ABSTRACT

Seasonal and interannual variability of harmful algal bloom taxa was compared at two timeseries stations in the Santa Monica Bay. Phytoplankton (with a focus on harmful algal bloom (HAB) taxa) and abiotic conditions were sampled over a five year period (2008-2013) weekly at the Santa Monica Pier (SMP) and monthly at the Santa Monica Bay Observatory (SMBO) 22 km offshore of the pier. Phytoplankton blooms at both locations were dominated by diatoms and were intermittent with no clear seasonal variability. The potentially toxin-producing taxa Pseudo-nitzschia spp. dominated 1 out of 3 major blooms observed at SMBO and 2 out of 11 blooms at the SMPier. Greater total abundances and more frequent major blooms occurred at the pier than at the open ocean station. Further, the three major blooms at the SMBO were preceded by a bloom of the same taxa at the SMPier by 1 to 2 weeks. Lingulodinium polyedrum abundances were significantly positively correlated at the two stations both during the same week and with a two week lag period, but total phytoplankton abundances were not significantly correlated. *Pseudo-nitzschia* spp., *Prorocentrum* spp. and non-HAB diatoms generally persist throughout the year whereas *L. polyedrum* and HAB dinoflagellates (a category including low abundances of *Akashiwo* sp., *Alexandrium* spp., *Ceratium* spp., *Dinophysis* spp. and *Gymnodinium*-like spp.) were intermittent in presence.

STUDY SITE: Santa Monica Bay

These data were collected through two research programs in the Santa Monica Bay, one of the northernmost basins of the Southern California Bight (SCB). The SCB is a transition region between warmer, more saline waters of the Davidson Current from the south and cooler California Current and upwelled waters from the north.

**Harmful Algae & Red Tide Regional Monitoring Program**
(2008-ongoing) [http://www.sccoos.org](http://www.sccoos.org)

- Timing and extent of HAB events are monitored through weekly sampling at 5-8 regional pier stations: data here are from surface waters at the Santa Monica Pier.
- **Santa Monica Bay Observatory** (2003-2013) [http://quercus.igpp.ucla.edu/sombo/](http://quercus.igpp.ucla.edu/sombo/)

- Vertical gradients in biogeochemical parameters and phytoplankton assemblages were sampled bimonthly to monthly 22 km offshore at an instrumented moored mooring; data here are from surface waters.

![Image of phytoplankton community comparison](image-url)

**PHYTOPLANKTON TAXA AT SANTA MONICA PIER SHORE STATION**

**Yearly Timeseries of Taxonomic Persistence:** There is no clear seasonal variability in the total phytoplankton abundance.
*Pseudo-nitzschia* spp., *Prorocentrum* spp. and non-HAB diatoms generally persist throughout the year whereas *L. polyedrum* and HAB dinoflagellates (category includes *Akashiwo* sp., *Alexandrium* spp., *Ceratium* spp., *Dinophysis* spp. and *Gymnodinium*-like spp.) were intermittent in presence.

**Yearly Timeseries of Blooms:** Major blooms (abundance > 1,720,000 cells/L; defined as mean+1stddev, circled) were always dominated by diatoms, including the November 2010 and March 2011 events that were dominated by *Pseudo-nitzschia* spp. Minor blooms (abundance > 713,000 cells/L; defined as mean+2stddev, dotted circle) were also dominated by diatoms. There is no clear seasonal variability in bloom timing as they occur in all 4 seasons throughout the 5.5 year timeseries.

**TOWARDS UNDERSTANDING PHYTOPLANKTON FORCING**

**Above:** Variability in temperature and nutrients is not clearly linked to abundances of the taxa studied nor to diatom and dinoflagellate relative abundances at the SMPier. However, changes in northeast Pacific marine ecosystems have been correlated with phase changes in the Pacific Decadal Oscillation. Warm periods are characterized by lower productivity off the United States west coast. Phytoplankton populations are plotted above on a scale calibrated to view taxa present at abundances less than minor blooms. The Pacific Decadal Oscillation Index, the leading principal component of North Pacific SST variability is plotted below (solid black line) [http://jisao.washington.edu/pdo/PDO/latest](http://jisao.washington.edu/pdo/PDO/latest). Dinoflagellates are depicted in warm colors (red and orange) corresponding roughly to the warm phase of the PDO and diatoms are depicted in cool colors (blue) corresponding to the cool phase of the PDO.

**ACKNOWLEDGEMENTS** This work would not be possible without the work of many dedicated students and boat crews including Michelle Honda, Sarah Diringer, Claire Guzman, Ruthie Muusker, Rebecca Rooke, Jaynel Santos, Willie McCarthy, and Trager Acker.