

California Department of Fish and Game  
California Department of Food and Agriculture

Sampling for Tributyltin at Tahoe Keys, Marina, Lake Tahoe  
and Shelter Island Yacht Basin  
San Diego Bay, California

August 1989

INTRODUCTION

Tributyltin (TBT) has been found in high enough concentrations in coastal areas of California to pose a threat to marine life. A survey of ten marinas in six California lakes conducted during the summer of 1987 also revealed high concentrations of TBT in a freshwater marina in Lake Tahoe. The results of more extensive monitoring in September, 1987 indicated an unacceptable hazard to aquatic life exists in Tahoe Keys Marina. Observed concentrations of TBT in the Tahoe Keys Marina exceeded chronic values (0.03 to 0.10 ug/L) and approached lethal levels (0.30 to 4.0 ug/L) for fish and invertebrates. Tissue residue levels in Lake Tahoe indicated fish in the main body of the lake were also exposed to TBT.

State legislation enacted at the end of 1988 restricted the use of TBT-based paints on boats shorter than 85 feet, thus practically eliminating the release of TBT in freshwater harbors and greatly reducing the release in saltwater harbors. The state Department of Fish and Game and Department of Food and Agriculture plan to continue jointly monitoring Tahoe Keys Marina and Shelter Island Yacht Basin for several years to determine the effectiveness of the new regulations in lowering TBT residues in fresh and saltwater environments. Shelter Island Yacht Basin was chosen as the site for saltwater monitoring because of its extensive history of environmental monitoring of TBT.

Long-term monitoring of Tahoe Keys Marina and Shelter Island Yacht Basin began in summer 1988. At Tahoe Keys Marina concentration of TBT in water decreased while concentrations in sediment and tissue remained unchanged from 1987. As a result, the sampling design will be modified in 1989 to better test change which might occur in the marina.

#### OBJECTIVE

The objective of the monitoring program will be to determine significant change over time in the TBT and DBT concentrations in water, sediment and biological tissue. *at local sites within Lake Tahoe and Shelter Island Harbors.*

#### PERSONNEL

This study will be conducted jointly by the Department of Fish and Game's (DFG) Pesticide Investigations Unit, and the Department of Food and Agriculture's (DFA) Environmental Hazards Assessment

Program, under the overall supervision of Brian Finlayson (DFG) and Randy Segawa (DFA). Other key personnel are listed below:

Project Leaders - Jim Harrington (DFG), Bonnie Turner (DFA)

Field Sampling - John Waithman (DFA)

Chemical Analysis - DFG, Water Pollution Control Laboratory

Madeline Ames will be the primary contact person for other agencies and the public. All questions should be directed to her at (916) 324-8916.

## STUDY DESIGN

### Monitoring Locations

Sampling for the freshwater environment will occur at Tahoe Keys Marina, Lake Tahoe and for the saltwater environment at the inner harbor of Shelter Island Yacht Basin, San Diego Bay, (Figure 1). One site in Shelter Island Yacht Basin and three in Tahoe Keys Marina will be monitored.

### 1989 Schedule

Sampling at Lake Tahoe will be conducted on September 19-21, 1989. Sampling at San Diego will be conducted on November 14-15, 1989. Therefore, mussels will be transplanted from Bodega Bay, California to Shelter Island Yacht Basin on August 20, 1989, to allow for three months bioaccumulation of TBT.

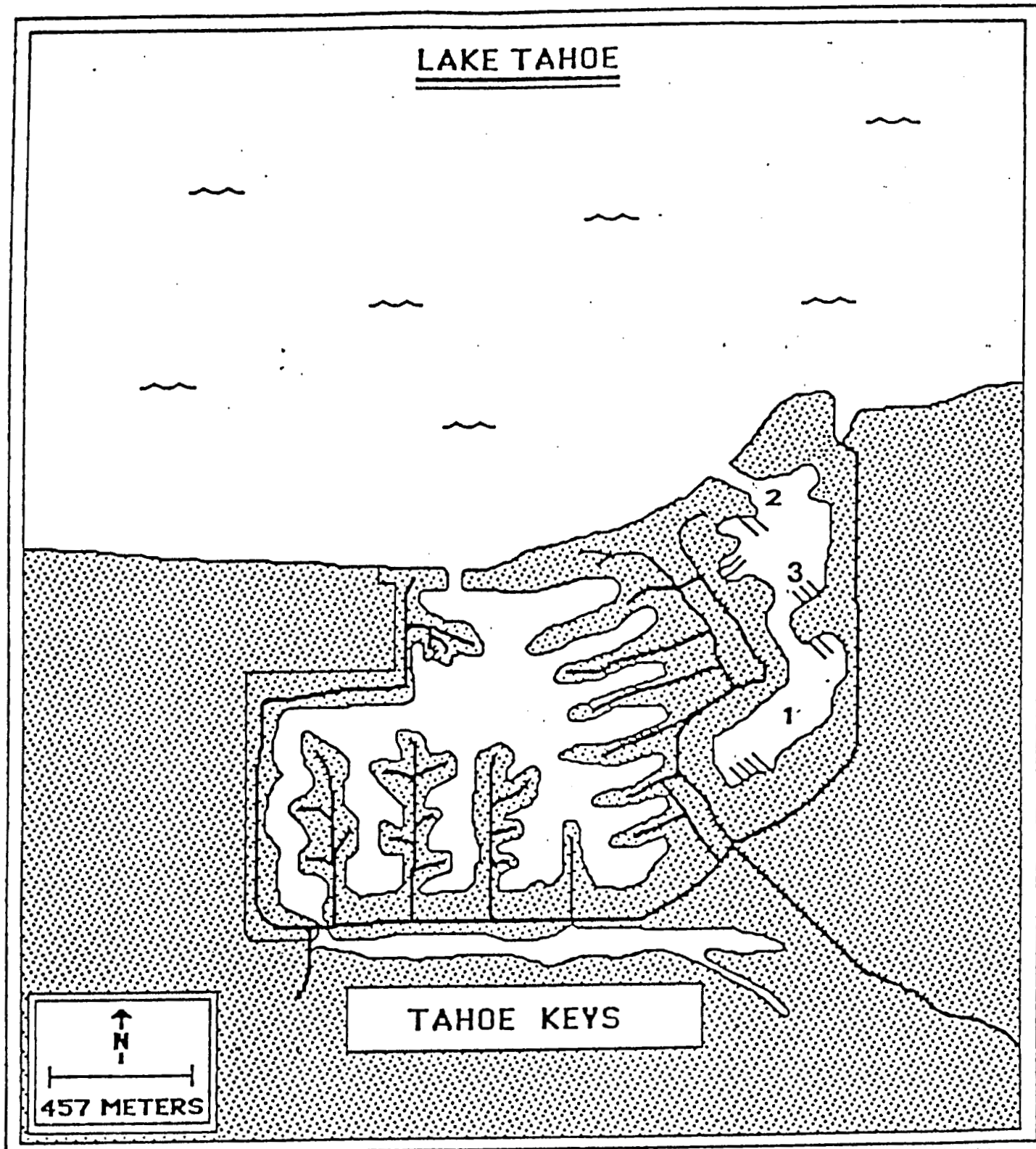


Figure 1. Location of the three TBT monitoring sites in the Tahoe Keys Marina area, Lake Tahoe, California.

## Collection

**Water** - At Lake Tahoe and San Diego, six replicate samples in one-liter polycarbonate bottles will be collected at mid-depth. 1-m depth. Samples will be cooled on wet ice, then frozen on dry ice, and kept at 0°C or less until analyzed.

**Sediment** - A coring device will be used to obtain eight sediment samples from three sites at Lake Tahoe and one site at San Diego. The upper 10 cm of each core will be removed from the coring device and placed in polycarbonate jars. Sediment samples will be cooled on wet ice, then frozen on dry ice, and kept at 0°C or less until analysis.

**Biota** - At Lake Tahoe, fish will be collected in the marina area using gill nets set on the bottom substrate. Twenty-four fish of the same species will be taken from gill nets to produce eight composite samples containing 3 fish each. Fillets from both sides of each fish will be removed for analysis. The target species will be tui chub (Gila bicolor), but if not enough are caught, Tahoe sucker (Catostomus tahoensis) will be used. Fish will be wrapped in aluminum foil, put in airtight plastic bags, placed on dry ice and kept at 0°C or less until analysis.

Approximately 1500 mussels (Mytilus californianus) will be collected from Bodega Bay and divided into 37 groups of 40 individuals. One group will be retained as a control and the other 36 groups will be divided into three sets of twelve groups.

The mussel groups will be put into nylon bait bags, transported to San Diego Bay, and suspended on weighted lines from three docks in the area of Shelter Island Boat Harbor. Ninety-days following the transplant, eight samples of mussels will be randomly chosen from the 12 groups collected from one set. Three sets will be used in the case of vandalism. The entire body of the mussel, excluding the shell, will be removed for analysis. Mussels will be wrapped in aluminum foil, placed on dry ice and kept at 0°C or less until analysis.

#### Mooring Records

Monthly mooring records containing information on number of boats and their lengths at each marina will be obtained by DFG personnel from harbor managers to estimate potential release of TBT into the study areas.

#### Chemistry

The chemical analysis will be performed by DFG laboratory. TBT and dibutyltin (DBT) residues in sediment and biological tissue will be determined by electron-capture gas chromatography using the method of Tsuda et al. (1986). TBT and DBT concentrations in water will be determined by flame photometric gas chromatography using the method of Matthias et al. (1986).

#### Quality Control

**Water** - A portion of the volume from the six replicate water

samples from each site will be composited and divided into three split samples for intralaboratory quality control and three split samples for interlaboratory quality control.

**Sediment** - Sediment cores will be thawed overnight, and homogenized. A portion of the volume from the eight replicate sediment samples from each site will be composited, homogenized, and divided into three split samples for intralaboratory quality control and three samples for interlaboratory quality control.

**Biota** - Fish from Lake Tahoe and mussels from San Diego Bay will be thawed overnight. A portion of the volume from the eight replicate tissue samples of biota will be composited, rehomogenized, and divided into three split samples for intralaboratory quality control and three split samples for interlaboratory quality control. Similar quality control will be done for the mussels.

#### Sample Allocation

The DFG Water Pollution Control Laboratory (WPCL) will be responsible for analysis of replicate water and sediment samples from Lake Tahoe and the DFA laboratory will be responsible for analysis of replicate water and sediment samples from San Diego. DFA will contract analysis to Cal-Enseco Laboratory, Sacramento. DFG will be responsible for replicate tissue samples from both Lake Tahoe and San Diego. The DFG laboratory and DFA will

exchange split water and sediment samples for interlaboratory quality control. The U.S. Navy Laboratory in San Diego will be used by DFG for intralaboratory quality control of tissue samples.



Estimated Number of Samples to be Analyzed

	DFG		DFA		Navy
	Rep.	Split (QC)	Rep.	Split (QC)	Split (QC)
<b>Tahoe Keys</b>					
Water	6	3		3	
Sediment*	24	9		9	
Fish	8	3			3
<b>Shelter Island</b>					
Water		3	6	3	
Sediment		3	8	3	
Fish	8	3			3
<b>Total:</b>	<u>46</u>	<u>24</u>	<u>14</u>	<u>18</u>	<u>6</u>

\* 3 sites in Tahoe Keys Marina.

Tsuda, T., H. Nakanishi, T. Morita, and J. Takebayashi. 1986.  
Simultaneous gas chromatographic determination of dibutyltin  
and tributyltin compounds in biological and sediment samples.  
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Matthias, C., J. Bellama, G. Olson, and F. Brinckman. 1986.  
Comprehensive butylmethtin species at ultratrace levels using  
simultaneous hydridization/extraction with gas  
chromatography-flame photometric detection. Environ. Sci.  
Technol. 20:609-615.