CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

35118

Project Title

The Potential Impact of Hyperion Treatment Plant's Chlorinated Effluent and West Basin Brine on Marine Organisms

Abstract

Objectives/Goals

In the fall of 2015, Hyperion Treatment Plant (HTP) will divert its effluent from the 5-Mile Outfall to the 1-Mile Outfall, leading to an increase in bacterial levels at local beaches. In order to control the bacterial levels on local beaches, HTP will be discharging its effluent dosed with 3 ppm chlorine. In addition to this, West Basin Municipal Water District will be discharging excess brine leftover from its water reclamation processes at the plant.

This study tests whether the increase in concentration of HTP effluent, chlorine, and West Basin brine in various combinations will have an adverse effect on the marine organisms in the area near the terminus of the 1-Mile Outfall.

Methods/Materials

Two different tests were conducted in order to determine the potential impact that the diversion will have. Seawater collected from the from the NRG power plant in Redondo Beach, California, a 24 hour-flow-weighted composite sample of HTP effluent, and a sample of West Basin brine were used in the chronic toxicity tests. Four treatments were then prepared; effluent, effluent + chlorine, effluent + brine, and effluent + brine + chlorine. The blade-like sporophylls of the giant kelp Macrocystis pyrifera were induced to sporulate. Spores were then collected and placed into the four experimental treatments. The spores were allowed to develop and the number of nongerminated and germinated spores along with germination tube length was observed and analyzed. In the second set of experiments, red abalone were spawned and the resulting fertilized eggs were allowed to develop in each of the four treatments. The number of normal and abnormally developed eggs was then observed and recorded.

Results

I hypothesized that the HTP effluent alone and in various combinations with chlorine, and West Basin brine will have a significant adverse effect on the giant kelp#s percent germination and germ tube length and the larval development of the red abalone. The results indicated that kelp spores showed no observable effect when exposed to any of the four treatments. However, the red abalone showed a significant effect when developed in the 7.14% HTP effluent concentration, chlorine, and West Basin brine with the HTP effluent concentration having the greatest single effect.

Summary Statement

The potential impact that Hyperion Treatment Plant's diversion from the 5-Mile Outfall to the 1-Mile Outfall in the fall of 2015 will have on the marine organisms.

Help Received

Dr. Masahiro Dojiri, PhD, Hyperion EMD, was my mentor for this project and allowed me to use the lab at Hyperion Treatment Plant.

Preliminary