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Supporting Information for

Implications of future Northwest Atlantic bottom temperatures on the American Lobster
(*Homarus americanus*) fishery

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Introduction

The supporting information shown here describes the historical datasets used in this analysis. We show a series of comparison figures of the modeled hindcast to the historical dataset described in the manuscript text that is relevant but not critical to the analysis.

Text S1

CTD and Bathymetry Datasets.

CTD casts with vertical profiles of ocean temperature and salinity from 1982-2012 for the Northeast Shelf Large Marine Ecosystem were obtained from the Northeast Fisheries Science Center's Oceanography Branch. High resolution CTD casts extracted from the World Ocean Database (WOD, Boyer et al. 2013) were used to supplement the NEFSC data. The WOD data

were filtered to remove duplicate CTD casts. The combined dataset contained 72,513 unique casts collected from 1982 to 2015 ranging in latitude from the coast of Florida through the Gulf of Maine (Figure S1).

Data were binned in both time and space by averaging all profiles by month onto a 34km block-averaged grid. Smaller grid sizes were tested but the 34km spatial scale was chosen because it balanced spatial resolution with data coverage at the grid scale. Seasonal climatologies at monthly temporal resolution were calculated from a subset of the dataset that had the most data coverage (1991-2010, see Kavanaugh et al. submitted). Bathymetric data were obtained from the National Geophysical Data Center, U.S. 3-arc second Coastal Relief Model (CRM) volumes 1 and 2 and binned to the same grid as the CTD casts. Surface temperatures were obtained from the binned casts as the average of the first 2m of the profiles. Bottom potential temperatures were assumed to be the last measurement in the profile if the pressure reported in the CTD cast was within 25m of the bathymetry from the CRM. Because we were interested in nearshore processes, we limited our analysis to only CTD profiles that were in waters shallower than 500m.

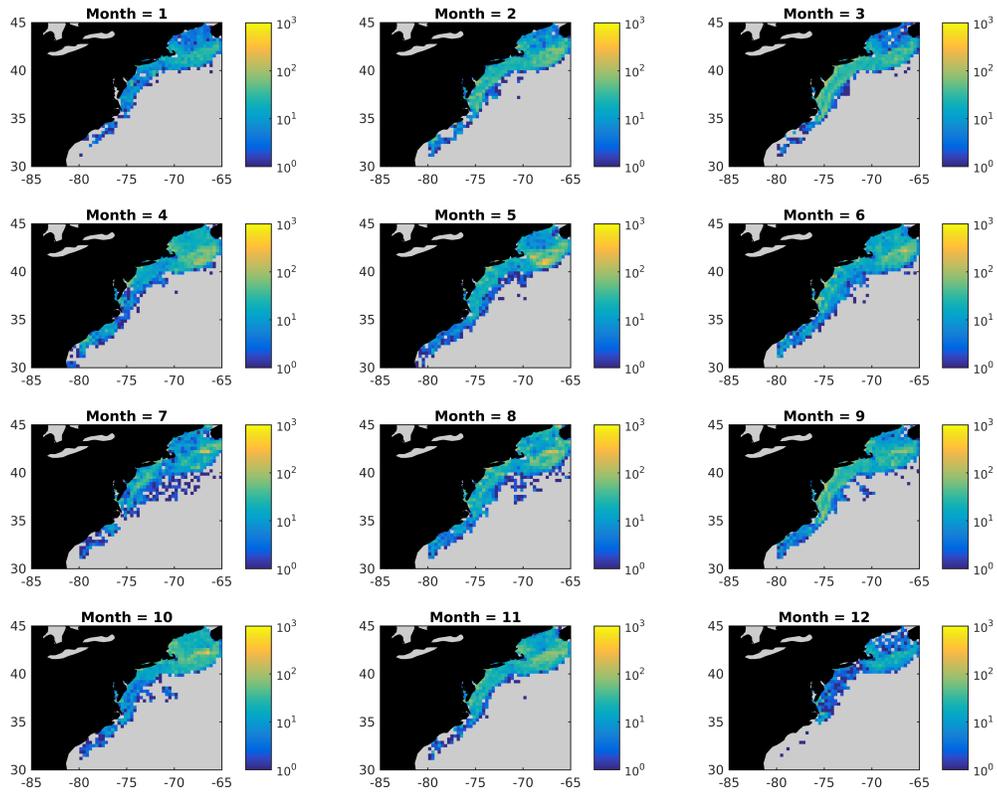


Figure S1. Total density of measurements from the combined NEFSC and WOD databases by month. Colors indicate the total number of CTD casts in a given pixel over the full dataset.

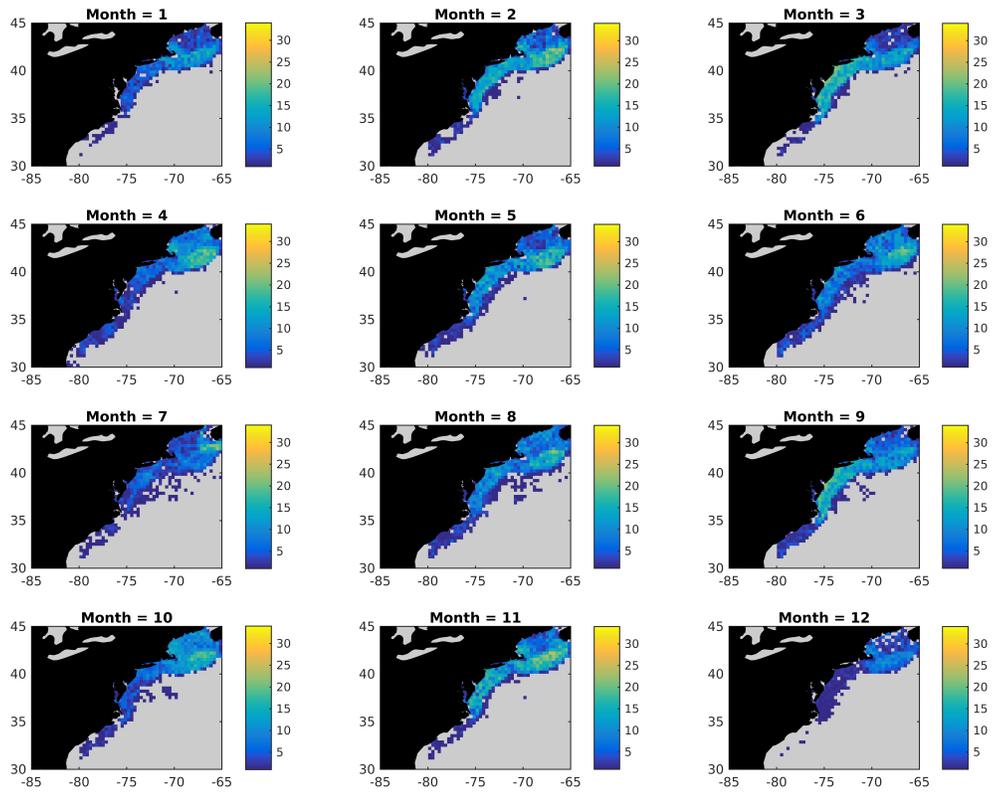


Figure S2. Yearly density of measurements from the combined NEFSC and WOD databases by month. Colors indicate the number of years there were measurements in a given pixel.

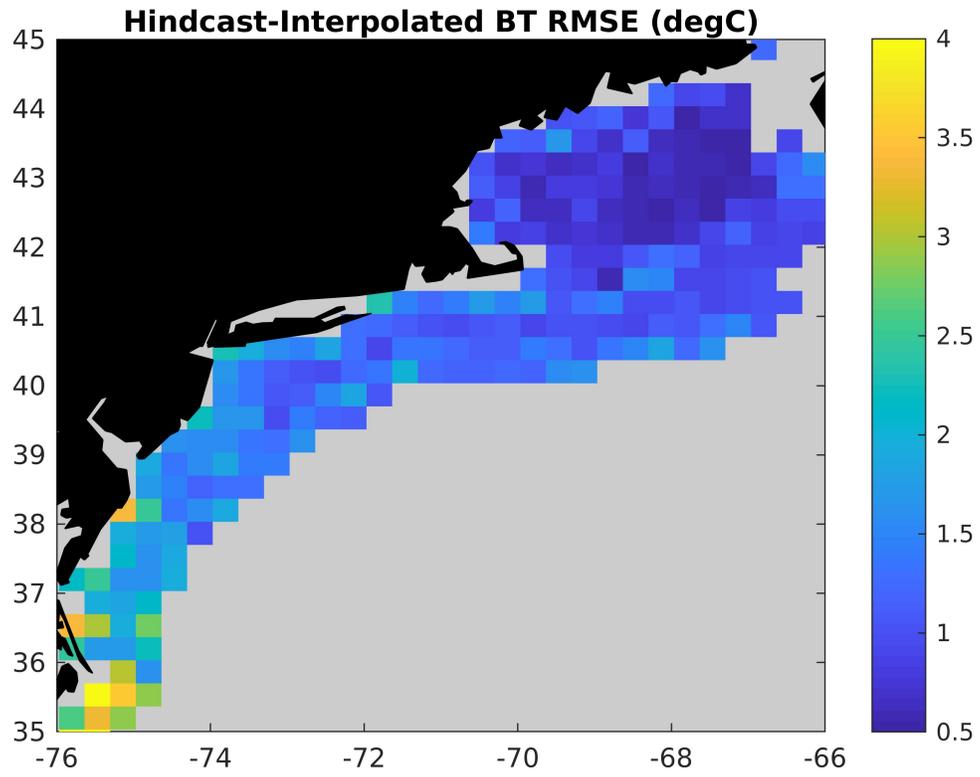


Figure S3. Temporal root mean square error (RMSE) between historical and modeled bottom temperatures calculated as in Lima and Doney (2004).

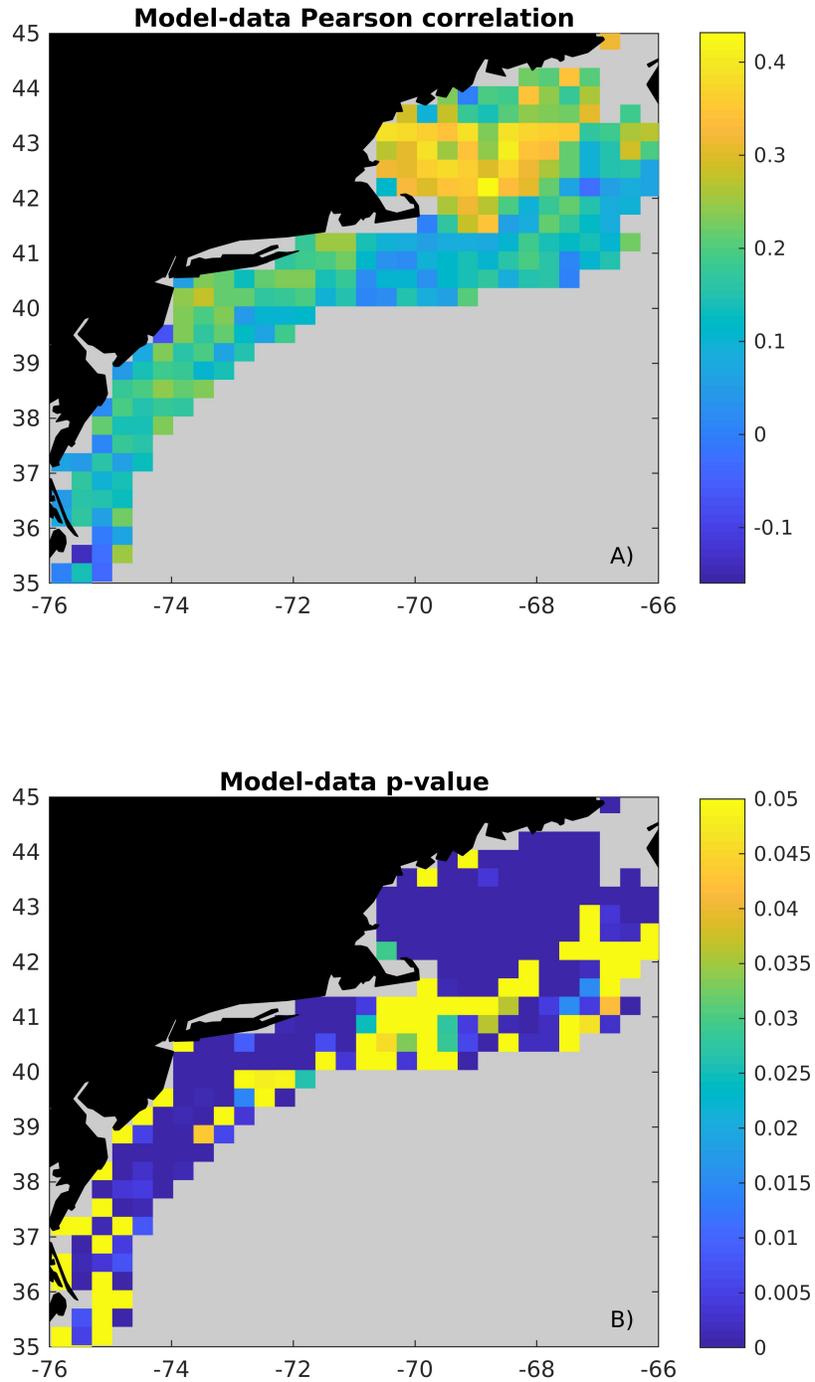


Figure S4. (A) Pearson correlation and (B) correlation p-values between modeled and interpolated monthly deviations from the 1982-2014 period. Deviations are calculated by subtracting the average month of either the historical data or the model output from the respective dataset.

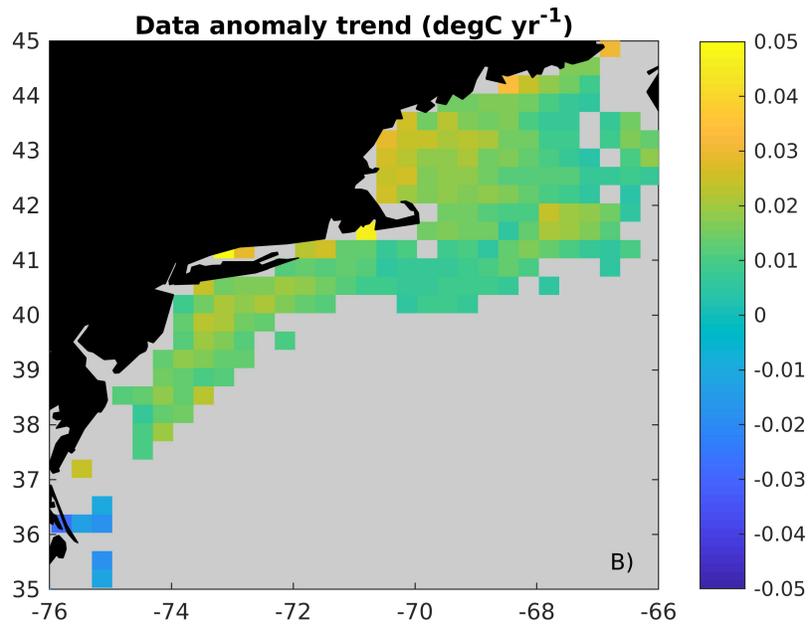
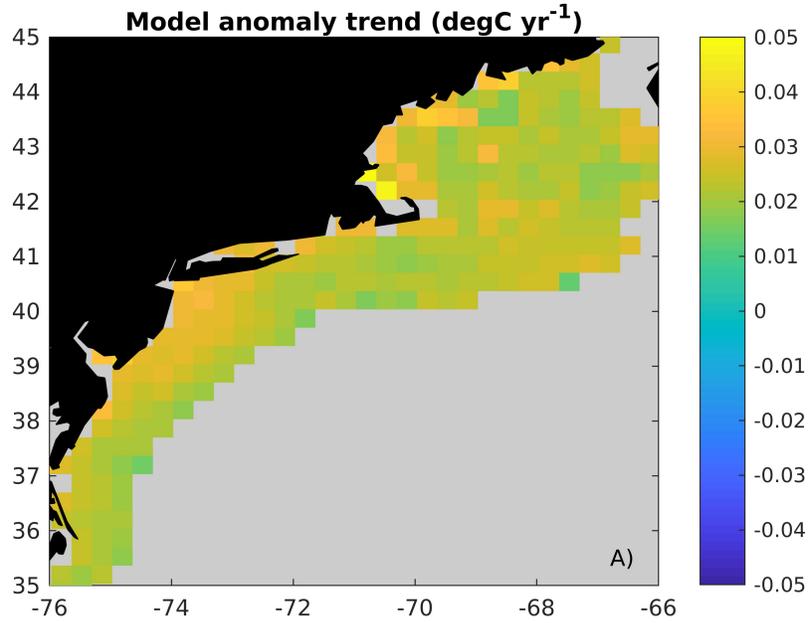


Figure S5. Long-term linear temporal trend ($^{\circ}\text{C yr}^{-1}$) in monthly deviations from the 1982-2014 (A) historical dataset and (B) ensemble mean model output. Deviations are calculated by subtracting the average month of either the historical data or the model output from the respective dataset. Only values with statistically significant trends at the $p < 0.1$ level are shown.

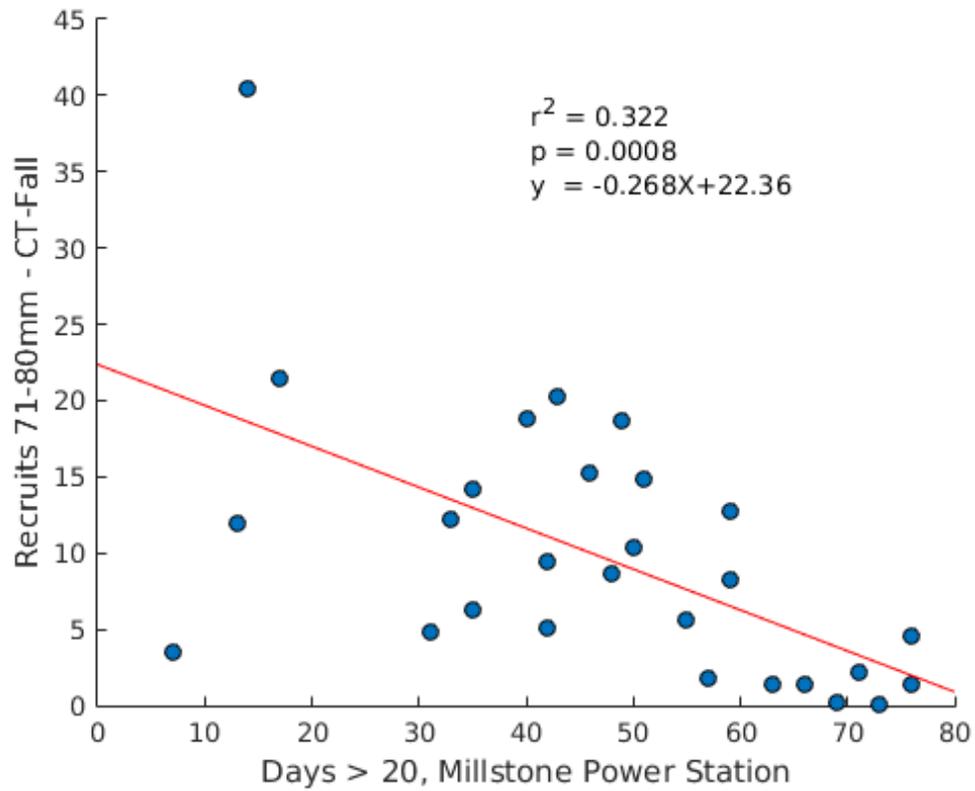


Figure S6. 5-year lagged recruit indices from Connecticut waters sampled during fall surveys (from ASFMC 2015 table 5.2.3.2C) plotted against annual number of days greater than 20 °C measured near the Millstone Power Station, CT (from ASFMC 2015 table 2.3.2).