Correlation Matrix of cHAB Onset Predictors Varies Among Lakes

Jessica Torrey, Shemaiah Sotrah, Courtney Richmond, Nathan Ruhl, Michael Grove
Department of Biological Sciences, Rowan University, Glassboro New Jersey, USA 08028

Five Polymictic Reservoirs in Southern New Jersey

Background
● Cyanobacterial harmful algal blooms (cHABs) may introduce toxins that travel through food chains and are also physically and chemically harmful for humans and other organisms
● Need to develop tools for predicting cHABs to avoid disruption

Methods
● Weekly water samples June-September 2019 adjacent to dam at five lakes
● Range of abiotic factors measured, including: nutrients, phycocyanin (PC), chlorophyll (CHL), dissolved oxygen (DO)
● Discrete samples measured in-situ in the field and in-vivo in the field and lab

Q1: Do correlation matrices differ among lakes?

Approach: Constructed correlation matrices of all water quality variables at each lake and analyzed the distribution of correlations among lakes
Analyses:
● Extracted correlation coefficients from Principal Components Analyses (PCA)
● Goodness of Fit performed on each distribution
● Kruskal-Wallis with Chi-Square and comparison with Steel-Dwass

Results:
● Correlation matrices are different among lakes (Kruskal-Wallis; p < 0.0001)
● LED shifted positive due to cHAB

Implications:
● Predictive modeling of cHABs among lakes should be possible

Future Work
Discrete in-situ fluorometric predictors of qPCR-derived cyanobacterial density

Q2: Which water quality variables are useful predictors of cHABS?

Approach: Obtained water quality variables and compared them among 5 lakes to determine which were the best predictors of cHABs
Analysis:
● Values extracted from PCA with Chi-Square to test utility for building a predictive model

Results:
● In-vivo PC:CHL lab (RFU) useful in all cases, four predictors never useful
● Helps determine which variables are necessary for a predictive model; some variables are always indicated while others are never indicated
● Compares validity of sample analysis in different environments; both lab and field analysis can be effective

Implications:
● cHABs may be detectable with low cost and low sample size methods
● Few predictors eliminated; concluding that predictive modeling of cHABs requires many inputs

Q3: How many environmental variables do you need to describe seasonal variation in water quality?

Approach: Used Principal Components Analysis (PCA) to inform a conceptual model describing the drivers of variation in water quality
Analysis:
● Variation in water quality data explained by principal components in a lake-specific PCA (n=5)

Results:
● Lakes with cHABs are simpler, require fewer principal components to describe the variation in water quality
● The opposite is true of lakes without cHABs

Implications:
● The difference between the number of predictor variables in simple vs. complex lakes is likely related to how difficult it will be to create a predictive model of cHABs.

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