Examining Fishing Practices of Divers in the Maine Sea Urchin Fishery: algal cover in study plots from Fishing Vessels NEC-MH2007-1 in the Gulf of Maine from 2009-2010 (NEC-CoopRes project)

Website: https://www.bco-dmo.org/dataset/3578
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Project
» Northeast Consortium: Cooperative Research (NEC-CoopRes)

Program
» NorthEast Consortium (NEC)

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Dataset Description

Project Objectives
In this project, working collaboratively with industry divers, we planned to:
1) Evaluate impacts of non-size-selective harvesting by divers, or 'straight raking', as compared with size-selective harvesting practices, or 'culling on bottom', by simulating harvest methods observed in the current fishery and then comparing long-term effects with control areas,
2) Increase the number of industry divers who have been trained in field assessment techniques,
3) Evaluate the effectiveness of translocating (replanting) culled urchins, using techniques available to any harvester,
4) Inform industry members, managers, and the public of our findings.

Methods & Sampling

For complete information, see the final report.

Site evaluation:
During April 6th to 11th, 2009, shortly after the annual fishing season had closed, all sites were marked and evaluated for urchin abundance and algal cover

Harvest treatments:
Treatments were designated A=straight raking (non-size-selective), B=size-selective fishing (bottom culling), and C=control (unfished). The lane arrangements ABC, CAB, and BCA (left to right when looking at the lanes from the sea toward shore - see figure in final report for the ABC arrangement) were randomly assigned to the

three experimental sites, which turned out to be Hancock Point, Winter Harbor, and Frazer Point respectively.

The harvest treatments were applied April 15 (Winter Harbor) and April 16 (Hancock Point and Frazer Point), 2009. At the size-selective plots (B), one of the two industry divers (Marcus) began at the deep end of the lane and made his way to shore, harvesting mostly only the legalsized sea urchins, using the techniques of size-selective divers. At the non-selective plots (A), the other industry diver (Greg) harvested all sea urchins that a straight-raker would take. That is, clumps of urchins that all appeared too small were passed over, but groups that contained at least one urchin that might be legal were entirely harvested. The third plot (C) at each site was untouched. The divers were video-taped to document the two fishing styles. Standard 2¼-inch stretch mesh catch bags were used throughout.

Counting, Measuring, and Replanting:
Harvested urchins were picked up by the fishing vessel (a 38-ft lobster-type boat with only 3.5 ft draft). On the vessel, all harvested urchins were separated by treatment and size (sub-legal, legal, over-sized), counted, and put in 80-lb (36 kg) plastic fish totes. The determination of size was made by an experienced commercial sea urchin culler. Test diameters were also measured for forty urchins chosen at random from each tote. The totes were only filled to about two-thirds full (about 50-60 lbs) to minimize crushing and spine puncture, and periodically hosed with sea water.

When harvesting was finished each day, sub-legal and over-sized urchins were moved to the replanting site at Bean Island Ledge and dropped onto it from the surface, over the ground line between the two marker buoys. The replanted sea urchins had been out of the water about 6-7 hours at most. Legal-sized urchins were returned to the sea at an undisclosed site well away from any of the experimental sites.

Post-harvest site evaluations in April, 2009:
After harvest (later the same day), the harvested plots were re-evaluated for urchin density as above. The replanted site was also re-evaluated for urchin density as above at the end of the second day of replanting (April 16, 2009).

On April 24, a little over a week after translocating, the replanted site (Bean Island Ledge) was evaluated for urchin density, and for urchin mortality by counting healthy-appearing urchins and moribund or broken ones in 60 random quadrats.

After re-evaluation, the groundlines were removed from each site.

Re-evaluations in July, 2009:
On July 1, 2009, the two industry divers re-evaluated the harvest and control lanes at the Winter Harbor and Frazer Point sites, using the same methods described above, except that no urchins were collected for measurement. First, ground lines were laid to mark the three lanes at each site, using buoyed anchors and bolts left behind during the last visit. On July 2, they marked and re-evaluated the harvest and control lanes at the Hancock Point site and the replanted and control areas at Bean Island. Then the ground lines were removed from all sites. A total of 11 dives were made by each of the two divers during this period (three at each of the three harvest sites and two at the transplant site), and each diver evaluated 30 quadrats during each dive, for a grand total of 660 quadrats evaluated for urchin counts and algal cover, including about 66 from which urchins were removed and measured on the boat.

Re-evaluations in September, 2009:
On September 1 and 2, 2009, just before the fishing season opened, the four sites were marked and evaluated in the same manner again, including collecting urchins for measurement. All lanes at all the sites were also videotaped under water. Then the ground lines were removed from all sites.

Re-evaluations in June, 2010:
On June 29 and 30, 2010, after the fishing season had closed, the four sites were marked, evaluated, and videotaped in the same manner again. Then the ground lines were removed for the last time.

Data Processing Description

Data and Statistical Analyses
Mean sea urchin abundances (counts·m-2) for each experimental lane, for each date and site, were calculated. Mean algal cover (%) was calculated for each of the three categories: crusting, total turfing, and canopy. Turfing and canopy covers were added together for analysis. Note that these could total more than 100%, if canopy cover overlaid turf. Median urchin test diameters were calculated for each experimental lane. Means

and medians were plotted over time, to compare pre-harvest conditions with post-harvest, and identify short and long term trends. Two sample t-tests were performed selectively to test for differences between two treatment abundances, or before-after comparisons. One-way ANOVA and the Tukey test were used when multiple range testing was required. Mann-Whitney rank testing was used to test for differences in algal cover (Zar 1999).

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Data Files

File
algal_cover.csv (Comma Separated Values (.csv), 117.30 KB) MD5:0efba0ba85febd92f40f183bc08c1cf9 Primary data file for dataset ID 3578

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Parameters

Parameter	Description	Units
visit	whether collections were made pre- or post-harvest of urchins	text
year	year of sampling	YYYY
month_local	month of sampling - local time	MM
station	station code: BI = Bean Island ledge; FP = Frazer Point; HP = Hancock Point; WH = Winter Harbor	text
lat	latitude: North is positive; negative denotes South	decimal degrees
lon	longitude: East is positive; negative denotes West	decimal degrees
day_local	day of sampling - local time	number
yrday_local	local day and decimal time; as 326.5 for the 326th day of the year; or November 22 at 1200 hours (noon)	number
diver_id	initials of diver's name	text
lane	sampling area within each plot	integer
quadrat_id	1-m^2 subsampling area within plots	integer

depth_w	approximate depth of water	feet
count	number of urchins collected in a quadrat	integer
green_pcent	the percent cover of green algae	percent
flesh_red_pcent	the percent cover of fleshy red algae	percent
filam_red_pcent	the percent cover of filamentous red algae	percent
turf	the percent cover of 'turfing' algae: sum of green and red algae	percent
crust_pcent	the percent cover of encrusting algae	percent
canopy_pcent	the percent cover of canopy algae	percent

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Deployments

NEC-MH2007-1

Website	https://www.bco-dmo.org/deployment/58741
Platform	Fishing Vessels
Start Date	2009-04-11
End Date	2010-06-29
Description	Divers collected sea urchins at 4 stations using two methods to determine best practices.

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Project Information

Northeast Consortium: Cooperative Research (NEC-CoopRes)

Website: http://northeastconsortium.org/

Coverage: Georges Bank, Gulf of Maine

The Northeast Consortium encourages and funds cooperative research and monitoring projects in the Gulf of Maine and Georges Bank that have effective, equal partnerships among fishermen, scientists, educators, and marine resource managers.

The Northeast Consortium seeks to fund projects that will be conducted in a responsible manner. Cooperative research projects are designed to minimize any negative impacts to ecosystems or marine organisms, and be consistent with accepted ethical research practices, including the use of animals and human subjects in research, scrutiny of research protocols by an institutional board of review, etc.

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Program Information

NorthEast Consortium (NEC)

Website: http://northeastconsortium.org/

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The Northeast Consortium encourages and funds
cooperative research and monitoring projects in the Gulf of Maine and Georges Bank that have effective, **equal partnerships** among fishermen, scientists, educators, and marine resource managers.

At the 2008 Maine Fisheremen's Forum, the Northeast Consortium organized a session on data collection and availability. Participants included several key organizations in the Gulf of Maine area, sharing what data are out there and how you can find them.

The Northeast Consortium has joined the Gulf of Maine Ocean Data Partnership. The purpose of the GoMODP is to promote and coordinate the sharing, linking, electronic dissemination, and use of data on the Gulf of Maine region.

The Northeast Consortium was created in 1999 to encourage and fund effective, equal partnerships among commercial fishermen, scientists, and other stakeholders to engage in cooperative research and monitoring projects in the Gulf of Maine and Georges Bank. The Northeast Consortium consists of four research institutions (University of New Hampshire, University of Maine, Massachusetts Institute of Technology, and Woods Hole Oceanographic Institution), which are working together to foster this initiative.

The Northeast Consortium administers nearly $5M annually from the National Oceanic and Atmospheric Administration for cooperative research on a broad range of topics including gear selectivity, fish habitat, stock assessments, and socioeconomics. The funding is appropriated to the National Marine Fisheries Service and administered by the University of New Hampshire on behalf of the Northeast Consortium. Funds are distributed through an annual open competition, which is announced via a Request for Proposals (RFP). All projects must involve partnership between commercial fishermen and scientists.

The Northeast Consortium seeks to fund projects that will be conducted in a responsible manner. Cooperative research projects should be designed to minimize any negative impacts to ecosystems or marine organisms, and be consistent with accepted ethical research practices, including the use of animals and human subjects in research, scrutiny of research protocols by an institutional board of review, etc.

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Funding

Funding Source	Award
NorthEast Consortium (NEC)	09-019

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