Estimating Capture Efficiency of a Survey Dredge for Atlantic Sea Scallops (*Placopecten magellanicus*)

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Figure 4. Images of a live sea scallop (left), sea star (middle), and dead sea scallop (right)

Abstract

Measuring capture efficiency of a survey dredge is required to estimate unbiased population size and fishing mortality of Atlantic sea scallops *(Placopecten magellanicus).* The goal of this project was to use paired dredges and image data to determine the capture efficiency of the sea scallop dredge.

Introduction

Large areas of sea floor need to be surveyed to estimate the population size of Atlantic sea scallops, so the population can be managed sustainably. Sea scallop dredges can be used to sample large areas in a short amount of time but are also inefficient. Measuring capture efficiency allows us to correct for this inefficiency, but estimating capture efficiency is difficult to do because it is hard to sample the same area with a dredge and another gear that is 100% efficient. For this project, we collected images of the sea floor with a GoPro camera before the dredge passed over it and attempted to use these images to estimate true scallop density on the bottom. In the future, we plan to compare these data to sea scallop density estimated from the dredge (Figure 1) in order to calculate dredge efficiency.

Figure 1. Catch of Atlantic sea scallops from a commercial dredge

Results

After an initial learning curve, we were able to successfully identify and count sea scallops, sea stars, and dead scallops in the images (Figure 4). Count precision was confirmed by revising the original set of tows and checking for any errors or missed counts. The results suggested that live sea scallops varied in population density across different tows. The same was true for the sea stars and dead scallops. For each variable, the tow that displayed the highest standard deviation in counts per image also displayed the greatest population density. This indicates that population density could also have been patchy where it was high.

Conclusions

Collecting images in the tow path before the dredge passes over the bottom appears to be an effective method for estimating the true population density between the different tows.

Figure 2. Image of the GoPro camera system fixed to the survey dredge

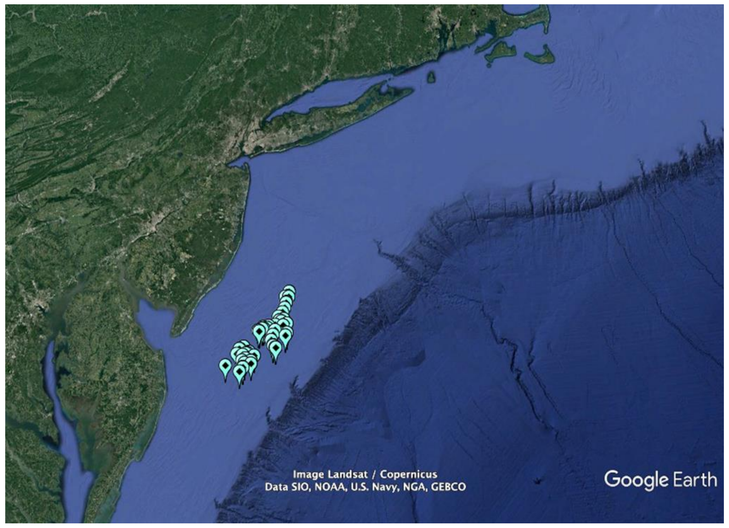

Figure 3. Map of Atlantic Ocean (light blue pins represent sample sites)

Future Studies

In the future, we plan to compare the scallop density estimated from the images with the scallop density estimated from the dredge. This will allow us to calculate the efficiency of the dredge and potentially evaluate the variation of efficiency across different tows. Knowing the capture efficiency of the dredge will help determine the true population density in the sampled area and will therefore make future surveys of the population more accurate.

Works Cited

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Materials and Methods

To take image samples of the bottom, a GoPro camera system was fixed to the dredge (Figure 2). A total of 11 dredge tows were recorded, and for each tow, 1000 images were analyzed. The sample site is located off the coast of New Jersey (Figure 3). The images were processed and analyzed by taking a count of sea scallops, sea stars (bycatch), and dead sea scallops. The data sets were then used to calculate the total sum, average sum per image, and standard deviation for each variable per tow. Excel and PowerPoint were the main tools for the image analysis.

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