

THE EFFECTS OF PHYSICAL STRUCTURE AND PROCESSES
ON THIN ZOOPLANKTON LAYERS
IN MAMALA BAY, HAWAI'I

A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAI'I IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

IN

OCEANOGRAPHY

DECEMBER 2008

By
Jeffrey C. Sevadjian

Thesis Committee:

Margaret McManus, Chairperson
Eric Firing
Zackary Johnson

Abstract

Vertically thin layers of zooplankton were found to be common and recurring features on the south shore of the island of Oahu, Hawai'i. The formation, maintenance, and vertical displacement of these thin layers are, in part, a function of regional physical oceanographic processes. The purpose of this study was to quantify general thin zooplankton layer characteristics and the underlying physical environment in which they occurred. We utilized a two-month time series of acoustic backscatter measurements from a calibrated acoustic Doppler current profiler to identify thin scattering features, took biological samples, and collected vertical profiles of physical, optical, and biological characteristics of the water column. In general, thin zooplankton layers were associated with increased water column stability. Stratification at the study site was generally low relative to that of previous thin layer study sites. Diurnal surface heating accounted for much of the observed stratification, and the breakdown of stability during civil twilight corresponded with a decrease in thin zooplankton layer formation. Biological and optical measurements taken during two focused shipboard profiling experiments during the study suggested a mechanism for zooplankton layer formation in which zooplankton converged to graze on thin phytoplankton layers.