

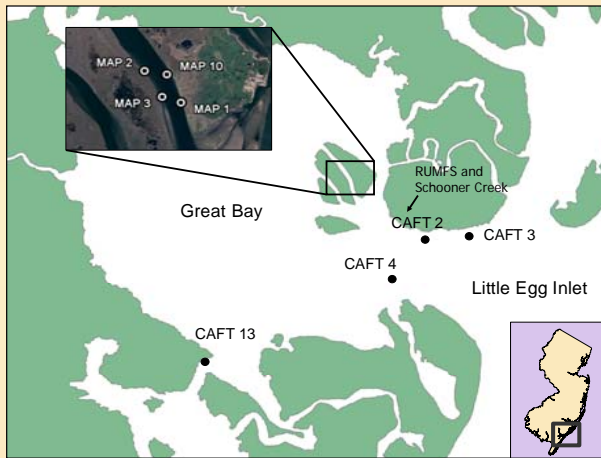
Exploring Summer Flounder, *Paralichthys dentatus*, Carcass Behavior in Preparation for Discard Mortality Studies

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Overview

- Understanding mortality of discarded *Paralichthys dentatus* bycatch in commercial fisheries is important to effective management of this resource.
- Goal - Determine criteria for distinguishing live summer flounder from carcasses based on movements determined from acoustic telemetry.
- Trilateration between four hydrophones produced meter-scale tracks over 1-5 days per fish and were augmented by mobile tracking.
- Underwater video (laboratory and field) helped interpret telemetry results



Study site at Rutgers University Marine Field Station (RUMFS) in Tuckerton, NJ.

Methods

Detachment Trials (N=13)

Premature detachment of transmitters during a tracking experiment would provide a spurious movement record. Deceased fish were tagged with dummy transmitters and placed in the invertebrate tank at RUMFS (Figures 1-4). The condition of the carcass, the activity of the scavengers, and the timing of tag detachment were noted (n=11).

An underwater camera system was used to observe scavenger activity in a natural environment (n=2). The camera was mounted to PVC pipe and placed in the boat basin (Fig. 7). The video was reviewed to observe the timeline of scavenger activity.

Movement Trials (N=9)

Carcass movement was determined by two means, visual observations of a float attached to a carcass (n=5) and trilateration using acoustic transmitters and a hydrophone array (n=4). The float trials in Schooner Creek were conducted as preliminary observations for the large-scale trials. For trilateration, carcasses were tagged using MAP transmitters (Lotek: MA-11-18, 5 second interval) (n=1) or a CAFT-MAP transmitter (Lotek: MS-16-25, 5 second interval) (n=3) and placed in the hydrophone array.



Fig. 1. Transmitters attached to Floy T-bar tags were toggled through the fish from the eyed side using a commercial tagging gun.



Fig. 2. The carcass is being devoured by spider crabs and a whelk. The red tag is still attached and would be audible at this time



Fig. 3. The red tag has been removed by invertebrates and is loose in the tank, photo taken at 0.62 hours.



Fig. 4. The red tag is still attached to the small amount of ventral skin left, photo taken at 52.43 hours.



Fig. 5. Fish with fishing line tied through the eye sockets about to be placed in Schooner Creek for a movement trial.



Fig. 6. Live fish to be deployed in the thoroughfare using the same tagging method used for carcasses.



Fig. 7. Camera system in the boat basin at RUMFS.

Results

Detachment Trials

Laboratory:

- Seven of the eleven carcasses lost their tags during the study
- Tag loss ranged from 0.6 h to 99.1 h with mean at 39.43 h
- Crabs may take multiple days to remove a tag if they begin at the gills and ignore the tag, or it can be removed in less than an hour if crabs begin at the tag attachment site
- Spider crabs excluded other scavengers aggressively

Camera:

- Scavengers (green crabs, mud snails, and blue crabs) are capable of moving carcasses

Movement Trials

Tethered with Floats:

- Average displacement: 2.5 m per h
- Greatest movement: 82 m before fishing line was tangled in debris
- Entanglement caused problems in assessing movement

Trilateration:

- Two of the four fish deployed into the thoroughfare seem to have left the range of the array then returned 1-4 days later- indicates oscillatory movement (Figs. 9-11).
- All dual frequency tags were picked up on the CAFT hydrophones indicating movement into the main bay (Figs. 9-11).
- Carcasses were not detected during mobile distribution tracking of Great Bay, Little Egg Inlet, and the Mullica River.

Conclusions

Summer flounder carcasses move differently from live specimens in sub-tidal estuarine habitats. This information can help develop a signature for dead flounder when working on discard mortality, especially latent mortality.

- Tidal oscillation and current influenced carcass movement - dead fish cannot bury which may cause them to be easily moved into the water column and carried away on the tide
- The dominant scavenger in the lab was spider crabs while in the boat basin it was green crabs.
- Scavengers dominate quickly and might exclude predators by covering or moving the carcass
- Scavengers may occlude tag reception or cause tag loss
- Time required for tag loss is greatly dependant on where organisms begin to feed on the carcass

Unexpectedly, carcasses traveled large distances from the deployment sites. For example, they moved out the thoroughfare and towards Little Egg Inlet and Main Marsh Thoroughfare before being lost from the tracking array. Live flounder remained within the array for multiple days with little change in location (see poster by DeCristofer *et al.*). Movement trends of deceased summer flounder appear to be a result of tidal cycles with fish moving with the strongest current. The implications of this study suggest that distinguishing between live summer flounder and carcasses with acoustic telemetry may be more difficult than anticipated.

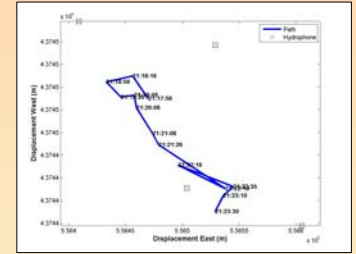


Fig. 8. Track of carcass tag 56 within the thoroughfare on 7-July 2009.

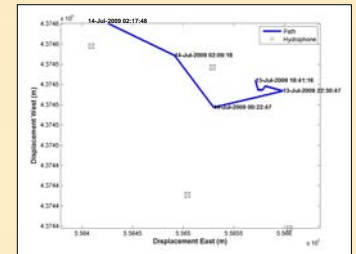


Fig. 9. Track of carcass tag 165 within the thoroughfare on 13-July and 14-July 2009.

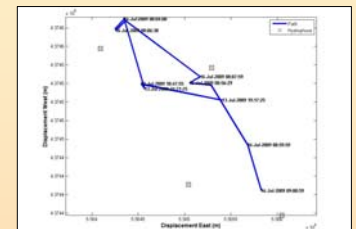


Fig. 10. Track of carcass tag 166 within the thoroughfare on 13-July and 16-July 2009.

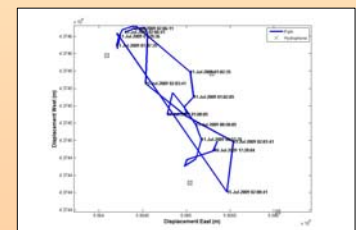


Fig. 11. Track of carcass tag 168 within the thoroughfare on 10-July, 11-July, and 15-July 2009.