Diel Oxygen Cycles in Wequetequock Cove

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Background and Rationale

- Wequetequock Cove is currently suffering from the effects of eutrophication. Dissolved oxygen concentration (DO) can be used to examine the severity of eutrophication. Understanding the diel cycles in Weque Cove can inform us on the scale of change occurring as well as give us a baseline to analyze future changes.
- Eutrophication: Severe reduction in oxygen due to the dense growth of plant life resulting in large-scale animal deaths. Eutrophication usually occurs as a result of human-caused effects.
- Diel cycle: A process occurring over a period of 24 hours; in this case, the flux of dissolved oxygen into and out of Weque Cove.

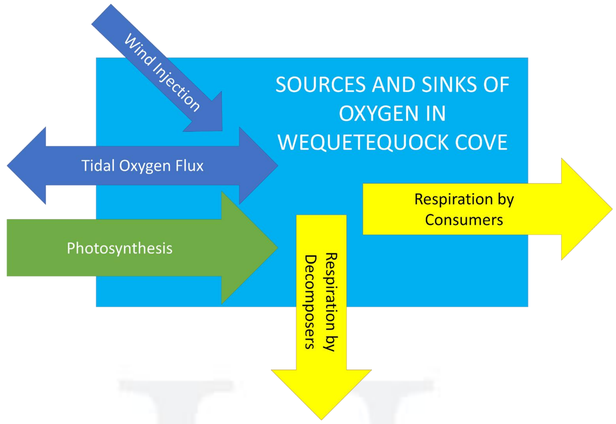


Figure 1: Box model of oxygen sources and sinks in Wequetequock Cove.

Methods

- A DO and temperature-sensing Optode (Mini-Dot; PME Instruments) was placed at [coordinates] for a period of 3 weeks [[when]], taking measurements continuously at 10 second intervals.
- A light sensor (Onset Corporation) was placed 1 m above mean water line, recording light intensity at 10 minute intervals for three days of the sampling period.
- Collected data were examimed to decipher underlying causes of diel O_2 variations.
- Graphs were created by averaging the DO and light measurements at each 10 minute time interval for 3 days to determine their value for that given time.

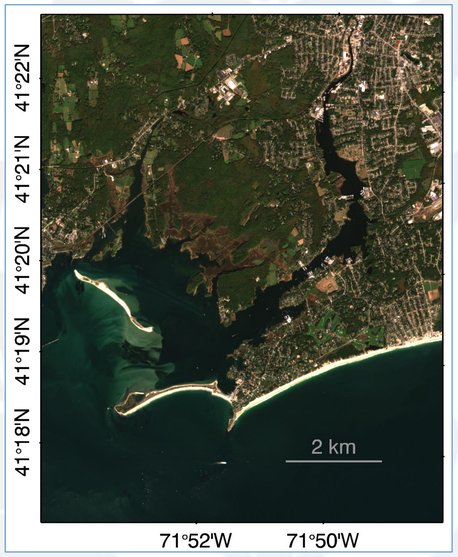
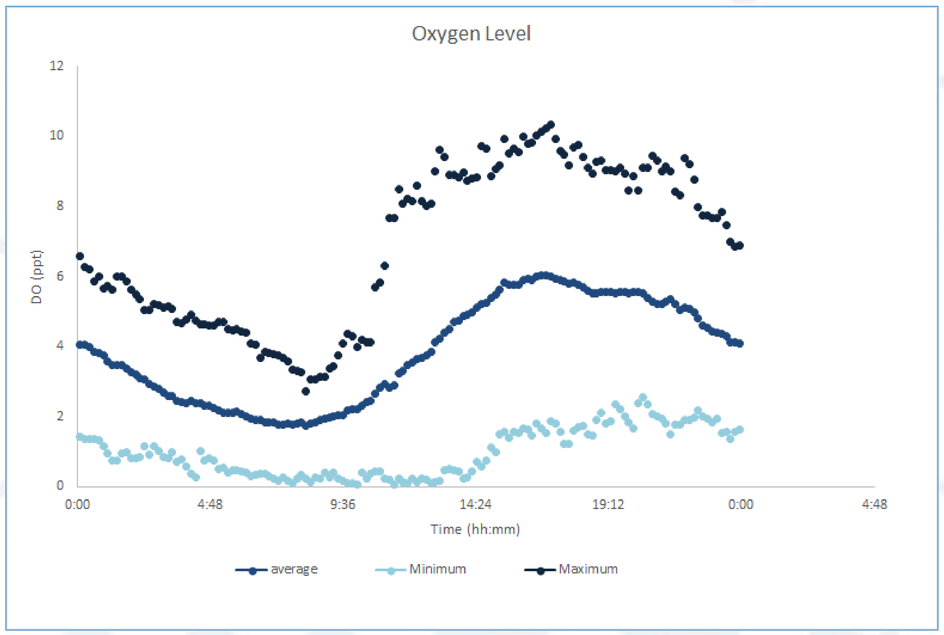


Figure 2: Satellite image of Wequetequock Cove. Location of the DO-sensing Optode indicated by marker.

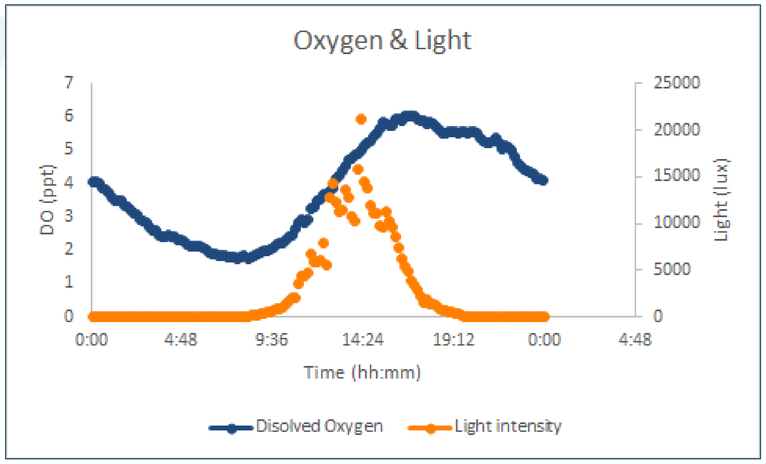
Results

- Oxygen levels show a clear diel pattern of one peak and one depression per 24 hour period.
- Maximum levels up to 10 µg/L are seen in the mid afternoon around 14:00 hrs.
- Minimum O_2 levels down to less than 1 µg/L are seen in the morning around 8:00 hours following a decline through the evening and night.



Results

- DO appears to decrease in the early hours of the day before the sun rises.
- DO increases steadily after sunrise until sunset.
- After sunset, DO decreases.



Conclusions

The diel pattern observed is most likely due to photosynthetic processes.

- Starting in the morning, primary production adds O_2 to the water until light intensity and DO reach a peak in the middle of the day.
- The sun sets through the late afternoon and evening, slowing primary production.
- Overnight, photosynthesis halts and respiration continues to deplete O_2 leading to the minimum levels observed in the morning.

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