployed in March 2022

➤ October is the last month due to MATOS data upload deadline

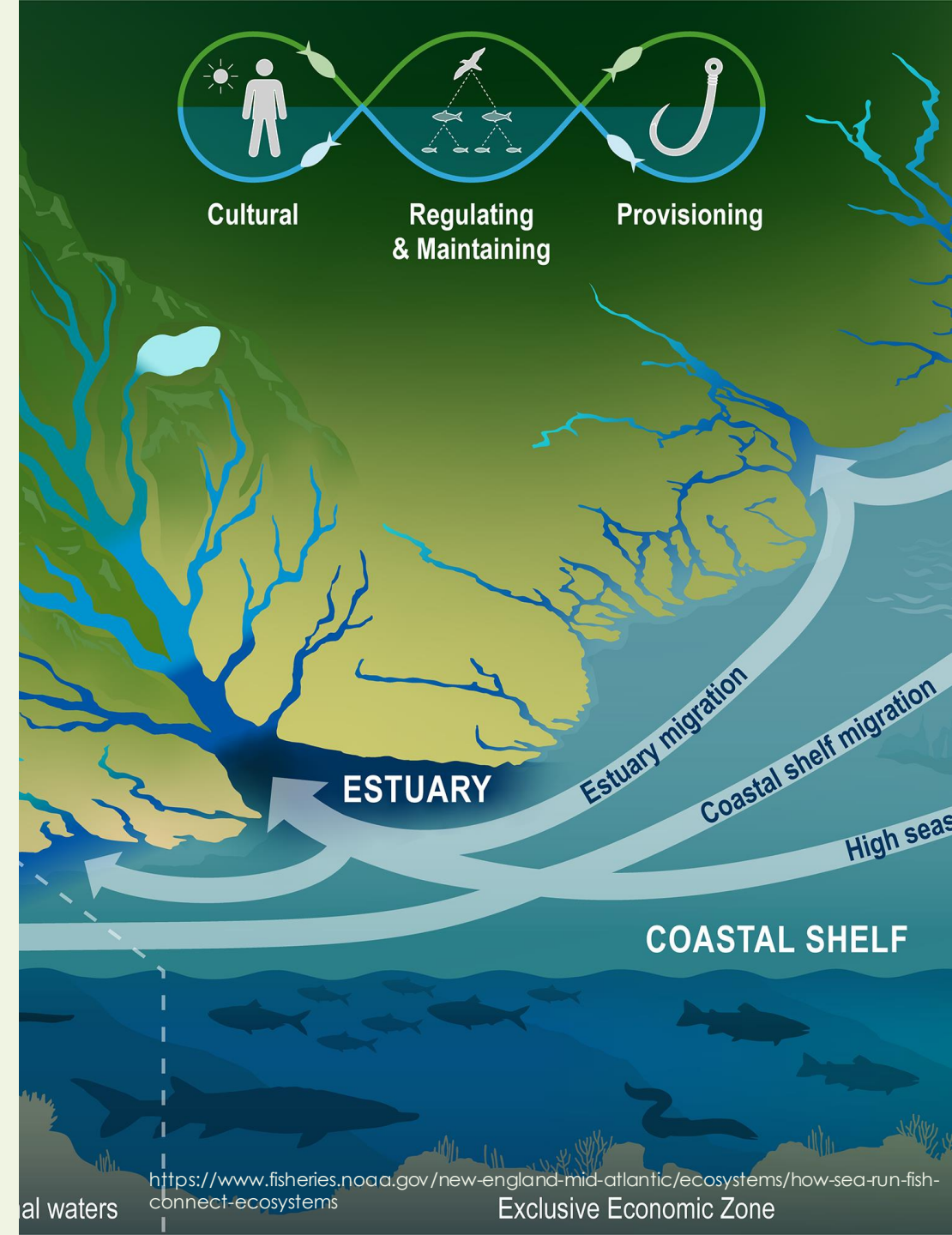
➤ Barnegat, Cape May, and Manasquan inlets support that fish have strong seasonal movements

Time Series of Hydrophone Detections



Discussion

- Migratory species have seasonal patterns and rely on estuaries during important life stages.
- This study builds the foundation for understanding connectivity impacts
- Little Egg Inlet is the estuary nearest to the Rutgers Marine Field Station and had many fish release events occur.
- Fish tagging trips occurred east of the Atlantic City Reef
- This is a part of a 5 year before-after, control-impact survey and will be continued with funding from Ørsted



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- ▶ Data was used in compliance with ACT_MATOS database User Agreement and Data Policy Version 1.2

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