Variation in movement and habitat use in sub-adult fishes within an estuarine seascape

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Introduction

Red drum (Sciaenops ocellatus) and southern flounder (Paralichthys lethostigma) are estuarine-dependent fishes found in subtropical waters of the Gulf of Mexico and the southeastern United States. Together red drum and southern flounder are among the most sought after species in near-shore Texas waters and support an economically important recreational fishery valued at over $1 billion dollars. While the importance of three-dimensional estuarine habitats to juvenile settlement is well recognized, patterns of habitat use, movement, and connectivity of juveniles and sub-adults across estuarine seascapes are poorly understood. Because regional success of adult populations are dependent on local production, an improved understanding of the suite of habitats required to reach maturation is critical to effectively identify essential fish habitat (EFH) and evaluate the potential impacts of environmental change (i.e. habitat loss).

Objectives

1) Examine habitat use and movement patterns at the habitat scale (m) for sub-adult red drum (age-1 and -2) and southern flounder (age-1)
2) Compare and contrast habitat use and connectivity at the bay scale (km) for sub-adult red drum and southern flounder

Methods

Map of Christmas Bay and adjacent bays in Galveston Bay, TX

Detailed habitat map of study site and receiver array (10 receivers) to examine fine-scale habitat use.

Vemco VR2W Positioning System (VPS) uses differences in time of arrival of detections (at 3 or more receivers) to triangulate fish positions (resolution~1-3 m) within the system array.

An array of 23 receivers deployed throughout Christmas Bay to study bay-scale habitat use.

Age-1 (n = 8) and age-2 (n = 6) red drum and age-1 (n = 8) southern flounder were externally fitted with Vemco V9-1H acoustic transmitters (60kHz, nominal delay = 120 s) and released on the south shoreline of Christmas Bay in January 2012.

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Movement

Red drum exhibited greater movement speeds than southern flounder (p<0.05).

Both species’ speed increased with temperature (p < 0.05); with a more dramatic increase for southern flounder.

Conclusions

1) Habitat use varies between important fishery species within the same seascape
2) Habitat use differs ontogenetically
3) Degree of habitat connectivity is affected by environmental factors (i.e. temperature)
4) Habitat use patterns may vary at different spatial scales (e.g. for red drum marsh habitat was very important at the bay scale but used relatively little at finer scales)

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