



Window to an Underwater World

Scientists at the NOAA Fisheries Northeast Fisheries Science Center’s Milford Laboratory are using GoPro cameras to determine if oyster cages used in shellfish aquaculture provide similar habitat for fish to naturally occurring rock reefs.

Oyster growers often cultivate oysters in off-bottom vertical cages under water. These cages allow growers to efficiently use the seafloor with a smaller footprint as well as keep their valuable product safe from predators.

Many fish are attracted to structure, whether natural or artificial, and members of the aquaculture industry have long reported finding fish and invertebrates around their cages. The project, funded by the [NOAA Office of Aquaculture](#) and the [Northeast Fisheries Science Center](#), grew out of these observations, and intends to find out if oyster cages provide habitat.

Collecting Video and First Impressions

From May through September 2018, a team of scientists and research divers collected 27 hours of underwater video per week in Long Island Sound during the project’s second field season. Study sites included an active shellfish lease and the Charles Island rock reef. Biological technicians Paul Clark and Gillian Phillips are now in the midst of the most time consuming and rewarding aspect of this project – the video review and data analysis.

As Gillian and Paul review the videos, they most frequently see four common Long Island Sound fish species around the cages: black sea bass, scup, tautog (blackfish), and cunner.

However, these fish use the cages differently. For example, transient scup use them opportunistically, while juvenile black sea bass seem to live around the cages. Understanding how these species use

habitat is important, as black sea bass and scup are commercial species, and locally, tautog supports a recreational fishery.



In addition to the “big four,” summer flounder, butterfish, banded rudderfish, and sea robins have also been observed using this habitat. Spider crabs are the most common invertebrates seen in videos. Each time the cameras were deployed and retrieved, the team took environmental measurements including temperature, salinity and dissolved oxygen. When the warmest seawater temperatures were recorded in late August, fish more typical of the southeastern United States were observed around the cages. For example, one video captured a school of yellow jack.

The rock reef site represents a naturally occurring habitat, and videos recorded there typically feature bushy bryozoans swaying in the current. Paul notes that the videos can lull you into a peaceful state of mind. Alternatively, Gillian warns, “You’ve got to make sure you don’t get seasick on land watching some of these videos!” The reef appears to attract smaller fishes compared with the cages, and reproductive behavior has not yet been observed there.

Turning Videos into Data

Counting Fish

Gillian and Paul review the videos using software specifically designed to help scientists analyze animal behavior so they can count how many fish are using the habitat at a given time. For this study, they count the maximum number of individual fish of each species present in a single frame within a one-minute segment of video. This commonly used metric for counting fish associated with structures is called MaxN. Using this metric for relative abundance helps prevent overestimation that can occur when individuals that pass by the camera more than once are double-counted.

Scoring Fish Behavior

The research team created a set of distinct behavioral categories in collaboration with fish ecologist Dr. Peter Auster from the University of Connecticut and the Mystic Aquarium. The scoring system allows Paul and Gillian to code such behaviors as: foraging, sheltering, territoriality, reproduction, schooling, and escape. The software is flexible, allowing species and behaviors to be added as the project develops. The first time Paul and Gillian review a video, they count fish to calculate relative abundance, while the second time through they score it for behavior.



GoPro camera being mounted on oyster cage to record activity

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