

**TITLE: ALGAL AND INVERTEBRATE POPULATIONS OF THE SALTON SEA IN
RELATION TO PHYSICAL AND CHEMICAL LIMNOLOGY.**

INTRODUCTION: A survey of the basic physical, chemical, and biological limnology of the Salton Sea is required to evaluate proposed solutions to prevent and eliminate ongoing fish and wildlife die-offs in the Sea. Fish and wildlife mortalities have been associated with physical stresses (high and low temperatures), chemical stresses (low dissolved oxygen, hydrogen sulfide, ammonia), and biological stresses (toxic algae, pathogenic bacteria and fungi). There has been no systematic survey of these limnological components since the 1960's.

The Salton Sea is truly a unique system. Often compared to the ocean and to other salt lakes, its inherent physical, chemical and biological components are different, and information from other systems has little direct relevance. For example, temperature/salinity relationships which determine water density are extremely volatile as the shallow lake occupies an arid desert basin (110+ days/yr with temperatures > 100 degrees). Similarly, high nutrient loading has resulted in a hypereutrophic water-body which acts as a fertile substrate for many pathogens and toxic algae. Populations of introduced fishes, such as tilapia, amass tremendous biomass in short time intervals. This sets the stage for massive die-offs upon physical, chemical or biological changes.

Increasing salinity has been a problem since the lakes' recent formation (initial fish community mostly extirpated and new fisheries established due to increased salinity). Scientists projected a continued rise in salinity and numerous engineering solutions have been proposed to halt the rise. Recent fish and wildlife die-offs have spawned increased interest in these solutions, however, salinity may not be the causative agent for these die-offs. The work proposed herein will define the context in which these die-offs occur and will aid in finding proper longterm solutions.

JUSTIFICATION: These data are needed to understand the basic processes of the Salton Sea ecosystem. The fish and wildlife of the Salton Sea represent "end-products" of a series of complex processes within the Salton Sea ecosystem. Problems within the fish and wildlife communities may originate at any point along these extended chains of cause and effect relations. Solutions to-date have been of a "band-aid" nature (e.g. removing carcasses of dead fish and birds), focusing more on the effect of the problem, not the cause. Effective, long-term solutions must be based on an understanding of those processes in order to focus on the earliest stage (causative agent).

OBJECTIVES: Major objectives of this program fall into three categories. One deals with the communities living within the water column and how they function in relation to the basic physical and chemical environments. A second area focuses on the animals associated with the Sea's bottom and their functions of transferring food, energy, pathogens, contaminants, etc up into the food chain. A third and final area, concerns the fact that many of these organisms have never been identified and a few are suspected to be extremely noxious organisms.

Specific objectives for each of these categories are as follows:

- A. Seasonal and spatial dynamics of plankton, nutrients and mixing regimes.**
- **Conduct vertical profiles of dissolved oxygen, pH, temperature and salinity along the major and minor axes phytoplankton and zooplankton sufficient to determine horizontal, vertical, and diel distribution is of the sea and at major point sources of water**
 - **Quantitative samples of phytoplankton and zooplankton sufficient to determine horizontal and vertical distributions**
 - **Assess macrodistribution of plankton through large scale observations of chlorophyll, temperature and turbidity through satellite imagery, aerial photography, towed spectrophotometers, etc.**
 - **Quantitative analyses of major nutrients (N, P, Si) sufficient to characterize primary production and eutrophication potential.**
 - **Assessment of tilapia grazing on plankton dynamics and composition (ie. What happens if tilapia dies off or increases? Does grazing increase or decrease abundance of toxic algae?)**
- B. Spatial and temporal distribution of benthic organisms.**
- **Density and diversity of organisms living within the mud/water interface.**
 - **Density and diversity of macroinvertebrates in shallow inshore areas (eg. corixids)**
- C. Biodiversity inventory of algae and invertebrates.**
- **Taxonomic analysis of algal species with annotated listings regarding toxic potential, public health threats, etc.**
 - **Taxonomic analysis of invertebrates (esp. arthropods, nematodes, rotifers, and protozoa)**
 - **Catalogs with electronmicrographs, light microphotographs, and/or line drawings of all known algal and invertebrate taxa, as foundation for later studies**

PRODUCTS:

Year 1 - Preliminary assessment of composition and distribution of major limnological components of Salton Sea.

Year 2 - Preliminary identification of new or previously unrecorded plankton and invertebrates.

Year 3 - Baseline report on dynamics of algal and invertebrate populations in relation to physical and chemical processes of the Salton Sea.

ANTICIPATED FOCUS: This study will provide information relevant to all three goals.

BUDGET:	PERSONNEL	(6.5 per yr X 100K X 3 yr)	1.95 M
	EQUIPMENT	(boat/computer/sampling equip)	0.15 M
	OTHER	(travel, data mngmt,rpt prep)	0.30 M
	TOTAL BUDGET		\$2.4 million

SUBMITTED BY: Biology Environment Team (See Roster)

(Principal contacts : Team members - Stuart Hurlbert, Tom Burke)