MASTER'S THESIS

GENETIC DIVERSITY AND GENETIC STRUCTURE WITHIN AND AMONG TRANSPLANTED AND UNTRANSPLANTED EELGRASS (*ZOSTERA MARINA* L.) BEDS

CHRISTOPHER ADAM DAVIS

SAN DIEGO STATE UNIVERSITY

1994

ACKNOWLEDGMENTS

I would like to thank my parents for their support, Darren Sandquist for encouraging me to return to the study of biology and Tim Lu and Pat Ewanchuk for friendship and assistance in both field and lab. I also would like to acknowledge the members of my committee, Dr. Art Getis, Dr. Kaius Helenurm and Dr. Susan Williams, for academic assistance and thesis review, as well as Dr. Terrie Klinger, who screened the gel and enzyme systems used in this study. The assistance of Dr. Silvia Ibarra, Dr. Robert Hoffman and Keith Merkel in locating sites and providing historical information also was greatly appreciated. Finally, I would like to thank Scott Schaffer, Nathan Eckrich, Dr. Jorge Terrados and Bruce Nyden for help in the field and Jeanne Putinier, Russ DiFiori and Harry Spanglet for assistance with methods and data interpretation. This research was funded by a grant from the National Sea Grant College Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, to Dr. Susan Williams under grant number NA89AA-D-SG138, project number R/CZ-108 through the California Sea Grant College, and in part by the California State Reources Agency. The views expressed herein are those of the author and do not necessarily reflect the views of NOAA or any of its sub-agencies. The U.S. Government is authorized to reproduce and distribute for governmental purposes.

ABSTRACT

Isozyme data from eight presumptive loci were used to investigate genetic diversity and genetic structure within and among transplanted and untransplanted eelgrass (*Zostera marina* L.) beds. Statistical comparisons between six transplanted beds and six untransplanted beds indicated that transplanted beds contain reduced genetic diversity relative to untransplanted beds. Possible explanations for these results include founder effects related to the protocols used to create transplanted beds, random genetic drift following the establishment of transplanted populations and reduced genetic diversity in the donor populations from which transplant material is collected. Among the twelve sites sampled in this study, younger, smaller sites, which typically were transplanted, exhibited less genetic diversity than older, larger beds, which typically were untransplanted. Analysis of the genetic structure of populations indicated that genetic differentiation among sites increased with increasing geographic scale. Moderate genetic differentiation was found among sites at scales of 80 and 380 kilometers, while little genetic differentiation was found within beds at a scale of ten hectares. There was little evidence of genetic or clonal structure on a scale from zero to about fifty meters. Although other factors such as selection may explain the observed distributions of genetic diversity, genetic drift and limited gene flow among sites, particularly at larger scales, likely accounts for the

observed patterns of genetic structure. Methods for increasing genetic diversity in transplanted populations are discussed and it is recommended that eelgrass beds with high genetic diversity, such as those in South San Diego Bay, be preserved.