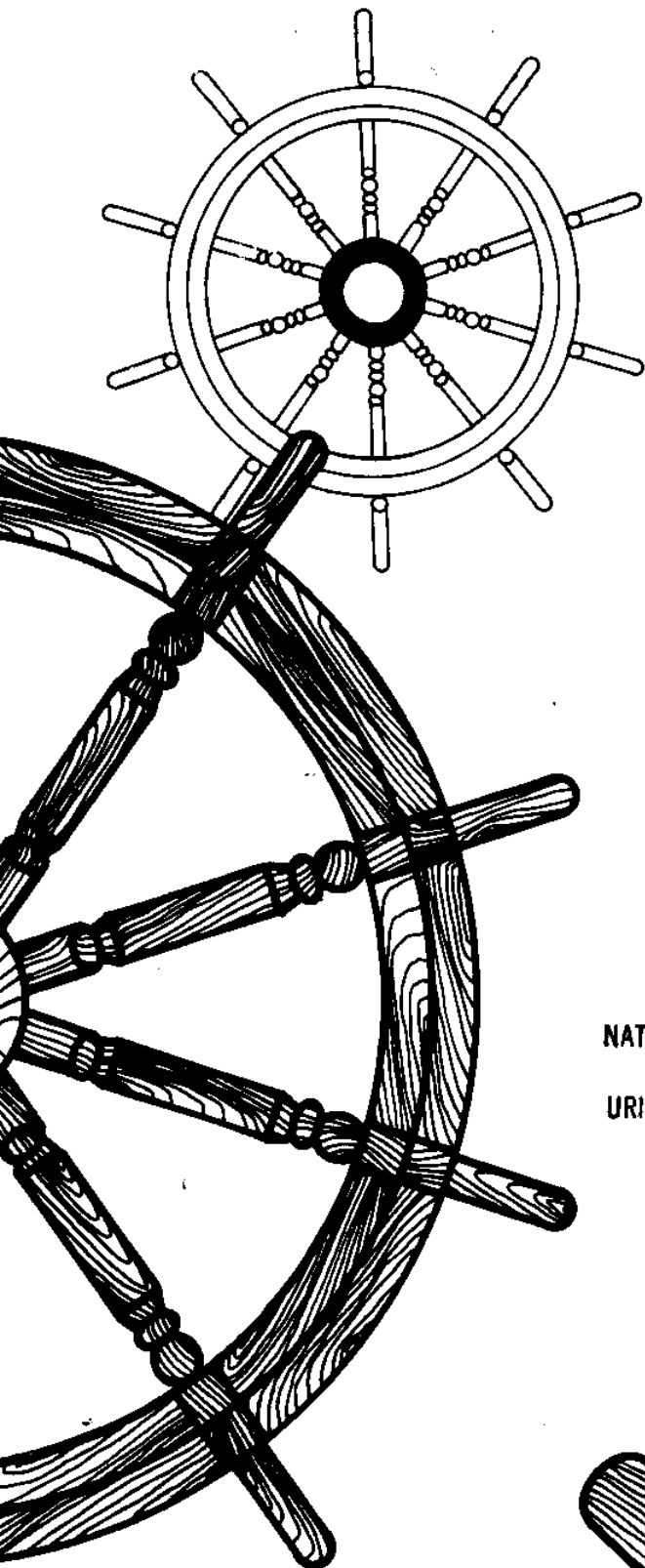


LOAN COPY ONLY

MS-4-10-82 c. 2

CIRCULATING COPY
Sea Grant Depository

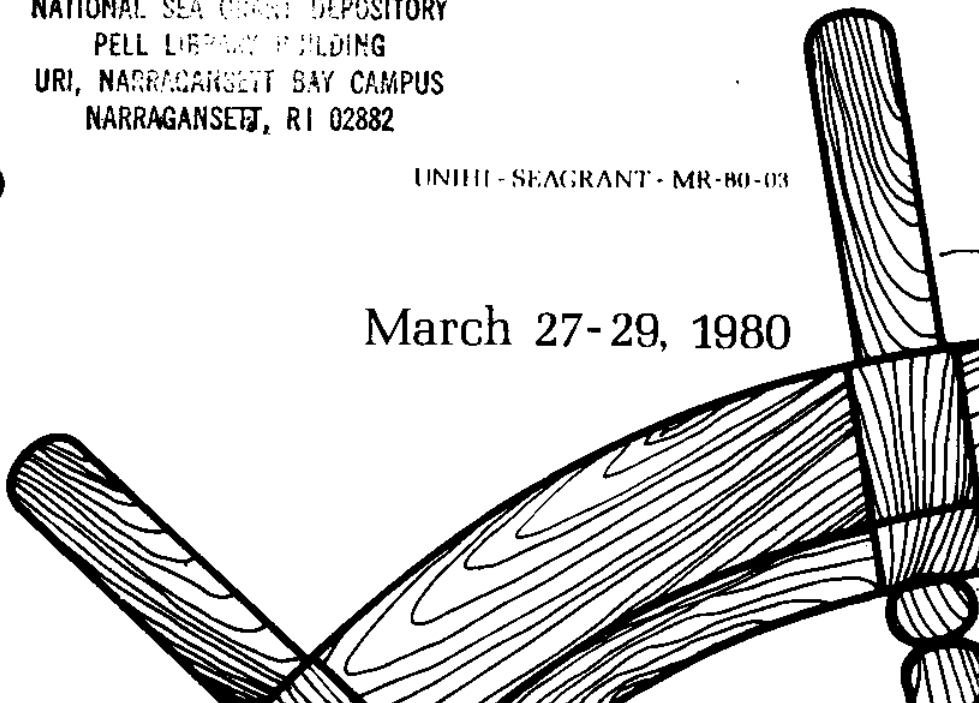


Proceedings of the
Fifth Annual
**Student
Symposium on
Marine Affairs**

NATIONAL SEA GRANT DEPOSITORY
PELL LIBRARY BUILDING
URI, NARRAGANSETT BAY CAMPUS
NARRAGANSETT, RI 02882

UNIII - SEAGRANT - MR-80-03

March 27-29, 1980



PROCEEDINGS OF THE
FIFTH ANNUAL STUDENT SYMPOSIUM
ON MARINE AFFAIRS

Sea Grant Miscellaneous Report
UNIHI-SEAGRANT-MR-80-03

March 1980

NATIONAL SEA GRANT DEPOSITORY
PELL LIBRARY BUILDING
URI, NARRAGANSETT BAY CAMPUS
NARRAGANSETT, RI 02882



This proceedings of the Fifth Annual Student Symposium on Marine Affairs, which will be held at the University of Hawaii Hilo campus on March 27-29, 1980, is published by the University of Hawaii Sea Grant College Program in cooperation with the Office of the Marine Affairs Coordinator and the State Department of Education. The US Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notations that may appear hereon.

PREFACE

This volume of the proceedings of the Fifth Annual Student Symposium on Marine Affairs, which will be held on March 27-29, 1980, at the University of Hawaii Hilo campus, contains thirty-eight papers in ten categories: marine biology I, marine biology II, aquaculture, energy, economic potential of the ocean, manganese resources, marine mammals, heritage of the sea, engineering, and ocean law and policy.

We have not attempted to edit the papers but wish instead to give credit where credit is due, to the forty-three students whose papers were selected and their teachers.

AIEA HIGH SCHOOL

Russell Taira

Ms. Iris Shinseki

CASTLE HIGH SCHOOL

Laura Knight

Mr. Michael Gaber

HANA HIGH SCHOOL

Gizelle Matsuda
Alice Jean Motooka
Angela Park

Mrs. Sydney Getzen

HILO HIGH SCHOOL

Curtis Kawamoto

Mr. Matthew Chow

HONOKA'A HIGH SCHOOL

Paul Panilo

Mr. Roku Kanekuni

KALANI HIGH SCHOOL

Gregory Lee

Ms. Phyllis Nakasuji

KAPAA HIGH SCHOOL

Marjorie de la Pena
Torrey A. Offley

Mr. Delano Kawahara

KA'U HIGH SCHOOL

Allison Fujimori

Mr. Yoshikazu Suenobu

KONAWAENA HIGH SCHOOL

Maia Zaiger

Mr. Earl Crozier

MOANALUA HIGH SCHOOL

John Hong

Mr. Robin Otagaki

PAHOA HIGH SCHOOL

Patrick Aniban
Doris Duldulao
Leighton Ikeda
Blanche Iwashita
Leslie Kaholoaa
Annette Oishi
Ethel Sakoda
Karen Yeargain

Mr. David Raabe

PARKER SCHOOL

Ian Haight

Mr. Robin Hori

PEARL CITY HIGH SCHOOL

Belinda Gauvreau
Christine Miranda

Mrs. Alice Kaneko

ROOSEVELT HIGH SCHOOL

Craig Rowland

Ms. Allison Kwok

SACRED HEARTS ACADEMY

Heather Carvalho
Darla Hee
Iris Shimokawa
Gail Silva

Mrs. Diana Rosa

ST. JOSEPH HIGH SCHOOL

Bruce Bowen
Ramona Carreira
Sarah Feliciano
Susan Harlocker
Mark Kennett
Laura Young

Sister Charles Marie

ST. LOUIS HIGH SCHOOL

Benjamin Chun

Mr. Mark Smith

WAIAKEA HIGH SCHOOL

Cindy Aoki
Randall Bachman
Graciela Cuellar
Karen Ide
Kevin Jackson
Trevor Jackson
Colleen Shikuma

Ms. Merle Yao

Because 89 papers were submitted to the Fifth Annual Student Symposium on Marine Affairs, it was impossible to include them all for presentation at the symposium and in the proceedings. We do feel, however, that the authors of the papers that were not included deserve recognition in this volume. Therefore, their names and schools are listed below.

HILO HIGH SCHOOL	Robbie Nakatsu
HONOKA'A HIGH SCHOOL	Al T. Yano
KAPAA HIGH SCHOOL	Michael A. Fernandez Maile M. Sakahara
KAILUA HIGH SCHOOL	Toni Turk
KA'U HIGH SCHOOL	Dewani K. Lauro
KUBASAKI HIGH SCHOOL (OKINAWA)	Steve Goodwin
MAUI HIGH SCHOOL	Deborah Hirose Vernon Tamura Hew Zane
McKINLEY HIGH SCHOOL	Jo Anne Shimomaye Barbara J. Thompson Kuan S. Yuen
MOANALUA HIGH SCHOOL	Kenneth J. Wader
MOLOKAI HIGH SCHOOL	Jean B. Fackelman
PAHOA HIGH SCHOOL	Darrin P. Amador Catherine C. Basilio Donna L. Bulosan Justina L. Enriquez Toni M. Ferreira Lynn R. Hayashi Randall E. Hayes Alison A.M. Julian Debbie L. Kubera Lois Okamura Chris Rafael Joselito D. Raras Thomas D. Richards David Rickard Darnel J. Savella Kevin Snider Lois Solywoda
PARKER SCHOOL	Lisa Hiromasa Rachel Kaima
SACRED HEARTS ACADEMY	Louise P. Amasol Felicia Ann E. Aquino Jenny S. Ishihara Brenda Lau
ST. JOSEPH HIGH SCHOOL	Jarrett K. Aiona Richard Akiona Jo Anne Balberde

ST. JOSEPH HIGH SCHOOL

Michael Branco
Debbie A. Coloma
Michael Costales
Renee De Lima
Greg Eaves
Timothy Sheets
Anita Tatum
Michael M. Veincent

WAIAKEA HIGH SCHOOL

Michelle Araki
Marian L. Evans
James Guerrero
Diana M. Hu
Daren K. Kodani
Lori Jean Nii
Iris H. Osaki
Jan N. Sakuma
Dee Slaughter

We gratefully acknowledge the support and cooperation of the Office of the Marine Affairs Coordinator and the State Department of Education.

Rose Pfund, Coordinator
Student Symposium on Marine Affairs

TABLE OF CONTENTS

Page

<u>1</u>	<u>MARINE BIOLOGY I</u>	
3	Opihi	Leighton Ikeda Patrick Aniban
9	Jellyfishes	Blanche Iwashita Karen Yeargain Leslie Kaholoaa
17	The Explanations of Crustacea	
24	A Comparative Study of the Uniqueness of Male and Female Hormones in the Sandcrab <i>Ocypode laevis</i> (Dana)	Russell Taira
<u>37</u>	<u>MARINE BIOLOGY II</u>	
39	Marine Science: Its Present and Future Status	Graciela Cuellar Ramona Carreira
43	Reef Building Corals	
49	Reef Building Corals (Barrier): Construction and Destruction	Colleen Shikuma
58	Dangerous Marine Organisms of Hawaii	Darla Hee
<u>69</u>	<u>AQUACULTURE</u>	
71	Aquaculture	Mark Kennett
75	Aquaculture: A Possible Industry for Hawaii	Gregory Lee
88	Prawn Farming: A New Industry for Hawaii	Curtis Kawamoto
92	The Diseases of Aquaculture	Bruce Bowen
<u>97</u>	<u>ENERGY</u>	
99	Offshore Petroleum Industry	Sarah Feliciano
106	Ocean Thermal Energy Conversion: An Update	Annette Oishi
112	A Wave-Powered Generator for Hawaii	Maia Zaiger
121	The Conversion of Ocean Water Into Hydrogen Through the Use of Wind Power	Benjamin Chun
<u>131</u>	<u>ECONOMIC POTENTIAL OF THE SEA</u>	
133	Fisheries	Susan Harlocker
140	Seaweed: Is There a Future for It	Trevor Jackson
145	Aquaculture in Hawaii: A Potential Success	Karen Ide
150	The Economics of Precious Coral	Marjorie de la Pena Torrey Offley
<u>161</u>	<u>MANGANESE RESOURCES</u>	
163	The Occurrence and Distribution of Ferromanganese Nodules	Ethel Sakoda
166	Manganese Nodules and Their Potential in Hawaii	Randall Bachman
172	Mining the Ocean Floor	Cindy Aoki
175	Possible Methods and Problems of Manganese Nodule Mining	Kevin Jackson

<u>183</u>	<u>MARINE MAMMALS</u>	
185	Communication of Aquatic Mammals in the Animal World	Allison Fujimori
197	Seaman's Best Friend	Heather Carvalho Gail Silva
206	Hawaii's Marine Mammal--The Humpback	Doris Duldulao
215	Reproduction of Humpback Whales	Angela Park
<u>221</u>	<u>HERITAGE OF THE SEA</u>	
223	The History of Whaling	Craig Rowland
229	Ancient Fishing Methods	Alice Jean Motooka
238	Hana Fisherman's Club	Gizelle Matsuda
<u>245</u>	<u>ENGINEERING</u>	
247	Artificial Reefs	Ian Haight
253	Ocean Lab Underwater Habitat	Paul Panilo
263	Hawaii's Future City	Christine Miranda Belinda Gauvreau
271	A Systems Approach to DO ₂ Boosting Venturi Utilization	John Hong
<u>277</u>	<u>OCEAN LAW AND POLICY</u>	
279	The Sea's the Limit	Iris Shimokawa
287	Law of the Sea	Laura Young
295	Hawaii's Coastal Zone Management	Laura Knight