The Bay Delta has Undergone Similar Food Web Changes to Other Systems Globally Following Changes in Nutrient Loads

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The San Francisco Bay Delta has undergone many changes in food web structure over the past several decades, including increases in macrophytes and invasive clams, shifts in dominance of planktivorous and piscivorous fish, and increased frequency of harmful cyanobacteria blooms. Many of these changes have been described as driven primarily by the wide range in effects of invasive species and alterations in habitat. However, changes in nutrient concentrations and nutrient ratios over time also fundamentally affect biogeochemical nutrient dynamics that can lead to conditions conducive to invasive species. In particular, changes in nitrogen: phosphorus ratios can "open niches" for new species, which, in turn, can alter habitat or biogeochemical cycling of nutrients, which further alter the potential success of various species. Several other aquatic ecosystems around the globe, from Europe to Australia and the US, have exhibited similar changes in food webs over time linked to similar nutrient changes as in the Bay Delta. Nutrient stoichiometry is thus suggested to be a significant driver influencing food webs in the Bay Delta mediated by positive and negative feedbacks between physiology, biogeochemistry, and organism dominance. Here, comparisons of other global ecosystems are made with the Bay Delta in terms of 1) changes in state from a system with high chlorophyll *a* and high pelagic productivity to one dominated by macrophytes, when phosphorus was reduced; 2) associations between high macrophyte production, invasive bivalves, piscivorous fish, and *Microcystis* growth, and 3) reductions in invasive species following targeted nitrogen reduction measures.

Keywords: global comparisons, nutrient stoichiometry, food web changes over time

Poster Topic: Global Perspectives

Environmental Foresight Through Computational Chemistry: to Avoid Wasting Resources through Implementing Changes that Turn out to be Bad Ideas

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Environmental issues have traditionally been discovered in hindsight after time lags of years to decades of industrial or consumer use of new chemistries. While choices of new materials and routes for accomplishing a technological goal are often driven to avoid newly discovered environmental issues, lack of data often prevents the best economic and planning decisions to be made when alternatives are introduced.
In this work, computational and estimation based methods are used to investigate potential environmental impacts of chemicals, particularly hydrofluoroethers (HFEs), while also retroactively looking at existing chemicals to see if we really do understand the impacts, even now. This work has predicted global warming potentials of a large number of HFEs. However, the definition of global warming potential assumes that all environmental impacts of a species are due to the presence of the original chemical released into the environment, and the retroactive look at chemicals currently in use will examine whether that definition is valid. The environmental degradation pathways of HFEs have been hypothesized but not quantified or validated to date. We predict formation rates and atmospheric lifetimes of likely daughter species of HFEs, and other heavily used compounds, in order to evaluate the environmental consequences after initial degradation in the atmosphere through hydroxyl radical attack. This work also estimates water solubility of species to identify if rain-out is a primary route for removal of parent or daughter species. We estimate octanol-water partition coefficients as a proxy measure of estimating bioaccumulation potential. HOMO-LUMO energy gaps are estimated to potentially correlate with toxicity data as it is developed in the future. Finally, kinetic rate constants of the degradation pathways are estimated using transition state theory. This complete set of evaluative tools gives more insight into potential environmental implications of replacing hydrofluorocarbons (HFCs) with HFE technologies, while expanding prior knowledge.

Keywords: Hydroflurocarbons Technology, Computational Chemistry, Environmental Degradation, HOMO-LUMO gap

Poster Topic: Global Perspectives

San Francisco Estuary and Watershed Science: Bridging Regional and Global Perspectives through Sound Scholarly Publication

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Now in its eighth year of publication, the online journal *San Francisco Estuary and Watershed Science* has continued to provide local researchers and policy-makers with critical information about this complex, highly managed, and ecologically important region. A fundamental part of the journal's aims and scope is to present science that highlights connections or discrepancies between regional and larger-scale processes and their joint effects on the Bay-Delta ecosystem and its management. For example, Malamud-Roam et al. evaluated regional to global climatic effects in their 2007 paper,
Holocene climates and connections between the San Francisco Estuary and its watershed.
Research that compares Bay-Delta systems and processes to those in other areas of the globe are also well cited among the journal's published articles. These include articles on open water processes of the San Francisco Estuary (Kimmerer 2004), a tree-ring reconstruction of the salinity gradient in the northern SF estuary (Stahle et al. 2011); and benthic assemblage variability in the upper SF estuary (Peterson and Vayssieres 2010). We present that the online journal serves a vital purpose for the Bay-Delta research community--to facilitate discussion and further knowledge about the science and policy surrounding the ecological issues of the region--and to reflect how they differ, mimic, and interplay with the same kind of academic research and debate being conducted on a global scale.

Keywords: scholarly publication, online journal, peer-review, regional focus, global connections

Poster Topic: Global Perspectives