



Quantifying movement and dispersal in adult weakfish, *Cynoscion regalis*: Day vs. night comparison



Brian Reckenbeil*, Jason Turnure†, Thomas Grothues†, and Kenneth Able†

*Undergraduate Biology, Moravian College, 1200 Main Street, Bethlehem, PA 18018

†Rutgers University Marine Field Station, Institute of Marine and Coastal Sciences, 132 c/o 800 Great Bay Blvd. Tuckerton, NJ 08087



RESULTS

INTRODUCTION

- Weakfish range from NC to Nova Scotia, but little is known about local movements, especially in the Great Bay-Mullica River estuary, NJ.
- Weakfish spawn during the crepuscular hours but spawning location preference is relatively unknown and could be different from daytime habitat.

This study quantifies the hourly cycle of weakfish dispersal using mobile tracking.

Figure 1



Figure 2



Figure 3



Figure 4



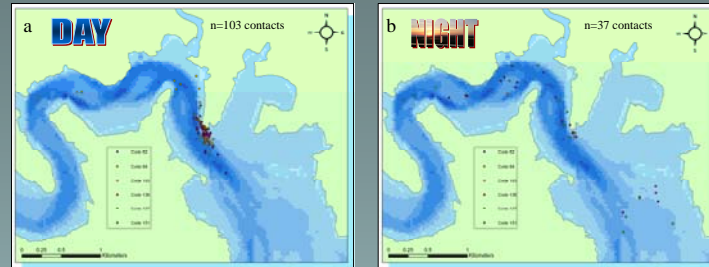
METHODS

Surgically implanted (Fig. 1) uniquely coded acoustic tags (Fig. 2; Lotek Wireless Inc.) in adult weakfish.

Weekly day (06:30—19:29) and night (19:30-06:29) tracking events took place using a top-side receiving unit (Fig. 3) and a mobile underwater hydrophone (Fig. 4) at seven standardized sampling locations (Fig. 5).

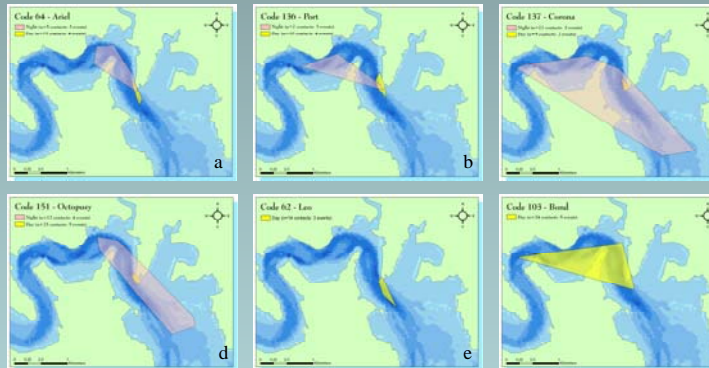
Minimum displacement per hour (MDPH) used as metric for movement; minimum convex polygon (MCP) measurements used to quantify dispersal.

Figures 6a-b. Individual fish locations pooled over multiple tracking events shows aggregative tendencies during the day, and movement and dispersal behavior during the nocturnal period



DISPERSAL

Figures 7a-f. An expansion of range during the night time hours was observed in multiple tracked weakfish over the course of 2 or more tracking events



MOVEMENT

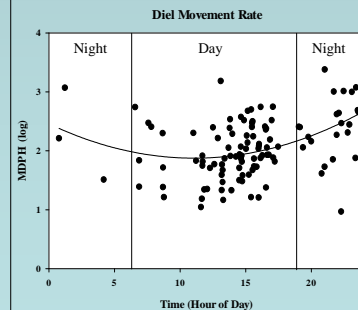


Figure 8. Weakfish exhibit an increase in movement rates beginning around the evening crepuscular period

Overall day/night distribution for six tagged weakfish shows a tendency for evening dispersal events, followed by a return to previously inhabited daytime locations (Figs. 6a-b).

MCP measurements pooled across all individual weakfish (n=6) and tracking events, and then normalized by tracking event duration, reveal, on average, a night time dispersal 11.5 times greater than during daylight hours (Figs. 7a-e).

One weakfish displayed greater dispersal during day tracking events, but not enough night tracking points were recorded to make a meaningful comparison (Fig. 7f). Code 62 (Fig. 7e) also lacked sufficient night data for comparison.

A weak curvilinear trend ($r^2=0.19$) in MDPH over 24 hours suggests an increase in nightly movements (Fig. 8).

CONCLUSIONS

Nocturnal dispersal events and nightly increases in movement rate appear to be common, which may be due to evening spawning events and/or foraging behavior.

Aggregative dispersal and movement observed in several individuals suggests schooling activity during both day and night.

Similar results obtained in a smaller, urbanized estuary (Manderson et al. 2007; Navesink River, NJ) suggest that behaviors may be common in other parts of the weakfish's range.

Caution must be exercised, however, in translating the results to a population level, since variation in individual fish behavior was observed, sample size was low, and a limited spatial area was covered.

FUTURE WORK

Behavioral (i.e. spawning, foraging, predator avoidance) and environmental (i.e. depth and water quality) correlates should be investigated to better describe potential drivers for observed differences in day/night patterns.

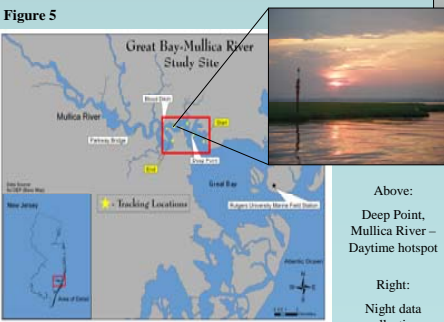
Quantitative measures of range and dispersal, such as MCP, become skewed based on behavioral differences between day/night. Therefore, more standardized techniques should be used in future studies.

Technological advances such as autonomous underwater vehicles (AUVs) with tracking capabilities may further elucidate movement patterns by obtaining more precise location and environmental data.

References available upon request

Acknowledgements

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Above:
Deep Point, Mullica River – Daytime hotspot

Right:
Night data collection