Supplementary Information
Indicator G: Bay Water Quality
State of Casco Bay 6th Edition

References

No references cited in this chapter.

Further Reading

Science. Friends of Casco Bay. (2021, July 6). Retrieved from https://www.cascobay.org/our-work/science/.

Information about Friends of Casco Bay's work collecting data on water quality through continuous monitoring stations and volunteer efforts.

Methods and Data Sources

Water quality data presented in this chapter was provided by Friends of Casco Bay (FOCB). FOCB has been monitoring water quality in Casco Bay for nearly 30 years. Data was initially collected by volunteers at as many as 40 sites around the Bay. Over the past five years, FOCB has moved towards the use of automated sensors and most quantitative data is now collected by professional staff. Staff collects data on surface water quality and vertical profile data approximately every three weeks during warmer months. FOCB maintained a single automated water quality monitoring station during the period covered by our data analysis.

The FOCB data are a long, important historical record of conditions in Casco Bay. Regular data collection over a period of decades includes information on multiple water quality parameters, often at the same location. Yet some changes in sampling locations and even methods over the past thirty years complicate data analysis, requiring careful consideration of potential sampling biases.

As a result, the core presentation of the data is graphical, emphasizing not complex statistics, but broad patterns. Statements on figures, in the text or in figure legends are backed up by statistical models. We evaluated several model frameworks, increasing model complexity from linear models to generalized additive models. Most analyses are based on models that incorporate multiple predictors using a hierarchical modelling framework, treating sites, and sometimes years, as random factors. We evaluated model performance using Aikake's Information Criteria and checked model diagnostic plots. Most data were analyzed untransformed, but Chlorophyll-A data were highly skewed, and thus transformed for analyses and graphics via log(x+1) transformation. Trend lines shown in the figures are statistically significant at the $p < 0.05$ level.

High frequency data poses significant analysis challenges because data is not only highly autocorrelated, but also shows important diurnal, tidal, and seasonal patterns. Our analysis of FOCB's high frequency water quality data relies heavily on generalized linear models with autocorrelated error structure (*AR(1)*) to partition variation. Periodic GAM smoothers at annual and diurnal periods were especially

informative. To heighten our ability to evaluate diurnal variation in dissolved oxygen, we subtracted daily median values from hourly data, generating a data set of hourly deviations from that day's median value.

Access to data and summary of data analysis can be found at https://github.com/CBEP-SoCB. For a full archive of data and all analyses steps head to https://github.com/CBEP-SoCB-Details.