

SEASONAL VARIATION OF DIATOMS AND DINOFLAGELLATES IN
MONTEREY BAY, CA DETERMINED BY CHEMTAX ANALYSIS OF
HPLC PIGMENT DATA

A Thesis

Presented to the

Faculty of the Moss Landing Marine Laboratories

California State University Monterey Bay

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Marine Science

by

Kelene Keating

Fall 2013

CALIFORNIA STATE UNIVERSITY MONTEREY BAY

The Undersigned Faculty Committee Approves the
Thesis of Kelene Nicole Keating:

SEASONAL VARIATION OF DIATOMS AND DINOFLAGELLATES IN
MONTEREY BAY, CA DETERMINED BY CHEMTAX ANALYSIS OF HPLC
PIGMENT DATA

Nicholas Welschmeyer
Biological Oceanography

Erika McPhee-Shaw
Physical Oceanography

Jason Smith
Environmental Biotechnology

Laurence Breaker
Physical Oceanography

Marsha Moroh, Dean
College of Science, Media Arts, and Technology

Approval Date

Copyright © 2013

by

Kelene Nicole Keating

All Rights Reserved

ABSTRACT

Seasonal Variation of Diatoms and Dinoflagellates in Monterey Bay, CA Determined by CHEMTAX Analysis of HPLC Pigment Data

by

Kelene Keating

Master of Science in Marine Science
Moss Landing Marine Laboratories

Phytoplankton samples were collected off the Monterey Municipal Wharf II at a single location (36° 36' N and 121° 53' W) weekly from June 2003 to March 2010. The contribution of five algal groups to total chlorophyll *a* (chl *a*) was derived using CHEMTAX from biomarker pigment measurements made via HPLC analysis. The purpose of this study was to specifically define the relative abundances of diatoms and dinoflagellates on a seasonal and interannual basis. Spearman's rho (ρ) correlation coefficients were calculated to determine the strength of the relationship between the diatoms and dinoflagellates and two environmental variables; sea surface temperature (SST) and upwelling indices (UI). During the summer of 2004 and until the end of 2006, previous studies had suggested that the typical diatom-dominated bay shifted to a dinoflagellate-dominated system resulting from global warming effects on mixed layer stability. The high-resolution (weekly), long-term (2003-2010) sampling regime described in the current study coincided with this time frame and allowed a robust test of the tenet that "the age of dinoflagellates" had developed in Monterey Bay.

Pigment analysis indicated that diatoms and dinoflagellates displayed interannual and seasonal variability, particularly during the anomalous oceanographic conditions from 2004-2006. Diatoms were most abundant during the upwelling season and displayed a significant and positive correlation to UI, while they exhibited no relationship with shifts in SST. The dinoflagellates revealed a consistent fall bloom each year, displayed a significantly positive correlation to increases in SST and a significantly negative correlation to UI. This data set proved to be a robust, unique collection that clearly captured the "age of dinoflagellates" and compared well with larger scale studies conducted off shore waters of Monterey Bay, indicating the value of high frequency shore station based monitoring for tracking major oceanographic features. In this study, however, it was shown that the dominant period of dinoflagellates was short-lived since diatoms returned to dominance in 2007.