|  |  |  |  |
| --- | --- | --- | --- |
| **Key Ecosystem Component** | **Indicator** |  |  |
| **ENVIRONMENT** | |  |  |
| ~~Surface Water Temperature~~ | 1. ~~Seasonal mean sea surface temperature~~ | ~~Satellite OISST (Huang et al., 2020)~~ | ~~Ian~~ |
|  | 1. ~~Marine heatwave days~~ | ~~Satellite OISST (Huang et al., 2020)~~ | ~~Ian~~ |
| Water Column Temperature | 1. Bottom temperature anomaly | World Ocean Database XBT and CTD (Boyer et al., 2018) and **Seawolf Sampling** | Ian |
|  | 1. Cold pool volume | GLORYS Reanalysis (Lellouche, 2003-2021), consider updating with MOM6 (1993-2019) | Ian |
|  | 1. Cold pool duration | GLORYS Reanalysis (Lellouche, 2003-2021), consider updating with MOM6 (1993-2019) | Ian |
| Winds | 1. ~~Mean wind stress~~ | ~~National Data Buoy Center (1971)~~ | ~~Ian~~ |
|  | 1. ~~Number of large storms~~ | **~~University of Manitoba Northern Hemisphere Cyclone Dataset~~** | **~~Ian~~** |
| Stratification | 1. Stratification anomaly | World Ocean Database XBT and CTD (Boyer et al., 2018) and **Seawolf Sampling** | Ian |
| Freshwater Inputs | 1. Hudson River flow | River Gauge (U.S. Geological Survey, 2016) | Ian |
| ~~Salinity~~ | 1. ~~Surface water salinity~~ | ~~World Ocean Database XBT and CTD (Boyer et al., 2018) and~~ **~~Seawolf Sampling~~** | ~~Ian~~ |
|  | 1. ~~Bottom water salinity~~ | ~~World Ocean Database XBT and CTD (Boyer et al., 2018) and~~ **~~Seawolf Sampling~~** | ~~Ian~~ |
| Habitat | 1. Lobster thermal habitat | Glorys 12 Reanalysis (Lellouche, 2021) | Ian |
|  | 1. Location of 20 C isotherm | Satellite OISST (Huang et al., 2020) | Ian |
| **MARINE COMMUNITY** | |  |  |
|  | 1. ~~Vessel density and speed~~ | ~~BOEM and NOAA MarineCadastre.gov~~ | ~~Ian~~ |

## SST

Get\_OISST.Rmd (NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature/RScripts)

OISST\_means.R

(NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature/RScripts)

SST\_*year*.R

(NYB\_INdicators\_Calculations/CalculateIndicators/Final\_Timeseries\_Figures/Figures\_*year*)

### Get\_OISST\_data.Rmd

1. Retrieves the SST data, saves it to your machine, and formats it labeling points inside the NYB
2. Please rename any raw files (they are downloaded as a long string of numbers and letters) and manually put them into the NYOS\_megafolder under NYOS\_megafolder/indicator.development/Indicators\_MOST\_RECENT\_2023/Raw Data/Temperature/raw data
3. Saves SST data as a file called L1\_SST\_data\_Processed*DATE\_YEAR*.csv
4. Please manually put this file into the NYOS\_megafolder under NYOS\_megafolder/indicator.development/Indicators\_MOST\_RECENT\_2023/Raw Data/Temperature. Most of the raw data is too big to go on the github

### OISST\_means.R

1. Formats the data for the final time series
2. This will save the formatted data to Final\_Timeseries\_Figures/TImeseries\_*year*

### SST\_year.R

1. Makes the final figure
2. Determines the 30th and 70th percentiles to compare with the average of the last 5 years of data for the short term column in the Indicators at a glance chart
3. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

Done

“/Users/ian/Desktop/NYB Indicators/Final\_Timeseries\_Figures/Figures\_2024/SST”

## Marine Heatwaves

MarineHeatwaves.R

(NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature/RScripts)

Glorys\_Bottom\_temp\_daily.R

(NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature/RScripts)

Marine\_Heatwaves\_2023.R

(NYB\_Indicators\_Calculations/Final\_Timeseries\_Figures/Figures\_2023)

### MarineHeatwaves.R

1. Takes the L1 SST data from your SST indicator and the bottom temperature from Glorys\_bottom\_temp\_daily.R (this script just formats the netcdfs as usable dataframes)
2. Uses Rheatwaves to calculate the marine heatwave metrics
3. Also uses a loop to calculate the heatwave metrics with a moving baseline

Glorys\_bottom\_temp\_daily.R

1. Takes the netcdfs as downloaded from Copernicus and reformats them into a table, labeling points within the NYB, for ease of use in **Marineheatwaves.R**
2. Please put any new GLORYS data into the NYOS\_megafolder under indicators.development/Indicators *YEAR*/raw data.

### Marine\_Heatwaves\_year.R

1. Creates marine heatwave figures
2. Determines the 30th and 70th percentiles to compare with the average of the last 5 years of data for the short term column in the Indicators at a glance chart
3. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

## Bottom Temperature

ProcessCTD\_SeaWolf.R

(NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature/RScripts)

HowtogetWODdata\_UPDATE2023.Rmd

(NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature/RScripts)

Bot\_Temp\_updated\_12\_08\_2023.R

(NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature/RScripts)

Bottom\_Temp\_year.R

(NYB\_Indicators\_Calculations/Final\_Timeseries\_Figures/Figures\_year)

ProcessCTD\_SeaWolf.R

1. Takes individual .cnv files for the seawolf (in the .L1 folder for each cruise on the NYOS megafolder in google drive - if you are unsure ask Tyler Menz) and formats and saves them into one table

### HowtogetWODdata\_UPDATE2023.Rmd

1. Retrieves all relevant files from the World Ocean Database, formats them and saves them. Starting with the 2023 report only the last 5 years of data will be downloaded and appended to the data from previous years.
2. These files are too large to be stored on github. Please put the new WOD data into the NYOS\_megafolder under indicators.development/Indicators *YEAR*/raw data.

### Bot\_Temp\_updated\_12\_08\_2023.R

1. Merges all Seawolf and WODB data and creates the final time series of bottom temperature saved to the Timeseries\_Files\_*Year* file

### Bottom\_Temp\_year.R

1. Creates the final bottom temperature figure for the Indicator report.
2. Determines the 30th and 70th percentiles to compare with the average of the last 5 years of data for the short term column in the Indicators at a glance chart
3. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

## Cold Pool

Cold\_Pool\_and\_Lobster.ipynb

(NYB\_Indicators\_Calculations/CalculateIndicators/Coldpool and Lobster Thermal Habitat)

Cold\_Pool\_Glider\_year.R

(NYB\_Indicators\_Calculations/Final\_Timeseries\_Figures/Figures\_year)

CP\_Volume\_year.R

(NYB\_Indicators\_Calculations/Final\_Timeseries\_Figures/Figures\_year)

### Cold\_Pool\_and\_Lobster.ipynb

1. Loads the GLORYS12 reanalysis data
2. Creates map figures for indicator report of different waypoints on the offshore cruise and of the three buoys used for the windspeed indicator
3. Calculates the time series of area of NYB inhospitable to lobster. See **Lobster Thermal Habitat**.
4. Determines the volume of the cold pool within the NYB.

### Cold\_Pool\_Glider\_year.R

1. Loads in the Cold Pool volume data (from Charlies calculations)
2. Creates the figure for the indicator report
3. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

### CP\_Volume\_year.R

1. Loads in the Cold Pool volume data (glorys reanalysis based)
2. Creates the final Cold Pool figure for the Indicator report.
3. Determines the 30th and 70th percentiles to compare with the average of the last 5 years of data for the short term column in the Indicators at a glance chart
4. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

## Wind Speed

NYOS\_NOAA\_BUOYDATA.R

(NYB\_Indicators\_Calculations/CalculateIndicators/Wind Stress)

Wind\_new.Rmd

(NYB\_Indicators\_Calculations/Final\_Timeseries\_Figures/Figures\_*year*)

### NYOS\_NOAA\_BUOYDATA.R

1. Retrieves data from relevant NOAA buoys
2. Calculates wind stress
3. Saves wind speed and stress files to Final\_Timeseries\_Figures/Timeseries\_Files\_*year*

### Wind\_new.Rmd

1. Reads in the wind speed data and calculates the 30th and 70th percentiles for the the short term trend comparison by buoy and season
2. Makes the final plot for the indicator report
3. Save this as a .png file to Final\_Timeseries\_Figures/Figures\_*year*
4. This script does a lot of other plotting when I was experimenting to see what different things looked like. Feel free to revisit these plots or ignore them!

Done

“/Users/ian/Desktop/NYB Indicators/Final\_Timeseries\_Figures/Figures\_2023/SmallCraftWarnings”

## Large Storms

Large\_Storms.Rmd

(NYB\_Indicators\_Calculations/CalculateIndicators)

Large\_Storms\_*year.*R

(NYB\_Indicators\_Calculations/Final\_Timeseries\_Figures/Figures\_*year*)

### Large\_Storms.Rmd

1. Reads in the cyclone data (Located in NYOS megafolder. Please double check website listed in code for updates before running)
2. Subsets for our study area and determined cyclone strength based on the local laplacian of pressure
3. Saves time series to Final\_Timeseries\_Figures/Timeseries\_Files\_*year*

### Large\_Storms\_year.R

1. Creates the final storms figure for the Indicator report.
2. Determines the 30th and 70th percentiles to compare with the average of the last 5 years of data for the short term column in the Indicators at a glance chart
3. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

## Stratification

Stratification\_Seasonally\_2023.R

(NYB\_Indicators\_Calculations/CalculateIndicators/Stratification)

Stratification\_year.R

(Final\_Timeseries\_Figures/Figures\_*year*)

### Stratification\_Seasonally\_2023.R

1. Combines the WODB and Seawolf data
2. Creates the timeseries for the NYB and saves to Final\_Timeseries\_Figures/Timeseries\_Files\_*year*

### Stratification\_year.R

1. Reads in the stratification data and calculates the 30th and 70th percentiles for the the short term trend comparison by season
2. Makes the final plot for the indicator report
3. Save this as a .png file to Final\_Timeseries\_Figures/Figures\_*year*

Fff$Val

Fff$Intercept

Fff$Val\_I <- Fff$Val + Fff$Intercept

Stratification\_summer.R

## Hudson River Flow

No instructions but I did Gruenburg\_River\_Flow.Rmd -> Hudson\_Flow\_2023.R

## Salinity

ctd from seawolf and WOD. Switch input from temp to salinity.

## Surface 20C Isotherm

20C\_isotherm\_year.ipynb

(NYB\_Indicators\_Calculations/CalculateIndicators/WaterTemperature)

### 20C\_isotherm\_year.ipynb

1. Loads all the sst data that are obtained from Get\_OISST.Rmd
2. Subsets by season (for the 2023 report we use JJA for summer and SON for autumn. In this notebook there is an option to use JAS for summer and OND for autumn. You may wish to change this - or even consider JJAS for summer and ON for autumn or something else as the seasons change)
3. Makes the final plot for the indicator report
4. Save this as a .png file to Final\_Timeseries\_Figures/Figures\_*year*

## Lobster Thermal Habitat

### Cold\_Pool\_and\_Lobster.ipynb

(NYB\_Indicators\_Calculations/CalculateIndicators/Coldpool and Lobster Thermal Habitat)

Lobster\_Thermal\_Habitat\_year.R

(NYB\_Indicators\_Calculations/Final\_Timeseries\_Figures/Figures\_year)

### Cold\_Pool\_and\_Lobster.ipynb

1. Loads the GLORYS12 reanalysis data
2. Creates map figures for indicator report of different waypoints on the offshore cruise and of the three buoys used for the windspeed indicator
3. Calculates the time series of area of NYB inhospitable to lobster and saves this to the Timeseries\_Files\_*Year* file

### Lobster\_Thermal\_Habitata\_year.R

1. Creates Lobster Thermal Habitat figure for the Indicator Report
2. Determines the 30th and 70th percentiles to compare with the average of the last 5 years of data for the short term column in the Indicators at a glance chart
3. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

## Vessel Density

TEUs\_*year*.R

(Final\_Timeseries\_Figures/Figures\_*year*)

### TEUs\_*year*.R

1. We began to use TEUs for this indicator in 2023. The yearly values are manually copied and pasted from this website <https://www.panynj.gov/port/en/our-port/facts-and-figures.html> into an excel spreadsheet to be saved as a .csv file to Final\_Timeseries\_Figures/Timeseries\_Files\_*year*
2. Creates Vessel Density figure for the Indicator Report
3. Determines the 30th and 70th percentiles to compare with the average of the last 5 years of data for the short term column in the Indicators at a glance chart
4. Save this as a .png to Final\_Timeseries\_Figures/Figures\_*year*

Done:

“/Users/ian/Desktop/NYB Indicators/Final\_Timeseries\_Figures/Figures\_2024/VesselDensity”