## PHYTOPLANKTON COMMUNITY'S RESPONSE TO OPEN OCEAN FISH FARMING IN TROPICAL WARM WATER

## A THESIS SUBMITTED TO THE GLOBAL ENVIRONMENTAL SCIENCE UNDERGRADUATE DIVISION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

**BACHELOR OF SCIENCE** 

IN

**GLOBAL ENVIRONMENTAL SCIENCE** 

**MAY 2004** 

By

**Romain Mauriac** 

**Thesis Advisor** 

**Robert R. Bidigare** 

## ABSTRACT

In 1998, the University of Hawai'i and the Oceanic Institute started the first offshore aquaculture experiment for the grow-out of Pacific Threadfin. One of the goals of the project was to assess the environmental viability of the cage. To do so, samples were taken once a month for water chemistry, and for analysis of the algal community in and around the cage. Virtually no nutrient increase was observed in the water column downstream from the cage. Two explanations for the lack of observed nutrient increase include immediate uptake by phytoplankton and/or rapid dilution by mixing in the surrounding water column. These alternative hypotheses are assessable through examination of the algal community. In this experiment, the responses of the algal community to the addition of nutrients from fish excretion and fish feed, and to the grazing pressure from heterotrophic microorganisms, were examined. Four samples were taken per day between September 26 and October 27, 2003, two in clear polycarbonate bottles and two in dark bottles. In addition, triplicates were taken to support statistical analysis. Sampling was performed upstream from the cage (one clear and one dark bottle) and downstream. Clear bottles were incubated 24 to 48 hours at the cage while brown bottles were brought back to the lab to be filtered immediately and conserved in liquid nitrogen. All samples were filtered using 47 mm GF/F filters and pigment composition was investigated using high performance liquid chromatography (HPLC). Pigment analysis allowed an accurate representation of the phytoplankton community. Comparison of samples taken upstream and downstream allowed estimation of nutrient uptake from the cage by algae. Clear bottles were used to estimate the response from the

phytoplankton community after 24 or 48 hours, regardless of mixing effects and currents. Monthly samples examined the long term impact of the fish cage whereas daily samples allowed investigation of the transitory effect due to daily feeding and fish excretion.