PUNALUU

SEA GRANT

F84-238-C-582-B-323

GEORGE H. BALAZS

2 of 3

F84-238-F-582-B-323

Kimber Lee Alspach
P.O. Box 11333
Hilo, HI 96721
(808) 964-5826
Born on August 28, 1964 in Yuma, AZ
Graduated from Yuma High School in May, 1982.

Post High School Academic Background

1987 - present	University of Hawai'i, Hilo Currently a senior majoring in Biology
1982-85	Arizona State Universty, Tempe, AZ Emphasis in Zoology
1981-82, and 1978	Arizona Western College, Yuma, AZ

Coursework and Grades Relevant to Proposed Project

Completed
PE 103 Small Crafts and Water Skiing (A)
BIO 101, 102 Biological Principles and Processes (A,B)
PED 205 Intermediate Swimming (A)
ZOL 280 Introduction to Animal Behavior (A)
BIO 320 Fundamentals of Ecology (C)
PED 305 Advanced Swimming (B)
PED 105 P.E. Activity: SCUBA (A)
BIOL 275 Fundamentals of Microbiology (B)

In Progress
GEOL 201 Oceanology
BIOL 309 Biogeography

Experience Relevant to Proposed Project

October, 1987	Participated in turtle tagging expedition at Kiholo Bay, Kona, Hawai'i.
March-December, 1986	Volunteer research assistant for the Wes Coast Whale Research Foundation, Kona,
June-December, 1984	Volunteer research assistant at Arizona State University, Tempe, Arizona for Marylou Cheal, PhD.

May 1983	Participant in annual survey of the endangered Yuma Clapper Rail on the Colorado River jointly sponsored by the Arizona Game and Fish Department, California Department of Fish and Game, United States Bureau of Land Management, and the United States Bureau of Reclamation.
July 1983	Research assistant for talapia tagging study by Arizona State University with the United States Bureau of Reclamation, Yuma, AZ.
August 1983	Research assistant for trout pen project sponsored jointly by the California Department of Fish and Game and the United States Bureau of Reclamation.

Skills, Hobbies, and Memberships Relevant to Proposed Project

1984 Basic SCUBA certification, NASDS, Tempe, Arizona.
1980-84 Cardiopulmonary Resusitation certification.
1980-84 First Aid certification.
Member: Hawai'i Audobon Society

Changing Tides

UH-Hilo Marine Option Program Newsletter

February 19, 1988 Vol. 5, No. 1

Welcome to MOP...

Thomas Ault
Ben Callin
Eric Richard
Andy Alspach
Darlene Gibbons
James Schwarger
Jason Armstrong
Samuel Guevara
Scott Spleen

We'd like to welcome all of those who signed up at registration, so drop your completed applications by our office.

We're Just About Ready to Sail!

The MOP sailing vessel (Venture Cat catamaran) is just about ready for the first sailing day this semester at Hilo Bay on February 27th. "Now that the pukas are patched and the final layer of glass is on, we can sand her down and start painting", said Jon Hodge, Assistant Student Coordinator, "at this point we could use some volunteers". Please contact Jon or Liz at MOP for the boat-work schedule. For those people who are interested in sailing on Hilo Bay, they will need to sign up at the Marine Option Program office located Mauka of the Life Sciences quadrangle by 4:30, Friday, February 26, 1987.

Two Hilo MOP Students Bound for Honolulu Symposium

The MOP Symposium March 12 and 13th on Coconut Island will have two visiting student speakers from the UHH-HILO MOP as guests along with a select group of students from other campuses in Hawaii. The students -- *Jon Hodge* and *Loretta Mazarakis* -- will present the findings of their latest MOP skill projects. *Jon Hodge* will show his underwater fish identification video featuring common damselfish species of Hawaii and *Loretta Mazarakis* will present the results of her project on the Hilo Bay Creel Survey.

Underwater Ecological Surveying Workshop Sponsored By MOP

Are you curious about research? Why not "get your feet wet" with the Marine Option Program and participate in a workshop designed to enable, facilitate and enhance your marine research capabilities? MOP will hold an underwater ecological surveying workshop this summer, May 21 -- June 1, 1988 at the "Hawaii Institute of Marine Biology", Coconut Island (Oahu).

The program includes: Fish Surveys
Invertebrate and Limu Surveys
Geomorphology
Night Surveys
Photo-quadrats

Expected cost will be $100.00 per student (tentative). Anyone planning on participating in the workshop must go to Oahu March 25 through March 27 for UH-Dive Certification physicals and dive tests with *Ed Hayashi* the UH dive safety officer. Also during this phase of the training *Geoff Saint* will be conducting **Dive Team Leader** and **Safety Diver** workshops for those students who are interested.

Other Qualifications: Must be a certified diver or experienced snorkler. Must attend upcoming MOP fish, coral, and limu I.D. courses. Must attend CPR and First Aid courses.

Fish ID	February 26	Dr. Leon Hallacher
Coral ID	March 4	Liz Ambrose
Limu ID	March 11	Dr. Don Hemmes

All classes will be held from 4-6 pm in Life Science Room 22.

This will be a unique experience designed to prepare you for "research in the field". You will also meet new and interesting people who share similar interest concerning the ocean and marine life. Contact MOP soon for details. This is a limited opportunity.

We can tell you from experience that this workshop should not be passed up! For inquiries contact *Liz, Jon* or *Dennis* at MOP 961-9544.

T-Shirt Contest

We are looking for artists to design a new T-shirt for the Marine Option Program. The T-shirt must have an ocean theme. The person who designs the winning T-shirt will get a free shirt with their design on it. The deadline for all drawings is March 31st.

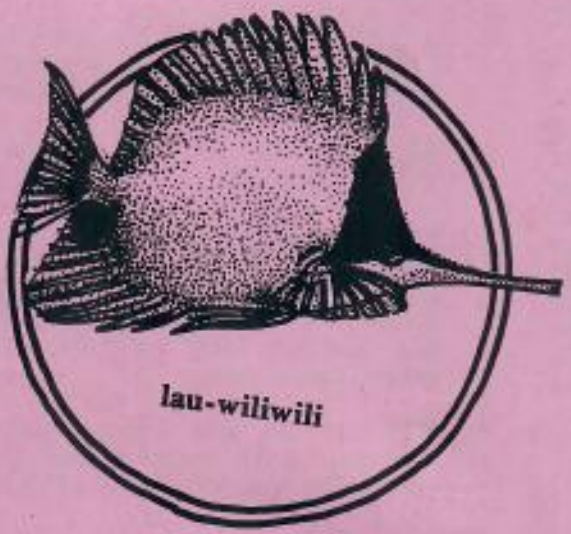
Calling All Media Junkies

Have you ever wanted to be a reporter or own your own newspaper? Well the opportunity of a lifetime has just arrived. The Marine Option Program is looking for a newspaper person. We need someone to update and edit our current newsletter.

There is plenty of room for new and creative ideas. So come by and gain a little experience while earning a stipend as the senior newsletter editor.

Welcome Aquanauts

We would like to welcome the new dive club and all its members to the campus. They have held at least two outings already and have many more scheduled. Several students had their first introductory dives last week and the week before. They plan to have snorkling lessons in the future and encourage those who may be interested in snorkleing or diving to sign up at the meetings which are usually held on Wednesdays at the Campus Center. Applications may also be obtained at the MOP office.



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Wanted: Live Fish

The Marine Option Program (MOP) has several positions open for display fish in our school aquarium which is scheduled to be completed this month. Minimum Qualifications: must be a saltwater tropical fish. Experience not required, we will train the right candidates. Excellent Benefits: free room and board and a complete health plan.

Anyone knowing a fish possessing these qualification please contact the Marine Option Program. Or anyone who would like to be involved with collecting fish for the aquarium please drop by the MOP office and talk to the staff or contact *Dennis Epperly, Jill Lippert* or *Joe Wethechold*.

Turtle Research Slated for Spring Break

The MOP annual turtle tagging project with research biologist *George Balazs* is on schedule with *Kimber Alspach* coordinating for UHH. There are still openings for the 3 day/2 night project at Punaluu Bay, March 21st -- 23rd. If you are interested in participating, please contact *Kimber* at 964-5826 or *Shelly* at the MOP office. Meals will be provided. All you need to bring is a sleeping bag and a warm jacket for the watch which is usually a few hours per group from dusk to dawn, plus your snorkeling gear. This ongoing study is conducted to learn more about the growth patterns and migratory habits of the Hawaiian Green Sea Turtle, Chelonia Mydas. The turtles love to feed on the algae in the bay which is enhanced by fresh water purcolating through the porous substrate in the littoral and sub-littoral zones. This freshwater lens can make the water a little chilly, therefore, a wetsuit is recommended.

Other News

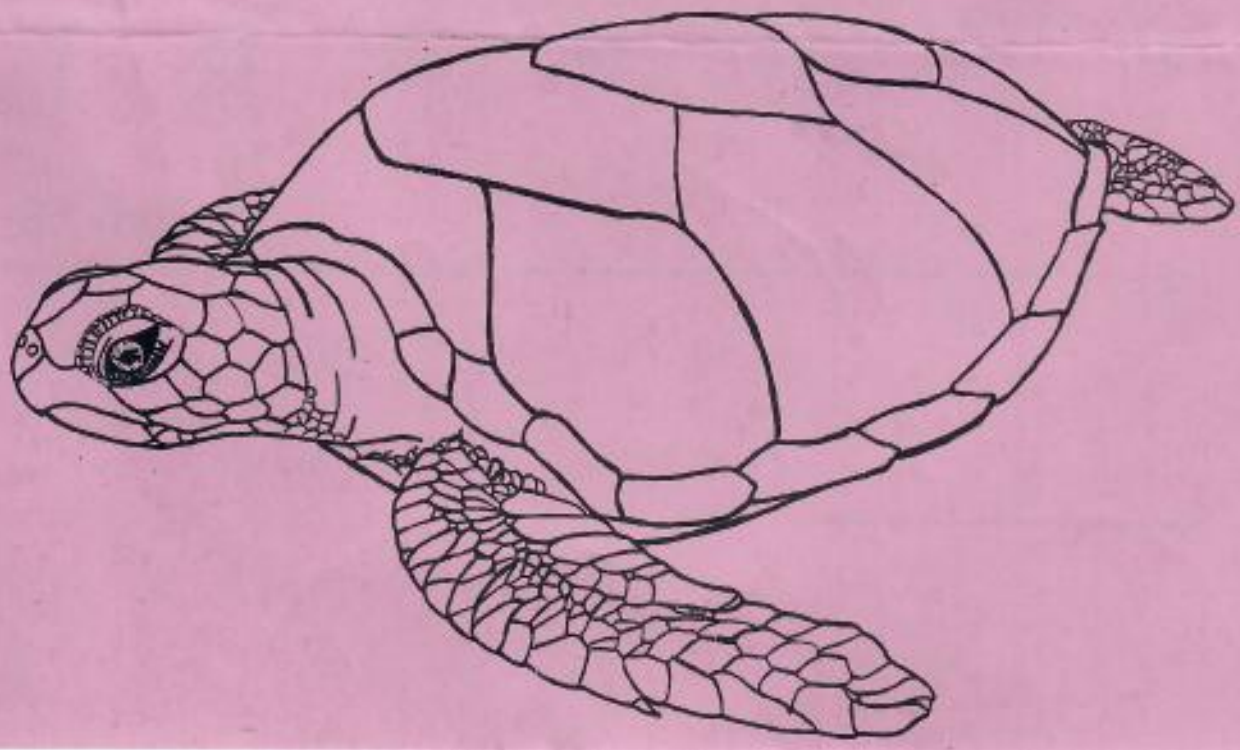
A new saltwater aquarium which is scheduled to be located in the Library is currently being built. A professional cabinetmaker is designing a suitable aquarium stand which should be completed sometime this semester. *Dennis Epperly*, the new assistant student coordinator with MOP is overseeing the project.

The University's converted fishing vessel *Patti Jo* is once again sea-worthy after many hours of hard labor carried out mostly by Professors *Walter Dudley, Leon Hallacher, Craig Severance, Tom Hammond and Bill Ebersole*. She's been refitted with 2 -- 25H outboard engines and various oceanographic equipment. Also we want to thank the student volunteers who put in their time and energy doing the misc. chores. The *Patti Jo* is being used for the labratory portion of Advanced Oceanography 301 which is taught by *Dr. Dudley*, *Dr. Hallacher* and *Mr. Hammond*.

We want to extend our best wishes to *Shelly Ebersole* who has recently given up her position as MOP student coordinator. She has decided to concentrate on her academic studies more thoroughly this semester so that she can finish up and move on in a teaching career. *Shelly* was a major driving force in the MOP for the last 2 semesters and her enthusiasm and organizational skills will be missed although in her own words "this doesn't mean I'm going to disappear from MOP completely this semester" ... and we hope you don't.

We welcome former assistant student coordinator, Liz Ambrose, into her new position as UHH MOP Student Coordinator. Let's give her our support in this important and demanding position.

uhu-uliuli



February 1988 MOP

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26 FISH ID 4-6pm	27 SAIL WITH US
28	29					

Mr.George Balaz
2570 Dole St.
Honolulu, HI 96822-2

Listen carefully and you will hear..

Seawords

News of the Marine Option Program University of Hawaii at Manoa
Seawords May 20, 1988 Vol. III No. 6

Turtle Tagging on the Big Island

By Dan Bauer

Tagging sea turtles drew about 25 MOP students from Hilo, Manoa and Maui programs to the black sand beach park of Punaluu on the Big Island for three days during spring break, March 21 through 23. The project was coordinated by UH-Hilo MOP and conducted by researcher Robert Forsyth of the National Marine Fisheries Service (NMFS).

MOP students helped Forsyth capture, study, tag and release Hawaiian green sea turtles (Chelonia mydas), a threatened species that frequents the southeast coastline of the Big Island, a region known as Ka'u.

The cove at Punaluu has been the site for several turtle tagging expeditions in the past, by Hilo MOP and others, under the direction of George Balazs of NMFS. The sea turtles may be attracted to the area by a species of red limu (Pterocladia capillacea) that grows there. By studying the green sea turtles, NMFS scientists hope to learn more about their growth patterns, and feeding and migratory habits.

Being classified as a threatened species means that the Hawaiian green sea turtle is likely to become an endangered species in the near future, according to the federal Endangered Species Act. An endangered species is one that is in immediate danger of extinction.

Turtle tagging Manoa MOP students take time out to visit the UH Hilo MOP campus. L to R: Dan Bauer, Tina Xavier, Lara Asato, Mary Roney, and Raymond Boland.

UH-Hilo MOP Coordinator and project supervisor, Walt Dudley explained the two-fold purpose of the project: NMFS receives data from the turtles, and MOP students learn about the sea turtles by participating in the methods that scientists use to study these reptiles.

Everyone camped out around the main pavillion of the county beach park for the duration of the project, which began Monday afternoon with the setting of the 60-feet long by 10-feet deep tangle nets used to snare the feeding sea turtles.

See page 3

Editor Says Goodbye

This is it. I'm out of here. Not only am I finally graduating (after five years) with my B.A. in journalism, I'm passing on the editorship of Seawords to my able assistant, Lani Teshima.

Working for MOP for the past two and a half years has been a great experience. I've met some of my best and closest friends through MOP, and had some of my best college experiences at MOP activities.

Some of my favorite stories I've written for Seawords include; Hawaii Transect Workshop (HTW) '86, the Lanai Survey, the oil spill on Windward Oahu, and the April Fools' issues. My best interview was on limnology with MOP alumni John Ford, who now works for the U.S. Fish and Wildlife Service.

This summer, I will be interning at the Pacific Business News, and then I will be trekking in Nepal in October.

I would like to thank several people for their help and guidance.

First, Sherwood for his endless resource of information. I hope some of his attention to detail has rubbed off on me.

Administrative officers Marianne Lam, Gail Browne-McDonald, Henrietta Yee and Ann Dorado were all very patient with me, and helpful with Seawords.

Manoa Student Coordinators Greg LeLesch, Liz Kaul and Lorena "Tap" Wada made my job easier by keeping me to date on MOP events and people, and by being good friends.

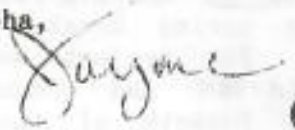
Manoa Coordinators Annie Orcutt and Phyllis Ha Tamaru were both full of energy and insight to marine events in Hawaii, and encouragement for Seawords.

Thanks also to the MOP office help for putting up with me. I didn't always deserve it -- Melinda Gaza, Susan Shimabukuro, Karen Izumi, Iris Miyamura, and Judy Domingo.

Last but not least, thanks to my assistant editor, Lani Teshima, whom I couldn't have done this job without.

I'll be in contact with MOP in the years to come, and look forward to keeping the friendship that started with MOP.

Aloha,



Now that Lani Teshima is the new Managing Editor at Seawords, her previously held position of Assistant Editor is open.

The duties of the Assistant Editor include: covering MOP events, interviewing people involved with MOP, maintaining regular Seawords columns, writing up stories and headlines, pasting up copy, and taking photos of MOP events.

Qualifications include: interest or experience in newsletter production, layout and graphics, and knowledge of Multi-Mate and DBase programs on the computer.

Desirable skills include: Ability to write well, familiarity with basic journalism styles, and knowledge of darkroom photography work. Also, work/study students are preferred.

If you are interested in the position or would like more information, contact Lani at 948-6000, or Sherwood at 948-8433.

With Liz Kaul leaving to go back to school in Arizona, Manoa MOP will be looking for a new Student Coordinator.

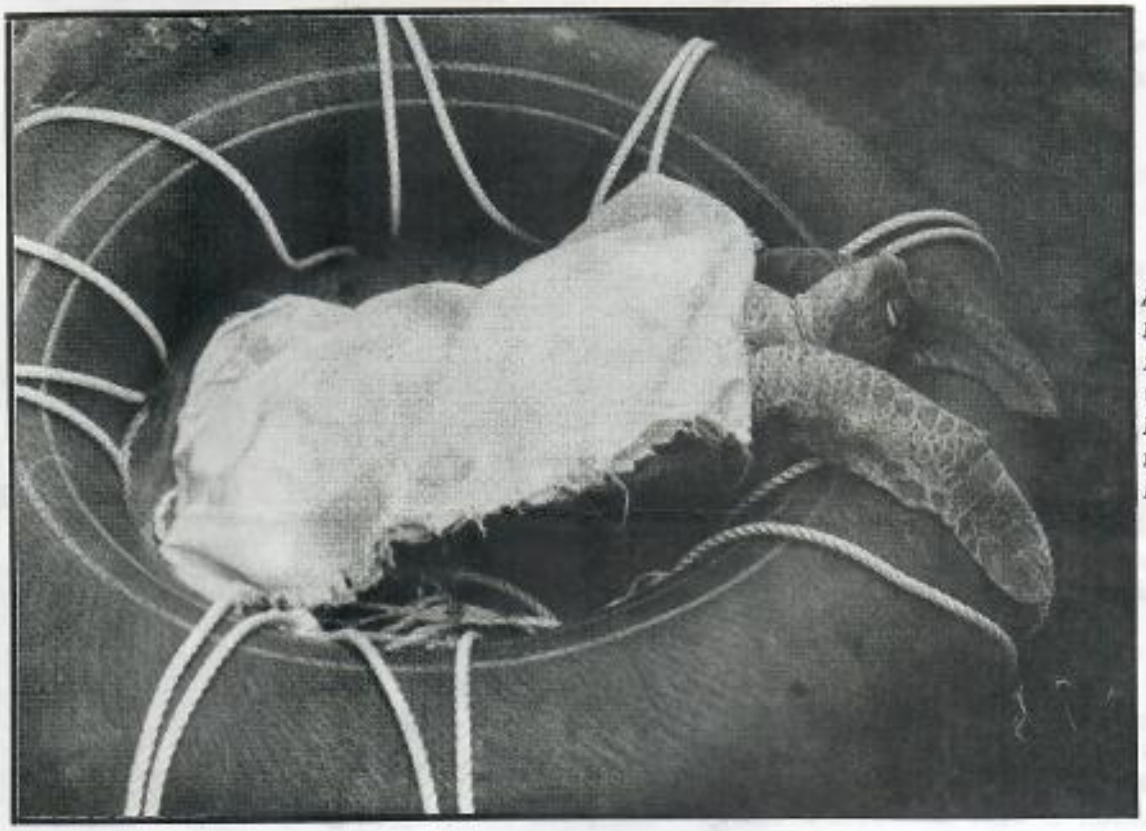
The duties of a MOP Student Coordinator include: assisting Manoa MOP and the MOP Director in conducting MOP activities such as student advising, report writing, maintaining student records, recruiting, workshop presentations, field trips and publicity.

To qualify, you must have extensive experience with MOP as a student, with familiarity of the program as well as marine offerings on campus. You will also need a scuba certification, and have outside experience with other marine programs.

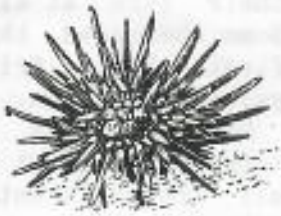
If you would like to be the new Manoa MOP Student Coordinator, contact Sherwood at 948-8433.

Turtle Tagging

From page 1



A turtle caught in Punaluu in the evening rests on an inflated tire tube, and waits to be measured in the morning. -Photo by Raymond Boland.



Wetsuits were worn by practically all the snorkelers. Cool groundwater that seeps in abundance into the cove through the porous lava rock made the water temperature feel to some snorkelers more like that of an alpine lake than a tropical ocean.

It didn't take long to catch the first turtle: one snared itself in the net while the snorkelers were still trying to get it set. The turtle was hauled out and set on its back inside an inner tube to rest out the night. Being placed on its back overnight immobilizes the turtle, while doing it no harm, Forsyth explained. That is the way that all caught turtles are stored overnight; then in the morning all measurements and samples are taken together.

That evening, four-person teams working two-hour watches monitored the net's floats for any sign of snared turtles. Netted turtles could easily become exhausted and drown if not promptly removed from the net. During normal activity, turtles need to come up for air every few minutes.

The net yielded no more turtles that evening, and at 1 a.m. a few hardy MOPers ventured into the water with snorkels and dive lights to pin up the net to the floats, so that the net could remain set in the water. However, no more turtles would get caught while the crew slept.

The following morning students helped as Forsyth took several measurements of the turtle, tagged its two front flippers, and turned it back on its stomach. The newly released turtle wasted no time in finding its waay downhill and back into the water, where it proceeded to make itself scarce.

Tuesday afternoon, a local throw-net fisherman gave the tagging crew a small green sea turtle that he had cuaght in his net. No more turtles were netted that evening, even though it was decided to pull an all-night watch (to the surprise of a few unlucky souls who had gone to bed unaware that they were due for late-night wakeup call).

Wednesday morning, Hilo MOPer William Dana decided that the team hadn't tagged enough turtles, so he snorkeled out into the frigid cove and caught one with his bare hands. That gave Forsyth and the students two small turtles to measure and tag that morning.

See page 4

Turtle Tagging

From page 3

Stomach samples were also taken of the two turtles. After some difficulty in getting the turtles to open their mouths, a rubber hose was inserted down their throats. Water was then flushed through the hose. As it washed back out their mouth, small pieces of limu came out with it. The sample was collected in a jar for later laboratory analysis. The newly tagged turtles were each then returned to the beach, where they swiftly splashed off, undoubtedly glad that their terrestrial ordeal was over.

Everyone stayed more than well-fed during the expedition, thanks to Kimber Alspach from Hilo MOP, who organized the whole project. Each of the students had their turn at kitchen duty for one meal. Some bemoaned the fact that this was the first camping trip that they had actually gained weight on.

Many students expressed that the most interesting part of the trip was meeting all the different MOPers from the various islands, who presented a wide assortment of personalities. Some enjoyed a trip to a large heiau located across the cove from the pavillion. Several felt they benefitted most from the hands-on participation in capturing, studying and releasing the sea turtles.

Following the return to Hilo, some visiting Manoa and Maui students stayed on to witness the creation of Big Island real estate when they ventured down the coast to Kalapana, where heavy ocean breakers were assaulting an active Kilauea lava flow.

Lara Asato, Tina Xavier, and Robert Forsyth (NMFS) after they have placed the turtle on its back in the inner tube. -Photo by Raymond Boland.

NMFS researcher and sea turtle specialist George Balazs normally heads such turtle tagging projects, but unfortunatley, circumstances prevented his attendance this year.

About 18 Hilo students participated in this year's turtle tagging project. Manoa MOP students in attendance were: Lara Asato, Dan Bauer, Ray Boland, Mary Roney, and Tina Xavier. The two MCC MOP students participating were: Robert Lohle and Heidi Tobias-Glover. The Manoa students recently held a MOP-in slide show about the expedition.

Left: MOP students detangle and lay out the net to be used to snare turtles. -Photo by Raymond Boland.

1988 MOP Certificates

The following is the list of graduating students who will be receiving their MOP certificates:

UH Manoa

Wayne Jones -- Underwater Baseline Surveys, and Sea Turtle Biology;

Thomas O'Connor -- The Design and Deployment of Remote Sensing Oceanographic Instrumentation and Field Acquialtion of Data;

Victoria O'Connor -- The Design and Deployment of Remote Sensing Oceanographic Instrumentation and Field Acquisition of Data;

Anthony Salvaggio -- Hawaiian Marine and Coastal Environmental Problems.

Windward Community College

LeeAnn Anderson -- Underwater Ecological/Geomorphological Studies, and Coordination of Marine Educational Program;

Linda Vaught -- Biologists' Aid, Hawaiian Monk Seal Headstart Project.

Maui Community College

Heidi Tobias-Glover -- Underwater Archaeology.

UH Hilo

Lisa Jeanne Hall -- Aquaculture, and Marine Education.

The following are receiving MOP Certificates of Appreciation:

UH Manoa

James Gonser -- Marine Journalism;

Madeleine Goodman -- Progressive Administrative Leadership for Marine Education;

Bruce Kennard -- Aquatics Education;

Bill King -- Marine Computing.

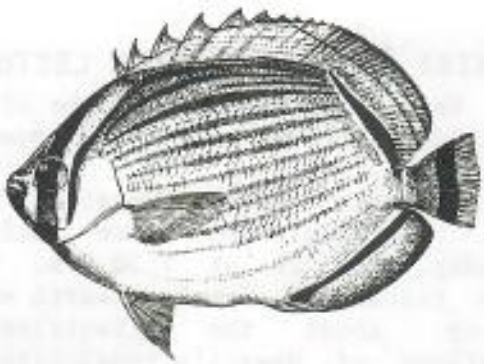
Windward Community College

John Hawkings -- Support for Marine Educational Programs.

UH Hilo

Don E. Hemmes -- Marine Education;

Craig Severance -- Seamanship and Marine Safety.



QUEST Dive Team Leaders

Congratulations to the following students, who have been selected to be dive team leaders during the 1988 MOP QUEST Workshop. They were chosen on the basis of their water skills, initiative and leadership abilities. They are:

Lead Divers

Lara Asato, Manoa
Chris Evans, Manoa
Lee Halverson, WCC
John Leary, WCC
Peter Ravetto, MCC

Safety Divers

LeeAnn Anderson, WCC
Dennis Epperly, Hilo
Dale Gilmartin, Manoa
Rodney Jacques, Manoa
George Stender, WCC.

Seawords

1000 Pope Road Room 203
Honolulu, Hawaii 96822
Ph. 948-6000

James Gonser - Managing Editor
Lani Teshima - Assistant Editor
Sherwood Maynard - Director

Supported by the UH Sea Grant College Program, the State Ocean Resources Branch, the State Aquaculture Development Program and the UH. The opinions expressed herein are not necessarily those of the Marine Option Program or the University of Hawaii.

Of Interest

WAIKIKI AQUARIUM OFFERS LECTURES

The Waikiki Aquarium will be offering two slide lectures during the months of May and June.

The first, called "Hawaii's Hidden World: Caves and Cave Life" on Wednesday, May 25 at 7:30 p.m. Bishop Museum researcher Frank Howarth will be speaking about the lifestyles and adaptations of Hawaii's troglobites, and the habitats themselves.

"In Your Wildest Dreams," is the title of the second slide presentation. UH zoologist Robert Kinzie will give an overview of the special lifestyles and adaptations of Hawaiian wildlife, and discuss the origins and value of the diversity of the island ecosystems. This lecture will be on Wednesday, June 8.

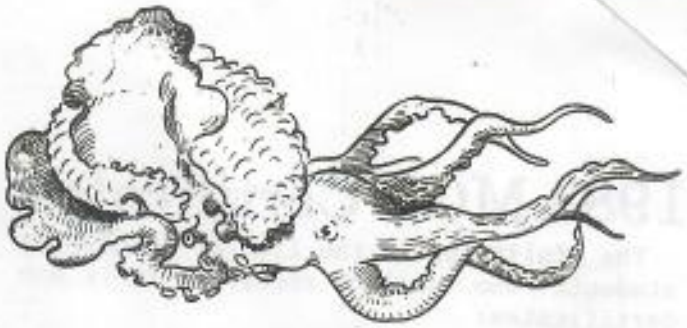
There will be a $2 donation for each presentation. For more information, call the Waikiki Aquarium Education Department at 923-9741.

AQUACULTURE WORKSHOP AT MRTC

An aquaculture workshop will be held on the topic of biological filtration and hatchery circulation on Saturday, May 28, at the UH Mariculture Research and Training Center (MRTC) on the windward side.

The workshop, which is being co-sponsored by Sea Grant, MRTC, the Hawaii Institute of Marine Biology (HIMB) and the Hawaii Aquaculture Development Program, will address such things as: the chemistry and biology of biofilters, the water quality requirements of a successful hatchery run, and the design and construction filters and small hatchiers.

The workshop will run from 8 a.m. to 12:30 p.m., and costs $40. If you are interested in attending, send $40, your name, address, phone number, name of employer and your position to: Recirculating Workshop, Sea Grant Extension Service, University of awaii, 1000 Pope Rd, MSB 205, Honolulu, HI 96822.



LAW OF THE SEA INSTITUTE

This year, the 22nd annual conference of the UH Law of the Sea Institute, and the 11th annual conference for the University of Rhode Island Center for Ocean Management Studies will be held together from June 12 - 16 at the Narragansett Bay campus of the University of Rhode Island.

Titled "New Developments in Marine Science and Technology: Economic, Legal and Political Aspects of Change," the conference will deal primarily in looking into the future of marine science and technology.

The pre-registration fee for the conference is $225. If you are interested in attending, or would like more information, write to: the Center for Ocean Management Studies, The University of Rhode Island, 19 Upper College Road, Kingston, RI 02881-0820.

NEW DOLPHIN BABIES AT SLP

Two dolphins were born (of separate mothers) at Sea Life Park, one on April 21, the other on April 23.

Both are Atlantic bottlenose dolphins, and weighed in at 30 and 35 pounds each.

According to park curator Ingrid Shallenberger, both births were "very normal," and both dolphins are currently doing well.

SCHOLARSHIPS TO JAPAN

Hosei University, located in Tokyo, Japan, is offering an undergraduate scholarship program through their Hosei University International Fund.

The Undergraduate Foreign Students' Scholarship Program is offered every year to two non-Japanese citizens. The scholarship covers the cost of enrollment, tuition, room and board, and students can study for up to a year.

If you are interested in studying in Japan for a year, see Jean at the office of the UHM Department of Oceanography for a brochure and application.

Of Interest

SEAWORDS GOES MONTHLY

Beginning this summer, Seawords will become a monthly publication.

However, to keep on top of such items as job openings, internships, and upcoming deadlines, MOP will be publishing a monthly Sealetters, which will be sent out to all current MOP students. A smaller version of Seawords, Sealetters will be published on the alternate weeks of Seawords, concentrating mostly on the types of items that appear in our "Of Interest" column.

If you are a current MOP student, you can expect to see your first issue of Sealetters around mid-June.

SUMMER NIGHT CLASSES AT UH'M

The UH Manoa College of Continuing Education and Community Service is offering classes through their evening credit course program that may be of interest to MOP students.

The courses listed below are for the summer accelerated term, which runs from June 6 through August 13. Tuition for these classes are $45 per credit for Hawaii residents, and $155 for non-residents.

Geog 368: Geography of Hawaii.
Zoo 200: Marine Biology, and
Zoo 200L: Marine Biology Lab.

If you would like to take these courses, or would like more information, call 948-8400.

MOP STUDENT WINS AWARD

Congratulations to Manoa MOP student Carol Yonamine, who received the Agatin Abbott Award from the Department of Geology and Geophysics.

Carol receives a plaque and $400 from the Agatin Abbott Memorial Fund, which was established 10 years ago following the death of long-time chairman Agatin Abbott.

The award is given out once a year to the senior undergraduate student with the highest GPA.

Carol, who refused to divulge her GPA, laughed and said, "My brothers told me I must've gotten the award because I was the only student in the department!"

Congratulations, Carol!

SEA LIFE PARK OFFERS CLASSES

Sea Life Park will be offering a number of classes for children and adults over the summer.

Both the "Keiki and Adult Explorations" and "Sea Creatures and Crafts" classes will feature on arts and crafts, facts about marine mammals, and other marine related activities. There are different classes for whales and dolphins, octopus, fish, sea lions and seals, and sea turtles. Classes are limited to preschoolers, accompanied by adults.

"Tidepool Discovery" will involve learning experiences at the park, plus field trips to nearby beaches and tidepools to study marine invertebrates and fish.

"Sea Creatures and Crafts" and "Tidepool Discovery" are geareed for elementary and intermediate students.

"Facing up to the Fish" and "Tidepool Trek" are open for the whole family. "Facing up to the Fish" includes a lecture with hands-on props, a game in the Hawaiian Reef Tank, bamboo pole fishing, and gyotaku (Japanese fish printing). "Tidepool Trek" is an introduction to tidepool creatures using a variety of props, and includes an exploration to nearby tidepools.

For adults, there is "Marine Animal Photography," which will teach students how to shoot with the "dry land" approach. Students should have some knowledge of 35mm photography and provide own camera and film.

All of these courses require reservations, and registration fees. If you would like to learn more about the events, write to: Sea Life Park, Education Class Registrar, Makapuu Point, Waimanalo, HI 96795.

BML SUMMER PROGRAM DEADLINE

There is still time left to sign up to attend the Blue-Water Marine Lab (BML) Summer Program.

The deadline for the program, which will start on June 20 (with orientations on June 18), will be on June 10.

If you would like more information on how to be register for the BML Summer Program, call Liz Kumabe at 923-9741.

Of Interest

JOBS AT NOSC

The Naval Ocean Systems Center (NOSC) is looking for a number of students to fill part-time positions.

There are two positions available at Hickam Air Force Base.

The first is for a computer science analyst, who will be assisting the on-site system administrator to install, operate, modify and maintain the existing office automation system. The position also involves the maintenance of software and hardware, trouble-shooting problems, designing, developing, testing and documenting computer programs.

To qualify, you must be a computer science or management information systems major, with knowledge in two or more of the following areas: VAX/VMS, computer networking/communication, database/data structures.

Desirable skills include experience with both the IBM PC and Apple Macintosh hardware and software.

The second is for a mechanical or civil engineering analyst, who will assist the facility manager/engineer in preparing, phasing and implementing a large construction project. Duties include reviewing, analyzing and documenting operational procedures pertaining to the building facilities, reviewing and analyzing construction design drawings and specifications, providing necessary engineering to support preliminary construction and facility issues, preparing engineering drawings, project work breakdown structure, and activity networks.

To qualify, you must be a civil or mechanical engineering major in the College of Engineering, and have completed freshman and sophomore level engineering courses.

Desirable skills include experience with drafting and blue-pring reading, and experience in the construction/consulting field.

The work for the following NOSC positions will be conducted at the Kaneohe Marine Corps Air Station.

There are two positions open for electrical engineering analysts, who will assist the work sponsor in designing, breadboarding and testing developmental electric cirvuits, integrating electronic components with mechanical hardware, and documenting designs of electronic circuits.

To qualify, you must be an electrical engineering major, having completed one semester of logic design or equivalent.

Desirable skills include the ability to use small hand tools, soldering and wire-wrapping, and experience in using an IBM PC.

The final position is for a mechanical engineering analyst, who will provide support in the field of mechanical hardware design, analysis, testing and cable winding for the fiber optic system of the NOSC ET Project. You will also be assisting in the design, layout and testing of developmental mechanical hardware for fiber optic cable winding system, integrating mechanical and electronic components to balance form and function, and documenting mechanical design, analysis and testing.

You must be a mechanical engineering major, and have completed one semester of mechanical design.

To qualify to any of these NOSC positions, you must:

1) Be a U.S. citizen;
2) Provide your own transportation;
3) Attend school on a full-time basis;
4) Be a graduate student with a GPA of at least 3.0, or an undergraduate junior or senior with a GPA of at least 2.0;
5) Be able to work at least 10 hours a week, with a maximum of 20 hours a week during school and 40 during vacation.

All positions pay $5.40 an hour. If you are interested and would like to apply, call the Marine Option Program (MOP) at948-8433.

BABY NEWS

Former MOP Administrative Officer Henrietta Yee gave birth to Shayna Noelle Yee on March 11, at 1:59 a.m. Shayna weighed in at 8 lbs, 6 oz., and both mother and daughter are doing fine.

Congratulations, Henrietta!

Of Interest

JOBS JOBS JOBS JOBS JOBS JOBS JOBS JOBS JOBS JOBS JOBS JOBS JOBS JOBS

There are job openings for those interested in aquaculture.

The first position is for a full-time employee for the UH Department of Animal Sciences Prawn Aquaculture Research Program. The position is a three-month casual hire appointment, with continuation depending on availability of funds.

The duties include: assistance in broodstock management, larval rearing, facility management, data collection, conduction of tank and aquarium level experimentation.

Qualifications include: the ability to physically perform the duties and responsibilities of the position. You must be willing to work some weekends and holidays, possess a valid Hawaii driver's license, and preferably have some experience in prawn or shrimp aquaculture research, including experience in larval rearing techniques.

The Prawn Aquaculture Program is also looking for two or more student employees who would like to assist in maintaining the prawn research experiments and facilities, feeding animals, taking data, building apparatuses and maintaining grounds.

To qualify, you must qualify for UH or Windward CC student employment, and be able to work 20 to 40 hours a week. Personal transportation to the Anuenue Fisheries Station on Sand Island is necessary.

If you are interested in these positions, call Yara L. Lamadrid-Rose at the Prawn Aquaculture Program at 847-6015 during the day.

There is an internship open for a UH authorized scientific diver to assist in a Damselfish behavior project in Kaneohe Bay. The investigator for the project, which is part of Earthwatch, needs one student dive partner from August 17 to September 23 to assist with tagging and observations.

Room and board will be provided at Coconut Island.

If you are interested, call David Booth (before May 30) or Bill Tyler (after May 30) at the Hawaii Institute of Marine Biology (HIMB), 247-6631.

The Honolulu laboratory of the National Marine Fisheries Service (HIMB) is looking for MOP student interns to help them with a small boat survey project.

The work will involve collecting information on a number of small recreational and commercial fishing vessels operating from small boat piers, harbors and launching ramps around Oahu.

In two 12-hour shifts, students will monitor the number of boats returning from fishing trips over a 24-hour period, at locations to be assigned.

The work period will last between one week to a month.

The students will be supervised by the Fishery Management Program, and a student project leader.

A MOP stipend could be awarded depending on the scope of the project.

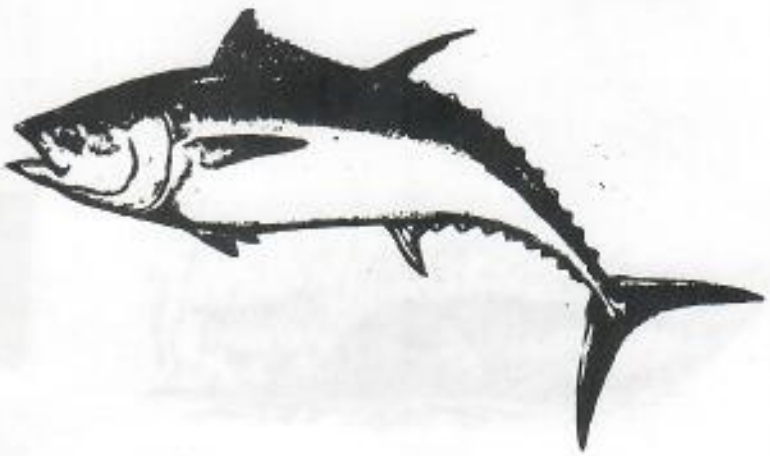
If you are interested, call Russell Ito at NMFS, 943-1210.

There is a part-time position available for a person to assist with field sampling of nearshore oceanographic parameters (one day a week for 10 to 12 hours), and to assist with equipment preparation, errands, data work up and clerical duties (an additional eight to 10 hours a week).

Desired qualifications include previous experience with sampling, and small boat operation.

The starting pay is $5 or $6 an hour, depending on experience.

If you are interested, call Patrick Sullivan at Oceanit Labs, 531-3017.



MOP Calendar

May

20-22: MANEA KAI '88 NBC EXHIBITION HALL, 948-8191.
21-June 1: MOP QUEST WORKSHOP HOSTED BY WCC at Coconut Island.
21 (Sa): SEAWEED PRESSING WORKSHOP Waikiki Aquarium, 9a.m.-noon, $10, w/Karla McDermid, 923-9741.
25 (M): WAIKIKI AQUARIUM, LECTURE. FRANK Howarth, "Hawaii's Hidden World: Caves and Cave Life." 7:30 pm, $2 donation.
29 (Su): KHET TV 11, NATURE, 7 PM "IN THE Shadow of Fujisan: Long Live the Turtle."
30 (M):HOLIDAY: MEMORIAL DAY
31 (Tu): KHET TV 11, 9 PM FRONTLINE "Trouble in Paradise," US military pacts in Palau.

June

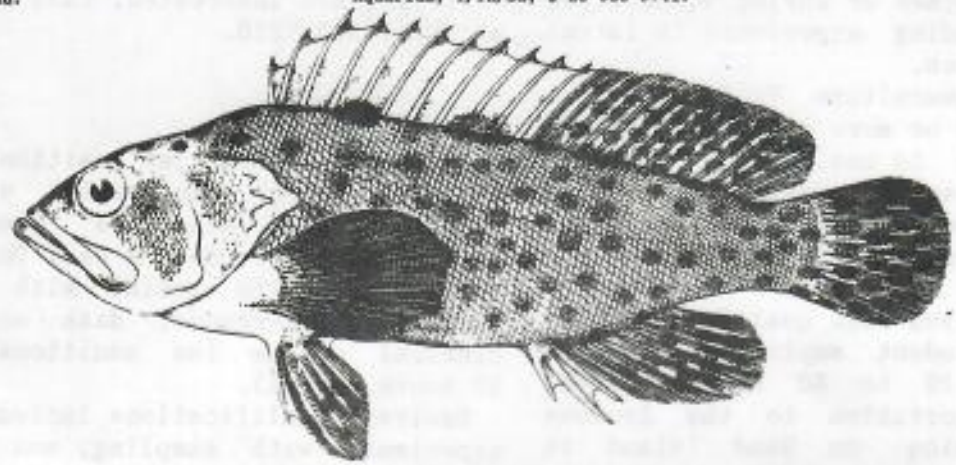
1 (M): ADVANCED NAUI DIVING COURSE W/ Geoff Saint. 948-8433.
1 (M): NAUI OPENWATER SCUBA COURSE W/ Alan Hong, 948-8433.
3 (F): MOP ALUMNI ASSOC. DIRECTORY Meeting, 10 am, MSB 229, 948-8433.
4 (Sa):GRE TEST DAY
6 - August 13: SUMMER ACCELERATED TERM for evening classes, UHM. See Of Interest for MOP oriented courses.
8 (W): LECTURE, WAIKIKI AQUARIUM, "IN Your Wildest Dreams," by Robert Kinzie, 7:30pm, $2 donation, 923-9741.
10 (M): APPLICATION DEADLINE TO ATTEND BML Summer Program. Call Liz Kumabe at 923-9741 for more info.
10 (M): HOLIDAY: KAMEHAMEHA DAY.
14 -25: CLASS, LIFE ON HAWAIIAN REEFS, 6 sessions, thru Waikiki Aquarium, $40, T/Th/Sa, 923-9741.
16 (Th): MANOA MOP ADVISORY COUNCIL Meeting, 3:30 pm.
18 (Sa): ORIENTATION DAY FOR THOSE Attending BML Summer Program.
19 (Su): FATHER'S DAY.
20 (M): FIRST DAY OF CLASS FOR THE BML Summer Program.
28 -July 2: CLASS, HAZARDOUS MARINE LIFE in Hawaii, 6 sessions, thru Waikiki Aquarium, T/Th/Sa, $ 20 923-9741.

July

1 (F): MOP ALUMNI REUNION COMMITTEE Meeting, 7 pm, Annie Orcutt, 948-8191.
4 (M): HOLIDAY: INDEPENDENCE DAY.
5 -16: CLASS, REEF FISH WATCHING, THRU Waikiki Aquarium, 6 sessions, T/Th/Sa, $40, 923-9741.
19-23: CLASS, HIGH SPEED NOMADS OF THE Open Seas, thru Waikiki Aquarium, T/Th/Sa, $20, 923-9741.
19, 23, 28: CLASS, MARINE ANIMAL Photography, thru Sea Life Park, 259-7933.
29 (Sa): MOP ALUMNI REUNION, WAIKIKI Aquarium, 948-8433.
30 (Su): MOP ALUMNI BEACH DAY, KUALOA Beach Park, Crafts & classes, 948-8433.

.....Denotes MOP activity.

MARINE OPTION PROGRAM UNIVERSITY OF HAWAII



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Marine Option Program
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2570 Dole Street
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UHH Marine Option Program

Changing Tides

Vol. V, No. 7 May 5, 1990

Upcoming Events

May 11
UHH Graduation!

May 13 - 22
QUEST Workshop

June 12 - July 24
UHH Summer Session

August 5 - 12
National Marine Educators Confrence at UH-Hilo.

Graduation

The Marine Option Program and *Changing Tides* would like to congratulate two members of the Marine Option Program who will be graduating this semester with a Marine Certificate. They are: Jan Heckman, a Philosophy major, whose project was a video documentation of the Marine Option Program titled *"MOP Opportunity"*, and Arlene Ohara, a Sociology major, whose report was entitled, *"Sewage Pollution Study: Waiakea Uka Drainage Canal and Keawe Street Canal"*. Both students plan on attending graduate school next year. Good luck Jan and Arlene!

Also graduating this semester are William Dana, Ropeti Ale, William Billings, David Christensen, Eric Hagiwara, Toni King, Melissa Kirkendall, James Schwarber and Gail Takaaze. Good luck MOPers!

***

We Got Em!

April 9-11, at Punaluu, twelve turtles were caught and tagged by a group of hard core MOP turtle wranglers. This was the second year in a row that turtles were caught during the day. Snorkeling after a turtle, whose agility in the water is amazing, can be exhausting.

One of the turtles, a male weighing an estimated 175+ lbs., was first caught and tagged on Nov. 28, 1982 at French Frigate Shoals where the females lay their eggs. It took four MOPers to wrestle it to the beach. It should be noted, for your trivia file, that French Frigate Shoals is approximately 800 miles from the Big Island. There are plans to mount a second tagging expedition next fall in addition to MOP's annual spring fling at Punaluu. Stats on this turtle tagging event can be found on the bulletin board outside the MOP office.

***

A Year End Review

by Jan E. Heckman

As the outgoing Student Coordinator and Newsletter Editor this is my chance to sing my swan song. In the last few months I have often thought about the impact of MOP on my life. I count my two years spent at MOP as one of the highlights in my life. I could go on and on about the friendly people and the ohana created, but not in a newsletter. But what stands out most in my mind are the opportunities offered.

MOP membership this school year has gone from 94 members to 136, I could continue to throw stats at you, but I would rather relate my impressions as student coordinator. I have seen students on their first snorkeling trip, first sailing adventure, first experience with sea turtles, and first chance to go on a research cruise, to name a few. The excitement that students bring back to the office as they relate their adventures is not only rewarding, because I know I had a small part in organizing the activity, but I also know these people will carry these good memories with them for life.

Undergraduate days are a time to explore, and while I know many of these experiences may not be used in future occupations, I also know MOPpers have learned something they may not have gotten anywhere else. With these final words, I would like to wish my fellow students the best in their endeavors.

***

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Changing Tides is a monthly news publication of the University of Hawaii at Hilo Marine Option Program (MOP). The Opinions expressed herein are not necessarily those of MOP, or of UH-Hilo but those of the *Changing Tides* staff and contributors. *Changing Tides* welcomes any editorial contributions or comments. All articles received are edited for grammar and spelling only.

Editor: Jan E. Heckman

Changing Tides, UHH-MOP
523 W. Lanikaula St.
Hilo, HI 96720
Ph. (808) 933-3544

Coast Guard Bi-Centennial

by Michael Childers

This year marks the 200th Birthday for the United State Coast Guard. On August 4, 1790 Congress began the Revenue Cutter Service. This "Coast Guard" had the duty of enforcing customs and tariff laws which sometimes involved battling privateers and smugglers. During the 1800's the Revenue Cutter Service fleet was expanded and saw action in the War of 1812, Mexican, Civil, and Spanish American Wars. In fact, the Coast Guard has played an active role in every national conflict while attached to the United States Navy.

In 1871 the U.S. Life Saving Service was formed. These early search and rescue teams patrolled the shores on foot and went to the aid of vessels in distress by rowing open wooden boats through treacherous surf. In 1915 the Revenue Cutter Service merged with the Life Saving Service to become the modern Coast Guard.

Through the years, search and rescue technology has advanced but the Coast Guard's motto has remained the same. *Semper Paratus*: "Always Ready".

Always ready is the condition of the new Coast Guard cutter *Kiska*. She is ported in Hilo, carries a crew of seventeen, and is commanded by Lt. Michael Sullivan. The 110 ft. cutter was built in 1989 by the Bollinger shipyards outside New Orleans, Louisiana. The *Kiska's* top speed of 29 knots allows her to respond quickly to any mission. Although primarily on station for search and rescue, the *Kiska* may also be used for law enforcement, navigation buoy repair, and general patrol. The Marine Option Program would like to welcome the crew of the Kiska to Hilo. We know the Coast Guard is always there when you need them and we're grateful to have them in Hilo.

***

Public Workshop Notice

A public workshop concerning an East Hawaii Light-Draft Navigation Facility, will be held May 16th at 7:30 PM. The department of transportation has been studying the feasibility of a light draft navigation facility in the east Hawaii area. This would include the feasibility of a protected boat launch ramp. The workshop will be held at the Pahoa High and Elementary School Cafeteria. For further information you should attend this meeting.

***

QUEST!

Besides being a very creative acronym, QUEST is a premier MOP activity. QUEST stands for Quantitative Underwater Ecological Surveying Techniques; sometimes known as transacting. Early in May, three students, Michael Childers, Lippert, and David Rose plus Jo. Coney, our fearless coordinator, will be attending QUEST on Coconut Island located in Kaneohe Bay, Oahu. This kind of training is not only important for MOP's future field research activities but can translate into a future job skill. Good Luck to all of them.

***

Ciguatera Poisoning Project Available

Dr. Hokama of Manoa has agreed to let UH-Hilo MOP assist in ciguatera poison testing. Since the Big Island has no facilities for testing fish, there is a definite need for testing. Dr. Hokama will train a MOP student, and provide supplies necessary for the project. The duration of this project would preferably be one year, but a semester to semester project would be acceptable. In return, MOP has agreed to offer the student a stipend and an Internship certificate. The MOP student we are looking for must be reliable, and dependable, able to work without supervision. We know you exist, so come into MOP and check it out.

***

Summer Work!

The Hawaii Volcanoes National Park is looking for students who would like to be involved in monitoring the Hawksbill Turtle. The park would like students to work July through September, this summer. As of this writing, the park is offering a subsistence allowance, and housing to interested students. The project will involve hiking into the area for a number of days at a time. This may be a great booster for the resume and a great way to spend your summer. For further information please call 967-8226 and ask for Larry Katahira or Andy Kikuta of the Hawaii Volcano National Park.

***

Summer Session

The University of Hawaii is featuring a special summer session on Marine Science. If you have a copy of the 1990 summer session catalog, you will notice classes marked with the MOP wave symbol. No, these are not courses in surfing, but rather markers for marine related courses.

To tell you a little about this summer session, the session starts on June 12th and ends on July 24th. Being 42 days in length, the summer session promises to be exciting! General registration continues June 1, at the CCECS office. The mailing address is Summer Session, University of Hawaii at Hilo, Hilo, HI 96720. In May there is walk in registration at the office of student services. The last day to withdraw and last day to register for class is June 8th. Don't forget, the only holiday is the Fourth of July. Following is a list of the classes that will be available for the summer session that relate to the marine science theme.

BIOL 171, sec 1, Marine Biology, M-T-Th-F 8-10am.
BIOL 171, sec 2, Marine Biology, M-T-TH-F 10-12pm.
GEOL/BIOL 194, Hawaii Marine Field Experience, Saturday 8am - 5pm
GEOL 201, sec 1, Oceanography, M-T-Th-F, 8-10am
GEOL 201, sec 2, Oceanography, M-T-Th-F, 10-12am
GEOL/BIOL 301L, sec 1, Laboratory in Oceanography, Wed, 8-12pm
GEOL/BIOL 301L, sec 2, Laboratory in Oceanography, Wed, 1-5pm
GEOL/BIOL 360, Marine Resources, M-T-Th-F, 1-3pm
BIOl/GEOL 399, Marine Option Program project M-T-Th-F, 3/4pm
Geol 494, Adv. topics in Physical Oceanography M-T-Th-F, 10-12pm
OCEAN 620, Physical Oceanography, M-T-Th-F, 8-12pm
Come by the MOP office and find out about this unique summer session.

***

National Marine Educators' Conference

This Summer is the National Marine Educators' Association 1990 Conference. The date of this conference is August 5-12 and will be held at UH-Hilo campus. If you are interested in helping out, please contact Gail Clarke at 966-6071 or Barbara Lee at 329-7452. The conference will consist of exhibits, meetings, field trips, presentations, and even a "Sea Swap". If you're a video buff, there will also be a Video Contest as part of the Marine & Environmental Film and Video Festival. So, give these people a call or stop by MOP for further details.

***

Greenpeace In Hilo

A Greenpeace office is now open in Hilo at 56 Waianuenue Ave., Suite 211, (935-0770). They are looking for volunteers to help in environmental document research and occasional field work. Here's another way to put any Earth Day resolutions to work.

***

SEMFISH

This newsletter is filled with acronyms and for headlines they work fine. If it caught your eye, great. This project is custom-designed for someone interested in Marine Resources. SEMFISH means "Stock Enhancement of Marine Fish in the State of Hawaii". This project is also known as the "Hilo Bay Fish Enhancement Project". Recently there have been a number of meetings at the UH Cooperative Extension Service Building regarding the stocking of fish in Hilo Bay. The fish chosen for this project is the Striped Mullet (ama'ama).

Through the SEMFISH study, large quantities of ama'ama will be raised and released in Hilo Bay. Each fish will be tagged with a special metal tag to identify the fish when caught at a later date. After fish are caught, their heads are run through a special detector. If the fish has a tag, the head containing the tag will be set aside for inspection. Interested students will be needed during the later part of the summer and early fall, and can work on this study for an "Internship" category skill project. For further information concerning the SEMFISH project, please stop by the MOP office, or call the Division of Aquatic Resources at 961-7501 or 961-7576.

Tentative Schedule

Time of Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
08:00	BIOL 171 - 1 GEOL 201 - 1	BIOL 171 - 1 GEOL 201 - 1	GEOL/BIOL 301L - 1	BIOL 171 - 1 GEOL 201 - 1	BIOL 171 - 1 GEOL 201 - 1	GEOL/BIOL 194
09:00	OCEAN 620	OCEAN 620	"	OCEAN 620	OCEAN 620	"
10:00	BIOL 171 - 2 GEOL 201 - 2	BIOL 171 - 2 GEOL 201 - 2	"	BIOL 171 - 2 GEOL 201 - 2	BIOL 171 - 2 GEOL 201 - 2	"
11:00	GEOL 494	GEOL 494	"	GEOL 494	GEOL 494	"
12:00	-	-	-	-	-	"
01:00	GEOL/BIOL 360	GEOL/BIOL 360	GEOL/BIOL 301L - 2	GEOL/BIOL 360	GEOL/BIOL 360	"
02:00	"	"	"	"	"	"
03:00	MOP	MOP	"	MOP	MOP	"
04:00	MOP	MOP	"	MOP	MOP	"

***** If you want to get a jump start on courses that fulfill the MOP certificate requirement!!!!

***** If you want to check out Waipio Valley and coral reefs, visit the Natural Energy Lab, and much more !!!!

***** If you want to do a MOP certificate skill project and get classroom credit at the same time!!!!

Return Requested,Please Forward
University of Hawaii-Hilo
Marine Option Program
523 W. Lanikaula
Hilo, HI 96720

HILO HAWAII MAY-9'90 U.S.POSTAGE .25

George Balaz
2570 Dole St.
Honolulu, Hi. 96822

University of Hawaii at Hilo

MARINE OPTION PROGRAM

Dear George,

Thank you for sending a slide of me and my friend. You ask me if I like those turtles. George, you should be one to talk!

It was a pleasure, as always, to work with you in Kaneohe. I was glad to see that we (or should I say they) generated some interest in helping you out. Although Christian Bal was not much help in catching the turtles, he did get some fairly good video footage of the process. I'll remind Manoa to make a copy for you. If they don't, let me know and I'll rattle their cage.

Just a reminder, so it's no surprise, I would like a small sample of tumor tissue in January for my cell bio class. Also, since this is my last year with MOP, I wanted to do a video project this year. The only / best idea I have come up with for subject matter is . . . turtles. Surprised? Would you be willing to be one of my advisors? Any suggestions and comments would help. Looking forward to hearing from you soon.

Aloha,

Sherri

Sherri Miller

523 W. LANIKAULA ST.
HILO, HAWAII 96720-4091 • TEL: (808) 933-3544

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

April 17, 1989 F/SWC2:GHB

Mr. Mufi Hannemann
Punalu'u Resort
P.O. Box 85
Pahala, HI 96777

Dear Mr. Hannemann:

The Marine Option Program (MOP) of the University of Hawaii at Hilo, working in cooperation with our agency, has just completed a 3-day study visit of green turtles (honu) at Punaluu Bay. I want to take this opportunity to send you a summary of results from this trip, as well as information on earlier work conducted at this location by the MOP (see enclosures).

A total of 14 turtles were captured in a harmless manner during this most recent visit. Three of these turtles had been captured and tagged during earlier visits to Punaluu (2 were tagged 5 years ago, and 1 was tagged over 10 years ago). As with past results, these data demonstrate that the turtles are resident to the area. The growth rates for the three turtles ranged from 1.5 cm (5/8 inch) to 3.0 cm (1 1/8 inch) per year in carapace (shell) length. While this rate may appear quite slow, turtles resident to Punaluu have been shown to exhibit faster growth than at most other preferred algae (limu) foraging sites throughout the Hawaiian Islands.

The fourth previously tagged turtle that we captured on this recent trip was an adult male. Our records show that the turtle had been originally tagged 9 years ago during the breeding season at French Frigate Shoals, 800 miles to the northwest of Kau. This documentation of a long-distance migration once again points out that green turtles resident to Kau periodically travel to (and return from) French Frigate shoals for breeding purposes.

Another important finding of our most recent trip was the discovery that turtles are no longer feeding at night inside the bay. Most, if not all, foraging appears to be occurring during the daytime, in contrast with past years. There are several possible explanations for this shift, but additional inquiry will be needed before any firm conclusions can be drawn. An obvious significant benefit derived from the turtles feeding during the day is that it offers quite an attraction for tourists. Visitors arriving on every tour bus while we were at Punaluu were fascinated by seeing the turtles. They flooded us with questions about them and asked for literature that they could take home. In addition to the tourist's interest, video footage was taken of the turtles and our research activities. A school teacher from Naalehu felt that this topic would be excellent to present to her

elementary class, especially with the incorporation of the Hawaiian "turtle lady" legend about Punaluu. I have sent her posters and other teaching aids for sea turtle biology and conservation.

We hope to carry out another study trip to Punaluu within the next 4-6 months. I will give you some advance notice when we know the exact dates. Please feel free to visit with us at that time at the County Park Pavillion so we can describe our research activities and goals in person. If you have any questions in the meantime, you may of course telephone me here in Honolulu at 943-1221.

Thank you in advance for taking the time to read the enclosed information.

Sincerely

George H. Balazs
Zoologist

Enclosures

cc: Dr. Walter Dudley
Dr. Leon Hallacker

University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
Division of Natural Sciences

April 24, 1989

Mr. George Balazs
NMFS
Southwest Fisheries Center
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear George,

Thanks for your letter. You're right, it can't hurt to keep trying with Hanneman.

Most of all Leon and I want to thank you for another successful turtle tagging expedition to Punaluu. Also, thanks for the information on turtle #13 (and Leon says, thanks for the $2).

You will shortly be receiving an invitation to the Annual Awards Ceremony for the College of Arts and Sciences of UH-Hilo. We've long wanted to express our appreciation to you for all of the years that you've been coming to the Big Island to tag turtles with our MOP students. By now it's probably something like 200 students who've learned about the endangered Hawaiian Green Sea Turtle and the fine research being carried out by the trained professionals of the National Marine Fisheries Service. At any rate we'll understand if you can't make it to the ceremony and will arrange a special ceremony for your next visit to the Big Island.

Thinking of future visits and future turtle tagging, let me throw out a few thoughts. One of our MOP students, Sherri Miller, is going to begin preparing a turtle tagging training video for our students. She'll be using the footage shot during this last expedition, as well as some I took on previous trips. For future expeditions, we plan on having all of the participants go through a training session with lecture and video prior to being accepted for the tagging expedition.

Secondly, Leon and I both felt that the two shifts of students was quite awkward. I think that next time we're going to somehow overlook our Dean and plan for one group for the duration.

523 W. LANIKAULA STREET
HILO, HAWAII 96720-4091 • TEL: (808) 961-9383

Thirdly, the legislature has begun to recognize the important role played by both MOP system-wide and by undergraduate education in marine science at UH-Hilo. Consequently, we have funding for an APT to take charge of the daily operations of MOP at UHH. This person will report to Leon and I and will hopefully be on board by mid-fall semester. A full-time professional will hopefully be able to organize the details of our MOP activities more thoroughly and consistently than was possible with our all-student staff.

Finally, it appears that in the not too distant future UH-Hilo (MOP) and HIMB are going to jointly manage a small field station at Puako. This might be a good base for us to do work on turtles on the Kona side of the island.

Think about these new developments as well as the change in turtle behavior that made all night vigils unnecessary. When you get a change drop me a note with your thoughts about future tagging expeditions. Perhaps we can now do two a year, one in the fall and one in the spring? We would like these expeditions to offer the optimum educational experience for our students and at the same time be the least possible hassle for you and your staff.

Once again, thanks for all these years of helping educate our MOP students.

Sincerely,

Walt

Dr. Walter C. Dudley
Professor of Marine Geology
and Oceanography

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

February 13, 1987 F/SWC2:GHB

Dr. Walter Dudley
Marine Option Program
Division of Natural Sciences
University of Hawaii at Hilo
Hilo, HI 96720-4091

Dear Walter,

Everything is in order at this end for our sea turtle research expedition to Punaluu on the nights of March 23 and 24 (Monday and Tuesday). We should plan to depart from Hilo by about noon on Monday, returning approximately mid-afternoon on Wednesday, March 25. As you know, the work will at times be strenuous and intense, but nevertheless exciting and educationally rewarding to our student team members. I'm sure for many it will be a unique experience that they will never forget. I've enclosed two general interest articles telling about our earlier work at Punaluu which you may want to circulate, if you haven't done so already.

The most important consideration for this trip, as in the past, is one of safety. I know that we equally share this concern and will take every precaution so that any injuries that may occur are limited to only minor scrapes and bumps. I feel confident that our good record on safety will continue to be upheld.

As I mentioned to you over the telephone, an employee here at our Laboratory (Robert Forsyth) will accompany me on this trip. Robert has considerable experience in the use of turtle nets, is a strong swimmer, and has NOAA scuba certification. I am sure that the students will find Robert to be a capable and congenial instructor and co-worker. If any questions arise while I am on the mainland from February 24 to March 11, please telephone Robert here at our Laboratory (943-1221).

The airfare and cost of renting a cargo van in Hilo will be covered by our agency. In addition, the nets and other necessary sampling gear will be airshipped several days in advance and paid for by us. Some of the important items that MOP will need to supply include 1) all food, drinks, and cooking gear, 2) folding chairs (at least four), 3) a 12-V car battery in good condition, preferably in a container with a handle for easy transport, 4) battery charger, 5) one, preferably two, large tarps and line for sun/rain cover, 6) extra 75-W bulbs for the pavillion, 7) a first-aid kit, 8) dive lights, preferably small ones with wrist straps, 9) electrical extension cord, 10) a 25-ft garden hose, 11) a large inner tube with plywood lashed to one side (I'll bring one, but we really do need two or more on hand), 12) a tire pump and patch kit.

Each student's personal gear should include extra warm clothing and sleeping gear. Prepare for the worse, that is, bone chilling nights with icy water and brisk mountain winds. Clothing should include caps that cover the ears and well insulated gloves. Not everyone that goes on the trip will need to be a capable swimmer willing to untangle turtles from the net. However, most should, since such duties comprise the bulk of the work. People involved in nighttime water activities should have a wet suit jacket and any other wet suit gear (hood, pants, etc.) that they can pull together. In addition, if "buckle" fins are used they need to be securely taped and/or covered with silicon to prevent self-entanglement in the net.

I'll be in contact with you again by telephone before leaving for the mainland. I'm delighted that you've taken the lead in making this trip become a reality. Important research data will surely be collected and I look forward to the trip with enthusiasm. I appreciate having the opportunity to once again work with you and your MOP students.

Best regards and Aloha,

George H. Balazs
Zoologist

Enclosure

University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
Division of Natural Sciences

August 11, 1989

George Balazs
National Marine Fisheries Service
SWFC Honolulu Laboratory
2570 Dole Street
Honolulu, HI 96822-2396

Dear George,

Walt and I have begun some serious planning for future turtle tagging expeditions. We fully intend to have advance training for the students and to limit our expeditions to week days to avoid conflicts at Punaluu.

We are in the process of hiring an APT for our MOP program. That will provide a reliable professional in the MOP office and the field to help with planning, logistics and training, and hopefully help eliminate the miscalculations and misunderstandings which have occurred in past years.

We are also presently in the process of organizing a summer school program in Marine Sciences for UHH's Summer 1990 Program. The Chancellor's goal for future summer school programs at UHH is to emphasize specific curricular areas. For next year, he has asked that "Marine Science" be the emphasis, and Walt and I have agreed to anchor a core of marine courses around which additional courses are added. We're very excited, because for the first time, the Administration is putting up "venture capital" to do a good job of advertizing the program (including a week of personal canvasing by Walt at numerous California institutions). We think we'll get a lot of good students out here next summer.

I'm writing to you because one of the things we would be very much interested in working into our curriculum is a trip to Punaluu to tag turtles. To my knowledge we have never been able to collect tagging data during the summer vacation and we think that this would be the perfect opportunity. Working within the constraints of summer school scheduling, we envision this as a 1-day activity which would take place on a Wednesday between June 13 and July 18. Unlike earlier trips, we would provide students with some advance training to facilitate a smoother operation in the field. Moreover, we would be able to pay your expenses including airfare, van rental, subsistence, and give you an Honorarium of $100. The tagging would be part of the required

523 W. LANIKAULA STREET
HILO, HAWAII 96720-4091 • TEL: (808) [redacted]

curriculum in an advanced course, so we would hope for complete attention and cooperation from the students. We will limit the course to 24 students for logistics and safety reasons and expect a mix of students from Hawaii and the west coast. To us it looks a nearly ideal situation.

Please consider our proposal and offer any suggestions you may have. Walt will call you soon (we divvy up everything!) to talk with you further about the possibility of doing this sort of activity next summer. Thanks.

With Best Wishes,

Leon E. Hallacher
Associate Professor of Biology

P.S. Thanks for the information about the new owners of the Punaluu Resort. Early in the summer we were able to track down the Honolulu attorney handling the sale (from the newspaper people), but decided not to call him for the new owner's name and address. We thought we might seem overly pushy in approaching the new owner so soon after the transaction. When more information came out in the papers just the other day, we got going again on the processing of our letter of "introduction". The information you sent will be very helpful, and we will be contacting the new owners soon. We will not cc. you on the letter, but will send you a copy of it. Cheers.

cc Walt Dudley

GHB

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

April 25, 1989 F/SWC2:GHB

Mr. Emmerich Grosch, Sr.
P.O. Box 390088
Keauhou, HI 96739

Dear Mr. Grosch:

I appreciated having the opportunity to meet you in person at the Punaluu Black Sand Restaurant and to describe our studies of green sea turtles at Punaluu Bay. By now you should have received the assortment of literature on Hawaiian sea turtles that I promised to send you.

If you have any additional questions about our work, please feel free to contact me by telephone (943-1221) or by letter.

Sincerely,

George H. Balazs
Zoologist and Leader
Hawaiian Sea Turtle
Recovery Team

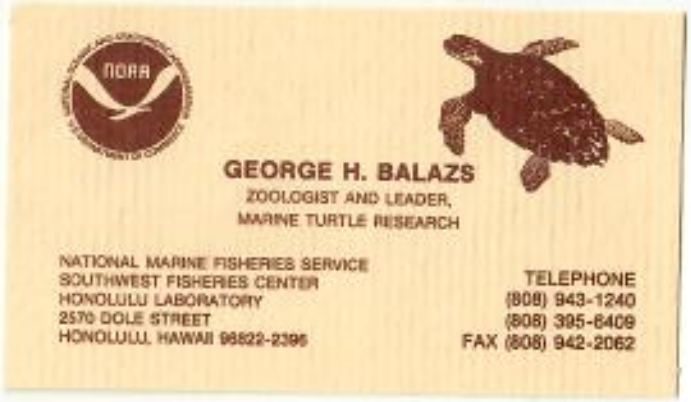
Balazs S: tagKau.049

Summary of 12 green turtles tagged and resighted at Punaluu Bay, Kau, Hawaii, during the April 9-11, 1990 cooperative NMFS/MOP-UH Hilo sea turtle research project.

compiled by
George H. Balazs

Tag No.	Straight carapace length (cm) recovery/initial	Weight (lbs) recovery/initial	Date originally tagged and interval (yrs)	Growth rate in cm/yr	Notes
7550, 7570, 71 (Y649RH)	78.6 / 66.4	-- / 88	12/18/83 6.3	1.9	
6360, 61 (Y650RH)	87.8 / --	-- / --	11/28/82 8.6	--	Adult male originally tagged while basking ashore at Tern Island, French Frigate Shoals
2899, 2926 Y180	61.5 / 43.8	102 / 24	9/78 and 4/89 11.6	1.5	Deformed carapace
7604, 05 (Y654RH)	71.9 / 48.4	-- / 41	1/10/84 6.3	3.7	
8920, 21 (Y655RH)	56.5 / 47.6	65 / 36	3/22/88 2.0	4.4	Donated by fisherman during Punaluu #9
Y637, 38, 39	55.1	56	--	--	Y639RH
Y640, 41, 42	59.1	76	--	--	Y641 exp; healed injuries to right margin. Y642RH
Y643, 44, 45	69.8	--	--	--	Y643 exp; Y645RH

Tag No.	Straight carapace length (cm) recovery/initial	Weight (lbs) recovery/initial	Date originally tagged and interval (yrs)	Growth rate in cm/yr	Notes
Y646, 47, 48	65.6	--	--	--	Y643 exp; Y645RH
Z1 (blue) Y651, 52	69.6	--	--	--	R2S missing but healed,
Z2 (blue) Y653	65.2	102	--	--	
Z3 (blue)	44.2	30			Laupapa 9:45 pm



Summary of green turtles, Chelonia mydas, tagged and resighted at Punaluu Bay, Kau, Hawaii during the 10-12 April 1989 cooperative NMFS/MOP UH Hilo marine turtle research project.

Compiled by George H. Balazs

NOAA, National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

Tag No.	Straight carapace length, cm	weight kg	Elapsed time since originally tagged (yrs)	Growth rate in cm/year	Notes
2899, 2926 (Y-180)	61.2	41.8	10.6	1.6	Deformed carapace.
7540, 7541 7542	69.2	46.4	5.3	2.4	
7599, 7600 (Y-201)	67.2	41.1	5.2	3.0	
3041, 6164 (Y-205, Y-206)	88.6		7.8		Adult male tagged during the breeding season at French Frigate Shoals.
Y-176, Y-177 Y-178, Y-179	74.4	60.0			Observed copulating 4-12-89
Y-181, Y-182	54.7	23.0			
Y-183, Y-184 Y-185	65.7	43.0			
Y-186, Y-187	65.9				
Y-188, Y-189 Y-190	63.3	40.2			Depigmented streak in carapace
Y-191, Y-192	50.7	17.7			

con't.

Tag No.	Straight carapace length, cm	weight kg	Elapsed time since originally tagged (yrs)	Growth rate in cm/year	Notes
Y-193, Y-194	50.0	18.6			
Y-195, Y-196 Y-197	64.7	38.4			
Y-198, Y-199 Y-200	65.6	38.2			
Y-202, Y-203 Y-204	61.9	39.8			Neck puncture and abraded marginals

pdate

B
KAU. GHB

Balazs

Summary of long term recoveries of green turtles made at Punaluu, Kau District, Island of Hawaii.

Tag No.	TAG Loss	Date recovered and length	Date/location originally tagged and length	Interval (mo.)	Interval (yr.)	Increase in carapce length (cm)	Increase in carapce length (in.)	Mean yearly growth rate (cm)	Mean yearly growth rate (in.)	sex
2877,79 (7533)	0	12-18-83 60.3 (Net)	8-31-78 Punaluu (Horseshoe) (41.3)	63.5	5.3	18.9	7.4	3.6	1.4	Male
2514,15 (7593,94)	1	1-8-84 78.0 (Scuba)	1-23-78 Punaluu (Bay) (57.2)	72.0	6.0	20.8	8.2	3.5	1.3	ND
5501-04	0	1-9-84 75.3 (Net)	7-28-81 Punaluu (Bay) (68.1)	29.0	2.4	7.2	2.8	3.0	1.2	Female

2875,76 (7638)	O	2-18-84 61.5 (Net)	8-31-78 Punaluu (Horseshoe) (39.4)	65.5	5.5	22.1	8.7	4.0	1.6	ND
2523,24 (7644)	O	2-19-84 65.5 (Net)	1-25-78 Punaluu (Horseshoe) (39.0)	73.0	6.1	26.5	10.4	4.3	1.7	ND
2896,97	O	3-25-84 69.5 (Net)	9-2-78 Punaluu (Hale Loke) (42.9)	66.7	5.6	26.6	10.5	4.8	1.9	ND
2885 (7686-88)	♂	3-25-84 75.5 (Net)	8-31-78 Punaluu (Horseshoe) (54.9)	66.8	5.6	20.8	8.2	3.7	1.5	ND

Expd. 1 26 Nov. 1983 Expedition - 3 turtles captured.
" 2 15-19 Dec. 1983 Expedition - 12 turtles captured (1 long term and 1 short term recovery).
" 3 8-10 Jan. 1983 Expedition - 13 turtles captured (2 long term and 2 short term recoveries).
" 4 17-19 Feb. 1983 Expedition - 12 turtles captured (2 long term recoveries).
" 5 23-28 Mar. 1984 Expedition - 31 turtles captured (2 long term and 9 short term recoveries).
" 6 13-14 April 1984 5 turtles captured (2 short term recoveries)
" 7 14-17 May 1984 11 turtles captured (4 short term recoveries)

X = 3.8

Painting of "Kaulia the Turtle Girl" by H. Kawainui Kane on display in the Punalu'u Black Sands Restaurant

University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
DIVISION OF NATURAL SCIENCES

April 17, 1990

Dear George,

Thanks for the kind letter, it's really appreciated. We were perhaps even more pleased than you that things went well in regard to logistics and in the number of turtles caught. Hope all future expeditions go as well.

As long as you're amenable, we'd like to try a tagging trip next Fall. If we follow your suggestion and shorten it a little (to 2 days and 1 night) then all three of us should be able to be in attendance the entire time. This could equate to fewer turtles, but perhaps we could make up the difference by having some of us use scuba (Balazs suggestion #2!).

At the very least, all of us (John, Walt, and Leon) could get certified, which would produce 2 buddy pairs. It is probable that Dave Rose and Mike Childers will also be UH certified next fall. MOP's probably going to purchase an inflatable this summer, so we'll have a good diving platform from which to operate.

Just about any time from mid-September through October would be good for us. When we went would depend upon your schedule and the tides, so you need only let us know when you think we should try this thing, and we'll set the time aside. Speaking of tides, we enclosed the Tides Program that we were telling you about. If you have any questions about it, just call John or Walt.

Working on several aspects of this summer's trip. Have already reserved the large pavilion for Tues - Thurs (July 17-19) so we'll be able to get there early and stay late if need be. As you know, Willie said yes to being a paid assistant during the summer trip, and we'll cut him an appropriate stipend. We'll advise our students to bring appropriate hiking footwear in the event that we need to do a "backup" hike into hawksbill territory. I'll call CCECS this week to see about an Aloha RT (on top of the one you'll get for July) in lieu of an "Honorarium". Will keep you appraised.

Walt and the "Do-Do Crew" (sewage study personnel) will be making a run down to Shipman Bay in May. They'll recon the place for turtles while there and will let you know what they find.

523 W. LANIKAULA STREET
HILO, HAWAII 96720-4091 • TEL: (808) 933-3383

That's about it. Hope you had an enjoyable Easter Holiday. Once again, thanks for the encouraging letter.

Sincerely,

Leon E. Hallacher
Associate Professor of Biology

Walter C. Dudley, Jr.
Professor of Marine Geology and Oceanography

John P. Coney
MOP Coordinator

Name_____

Advanced Oceanography Lab
Summer 1990
Turtle Tagging Quiz - 40 pts

1. According to your sea turtle fact sheet, how many species of living sea turtle are presently recognized?

2. What is probably the minimum age at which green sea turtles become sexually mature?

3. What makes up bulk of the green sea turtle diet?

4. How do green sea turtles digest the food they eat?

5. How does the green sea turtles underwater vision compare to its ability to see on land?

6. How does the learning ability of the green sea turtle compare to that of a rat or bird like a pigeon?

7. Briefly describe sleeping behavior in adult turtles. How does this compare to newly hatched (less than 2 days old) turtles?

8. Which turtle-derived products, if any, can be legally sold in the United States?

9. Briefly describe mating in the green sea turtle? How frequently do green sea turtles make nesting migrations? (8 pts)

10. Besides their capture for commerce, sea turtles are endangered for other reasons. What are the three most important addition threats to sea turtles? (8 pts)

A:7GRNT.GHB

Seven tagged green turtles resighted at Punaluu Bay, Kau, Hawaii, on 18 July 1990

by
George H. Balazs, Walter Dudley, and Leon Hallacher
National Marine Fisheries Service, Honolulu Laboratory
2750 Dole Street
Honolulu, HI 96822-2396

Tag no.	Date orig. tagged	Interval (year)	Straight length (cm)		Curved length (cm)	
			original	7/90 and (increase)	original	7/90 and increase
8920, 8921, Y655	3/22/88 (4/9/90)	2.3	47.6	57.0 (9.4)	53.0	61.0 (8.0)
6714-17	11/26/83 (3/26/84)	6.5	71.1	78.9 (7.8)	--	85.0 (--)
Y643-45	4/9/90	0.25	69.8	70.0 (0.2)	75.0	75.5 (0.5)
Y653, Z2	4/10/90	0.25	65.2	65.8 (0.6)	70.0	70.0 (0)
7604, 7605, Y654	1/10/84 (4/9/90)	6.5	48.4	71.9 (23.5)	53.3	76.5 (23.2)
7622, 7623	2/17/84	6.4	47.7	67.8 (20.1)	50.2	72.5 (22.3)
Y176-79	4/10/89	1.25	74.4	75.9 (1.5)	79.0	80.0 (1.0)

A.12GRNT.GHB

Twelve green turtles hand captured and tagged at Punaluu Bay, Kau, Hawaii on July 18, 1990

by
George Balazs, Walter Dudley, and Leon Hallacher
Southwest Fisheries Center Honolulu Laboratory
National Marine Fisheries Service, NOAA
2570 Dole Street
Honolulu, Hawaii 96822-2396

	Straight carapace (cm)			Curved carapace (cm)	
Tag no.	Length	Notch	Width	Length	Width
N378, N379 N380(RH)	71.0	70.5	58.2	76.0	69.5
N381, N382	55.4	55.2	43.6	59.5	52.5
*8920, 8921 Y655(RH)	57.0	57.0	44.3	61.0	53.0
*6714, 6715, 6716, 6717	78.9	78.6	60.8	85.0	77.0
*Y643, Y644 Y645	70.0	69.5	56.4	75.5	71.0
*Y653, Z2	65.8	65.6	53.3	70.0	67.0
N383, N384, N385	71.9	71.7	57.4	77.5	73.0
N386, N387	67.0	66.7	52.2	72.0	64.0
*7604, 7605, Y654	71.9	71.9	57.5	76.5	72.0
*7622, 7623	67.8	67.6	51.4	72.5	66.0
*Y176, Y177, Y178, Y179	75.9	75.5	61.8	80.0	77.0
N388, N389	69.5	--	54.1	74.0	68.0

(small fibropapilloma present in the dorsal corner of the left eye. Photo by Carl Lawrence.)

*7 of the 12 turtles (58%) captured were tag resightings.
Seawater temperature - Nearshore 22°C
Offshore 25°C

VISUAL CENSUS
OF THE
GREEN SEA TURTLE (CHELONIA MYDAS)
IN THE HILO AREA.

June 15 - July 13, 1990

S. M. West (stephanie)
S. Haggerty (Summer)
S. E. Ferrell (Sarah)

INTRODUCTION

There are currently seven recognized species of sea turtles in the world today: the green sea turtle, the loggerhead, the hawksbill, the flatback, the leatherback, the olive (Pacific) ridley, and Kemp's (Atlantic) ridley.

Off the coast of the big island of Hawaii Chelonia mydas, the green sea turtle, is currently under observation by biologists and ecologists alike. This is due to its recent rapid reduction in population size as a result of intentional and accidental turtle deaths.

Between the dates of June 15, 1990 and July 13, 1990 a visual census of the North Hilo Coast of Hawaii was conducted. Green sea turtles were observed and recorded from designated shoreline sites ranging from Leleiwi Point to the east side of the Hilo Bay breakwater. Data were also collected within Hilo Bay itself using visual censusing while kayaking three established transect lines. The turtles observed in both experimental areas were classified as to size, presence of tumors, and behavior patterns.

METHODS AND MATERIALS

The shoreline census of the green sea turtle was conducted off the North Hilo Coast from Leleiwi Point to the outside edge of the Hilo Breakwater. The shoreline was divided into thirteen adjoining half-kilometer sites (see Diagram 1). Each site was surveyed by three students from the UHH Marine Options Program for four weeks, one to two days per week. Students used 7x35 or 8x25 strength binoculars for two to four hours per observational day, noting behavior and any physical aberrations. Individual green sea turtles were delineated according to temporal and spatial criteria (Balazs, May 1990).

The kayak census of Hilo Bay was taken over three established transect lines: Bayfront, Cocoanut Island, Breakwater (see Diagram 2). Transects were followed by two students once a week for approximately two to three hours. Turtle locations along the transects were noted, as were behavior patterns and presence of tumors. Bayfront and Breakwater transects were run at a lower frequency due to high wave action and lack of time.

Weather conditions including sun glare and cloud cover were noted, as were time of day and tidal changes. The turtles seem to prefer feeding at lower tides when the algae is in shallower water. Transportation difficulties prevented the observers from always censusing at optimal hours. Number of observers and individual skill levels were also taken into consideration. Sites 7 and 8 were not censused because they were surrounded by private property. All data were logged onto a Lotus 123 spreadsheet.

RESULTS

Turtles observed in the shoreline census are indicated on Graph 1 which is divided into the thirteen experimental sites (see Graph 1). These raw data combined with the amount of time spent at each site indicate the number of turtles seen per person hour (see Table 1). A person hour is defined to be the amount of time one surveyor spends looking in one area of turtles. If more than one observer is observing the same area--and essentially the same turtles--at the same time, turtles are counted per one person hour. Mean turtles seen per person hour per shoreline site are indicated on Graph 2.

Mean turtles observed during Hilo Bay kayak transects are presented on Graph 3. All turtles sighted within the bay were found along the Cocoanut Island transect.

Both turtles seen in Hilo Bay and one of the turtles seen at Site 3 all appeared to have some sort of tumorous growths on their heads.

DISCUSSION

The observational data seem to indicate a general trend of higher mean turtle densities further from Hilo Bay (see Graph 2). Within Hilo Bay itself, only two turtles were spotted during the entire research session. Several hypotheses could be proposed to interpret this trend. One hypothesis relates to the major component of the diet of the local green sea turtle: Pterocladia. Pterocladia, a red algae, thrives in the well-aerated breaking water of the rocky coastlines. The presence of nutrient-rich fresh spring water in these areas seems to enhance the algae's growth. Two of the sites under observation, Site 3 and Site 10, are known to have such springs (see Diagram 1). Peaks were noted in turtle densities at these areas, possibly supporting this hypothesis (see Graph 2). Hilo Bay also contains such a spring in the area of Cocoanut Island. However, because of the breakwater, the water in the bay is poorly circulated, poorly aerated, and possibly polluted. This could explain the low turtle densities within the bay. Until an aerial infrared photograph of this coastal area can be created, no definite correlation between turtle density, presence of springs, and diet can be made. The extent of the red algae cover could be ascertained through the use of SCUBA gear, but the high wave energy of the area prohibits any extensive diving.

Another hypothesis which could be used to explain these data involves human disturbances. High levels of arsenic in Hilo Bay and the presence of a sewage treatment plant on Puhi Bay could explain the low turtle densities in the bay and at Sites 12 and 13. Also noted were lower turtle densities in areas of human activity such as fishing, swimming, and heavy boating. Sites 4, 5, and 9 are all heavily populated beach areas, and are all areas of low turtle densities. The inaccessibility of Sites 1 and 3 could therefore contribute to their higher turtle densities. Site 2 is an area of low wave energy with a natural pool, and is

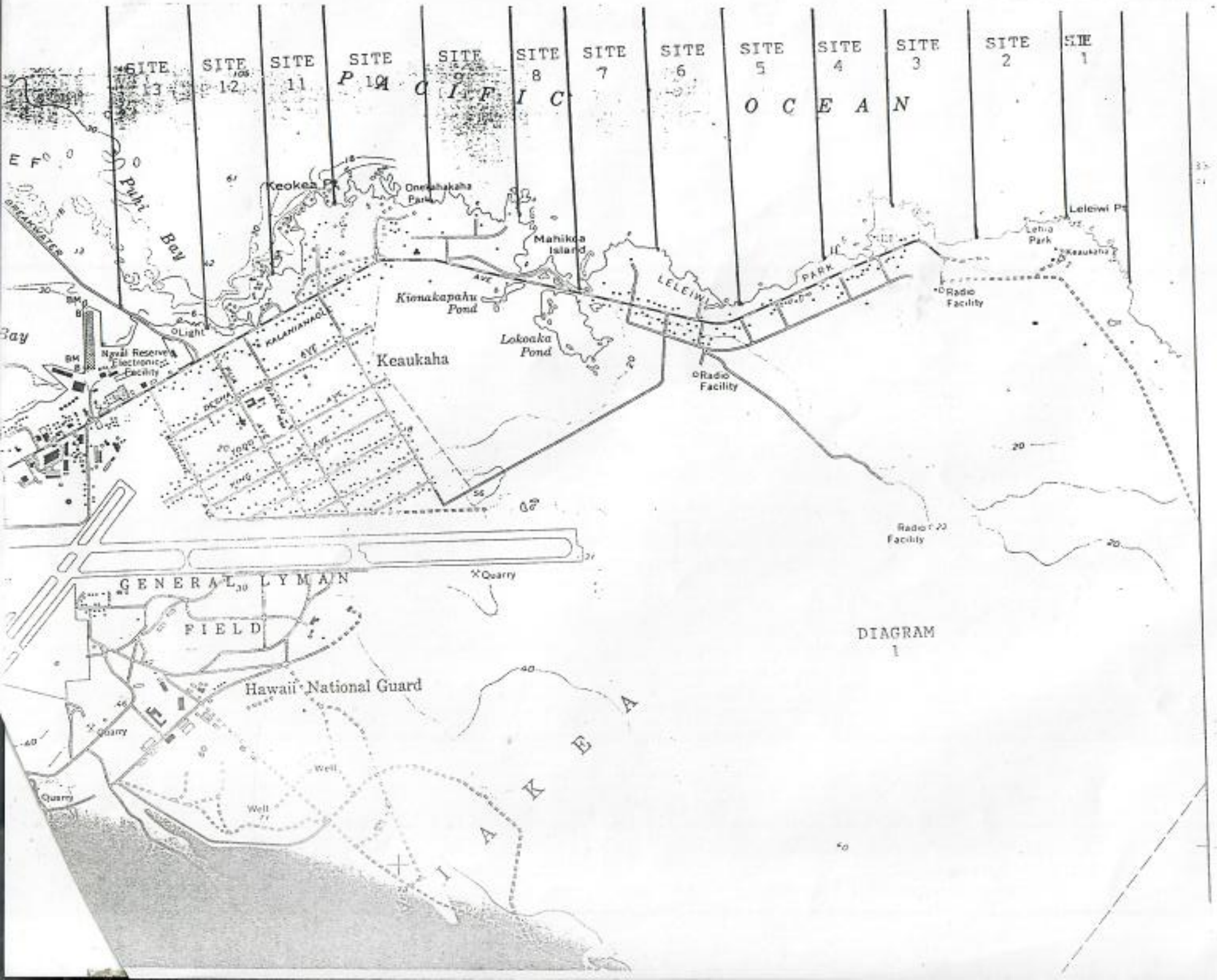
a popular camping spot.

Finally, such factors as weather, tidal conditions, time of day, condition of seas, experience of observers, and factors beyond experimental control could also have an effect on turtle densities in the areas under observation.

The tumors noted on three of the observed turtles, two in Hilo Bay and one at Site 3 (see Diagrams 1 and 2), are classified by George Balazs and others as growths known as fibropapillomas. The cause of these growths has as yet been undetermined, but there are several theories. One such theory blames a parasite, another blames pollution, while yet others name viruses or cancers as the culprit. There is currently a theory that the cause is something resembling the human AIDS virus; something which weakens the immune system of the turtles. If this is so, any slight injury, such as a spear wound, or infection, such as a cold, could cause the growth of the tumors. Without a strong immune system to combat the illness, the tumors grow until they occlude the eyes, render flippers inoperable, and may eventually suffocate the victim or in other ways prove fatal.

CONCLUSION

Estimates of Green Sea Turtle density in the coastal waters of Hilo provide a foundation for further research in this area. Compared to the more heavily researched areas of Punaluu and Kona, the Hilo shoreline has had little attention. Due to the recent decline in local turtle populations, noted by fishermen and conservationists, this census will hopefully be the first of many. These censuses will provide valuable data for future conservation efforts to save this endangered species.


SITE 13
SITE 12
SITE 11
SITE 10
SITE 9
SITE 8
SITE 7
SITE 6
SITE 5
SITE 4
SITE 3
SITE 2
SITE 1
PACIFIC OCEAN
Puhi Bay
Keokea Pt.
Onekahakaha Park
Mahikoa Island
Kienakapahu Pond
Lokoaka Pond
Keaukaha
LELEIWI PARK
Leleiwi Pt.
Lehia Park
Keaukaha
Radio Facility
Light
Naval Reserve Electronics Facility
KALANIANAOLE AVE
GENERAL LYMAN FIELD
Hawaii National Guard
Quarry
Well
DIAGRAM 1

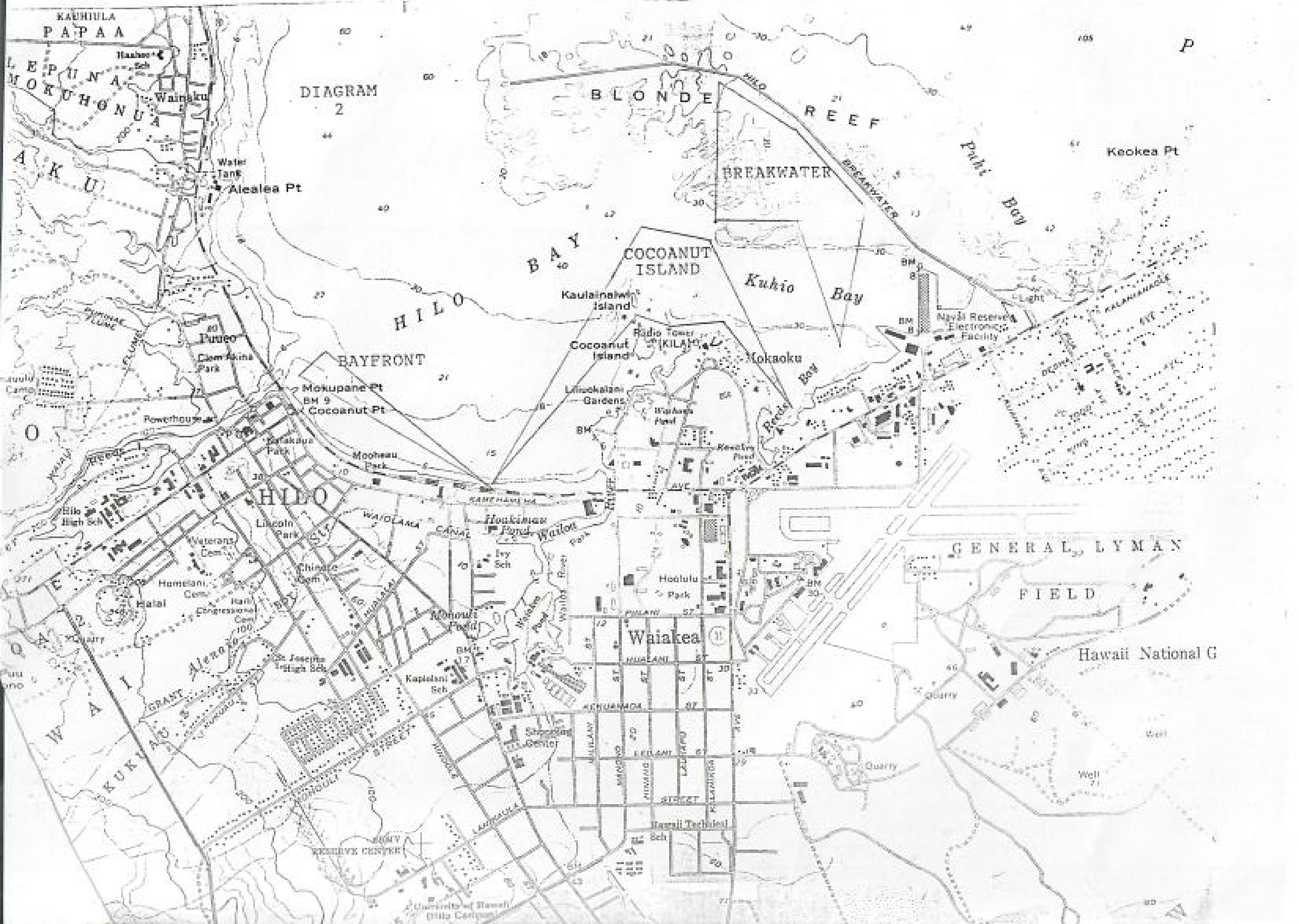


DIAGRAM
2
HILO BAY
BLONDE REEF
BREAKWATER
COCOANUT ISLAND
Kuhio Bay
Pahi Bay
Keokea Pt
Alealea Pt
Mokupane Pt
Cocoanut Pt
BAYFRONT
Kaulainaiwi Island
Cocoanut Island
Radio Tower (KILA)
Mokaoku
Liliuokalani Gardens
Naval Reserve Electronic Facility
Light
HILO
Hilo High Sch
Lincoln Park
Veterans Cem
Chinese Cem
Homelani Cem
Haili Congregational Cem
Halai
Quarry
St Josephs High Sch
Kapiolani Sch
Ivy Sch
Shopping Center
Waiakea
Hoolulu Park
Hawaii Technical Sch
GENERAL LYMAN FIELD
Hawaii National G
Quarry
Well
Powerhouse
Puueo
Wainaku
Water Tank
Mooheau Park
Kalakaua Park
Houkimau Pond
Wailoa
Waiakea Pond
Reeds Bay
Reeds Pond
Wailoa River
KAMEHAMEHA AVE
KALANIANAOLE AVE
PAPAA
MOKUHONUA
WAIAKEA
KAUHIULA
FLUME
ALENAIO
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HUALANI ST
KILAUEA
KINOOLE
KAPIOLANI
WAIANUENUE
PONAHAWAI
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KILAUEA AVE
ANUENUE
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Hawaii
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GRANT
HAILI
WAIOLAMA CANAL
MANONO ST
KALANIKOA
LAUHANA
KEAWE
LIHIWAI
KOMOHANA
AUPUNI
MOHOULI
HINANO
KALANIKOA
AMFV RESERVE CENTER
University of Hawaii (Hilo Campus)

TABLE 1

Observation Summary
Turtles per Person Hour

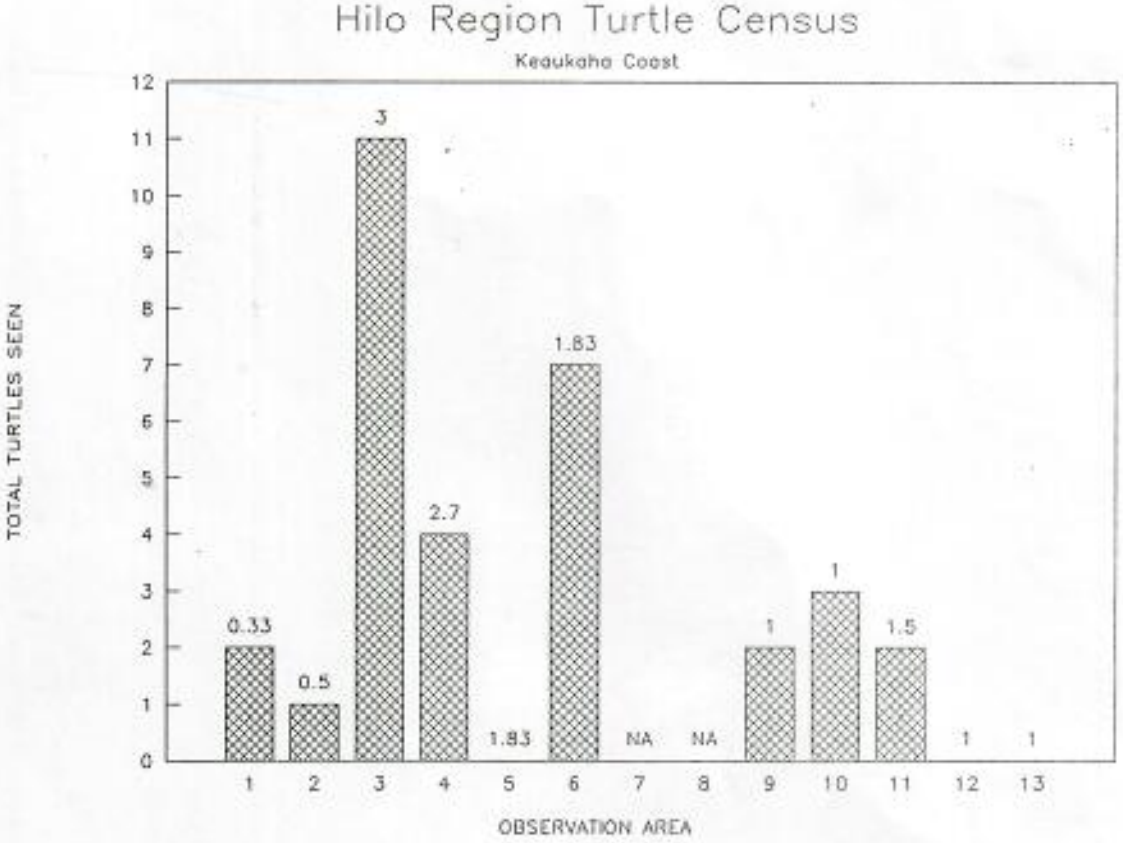
Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
6.1	2.0	9.6	2.7	0.0	2.4
		1.3	0.0	0.0	5.0
		1.5	1.7		

Area 7	Area 8	Area 9	Area 10	Area 11	Area 12	Area 13
NA	NA	2.0	3.0	1.3	0.0	0.0

Observation Summary
Mean Turtles per Person Hour

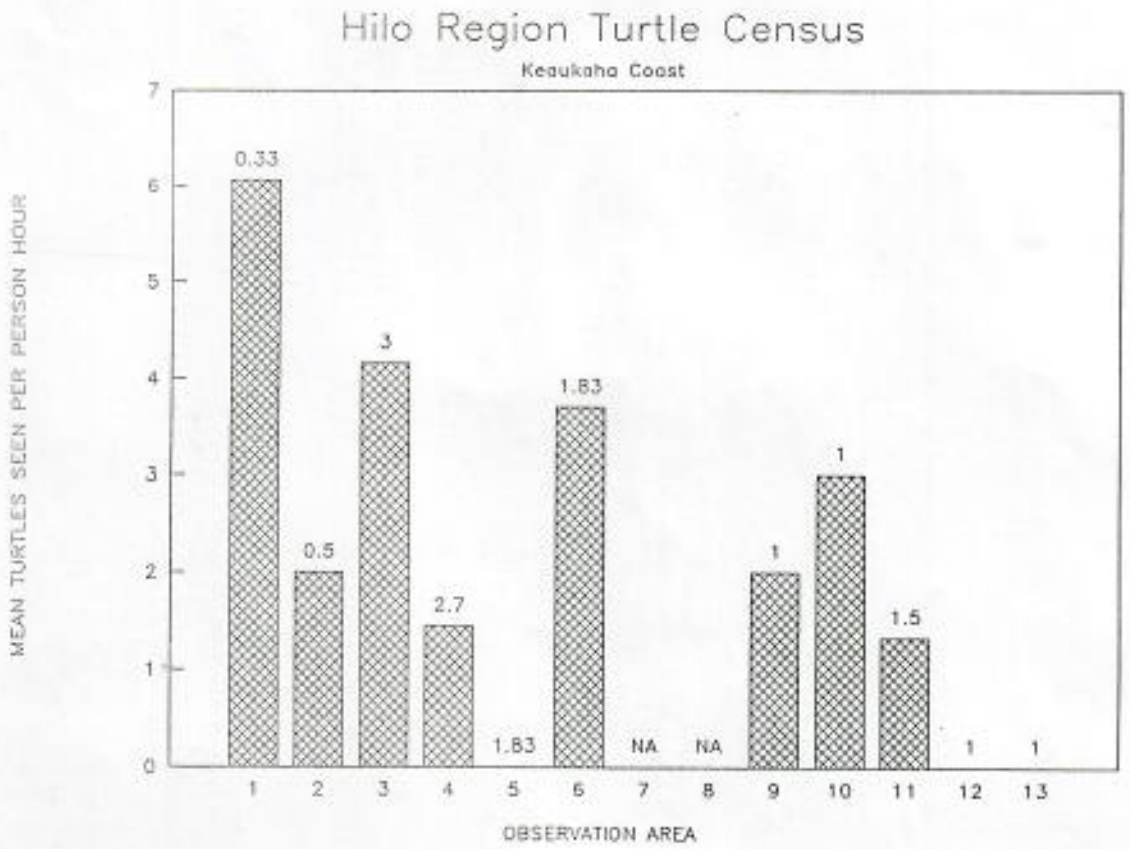
Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
6.1	2.0	4.2	1.4	0.0	3.7

Area 7	Area 8	Area 9	Area 10	Area 11	Area 12	Area 13
NA	NA	2.0	3.0	1.3	0.0	0.0



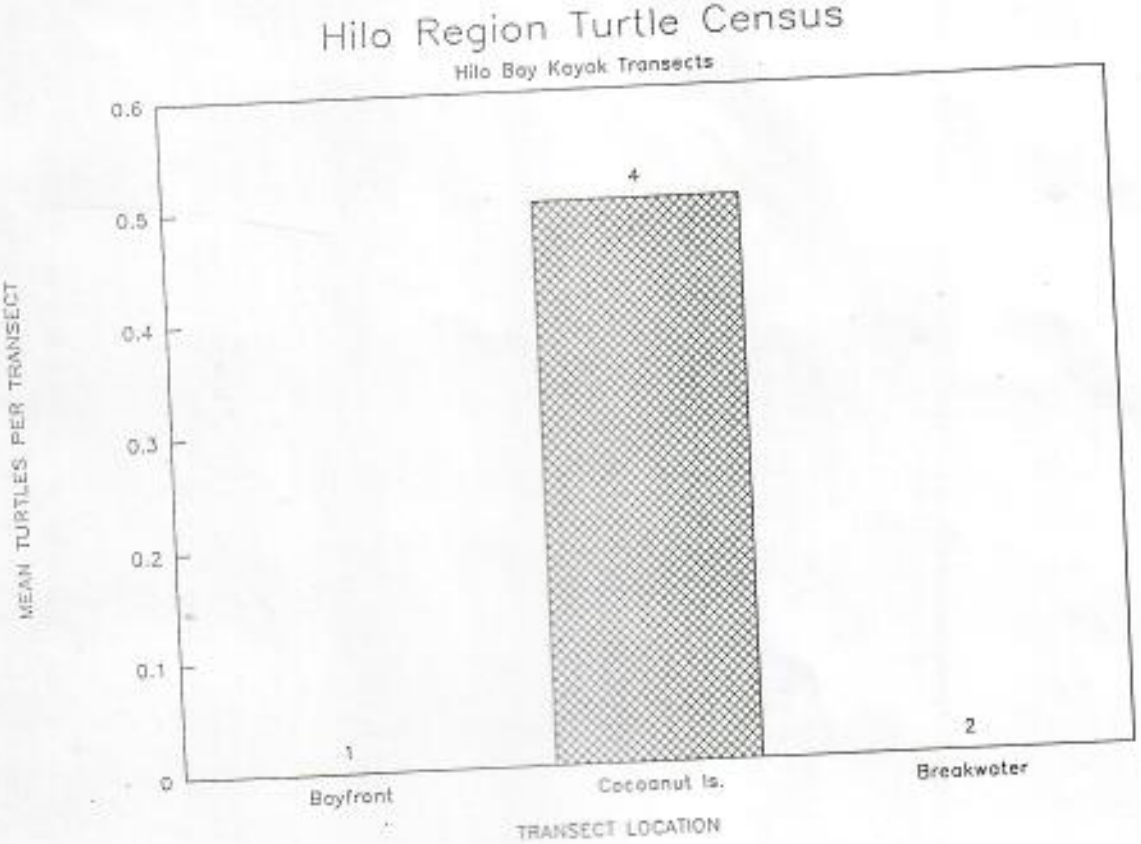
GRAPH 1:

Graph 1 displays the total number of Green Sea Turtles observed at each of the thirteen experimental sites along the North Hilo Coast. The number at the top of each bar indicates the amount of time, in hours, spent at each site. Data from sites 7 and 8 are not available as these sites were inaccessible.



GRAPH 2:

Graph 2 displays the average number of Green Sea Turtles observed per person hour at each of the thirteen experimental sites along the North Hilo Coast. The number at the top of each bar indicates the amount of time, in hours, spent at each site. Data from sites 7 and 8 are not available as these sites were inaccessible.



GRAPH 3:
Graph 3 displays the average number of Green Sea Turtles observed per transect within Hilo Bay. The number at the top of each bar indicates the number of times each transect was run.

ACKNOWLEDGEMENTS

We would like to thank the following people for their help and support: George Balazs of the National Marine Fisheries Service, Dr. Leon Hallacher as our advisor, and Dr. Walter Dudley for his assistance on the Lotus 123. Special thanks to John Coney for his time and patience, J. Watson Brown for her enthusiasm and support, and C.W. Smith for his first-hand accounts of the majestic Green Sea Turtle.

August 23, 1990

Dear Georg Balazs:

Enclosed please find the Green Sea Turtle slides you so kindly lent us for our report. Unfortunately, I was unable to have copies made from them, as the copyright is still protected (See enclosed letter). Would it be possible for you to have copies made from them for us, if you found the time? We would gladly reimburse you for 2 sets of slides and 3 sets of pictures, if it's not too inconvenient. If this is too much trouble, we totally understand and thank you again for their use.

Also, please find enclosed a copy of the written report completed by Stephanie, Summer, and myself, as well

photos I took during the Arabia turtle tagging trip.

Thank you again for all of your help and patience.

Sincerely,

Sarah A. Haggerty
M.U. Box 228
Bowdoin College
Brunswick, Maine 04011

University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
DIVISION OF NATURAL SCIENCES

December 28, 1990

Dr. George Boehlert, Director
Honolulu Laboratory
National Marine Fisheries Service
2570 Dole Street
Honolulu, HI 96822

Dear Dr. Boehlert:

Having recently returned from another highly successful turtle tagging expedition with George Balazs, we felt that you might wish to know how much these cooperative projects have meant to our program, institution, and the generation of students who have been privileged to participate.

For almost twenty years, the UHH Marine Option Program has worked with George Balazs in his effort to learn more about the endangered green sea turtle, *Chelonia midas*. Our work with George has focused on the turtle population at Punaluu Beach Park on the southern coast of the Big Island, and over the years we have helped him capture and tag 134 turtles at Punaluu. A large percentage of these animals have been recaptured and have provided extensive data on movements and growth rates.

We believe that this cooperative effort has been and will continue to be extremely valuable both to the National Marine Fisheries Service and to the students of the Marine Option Program. From our prospective, this interaction provides some of UH Hilo's more promising undergraduates with hands-on research experience working on an important investigation with national and international implications. In the process they learn much about the general biology of sea turtles, and many details of the natural history of Hawaiian green sea turtles. From the vantage point of the NMFS, we believe our student volunteers represent an extremely cost-effective way for George to acquire valuable data on one of the Big Island's green sea turtle populations. Clearly, had this cooperative effort not been initiated, the NMFS would know significantly less about the Hawaiian green sea turtle than it does at present.

523 W. LANIKAULA STREET
HILO, HAWAII 96720-4091 • TEL: (808) 933-3383

Another aspect of our cooperative work has been public education. Literally hundreds of residents and visitors have visited Punaluu during our tagging projects. They have been given printed literature on sea turtles and on our capture and release studies. Most have asked questions and taken photos. This direct contact with the public has given them a sense of the importance of the research work done by the National Marine Fisheries Service in protecting endangered species.

In conclusion, we earnestly hope that you will continue to lend your support to this valuable cooperative effort. Together we can continue to work to insure the preservation of Hawaii's green sea turtles. Thank you.

Sincerely,

Leon E. Hallacher
Professor of Biology

Walter C. Dudley, Jr.
Professor of Oceanography

cc George Balazs, NMFS Honolulu Laboratory

28 Jun 91

Hawaii Tribune Herald

...ing. 965-87.. Jerr

SPECIAL Sale. A kinds of birds, fishes, rabbits, turtle, parrot, cages, aquarium, pet supplies. 959-8508.

Turtle Ranch, over 30 turtles, 10 hatchlings, all on endangered species list, pen included. $1000. 889-5625.

23 Livestock

$500 reward for information leading to the location of a Brangus heifer lost in Paauilo ...

...ith's Silva | at. & furn., ...othes, ...u Vill. | ...le Est. | ... Sale. ... St. ...inette Goods. ..., 8:00 - | ...6,

...sal | Farm. impler... Plow, 2 etc. 1-5. | Ford Die... 3 in 1 f... Excelle... $12,000. | Metal heav... type | New...

George,

A student brought this to me. Was in Sunday's Hawaii Tribune Herald. This ain't legal is it? Thought you ought to know.

Cheers,

Z

GHP – DO

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

February 8, 1991 F/SWC2:GWB

Drs. Leon E. Hallacher
and Walter C. Dudley, Jr.
College of Arts and Sciences
University of Hawaii at Hilo
523 W. Lanikaula Street
Hilo, Hawaii 96720-4091

Dear Drs. Hallacher and Dudley:

My thanks for your letter of 28 December. I fully agree with your assessment of the benefits of our cooperative programs. Lacking a permanent presence on the Big Island, the NMFS conducts most work there on an ad hoc basis. To date, the marine turtle research effort has probably been the best represented NMFS program, in no small part due to cooperators such as the UHH MOP. We fully intend to continue this cooperative arrangement, and I am personally pleased that it is beneficial on your side. We interact extensively with MOP at the Manoa campus as well, and find the program to be very cost-effective for our work, while helping with the educational progress of certain students. I thank you and all the participants for your program's assistance over the years.

Sincerely yours,

George W. Boehlert
Director, Honolulu Laboratory

University of Hawaii
Sea Grant College
Program

MAKAI

"Toward the Sea"

Vol. 6, No. 10
October
1984

Learning About Green Turtle's "Lifestyles"

by Rick Klemm

(Editor's note: A shorter version of this article appeared in the September 1984 issue of Manulani, *the inflight magazine of MidPacific Air.)*

Punaluu is a sheltered cove with a black sand beach located on the southeastern shore of the Big Island of Hawaii, roughly halfway between the villages of Naalehu and Pahala. The cove's name means "diving spring," and long ago natives dove into the cove with gourds to obtain water from an underwater spring.

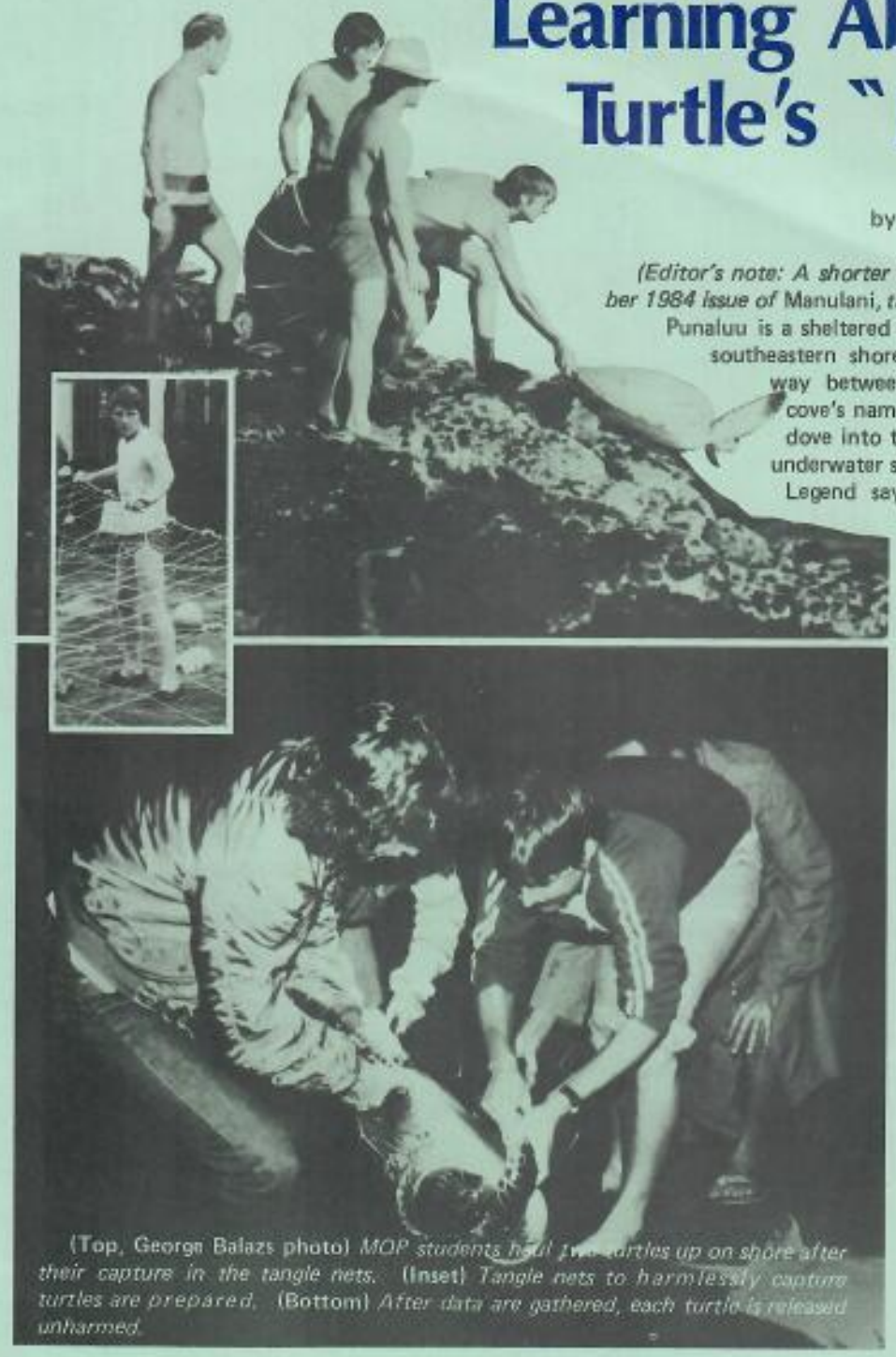
Legend says that during some stormy weather when the natives could not dive for water, a pair of supernatural turtles, a mother and father, came to Punaluu. The mother deposited into the sand an "egg," which looked like a piece of kauila wood. From the egg hatched a daughter turtle named Kauila. In a spring dug earlier by her mother and father, Kauila lived and grew. Out of water she could assume human form and played with the children. The people loved Kauila because she watched after the children as they fished in the spring and because the spring gave them drinking water.

Today, the spring is just a scenic spot behind the black sand beach, and no one dives into the ocean to obtain drinking water from the underwater spring anymore. But the images of diving and turtles have been brought to life in recent years by scientific researchers.

On a late Friday afternoon in February George Balazs, a wildlife biologist with the National Marine Fisheries Service in Honolulu, and a team of students from the Marine Option Program at the University of Hawaii-Hilo set up a weekend turtle research operation at a county park pavilion near the beach.

At the center of the beach an algae-

(Continued on page 2)



(Top, George Balazs photo) *MOP students haul two turtles up on shore after their capture in the tangle nets.* (Inset) *Tangle nets to harmlessly capture turtles are prepared.* (Bottom) *After data are gathered, each turtle is released unharmed.*

Green Turtle's "Lifestyles" *(Continued from page 1)*

covered lava rock outcropping is rhythmically bathed in the high-tide surf. Out of the corner of one eye I see a green flash, the color of a young coconut in water, off to my right on the oceanside of the outcropping. As my eyes shift for a better look, the flash disappears.

"You probably saw a green turtle," Balazs says. He explains that they come inshore to feed on limu (algae) at high tide, when water covers the rocks. In between high tides the turtles find holes and cracks further offshore in which to sleep and rest.

Balazs uses this knowledge of the Hawaiian green turtles' feeding and resting habits to set traps for their capture. With help from some of the MOP students, two tangle nets are laid across "traffic lanes" within the cove between feeding and resting grounds.

Balazs has been studying Hawaiian green turtles for 12 years. He was attracted to Punaluu in 1974 when a local couple discovered a clutch of turtle eggs on the beach near their concession. The clutch eventually yielded about 125 hawksbill turtles. Balazs found the cove at Punaluu and neighboring coastal waters to be numerously populated with green turtles. Possibly because of the presence of a particular limu and other underwater features, this area along the Kau coast may be one of the best feeding grounds for green turtles in the main Hawaiian islands.

After dark, MOP students Bill Harlan and Chris Doll take the first 2-hour watch to periodically scan the net floats for signs of captured turtles. A short time later, Robert "Punchy" Kim, owner of Scuba Air Fills in Hilo, arrives. Kim is a long time community advisor to the UH-Hilo Marine Option Program.

"It's a long shot tonight for catching turtles," Kim says, pointing to the full moon on the eastern horizon.

With funding from the UH Sea Grant College Program, Balazs has been capturing turtles at Punaluu since late last year to learn more about their feeding habits and growth rates. Growth rates among green turtles along the Kau coast appear to be more rapid than among turtles elsewhere in the main islands. Because of faster growth rates, Balazs thinks the Kau green turtle population may make up a large proportion of the breeding colony at French Frigate Shoals in the Northwestern Hawaiian Islands. It is believed that all Hawaiian green turtles go there to breed.

A couple of young fellows from Pahala waiting for a party to begin down the beach stroll over to find out what the research team is doing. When they find out, one says, "You guys should go to Turtle Bay — choked with turtles. Guys shoot'em with rifles."

Later Balazs says he knows the spot, about 20 minutes walk north up the coast. This is the first he has heard of rifles being used there to kill turtles, an illegal activity under any circumstance. He adds that shooting turtles is not uncommon in other parts of the island chain. Another method he is familiar with involves swinging a bamboo pole with a heavy line and treble hook back and forth until a turtle is snagged in one of its fins. On shore the snagged turtle is slain and dressed on the spot, as evidenced by discarded carcass remains.

Balazs and MOP students inspect a turtle.

Gathering data about the Hawaiian green turtles is essential, Balazs thinks, if they are to survive into the future. They are not an endangered species, but they are threatened, which means that any downward change in their population might put them on the brink of extinction. As a result, they are protected by federal and state laws. He believes that through knowledge and greater understanding the green turtles can be restored and properly managed to their benefit and ours.

At about 10:00 p.m. the research team makes its first "capture." Two Filipino fishermen from Pahala bring a small turtle they captured while fishing with gillnets a short distance down the coast. They had talked about the turtle research with

(Continued on page 5)

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by Peter J. Rappa

Hawaii's governmental budget is appropriated in 2-year cycles. Biennial budgets are prepared during odd-numbered years. During even-numbered years, such as this year, supplemental budgets are prepared and biennial budgets are amended.

The supplemental budget presented here is divided into the capital improvement and operating budget . The capital improvement budget is used for such projects as constructing new buildings and refurbishing existing ones. The operating budgets funds salaries and equipment used to carry out various state functions.

In this installment of Marine Bills Digest the capital improvement portion of the budget will be explored. Detailed here will be only those projects that were added or deleted during the past session.

CAPITAL IMPROVEMENT BUDGET

ECONOMIC DEVELOPMENT

Aloha Tower Development (PED 142, LH 009) $33,260,000 (Revenue Bonds); line item A.16B; expending agency: Department of Planning and Economic Development.

Plan, design, and construction of improvements and facilities for the redevelopment of the Aloha Tower Complex. These funds are to be used for the public participation portion of the redevelopment of this historic landmark.

TRANSPORTATION FACILITIES

Improvements to the facilities of Piers 19 to 34 at Honolulu Harbor (TRN 301, J 02) $1,443,000 (special funds) $135,000 (revenue bond); line item C.19; expending agency: Department of Transportation.

A change in funding for the design phase of the improvements to piers 19 to 34 in Honolulu Harbor from special funds to revenue bonds totaling $135,000.

Waterfront Redevelopment. (TRN 301, J 05) $150,000 (revenue bonds); line item C.22; expending agency: Department of Transportation.

Deleted the $1,481,000 construction portion of this project to redevelop existing facilities between piers 2 and 18.

Fireboat for Honolulu Harbor (TRN 301, J 29) $130,000 (special funds); line item C.24B; expending agency: Department of Transportation.

Replacement of existing fireboat for Honolulu Harbor.

Hilo Harbor Improvements, Hawaii (TRN 311, L 01) $325,000 (revenue bonds); line item C.27; expending agency: Department of Transportation.

Change in the method of funding from special funds to revenue bonds for improvement to Hilo Harbor.

Kahului Harbor Backup Improvements, Maui (TRN 331, M 01) $162,000 (revenue bonds); line item C.28; expending agency: Department of Transportation.

Change in the method of funding from special funds to revenue bonds for improvement to Kahului Harbor.

Container Facilities at Kahului Harbor (TRN 331, M 06) $1,810,000 (revenue bonds); line item C.29; expending agency: Department of Transportation.

Change in the method of funding for the design portion of the construction of pier facilities at Kahului Harbor from special funds to revenue bonds, a total of $120,000.

Statewide Commercial Harbor Sewer System Improvements (TRN 395, I 04) $368,000 (special funds) $310,000 (revenue bonds); line item C.34; expending agency: Department of Transportation.

Change in method of funding of $310,000 from special funds to revenue bonds for improvement to sewer facilities at Honolulu Harbor.

ENVIRONMENTAL PROTECTION

Investigation and Development of Desalting Plant Technology (LNR 404, G91) $100,000 (general obligation bonds); line item D.2A; expending agency: Department of Land and Natural Resources.

Plans, land acquisition and construction of a one million gallon a day desalting demonstration plant.

Niumalu Shore Protection, Kausi (TRN 903, 10 K) $35,000 (general obligation bonds); line item D.2B; expending

LLS DIGEST

agency: Department of Transportation.

Design and construction of a revetment for shoreline protection at Niumalu, Kauai.

Wailoa River and Hilo Bay area (TRN 903, 17 H) $150,000 (general obligation bonds); line item D.2C; expending agency: Department of Transportation.

Dredging and other improvements at Wailua River and Hilo Bay area.

FORMAL OBLIGATION

Edmondson Hall, Explosion Repairs (UOH 100, O 73) $480,000 (general obligation bonds); line item G.40A; expending agency: Department of Accounting and General Services.

Repairs to the University of Hawaii at Manoa's Edmondson Hall, home of the Zoology Department and Cooperative Fishery Unit.

HIMB, Coconut Island, New Electrical System (UOH 102, I 25) $1,053,000 (general obligation bonds); line item G.40C; expending agency: Department of Accounting and General Services.

Design and construction of a new electrical system for the Hawaii Institute of Marine Biology, on Coconut Island, Kaneohe Bay.

CULTURE AND RECREATION

Hawaiian Island Aquarium (UOH 881, LH 005) $300,000 (general obligation bonds); line item H.4A; expending agency: Department of Accounting and General Services.

Program and schematic design for a new Hawaiian Islands aquarium including exhibits, classroom, and related facilities.

Ukumehane-Kaanapali Wayside and Beautification (LNR 806, F 81) $110,000 (general obligation bonds); line item H.13A; expending agency: Department of Land and Natural Resources.

Incremental development of wayside parks and beautification on highway from Ukumehane to Kaanapali.

Malaekahana Beach Park (LNR 806, H 70) $150,000 (general obligation bonds); line item H.17A; expending agency: Department of Land and Natural Resources.

Planning funds for refining or amending master plan, pre-land acquisition studies, land acquisition research, interpretive planning and studies, and related work for North Shore Area Park.

Makena-La Perouse State Park, Maui (LNR 806, LSO 007) $1,250,000 (general obligation bonds); line item H.18A; expending agency: Department of Land and Natural Resources.

Land acquisition for Makena-La Perouse State Park; may be used to match other non-state funds.

Nawiliwili Boat Harbor, Kauai (TRN 801, 01 K) $70,000 (general obligation bonds); line item H.18B; expending agency: Department of Transportation.

Berthing facilities, loading dock, paving, utilities, and other improvements.

Lanai Boat Harbor (TRN 801, 01 M) $380,000 (general obligation bonds); line item H.18C; expending agency: Department of Transportation.

Improvement to comfort station, dredging, fill, revetment, paving, and other improvements.

Lahaina Boat Harbor, Maui (TRN 801, 03 M) $240,000 (general obligation bonds); line item H.18D; expending agency: Department of Transportation.

Improvements to Lahaina Boat Harbor including offices and dredging.

Statewide Boat Launching Facilities Program (TRN 801, 03 S) $210,000 (general obligation bonds); line item H.18E; expending agency: Department of Transportation.

Planning and constructing boat launching facilities statewide at existing and new sites. This project is deemed necessary to qualify for federal aid financing.

Kualana Boat Launching Facility, Hawaii (TRN 808, 18 H) $50,000 (general obligation bonds); line item H.18F; expending agency: Department of Transportation.

Provide in-kind improvement for lease rental of lands.

GOVERNMENT-WIDE SUPPORT

Kawainui Marsh, Oahu (LNR 101, LH 007) $5,730,000 (general obligation bonds); line item K.3A; expending agency: Department of Land and Natural Resources.

Acquisition of land and water rights at Kawainui Marsh, Oahu. □

Green Turtle's "Lifestyles" (Continued from page 2)

Balazs carefully takes a blood sample from neck of a turtle.

MOP student Diane Mazarakis earlier in the evening. The "minnow" is placed on its back in a holding area until morning. Doing this with all the captured turtles prevents their escape and keeps them from injuring themselves and each other.

Thirty minutes later, the research team makes a real capture – a large turtle, weighing about 60 pounds, and another "minnow," about 30 pounds. The biggest capture comes around 2:05 a.m. when Chris Doll and Balazs bring in a third "minnow" and a large turtle, estimated to weigh 150 pounds. At the morning weigh-in, another 52 pounds will be added to that figure.

Five turtles are captured that night in the tangle nets, in addition to the one donated by the fishermen. The last capture is made sometime between 4:00 and 6:00 a.m. by the last watch and goes unnoticed by the rest of the fast asleep research team.

Not much is known about the feeding habits of green turtles, Balazs says, because most research has been carried out at breeding and basking sites where turtles can be more easily studied. He thinks the turtles at Punaluu like to feed on a red limu with the scientific name of *Pterocladia capillacea*. It has no Hawaiian name that he knows of. This limu thrives at Punaluu where freshwater percolates through lava rock into the ocean. Balazs theorizes that the freshwater may be adding nutrients to the ocean water which help the red limu to grow abundantly.

In 1982, 1,300 hatchling green turtles were tagged at French Frigate Shoals. Balazs expects some of these hatchlings to settle down in feeding areas along the Kau coast. If he is lucky he may capture a few during his 12-month study at Punaluu.

After breakfast, Balazs and the students prepare to take measurements and blood samples from the turtles, as well as to tag them. None of the captured turtles bears tags although one has a scar that suggests an earlier tagging.

Soon after they begin, it quickly becomes apparent why it will take them nearly all morning to finish their work: busloads of tourists and several local residents. Once they see the turtle research sign posted in front of the pavilion, they all come to see the turtles, to "talk story," to ask turtle questions, and to get pictures of, with, and amid the creatures.

Balazs and the students graciously accept these interruptions, enriching the sightseers' knowledge of both green turtles and Hawaii.

The first thing Balazs does is to "staple" a corrosion resistant ID tag on the back edge close to the body of each front fin. Large turtles get tags in the rear fins as well. Then he and the students measure the shell and head and weigh the turtle.

Finally, Balazs takes a blood sample from the turtle's neck, its head covered with a towel to keep the turtle calm. The blood sample will be sent to the mainland and analyzed to determine the turtle's sex. This is one operation Balazs tries to avoid doing when visitors are around because they may misunderstand that what is being done is harmless to the animals.

When all data are gathered about each turtle, three or four MOP students carry it in an inner-tube rig to the ocean's edge and release it. As a surge comes in, the turtle rides it to slightly deeper water where it can "fly" away in a burst of speed. Balazs says that turtles can achieve short bursts of up to 25 miles per hour.

As the last turtle, the 202-pounder, swims to freedom, the cycle of capture and data gathering is ended. It will begin, again, later in the afternoon when Balazs and his crew will set a third tangle net for the next night of work.

And, later toward sunset, perhaps someone else will be standing on the beach near the limu-covered lava rock outcropping and see a flash of green, the color of a young coconut in water. Feeding time again. □

Turtle Research Postscript

In a telephone conversation, Balazs related that on his final research trip to Punaluu he witnessed the bloody, illegal capture of a tagged green turtle by three men in daylight on the beach. One of the reasons he originally chose to do field research at Punaluu was the unlikelihood of such poaching occurring in full view of the many tourists and residents who come here each day.

Having confirmed that poaching occurs at Punaluu, Balazs said that he must now treat the data he has gathered in the last year much differently. □

MARINE MISCELLANY

HO'ONANEA I KA EA KAI

Ho'onanea I Ka Ea Kai – Enjoy the Living Sea welcomes users of this brochure to the island of Hawaii, the Big Island, and guides users to selected coastal locations for the abundant ocean and coastal recreational opportunities available at them.

Visitors to the Big Island frequently think of it as an isle of volcanoes and macadamia nut and coffee plantations. The purpose of the brochure is to introduce visitors, including residents from elsewhere in the state, to the wealth of ocean recreational activities they can participate in during their stay on the Big Island. Twelve beach and park areas located along three coastal sections around the island are featured in the guide.

The 24-page color brochure was published by the University of Hawaii Sea Grant College Program and is a product of the Big Island Ocean Recreation and Tourism project. The initial printing was funded by the Hawaii Visitors Bureau and the Hawaii Department of Planning and Economic Development.

Each of the 12 beaches and park areas, such as Kealakekua Bay and Lapakahi State Historical Park, is described in terms of historical and other background information, site features and suitable recreational activities, and facilities such as restrooms, showers, and parking. Color maps and travel instructions are provided, and photographs of sites and recreational activities accompany each narrative.

Additional information is included on geography and climate, water safety, dangerous marine organisms, conservation, and special events.

To obtain a copy send your request to Ocean Guide, University of Hawaii Sea Grant Extension, 1000 Pope Road, Room 213, Honolulu, HI 96822. For more information call Ray Tabata at 948-8191.

OCEAN RECREATION CLASSES

The Campus Center Board Outdoor Recreation Program at the University of Hawaii-Manoa offers the following noncredit ocean recreational courses for both students and nonstudents (nonstudents add $10 to fees listed). Register at the Ticket Desk, Room 212, at the Campus Center.

- Basic Sailing: $50; 1 to 6 p.m.; Session II, Saturdays, October 6 to November 3; Session III, Sundays, October 7 to November 4; Session IV, Sundays, November 11 to December 16.
- Advanced Sailing: $55; 1 to 6 p.m.; Saturdays, November 10 to December 15.
- Advanced Scuba: $60; 1 to 5 p.m.; Session II, Sundays, October 7 to October 28; Session III, Sundays, November 4 to December 2.
- Celestial Navigation: $65; 7 to 9:30 p.m.; Wednesdays, October 10 to November 28.

No classes are held on Thanksgiving weekend for courses extending through this holiday period. For more information on these and other recreational courses call **Athline Clark** at 948-6469.

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UHH Marine Option Program

Changing Tides

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Return Requested, Please Forward
University of Hawaii-Hilo
Marine Option Program
523 W. Lanikaula
Hilo, HI 96720

January
TGIF
Snorkel
Sailing

Febuary
TGIF
Fishing

A Special Thanks

Last summer while turtle tagging at Punaluu, a special couple approached the MOP staff and inquired what all the activity was about. Debbie and Rick Soehren from Sacramento, California were on the Big Island doing research for a guide on viewing Hawaiian birds. After hearing about the Marine Option Program, they expressed a desire to make a donation to help offset the cost of feeding hungry student volunteers. An unusually generous contribution from the Soehrens' arrived shortly thereafter. Their generosity helped provide the food for the November turtle tagging expedition. Debbie and Rick, thank you for your kokua. **Mahalo, nui loa,** from the staff and students of the UH-Hilo Marine Option Program.

***

A Synopsis of Some MOP Fall 1990 Activities

This semester has again been a busy one for UH-Hilo MOP. Although the weather often failed to cooperate, we were still out there doing what we do best; Doing It. The raindrops, called torrential by those uninitiated to East Hawaii and drizzle by those of us who have been here for a while, slackened long enough to get in a couple of great sailing and fishing sessions. You know it seems the MOPpers who sign up and come the first time always sign up again. Might we have something going here? Allright, so we had to cancel a couple of times due to atrocious weather. We've just picked some dates and we're working on agreeable conditions. Come on in and sign up.

Speaking of atrocious weather, turtle tagging on September 18 and 19 was canceled due to Hurricane Marie. Schedules were juggled and a replacement date was set for November 27 and 28. A tenacious crew of William Dana, Ronald Gabonia, Doug Poteet, Terry Reissen, Jim Synder, John Coney and myself left campus in a (torrential downpour-drizzle) reaching Punaluu about 11:00am. George Balazs, of the National Marine Fisheries Service, the authority on Hawaiian Green sea turtles arrived right after us inquiring, " What's for lunch! " After a round of " Dolphin Safe " tuna sandwiches it was time to hit the water. A new technique for capturing turtles, utilizing a seine net, was employed and by 13:30 seven turtles were patiently waiting on the beach to have their overall health checked, bellies measured and new license plates (tags) attached. A growing crowd of inquisitive tourists surveyed the action and kept up a steady stream of questions. As one woman remarked to her husband with drops of rain streaming off her chin " I've never had the opportunity to see anything like this in my life, and probably never will again. If you want to go back to the car, fine! I'm staying. " (he stayed too)

The second crew of turtle taggers, Lani Brewer, Clint Elliot, Jill Lippert, Sherri Miller, and Christi Wilcox, led by Doctors Dudley and Hallacher arrived around 17:00. After a quick review of our day's activities the decision was made to

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Changing Tides is a monthly news publication of the University of Hawaii at Hilo Marine Option Program (MOP). The opinions expressed herein are not necessarily those of MOP, or of UH-Hilo but those of the *Changing Tides* staff and contributors. *Changing Tides* welcomes any editorial contributions or comments. All articles received are edited for grammar and spelling only.

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recon a nearby cove for turtles that might have decided to bed down early. Although three were caught napping, two of them were still awake enough to escape the turtle researchers' grasp.

The next morning, although dawning gray, was interspersed with patches of blue. After a hearty breakfast of eggs, toast, fresh fruit, orange juice and coffee, impeccably prepared by Chef John Coney, the crew hit the beach. George Balazs gave the pre-mission briefing with valuable input from turtle catcher extraordinare " Willy " Dana. The seine net technique was employed again with good success, Several turtles were also captured by hand. By now you know the results, ten turtles on the beach patiently waiting to have their..... (please see related article by Lani Brewer)

Other aspects of marine research continued on through the semester unabated by the weather. Nothing short of small craft warnings kept the *Kaimi* and her fearless crew from the scheduled weekly sampling of water quality in Hilo Bay. Research also progressed on various organisms observed under high magnification provided by the SEM (Scanning Electron Microscope). (See related article by J.C.)

When I said earlier," we're doing what we do best." *Doing It*, I meant it! Stop by the MOP office and see what's going on. Quite possibly it's something you've always wanted to do. If you wait to read my synopsis at the end of next semester, you will have missed out on so much, so don't wait!

***

Summer Skill Projects Abound

by Leon E. Hallacher

In summing up this past summer's productivity vis-a-vie MOP Skill Projects, I can't help but think back to a line from the movie classic, *Butch Casidy and the Sundance Kid.* The Sundance Kid (Robert Redford) looks over at Butch Casidy (Paul Newman) and says," Who are those guys?", in reference to the juggernaught of lawmen doggedly tracking them down.

This summer, the lawmen were students from all over the mainland, their quarry was the MOP Skill Project, and they were relentless in pursuit of their quest. Fourteen students from five university campuses (University of California at Santa Cruz, Fairleigh Dickenson University, Colby College, Sierra College, and the University of Maine at Orono) enrolled in a special directed studies course entitled MOP Certificate Skill Project Investigations.

Sally Haggerty, Stephanie West, and Summer Ferrell were regularly seen kayaking and walking along the Hilo coastline as they worked on their project, *"Visual censusing of green sea turtles in the Hilo Bight."* Andee Morozowsky and Denise Ramick spent hours and hou bobbing in the waters of the Kapoho tidepools while they evaluated the *"Habitat utilization and territorial behavior of two species of damselfish."*

The largest project team consisted of five students; Beth Brandreth, Chris Burger, Terry Jones, Carl Lawrence, and Gina Rygle. They spent many days in the field working on their multidisciplinary study entitled, *"Biological and physical characterization of the reef flats at Kapoho."* Their efforts, as well as those of Andee and Denise, were effectively encapsulated in a fifteen minute video production by our own Michael Childers. The video, entitled *"Kapoho reef survey, Summer 1990"*, was yet another skill project completed by Mike.

In addition to field-oriented projects, a number of students took advantage of the UHH's transmission electron and scanning electron microscope facilities and the expert guidance of Dr. Don Hemmes to look at cellular structure in various mollusc species. Joe Rininger and Vicky Baldwin did separate but related projects respectively entitled, *"Microphotography of living dove shells (Collumbellidae)"* and *"Microphotography of living marine gastropods (Triphoridae)."* Shannon Erickson, utilizing SEM facilities, looked at cowrie mantle ultrastructure in her project entitled, *"Scanning electron microscopy of the outer surface of the cowrie mantle."*

The hard work put into these skill projects culminated in public presentations by each student at the First Annual UHH Summer Marine Science Skill Project Symposium. Faculty and students attending the Symposium were rewarded with excellent presentations and an entertaining video. All in all, it was a banner summer in regard to skill projects, and a pretty good start to UH Hilo's blossoming Summer Program in Marine Science.

***

The Perspective of a New Convert to Turtle Tagging

by Lani Brewer

Whitewater tumbling over my head, I made a quick grab for the dark, leathery turtle flipper beating beside me. Before the next wave set hit me I surfaced for a bit of air and rolled with the surprisingly powerful little creature. Gaining my footing somewhat on the slippery red limu covered reef, which the accosted turtle had previously been feasting upon, I managed to get the turtle under control enough to flag someone down for assistance. In no time, there was a group of about five other MOPpers who helped turn the turtle over and hoist him into the innertube raft. The excitement over, I noticed my elevated pulse and breathing rate as I watched the raft being dragged to the beach. Although the whole process took no longer than five minutes, the excitement of the experience was imprinted upon my mind forever.

Emerging onto the beach, I was overwhelmed by the beauty of Punaluu and the amount of onlookers which had accumulated while we were in the ocean. The tourists hung over George Balazs as he carefully and efficiently tagged, measured, weighed, and cared for the turtles. The only thing keeping the onlookers at bay was the occasional blast of black sand thrown up by the turtle's front flippers.

Originally, the onlookers were attracted to Punaluus' sandy expanse of beach with its natural springs shaded by coconut trees and Mauna Loa rising up in the background. However, seeing the turtles lying on the beach was a much more thrilling sight for the tourists and also for me and the other MOPpers.

After having a lunch and packing up our gear, we Turtle Taggers got together for a group photograph. As I reflect back, I fell that the experience was definitely well worth the time and energy that I invested. The next time that I see posters about Turtle Tagging, Lani Brewer will be the first name on the sign-up sheet.

***

Maui Weekend

by Leilehua Yuen

Cecil B. DeMille they're not, but the MOP students selected for the video workshop on Maui were creative, had fun and learned plenty.

After landing in Kahalui, the students piled themselves and their gear into vans and headed for the nearest drive-in for some Maui-style plates. Maui-style means RICE with the laulau--yuck! To get off on the right fin, several orders were changed to mixed seafood platters.

Next stop was Maui Community College. Those guys have one rad media center, and MOP got to play with it all weekend. Lectures started Friday night, with basic video photography theory and demonstrations of video techniques. Students finally hit the pillows at the Maui Seaside Hotel sometime after midnight.

At 7am Saturday, the gang was preparing for the next phase: actually getting under water with the video cameras. The Kihei dive spot was beautiful, but visibility could have been better. Clouds of very fine sand drifted through the water. After lunch, the MOPpers convoyed back to MCC for editing.

What a disappointment for those with no previous video experience. Several minutes of the photographers' own fins and tumbling coral with the tails of fish disappearing into the distance flashed by on the monitors. Fortunately, part of the workshop was figuring out how to correct the mistakes.

Lectures followed the hands-on work, and included viewing some very professionally shot footage. Steve Holly and Steve Russell showed the video they made of the bird refuge on Kaua'i. Beautifully done, it was part of the legislative testimony to preserve the area. It was an effective demonstration of the positive impact possible through video photography.

Sunday was a repeat of Saturday, but with improved visibility and experience to draw from. Editing and lectures went on late into the night, broken only by excursions for food.

Monday dawned overcast and drizzly, which gladdened the hearts of all involved--everyone was stuck inside all day editing. The weather had been perfect for diving all weekend, right up until the MOPpers had to stay inside.

Editing became more and more frantic, with at least one group using stock footage to cover what could not be shot. The three pm Aloha flight home took off, leaving harried MOPpers frantically working editing boards. Finally at four pm, the last editing was complete.

Viewed with pizza and beer, the videos looked great. Then the MOPpers piled themselves and their gear back into vans for the trip to the airport and home.

To see the results of the intrepid gang's weekend, come by the MOP office and schedule a viewing.

***

Computers and the Sea

By John Coney

At this time of the year most students are trying very hard to complete those term papers that they should have started a couple of months ago! At MOP, the majority of students use Wordperfect for their writing needs. With Wordperfect, there are a few tricks to make your writing easier.

An important trick is to frequently utilize the spelling checker and thesaurus. The spelling checker is used by pressing the control key and the F2 key, and choosing option 3. This allows the entire document to be checked. A word count is displayed after the document is checked. To spell check just a section of your document, you block the area (Alt F4) move the cursor to highlight the area, and then press control F2 key. For students writing in a language other than English, other language dictionaries are available.

The Thesaurus can make your vocabulary much more powerful. To utilize the Thesaurus place the cursor over the word you would like referenced, and press Alt F1.

While writing is never easy, learning a few tricks can make your job easier. Good luck on your papers and Happy Holidays!

***

Spring 1991 Schedule for UHH-MOP

January:

14	Semester Starts
18	TGIF
19	Snorkel at Kapoho
27	Sailing on Hilo Bay!

February:

22	TGIF
23	Fishing on Hilo Bay!

March:

2-3	Maui Symposium
9-10	Camping Honomolino
17	Sailing on Hilo Bay!
22	TGIF
25-29	Spring Break (MOP Archeology Symposium)

April:

16-17	Turtle Tagging
19	TGIF
20	Fishing on Hilo Bay!

May:

5	Sailing on Hilo Bay!
8	Last Day of class, & graduation party

***

High Mag!

by John Coney

The SEM (scanning electron microscope) is a powerful tool used to view images with magnifications as high as 100,000 times. This would be equivalent to your foot being magnified to appear to be about 19 miles in length. A model WB-6 SEM, manufactured by International Scientific Instruments Corporation was purchased with a grant from the National Science Foundation and matching funds from UHH, it is currently available for faculty and student research and teaching applications.

Ever since the invention of the first light microscope man has strived to view specimens at increased resolution and magnification. By 1938, the first SEM was constructed by M. von Ardenne. This was possible as a result of the work of H. Stintzing in 1929, who is honored with the first theoretical description of the SEM. It wasn't until the early 60's that Cambridge Instrument Company produced the first commercial SEM. This SEM was primitive, and required the operator to manipulate many hand cranked valves in a specific order. Since the proliferation of digital electronics, today's SEM is fully automated in operation.

People frequently confuse scanning electron microscopy and transmission electron microscopy. I like to use the analogy that SE. work scans the image obtaining a "topographic view" of the specimen and is more akin to a dissecting microscope. On the flip side, TEM work gives the operator a cross sectional view of the specimen. Both the SEM and TEM are important tools and have complementary uses.

The mechanics of the SEM are generally like that of a camera. Instead of photons (light) the SEM uses a controlled beam of electrons, and the lenses are magnets instead of glass. The electron beam travels down a column at voltages ranging from 3KV (thousand volts) to 30KV. Once the beam reaches the specimen, a secondary electron image is formed by both secondary electrons and backscattered electrons emitted when the electron beam strikes the specimen. These electrons are then picked up by a detector which converts the electrons to light photons, and then into a digital signal. At this point the signal enters the station console and is enhanced digitally. The signal is then converted back into an analog image and displayed on a persistent phosphor screen, or the image is displayed on a smaller screen used for photography. The operation of the SEM requires the column to remain under high vacuum of no less then $4x10^{-6}$ torr. The magnitude of this vacuum would be a million times less then the atmospheric pressure found at sea level. This is necessary to keep the filament from oxidizing, and the removal of air prevents the electron beam from colliding with air particles in the column. To create the needed vacuum, three pumps are used in the following sequence; 1) Roughing pump, 2) Diffusion pump and 3) Ion pump. In past times, operators needed to manually watch vacuum gauges, and turn the appropriate valve at the correct time to evacuate the specimen chamber. Today this is done completely automatically.

University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
DIVISION OF NATURAL SCIENCES

February 20, 1991

Dear George,

On Monday (Feb 18) while picnicking with my family at Liliokalani Gardens, I spotted a small green sea turtle in the main pond (estimated carapace length about 15"). It was resting on the bottom near the shoreline, with just the top of its carapace exposed. Periodically it would raise its head to breath. What was absolutely remarkable to me was the fact that its entire body, with the exception of its head, was covered with filamentous algae (probably freshwater cyanobacteria). Even its front and back flippers were covered with algal growth. The damn thing looked like it was covered with fur!

The extent of the freshwater algal growth on the animal suggests to me that the turtle never leaves the pond. Perhaps this is voluntary confinement, perhaps it's trapped. In any event, it's a sitting duck for poachers given the small, shallow nature of the pond and it's rather casual attitude to being approached. I don't know if there's anything that could (or should) be done. Just thought you'd want to be advised of the situation.

Best wishes,

523 W. LANIKAULA STREET
HILO, HAWAII 96720-4091 • TEL: (808) 933-3383

University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
OFFICE OF THE DEAN

Dear George,

Let me start off by saying congratulations on a job well done handling another UHH-MOP turtle tagging mob. We in Hilo really appreciate your time and effort in giving students like me an experience of a life time.

Along with this letter I have included the last of the white turtle tagging tees, compliments of the UHH-Marine Option Program, I hope it fits ok. You'll have to test it out on our next Punalu'u event, we're looking forward to meeting with you again.

Sincerely,
Terry S. Riessen

UHH-MOP, Student assistant

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University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
DIVISION OF NATURAL SCIENCES

July 3, 1991

George Balazs
National Marine Fisheries Service
SWFC Honolulu Laboratory
2570 Dole Street
Honolulu, HI 96822-2396

Dear George,

In regard to Stephanie West's vitae, I have this bad feeling I know what "NOACC" stands for: ***NOAA***. It may be a rather substantive misunderstanding on Stephanie's part concerning the disposition of their final report. I have a vague recollection of telling her, Sally, and Summer something like, "Who know's, maybe George Balazs will incorporate your findings into one of his reports." I think I said something like that because I thought there was a remote chance that it might in fact eventually happen, but mainly to give them a needed moral boost (they weren't seeing many turtles, and I was trying to let them know that even nonsightings might prove to be useful vis-a-vie population distributions). She may have thought that it was a certainty that you would put their findings into some sort of report. Rather naive, but I know she would not purposely lie on her vitae. Anyway, I'll contact her to see if my fears are correct. If so, I know she'll remove that information. The part about the MOP Certificate is correct. All the students who enrolled in Biol/Geol 399 (Directed Research) last summer will receive a MOP Certificate when they send us proof of graduation.

About the coming turtle-tagging. You don't need any constructive criticism. I wouldn't have you do anything different from the regular MOP trips. The students have been told that the primary function of this trip is research, specifically that we're assisting you (NOAA) in the investigation of the endangered green sea turtle. They have a worksheet to fill out that will require that they watch or assist in the working up of turtles. They will also probably ask you many questions. I've enclosed a copy of their handout and worksheet. You could probably head off repetitive questions about their diet, breeding grounds, etc. by giving a 5-minute briefing to the group when we arrive. We plan to leave campus at 1:00 pm, and should easily make Punaluu by 3:00 pm. Can't leave any earlier since they have class until noon and need an hour to eat lunch at the cafeteria. That's about it. I'll be in touch before the "event". Thanks again.

Aloha,

523 W. LANIKAULA STREET
HILO, HAWAII 96720-4091 • TEL: (808) 933-3383 • FAX: (808) 933-3693

University of Hawaii at Hilo

COLLEGE OF ARTS AND SCIENCES
DIVISION OF NATURAL SCIENCES

March 27, 1991

Dear George,

I just want to touch bases with you on turtle tagging dates. Here's what we have on our calendars:

1. This semester's BiolGeol 301L/MOP trip is scheduled for April 23 & 24.

2. This summer's QUEST-related turtle activities are slated for Wed 22 May and Thurs 23 May. We have you scheduled to talk on "Turtle Biology" and "Turtle Study Field Methods" from 19:00 to 20:50 hours on Wednesday evening. On Thurs, we have a turtle censusing dive slated for 14:00 to 16:00 hours. I guess you'd fly into Hilo in the late afternoon on Wednesday, and fly out of Kona late the next afternoon. It'll probably be a turtle-snorkel for you because of flight-associated decompression problems. Even a morning turtle dive wouldn't help that much. We can talk about this wrinkle when I call to confirm these dates with you.

3. This summer's Advanced Oceanography Laboratory turtle trip is slated for Tues & Wed, 16 & 17 July at Punaluu.

Whew, that's a lot of turtle tagging/watching. I'll call you early next week to make sure that these trips are correctly scheduled. In the mean time, have a nice Easter.

Aloha,

cc Walt Dudley
John Coney

523 W. LANIKAULA STREET
HILO, HAWAII 96720-4091 • TEL: (808) 933-3383

--Summary of turtles tagged and/or recaptured at Punaluu Bay, Hawaii--
--during 7/16/91 to 7/17/91--

National Marine Fisheries Service
2570 Dole Street
Honolulu Hawaii 96822-22396

Tag No.	Straight (cm) Length	Notch	Width	Curved (cm) Length	Width	Tumor Ranking	Comments
Expedition date 07/16/91							
V356 (07/16/91), Y191, Y192	59.8	59.3	45.0	63.5	53.5	0	Punaluu; LFF used for width measurement. Mouth examined w/ speculum.
Y198, Y199, Y200, Z252	71.5	71.3	58.3	77.0	73.0	0	Punaluu; examine mouth - pterocladia present. Precentral & lst Marg. left - likely prop slash (healing)
Expedition date 07/17/91							
6360, 6361, Y650	87.7	87.7	66.7	93.0	88.0	0	Punaluu; Skin & burrowing barns. in plastron, mouth checked.

Tag No.	Straight (cm) Length	Notch	Width	Curved (cm) Length	Width	Tumor Ranking	Comments
Expedition date 07/17/91							
6714, 6715, 6716, 6717	79.1	79.0	60.4	86.0	78.0	0	Punaluu; recap from 11/26/83 SL-71.1 cm. Mouth checked.
7540, 7541, 7542, N828, Z253	70.9	70.5	55.8	76.5	71.5	0	Punaluu; mouth checked, worn beak end, picked out BB's (5). HF's tightly clasped, unable to take tail measurements. Missing tag 7542 orig. tagged 12/17/83 at R34 possition.
7604, 7605, Y654, Z258	73.2	73.2	58.7	78.5	73.5	0	Punaluu; Mouth checked
N553, N554, N555, Z230	71.3	71.0	57.9	77.5	72.0	0	Punaluu; mouth checked, worn grooves on beak
N829, N830, N831	68.3	68.0	54.4	75.0	69.0	0	Punaluu; mouth checked
V357, V358, V359	66.4	66.1	53.2	72.0	66.0	0	Punaluu; mouth checked, end of beak abraded grooves. LFL missing and healed - possible tag loss?

Tag No.	Straight (cm) Length	Notch	Width	Curved (cm) Length	Width	Tumor Ranking	Comments
Expedition date 07/17/91							
V360, V361, V362	52.7	52.4	38.6	57.0	49.5	0	Punaluu; mouth checked, PL - skin barn, 1-burrowing barn. Lower right jaw edge serrations broken.
V365, V366, V367	54.9	54.9	43.5	59.0	53.5	0	Punaluu; mouth checked - Pterocladia capilacea present. 10-11th marg. - healed groove.
V364 (07/17/91), Y186, Y187	68.5	68.2	51.8	73.5	65.0	0	Punaluu; mouth checked, 2nd L. lat. healing gouge (12 X 2.5 cm).
Y640, Y641, Y642	62.6	62.0	52.4	68.0	66.0	0	Punaluu; mouth checked - small yellow scabs on toungue, PCA, 9th 10th and 11th L. marg. partly missng but healed. Small white-healed pimple R. eye.
Y646, Y647, Y648, Z254	66.9	66.7	53.4	71.5	66.5	0	Punaluu; R2S Missing and healed, PC in mouth.

Tag No.	Straight (cm) Length	Notch	Width	Curved (cm) Length	Width	Tumor Ranking	Comments
Expedition date 07/17/91							
N538, Y653, Z2	66.8	66.6	53.8	70.0	68.5	0	Punaluu; Tail measurements NT - hind flipper clasped so tightly together that it wasn't possible, (prude!). 10% tip of LFL missing. Joe Zuckerman - Photo.

SUMGRT-6T.GHB

Summary of green turtles tagged and resighted at Punaluu Bay, Kau, Hawaii

by
George H. Balazs
Marine Turtle Research Program, Honolulu Laboratory
National Marine Fisheries Service, NOAA
2570 Dole Street
Honolulu, Hawaii 96822-2396

Study dates	Method of capture	Total no. captured	No. newly tagged	No. tag resightings	Total no. tagged to date	Original and resighting tag dates for turtles resighted at Punaluu
6/76-9/76	SC	42	37	5	37[a]	
5/7/77	N	3	3[b]	0	3	
1/20-1/26/78	N, SC, SK	8	8	(1)	11	(8/76)
8/31-9/3/78	SK	10	10	0	21	
7/26-7/29/81	N, SK	7	7	0	28	
11/26/83	SC	3	3[c]	0	31	
12/15-12/19/83	N, SC, SK	12	10	2[c]	41	8/78; 11/83
1/8-1/10/84	N, SC, SK	13	9	4	50	1/78; 7/81; 12/83; 12/83
2/17-2/19/84	N, SK	12	10[d]	2	60	8/78;1/78
3/23-3/28/84	N, SC, SK	30	20	10	80	1/84; 1/84; 1/84; 2/84; 9/78; 11/83; 1/78 and 2/84; 8/78; 12/83; 8/78 and 12/83
4/13-4/14/84	N, SK	3	2	1	82	12/83-1/84-4/84
5/14-5/17/84	N, SK	11	7	4[e]	89	2/84; 1/84; 3/84; 2/84

Continued.--SUMGRT-6.GHB

Study dates	Method of capture	Total no. captured	No. newly tagged	No. tag resightings	Total no. tagged to date	Original and resighting tag dates for turtles resighted at Punaluu
6/26-6/29/84	N, SK	13	8	5[d]	97	2/84; 2/84; 1/84; 1/78-2/84-3/84; 12/83-1/84-4/84
3/23-3/25/87	N	7	5	2	102	3/87; 3/87
3/21-3/23/88	N	3	3	0	105	
4/10-4/12/89	SK	14	11	3[f]	116	12/83; 1/84; 9/78
4/9-4/11/90	SK	12	8	4[g]	124	12/83; 1/84; 3/88; 9/78 and 4/89
7/18/90	SK	12	5[h]	7	129[i]	4/90; 4/90; 4/89; 2/84; 3/88 and 4/90; 11/83 and 3/84; 1/84 and 4/90
11/27-11/28/90	BN, SK	17	5	12[g,h]	134	4/90 and 7/90; 7/90; 4/90 and 7/90; 4/89; 12/83 and 4/89; 4/90; 4/89; 4/89; 1/84 and 4/90; 4/89; 12/83 and 4/90.
4/23-4/24/91	BN, SK	20	4	16	138	7/90 and 11/90; 4/90-7/90-11/90; 4/89 and 11/90; 12/83-4/89-11/90; 4/90 and 11/90; 11/90; 11/90; 12/83-4/90-11/90; 2/84 and 7/90; 4/90; 4/89 and 7/90; 4/90; 9/78 and 3/84; 4/89; 4/89; 11/83-3/84-7/90

Continued.--SUMGRT-6.GHB

Study dates	Method of capture	Total no. captured	No. newly tagged	No. tag resightings	Total no. tagged to date	Original and resighting tag dates for turtles resighted at Punaluu
7/16-7/17/91	BN, SK	15	3	12	141	--
11/12-11/13/91	SK	24	8	16[f]	149	--

N = net; BN = beach net; SC = hand capture while scuba diving; SK = hand capture while skin diving

[a]Monel alloy tags. All other tags used are made from Inconel 625 alloy. "Total no. tagged to date" was computed separately for Monel and Inconel.

[b]Tagged turtle 5008 (8165) resighted 6/19/84 nesting at East Island, French Frigate Shoals.

[c]Tagged turtle 6711-13 resighted 7/9/86 nesting at East Island, French Frigate Shoals.

[d]Includes tagged turtle 7634-37 with four leeches, leech eggs, and likely small tumor in corner of right eye.

[e]Also includes tagged turtle (6182, 6242, 6260) originally tagged nesting at East Island, French Frigate Shoals, 6/82 and 8/82.

[f]Also includes tagged male (3041, 6164, Y205-06) originally tagged basking ashore at Whale-Skate Island, French Frigate Shoals, 5/4/79. Resighted at same location 6/79, 6/80, and 6/82.

[g]Also includes tagged male (6360-61, Y650) originally tagged basking at Tern Island, French Frigate Shoals, 11/28/82.

[h]Includes tagged turtle N388-89, N537 with small tumor in corner of left eye.

[i]N376, N377 not included in total. This turtle, rescued by Jerome Jude early July 1990 off Kona, released at Punaluu 7/17/90. Straight carapace length 19.8 cm.

UHH Marine Option Program

Changing Tides

Vol. VII, No. 3. February 15, 1992

MOP SPRING - '92 SCHEDULE

February 22-23
MOP goes camping

March 8-9
Ninth Annual Student Symposium

March 13
TGIF

April 5
Sailing and Fishing

April 14-15
Turtle Tagging

May8
TGIF

May 17-28
QUEST

STUDENT SKILL PROJECT SYMPOSIUM

The Ninth Annual MOP Student Skill Project Symposium will be hosted by the University of Hawaii - Hilo on March 7, 1992. Deadline for abstracts is February 7, 1992. Stop in or call your MOP office for more information.

UNDERWATER ARCHEOLOGY SYMPOSIUM AND WORKSHOP

On March 23 - 27, UH-MOP Manoa will be hosting its annual Archeology Symposium and Workshop. The symposium will be held at the Maritime Center in downtown Honolulu, and the workshop will be at Coconut Island in Kaneohe Bay. The application deadline is February 28, 1992. There is a 15 student limit, with people interested in scientific diving, marine archeology, and marine resource management preferred.

For further information contact:
Steve Russell - Coordinator
UHM-MOP
1000 Pope Rd. Room #229
Honolulu, HI 96822
Phone: 956-8433 or contact your local MOP office.

FALL - '91 CAMPING AT KA'ALU'ALU

Angie Treloar

So, is this what college is all about? As I sit on the "Green Sand Beach" on the southeast shore of the Big Island of Hawaii on October 19 & 20, watching the waves crash down upon the isolated shoreline, I realize that I may never again have an opportunity to experience something so memorable.

The beach is referred to as "Green Sands" because of the abundance of a greenish volcanic mineral called "*olivine*."

Getting to this beautiful destination took our group 30 minutes driving through open, rolling hills, and cow pastures. The clear blue water, incredible coarse yet soft sand, and surrounding black lava rock were breath-taking to say the least.

We ventured out into the unknown waters in snorkeling groups. After the initial fright of swimming through the powerful breaking waves to get to the mouth of the bay, I began to relax and enjoy the underwater world that surrounded me. This experience is one that few students on the mainland could even try to imagine as part of a college education, a first hand, hands-on learning process.

Having been to the farthest southern point of the United States, on a beach called Green Sands, looking at Ka'alu'alu Bay, I realize the memory of this beauty will be etched in my mind, forever.

FALL - '91 TURTLE TAGGING

WHAT AN EXPERIENCE !

Enthusiastic MOPers broke a five-year record by catching, tagging, and releasing 24 Pacific green sea turtles (Honu in Hawaiian or scientifically named - *Chelonia mydas*) on the 12th and 13th of November. This happened during MOP's turtle tagging activity held every semester at Punalu'u Bay, where the turtles go to graze on *Pterocladia* (a red seaweed frequently consumed by the green sea turtles in Hawaii and especially rich in Punalu'u Bay). Nets have been used for capturing the bulk of the turtles in past taggings, but Mr. Balazs and assistant

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Changing Tides is a monthly news publication by students of the University of Hawaii at Hilo Marine Option Program (MOP). The opinions expressed here in are not necessarily those of MOP, or of UH-Hilo, but those of the *Changing Tides* staff and contributors. *Changing Tides* welcomes editorial contributions or comments.

Editor : Jerry Van Epps

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Russ Miya had trouble keeping up with the volume of turtles being captured by hand, so the nets weren't needed.

Brad Blankenship, a MOP student and cowboy from Wyoming, led the "roundup" by single - handedly capturing eight Honu and assisting on numerous others; I guess it's in his blood.

The largest turtle brought ashore was a male weighing 225 pounds, with a shell measuring over 80 centimeters (approximately three feet). This Honu had been caught twice in the past five years at French Frigate Shoals (about 800 miles away) during mating season. The age of the giant Honu was unknown, although reproductive maturity begins at about 25 years, and this definitely was a sexually mature male. He was "guesstimated" to be between 30 and 40 years old.

George Balazs of the National Marine Fisheries Service (NMFS), a long time turtle researcher, again coordinated the tagging, measuring, weighing, and general examination of the turtles' health. Mr. Balazs has been doing turtle research, assisted by UH - MOP volunteers from around the islands, since as early as 1976. He is currently pursuing research funding to find the cause of the very serious problem the Honu are having with lobulated tumors called *fibropapilloma*, a cancerous growth that has been found covering the turtle.

To date, approximately 140 different turtles have been examined and tagged at Punalu'u. Russ Miya, a U.H. Manoa MOP alumni, has been working full time with George for the past year on green sea turtle research.

Drs. Walter Dudley and Leon Hallacher pulled a few turtles from the water to end this incredibly exciting experience. The weather was overcast with mild temperatures, which was excellent for turtle tagging. No harm came to either humans or turtles, just a lot of hard, meaningful work for a cause we all felt privileged to be a part of while "attempting to preserve another endangered species on Mother Earth."

The Honu is federally protected under the Endangered Species Act, with penalties of up to $25,000 and/or one year in jail for disturbing, harming or killing a Hawaiian green sea turtle. If you see anyone causing harm to the green sea turtle, please call:

1) U.S. Fish and Wildlife (541-2682)
2) National Marine Fisheries Service (548-5918)
3) George Balazs (943-1221)
4) Marine Options Office (U.H.Hilo, 933-3544)
5) MOP-UH Manoa (956-8433)

Special thanks to all the MOPers that participated in turtle tagging. Your hard work made this a fantastic success.

PUNALU'U HISTORY

Punalu'u is one of the most famous black sand beaches on the island of Hawaii. Unfortunately, much of its sand has been lost over the years due to sand mining, shoreline subsidence, and especially to tsunamis in 1868, 1960 and 1975.

Punalu'u has been the site of Hawaiian villages from prehistoric times. By the late 1800s it served as a major stop for inter-island coastal steamers and as a coastal railroad terminal. As you swim in the waters of Punalu'u Bay, you will notice much cool fresh water from underwater springs. In former times, some Hawaiians obtained fresh water by diving (lu'u) into the ocean with gourds, which they filled with fresh water from these underwater springs. The name Punalu'u means "diving water".

There is a Hawaiian legend of Punalu'u, "The Legend of Kauila, the Turtle Girl." The legend goes that there was a spring-fed pond of water behind the beach at Punalu'u. A mother turtle and her baby lived in the pond until the young turtle grew up. The young turtle was named Kauila. The spring came to be called "The - rising - water - of - Kauila."

The turtle girl was able to assume human form and play with the young folk, but would change back into a turtle when she went back into the spring. When bubbles came up in the spring, people knew the turtle girl was asleep in her home. Children used to catch fish and shrimp in the spring and Kauila watched to make sure they didn't fall in. The people loved Kauila for this and for her spring which gave them drinking water. They never used her water for any other purpose, making it "kapu" to do so.

OPEN WATER BASIC DIVING CERTIFICATION

Jerry Van Epps

I would like to alert our readers to a truly exciting, exhilarating, and physically demanding activity available to most of us in Hawaii. Scuba diving is the activity I'm referring to, and I would like to describe to you what to expect when going for your open water or basic diving certification.

I finished my open water certification a few months back. I hope this article stimulates your interest in scuba diving as much as the actual experience did for me. The beauty of Hawaii that surrounds you is only half of what really exists. The other half is below the crystal clear, subtropical ocean that surrounds us. For those of you who snorkel, you already have an idea about what I mean. The colorful fish and coral that make up this new, tranquil, underwater habitat are a big part of the unique beauty that gives you exhilaration and euphoria when exploring it.

The open water certification is good to a depth of 60 feet, and for Hawaii that's plenty. The course consists of five dives and five classroom sessions, including videos, book review (PADI open water dive manual, 5 chapters), and testing. After each chapter, a dive follows relating to what the chapter covered.

Most of the course is based on safety procedures, which is a must, because although diving is fun it is also potentially dangerous.

The course is a building-block from which you decide how much you want to develop your diving skills. Besides being recreational, diving has many occupational applications.

Through the basic course, equipment is provided along with transportation: all it takes is your time and desire to experience one of life's great adventures. You may not be able to travel in space during this lifetime, but you can explore the next best thing; the under-sea world of Hawaii.

STUDENT EXPERIENCES ABOARD THE RESEARCH VESSEL *MOANA WAVE.*

Terry Riessen & Tammy Wenham

Terry Riessen, a long time MOPer, and Tammy Wenham, a newer MOPer, had the opportunity to spend ten days aboard the research vessel - *Moana Wave*, operating out of Oahu. Their experiences are related in the following articles.

Terry's story:Being invited aboard the R/V *Moana Wave*, to assist in study of the boundary fauna of the Hawaiian Islands, is not exactly a run-of-the-mill experience for the common third semester undergraduate. When UHH-MOP asked if I wanted to go, my first question was, "What's it going to cost me?" To my surprise, it wasn't going to cost me a cent. Then I wondered what the catch was. What could the University of Hawaii possibly have in mind for an insignificant nobody, like myself, to be willing to support me for ten days, aboard a ship miles out at sea? I really wasn't sure, but after I was finally aboard it came to me, and it didn't take long (no more than two seconds to be specific). While climbing out of the zodiac, I was greeted by the crew. These were ordinary, hard-working people, aboard a not-so fancy ship, not exactly a bunch of clean, white coated men aboard the Love Boat. In other words, they were definitely not what I would have expected for a scientific research vessel.

Not that I was the least bit disappointed, because I wasn't, I just knew that from that point on, it wasn't exactly going to be a vacation. Or was it?

Following our orientation of the ship, we were given our watch schedules, the hours that we were expected to "work" for our stay on the ship. I was given the day watch, spanning from 8:00 a.m. to 4:00 p.m., or until all work was finished, which averaged about two hours of work or so (real tough schedule). I was satisfied. Sorting the catch from the night before wasn't all that bad, in fact, it was actually very interesting. I learned to identify many mid-water fish, fish larvae, and crustacean larvae from the Hawaiian island area, but those d___ shrimp (hundreds, or perhaps even thousands of tiny red shrimp all sorted into three or four species), well...that's a story for another day. I was content with my given duties, for the time, but needless to say, I couldn't help but wonder about the second shift and the third (graveyard) shift. What were their duties like? Being determined to experience just about everything possible on that cruise, I stayed up those extra, late hours to lend a hand with the trawl. From that experience I understood the root of my first impression upon coming aboard the ship. Handling rope, and nets, and winches while on an object that is always rolling in motion with the waves, well, I need not say that a person who's life is at sea definitely has his work cut out for him. It was difficult work at times, but it was worth the experience.

After hours, when all duties were done, I found myself at home in the ship's mini-lab, a sort of home away from home for Dr. Richard Young, the chief scientist on board. There I opened a door to a whole new world, the realm of the micro-marine organism. I discovered sea creatures, some no larger than an eye of a needle, while searching haphazardly through a sample of sea water: zooplankton, jelly fish, fish larvae, and crabs about as large as peas.

If one ventured on through the ship's many corridors, it wouldn't take long to locate the ship's dry lab, a room full of high-tech, state-of-the-art electronics. I found it quite comfortable to be in a room full of hundreds of thousands of dollars worth of equipment, that at first glance, could probably be mistook as capable of running a small city (very intimidating). Among the masses of metal and wire were instruments to measure water depth and the depth of the trawling net, as well as inconspicuous little video screens that could tell you exactly where the ship was at, any time, at any location, on the face of the earth.

There is only so much a student can learn in a class. One can truly absorb what has been read in a book only when he or she has had the opportunity to experience those words in action. I used to consider myself a marine science student, and well underway. My experiences aboard the *Moana Wave* made me realize that I've just scratched the surface of my education. My only regret was forgetting my Slim-Fast at home. I'm sure all of you "*Wave* veterans" out there know exactly how I felt.

Also writing about her experience aboard the *Moana Wave* is MOPer Tammy Wenham.

Tammy's story: My first introduction and visit on the *Moana Wave* was both exciting and relaxing. I was never bored while aboard. The intensity of the sunsets, and the moon rising over the deep blue waters and near the various islands of the Hawaiian chain was amazing. Working and talking with the hard-working scientists and unique crew members was quite educational; I was able to look over most of their shoulders and see the kind of work they were doing. I assisted by sorting the varieties of sea life specimens they brought aboard.

The food was great! We ate like royalty. Paul and Ray (the two cooks) prepared 3 meals per day, plus in-between meals, and the fridge was open and full of food and ice cream. Cookies, chips, and peanut-butter cups were also always available. Late - night workers could be found creating ice cream sundae masterpieces. There was also an exercise bike aboard to help burn off some of the culinary works of art I enjoyed on the voyage. I tried jogging around the main deck a few nights, but the possibility of falling overboard was a constant threat, and a cold, lonely, and deadly one at that.

The scientific party's cabins had 2 bunkbeds, with a porthole to look out at the fabulous view of the open ocean. With the natural rocking motion, like a baby in a crib, peaceful dreams were insured. If you ever felt bored with the endless open ocean or deep sky of stars, then you could retreat to the ship's lounge which was packed with books, video tapes, and game discs.

What I really enjoyed aboard the *Moana Wave* was the acceptance of my presence by those running the ship. My inquisitiveness was never left unanswered. Some nights I went to the bridge to sit in the Captain's chair and watch the crew

controlling the ship through all the electronic instrumentation. We were also visited numerous times by playful pods of dolphins that enjoyed giving acrobatic demonstrations in the ship's wake.

The *Moana Wave* is truly a research vessel, with a comfortable learning atmosphere, that should be experienced by anyone interested in being a part of the marine science educational adventure.

MARINE TRIVIA

Q: Where is the exact location of the Marianas Trench? Also, what distinctions exist between trenches and surrounding areas?

A: The Marianas Trench is located to the east of the Marianas Islands in the western Pacific Ocean. The trench includes the Challenger Deep, which descends to about 35,800 feet below sea level according to measurements made by Jacques Piccard in 1960.

Trenches form at subduction zones, areas of the ocean floor where two converging tectonic plates (usually an oceanic and a continental plate) collide. Trenches usually are long, narrow, and uninterrupted. For example, the Marianas Trench is about 1500 miles long, but averages only 45 miles in width.

Trench walls don't drop straight down. Steps in the walls indicate that sections of the ocean floor have collapsed in a process known as subsidence. Usually, trenches are v-shaped in cross-section, with their bottom flattened due to the accumulation of marine sediments. An outer ridge rises at the junction between a trench and the adjacent ocean floor. (Reprinted with permission from the Sea Secrets column of Sea Frontiers, International Oceanographic Foundation, Miami ,Florida.)

Q: What makes a whale raise the rear portion of its tail out of the water and violently slap it down?

A: The behavior is called tail slapping or lobtailing. Many researchers believe that whales may communicate by slapping various parts of their bodies against the water surface. Whales and dolphins rely heavily on their sense of hearing, and sounds are an important part of their social repertoire.

Lobtailing often is associated with another behavior known as breaching, or leaping. Both breaching and lobtailing are observed frequently in social situations and are believed to convey information, although the message may vary with the circumstances. (Reprinted with permission from the Sea Secrets column of Sea Frontiers, International Oceanographic Foundation, Miami, Florida.)

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Address Correction Requested

[redacted], Hi 96744

JOHN PENISTEN

570 Iwalani Street
Hilo, Hawaii 96720
(808) 959-6986

TRAVEL — WRITER — PHOTOGRAPHER

GHB

6-22-91

Dear George:

Enclosed, please find three copies of Hawaii Magazine and the turtle tagging article which begins on page 22.

I hope you like it. I thought it looked pretty good.

I'd like to thank you again for the help in providing me the background and information and the proofreading you did on the piece.

I think the editor pretty much ran what we provided and I don't think they left out any significant parts.

Hope you're having a nice summer. I'm keeping away from UH-Hilo as much as possible this summer.

All the best,

John

ARCAS

Wildlife Rescue and Conservation Association

July 30, 1993

Dr. George Balaza
National Marine Fisheries Service
Southwest Fisheries Science Center
Honolulu Laboratory
2570 Dole Street
Honolulu, HI 96822-2396
Fax: 800-943-1290

Ms. Macol M. Stewart
ARCAS
South Coast Project
U.S. Mailing Section 135
P.O. Box 02-5289
Miami, FL 33102-5289
Fax: 011-502-2-535329

Dear Dr. Balaza:

Thank you so much for sending me the Manual of Sea Turtle Research and Conservation Techniques. It has been amazingly helpful. The Manual gave me a basis upon which to review the local practices, and it provided more than enough information to tide me over until my Spanish improved enough to delve into the regional literature. I am presently attempting to procure a copy in Spanish, because only one of the people with whom I work speaks English.

Things have come a long way down on the south coast since I called you frantically in search of information in June. Please forgive me for not getting back to you sooner, but I spend most of my time at the project sight in Aldea Hawaii so I don't get near a fax very often. (We don't even have telephones or electricity down there.) Since June I have done a great deal of reading and investigating, and hopefully I have generally figured out what is going on. After our first month of official egg collection we are incubating over 600 eggs. It is a far cry from our goal of 10,000, but we have until January and peak season is not until September and October. All of the eggs so far are from Lepidochelys olivacea. Dermochelys coriacia nest here as well, and people have reported seeing Eretmochelys imbricata and Chelonia agassizi. (This is what originally confused me. I mistook Chelonia agassizi for Chelonis depressa-- Dr. Hallacher taught us that there were seven species of sea turtles, not eight.)

We are incubating the eggs in partial shade under a moveable palm roof. Because we often receive only one donation of a dozen eggs in a day, nest size ranges from 12-85 eggs, with an average of 23.64 eggs per nest. The Guatemalans prefer to bury 12 eggs at a time, because they feel that larger nests produce deformed hatchlings. They claim to have been getting a 95% hatching success rate. I suspect that these small nests are too cold, and are producing too many males. We have devised a system to take the temperature in the center of the nest during incubation. So hopefully we will be able to get a better idea of how many females we are actually getting.

ARCAS is busy writing grant proposals because they want to construct a full scientific station out here. Do you have any suggestions as to what type of equipment we should ask for? Any equipment ideas and general price ranges would be a huge help.

U.S. Mailing
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5a. Calle 9-55, Zona 1
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Guatemala, Central America
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FAX: (502-9) 500-566

As for the tags, we are trying to procure them simultaneously for all 25 tortugarios on Guatemala's south coast. I faxed Anny Chaves in June when you gave me her fax number, but now I am letting DIGEBOS (the government agency which coordinates turtle conservation) handle it. I don't want to step on any official toes, but I desperately want tags. The idea is to get all of the tagging set ups and have a seminar to train the technicians from all of Guatemala's 25 tortugarios at once. If we can get the tags before I go back to the states (to school) on August 28th, they want ME to give the seminar. Gulp. IN SPANISH. Gulp.

Do you have any advice for me? (On the tagging that is, not on the Spanish.) I remember what we did with Dr. Hallacher, and I can reread what it says in the Manual, but what else? Is there anything else that I can read, o great tagging guru? Any words of wisdom?

The turtles only come near/on shore at night so I can't swim out and catch them like we did in Punalu'u. I guess I'll have to catch one or two the night before after they lay eggs in order to demonstrate the tagging. I suppose that we could do the entire seminar at night, but I think that it would be better to demonstrate during the day when everyone can see and then go out and practice at night. (Especially since these turtles invariably like to come out when it is pitch black and raining buckets-- it is the rainy season now.) If we conduct the seminar in Hawaii, we have two tanks 1m x 2m x.75m where I could keep the turtles until day time. But would they hurt themselves thrashing around in there? Otherwise I suppose I'll have to put them in the sand on their backs in the shade under a tarp like we did at Punalu'u. But how long can they stay this way? Do I need to wet them from time to time? People in this part of the world have a tendency to be quite rough on animals, so I don't want to set a bad example for them. What to do?

I would also love it if you could draw me a picture of the way that you tie a rope around the turtles to weigh them. I knew that I was going to have to know this one day. I should have had you teach me at the time, but maybe you can teach me now. Ropes to rig up turtles for weighing are much easier to come by than nets in these remote parts with equipment deficits.

Speaking of equipment deficits, there is no way we can get 25 callipers to measure straight carapace length. Apparently they have never heard of such a thing around here, but then again they eat turtle eggs around here too. I guess we will have to settle for curved length and width, and head width.

I can't believe that I am the local tagging expert. See what you all have started? You all have created a monster.

I don't remember if I thanked you properly for putting me in touch with Steve Kolinski. I called him last spring and he was as helpful as he was friendly. We talked for a long time about his experiences in Micronesia, with the Peace Corps, and with turtles. We actually talked for a bit too long-- you should have seen my phone bill! But I couldn't help it: our conversation was so interesting. He sent his best to you. But for all I know, you may have talked to him since then. (For all I know, I may have said all of this already in another letter. Yes, I am only 25 and my memory

is already that bad.)

If you speak to Dr. Hallacher, give him my regards. And send my warmest salutations to the green turtles. And please, please, if you have any advice to relieve my mounting pre-seminar stress, angst, and anguish, do not hesitate to drop me a note in the mail. It should take me about 10 days to two weeks to receive anything mailed from Hawaii USA to the ARCAS U.S. Mailing address.

I thank you for all of your help. You are truly the supreme turtle guru. I look forward to hearing from you again soon.

Sincerely,

Nacol M. Stewart
Assistant Director
ARCAS South Coast Project

University of Hawaii at Hilo

KALAKAUA MARINE EDUCATION CENTER

Noi'i, nowelo aku; He kai 'a'e na ka lani.
Research and seek out wisdom;
These are seas tread upon by heaven.

August 18, 1993

Mr. George Balazs
National Marine Fisheries Service
Southwest Fisheries Science Center
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear George,

Thanks for the turtle card - always a hit with my crew.

The Dean has finally gotten back to me on the turtle sign. She thinks it is "wonderful and elegant" but felt that it could be rearranged to be more effective. She suggests that the information in the last paragraph go up front and be more explicit on the protected status of the turtles. Leon felt the same way. I can envision a sign with paragraphs 1 and 2 on one side, paragraph 3 on the other and the drawing in the middle as the focal point. You get to make the final decision. Give me a call if you want to talk it over. Once we have our final designed decided upon, we can get estimates.

We'll also be bugging soon you about dates for a fall turtle tagging expedition to Punaluu.

Thanks again for the card.

With warm Aloha,

Walt

HILO, HAWAII 96720-4091
TEL: (808) 933-3411/933-3544 ● FAX: (808) 933-3677

Yale University *New Haven, Connecticut 06511*

February 28, 1994

Dr. George Balazs
2570 Dole St.
Honolulu, Hawaii
96822-2396

SCHOOL OF FORESTRY AND
ENVIRONMENTAL STUDIES
GRADUATE STUDENT
Macol Stewart
Sage Hall
205 Prospect Street

Dear Dr. Balazs:

Please forgive me for the inexcusable tardiness of this letter. You have been so helpful to me and so generous with your time, and I am embarrassed that I have not been organized enough to write you until now. Both my summer in Guatemala as the Assistant Director of the ARCAS South Coast Project and the fall semester at Yale (this year in two Master's programs as opposed to one) have been so hectic that I have been unable to keep on top of all of my responsibilities. I sincerely apologize and I hope that you will pardon me.

I would like to thank you for all of the tagging information which you sent to me last summer in Guatemala. The tagging seminar which I had been so nervous about turned out to be a great success. I have included the materials which I used in the seminar for your reference. Although the pictures are not very clear (they are photocopies of photocopies of photocopies) I am sure that you will have no trouble recognizing them. (Note that you received due credit.) It was a good thing that we had these pictures, because we were unable to find a turtle that night to practice on. But fortunately, everyone had the pictures to take home with them to refresh their memories when they did have turtles in front of them.

I appreciate your concern with my progress and the success of the project. The people in Guatemala told me that you wrote, but they never forwarded the letter. I am well aware of your busy schedule, and it makes receiving a letter from you all the more meaningful. Again I am shamed that I did not write you until now.

I would also like to thank you for the introduction to Anny Chaves. With her help we were able to obtain tags for our project in Guatemala. In addition, I had the opportunity to meet her in Costa Rica, and to accompany her to the University and to Playa Grande to collect data on leatherback nesting. Without your introduction none of this would have been possible.

Most importantly, I would like to thank you for introducing me to sea turtles. The two days which you spent with us in Dr. Hallacher's oceanography class opened doors for me that I did not even know existed. Your enthusiasm was infectious, and it led me to the ARCAS South Coast Project, to this symposium, and to continue working with sea turtles. Next summer I plan to return to Guatemala to conduct a study of the supply side of Guatemala's market for sea turtle eggs, a project which has grown out of my research on the economic incentives driving the exploitation of sea turtle eggs.

Again, thank you for your instruction, your assistance, and your inspiring dedication. I look forward to seeing you at the symposium and in years to come.

Sincerely,

Macol Stewart

COPY TO ALAN & Karen

McKeon
Art
Consulting

George H. Balazs
National Marine Fisheries Service
Southwest Fisheries Science Center
Honolulu, Hawaii 96822-2396

March 2, 1994

Dear George,

I know its been a while since I've been in touch. Last year school kept me buried in books. This semester, I decided to back off of the academic endeavor and put my energies into marine conservation activities. As a result, lots of exciting opportunities are emerging. I have also changed the focus of my studies from Marine Biology to Environmental Studies for a number of practical reasons.

I wonder if you received the postcard I sent you from the Azores last summer? My husband and I spent a glorious month on the islands. A friend of ours lives on Faial, home of the Marine Science Institute, speaks Portuguese and has a beautiful sailboat there.

The highlight of the trip for me was the opportunity to swim with Sperm whales, Orcas and more than 100 dolphins all at one time!!! The next time we talk, I'll give you all the details but allow me to say here that we were 12 miles off shore in a zodiac, swimming in 170 ft. visibility with seas as flat as a lagoon!! Of course, we saw lots of turtles too and tagged in the boat. If your research ever takes you to that part of the world, I can highly recommend it!

Speaking of research, I'm working on a paper about the human impact on sea turtle conservation for an Environmental Biology class. (My professor, Dr. Craig Fusaro, met you in Hawaii but I don't know when).

I would like very much to include information from your studies in my paper. However, I've had some difficulty finding the resources in local libraries. Ideally, I'd like to read your papers and then conduct an interview either by phone or mail. Can you help me out? Please let me know if it would not be too much trouble.

We won't be getting to Hawaii next summer because we are going to Tahiti to meet my new Tahitian goddaughter. Hopefully, we'll get back to Punaluu the following year. In any event, it would be nice to see you again and to swim with the turtles. Hope to hear from you soon.

Best Regards

Laurie McK

121 Gray Ave.
Suite 205
Santa Barbara
CA 93110

805 963-8819 ?

1404 FOOTHILL ROAD • OJAI, CALIFORNIA 93023 • (805) 646-7917

Received
2/13/95

Denise M. Butler
100 North Loop Rd.
Irving College rm. B-210
SUNYat Stony Brook
Stony Brook, NY 11790

Marine Turtle Research
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear Sir,

I am a Biology major attending the State University of New York at Stony Brook. Last semester I attended the University of Hawaii at Hilo on an exchange program. While there, I had the opportunity to go turtle tagging with the Marine Options Program at the University. This was one of the most incredible experiences I have ever had. Needless to say I became very interested in the Green Sea Turtle. This semester I am doing a paper on the turtle. Due to lack of resources in the library I am asking you for information. There are eight topics that my paper must include. They are: 1. Physical description 2. Systematics and paleontology 3. Geographical distribution 4. Ecological distribution 5. Habits 6. Sensory modalities 7. Physiology and 8. Other unusual properties. If you could send me any information you may have on these topics it would be greatly appreciated. Thank you for your time.

Sincerely,

Denise M. Butler

Denise M. Butler

On Matters Maritime

Punalu'u Shoreline Changes

by Kiko Johnston-Kitazawa

Happy New Year! In Hawai'i the new year is marked by the rising on the eastern horizon (at sunset) of the constellation Makali'i. This tiny, tight cluster of stars is also known in Greek as the Pleiades, in English as the Seven Sisters and in Japanese as Subaru. Should you wish to find it but aren't sure what the shape looks like, consult the grille ornament of the Japan-built auto of the same name.

Last month I was asked to write a monthly column on matters maritime. Two days before deadline, I suggested reprinting my 1991 article on canoe building (December *Ka'u Landing*). Now I hope to have a more ordered series including oceanography, geology, landings, water safety and more how-to-build articles — fishing boat, kayak. Also history.

In any of these areas a writer trying to pass on information to readers unfamiliar with the subject risks being corrected by those more familiar with the subject. I welcome this. Often, especially in matters of history, one tries in vain to find people who know about a place. But soon after writing, "The mooring buoys for ships at Honuapo were here, here, and here..." I was deluged by folks saying, "No, they were like this, and I saw them," and I found my sources.

In this month's column I will risk commenting on how I think the shoreline at Punalu'u has changed, some possible reasons why, and ways it might change in the future. The forces at work similarly affect other parts of the coast of Ka'u.

One good source is nautical charts. These are updated regularly by two main methods: (1) formal government surveys by the National Oceanographic and Atmospheric Administration (NOAA), and (2) corrections and observations sent in by mariners and other observers.

A grounded vessel in a harbor channel that became shallower due to silt deposits gets its captain's attention and NOAA gets notified, whereas a sugar mill stack that is no longer there can remain on a chart for years as no one bothers to report it.

Portion of Punalu'u Harbor, showing how much the beach (currently in the crosshatched area) has moved since this mapping in 1977. Also shown by arrows is the strong outflowing channel, and the marker buoys.

Harbors that have fallen into disuse also are not often surveyed.

Reproduced here is Chart 19992 corrected to June 25, 1977, showing Punalu'u Harbor. The underwater portions are about the same, but the shoreline shows some features from before 1971, others from before 1963. I have a feeling some are older, but will have to wait to hear from readers on these.

Note the area labeled "marsh" surrounded by a dotted line. In the early part of the last century, it must have been a pond, for in the aftermath of the 1868 earthquake and tsunami we find a writer lamenting that the pond of Punalu'u was no more. However, it must have been restored, whether by nature or people we don't know, for in the later part of the last century there is a record of a channel being cut through the beach near today's boat launch ramp for the purpose of floating 11-ton mill gears in from a schooner anchored outside Punalu'u on a scow (a flat-bottom square-ended vessel) to unload in the placid waters of the pond. One hopes it was a rare quiet day at sea as well.

By the time this writer was a child in the 1960s, the pond was a reed marsh. The reeds and mud were removed in the early 1970s at the time of the restaurant construction. The coconut trees on the beach between the pond and the sea were planted at that time by Girl Scouts, according to one source. In 1975 a tsunami washed over the beach, flattening it and washing away the footbridges in the pond. One of the laminated wood arched beams washed up at Ninole.

The beach has moved inland by about its own width from the position on the chart and the line of the seaward edge of the beach today is where the landward edge was on the chart. Along the beach road, the present seaward edge of the beach is about where the pond's seaward edge is shown on the chart, and the back edge of the beach would be about the mauka edge of the road were it not for the county road crew's efforts with a front-end loader after every high surf period.

The springs that formerly fed the larger of the two oval ponds now carve ravines back into the beach at low tide during calm periods. In front of today's lei stand, the receding beach has exposed a broad *papa* or shelf of rock where the small square is on the chart.

During the very impressive surf from Hurricane Fernanda, waves washed over the entire stretch of beach from the boat ramp to the lei stand into the pond. The sand carried by these overtopping waves advanced the pond shore inland about one foot.

Black sand beaches like

Continued on Page 18

Punalu'u Beach ...

Continued from Page 15

Punalu'u are formed when hot lava entering the sea is pulverized by the sudden cooling. Much of the sand thus formed slides down the undersea slope, but some is carried along the shore by winds and currents and deposited in protected pockets.

A prolonged eruption can create a large beach a long distance from the lava entry, as those who saw the formation of Kamoamoa beach can attest. Once the eruption ceases, loss of sand from the beach begins. Sand can be washed inland by storm surf or tsunami, blown inland by heavy winds, tracked inland on shoes or car or bus tires, carried off in small amounts by souvenir seekers or larger amounts by landscape crews. Currents can also carry sand out to sea and downslope.

One rumor this writer has heard but has not been able to verify was that at some point in the '50s or '60s a trucking firm was engaged in artificial replenishment of a black sand beach.

Research since the mid 1980s seems to indicate the Island of Hawai'i sinking at a rate of about one quarter of an inch per year or roughly a foot per half century. While some hold that the sea is rising (and it is possible for the sea to rise or fall and more amazingly for the land to rise or sink), sinking land and/or rising sea have the same effect of accelerating the reduction of Punalu'u beach.

On the chart there are some references to the rocks and reefs marked "breakers" and "awash half tide" having been dry land in the past, as well as reports of coconut trunk roots on the bottom, and even a dwelling on a small *moku* or island. Given four feet of sinkage in 200 years, and the large amount of sand possibly present during an eruption, this is certainly within the realm of possibility.

As for predicting the future, if things continue for a time in a fairly steady manner, the beach will continue to move inland at the expense of the pond and the beach road, which will become indefensible without extreme measures like the rock retaining wall and gravel berm that the county used to keep the road between Kaimu and Kalapana. This is also the method the state Highways Division uses for the bay front highway in front of downtown Hilo. In both cases, waves still come over the road during heavy surf and the presence of a wall seems to accelerate erosion of the sand remaining below it. Such a wall would not be a pretty sight.

If an eruption poured into the sea upcurrent and fairly nearby, much of the bay could become refilled with sand and a wider beach form.

Punalu'u is a bay because previous lava flows have pushed out into the sea to form the points on either side. A future flow could come to shore between these points and entirely fill the bay. This happened at Kaimu.

Large earthquakes can cause parts of the coastline to subside several feet, leaving coconut trees standing in the sea (Halape and Kapoho) and the sea washing about within church walls (Kalapana).

Finally, the recently discovered (and thankfully, infrequent) submarine landslides can send chunks of the mountain (shoreline included) plunging into the depths, eliminating this writer, and with the splash, most of his readers.

Punalu'u: a changing, temporary phenomenon. Enjoy it while it's here.

In closing, though we may not know when or how Punalu'u will end, I submit some guidance to help keep *you* from ending at Punalu'u.

The major hazard to be aware of is the current going out the channel to sea. This channel is toward the left point of the bay (as one faces seaward) between the rocky left point and breakers on the reef. Water flows out through here, often faster than a person with fins can swim. Most of this outflow is water that waves have thrown across the reefs, but spring water outflow and the ebb current of a falling tide contribute.

The usual strategy of swimming to the side of the current is not much help here, as one side is a jagged cliff with pounding waves and on the other, breakers can pound you across jagged submerged reefs. By far the best idea is not to get near enough to the "drain" to get sucked out.

When swimming at the boat ramp end of the beach, stay inside the buoys. When swimming in front of the beach road end of the beach, keeping to the right toward the pavilions is best, as it is against the current inside the reef and if you tire you can swim back with the current.

One can also swim between the two parts of the beach within a fairly close distance of the shelf, but watch for shallow spots.

If snorkeling, remember to lift your head and check where you are. Several of the people we've had to pull in said they became so entranced following a turtle that they didn't realize they were in the channel — this, despite having been warned not to go past the buoys.

This advice is for average trade wind conditions. In varying wind strengths or directions, and different wave heights, the current may differ. Remember: "If in doubt, don't go out!"

Finally, if you are so unfortunate as to be swept out, don't be shy. Let it be known you are in trouble. Rest. Stay out of the breakers, and hope someone who knows how to use the rescue board or a canoe will come and get you.

Ka'u Kupunas Dance in Hula Festival

Na Kupuna Waihine O Ka'u captured a second place award in the November King David Kalakaua Kupuna Hula Festival at the Kona Surf. Left to right: Mabel Kaipo, Susan Pua, Ginger Harris, Florence Selfridge, Teacher Lori Lei Shirakawa, Hattie Macomber, Mae Akamu, Annie Wong-Yuen, Jeannete Howard.

12/96

Dear George,

I hope your work with sea turtles this year was rewarding. I am graduating from the University of Hawaii at Hilo in May. You have been an inspiration to me with your work.

Aloha,

Shannon Oshiro

Thinking of you
and wishing you
a beautiful holiday season.

Shannon Oshiro
P.O. Box 1136
Mountain View, HI
96771-1136

need ADDRESS = 1613 E. NELSON
GONZALES, CA
70737

10/96

Hi, Dr. Balazs!!

Retro

How have you been? Are there any recent discoveries on fibropapillomas? What happened to the infected honu you brought to Kane'ohe Bay from Punalu'u?

stayed here

We are now well-settled in Louisiana (and our belongings have at last arrived; never employ the services of Big Island Moving. They are **extremely** unorganized, but insistent on rapid and accurate payment!). Life at my new high school is alright, though I had some difficulties adapting to the eight hour school day. My fellow students are friendly and show slightly different mind-sets from those I knew back home. Also, while I am greatly fascinating to my schoolmates, they amuse me, too. One boy asked me, "How do you like living in America now?" Hawai'i is still a wonderful place of abundant nature and mystique indeed! And I miss it. But there is beauty in Louisiana... and fragility as well. My mom is planning an Earth Day conference, which will focus on a major ecological area here, the Barataria-Terrebonne estuary; this 1 million+ acreage of marshlands is one of the United States' most significant.

I am enclosing a copy of my essay on the honu and hawksbill sea turtles; it took first place in my grade division for the "essay" category in last year's Language Arts Showcase. I don't remember whether I sent you this writing yet; in any case, I hope you'll enjoy reading it!

Sincerely,
Joy Yoshina

GROWTHS OF DEATH

"...Ah... We found a turtle this morning with tumors," George Balazs informed me, in a rather hushed voice, barely letting his words reach me before returning to the supine honu, or green sea turtle. His eyes, though usually happy and smiling, had appeared red and damp in the light morning sun. Had he been crying? I wondered to myself before realizing what he had just spoken to me of.

What! A tumored honu!! With my mouth agape, I looked past him with fear, for this would possibly be the end for our pristine Punalu'u Bay, home to the fastest growing herd of green sea turtles in Hawai'i. The tumors or fibropapillomas, a disease of unknown cause and cure, had made a definite intrusion into Punalu'u and would now destroy this natural sanctuary, transforming it into a new place of contagion. Up to now, Punalu'u had been an untainted bay far away from the deathly mire of fibropapillomas.

I stood outside of the group as George leaned forwards to examine the honu. George wore his beige-colored long sleeved shirt with a logo sewn on the backside and his cuffs were folded up to his forearms. He had on faded denim blue corduroy shorts, and white socks, pulled up to mid-calf length. A pair of white, grey-trimmed tennis sneakers protected his feet. His greying hair was pulled back in a ponytail. Though usually he wears a cap, none adorned his bent head now. Personally, he reminds me of a green sea turtle; besides having similar characteristics of benevolent eyes and a gentle nature, his profile--in an odd way--resembles a turtle's.

The honu was set on its back in one of the wet tubular platforms, with its gleaming yellow plastrom or underside upright. Initially, it had looked to me like any other honu brought ashore for measurements and, if needed, tagging. Its head was tilted towards the sky, eyes open, and flippers limply outstretched. It was very still and barely moved even when George examined it.

Eager to observe everything, the group of students from the University of Hawai'i's Marine Option Program canopied and circumbulated his squatted form to get the best viewing position. Through a gap between the closely gathered young scholars, I saw several of the horrid growths of unexplained origin which had attached themselves and began their utterly vile growth around the honu's eyes. Adding to my feelings of pity and revulsion, George expressed to me that there were more in the turtle's throat. I felt like shrieking and falling to the ground, a sudden influx of shocked hysteria from the sight of the grotesque whitish blobs disempowered me. How could this be?? When had this gentle honu contracted these ugly, vicious tumors, which would sip from it its life like a disgusting tapeworm? I voiced my queries, demanding answers about this wretched disease. George replied that they had measured this turtle last April, and they hadn't observed any such growths then. But this was now, and here was the same turtle. However, it would begin to feel the ghastly tumors which beckoned to a soundless and ever so slowly creeping death. Within seven months, a healthy turtle had received its death sentence.

With sad eyes on the doomed creature, memories of a special turtle here, at Punalu'u, surged upon my conscious mind like the

things left on a beach's shore by waves and exposed to the bright sun.

...I had seen him the same moment he saw me. He had skillfully glided through the murky ocean water to me from his seaweed meal in a few seconds, despite the yards of distance between us. Closer and closer he came, until he was right beside me and scrutinizing my face...

"Z-25!" I had thought to myself happily as I looked him over. His green-shaded head was covered with scales, boasting of smoothness. Z-25, which was my only name for him, had a face, like all honu, that emanated gentleness and a sort of kindness. Large, dark eyes studied me, displaying his happiness at seeing me once again. He had two tiny holes for nostrils at the front tip of his head, above a sharp, fingernail-like beak. A multi-ridged neck supported his pleasant face, with fold after fold of "skin." Z-25's shell, or carapace, was beautiful and large. Although fuzzy hair-like algae growth had dulled its luster, perceptible shades of dark green were stroked together naturally like sunlight reflecting off a damp meadow of kelly green grass. His front flippers were similar in their contour to an albatross' wings, with yellow claws at the lower middle outside. A terrible urge to reach out my hand and stroke his bumpy neck filled me. Without thinking, I stretched out my arm and did just that, feeling the pleasant texture of my special friend's skin. I realized I had broken the law by touching Z-25! But he did not make any effort to swim away. In fact, he remained there beside me, in the thermocline water, as if asking for another caress.

Another time, I had been admiring a juvenile green sea turtle in the same brimy waters, watching it tugging at the well-rooted reddish brown limu (seaweed) growing on a rock. Suddenly, a turtle with a familiar gumdrop-shaped shell gently nudged the smaller turtle away. Hey! Do I know you from someplace before? Then recognition passed over me. Z-25! Do you remember me?? I had screamed in my mind. Z-25 turned to face me, after getting the first turtle out of the way. His large, multicircular eyes looked at me from his floating position near the surface of the water, as he seemed to answer, "Yep!" I was thrilled. He had pushed against the juvenile honu to greet me again. His mouth appeared to turn up in a dog-like smile. This was too much for me! First, Z-25 lightly diverted a juvenile turtle away while I was looking at it, then, he "smiled" at me! He seemed so much like a person, a human being. I felt the layered neck and the smooth top of his head once more. It was irresistible, the texturized patch of neck and the `un-wrinklyness' of the head. His great brown and black eyes were looking elsewhere, but his mind must have been concentrating on me. I gazed with deep fondness at his huge shell and powerhouse flippers. They were beautiful. I love you, Z-25, was all I could think.

My mind retrieved another memory of a sea turtle; my precious moments with a single, fragile baby honu'ea or hawksbill turtle.

The last weeks of my past summer, filled with such warm and lovely memories, were spent partly on the brief black sand shore of Kamehame. The shore of Kamehame, though a paltry bit of black

sand, is incredibly valuable to the future of the endangered hawksbill turtle species. Female hawksbills come to these shores to lay their eggs, the priceless few which contain the hope for their species, during a few months each year. The Hawai'i Volcanoes National Park began a program with volunteers to monitor the nests in order to further help the hawksbill. Once, a batch of baby honu'ea had scrambled out to their destinies in the ocean. However, because a few were too weak to make the journey out of their sandy womb, the volunteers went in to excavate the nest. They soon found a live baby honu'ea, left trampled under in the rush and amid half-rotted eggs. Since it was too feeble to be released so soon, it was kept for a few days, which enabled me to see it and be the last person to hold it before it swam to its future.

I reflected on an earlier summer incident at Kamehame, when I had skipped along the black dunes, the fine sand constantly worn even finer by the sea and wind. It was some time after a hawksbill nest had hatched--one day, perhaps--and the young 'uns had come scurrying out. I looked down upon the sand, having noticed a small odd shape. It was of a dark brownish pigment, crumpled, and thinned to an almost two-dimensional width. Bending closer to scoop it up, I gasped, realizing it was a dead and scavenged upon baby honu'ea!! This was the first time I had ever seen physical evidence of young hatchlings perishing before they reached the salty foam of the seawater. I cried out, startled and horrified, to my parents; and as they rushed over to see what I had found, I discovered two additional hollowed-out little bodies, which spoke

of lamentable fates. Already, I observed contemptuously while glancing around the sand at my feet, the fire ants, which so mercilessly hunted these shores, had chewed apart what baby turtle flesh would nourish them.

I remembered the fate of those hatchlings as it was first laid in my hands; and wanted to hold it forever and adore its preciousness. The baby honu'ea was a soft, perfectly blended olive grey, about the size of a jumbo shrimp. Its eyes spoke of innocence; large, dark brown, and unblinking. Its shell hadn't yet attained the traditional beauty or strength of a hawksbill carapace, rather being feet-tinglingly vulnerable to bending. Its belly was terribly sunken in. Had it been starving, in that deep, hot ditch it was deposited in weeks ago? I asked myself, frowning, with compassion and tears growing inside of me. It remained on my palm like an old, soggy leaf; hardly moving. Was this because of absolute fright of me or a malnourished body? I couldn't answer myself, so I turned to ask Jill, who had been monitoring it. She replied flatly, along with my parents, that they didn't know.

"Let it go now, Joy," they had told me. But I couldn't. Looking out into the ocean, I reflected on how rough the waves seemed, like they could crush this baby in my hand, which felt so small, frail, and helpless. I wanted so fully to protect it until it was larger and stronger. But... I couldn't. I held it for a few more moments, gazing at it with undivided attention, before stripping off my socks and hiking shoes, and pulling up my pants legs with one hand to wade into the bay. The waves, which soon sloshed and gulped at my waist, called out for the young thing. I

had supported it till now with my left palm; then I slowly lowered it into the water. I had felt a sort of guilt in letting such a pretty, defenseless thing into the world. In a few moments, its small figure had been taken away into the vast expanse. I couldn't see it above the waves anymore, and a terrible sadness about what would become of it drizzled on my mind.

Still in my shocked position behind George Balazs, I recalled another event involving a sea turtle, this one of a dead honu left ashore at Punalu'u.

It was the morning following the sad release of the baby hawksbill. My parents and I had camped overnight at Kamehame, within hearing distance of the calmly ebbing waves against the solid land of Pele, the awesome fire goddess of Hawai'i. We had awoken and were especially hurried this morning because of what we had heard from a friend back at Punalu'u Bay. A dead honu had been found.

Quickly packing our camping equipment away into the bed of the truck, we drove a rapid pace over the bumpy road connecting remote Kamehame to the rest of the island. Once we reached our more-familiar black sands beach, we jumped out of the car and rushed about, looking desperately for the honu which had been, supposedly, murdered by human hands. In a few minutes we located the green sea turtle, which lay across a pebbly cove wet with oceanwater.

I leapt across the ancient lava rocks and crouched beside the lifeless figure, and at once a frightening mass of bomber flies rocketed off of the honu. They shifted in the air; iridescent blue, green, and red-violet swirling everywhere above the dead body

looking rapaciously for a place to land once more. Those colors would have been dazzlingly wondrous elsewhere, but I felt only irritation and abhorrence to them, knowing what they were and what they were trying to do. Their sickening, constant drone angered me. I swept away the buzzing pests which congregated in dreadful numbers, settling where they could like a fast mold as soon as there was space for them to do so. They, like the fire ants at Kamehame, always immediately picked up knowledge of a freshly dead carcass and rushed to it to propagate their kind. But--oh, the dead honu! I agonized over it, imagining its cruel and condemnable, needless death. It was an awful sight; such a gentle creature laid out to dry up and be feasted upon by maggots and the like! It was a sorrowful sight indeed, thrown upon the lava rock with water splashing lightly over its hind area and its once defined and smooth face now bloated horribly. The honu's shell looked so dry--all of the usual fuzzy algae seemed to have melted away completely--as if it would crack soon under the sun's blazing rays. Its eyes were opened halfway, yet it saw nor expressed anything, and would not ever again. It was one less beautiful and graceful honu, and though we have suspects of this turtle's killers, we will probably never know with certainty who and how this honu's life was ended.

And still the flies buzzed.

All this I recollected while staring at George, stooped over the irrevocably plagued honu, which remained quiet and motionless. Coming back to the present from my rich stores of memories on the dear sea turtles, I could tell this was a monstrously real

nightmare for him; who, like me, once thought Punalu'u would be safe from the probing and cold, bony fingers of fibropapillomas, which grasped till the death.

Then, before me, George stood straight and tall from the honu. Speaking for all to hear, and yet not for all to respond to or fully understand, he announced, "I'll call for a crate and take this turtle back to Honolulu.... It may infect the rest of the herd here."

With a long and quietly audible sigh, he left and made his way to the pay phone. I stood gazing after him with tears in my eyes and an urge to resurrect Punalu'u's past embosoming my heart.

To Uncle George,

Malika et Emily
Malika and Emily
sont heureuses de vous annoncer
are happy to announce
la naissance de leur frère,
the birth of their brother,
Christopher Wahid
et de leur soeur,
and sister,
Melanie Le'i'la
le 18 Juin 1989
on June 18, 1989

Walter and Kamila Dudley
523 W Lanikaula Street
Hilo, Hawaii 96720-4091

Summary of tagging and resighting data for green turtles captured at Punaluu, Kau, Hawaii
Compiled by George H. Balazs

	Expedition No. and dates	Method of capture	Total no. captured	No. newly tagged	No. tag resightings	Total no. tagged in population to date	Peterson population index estimate *
0.	June 1976-Sept. 1976	SC	42	37	5	37 [a] = Monel tags	-
1.	May 7, 1977	N	3	3 [b]	0	3	-
2.	Jan. 20-26, 1978	N, SC, SK	8	8	(1)	11	-
3.	Aug. 31-Sept. 3, 1978	SK	10	10	0	21	-
4.	July 26-29, 1981	N, SK	7	7	0	28	-
5.	Nov. 26, 1983	SC	3	3 [c]	0	31	-
6.	Dec. 15-19, 1983	N, SC, SK	12	10	2 [c]	41	186
7.	Jan. 8-10, 1984	N, SC, SK	13	9	4	50	133
8.	Feb. 17-19, 1984	N, SK	12	10 [d]	2	60	300
9.	March 23-28, 1984	N, SC, SK	30	20	10	80	180
10.	April 13-14, 1984	N, SK	3	2	1	82	240
11.	May 14-17, 1984	N, SK	11	7	4 [e]	89	225
12.	June 26-29, 1984	N, SK	13	8	5 [d]	97	231
13.	March 23-25, 1987	N	7	5	2	102	339
14.	March 21-23, 1988	N	3	3	0	105	102
15.	April 10-12, 1989 [j]	SK	14	11	3 [f]	116	490
16.	April 9-11, 1990	SK	12	8	4 [g]	124	348
17.	July 18, 1990	SK	12	5 [h]	7	129 [f]	213
18.	Nov. 27-28, 1990	BN, SK	17	5	12 [g, h]	134	183
19.	April 23-24, 1991	BN, SK	20	4	16	138	167
20.	July 16-17, 1991	BN, SK	15	3	12	141	172
21.	Nov. 12-13, 1991	SK	24	8	16 [f]	149	211
22.	April 14-15, 1992	SK, BN	15	4	11	152	203
23.	July 14-15, 1992	SK, BN	20	3	17 [f]	155	179
24.	Nov. 17-18, 1992	SK, BN	26	10	16	165	252
25.	April 13-14, 1993	SK, N	23	12	11	177	345
26.	July 13-14, 1993	SK	16	2	14	179	202
27.	Nov. 30-Dec. 1, 1993	SK	24	9	15	188	286
28.	April 5-6, 1994	SK	27	7	20	195	254

	Expedition No. and dates	Method of capture	Total no. captured	No. newly tagged	No. tag resightings	Total no. tagged in population to date	Peterson population index estimate *
29.	July 5-6, 1994	SK, BN	29	3	26	198	217
30.	Oct. 6-7, 1994	SK, BN	26	3	23 [b]	201	224
31.	April 20-21, 1995	SK, BN	30	3	27	204	223

N = net; BN = beach net; SC = hand capture while scuba diving; SK = hand capture while skin diving

a Monel alloy tags. All other tags used are made from Inconel 625 alloy. "Total no. tagged to date" was computed separately for Monel and Inconel.

b Tagged turtle 5008 (8165) resighted 6/19/84 nesting at East Island, French Frigate Shoals.

c Tagged turtle 6711-13 resighted 7/9/86 nesting at East Island, French Frigate Shoals.

d Includes tagged turtle 7634-37 with four leeches, leech eggs, and likely small tumor in corner of right eye.

e Also includes tagged turtle (6182, 6242, 6260) originally tagged nesting at East Island, French Frigate Shoals, 6/82 and 8/82.

f Also includes tagged male (3041, 6164, Y205-06) originally tagged basking ashore at Whale-Skate Island, French Frigate Shoals, 5/4/79. Resighted at same location 6/79, 6/80, 6/82.

g Also includes tagged male (6360-61, Y650) originally tagged basking at Tern Island, French Frigate Shoals, 11/28/82.

h Includes tagged turtle N388-89, N537 with small tumor in corner of left eye.

i N376, N377 not included in total. This turtle, rescued by Jerome Jude early July 1990 off Kona, released at Punaluu 7/17/90. Straight carapace length 19.8cm.

j 100 turtles newly tagged since Expedition 15 which marked the beginning of daytime capturing.

* $\frac{\text{No. tagged turtles recaptured}}{\text{Total No. turtles captured}} = \frac{\text{Total No. turtles tagged}}{\text{Total No. turtles in resident population (X)}}$

Date: Mon, 1 May 1995 17:31:40 -1000 (HST)
From: "George H. Balazs" <gbalazs@honlab.nmfs.hawaii.edu>
To: Hallacher Leon <leonh@uhunix.uhcc.hawaii.edu>,
    Dudley Walter <Dudley@uhunix.uhcc.hawaii.edu>
Subject: Punalu'u data

Walt/Leon- In Wednesday or Thursday's mail each of your will be receiving a summary current to our last trip on all tagging in our work at Punalu'u. I'd like you to take a little time to look it over. I realize there are weaknesses in the way I'm using the Petersen Index over such a long period of time. However, it's striking ot me that except, for a few higher and lower values, our estimated population for the site fairly constant between about 160 and 250 or so. In fact, it appear to me that these data provide no evidence of a population increase. What we might be dealing with is the near total shift from night to day feeding, and the increasing tameness of the turtles, resulting in perceptions of more turtles (we can see them now) and tameness that allows us to catch many more than we did in the past. I throw this out for your thought and comment, after you've looked at what I've mailed.

Another point to ponder. It seems clear to me that heavy grazing is occurring on the Pterocladia. In the past the Pterocladia always (by my memory) looked longer and more lush. What troubles me is that just short distances down the coastline, easily within 1-2 km, there appears to be large amounts of Pterocladia just "waiting" to be grazed. We saw evidence of that when I led The Honu Project people out to "turtle bay" following right after you left Punalu'u.

Ponder also the following: On our last trip we caught 30 turtles-- 28 were recoveries. 9 of the 28 were also recaptured on our proceeding trip of 10/94. And another 7 were also recaptured 2 trips ago during 9/94. So 16 of our recent recaptures (57%) are ones seen over again quite recently. Here's a breakdown of when the 28 recapturs were originally tagged:

1981- 1
1984- 1
1988- 2
1989- 1
1990- 1
1991- 4
1992- 7
1993- 6
1994- 5

Our daytime capturing started in April of 1989. Remember, we did that because we weren't catching much of anything at night, but were by hand when snorkeling during the day. Since April 1989 (expedition #15 of 31) up to the present we have tagged 100 new turtles. Prior to that we tagged 104 (i.e., Jan. 78 to March 88). A total of 204 turtles have now been tagged by us at Punalu'u.

I hope we can talkstory later about all of this. There is something interesting going on here-- that we don't fully understand yet. All of this does, however, give me plenty of motivation to net at night again, to see if there is another "population" of turtles (maybe all untagged!) feeding in the bay at night.

Aloha, George

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396
(808)943-1221 • Fax: (808)943-1290

June 2, 1994 F/SWC2:ghb

Ms. Danea Leigh
614 North M Street
Lake Worth, Florida 33460

Dear Ms. Leigh:

As Deputy Chairman of the IUCN Marine Turtle Specialist Group, it is my pleasure to present you with the enclosed Certificate of Merit for your conservation efforts at Punalu'u Bay, Hawaii, on behalf of sea turtles. Thank you for the time, energy, and courage you devoted to this important case so that justice would be served. Your actions in reporting what you witnessed, and later making yourself available for court proceedings, set an outstanding example for all to follow.

Sincerely,

George H. Balazs
Zoologist

cc: Barbara Schroeder, Florida Sea Turtle Coordinator

U.S. Department of Justice

United States Attorney
District of Hawaii

300 Ala Moana Blvd., Box 50183
Honolulu, Hawaii 96850

(808) 541-2850
FAX (808) 541-2958

May 17, 1994

George Balazs
National Marine Fisheries
2570 Dole Street
Honolulu, HI. 96822-2396

Re: United States v. Anthony Barro, et al.
Cr. No. 93-0611 MY

Dear George:

The address for Carolyn Martin is as follows:

Carolyn Martin
614 North M Street
Lake Worth, FL. 33460

I don't have an address for her daughter, but I assume Carolyn would share the letter with her.

I was upset to see that three turtles had been killed at Kiholo Bay. It seems that the number of these cases is rising. I hope NMF's enforcement people are able to identify the people who are responsible.

By the way, I saw you on TV2 with regard to the effect of ocean rubbish on turtles. That kind of education effort is vitally important, and I urge you to keep it up.

Very truly yours,

Mark E. Recktenwald

Marine Option Program
Turtle Tagging at Punalu'u

Background Information

For almost a decade, the Marine Option Program of the University of Hawaii at Hilo has assisted George Balazs of the National Marine Fisheries Service (NMFS) in his effort to learn more about the diet and movements of green sea turtles (*Chelonia midas*) in Hawaiian waters. Most of these cooperative efforts have been located at Punalu'u Bay, on the southern coast of the Big Island. This has been a particularly rich turtling ground, probably because of dense *Pterocladia* (a red seaweed frequently consumed by green turtles in Hawaii) growth on the inshore rocks of the bay. For this research activity to proceed successfully, and for your safety, it is important that each of your read this handout carefully and follow instructions. Thanks.

The NMFS investigation requires that green sea turtles be captured, tagged, and released unharmed. Usually, catching of turtles is done by hand during daylight hours by one of two methods. The first involves the use of two-persons teams. Assigned teams try to catch turtles by hand (assigned by Mr. Balazs after consultation with faculty and staff) by swimming slowly up to them and trying to grab them by their front flippers. Once grabbed, the turtle is quickly rolled onto a float (again, in an upside-down position) and brought to shore. The second daylight method involves deployment of a beach seine (large net) which is then dragged toward shore. Turtles encompassed by the net are grabbed by hand and brought to shore.

In the past, a third method was used to catch turtles: netting them at night. Netting was done during the night with a large-mesh fence net. The turtles came in to feed and got entangled. The net float-line was constantly monitored by students during the night. When the line submerges, a turtle may be in the net and in danger of drowning unless it is quickly brought to the surface. The students on watch at the time swam out to the net, freed the turtle, placed it upside-down on a float, and swam it to shore where it spent the night. In the morning the turtles were measured, weighed, tagged, and released. Although night netting has not been done for some time, it is always possible that it may be re-introduced during this trip, depending upon conditions and the turtles (they don't always cooperate with being people-handled). George Balazs will decide on the appropriate methodology to use.

The primary goal of this cooperative effort is turtle research. Although we try to involve all students in the capturing of turtles, circumstances sometimes arise which preclude all persons from having that opportunity (scarcity of turtles/abundance of students, bad weather, etc.). In essence, there are no guarantees. Please be patient and remember that we'll try to accommodate everybody.

About Punalu'u

Punalu'u is one of the most famous black sand beaches on the island of Hawaii. Unfortunately much sand has been lost from the beach over the years due to sand mining, storms, shoreline subsidence, and especially tsunamis in 1868, 1960, and 1975. Please do not add to the loss of sand by taking "samples" home.

Punalu'u has been the site of Hawaiian villages from prehistoric times and by the late 1800's served as a major stop for inter-island coastal steamers and as a coastal railroad terminal. After the 1941 attack on Pearl Harbor, the Army dynamited much of the port facilities and stationed troops at the pier for the duration of World War II to ensure that it could not be used as a landing site by the Japanese. The 1946 tsunami completed the destruction of Punalu'u as a port and razed much of the village.

As you swim in the waters of Punalu'u bay you will notice much cool fresh water from submarine springs. In former times some Hawaiians obtained fresh water by diving into the ocean with gourds, which they filled with fresh water from these underwater springs. The name Punalu'u means "diving spring."

As you look back toward Mauna Loa from Punalu'u you will notice several forested green hills projecting above the sugar cane fields. These features are the Kaiholan and Puu Enuhe hills, which are remnants of the ancient Ninole volcano. The Ninole volcano was active between about 500,000 and 100,000 year ago. Since then it has been deeply eroded and almost completely buried by lavas from Mauna Loa volcano. The "hills" are the crests of ridges and their truncated ends may represent ancient sea cliffs cut by wave erosion.

Basic Turtle Tagging Rules

1. Catching of turtles is done ***only*** under the supervision of George Balazs of the National Marine Fisheries Service. Do nothing until told what to do by George Balazs or his assistant, Drs. Hallacher or Dudley, or John Coney. Under no circumstances should anyone attempt to catch or restrain a turtle on their own volition or while away from organized group activities. Seriously! To do so is both irresponsible and a federal crime. Also, if people not associated with the class or NMFS offer to help, politely say no. The Federal Permit which has been issued to Mr. Balazs does not allow members of the general public to capture or handle turtles.

2. In the unlikely event you're on net watch during the night, take your job seriously. Stay alert and check the net at regular intervals. Conversation/visitors are OK as long as they don't detract you from your duties. If you are distracted or miss seeing a netted turtle, that animal will ***die***. To lose an endangered animal through negligence would be inexcusable.

3. When handling or catching turtles, be aware that they can ***hurt you***. Watch for flippers which can hit you with amazing force. Turtles can and do bite on occasion. Keep your fingers away from their mouths or you could lose them. They can bite just about any other part of your anatomy as well, so stay away from their mouths!

4. Help out where you can. Remember that team work is the ticket, so let's all pull together.

Safety Rules

1. ***Never, repeat never***, enter the water alone! We have a mandatory buddy system. You must swim with a buddy and have your buddy in sight at all times. If your buddy leaves the water, so do you. This doesn't mean that you are going to be chained to someone for the entire time we're there, rather whenever you enter the water do so with a buddy.

2. Make sure that someone on shore knows that you and your buddy are in the water and is on "lifeguard duty" (keeps an eye on you).

3. If you drift away from your buddy but have them in sight, raise both arms in the air, make fists, and tap them together. This is the scuba signal for "let's get together". If you lose sight of your buddy and cannot locate them in a minute or two, give the same signal to the "lifeguard" on shore and they will either direct you to your buddy or see that assistance is rendered in finding them.

4. If you or your buddy are in trouble, give the international distress signal - "right-left waving of the open hand above head." The "lifeguard" on shore will see that assistance is rendered immediately.

4. No alcohol or drugs at any time!

5. No disappearing acts. If we can't find you, we're going to assume you're in trouble and come looking for you! To avoid the embarrassment of being unnecessarily "rescued" let Drs. Hallacher or Dudley or John Coney know if you will be out of sight of the group for any period of time.

If these rules are flagrantly broken and you have endangered someone's life, or maybe even your own, grave consequences will result! Remember you can be safe and still have fun.

Basic Turtle Capture Scenarios

A. Daytime turtle capturing - Rotating Team Method

1. Turtle capturing teams consist of 3 persons; two catchers and a tube person. Three-person teams will be determined after we arrive at Punaluu.

2. Two (maybe three turtle capture teams) will enter the water to locate and capture turtles. Other teams will wait on shore near the beach command center (the canopy).

3. The catchers will catch a turtle and with the aid of the nearby tube person roll it onto its back into the tube. They will then swim it into shore.

4. Once a capture-team has returned to shore with its turtle, a new team will replace it in the water. This way nobody gets exhausted and as many people as possible get to attempt to catch turtles.

5. Swimming after turtles can be exhausting, so watch yourself. When any member of a team begins to feel tired (turtle or no turtle captured), the *entire team* is to stop and return to shore ***immediately***. No shame!

B. Daytime turtle capturing - Seine Method

1. Following George Balazs' instructions the net is set in such a way as to place it between turtles feeding near shore and their escape route to the ocean. Setting procedures will be explained on site.

2. The net is slowly pulled toward shore until the turtles encompassed by it can no longer escape around the ends of the net. People are placed strategically along the net to grab turtles which manage to swim under or over the net.

3. Once the net has been pulled almost all the way ashore, the turtles which have been captured by it are grabbed by hand and brought to shore individually.

C. Night-time turtle capturing.

1. Fence nets, set during the daytime, will be watched at all times during the night. The florescent floats on the top of the nets should be scanned every five minutes. If floats are underwater or a turtle is seen entangled in the floats, immediately send for Mr. Balazs or Drs. Dudley or Hallacher, whomever is on duty.

2. Under the supervision of Mr. Balazs, Mr. Coney, Drs. Hallacher or Dudley, a team of two students will swim out to the net and after determining that it is indeed a turtle, remove the turtle from the net, place it in the buoy and swim it to shore.

THE EFFECT OF TURTLE GRAZING ON *PTEROCLADIA* BIOMASS IN PUNALU'U BAY, HAWAI'I

DATE
MARCH 7, 1992 - MAY 4, 1993

PROJECT LEADER
YUKO OKANO

ADVISOR
LEON HALLACHER, PROFESSOR OF BIOLOGY
UNIVERSITY OF HAWAII AT HILO

FINAL REPORT DATE
MAY 4, 1993

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Figure-2 : Map of the study site in Punalu'u.

Figure-3 : Design of the cage.

Figure-4a, 4b : Algal biomass change in north cage.

North exp.:mean=0.2g/in^2, S.D.mean=0.07, n=8

North control:mean=0.05g/in^2, S.D.mean=0.007, n=8

Figure-5a, 5b : Algal biomass change in south cage.

South exp.:mean=0.3g/in^2, S.D.mean=0.09, n=10

South control:mean=0.04g/in^2, S.D.mean=0.007, n=10

Figure-6 : Algal biomass mean and standard deviation of mean for treatments.

INTRODUCTION

Punalu'u Bay is located in the southern Ka'u district of the island of Hawai'i (Fig. 1), and is a very unique area in terms of the abundance of green sea turtles. The bay also has abundant red algae, *Pterocladia,* growing nearshore. It is the primary diet of Punalu'u's green sea turtles, *Chelonia mydas* (Balazs, 1982). During this project, the effects of grazing by the turtles on *Pterocladia* was monitored. The purpose of this study was to make preliminary estimates of the effects of grazing by *Chelonia mydas* on *Pterocladia.*

MATERIALS AND METHODS

In the experiment, turtles were excluded from grazing by wire cages. Two metal cages were built, and submerged parallel to the east shore of the bay; one was located south of the other (Fig. 2). The approximate depth of the two sites was two to three feet.

The approximate size of each cage was; 55 cm in width, 64 cm in length , and 31 cm in height (Fig. 3). Each had a solid concrete base which weighed about 50 pounds to minimize the effects of strong surge or wave action. The bottom of the inside of each cage was completely filled with algae covered rocks. Two of these

rocks were chosen as "experimental" rocks from which algal samples would be taken. Two rocks outside of but near each cage were chosen as controls. There were total of 4 rocks at each site from which algal samples were taken.

Samples were taken approximately once every 3 weeks, and continued for 15 weeks, from September 4, 1992 through December 7, 1992. However, the experiment on the north cage was terminated on November 21, 1992, when the cage was lost. During each sampling event, all experimental and control rocks were carried to shore in an inner tube. Algal samples were then scraped off the rocks and carried back to the laboratory. These samples were standardized by using a very small quadrat which was square inch in area.

Once samples were brought to the laboratory, they were rinsed in fresh water to remove salts, dried for 1 week or more, and weighed.

Dry weights (g/in^2) were statistically compared to test for differences between the mean weights of experiment and control algal samples. The null hypothesis was; that the difference between the mean experimental and control weights was not significant. The alternative hypothesis was that the difference between the mean experimental and control weights was significant.

RESULTS

Experimental replicates from the north and south cages showed dramatic increases in algal biomass while controls had very small change (Fig. 4 & 5).

Biomass at first sampling was from 0.02 g/in^2 to 0.08 g/in^2 for both experimentals and controls at the north and south sites. However, the maximum amount of south experimental sample was 0.80 g/in^2 on December 7 while the maximum of the south control was 0.08 g/in^2 on September 4. The maximum amount of north experimental biomass was 0.48 g/in^2 on Octorber 27, and the north control had a maximum value of 0.08 g/in^2 on November 21.

Toward the end of the experiment algal biomass declined on experimental rocks. Biomass declined on both experimental rocks in the north cage between October 27, 1992 and November 21, 1992. One south experimental rock had a decrease in biomass from November 21, 1992 to December 7, 1992. The most probable explanation for biomass decline on experimental rocks was hydrodynamic fragmentation by strong wave action in the bay (Fralick & Andrade, 1981). When swells come into the bay, currents in the bay become quite strong. There were several storms that passed south of the Big Island during the period when biomass decline occurred (Honolulu Advertiser, 1992). During one of these storms, wave height in Punalu'u bay was reported as high as 8 to 15 feet. Algae inside the experimental cages would be affected by strong waves more than controls since it was much longer resulting in a higher drag ratio and resistance to water motion. The maximum length of south experimental algae was 11.2 cm while that of the south control was 6.6 cm during the period. North experimental samples recorded 8.0 cm in the maximum length while the north control had 4.4 cm.

The means of both north and south experimentals were significantly higher than

those of north and south controls, at 95 % confidence intervals (Fig. 6).

CONCLUSION

In conclusion, experimental algal biomass was significantly higher than control biomass, indicating that *Pterocladia* is subject to intense grazing pressure at Punalu'u. Green sea turtles are major contributors to this pressure. First, they feed almost exclusively on *Pterocladia*. Second, the turtle population at Punalu'u is large. Third, turtles are large animals that eat large amounts of food. However, what still remains to be tested is how much grazing pressure is attributable to *Chelonia mydas* and how much to other herbivores such as fish.

ACKNOWLEDGEMENT

Throughout this project, I was helped and encouraged by professors and staff from the Marine Option Program, University of Hawaii at Hilo. Dr. Leon Hallacher, advised me on the project. Dr. Brian Tissot helped me with statistical analyses. Mr. George Balazs, from the National Marine Fisheries Service, willingly gave me his support and information on green sea turtles and *Pterocladia*. Mr. John Coney, Mr. Mike Childers, Mr. David Rose, and Ms. Tammy Wenham provided their help in the field. I give special thanks to all of these people and their support.

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Figure-1

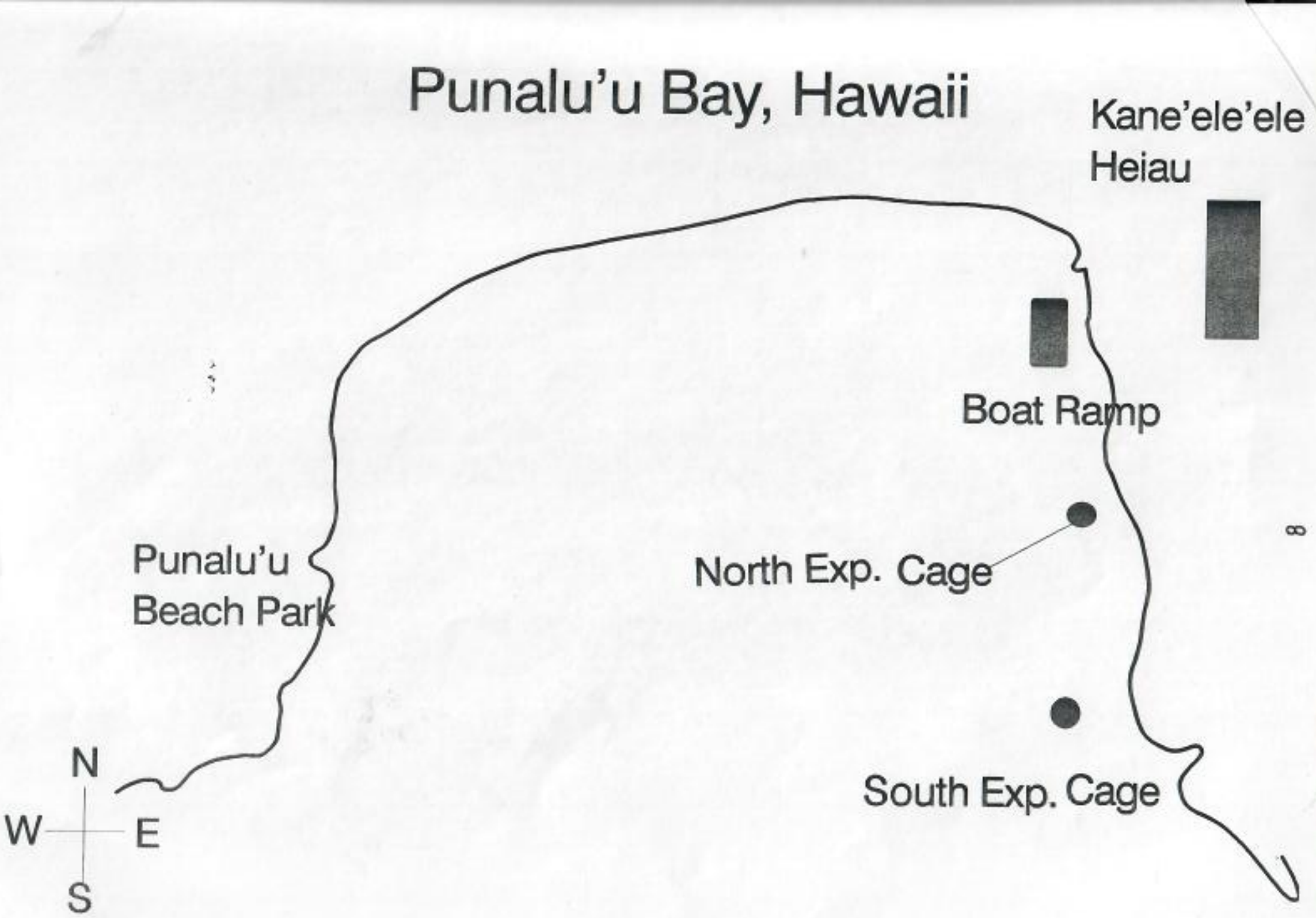

Punalu'u Bay, Hawaii
Kane'ele'ele
Heiau
Boat Ramp
Punalu'u
Beach Park
North Exp. Cage
South Exp. Cage
N
W
E
S

Figure-2

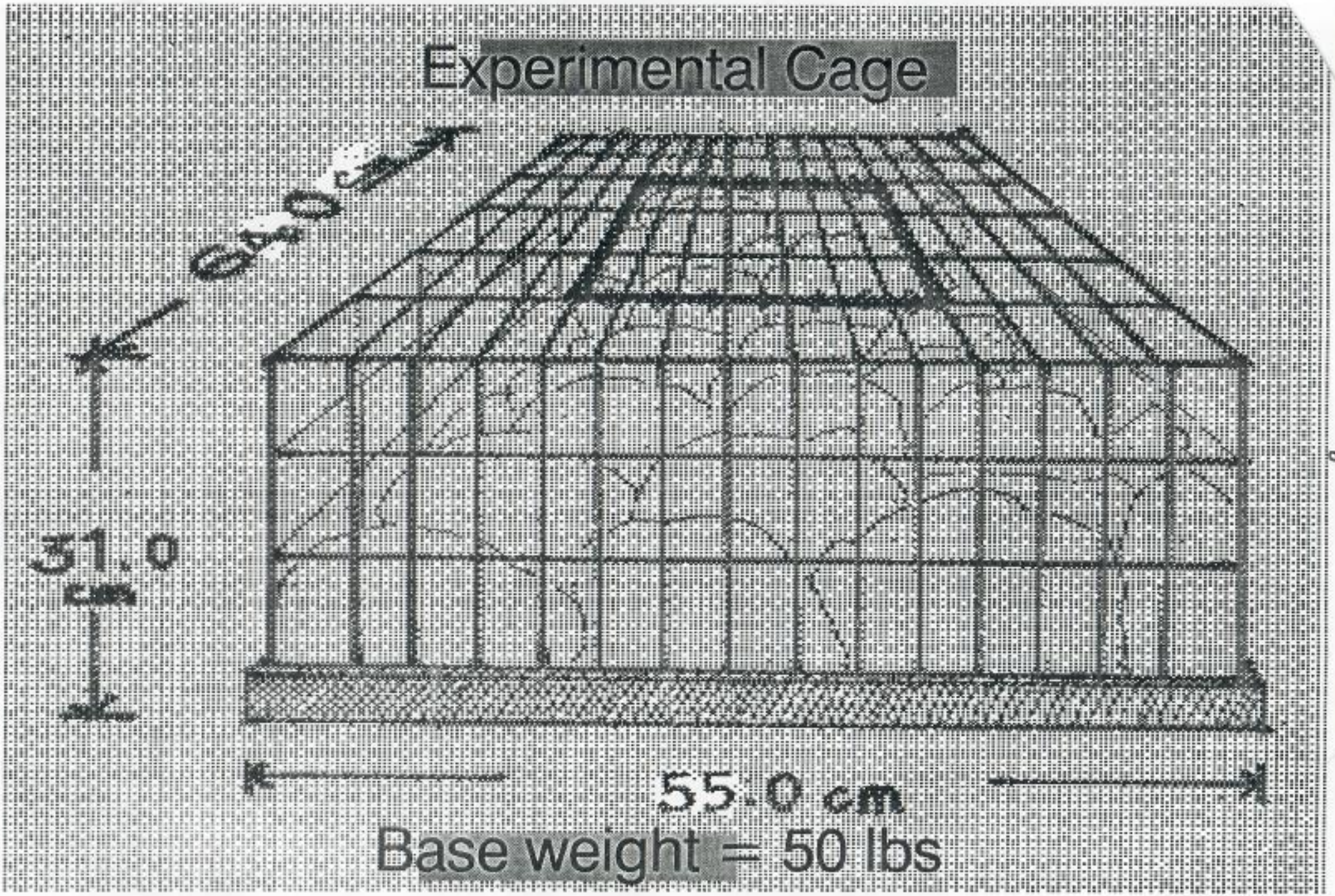


Figure-3

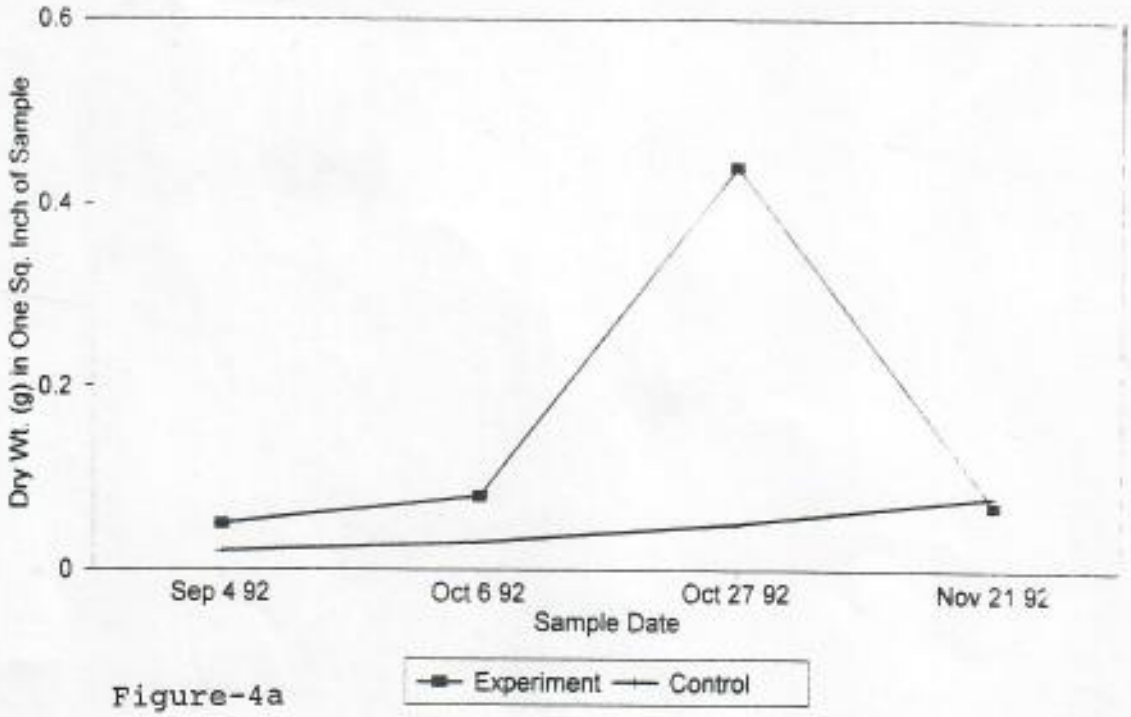


Figure-4a

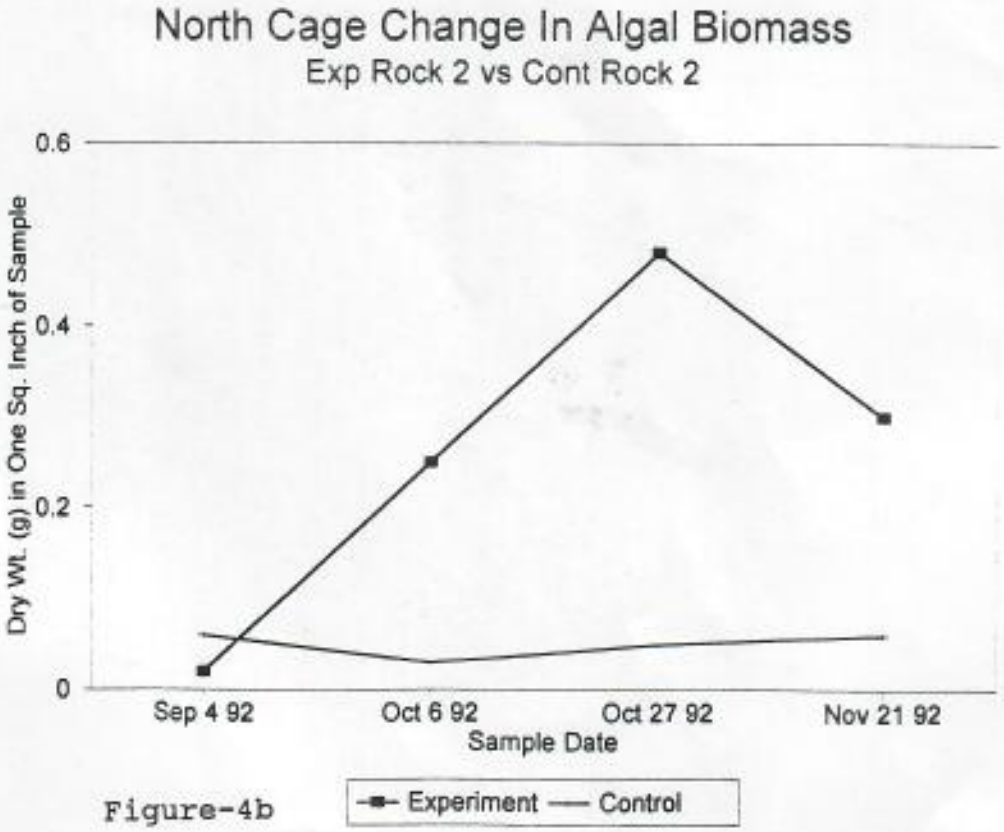


Figure-4b

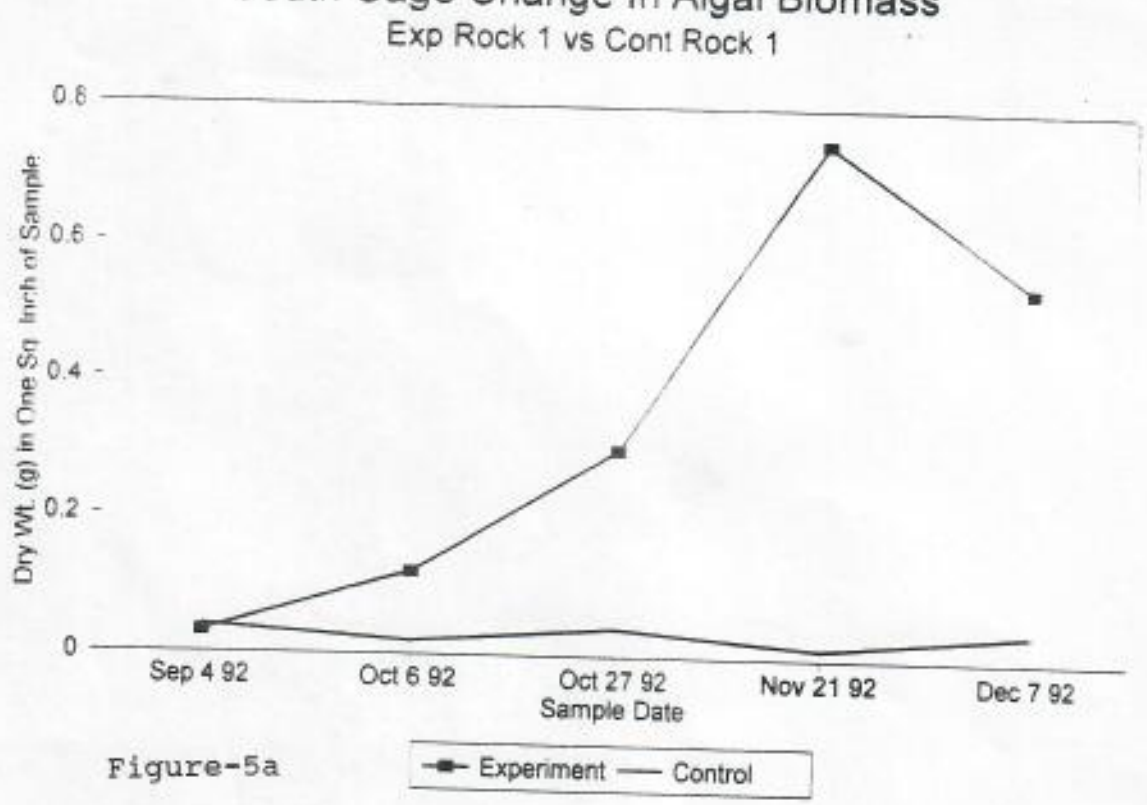


Figure-5a

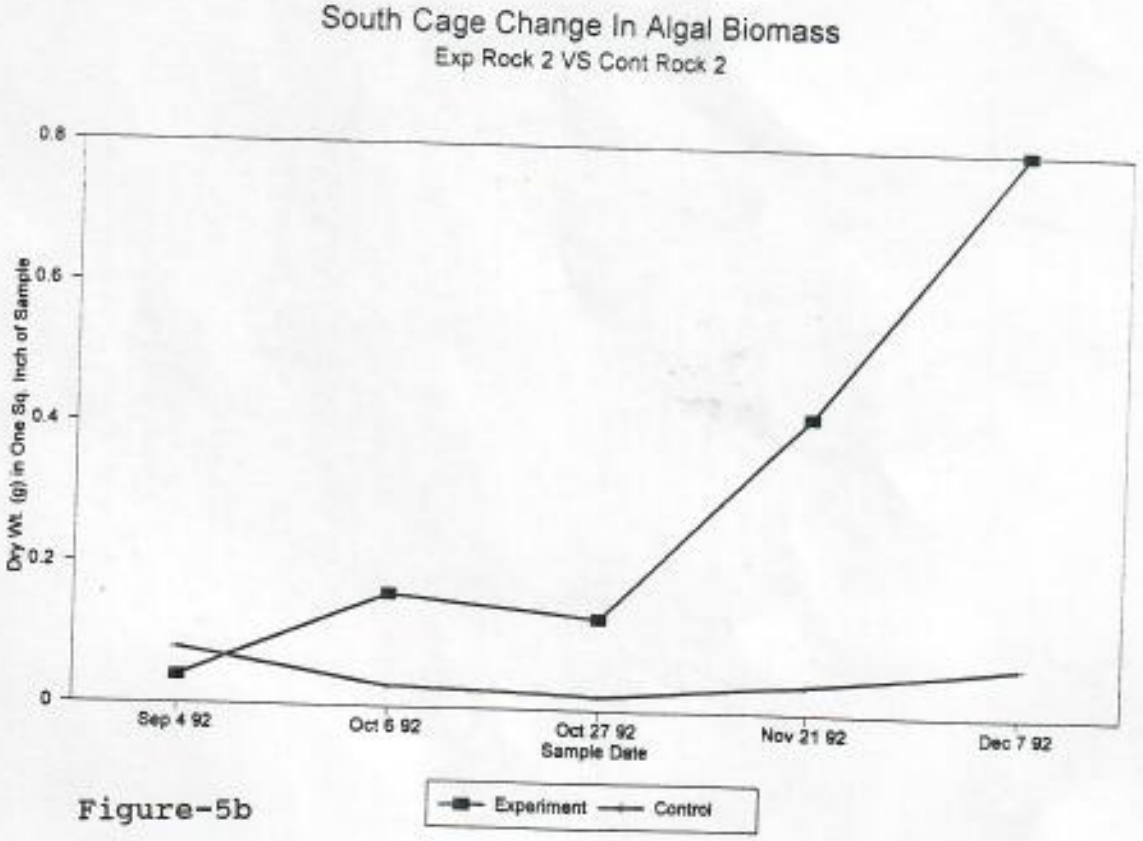


Figure-5b

Punaluu Cage Experiments

Algal Biomass

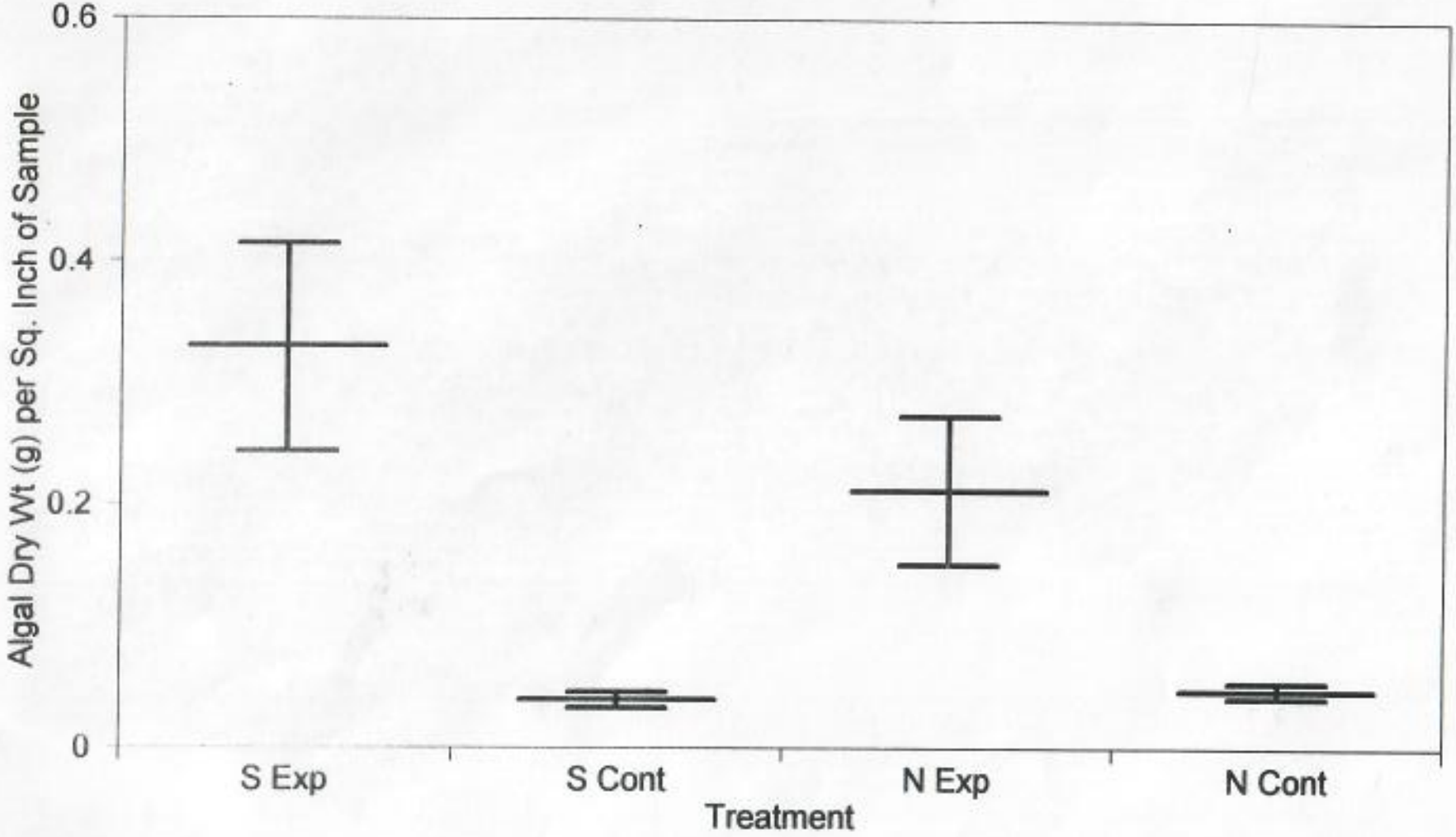


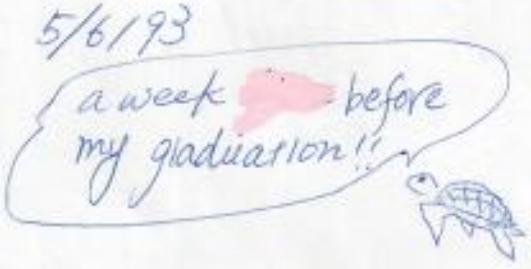
Figure-6

Dear George,

I finally finished my report of Pterocladia. I got your paper and used as my reference. Thank you very much throughout the project. I certainly had great experience and I hope I could still have some time to experience some more. Anyway, here's my report, and I'm glad to have your comments on it.

I am going to move to OAHU during this summer. I wish I could see you again. Thanks again!!

5/6/93



Aloha, Yuko Okano ☺

UHH Marine Option Program

Changing Tides

Vol. VII, No. 3, February 15, 1992

MOP SPRING - '92 SCHEDULE

February 22-23
MOP goes camping

March 8-9
Ninth Annual Student Symposium

March 13
TGIF

April 5
Sailing and Fishing

April 14-15
Turtle Tagging

May8
TGIF

May 17-28
QUEST

STUDENT SKILL PROJECT SYMPOSIUM

The Ninth Annual MOP Student Skill Project Symposium will be hosted by the University of Hawaii - Hilo on March 7, 1992. Deadline for abstracts is February 7, 1992. Stop in or call your MOP office for more information.

UNDERWATER ARCHEOLOGY SYMPOSIUM AND WORKSHOP

On March 23 - 27, UH-MOP Manoa will be hosting its annual Archeology Symposium and Workshop. The symposium will be held at the Maritime Center in downtown Honolulu, and the workshop will be at Coconut Island in Kaneohe Bay. The application deadline is February 28, 1992. There is a 15 student limit, with people interested in scientific diving, marine archeology, and marine resource management preferred.

For further information contact:
Steve Russell - Coordinator
UHM-MOP
1000 Pope Rd. Room #229
Honolulu, HI 96822
Phone: 956-8433 or contact your local MOP office.

FALL - '91 CAMPING AT KA'ALU'ALU

Angie Treloar

So, is this what college is all about? As I sit on the "Green Sand Beach" on the southeast shore of the Big Island of Hawaii on October 19 & 20, watching the waves crash down upon the isolated shoreline, I realize that I may never again have an opportunity to experience something so memorable.

The beach is referred to as "Green Sands" because of the abundance of a greenish volcanic mineral called "*olivine*."

Getting to this beautiful destination took our group 30 minutes driving through open, rolling hills, and cow pastures. The clear blue water, incredible coarse yet soft sand, and surrounding black lava rock were breath-taking to say the least.

We ventured out into the unknown waters in snorkeling groups. After the initial fright of swimming through the powerful breaking waves to get to the mouth of the bay, I began to relax and enjoy the underwater world that surrounded me. This experience is one that few students on the mainland could even try to imagine as part of a college education, a first hand, hands-on learning process.

Having been to the farthest southern point of the United States, on a beach called Green Sands, looking at Ka'alu'alu Bay, I realize the memory of this beauty will be etched in my mind, forever.

FALL - '91 TURTLE TAGGING

WHAT AN EXPERIENCE !

Enthusiastic MOPers broke a five-year record by catching, tagging, and releasing 24 Pacific green sea turtles (Honu in Hawaiian or scientifically named - *Chelonia mydas*) on the 12th and 13th of November. This happened during MOP's turtle tagging activity held every semester at Punalu'u Bay, where the turtles go to graze on *Pterocladia* (a red seaweed frequently consumed by the green sea turtles in Hawaii and especially rich in Punalu'u Bay). Nets have been used for capturing the bulk of the turtles in past taggings, but Mr. Balazs and assistant

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Changing Tides is a monthly news publication by students of the University of Hawaii at Hilo Marine Option Program (MOP). The opinions expressed here in are not necessarily those of MOP, or of UH-Hilo, but those of the *Changing Tides* staff and contributors. *Changing Tides* welcomes editorial contributions or comments.

Editor : Jerry Van Epps

Changing Tides, UHH-MOP
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Fax (808) 933-3355

Russ Miya had trouble keeping up with the volume of turtles being captured by hand, so the nets weren't needed.

Brad Blankenship, a MOP student and cowboy from Wyoming, led the "roundup" by single - handedly capturing eight Honu and assisting on numerous others; I guess it's in his blood.

The largest turtle brought ashore was a male weighing 225 pounds, with a shell measuring over 80 centimeters (approximately three feet). This Honu had been caught twice in the past five years at French Frigate Shoals (about 800 miles away) during mating season. The age of the giant Honu was unknown, although reproductive maturity begins at about 25 years, and this definitely was a sexually mature male. He was "guesstimated" to be between 30 and 40 years old.

George Balazs of the National Marine Fisheries Service (NMFS), a long time turtle researcher, again coordinated the tagging, measuring, weighing, and general examination of the turtles' health. Mr. Balazs has been doing turtle research, assisted by UH - MOP volunteers from around the islands, since as early as 1976. He is currently pursuing research funding to find the cause of the very serious problem the Honu are having with lobulated tumors called *fibropapilloma*, a cancerous growth that has been found covering the turtle.

To date, approximately 140 different turtles have been examined and tagged at Punalu'u. Russ Miya, a U.H. Manoa MOP alumni, has been working full time with George for the past year on green sea turtle research.

Drs. Walter Dudley and Leon Hallacher pulled a few turtles from the water to end this incredibly exciting experience. The weather was overcast with mild temperatures, which was excellent for turtle tagging. No harm came to either humans or turtles, just a lot of hard, meaningful work for a cause we all felt privileged to be a part of while "attempting to preserve another endangered species on Mother Earth."

The Honu is federally protected under the Endangered Species Act, with penalties of up to $25,000 and/or one year in jail for disturbing, harming or killing a Hawaiian green sea turtle. If you see anyone causing harm to the green sea turtle, please call:

1) U.S. Fish and Wildlife (541-2682)
2) National Marine Fisheries Service (548-5918)
3) George Balazs (943-1221)
4) Marine Options Office (U.H.Hilo, 933-3544)
5) MOP-UH Manoa (956-8433)

Special thanks to all the MOPers that participated in turtle tagging. Your hard work made this a fantastic success.

PUNALU'U HISTORY

Punalu'u is one of the most famous black sand beaches on the island of Hawaii. Unfortunately, much of its sand has been lost over the years due to sand mining, shoreline subsidence, and especially to tsunamis in 1868, 1960 and 1975.

Punalu'u has been the site of Hawaiian villages from prehistoric times. By the late 1800s it served as a major stop for inter-island coastal steamers and as a coastal railroad terminal. As you swim in the waters of Punalu'u Bay, you will notice much cool fresh water from underwater springs. In former times, some Hawaiians obtained fresh water by diving (lu'u) into the ocean with gourds, which they filled with fresh water from these underwater springs. The name Punalu'u means "diving water".

There is a Hawaiian legend of Punalu'u, "The Legend of Kauila, the Turtle Girl." The legend goes that there was a spring-fed pond of water behind the beach at Punalu'u. A mother turtle and her baby lived in the pond until the young turtle grew up. The young turtle was named Kauila. The spring came to be called "The - rising - water - of - Kauila."

The turtle girl was able to assume human form and play with the young folk, but would change back into a turtle when she went back into the spring. When bubbles came up in the spring, people knew the turtle girl was asleep in her home. Children used to catch fish and shrimp in the spring and Kauila watched to make sure they didn't fall in. The people loved Kauila for this and for her spring which gave them drinking water. They never used her water for any other purpose, making it "kapu" to do so.

OPEN WATER BASIC DIVING CERTIFICATION

Jerry Van Epps

I would like to alert our readers to a truly exciting, exhilarating, and physically demanding activity available to most of us in Hawaii. Scuba diving is the activity I'm referring to, and I would like to describe to you what to expect when going for your open water or basic diving certification.

I finished my open water certification a few months back. I hope this article stimulates your interest in scuba diving as much as the actual experience did for me. The beauty of Hawaii that surrounds you is only half of what really exists. The other half is below the crystal clear, subtropical ocean that surrounds us. For those of you who snorkel, you already have an idea about what I mean. The colorful fish and coral that make up this new, tranquil, underwater habitat are a big part of the unique beauty that gives you exhilaration and euphoria when exploring it.

The open water certification is good to a depth of 60 feet, and for Hawaii that's plenty. The course consists of five dives and five classroom sessions, including videos, book review (PADI open water dive manual, 5 chapters), and testing. After each chapter, a dive follows relating to what the chapter covered.

Most of the course is based on safety procedures, which is a must, because although diving is fun it is also potentially dangerous.

The course is a building-block from which you decide how much you want to develop your diving skills. Besides being recreational, diving has many occupational applications.

Through the basic course, equipment is provided along with transportation: all it takes is your time and desire to experience one of life's great adventures. You may not be able to travel in space during this lifetime, but you can explore the next best thing; the under-sea world of Hawaii.

STUDENT EXPERIENCES ABOARD THE RESEARCH VESSEL *MOANA WAVE.*

Terry Riessen & Tammy Wenham

Terry Riessen, a long time MOPer, and Tammy Wenham, a newer MOPer, had the opportunity to spend ten days aboard the research vessel - *Moana Wave*, operating out of Oahu. Their experiences are related in the following articles.

Terry's story:Being invited aboard the R/V *Moana Wave*, to assist in study of the boundary fauna of the Hawaiian Islands, is not exactly a run-of-the-mill experience for the common third semester undergraduate. When UHH-MOP asked if I wanted to go, my first question was, "What's it going to cost me?" To my surprise, it wasn't going to cost me a cent. Then I wondered what the catch was. What could the University of Hawaii possibly have in mind for an insignificant nobody, like myself, to be willing to support me for ten days, aboard a ship miles out at sea? I really wasn't sure, but after I was finally aboard it came to me, and it didn't take long (no more than two seconds to be specific). While climbing out of the zodiac, I was greeted by the crew. These were ordinary, hard-working people, aboard a not-so fancy ship, not exactly a bunch of clean, white coated men aboard the Love Boat. In other words, they were definitely not what I would have expected for a scientific research vessel.

Not that I was the least bit disappointed, because I wasn't, I just knew that from that point on, it wasn't exactly going to be a vacation. Or was it?

Following our orientation of the ship, we were given our watch schedules, the hours that we were expected to "work" for our stay on the ship. I was given the day watch, spanning from 8:00 a.m. to 4:00 p.m., or until all work was finished, which averaged about two hours of work or so (real tough schedule). I was satisfied. Sorting the catch from the night before wasn't all that bad, in fact, it was actually very interesting. I learned to identify many mid-water fish, fish larvae, and crustacean larvae from the Hawaiian island area, but those d___ shrimp (hundreds, or perhaps even thousands of tiny red shrimp all sorted into three or four species), well...that's a story for another day. I was content with my given duties, for the time, but needless to say, I couldn't help but wonder about the second shift and the third (graveyard) shift. What were their duties like? Being determined to experience just about everything possible on that cruise, I stayed up those extra, late hours to lend a hand with the trawl. From that experience I understood the root of my first impression upon coming aboard the ship. Handling rope, and nets, and winches while on an object that is always rolling in motion with the waves, well, I need not say that a person who's life is at sea definitely has his work cut out for him. It was difficult work at times, but it was worth the experience.

After hours, when all duties were done, I found myself at home in the ship's mini-lab, a sort of home away from home for Dr. Richard Young, the chief scientist on board. There I opened a door to a whole new world, the realm of the micro-marine organism. I discovered sea creatures, some no larger than an eye of a needle, while searching haphazardly through a sample of sea water: zooplankton, jelly fish, fish larvae, and crabs about as large as peas.

If one ventured on through the ship's many corridors, it wouldn't take long to locate the ship's dry lab, a room full of high-tech, state-of-the-art electronics. I found it quite comfortable to be in a room full of hundreds of thousands of dollars worth of equipment, that at first glance, could probably be mistook as capable of running a small city (very intimidating). Among the masses of metal and wire were instruments to measure water depth and the depth of the trawling net, as well as inconspicuous little video screens that could tell you exactly where the ship was at, any time, at any location, on the face of the earth.

There is only so much a student can learn in a class. One can truly absorb what has been read in a book only when he or she has had the opportunity to experience those words in action. I used to consider myself a marine science student, and well underway. My experiences aboard the *Moana Wave* made me realize that I've just scratched the surface of my education. My only regret was forgetting my Slim-Fast at home. I'm sure all of you "*Wave* veterans" out there know exactly how I felt.

Also writing about her experience aboard the *Moana Wave* is MOPer Tammy Wenham.

Tammy's story: My first introduction and visit on the *Moana Wave* was both exciting and relaxing. I was never bored while aboard. The intensity of the sunsets, and the moon rising over the deep blue waters and near the various islands of the Hawaiian chain was amazing. Working and talking with the hard-working scientists and unique crew members was quite educational; I was able to look over most of their shoulders and see the kind of work they were doing. I assisted by sorting the varieties of sea life specimens they brought aboard.

The food was great! We ate like royalty. Paul and Ray (the two cooks) prepared 3 meals per day, plus in-between meals, and the fridge was open and full of food and ice cream. Cookies, chips, and peanut-butter cups were also always available. Late - night workers could be found creating ice cream sundae masterpieces. There was also an exercise bike aboard to help burn off some of the culinary works of art I enjoyed on the voyage. I tried jogging around the main deck a few nights, but the possibility of falling overboard was a constant threat, and a cold, lonely, and deadly one at that.

The scientific party's cabins had 2 bunkbeds, with a porthole to look out at the fabulous view of the open ocean. With the natural rocking motion, like a baby in a crib, peaceful dreams were insured. If you ever felt bored with the endless open ocean or deep sky of stars, then you could retreat to the ship's lounge which was packed with books, video tapes, and game discs.

What I really enjoyed aboard the *Moana Wave* was the acceptance of my presence by those running the ship. My inquisitiveness was never left unanswered. Some nights I went to the bridge to sit in the Captain's chair and watch the crew

controlling the ship through all the electronic instrumentation. We were also visited numerous times by playful pods of dolphins that enjoyed giving acrobatic demonstrations in the ship's wake.

The *Moana Wave* is truly a research vessel, with a comfortable learning atmosphere, that should be experienced by anyone interested in being a part of the marine science educational adventure.

MARINE TRIVIA

Q: Where is the exact location of the Marianas Trench? Also, what distinctions exist between trenches and surrounding areas?

A: The Marianas Trench is located to the east of the Marianas Islands in the western Pacific Ocean. The trench includes the Challenger Deep, which descends to about 35,800 feet below sea level according to measurements made by Jacques Piccard in 1960.

Trenches form at subduction zones, areas of the ocean floor where two converging tectonic plates (usually an oceanic and a continental plate) collide. Trenches usually are long, narrow, and uninterrupted. For example, the Marianas Trench is about 1500 miles long, but averages only 45 miles in width.

Trench walls don't drop straight down. Steps in the walls indicate that sections of the ocean floor have collapsed in a process known as subsidence. Usually, trenches are v-shaped in cross-section, with their bottom flattened due to the accumulation of marine sediments. An outer ridge rises at the junction between a trench and the adjacent ocean floor. (Reprinted with permission from the Sea Secrets column of Sea Frontiers, International Oceanographic Foundation, Miami ,Florida.)

Q: What makes a whale raise the rear portion of its tail out of the water and violently slap it down?

A: The behavior is called tail slapping or lobtailing. Many researchers believe that whales may communicate by slapping various parts of their bodies against the water surface. Whales and dolphins rely heavily on their sense of hearing, and sounds are an important part of their social repertoire.

Lobtailing often is associated with another behavior known as breaching, or leaping. Both breaching and lobtailing are observed frequently in social situations and are believed to convey information, although the message may vary with the circumstances. (Reprinted with permission from the Sea Secrets column of Sea Frontiers, International Oceanographic Foundation, Miami, Florida.)

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