

## **Environmental Factors that Influence the Position of a Group of Striped Bass**

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### **Background:**

Striped bass, *Morone saxatilis*, congregate in Eel Pond, Woods Hole, MA between May and October. One group of small fish (“schoolies”; i.e. below the legal 28” limit) congregates below a wall, behind the Marine Resources Center (MRC) building at the Marine Biological Laboratory. Qualitative observations indicate that the group changes its position relative to the wall during the day. Since many environmental factors such as time of day, water depth associated with tides, and a changing building shadow as the sun arcs across the sky, change daily, I decided to measure some of these parameters and see if any correlated with the group position.

### **Question:**

What factor(s) are important for determining the proximity to the wall of a group of striped bass?

### **Hypothesis:**

The bass will congregate and move with the building shadow as it changes throughout the day.

### **Procedure:**

The wall behind the MRC and a side wall that runs perpendicular to it were marked in foot-long increments (see Fig. 1). A location on the wall (\*), approximately centered on the group of fish, was marked for the experimenter to stand. Every day during the study, 7/9/18-7/13/18, approximately every one or two hours, measurements of the time of day, the number of feet that the building shadow extends out over the water, the depth of the water (taken from a floating dock at the end of the wall perpendicular to the MRC [X]), and the distance that the fish are away from the wall were measured. These measurements were made when the group of fish was in a “resting condition.” That is, they were not being fed and the experimenter was careful not to move. The markings on the wall perpendicular to the MRC were used for measuring the shadow and the position of the fish. Two measurements were made of the group of fish; 1) the distance from the wall to the closest fish and 2) the distance from the wall to the center of the group of fish.

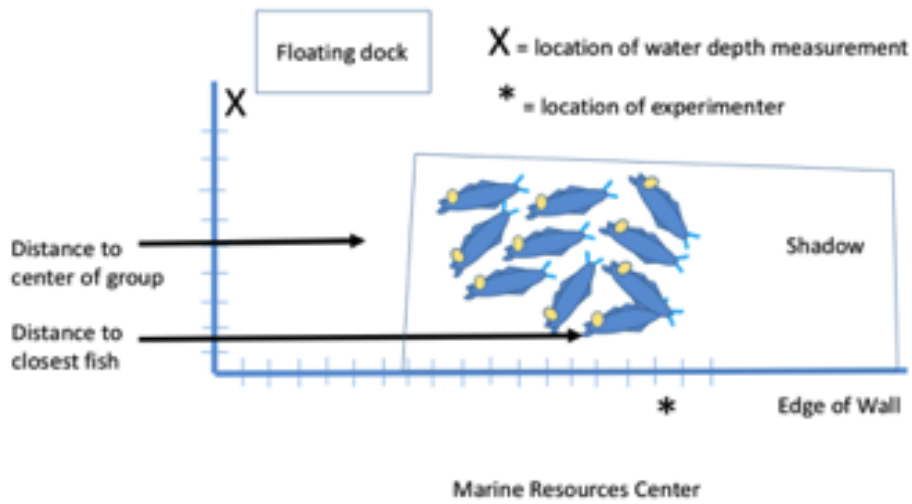
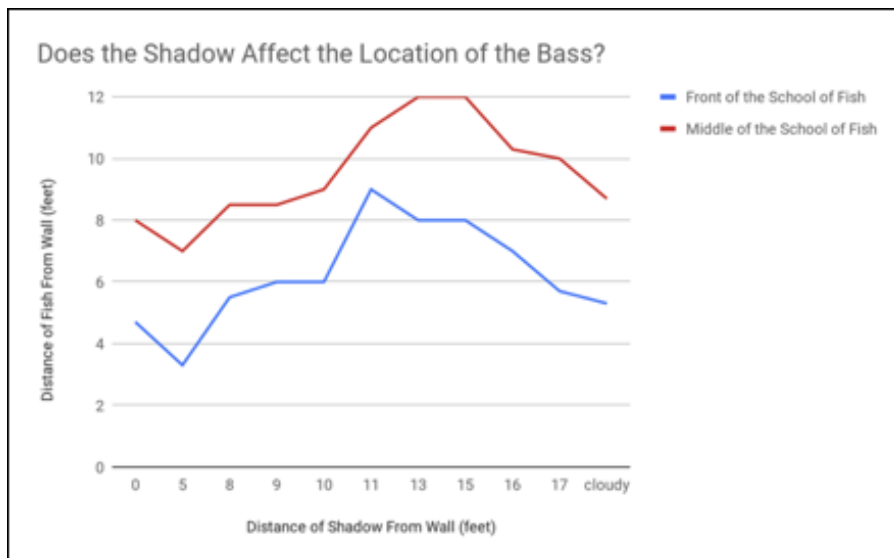
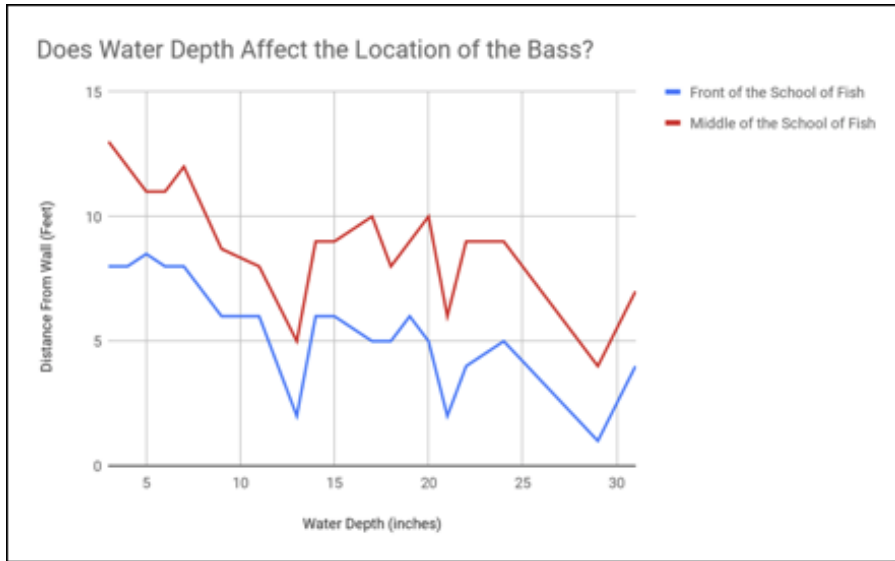


Figure 1 Fish congregate behind the Marine Resources Center. Measurements were made from the wall to both the closest fish and the center of the group. The shadow was measured from the wall to the outer edge of the shadow. Water depth was measured near a floating dock (X).

**Results:**



Graph 1 The position of striped bass in relation to the extent of a shadow cast by the Marine Resources Center on the water. The distances from the wall to closest fish in the group (blue) and the center of the group (red) are plotted relative to the extent of the shadow.



Graph 2 The relationship between water depth and the position of fish relative to the wall behind the Marine Resources Center. The distances from the wall to closest fish in the group (blue) and the center of the group (red) are plotted relative to water depth.

Table 1 High and low tides during days and times of this study

NOAA/NOS/CO-OPS

Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

Daily Tide Predictions

StationName: Woods Hole

State: MA

Stationid: 8447930

Prediction Type: Harmonic

From: 20180709 00:19 - 20180713 21:25

Units: Feet

Time Zone: LST\_LDT

Datum: MLLW

Interval Type: High/Low

Date	Day	Time	Pred	High/Low
2018/07/09	Mon	05:23 AM	1.75	H
2018/07/09	Mon	11:48 AM	0.20	L
2018/07/10	Tue	06:18 AM	1.89	H
2018/07/10	Tue	12:40 PM	0.08	L
2018/07/11	Wed	07:10 AM	2.04	H
2018/07/11	Wed	01:37 PM	-0.03	L
2018/07/12	Thu	08:02 AM	2.19	H

2018/07/12	Thu	02:38 PM	-0.12	L
2018/07/13	Fri	08:53 AM	2.29	H
2018/07/13	Fri	03:39 PM	-0.18	L

### **Conclusion:**

There is a correlation between the water depth and the distance that the striped bass are from the wall at rest (non-feeding condition). That is, if the water is deeper, then the fish are closer to the wall, and if the water is shallower, the fish are farther away from the wall. When the water depth was about five inches, the middle of the group of fish was about thirteen feet away from the wall. When the water depth was about thirty inches, the middle of the group of fish was about seven feet away from the wall. One possible explanation for their position could relate to the shallow water; the fish may not have enough water depth to swim. However, the fish do come close in shallow water when fed. A more likely explanation is that the striped bass are more exposed to predation by birds in shallow as opposed to deep water.

There also appears to be a relationship between the extent of the shadow and fish position; as the shadow cast by the Marine Resources Center on the water increases, the group of fish appears to move further away from the wall until the shadow encompasses the study area. During the days (7/9/18-7/13/18) and times (8am-5pm) that observations were taken, high tides tended to be earlier in the morning (5:23am-8:53am) when there would be little shadow while low tides were later (11:48am-3:39pm) when there would be a more extensive shadow. As a result, it is hard to separate the effects of water depth and the extent of the shadow on the position of the fish. In future studies the shadow might be controlled by placing a tarp over the study area.

### **Suggestions for Further Study:**

The preliminary results indicate that the fish shift their position and it appears to be correlated to some combination of water depth and extent of the shadow. The shadow can be eliminated as a variable by placing a tarp over the water to create a constant shadow. Other variables such as the presence of other people (e.g., tour groups) may have affected the results. In addition, the size of the fish group is not constant. Other environmental factors water temperature, oxygen levels, and weather conditions will need to be monitored in the future.