Distinguishing Among Phytoplankton Groups Using Turner Designs' PhytoFind

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Goal

Detection of phytoplankton group specific fluorescence signatures in an effort to distinguish among phytoplankton groups.

Technology

Uses specific optical configurations to measure fluorescence signatures from various algal cultures.

Result

The PhytoFind can distinguish among three groups of algae:

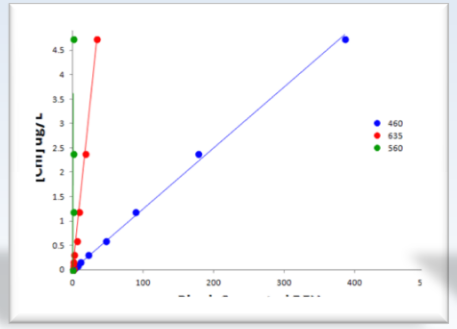
Green/Brown – includes algal groups such as Diatoms, Dinoflagellates, Chlorophytes

Mixed – includes algae that use phycoerythrin as a dominant light harvesting pigment

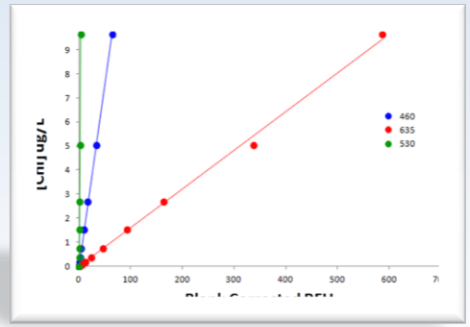
Cyanobacteria –prokaryotic algae

Methods and Calibration

Multiple calibration curves are created from serial dilutions of various algal cultures. Response factors are derived for each sensor per algal culture using calibration curve data.



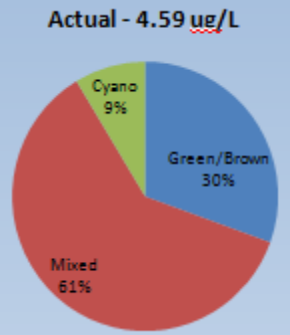
Dunaliella

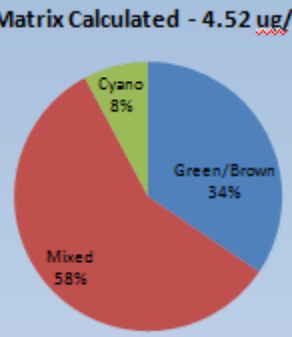


Cyanothece

Calculations

Response factors are used to mathematically deconvolve bulk fluorescence measured by the PhytoFind. Final values are calculated as algal group percent:





Correction Factors

Background fluorescence values, collected from filtrate analysis, are used to automatically correct for interference from dissolved organic materials, increasing accuracy of results.

Validation of Results

Field data were collected in Elkhorn Slough, an estuarine system with an established split phytoplankton community, lower versus upper slough. Collected samples were analyzed via HPLC and marker pigments (carotenoids) were used to roughly estimate group percentage. HPLC corroborated PhytoFind's results indicating a split community within Elkhorn Slough.

FIELD DATA	Lower Slough	Upper Slough
Groups	Green/Brown, Mixed, Cyano	Green/Brown, Mixed, Cyano
HPLC Data	99%, 1%, 0%	34%, 60%, 6%
PhytoFind Data	100%, 0%, 0%	42%, 53%, 5%

Conclusions

The PhytoFind is capable of distinguishing among 3 different phytoplankton groupings using relative fluorescence. This allows for a quick determination of phytoplankton constituents in water, a rapid assessment of algal blooms, and monitoring spatial and temporal changes in phytoplankton communities.