Forage Fish Distribution at Pier Edges in the Hudson River

Iris Kemp*, Thomas M. Grothues ‡, Kenneth W. Able‡

*School of Sciences and Mathematics, College of Charleston, 66 George St. Charleston, SC 29424
‡Rutgers University Marine Field Station, Institute of Marine and Coastal Sciences, 800 Great Bay Blvd. Tuckerton, NJ 08087

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Introduction
• The majority of the Hudson River estuary shoreline has been anthropogenically modified with the potential to affect fish distribution.
• Potential responses include use of pier-edge habitats as refuges and use of pilings as current baffles. Responses to these variables may be confounded by differing light levels.
• We investigated forage fish distribution in response to piers and pilings. Newly developed Dual-frequency Identification Sonar (DIDSON) allows observation under piers or relict pile fields independent of light or water clarity.

Methods

Dual-frequency Identification Sonar (DIDSON)

• This is a non-invasive sampling technique that permits the observation of pelagic and benthic habitats.

DIDSON Echogram Analysis

• Individual fish were measured to the nearest cm using DIDSON image software.
• Size range and school abundance were sub-sampled using a grid superimposed on the echogram.

Study Site

• We sampled along the eastern shore of the Hudson River in three habitats: under-pier, pier-edge, and relict pile field.
• Transects were performed on north and south sides of structures at day and at night. Each transect was 5-7 minutes. The paddler kept an audio record of piling counts and location for later analysis.

Results

• More forage fish schools (e.g., Atlantic silversides, bay anchovies) were observed at night than at day (single-factor ANOVA, df=1, p=.0001, α=0.05, Chart 1).
• Schools occurred most often in pier-edge habitats (single-factor ANOVA, df=2, p<.0001, α=0.05, Chart 2).
• There was a significant (p=.0005) interaction among school distribution on the north and south sides of piers and relict pile fields and in the types of habitats (2-factor mixed model ANOVA, df=2, α=0.05).
• There was a significant (p<.0001) interaction among all variables: time of day, type of habitat, and north and south structure side (3-factor mixed model ANOVA, df=1, α=0.05).

Conclusions

• Light levels and type of habitat affect the positioning of forage fish schools around structures. Schools were most frequently observed at night and in pier-edge habitats. More observation and analysis is necessary to investigate school distribution as a function of orientation to structure.
• Future studies should be conducted on a seasonal basis, as current baffles may be most important in winter conditions.
• Differing flow regimes may also be considered as a factor.

References available upon request.