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Quantifying finfish and blue crab use of created oyster reefs in the lower Chesapeake Bay

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Transient Finfish Use of Created Oyster Reefs in the Lower Chesapeake Bay

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INTRODUCTION:

- Structurally complex reefs created by the eastern oyster *Crassostrea virginica* provide a host of ecosystem services, including habitat provision
- Dramatic losses have prompted efforts in Virginia & Maryland to recreate three-dimensional reefs and recover lost ecological functions and services
- We evaluated the use of existing, sub-tidal restored oyster reefs by mobile finfish and blue crabs to assess influence of restoration activities on community structure

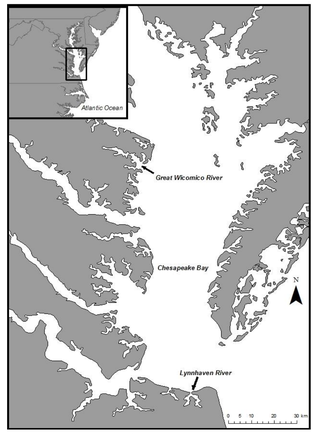

Figure 1 – Map of Chesapeake Bay with study systems labeled.

OBJECTIVES:

1. Quantify abundance of transient finfish at restored reef sites in two lower Chesapeake Bay tributaries
2. Compare relative abundance between restored oyster sites and unrestored, non-structured bottom sites
3. Describe trophic linkages between created reefs and higher trophic levels through diet analysis (data not presented)

METHODS:

- Sampling locations selected using benthic mapping data
- 4 sites in the both the Great Wicomico and Lynnhaven Rivers (Fig. 1)
  - 2 existing, sub-tidal reefs
  - 2 unstructured controls
- Finfish Sampling:
  - 5 events in Summer 2015: June (2), July (2) and August (1)
  - 3 panel experimental gill nets:
    - 30.5 m long x 1.8 m depth
    - Mesh size: 1.58 cm, 3.81 cm, 6.35 cm
  - Nets set for 3 hours on mix of flood and ebb tides
- Upon retrieval all organisms counted and measured
- Stomach contents from a subset of catch were removed and preserved for prey identification
- All prey items identified to lowest taxon level, and if possible weighed and measured

Photo 1: Channel Marker denoting reef location

Photo 2: Gill net retrieval

RESULTS – Total Abundance:

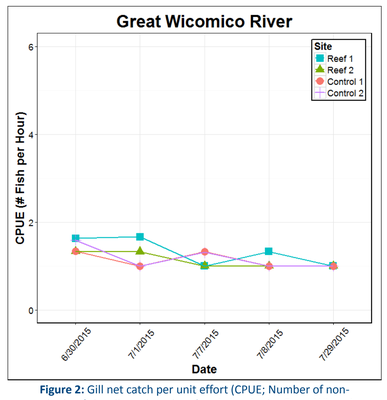

Figure 2: Gill net catch per unit effort (CPUE; Number of non-menhaden fish collected per hour) at 4 sites in the Great Wicomico River over the course of summer 2015

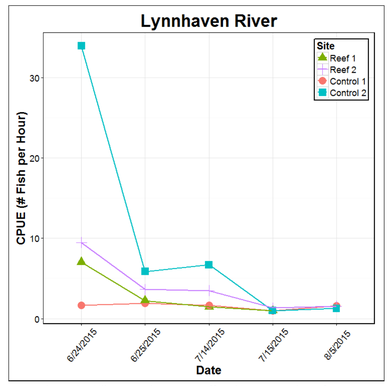

Figure 3: Gill net catch per unit effort (CPUE; Number of non-menhaden fish collected per hour) at 4 sites in the Lynnhaven River over the course of summer 2015

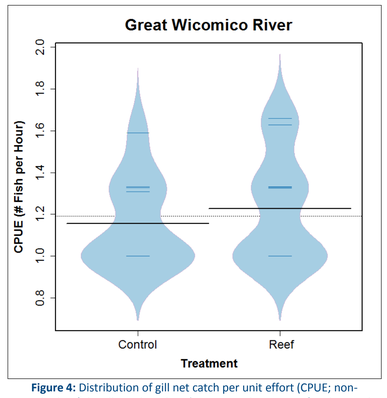

Figure 4: Distribution of gill net catch per unit effort (CPUE; non-menhaden fish collected per hour) at restored oyster reef and control sites in the Great Wicomico River. Black bars represent average CPUE for each treatment. Dotted line represents overall average CPUE

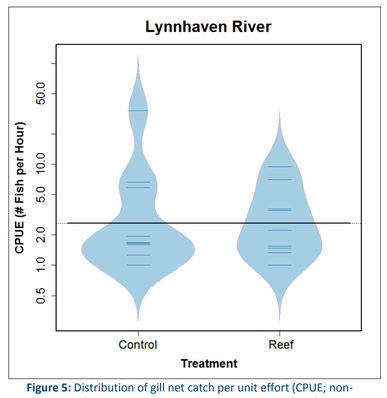

Figure 5: Distribution of gill net catch per unit effort (CPUE; non-menhaden fish collected per hour) at restored oyster reef and control sites in the Lynnhaven River. Black bars represent average CPUE for each treatment. Dotted line represents overall average CPUE

RESULTS – Species Abundances:

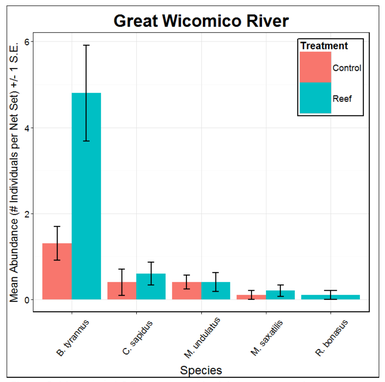

Figure 6: Mean (+/- 1 S.E.) number of individuals per species caught per gill net set in the Great Wicomico River at restored oyster reef and control (non-restored) sites

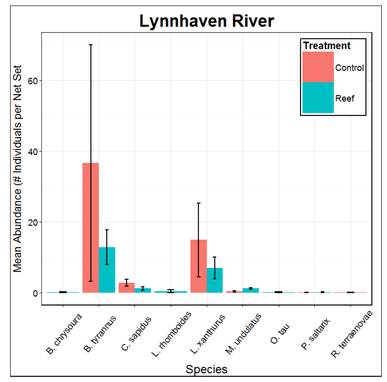

Figure 7: Mean (+/- 1 S.E.) number of individuals per species caught per gill net set in the Lynnhaven River at restored oyster reef and control (non-restored) sites

DISCUSSION:

- Little to no difference in mean catch per unit effort (CPUE) between reef and control sites in either river
- No difference in individual species abundance between reef and control sites
- Consistently low catch per unit effort in Great Wicomico; high variability in the Lynnhaven River
- Greater total abundance in the Lynnhaven River
- Catch dominated by a few common estuarine fish species
- Establishing trophic interactions and links between restored oyster sites and mobile organisms through diet analysis may be more valuable than relative abundance data
- Need to evaluate scale of restoration and scale at which organisms perceive environment and use habitat
- Understanding how restoration activities influence estuarine community dynamics and the provision of ecosystem services is vital to optimize restoration efforts and maximize investment

Figure 8: Most abundant species collected in oyster reef sampling (clockwise from upper left): Atlantic Croaker (*Micropogonias udulatus*), Spot (*Leiostomus xanthurus*), Atlantic Menhaden (*Brevoortia tyrannus*), Striped Bass (*Morone saxatilis*)

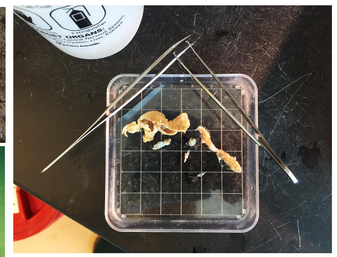

Photo 4: Atlantic Croaker (*M. undulatus*) stomach contents. Small prey fish from family Gobiidae (gobies) visible on right.

FUTURE WORK:

- Continue diet analysis & fish community sampling in Fall 2015 and Spring – Fall 2016
  - Shorter gill net sets
  - Increased sampling effort
  - Additional river(s)
- Interest in:
  - Short-term movement & telemetry to investigate frequency of use of oyster habitat in Great Wicomico
  - Experimental mesocosm work to evaluate mechanisms influencing fish use of structured oyster habitat

Photo 5: Curious cormorant observed in underwater video observations

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