Signaling Dissolved Oxygen Response to Eutrophication Using High Frequency Data

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Dissolved oxygen (DO) monitoring, as part of an estuarine monitoring program, should be used to signal changes that may impact living resources in the face of pressure from eutrophication. Historically, DO concentrations were investigated through routine sampling, typically once or twice per month, or short-term intensive sampling. *In situ* continuous monitoring implemented over the last decade has provided high frequency datasets that have revealed new insights on shorter temporal DO patterns. The aim of this presentation is to describe the use of high frequency DO data as a signal for coastal eutrophication in the Maryland Coastal Bays, USA. Being a shallow, unstratified system, the Coastal Bays were not thought to exhibit drastically low DO conditions, at least not to the same degree as the nearby deeper, stratified Chesapeake Bay. However, high-frequency data from *in situ* continuous monitors have revealed low DO conditions at some sites. These monitors, collecting data every 15 minutes, are deployed across stations collectively exhibiting a gradient of eutrophic conditions. Three methods of using these data to relate DO to eutrophication effects will be discussed. The first method tested the use of high-frequency data to evaluate established DO thresholds. Failure rates of established DO thresholds for the Coastal Bays were compared to failure rates for established DO criteria for various time intervals used in the Chesapeake Bay. As expected, stations exhibiting greater nutrient enrichment failed criteria more often. The second method tested the use of consecutive DO readings below established thresholds to signal degradation or recovery. Duration of DO below threshold concentrations was calculated for each station, and maximum monthly durations were then plotted against monthly percentage failure of established DO thresholds to determine a signal of improving or declining eutrophication effects. Preliminary evidence indicates that as percentage threshold failure increases, maximum duration of failure also increases. Finally, the third method tested the duration of DO below LC50 thresholds for common estuarine finfish species as a direct examination of effects on living resources. Species were chosen based on prevalence in finfish surveys and to represent a variety of low DO tolerance levels. Several stations had overall poor DO conditions for some fish species, and other stations exhibited seasonal or diel patterns of poor DO conditions. This study concludes that high frequency data from strategically-placed *in situ* continuous monitors can yield important data for use in signaling effects of management practices to control coastal eutrophication.

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