SUMMARY PROPOSAL FORM

PROJECT TITLE: DOCUMENTING MULTIPLE PHYCOTOXINS IN COASTAL ECOSYSTEMS OF THE CALIFORNIA COAST

OBJECTIVE:

The overarching objectives of this research project are to build awareness of the presence of undocumented phycotoxins in estuaries and coastal regions adjacent to freshwater discharge along the coast of the Southern California Bight, and to provide insight into the causative species for these toxins through isolation and culture of toxin-producing species. The longer-term goal is to contribute to the establishment of guidelines for monitoring potentially toxic species and their harmful products in estuarine environments throughout the region.

METHODOLOGY:

A spatial and temporal survey to obtain baseline information on the presence of potentially harmful cyanobacteria and algae, and their phycotoxins, will be conducted at numerous sites along the southern California coastline. We will obtain water and grab samples and employ passive toxin sampling methodology to provide a temporal aspect to the analysis. Algae and cyanobacteria will be examined via microscopy, and toxins will be assessed by HPLC and/or ELISA. Species of interest will be isolated and cultured, and studied experimentally in order to provide further physiological and genetic characterization.

RATIONALE:

The widespread occurrence of marine harmful algal blooms and their toxins (in particular domoic acid and saxitoxins) in coastal waters of California has been documented during the last 15 years. In contrast to these ‘showcase’ marine phycotoxins, there is a paucity of research on many other algal and cyanobacterial toxins that occur in our coastal environment. During fall 2014, ad-hoc sampling of estuarine and coastal interface waters along the coast of southern California revealed the consistent and simultaneous presence of several toxin-producing species of algae and cyanobacteria, and/or multiple toxins. The potential human and environmental health risks posed by acute or chronic exposure to mixtures of these previously undocumented phycotoxins is unknown. We propose a combination of field and laboratory studies to characterize the extent and distribution of these toxins, to identify the causative species, and assess their environmental tolerances. We hypothesize that freshwater habitats of urbanized and developed land stimulate the growth of diverse and potentially toxic cyanobacterial/algal assemblages, creating ‘hot spots’ of complex matrices of toxins in estuaries and along coastlines.

DATA SHARING:

All sequence data obtained in the study will be deposited in public databases. Cultures of toxic cyanobacteria and algae will be made publicly available. Scientific data resulting from the study will be shared through publication in the primary literature, presentation at scientific meetings, and through interactions with various state agency charged with water quality management.