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A Data Repository for Minimal Effects of Oyster Aquaculture on Water Quality: Examples from Southern Chesapeake Bay

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Spatial Information
36.89 to 37.65°N, -76.36 to -76.0°W; Virginia portion of southwestern shore of Chesapeake Bay, U.S.A.

Abstract
The objective of this study was to quantify the effects of oyster aquaculture on water quality, sediment quality, and hydrodynamics at select sites in southern Chesapeake Bay. To this end, information was gathered over the course of approximately one year from February 2017 to October 2017 at four operating commercial farms. Farms were sampled during spring, summer, and fall seasons during times of oyster filtration activity when temperatures were greater than 10°C. Aquaculture sites differed in environmental setting, in terms of their exposure to waves and resulting sediment characteristics. Sites had mesohaline salinities (ranging from 15-22 psu) and mean water depths of ~1 m (ranging from 0.5 to 2 m depending on distance from shore and tidal stage). Site characterization was conducted at each oyster farm using standard sedimentological measurements with a PONAR grab to map sediment characteristics throughout the extent of each oyster farm and surrounding area. Following site characterization, hydrographic, water clarity, and water quality data were collected using high frequency spatial water quality mapping of transects on a moving vessel and an instrumented profiler at discrete point samples. On high frequency spatial water quality mapping (transect) cruises, the vessel was driven along 10-30 transects including approximately half inside and half outside the extent of cages while vessel-mounted instruments sampled continuously. On discrete point sample (instrumented profiler) cruises, data were collected at five designated stations along a central transect of the farms with three stations within the extent of cages and two stations outside. The two smallest oyster farms were sampled only during Summer 2017. Two of the larger oyster farms were sampled during Summer and Fall 2017. Additionally, during Summer 2017 at Windmill Point, a stationary upward facing acoustic Doppler profiler collected data over one month.

Description
Data were collected on multiple sampling cruises in 2017-2018 as listed in the **Cruise Log**. Original data collected on high frequency spatial water quality mapping transects are compiled into two files, **Transect YSI Data and Transect ADCP Data**, for the respective instruments whose sampling frequencies were not

equivalent. With regards to transect data analysis for the associated manuscript, the **Transect Methods for Removing Outliers and Trends** file outlines the process by which outliers were selected and removed and the processes by which trends were identified and subtracted from the data. Furthermore, also with regards to transect data analysis for the associated manuscript, the **Transect Methods for Autocorrelation Analysis and Subsampling** file illustrates the process by which spatial autocorrelation was calculated for subsampling purposes.

The **Transect ANOVA Results** file presents the full statistical report of all two- and three-way analyses of variance that were performed on the subsampled data to analyze differences between inside vs. outside the farm, site differences, and seasonal differences.

Site characterization in terms of sediment grain size and organic content can be found in the **Sediment Characteristics** file. Data collected by the stationary ADP over one month at Windmill Point in summer 2017 are included in the **Stationary ADP Data** file. Data collected on instrumented profiler cruises, which are not part of the associated manuscript, are compiled into the file **Instrumented Profiler Data**. To better understand how instrumented profiler data were collected, the Instrumented Profiler Data Methods document details the instruments used, how instruments and water samples were collected spatially and with depth, and subsequent laboratory analyses when applicable.

List of files:

- Cruise Log
- Transect YSI Data
- Transect ADCP Data
- Transect Subsampled Data
- Transect Methods for Removing Outliers and Trends
- Transect Methods for Autocorrelation Analysis and Subsampling
- Transect ANOVA Results
- Sediment Characteristics
- Stationary ADP Data
- Instrumented Profiler Data
- Instrumented Profiler Data Methods

FILES ARE AVAILABLE AT: https://doi.org/10.25773/wwva-tz18

Keywords
Oyster aquaculture, water clarity, water quality, hydrodynamics, suspended sediments, eastern oyster, suspended particles, high frequency spatial mapping, acoustic Doppler current profiler, ADCP, total suspended solids, TSS, sediment grain size, sediment organic content, light attenuation, Secchi depth, colored dissolved organic matter, CDOM, conductivity temperature depth sensor, CTD, water quality sonde, chlorophyll-a, particle size distributions, particle characteristics, current speed, Chesapeake Bay

Associated Publications

Turner, Jessica S., Kellogg, M. Lisa, Massey, Grace M., and Friedrichs, Carl T. (2019) Minimal effects of oyster aquaculture on water quality: Examples from southern Chesapeake Bay. PLOS ONE *in press*

Kellogg, M. Lisa, Turner, Jessica S., Dreyer, Jennifer C., and Massey, Grace M. (2018) Environmental and Ecological Benefits and Impacts of Oyster Aquaculture, Chesapeake Bay, Virginia, USA. A final report to The Nature Conservancy. https://doi.org/10.25773/hdb1-xf91

Kellogg, M. Lisa, Turner, Jessica S., Dreyer, Jennifer C., and Friedrichs, Carl T. (2018) Environmental and Ecological Benefits and Impacts of Oyster Aquaculture: Addendum. An addendum to the final report to The Nature Conservancy. https://doi.org/10.25773/r01b-tg44

Publication Statement

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