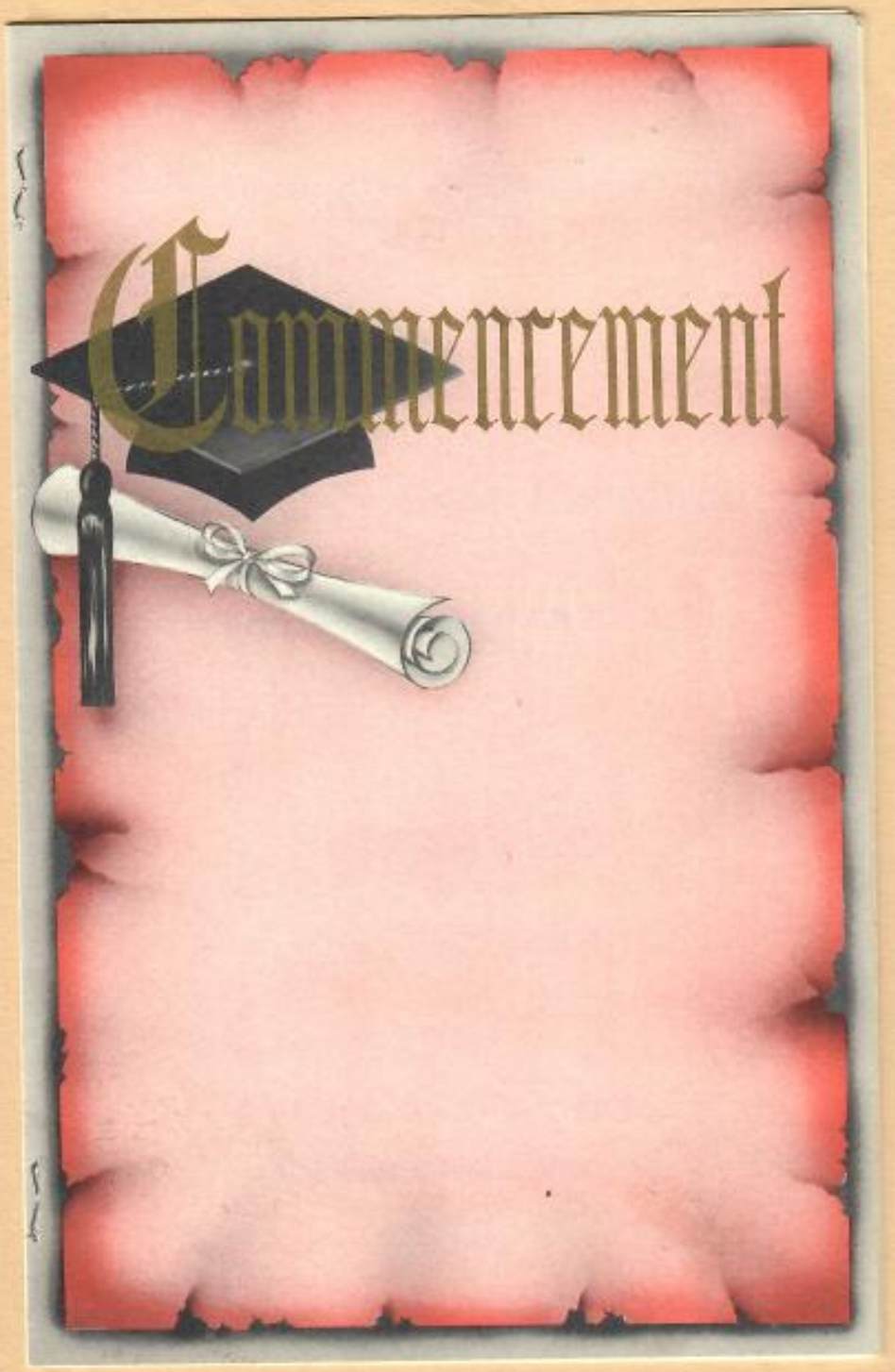
"Our 1967 Kids!"

LINDA RAE
&
GEORGE HARVEY.

By

EMILY B. BALAZS.
&
GEORGE BALAZS JR.

Scrap Book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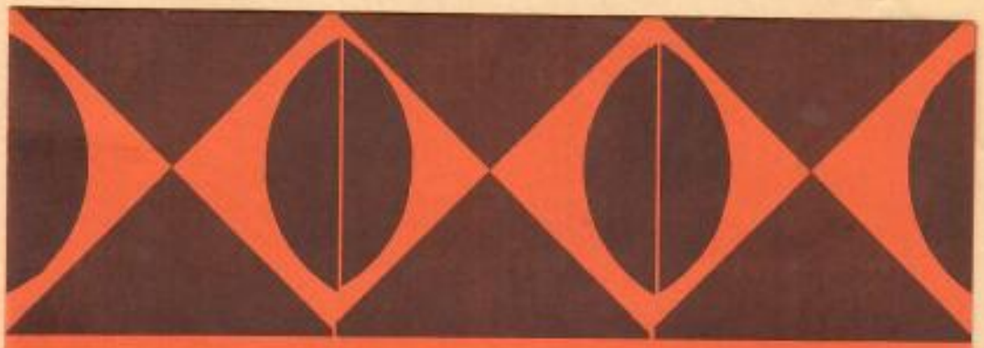

COLLEGE OF TROPICAL AGRICULTURE

LUAU

PEARL CITY COMMUNITY CHURCH
933 Lehua Avenue
June 5, 1967 6 P.M.

Sponsored by Agricultural Coordinating Council

He's Incubating a New Industry

Scientist Seeks to Transplant Gr

By Helen Altonn
Star-Bulletin Writer

If all goes well, a Coconut Island scientist will be the proud father of a batch of green sea turtles sometime in August.

About 282 turtle eggs recently were transplanted into nests and an incubator on the island from French Frigate Shoals, one of the turtle's breeding grounds in the Pacific.

The transfer was a tricky process, done here for the first time in an attempt both to conserve the valuable reptiles and to try and raise them economically as a source of protein.

George Balaz, University of Hawaii marine biologist, is conducting the experiment under the Sea Grant aquaculture program at the Hawaii Institute of Marine Biology.

THE U.S. Bureau of Sport Fisheries and Wildlife approved Balaz's request for the eggs. They were collected by David L. Olsen, assistant manager for the Hawaiian Islands National Refuge.

He got them from East Island, one of the most remote islands in the refuge.

He said only three turtles were laying at the time, in early June, and he took all three clutches of eggs—making sure they were picked up and redeposited in the same position in which they were laid.

Balaz put 39 eggs in an incubator just to see what will happen. The others are in three nesting pits, about two feet deep, at an isolated end of Coconut Island.

"I know how the female turtle feels because I cleared the pits and put the eggs in there myself," he quipped.

NEW HOME — Turtle eggs laid on East Island in the National Wildlife Refuge are placed in a new nesting hole at Coconut Island in Kaneohe Bay. —Photo by Lloyd Watarai.

THE FEMALE turtle digs a body pit with her front and back flippers--about six feet deep—and once she's in there uses her back flippers to dig a nest.

She drops her eggs like ping-pong balls and then covers up the entire hole and pats it down—leaving nature to take care of her eggs.

"Trying to find an egg pit is extremely difficult because she camouflages them so well," Olsen said.

A Star-Bulletin team visited the Coconut Island nesting site with Balaz, Olsen and Eugene Kridler also showed up to see how the eggs were doing. Kridler is the federal wildlife administrator in Hawaii, in charge of the refuge.

Balaz buried a temperature probe with one clutch of eggs to record day and night temperatures. He also has a tape recorder in one pit, with a microphone. He hopes the turtles will make some noise several days before they hatch.

"WHEN I HEAR the noise, I'm going to get sleeping facilities out here and wait," he said.

Kridler said there is scant knowledge about the green sea turtle, although it is the most important species of turtle in the world economically.

No one has ever seen the turtles in the period from birth to "platter size" — about one year old, he said. This is the so-called "lost year."

"Where do they go and what do they feed on? No one really knows — not only here, but on a worldwide basis," he said.

He said the project at the HIMB should contribute much practical information about the turtles.

BALAZ IS hopeful but cautious about predicting results. He said survival of eggs in the natural nests is less than 60 per cent "so what we will get in the transplanting is yet to be seen."

He must devise rations to raise the turtles. They are believed to be carnivorous the first few months — and maybe for the first year — and then are herbivorous, he said.

"That's what they say (in literature) and that's not the heck of a lot," he commented.

He said he became interested in sea turtles while looking up literature about them for another worker at the institute. "Instead of passing it on, I start

the green sheet

A UNIVERSITY OF HAWAII NEWSLETTER
January 1972 Vol. 4 No. 5

OEO SPONSORS SHRIMP FARM PROJECT

One man on campus has pollution licked. This bold and daring scientist actually utilizes the pollution!

Robert Cordover, graduate student in oceanography, uses it in a very practical manner for his extraordinary research project on Shrimp Farming.

The research is taking place on Coconut Island. The sewage that pours into Kaneohe Bay—no doubt dismaying many ecologists and swimmers—happens also to produce nutrient-rich water and algae for Bob Cordover to feed his shrimp.

Cordover was awarded an Office of Economic Opportunity government grant for research in starting a commercial shrimp industry for unemployed people on Molokai and Maui.

New Way Of Looking

Anything that's been done in shrimp production before, Cordover has abandoned or altered for an innovative, better, more economical method.

For example, shrimp are normally raised in tubs. "The algae used for their food is raised in batches and fed to them in their tubs. This takes at least six people washing and feeding and pouring algae in various containers at exactly right timing—a few hours too late and the algae loses its food value. It's an unreliable method," Cordover says.

He found a way to turn all this into an economical one-man operation by building big tanks and introducing into them 6700 gallons of Kaneohe Bay water with the sewage outflow nutrients already in it.

Using various types of mesh, he lets in algae, but keeps out the fish and everything else that eat either algae or shrimp.

Algae goes through a whole generation in a day. So after about 10 days and 10 generations, the dominant species will hold up and become the food for the shrimp. Cordover maintains 100,000 algae cells per milliliter of water by controlling the flow rate: slow enough for the algae to reproduce itself, yet fast enough to get nutrients needed to mature the population.

"Shrimp grow so fast they outgrow algae as food sometimes within a week, and then need larger-sized food," Cordover explains.

He accomplished the manufacture of larger pieces of algae for the maturing shrimp through the use of an old-fashioned farm cream separator.

Outgrowing Algae

The algae-rich water is poured into the cream separator, and the water syphoned off, allowing the algae to stick to plates, now of a peanut-butter consistency. He scrapes this off and freezes it together with a binder (such as agar). Now it is in sizeable chunks the mature shrimp can eat.

From the small culture tank, the

Continued on page 11 . . .

Robert Cordover

Shrimp Project

. . . Cont'd from first page

mature shrimp go into a huge tank of 350 square feet. By ordinary means, one could keep only 350 shrimp in this space, but Cordover will take care of 50,000 shrimp here by giving each one his own condominium apartment!

He has devised a series of small vertical apartments, something like beehives, so the space from bottom to top of the tank can be utilized. With special pipes he controls water flow and air flow, and the draining off of waste material which settles on the bottom.

Help From Specialists

Cordover, in conceiving his research project step by step, often seeks a UH specialist for advice with a particular problem. "Bob Grace of the engineering department has been great about helping work out the many engineering needs of tanks and water flow. Bob Nakamura and Coy Brooks in animal sciences gave me information on shrimp so we know now what a healthy shrimp should be and what he should eat. George Bala[illegible] expert in swine nutrition, is helping me understand shrimp nutrition. Allen Cattel, oceanographer interested in nutrients, has added to our knowledge of nutrients in algae.

World Inquiries

"Now that news of this research is getting around, I receive inquiries from all over the world . . . from Indonesia, South America, French Guinea, the South Pacific, and many other places. If I control the technology involved in this, I hope I can see that it goes into projects for the public good. We need to make a contribution to other people's lives."

Cordover is training one man from Molokai and one from Maui, and they in turn will take the knowledge to their islands for the start of a shrimp industry there.

SEA GRANT NEWSLETTER

November 1, 1972

Baby Turtles Are HIMB Lunch Guests

University of Hawaii marine biologist George Balazs is currently engaged in a pilot study to evaluate the feasibility of rearing the green sea turtle (*Chelonia mydas*) on a commercial scale. The study, which is being conducted at the Hawaii Institute of Marine Biology, was initiated earlier this year after Balazs and several colleagues noticed the surprising lack of information regarding the management and nutritional requirements of the animals.

This project, which is primarily a nutrition study, has an interesting history beginning with the transplanting of three nests of eggs from East Island in the French Frigate Shoals to the HIMB on Coconut Island. A microphone and temperature probe were buried in the single fertile nest. Although the normal hatching time is 55-60 days, definite noises were not detected until Day 72. Between Day 72 and Day 83 it was found that the level of activity in the nest was directly related to the amount of noise generated by jet aircraft stationed at the nearby Kaneohe Marine Corps Air Station. On the evening of Day 83 the viable nest was completely excavated to reveal 6 live turtles and 72 unhatched eggs. An examination of these eggs showed dead embryos ranging from no development to ready-to-hatch. No single high-fatality age was apparent.

According to some sources, as many as 50% of sea turtle eggs must hatch before any of the turtles can reach the surface, because digging out of the nest requires a team effort of the hatchlings However, in Balazs' experiment, less than 10% of the eggs hatched. Balazs suggests that the high mortality of embryonic turtles may have been produced by the noise of the Kaneohe jets, but at this point there are many possible causes, so that such a conclusion would be premature.

The sea turtle eggs were collected by David L. Olsen, assistant manager for the Hawaiian Islands National Refuge, with the aid of Eugene Kridler. Kridler is the Bureau of Sport Fisheries and Wildlife administrator in Hawaii.

Balazs' nutrition experiments are currently progressing with more than one hundred young turtles, secured from the Leeward Islands with the permission of the Bureau and the efforts of the U.S. Coast Guard.

The turtles are divided into groups and fed highly regulated diets. The formulas vary in their amount of protein, calcium, phosphorus, and other ingredients. The growth rates of each group are charted and compared with the other groups. Several University nutritionists are acting as advisors to the study.

Although little is known about a green sea turtle's first year of life, some biologists have suggested that the animals are entirely carnivorous during this period. Balazs has found that some of his turtles are thriving on strict vegetarian diets, as well as diets composed of by-products from the meat and fish industries.

The data that are expected to be produced from this study, coupled with the arrival of data on turtle behavior and physiology from concurrent studies, could lead to the artificial stimulation of egg production and breeding as is currently being done with poultry.

Noise Could Ham

TURTLE TRANSPLANT—George Balazs examines a new batch of sea turtle hatchlings brought in from French Frigate Shoals for rearing at Coconut Island.—Photo by Warren Roll.

By Robert Barr
Associated Press Writer

University of Hawaii marine biologist George Balazs says he's puzzled, but undaunted, after hatching only eight green sea turtles from about 280 eggs.

Balazs transplanted three nests of turtle eggs from the French Frigate Shoals to Coconut Island, and two of the nests were not fertile.

What baffles Balazs is that the 72 eggs in the third nest which did not hatch showed development from four days to ready-to-hatch.

"One would think they would all be in the same stage," Balazs said, "instead of dying all along the way.

"What really bewilders me is that some who were ready to hatch didn't try to peck out."

THE COAST GUARD came to the rescue, however, by bringing in 122 hatchlings from the remote nesting grounds, and Balazs is proceeding with his experiments on what the young turtles eat.

His research aims to open the way for commercial raising of the tasty turtles. There are plans to transfer more clutches of eggs to Coconut Island for incubation.

Balazs said the development of the eggs might have been hampered during the five days it took to move them to Honolulu. He said future nests will be moved in one day, and will be transported whole—sand and all.

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HONOLULU ADVERTISER Saturday, Dec. 2, 1972 D-3

commission probes possible p

By JOHN KNOX
Advertiser Staff Writer

Should there be a law against catching green sea turtles and selling their meat for restaurant food or their shells for tourist curios?

The State Animal Species Advisory Commission batted that question around for three hours yesterday, but postponed a decision on whether the big turtles are an endangered species.

However, commission members and scientific experts present did agree research is needed to determine whether commercial fishing is a threat to the turtle population. They approved a motion to ask the Legislature for research funds.

The commission could not decide whether to recommend partial or total protection for the turtles while the proposed three-year study is undertaken. Members appointed a subcommittee to explore that question further over the next month.

HAWAII'S GREEN sea turtles form a distinct local population which drifts up and down the Island chain. They rarely come up to shore on the populated islands, but their breeding grounds at French Frigate Shoals are the largest green sea turtle hatchery in the United States.

The adult turtles average about 275 pounds, and giants of 500 pounds are sometimes caught. It's believed they live to be 150 years old.

Two marine-science experts told the commission yesterday there is good reason for immediate turtle-fishing controls.

"I don't think we have the luxury of time that some might think," said Eugene Kridler, local wildlife administrator for the Federal Bureau of Sport Fisheries and Wildlife.

Kridler said his agency protects the turtles' breeding grounds in the leeward islands, but he said such protection would mean nothing if adult turtles are killed before they can breed.

He estimated commercial fishermen last year killed about 270 turtles. "The entire adult population is probably in the low thousands," said Kridler.

Michio Takata, director of the State's fish and game division, said his agency has no way of knowing how many additional turtles were killed by sport fishermen or divers.

GEORGE BALAZS, a research biologist with the Hawaii Institute of Marine Biology, told the commission that

Secret Base Lets Turtle Out of Bag

By Helen Altonn
Star-Bulletin Writer

A highly secret U.S. Air Force missile base on Canton Island has lifted its clamp on visitors for a Hawaii resident interested, not in missile operations, but in marine turtles.

George H. Balazs, marine biologist at the University of Hawaii's Institute of Marine Biology, spent eight days on the remote island in February with special permission from the Air Force Space and Missile Test Center (SAMTEC).

Canton is the largest of the Phoenix Islands in the Central Pacific, about 1,900 miles southwest of Hawaii. It is closed to the press.

"All that can be said about what Canton is used for is that 'it is a terminal area for Department of Defense research and development of missile launchers,'" Balazs said, noting that this was the official description given to him.

HE IS MORE concerned with the use of the island as a turtle nesting site — a fact which he said has been known by the military but not by the scientific community.

He said he found evidence of "a fairly large number of animals" at Canton and concluded:

"The size of the total nesting population in the Phoenix Islands could well constitute the largest found in any Central or South Pacific island group due to exploitation of the resource in the inhabited locations."

Balazs said he learned of the Canton turtles last year in a roundabout way.

He received a telephone call from a man on Canton following a Star-Bulletin article about his work with

green sea turtles at Coconut Island in Kaneohe Bay.

The man explained that someone had sent him the newspaper. He said he had some baby turtles and one was sick and he wanted to know what to do about it.

BALAZS SAID he started to tell the man what he might try and then "all of a sudden I realized if he's got baby turtles, there's got to ge some nesting."

He began questioning the man who told him turtles nest on the island and he saw hundreds go ashore on some of the beaches last November.

"I was in a state of shock," Balazs said. "I kind of pride myself on my knowledge of where turtles are in the Pacific."

He said he started digging through library files. "After doing an extensive review of the literature, it seemed clear that the scientific 'turtle' community had no data or information or was even aware of the presence of these turtles," he said.

"OF COURSE, it's very important to study all existing sea turtle colonies because of their generally endantered state throughout the world," he emphasized.

He drafted a research proposal stressing the importance of his going to Canton to survey the turtle population and after about two months of correspondence received permission.

His trip was funded by the University but he said "the personnel on Canton greatly assisted me wherever possible."

In fact, he said he was amazed at the military interest in conservation and the environment on Canton after the Air Force destruction on Eniwetok.

"They lecture people (contractors going there) on how to act — not to touch the turtles and not to fool around with the birds. If they break any regulations, they get booted out immediately," he said.

"EVERY SECOND week they show a 20-minute ecology movie made for that area about preserving the turtles and the birds."

Balazs was intrigued with Canton, which he said he knew practically nothing about when he got the call from there. "I ran to a map and looked it up."

And he was surprised and impressed with the amount of turtle nesting activity at four locations which he spotted.

He said it appears that seasonal nesting occurs, probably during October and November. "But it takes

RARE SIGHT — A colony of nesting viously unknown to scientists — ho

place all year around on a low key level."

Balazs said he did a lot of night work on Canton because it was so hot during the day.

ONE NIGHT when he was on the beach, two turtles joined him to nest.

"It was a sight to see a 350-pound mam ing up there a hole — kind of see her strug land when sh flying through sorts of grac said.

Balazs cited reasons for the sence of infor

A · Los Angeles Herald-Examiner, Wednesday, August 22, 1973 C-9

A marine biologist holds one species of sea turtle being raised at the Hawaiian laboratory. It is now thirteen months of age.

Protein From the Sea

The domestication of plants and animals (agriculture) has had far reaching effects on man's development. But this practice has been limited to the land.

In the past it has been too difficult to domesticate marine plants and animals. But some beginnings are now being made.

These attempts at aquaculture promise a breakthrough in food production that could help solve the protein needs of the world. At a time when it is urgently needed.

Aquaculture is the rearing and tending of aquatic animals in all type of water. Mariculture refers specifically to the use of sea water.

Many kinds of sea creatures have a great potential of becoming aquaculture stock. But problems exist in the domestication of any aquatic organism.

First, it must be determined if it is possible to raise a particular plant or animal under controlled conditions. Then work must be done on each phase of the life cycle in a laboratory.

Only after such problems have been solved can the economic feasibility of commercial production be determined.

Food editors attending the National Pineapple Cooking Classic had an opportunity of visiting a marine laboratory on Coconut Island in Hawaii. It is operated jointly by the University of Hawaii and University of California.

Production of the Malaysian prawn is the most important of the projects being carried out at the present time. These animals create particular difficulty because they require both salt and fresh water at different stages of their life cycle.

Other problems in raising the prawns include preparing a food that is attractive as well as nutritious. Further it must hold together in the water long enough for the animals to find and manipulate it while feeding.

Raising sea turtles is another of the projects being carried out on the island. Two of the five species — Hawksbill and Green — are being grown.

In addition to being able to raise the turtles from eggs, marine biologists hope to learn more about these valuable and endangered species. Once accomplished, they hope to raise the animals for food, shell, etc.

The growing of octopi is also being accomplished at the laboratory. Although uncommon in the U.S., octopus is a high protein, low fat and carbohydrate food. Virtually the entire beast is edible.

The octopus converts its food with far greater efficiency than any other animal known to man. It accumulates a pound of flesh for about two pound of what it consumes.

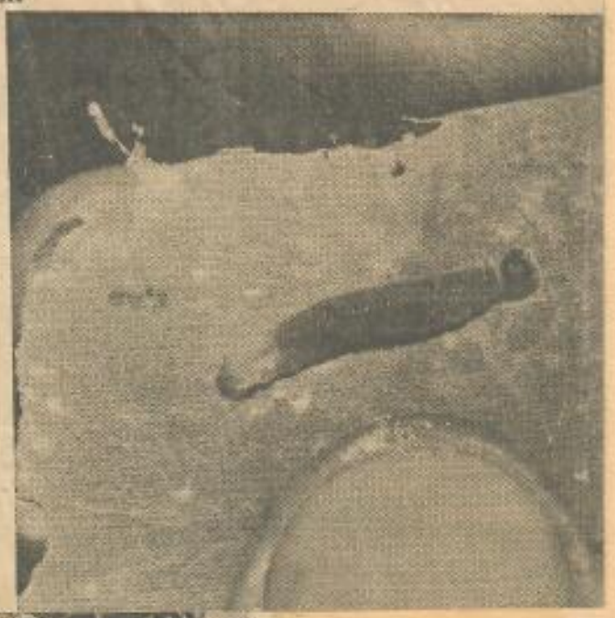
With proper feeding an octopus of about three to four pounds can be produced in six months. They can be raised in a limited amount of space.

According to Dr. John E. Bardach, Director of the Hawaii Institute of Marine Biology, aquaculture many not be a prime solution to man's food problems. But it could help.

The annual fish catch is not increasing — the sea has natural limitations — it is virtually impossible to economically harvest plankton for human consumption.

Dr. Bardach sees cultivating aquatic animals as an importan protein source for the increasing dietary needs of the world.

better watch out or this bug will get your banana tree



Quick.

If you have banana trees in your yard, put down the paper and go out and inspect them.

Have the smooth green leaves been cut into jagged strips? Do you notice rolls made of the leaves and the presence of a pale green caterpillar covered with powdery white munching happily within?

IF SO, your banana trees are in serious danger of being totally stripped away, and the Department of Agriculture here has issued a clear warning:

Advertiser Photo by David Yamada

A stuffed Pacific Green turtle for sale in Waikiki.

The Leatherback and the Hawksbill turtles are already on the U.S. Endangered Species List. The Pacific Green Turtle's ranks are depleted, and they continue to decline at a rate that is worrisome.

THE SAD STATUS of Pacific marine turtles will be spelled out tonight in a public hearing on proposed new regulations to try and ease harvesting pressures on the sea creatures.

The hearing is sponsored by the State Division of Fish and Game, and will start at 7:30 p.m. in the fourth floor conference room of the Bishop Museum.

The proposed regulations would:

- Ban the sale of turtles or parts of turtles.
- Allow fishermen to capture green sea turtles for home consumption, but only if the upper shell of the turtle measures 36 inches or more, and only if the turtle is caught in waters around the eight major Islands of Hawaii.
- Require fishermen to get permits before getting the Green Turtles.
- Ban capturing Green Turtles with nets.

Interest in the steady trend toward extinction of marine turtles in the Pacific was kindled earlier this year when George H. Balazs of the Hawaii Institute of Marine Biology published a paper on their status in The Elepaio, the journal of the Hawaii Audubon Society.

Balazs also spent several weeks in field research on the nesting habits of the Green Turtle this summer at French Frigate Shoals, part of the Hawaiian archipelago to the northwest of Oahu that falls within the Hawaiian Islands National Wildlife Refuge.

PRACTICALLY all of the fewer than 1,100 Green Turtles that account for its breeding population in the Pacific return to nesting sites at French Frigate Shoals.

In addition, Frank Radovsky and Alan Ziegler of the Bishop Museum's professional staff have taken steps to make known the plight of the turtles.

And State Rep. Anson Chong has started issuing a newsletter on steps under way to help protect the Green Turtle. Chong's bill to release money for the accumulation of hard data on the Green Turtle awaits one more reading in the State Senate before passage.

The problems of the turtles are related directly to their commercial exploitation, according to Balazs. The Green and the Hawksbill both make for good eating, and the shell of the latter is highly prized for jewelry making.

THE LEATHERBACK is reportedly unpalatable, but there is a limited market for its eggs and extracted oils, Balazs said. The Leatherback's nesting beaches are largely exploited by man.

Balazs said the Leatherback may be the world's largest living reptile, with some individuals measuring seven feet long and

Here in Hawaii

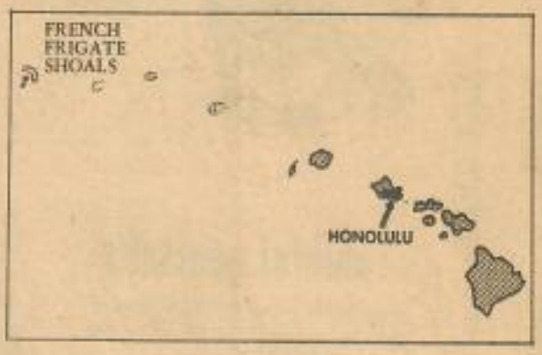
Last Outpost for the Green Turtle

By Helen Altonn
Star-Bulletin Writer

Hawaii has the largest and last remaining colony of green sea turtles in the United States — and the responsibility of safeguarding it, says George H. Balazs, University of Hawaii marine biologist.

It's the only green sea turtle colony in the world that can be protected and managed under a single government's jurisdiction at both the feeding and breeding grounds, he points out.

Balazs, of the Hawaii Institute of Marine Biology, has done extensive research on turtles and has led a movement to save them from commercial exploitation.



THE STATE Division of Fish and Game now proposes such a regulation. Public hearings were held Sept. 21 and the division is accepting testimony concerning the measure through Saturday.

Michio Takata, division chief, said he has already received a "mountainous amount" of testimony, mostly favoring the regulation.

The opponents primarily are the commercial turtle harvesters. (Only six persons in the State hunted turtles for profit last year, according to Balazs. The most anyone earned was $5,003.)

Takata said the regulation will be presented to the Animal Species Advisory Commission at a meeting Oct. 12 on Kauai. Then it must go to the State Board of Land and Natural Resources for approval.

THE REGULATION will be ready for board consideration either at its Oct. 26 or Nov. 9 meeting, Takata said.

The regulation would prohibit the sale of any leatherback, hawksbill or green sea turtles or any parts of them — thus abolishing turtle steaks from restaurant menus and use of turtles for curio and jewelry items.

Green sea turtles could be taken for home consumption if their upper shell length was 36 inches or more. But use of nets to capture turtles would be unlawful.

Violations would be punishable with a fine of $100 or imprisonment of up to 30 days.

BALAZS explains in his testimony on the regulation that the hawksbill and leatherback turtles are on the endangered species list and the green turtle is listed as "depleted" throughout the world.

He says the only nesting site left for Hawaii's green sea turtles is at French Frigate Shoals, about 480 miles west-northwest of Honolulu.

In recent studies of the nesting areas, he found the green turtle population to be under 1,100. He said this is a drastic drop from a 1968 estimate which placed the population between 2,600 to 5,200.

U.S. Fish and Wildlife personnel have shown by tagging turtles that they migrate from French Frigate Shoals to the major Hawaiian Islands.

"IT CAN therefore be concluded that French Frigate Shoals is the only

HAWAIIAN
at French Fri
"chick" in the

cial exploitation is most definitely in an insecure position."

He attributed "extremely large" increases in pounds of turtle caught over the past 10 years to the increase in tourism, with the incentive coming from restaurants and hotels.

"IF THIS is the case, it then logically follows that a few fishermen are erod-

SEA GRANT NEWSLETTER

January 1974

Tour participants take time out for a leisurely lunch on HIMB lawn.

Tour members and HIMB personnel gain insight on turtle research from G. Balaze.

Proposal to save our turtles

by Linda Evans BALAZS

The atmosphere was tense and hushed. Many people stood at the back of the room as if afraid to come forward to take a seat, yet all were there to witness or voice opinions at the public hearing on Regulation 36 which is aimed at protecting the marine turtles in Hawaii.

The regulation would prohibit the sale of turtles or turtle products taken in Hawaiian waters. It would permit the taking of turtles for home consumption but a free permit would be required and nets would not be allowed because of the possibility of drowning turtles under the allowed 36 inch carapace (shell) length.

The meeting took place Friday, Sept. 21, 7:30pm, at the Bishop Museum with some 100 people attending.

Prepared testimony was given by many scientists and concerned persons, among them was George H. Balazs, Jr. Marine Biologist at Hawaii Institute of Marine Biology at Coconut Island. Balazs has been studying population, breeding and nesting habits, and nutritional aspects of marine turtles in Hawaii for the past two years. He recently conducted a two month turtle study at French Frigate Shoals in the Hawaiian Islands National Wildlife Refuge 480 miles northwest of Oahu.

Balazs stated that of the three types of marine turtle found in Hawaii, two are on the endangered species list (hawksbill and leather back) and one (green) is officially listed as "depleted". He further stated that Hawaii has the largest remaining green turtle colony in the U.S. but no laws presently exist h to protect or perpetuate marine turtles i the major islands. Hawaii's turtles seem destined to become rare or extinct if the present trends continue.

According to Balazs, there is a direct relation between the rise in tourism and pounds of turtle taken commercially in th past 10 years. A low of 380 lbs. was rep ed in 1963, but this figure rose to 25,58 lbs. in 1972 and is already reported at 14,900 lbs. for the first six months of t year.

Many divers testified in favor of the r lation because of the declining numbers o turtles they have seen in recent years. Others in favor were zoologists, marine b logists, oceanographers, and a former tur hunter from Maui who sent a sympathetic t timony to be read at the hearing.

Many people otherwise favoring the reg- ulation wanted the section prohibiting ne to be changed. They stated that this wou make the taking of turtle for home consum tion too restrictive.

Several people felt that the size rest- tion on turtles for personal consumption should be lower than the proposed 36 inc upper shell length. However, it was poi out that this length was selected becaus available information indicates that gre turtles become sexually mature at a shel length of between 33 to 36 inches. The posed size would therefore allow individ the opportunity to reproduce at least on before being subjected to hunting by man

According to Michio Takata, Fish and G director, written testimony on Regulatio will be accepted until Oct. 6. He urged ever, that this be received by Friday, O because the sixth falls on a Saturday. sons interested in expressing pros, cons possible changes in the regulation may w to Michio Takata, Director Hawaii State and Game Division, 1170 Punchbowl St., H Hi. 96813.

The turtle being marked is part of an experiment to study their

The Detroit News November 22,1973

Green turtle colony faces extinction

HONOLULU — (UPI) — The last remaining colony of green sea turtles in the United States is being threatened by tourists' appetites.

Hawaii has the only green sea turtle colony in the world that can be protected and managed under a single government's jurisdiction at both the feeding and breeding grounds.

But a scientist leading a movement to save the gentle creatures warns they may face extinction if their commercial exploitation isn't halted.

George H. Balazs, University of Hawaii marine biologist, frequently visits the nesting site at French Frigate Shoals, about 480 miles west-northwest of Honolulu.

In studies of the nesting area, he has found the green turtle population is under 1,400, a drastic drop from a 1968 estimate which placed the population between 2,600 and 5,200.

"Any turtle colony with a breeding population of only slightly less than 1,100 that is being subjected to increasing commercial exploitation is most definitely in an insecure position," Balazs said.

The turtles bask peacefully in the sun and breed in the northwestern islands of the Hawaiian Archipelago with only the Hawaiian monk seals and birds for company.

FROM THE MIDDLE of May until the first week of August each year, the turtles are safe, breeding on the sandbars which are federally protected as a national wildlife refuge.

But Balazs said tagging shows that these same turtles then migrate from French Frigate Shoals to their feeding grounds, the major Hawaiian islands, filled with tourists seeking exotic foods and novelty souvenirs, such as turtle shells and jewelry.

There is no protection for the feeding areas in the main Hawaiian island, Balazs said. The huge turtles, which have been known to reach 50 years in age and 325 pounds if not eaten first, feed on algae and marine plants.

"Since they are gentle and will not attack unless disturbed at their breeding grounds, they are easily caught," Balazs said.

"The pounds of turtles taken since 1963 follow the increasing trends of tourism," he said. "A unique Hawaiian resource is being eroded to provide an exotic luxury food for short-term visitors."

BALAZS FAVORS regulations prohibiting the sale of any of the major types of turtles, thus abolishing turtle steaks from restaurant menus and the use of turtles for curio and jewelry items.

The State Board of Land and Natural Resources is considering these regulations with a stipulation that green sea turtles could be taken for home consumption if their upper shell length was 36 inches or more.

Balazs is optimistic that turtle as a source of food can one day be obtained from animals raised domestically for this purpose, not by depleting the decreasing numbers in the sea.

"The green sea turtles are likable and interesting to work with," Balazs said. "They have been overexploited in many areas of the world.

"It would be a shame if Hawaii, with the breeding and feeding grounds under one government jurisdiction, could not insure the turtle's survival."

e Tourists' appetites threat to turtles

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A Particular Point of View

Tuesday, December 18, 1973 Honolulu Star-Bulle

Protecting Hawaiian Sea Turt

By George H. Balazs
Hawaii Institute of Marine Biology

THE STATE of Hawaii, Department of Land and Natural Resources is presently considering a regulation which will provide partial protection for sea turtles found in the waters surrounding our major inhabited islands. As no laws have ever existed to ensure the continued survival of these unique salt water reptiles (other than outlawing firearms for hunting and prohibiting the sale of speared animals) the proposed regulation represents a sound move which should be carried out with all due haste.

Although the plight of sea turtles has been widely recognized in other areas of the world, a concern for these animals in Hawaiian waters has been very slow in coming. Of the five major types of sea turtles which exist today, three are officially listed as endangered species (hawksbill, leatherback and Atlantic ridley) and their continued survival is questionable.

The only sea turtle of any consequence to the Hawaiian Archipelago is the green turtle. Because large declines continue to occur in green turtle colonies throughout the world, this turtle is officially listed as being depleted.

FOR CENTURIES green turtles have been a valuable source of protein for native peoples at numerous locations in both the Atlantic and Pacific Oceans. As with other once abundant wildlife, pressures from man have reduced numbers. This has been brought about, for the most part, by the creation of new markets which have provided the incentive for relentless commercial exploitation.

Although the green turtle is not yet considered endangered, the outlook does not seem encouraging. Increasing commerce and the accompanying popularization of turtle products (steak, soup, jewelry, leather and cosmetics) can only mean further decimation. It is unfortunate that a philosophy exists which tends to allow serious concern about the future of a species only after drastic declines have occurred and the animal qualifies as being endangered.

If the criteria for giving protection is to prove in no uncertain terms that a population is overexploited with numbers and habitat seriously reduced, it will then be next to impossible to save many commercially sought after species in their natural environment. In the case of a long range migrant animal with a complex life cycle such as our Hawaiian green turtle, it may be impossible to save them at all, even under captive conditions in zoos.

PROTECTIVE measures such as mercial and private, should have been apparent. Hawaii's rapidly growing resident and tourist population has long been predicted.

Increasing interests in water activities with accompanying use of SCUBA, fast boats, and efficient spear guns and nets have all acted to place man in a position closer to the green turtle. As more tourists visited our Islands, a greater demand was created for exotic foods not normally obtained in their own home towns. Green turtle steak filled the menu nicely and was psychologically acceptable because of it being described as tasting like veal. It may have been too much to expect the average tourist to be aware of the sea turtle's plight and refuse to order this dish. It may have also been unrealistic to expect the part-time fisherman to resist the high prices offered by restaurants for sea turtle.

Even if the increasing demand with accompanying incentive for greater exploitation were not easily recognized, the fate of other similar green turtle colonies which have been overexploited at other locations should have been readily seen. It is unfortunate that man is not yet wise enough to learn from the mistakes of others. It is even more unfortunate, in our own particular case, for the Hawaiian green turtle.

ALL EVIDENCE presently available, and it is considerable, tells us that our green turtle colony has been overexploited. Consider a few of the facts brought out at recent public hearings:

1. State Fish and Game records show that the reported commercial turtle catch has risen over the past 10 years from 380 pounds in 1963 to a record 25,583 pounds in 1972. For the first six months of 1973, 14,486 pounds were reported.

It should be stressed that this only represents the reported commercial catch and that the actual commercial catch has long been thought to be many times larger.

Suspicions were confirmed at the Kauai public hearing (Dec. 6) where individuals stated, in a feeble attempt to show that turtles are still abundant, that they had taken hundreds of turtles during the past few years. Fish and Game records show that absolutely no reports were filed from Kauai from 1957 through 1969 and that for the years 1970, 1971 and 1972 only several hundred pounds were reported for each year. No reports have been submitted for the first six months of 1973.

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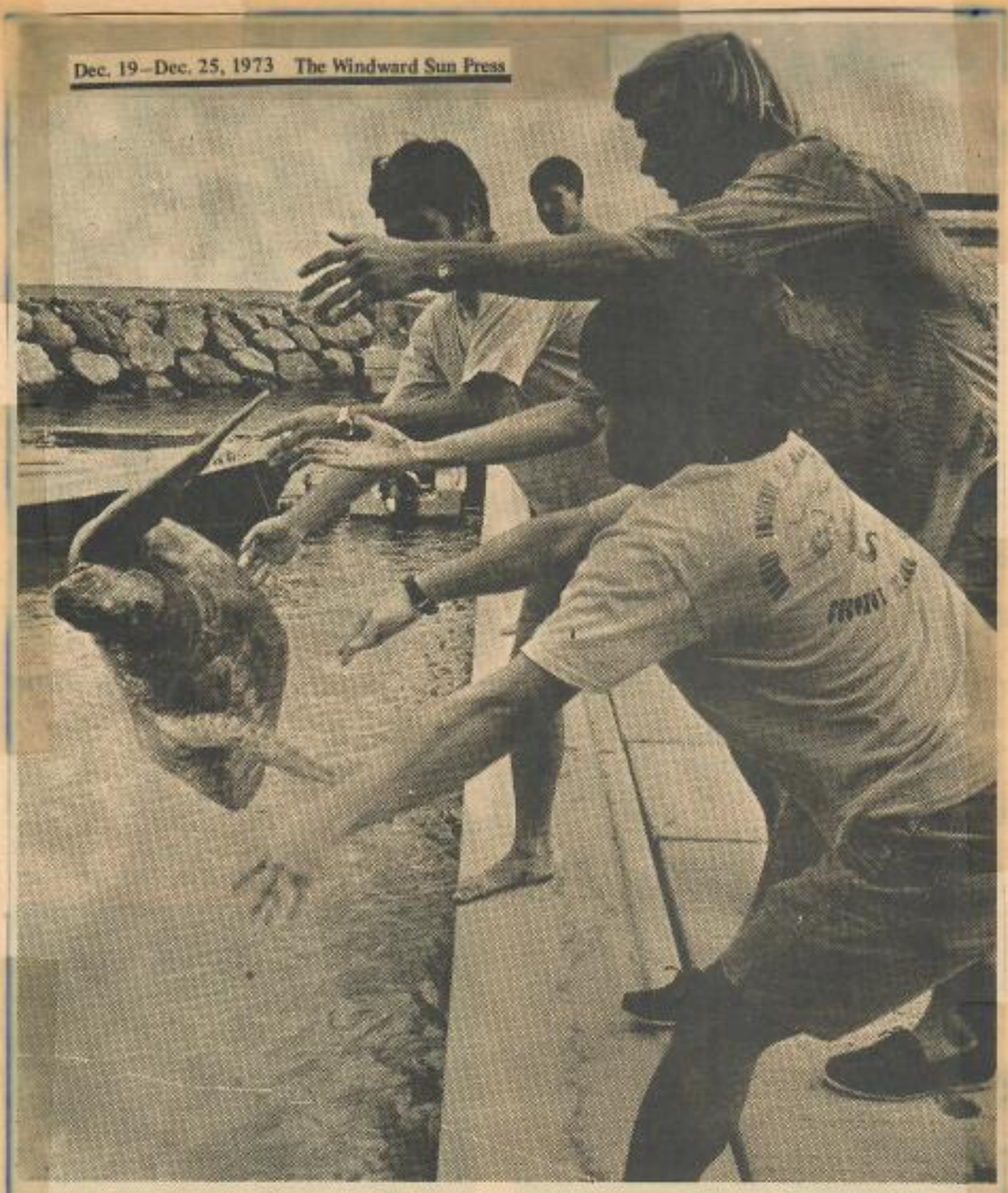
Dec. 19–Dec. 25, 1973 The Windward Sun Press



Sea Turtles tagged, released off WW shore

Nine large green sea turtles were tagged and released on the Windward shore last week by the University of Hawaii and Sea Life Park, as part of a joint study of the animals' breeding and migratory habits.

Details of the study were worked out this week between Dr. Edward Shallenberger, vice president of Sea Life Park and George Balazs, Junior Marine Biologist at the Hawaii Institute of Marine Biology at Coconut Island.

Approximately fifteen turtles remain at Sea Life Park, five at the feeding pool, three in the Hawaiian Reef Tank and another seven in the turtle pond nearby.

Green sea turtles have been found in excess of 400 pounds and can lay up to 200 eggs per year. The University of Hawaii and Sea Life Park are using recently developed incubation techniques to attempt to produce live offspring. Normally, the animals bury their eggs in about 30 inches of sand and hatchlings appear in 45 to 65 days, depending upon temperatures of the sand.

In the five years the turtles have been exhibited at Sea Life Park, all have survived captivity in good health; however, no live young have ever been produced at the park.

Protective legislation is now under consideration by the state Department of Land and Natural Resources which would place stronger controls on the capturing of green sea turtles, as their number is being rapidly depleted.

Persons capturing any of the tagged green giants should notify the Coconut Island facility. Complete information is printed on each tag.

Turtleless Soup

By Jeff Stansbury
And Edward Flattau
Los Angeles Times Syndicate

Hawaiians may shortly have to forego such traditional delicacies as turtle steak and turtle soup.

One person who would be delighted at this hopefully temporary ban is University of Hawaii marine biologist George H. Balazs. He contends that the largest and only major green sea turtle colony under United States jurisdiction is in danger of being wiped out by man's exploitation. Balazs is referring to the nesting sites at French Frigate Shoals, small islands in the Hawaiian Archipelago some 480 miles northwest of Honolulu. While that area is protected as a national wildlife refuge, the turtle's feeding grounds in waters off the major Hawaiian islands are not. Turtles have been slaughtered there indiscriminately by Hawaiians and tourists who value the reptiles for their meat and shells.

Consequently, Blazs has found that the breeding population at French Frigate Shoals has dropped from approximately 3,900 in 1968 to less than 1,100 today, a number which might already be low enough to doom the colony.

Balazs would like to see a moratorium imposed on the taking of these giant green sea turtles until their world population is restored to a healthy, stabilized level. Their numbers have declined from more than a million to less than 400,000 over the past century.

He considers the moratorium politically unrealistic for the Hawaiian State Legislature, but the ban will probably be imposed anyway. The Interior Department is proposing to place the green sea turtle on the endangered species list under a new tough federal law that would essentially bar the killing or sale of the creatures in the United States for any reason. Hawaiian officials had been considering a weaker measure which would forbid the commercial capture of sea turtles

Some readers might ask why Hawaiian gourmets shouldn't enjoy turtle declicacies until the supply of animals runs out.

First of all, turtles convert microscopic plant life (on which they feed) into edible protein in the form of their flesh. In abundant supply, they can provide an important part of the diet of poor islanders who catch them in numbers which would not ordinarily cause significant population decline. Turtles are also part of the oceanic food chain, and their excrement is a source of nourishment for other marine life.

Finally, there is safety and stability in nature's diversity. The more species there are, the more chance that some of them are resistant to highly contagious diseases which could rage unchecked through a single species of animal.

Those who wish to continue depradation of the green sea turtle defend their position with arguments typical of hunters selfishly reluctant to surrender the chase, however depleted their quarry is. They point out that the catch of turtles in Hawaiian waters has increased over the past few years. But they neglect to say the average age of the turtles being seized is now below that of sexual maturity. No one mentions that extinction of previous marine species has typically been preceded by increased catches due to a final flurry of intensive fishing.

Others argue that we don't have to worry about extinction of the wild sea turtle because man can raise the animal domestically. Depending on "farms" to save wild creatures from destruction has proven unreliable because of the difficulties experienced in re-creating natural habitats.

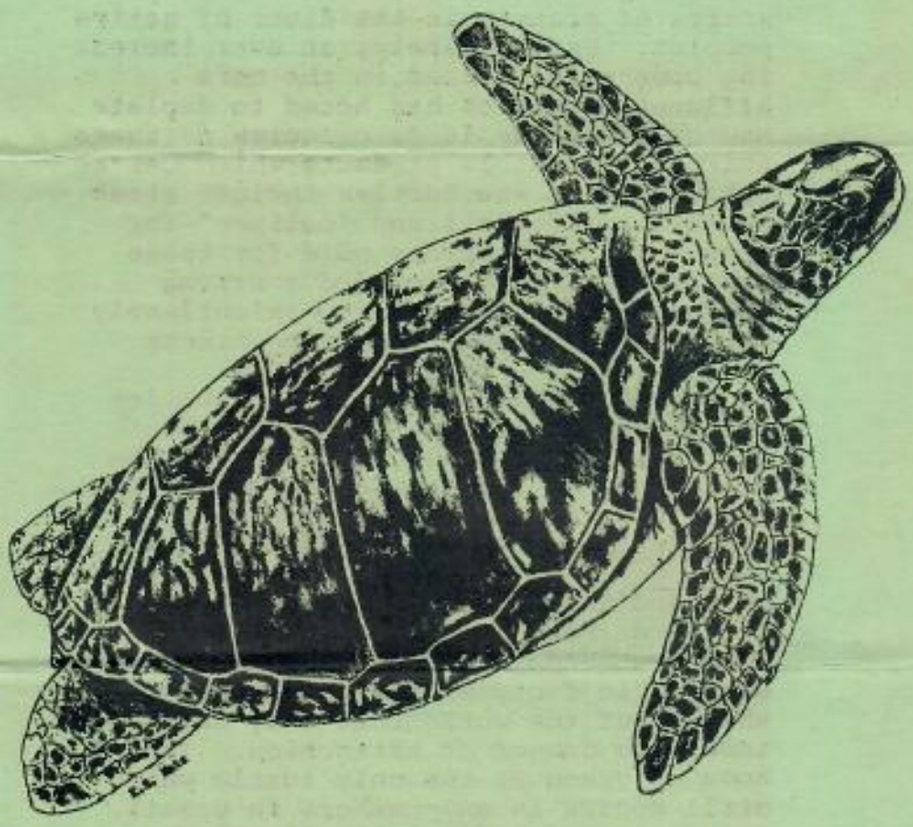
Dr. David W. Ehrenfeld, professor of biological sciences at Columbia University, points out that wild turtles — each of which can weigh 250 lbs. at maturity — need an enormous amount of room, which would create severe space problems for any facility. Crowding the turtles together in great numbers would precipitate disease and force the farmers to substitute fish feed for marine vegetation. This latter action would nullify for man the nutritional advantage he receives from the turtle's conversion of water plants to edible protein.

Ehrenfeld says raising wild turtles away from their nesting beaches could contribute to their demise, since scientists doubt the animals could find their way back to breed if they did not hatch at their natural site.

He believes that man's best chance to replenish the turtle population through farming is to establish nonprofit ranches at nesting beaches which already support colonies of the creatures.

In the short run for Hawaii,

HONU O KE KAI



THE HAWAIIAN GREEN SEA TURTLE

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Hawaii's Green Turtle

Members of the human race, if they like something, have a tendency to love it to death — especially if they can eat it or make money out of it.

The fate of being loved to death threatens the sea turtles, for centuries a valuable source of protein food for peoples in many areas of the world and also a source of shells used for many purposes.

The only sea turtle of consequence in the Hawaiian Islands is the green turtle, officially listed as depleted although Interior Secretary Rogers Morton and others have proposed including it on the list of endangered species.

Its breeding population is so far down that there is danger it has already fallen below the minimum level needed for survival, according to George H. Balazs, marine biologist at the University of Hawaii Institute of Marine Biology.

Only known nesting areas of the green turtle now in the Hawaiian Archipelago are in French Frigate Shoals, although the turtles used to nest on Lanai and Kauai beaches.

What's being done to stop the decline in the green turtle population?

Well, for one thing, a major seafoods restaurant, Fisherman's Wharf, took turtle steak and soup off its menu back in November. This was done to help conserve the species, says Eric Weyenberg, the manager.

Balazs wrote letters to 20 restaurants in February asking them to remove the turtles from their menus. He hasn't been able to ascertain the response, but knows some of them still serve turtle steaks—the main cause of depletion.

The State Division of Fish and Game is still working on regulations that would prohibit all turtle fishing in Island waters except for turtles to be consumed at home.

Two bills affecting turtles are now before the Legislature.

They are:

SB 1530, introduced by Sen. Mason Altiery, would impose a moratorium on taking turtles.

HB 1635, introduced by Rep. Anson Chong, would release up to $35,000 for research and management studies on the turtle.

Both bills deserve passage as a means of protecting a diminishing species before it gets eaten up.

Transplanted Turtles Go Home

By Helen Altonn
Star-Bulletin Writer

George H. Balazs, Hawaii marine biologist, was expected to arrive at French Frigate Shoals today with 30 juveniles he has raised for the past 2½ years at Coconut Island.

They are green sea turtles which he captured at the Shoals as one-day-old hatchlings and brought here for research dealing with their dietary requirements and growth.

ENDANGERED SPECIES—An adult Hawaiian green sea turtle nests at French Frigate Shoals, the only remaining green turtle nesting site in the Hawaiian Archipelago.—Photo by George H. Balazs.

The turtles, now ranging from 20 to 30 pounds in weight, were gathered from the Shoals and returned under arrangements made by the U.S. Fish and Wildlife Service.

Balazs, with the University of Hawaii Institute of Marine Biology, conducted the growth studies to determine the suitability of raising green sea turtles commercially.

HE SAID THE results of his work, combined with information from other researchers, "necessitated a rejection of the animal for such purposes at the present time."

He cited three major reasons for the decision:

—Relatively high levels of protein are needed in artificial diets to produce good growth (resulting in an expensive diet).

—Inability of large numbers of young to be produced in captivity.

—Problems relating to the effects of commercial sea turtle husbandry on conservation of the world's declining natural populations.

HE ROUNDED up the turtles from Coconut Island ponds Tuesday, crated them and loaded them on a U.S. Coast Guard buoy tender for the return home.

The only remaining green turtle nesting site in the Hawaiian Archipelago is the Shoals, 480 miles northwest of Honolulu.

Balazs planned to release his juveniles at sites frequented by turtles of the same size.

The animals have numbered and addressed tags on each flipper and are experimentally marked by "a harmless internal antibody that can be detected at a later date through laboratory analysis," Balazs told the Star-Bulletin before departure.

HE POINTED out the the green sea turtle "has a complex and little understood l
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The Sunday Star-Bulletin & Advertiser Prepared by the staff of The Honolulu Advertiser November 16, 1975

: forgotten bird island also bomb target

tively known. The importance of Kaula as a nesting site for numerous species of sea birds was well-known to the Hawaiian people. Possibly this information was not available to President Roosevelt, thereby causing the island to be simply overlooked and forgotten. Another possibility is that Kaula's steep cliffs may have been regarded as a natural defense against feather poachers. Federal protection may not have been thought necessary in order to ensure the birds' continued well-being.

This explanation would seem to be the most reasonable, as the first known landing on the island by a non-Hawaiian did not take place until 1920. Even then, the individual was unable to reach the summit.

WHATEVER THE ORIGINAL reason for not including Kaula in the Presidential Order of 1909, the result has been, and continues to be, the destruction of nesting sea birds by military bombs and gunfire. The events that brought about this incompatible and intolerable use of public property provide an interesting lesson in land acquisition and environmental degradation.

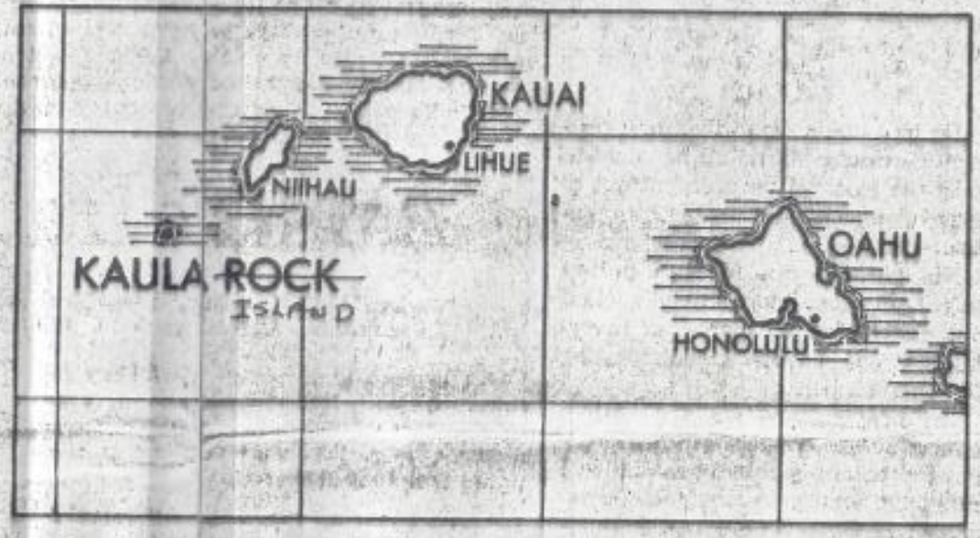
In December of 1924, Territorial Governor Farrington signed Executive Order 173 which set aside Kaula Island for public purposes as a United States Lighthouse Reservation under the control of the Department of Commerce. During the summer of 1925, personnel of the Lighthouse Service succeeded in building a trail to the island's summit. On the top, two stone structures were found that were thought to be religious shrines. A shelter cave with a low stone wall across the entrance was also discovered.

These findings confirmed the reports of

revealed that 15 species of plants and 14 species of sea birds were present.

AMONG THE BIRDS in greatest abundance were noddy and sooty terns, red-tailed tropicbirds, blue-faced, red-footed and hooded boobies, and frigate birds. White terns, petrels and shearwaters were also found. The biology of Kaula was clearly typical of the other isolated islands in the northwestern portion of the Hawaiian chain.

Practically no information about Kaula is available for the 25 years following installation of the automatic light. It seems



safe to assume that, except for yearly maintenance visits, the island and its sea birds were left in peace. In Washington, however, one significant event did take place during this period that would ultimately affect the island's safety. In 1939, the Lighthouse Service of the Department

Kauai started to voice opposition to this senseless killing of sea birds, many of which are valuable to fishermen for locating schools of fish and detecting ocean current changes. People living on Kauai seemed to be the most concerned, prob-

which show that the Territorial Government, Congress or the President ever granted approval for bombing, or was even officially notified of this action. Between 1952 and 1965 the Coast Guard continued to hold jurisdiction over Kaula and, at the same time, apparently raised no objections to the military's delivery of all kinds of ordnance. In addition to the standard bombings, strafings and use of high intensity flares, this ordinance also at time included torpedos and Regulus missiles fired from submarines.

Beginning in the 1960s, residents of

inquiry by Rep. Patsy Mink, the Department of the Interior (administrators of the National Refuge System) stated that Kaula has ". . . impressive value as a nesting area for certain sea birds . . ." and that it is ". . . highly desirable that the Island of Kaula be considered for National Wildlife Refuge status as an addition to the Hawaiian Islands National Wildlife Refuge."

Further, Mrs. Mink was told that everything possible would be done to have the island incorporated into the Refuge. Unfortunately, the Department of the Interior subsequently dropped the matter, after being told by the Navy that Kaula was vital to the war effort in Vietnam. Conservation groups on Kauai also agreed to stop campaigning against the Navy, after being told the same thing.

In March 1965, Rep. Spark Matsunaga publicly announced that jurisdiction of Kaula had been officially transferred from the Coast Guard to the Navy. The island's "give-away" therefore took place without organized opposition, in the name of national security. It is interesting to note that throughout the crisis of World War II, the bombing of Kaula and its sea birds had not been considered necessary by the military for "national security" or "defense readiness."

KAULA WOULD AGAIN have drifted out of public eye after Navy acquisition, had it not been for the pilots of two Skyraiders from the aircraft carrier Ticonderoga enroute to Vietnam. On the night of Oct. 5, 1965 these pilots became "confused" (as it was later explained) and dropped eight 250-pound bombs on Niihau, 32 miles from their intended destination of Kaula. Fortunately, the explosions took

SundayFocus editorial opinion, co

The Sunday Star-Bulletin & Advertiser

Kaula: forgotten bird island

By LINDA R. EVANS
Special to The Advertiser

The Island of Kaula was one of the five Hawaiian Islands seen by Captain Cook during his first visit in 1778. Following Cook's death during the second visit in 1779, Kaula was the last island seen when the expedition's vessels departed from Hawaiian waters.

Today, Kaula has been virtually forgotten by the people of Hawaii and remains practically unknown to the outside world. There can be little doubt that the U.S. Navy would like it to stay that way. To them, the island is known as the Kaula Rock Target.

Kaula covers 136 acres (four times the size of Ala Moana shopping center) and is located 20 miles to the southwest of Niihau and 150 miles to the west-northwest of Honolulu. The island rises abruptly to an elevation of 550 feet and has been described as appearing like a huge sea turtle on the horizon.

In 1909, President Theodore Roosevelt set aside nearly all of the small volcanic and coral islands in the northwestern portion of the Hawaiian chain as a sanctuary for wildlife. Millions of migratory sea birds, as well as seals and turtles, depend on these islands for breeding purposes. The result of Roosevelt's farsighted conservation action can be seen today as the Hawaiian Islands National Wildlife Refuge, one of the most outstanding natural preserves in the world.

ONLY TWO OF THE northwestern islands, Kaula and Midway, were not covered by the Presidential Order of 1909. Both of these islands should have been. Apparently there was little reason or incentive at the time to have strategically located Midway officially declared a sanctuary. By 1909 the island had been colonized for some six years by the Commercial Pacific Cable Company. Midway's massive albatross populations were therefore already safe from the Japanese feather poachers that were slaughtering hundreds of thousands of birds on the other small islands in the chain.

The reason for not including Kaula in the sanctuary perhaps will never be positively known. The importance of Kaula as a nesting site for numerous species of sea birds was well-known to the Hawaiian people. Possibly this information was not available to President Roosevelt, thereby causing the island to be simply overlooked and forgotten. Another possibility is that Kaula's steep cliffs may have been regarded as a natural defense against feather poachers. Federal protection may not have been thought necessary in order to ensure the birds' continued well-being.

This explanation would seem to be the most reasonable, as the first known landing on the island by a non-Hawaiian did not take place until 1926. Even then, the individual was unable to reach the summit.

WHATEVER THE ORIGINAL reason for not including Kaula in the Presidential Order of 1909, the result has been, and continues to be, the destruction of nesting sea birds by military bombs and gunfire. The events that brought about this incompatible and intolerable use of public property provide an interesting lesson in land acquisition and environmental degradation.

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These findings confirmed the reports of Captain Cook that early Hawaiians periodically made visits to Kaula.

Due to unfavorable weather conditions, Lighthouse Service personnel were not able to make another landing on the island until the summer of 1932. At that time an automatic gas light was constructed and put into service. The first and only published survey of the island's flora and fauna was also conducted in the summer of 1932. Results of this survey appeared in a Bishop Museum report and revealed that 15 species of plants and 14 species of sea birds were present.

AMONG THE BIRDS in greatest abundance were noddy and sooty terns, red-tailed tropicbirds, blue-faced, red-footed and hooded boobies, and frigate birds. White terns, petrels and shearwaters were also found. The biology of Kaula was clearly typical of the other isolated islands in the northwestern portion of the Hawaiian chain.

Practically no information about Kaula is available for the 25 years following installation of the automatic light. It seems

safe to assume that, except for yearly maintenance visits, the island and its sea birds were left in peace. In Washington, however, one significant event did take place during this period that would ultimately affect the island's safety. In 1939, the Lighthouse Service of the Department of Commerce was integrated into the U.S. Coast Guard.

In 1947, 25 years after installation, the Kaula light was permanently closed down. This action extinguished the island's hope for remaining unmolested.

THE FIRST ADMITTED bombing and strafing by Navy and Marine Corps aircraft started in 1962. This was apparently initiated with the blessing of the Coast Guard. However, no records can be found

Old law a new threat to turtles

By BRUCE BENSON
Advertiser Science Writer

When marine biologist George Balazs noticed turtle-skin purses on sale in Shirokiya's at Ala Moana Center, he notified management that selling turtle products is endangering the species.

Balazs, a researcher at the Hawaii Institute of Marine Biology, is an active voice in an international movement to protect all species of marine turtles. He has produced excellent results in his notices to some retail outlets.

Store managers at J. C. Penney's and Liberty House, for example, listened to his arguments and promptly removed all turtle-product items from the shelves.

Shirokiya's, however, went to Federal and State officials and wound up with a State-issued license giving them permission to continue selling their purses — thanks to an old Hawaii law.

For Balazs, the turtle-products license is galling.

"I think that requiring a license for the import of these products gives their sale a degree of false legitimacy, a false facade of it being okay to sell the stuff," he said yesterday.

BALAZS AND OTHER pro-turtle forces thought they had achieved success in relieving the hunting pressure on the creatures when the State Division of Fish and Game adopted Regulation 36 to prohibit further commercial exploitation.

While that may be the rule for Hawaiian waters, it now turns out that the division has an earlier rule known as Regulation 11 that allows the licensing of imported marine products that are illegal to take locally.

Adopted before Statehood, the old rule apparently intended to ensure the delivery of fish products to the Islands from elsewhere when those products were out of season locally, hence illegal to take here.

The problem of "endangered species" has become more critical in the years since Rule 11 was written. But a division official said yesterday that he must still follow it and issue permits to those who seek to import marine products that are banned within Hawaii.

"If the product cannot be taken legally from the imported areas, then such provisions would be taken care of there by people who would be concerned. Our concern is to protect it here," said the official, who wished to remain anonymous.

BALAZS WROTE in a recent issue of 'Elepaio, the journal of the Hawaii Audubon Society: "It is regrettable that we have not yet become responsible enough to protect the world's other declining turtle populations from our commerce here in Hawaii."

There is an attempt, meanwhile, by the U.S. Fish and Wildlife Service to restrict turtle trade within states and importation into the United States.

But one problem, according to Kimberly Wright, special agent for the service in Honolulu, is that once a product gets to the retail shelf the burden of proof that it came from an officially endangered species shifts to the Federal Government.

"A lot of times, by the time a product is made into a commercial article it is almost impossible to identify the species," she said.

That difficulty may turn out to work to the advantage of local conservationists, since Regulation 11 says the seller must identify the species of the goods being sold before the State grants a license.

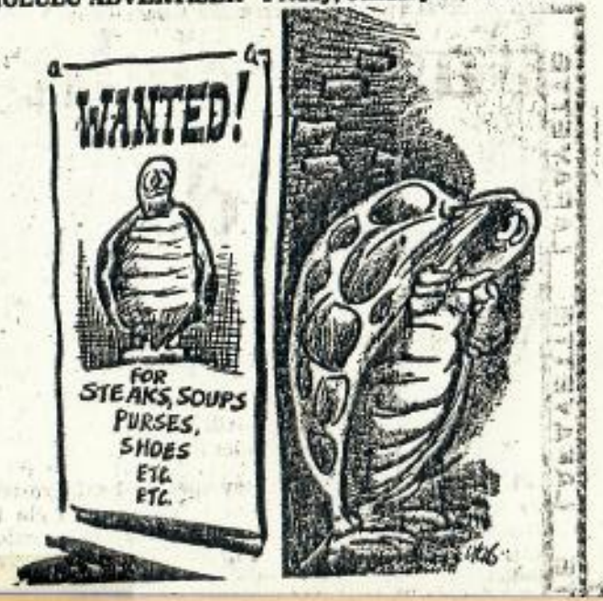
MEANWHILE, Elsie Shimabuku, head of import and export here for Shirokiya's, assured a reporter yesterday that the sale of the turtle purses is entirely within the law.

And the Pocketbook Man, another Ala Moana shop spotted selling turtle products by Balazs, said yesterday that are selling none of the wares. (Balazs claims he saw them on the store's shelves Monday.)

Still others to catch his eye include Betty Ford, who served turtle soup at the White House last spring, according to Vogue magazine.

Balazs sent notification to the First Lady — but, as he reported in the 'Elepaio journal "short letter from social secretary—to my knowledge, no corrective action taken."

IONOLULU ADVERTISER Friday, January 16, 1976 A-15



Extinction threatened

I was astonished to read the "mini-editorial on the subject of turtles" which appeared in the Dining Out advertising supplement of the Sunday Star-Bulletin and Advertiser (1/18).

The author, Mrs. Francee King, claimed to have "set the record straight" on the ethics of restaurants in Hawaii selling imported sea turtle soup and meat. What she actually did was to spread erroneous information that is damaging to responsible efforts to conserve these vanishing creatures.

In essence, Mrs. King told her readers that it is perfectly all right to order sea turtle dishes. Her rationale for this stamp of approval was that such products are not obtained from our locally depleted turtle population, but rather from European sources where Mediterranean turtles are "plentiful" and "not endangered". Let's see if the facts can support her claims.

1. Nearly all sea turtle products coming from Europe are derived from animals that were killed at widely separated areas around the world. The Caribbean is presently one of the principal areas of exploitation. At this location, company ships are efficiently exterminating turtles in their shallow water feeding pastures. On the nesting beaches, adult females are slaughtered when they crawl out of the ocean — often even before having a chance to lay their eggs.

Also not uncommon is the practice of killing turtles solely for the few pounds of cartilage that can be cut from their belly plates. Such dried cartilage brings a

letters

high price from the European processing plants wher
it is turned into what Mrs. King alludes to as "soup
the evening, beautiful soup!" In short, companies i
Europe are literally ransacking the earth to supply th
international luxury market with sea turtle products.

2. The International Union for Conservation of Na
ture (IUCN), one of the most highly respected conse
vation organizations in the world, has examined th
global survival status of sea turtles.

Its findings revealed that the majority of the popula
tions are either extinct, threatened with extinction, o
rapidly declining. A major factor found to be respons
ble for this dismal situation is the international trade i
sea turtle products (meat, soup, hides and shell). Fu
ther, all species of sea turtles, including those found i
the Mediterranean, now have the dubious distinction o
appearing on the IUCN's "endangered" list.

To quote the words of Dr. Archie Carr, the foremos
authority on sea turtles, what we need is "more sanctu
aries, more research, and a concerted effort by a
impractical, visionary, starry-eyed and antiprogressiv
organizations, all little old ladies in tennis shoes, an
all persons able to see beyond the ends of their nose
to control the international commerce in sea turtl
products." I might add that this certainly also applie
to existing commercial turtle "farms", as their preser
practices are not in the conservation interests of se
turtles.

I really can't see why some restaurants in Hawa
(and their advertising agents) feel insecure if they are
n't selling genuine sea turtle dishes. Alternate or imita
tion products of equal taste and exotic appeal ar
readily available. Their use would not place the per
sons involved in the unethical position of helping t
drive a species to the brink of extinction.

GEORGE H. BALAZ
Hawaii Institute of Marine Biolog

WINNERS OF THE FIRST ANNUAL

MARINE PHOTOGRAPHY CONTEST

sponsored by the

SEA GRANT MARINE ADVISORY PROGRAM

UNIVERSITY OF HAWAII

April 23, 1976

at the

WAIKIKI AQUARIUM

BEST OF THE EXHIBITION

"Portlock Seascape"	Wayne Levin
"Sunset at the Hanapepe Salt Flats--Hanapepe, Kauai"	Mary Ann Lynch
"Saved from the Sea"	Warren R. Roll

OCEAN ECOLOGY

"Seaweed"	Marjorie P. Roseberry

OCEAN ECONOMICS

"Fisherfolks"	J. Patricia Swenson

OCEAN RECREATION

"Banzai Pipeline"	Aaron Chang

OCEAN LIFE

"Hydromedusa"	Dale Sarver

THE OCEAN

"Tidal Pool"	David E. McKenna

PHOTOS SELECTED FOR THE 1977 SEA GRANT CALENDAR

"Red Fish"	Frank W. Adams
"Reflections"	Jack Lynch
"Living Together in Peace"*	George Balazs
"The Cast"	Christopher Skapik
"Saved from the Sea"	Warren R. Roll
untitled	Ron Edmonds
untitled	Ron Edmonds
"Sunset at the Hanapepe Salt Flats--Hanapepe, Kauai"	Mary Ann Lynch
"Ili Ili"	Heather Louise Fleming
"Heads or Tails"	Cindy Turner
"Wave Energy"	Mathias Hesermans, Jr.
"Rocks and Sea Mokapu"	Wayne Levin

* This is the B/W of a seal and turtle sleeping next to each other at French Frigate Shoals

A Particular Point of View

Saturday, June 5, 1976 Honolulu Star-Bulletin A-11

The Facts on Turtle Farms

By George H. Balazs
Biologist, Hawaii Institute of Marine Biology

DURING THE PAST year and a half readers of Honolulu's two daily newspapers have been exposed to no less than five articles dealing with the controversial subject of commercial sea turtle farming. Conflicting information has often been presented; therefore it's not hard to understand why many people are confused over the whole issue.

To add substantially to this confusion, on May 7 KGMB-TV news presented a glowing report on turtle farming which neglected to even mention that the subject is controversial. Before anyone in Hawaii runs out and starts investing hard-earned dollars in such a scheme, I want to briefly summarize the existing situation and put it into proper perspective.

Many may recall the numerous claims made by promoters of the world's only sea turtle "farm", Mariculture, Ltd., located in the Caribbean on Cayman Island. In essence, the claims stated that such an operation is (1) beneficial to the conservation of the world's declining sea turtle populations; (2) biologically feasible; and (3) economically successful.

Along with Dr. Archie Carr and other knowledgeable sea turtle scientists, I have disputed these claims as being unfounded, unsubstantiated and, for the most part, just plain hogwash. Let us see how the claims hold up against the evidence.

George Balazs

WITH RESPECT to conservation merits, in November of 1974 the respected International Union for Conservation of Nature (IUCN-Switzerland) sent a task force of turtle specialists to Cayman Island to examine critically the company's contentions. Investigations found that Mariculture, Ltd., was guilty of making claims and statements that were misleading and demonstrably incorrect. The conclusion was reached that the company's operation cannot be regarded as being in the conservation interests of sea turtles.

With respect to biological feasibility, that is, the actual capability of successfully farming turtles, the same international task force found that the viability of the company's turtle culture operation has yet to be proved, as indeed has that of turtle farming in general.

Large numbers of eggs must now be removed from natural nesting beaches, and the outlook seems poor for achieving self-sufficiency in the production of young. Furthermore, disease and mortality problems are considerable, and the type of high protein feed that turtles will accept is incredibly expensive and inefficient.

WITH RESPECT to economic success, the evidence is even more damaging. In May of 1975 Mariculture, Ltd., went bankrupt. This came after seven years of efforts, millions of dollars in expenditures, and numerous promises and predictions that did not prove true. Just two months ago a German corporation purchased Mariculture, Ltd., from the bankruptcy trustees.

All total, the stockholders of Mariculture, Ltd., ended up with absolutely nothing- a loss amounting to $3.5 million. Unfortunately, many of these investors were American citizens who had believed the company's promotional literature and other glowing "success" stories heard about turtle farming.

The lesson seems clear to me. Perhaps at some date in the distant future sufficient scientific information and expertise may be developed to make turtle farming a realistic and acceptable proposition. However, for the present time it's just another pie-in-the-sky scheme that doesn't make good sense.

Honolulu Star-Bulletin Saturday, September 11, 1976

Hawaiian green sea turtles with a seal.

Green Sea Turtle Study Will Begin This Month

A three-year management study that begins this month will pinpoint concentrations of the Hawaiian Green Sea Turtle in State waters and in the more remote areas of the Leeward chain.

The study in the Leeward Islands beyond Kauai will complement a joint State-federal resource assessment survey of the area scheduled to begin later this year.

Other survey objectives include determining the distribution and abundance of algae used as food by the Hawaiian green sea turtle.

The purpose of the study is to insure that adequate numbers of the Hawaiian green sea turtle, a popular ocean delicacy, will continue to survive.

George H. Balazs of the Hawaii Institute of Marine Biology will conduct the State-funded study.

He will attempt to determine the rate of growth and age of this turtle at sexual maturity under natural conditions.

This type of information on the green turtle is virtually nonexistent, he said.

The study also will cover the reproductive potential, as well as mortality factors limiting the population.

These turtles are known to travel 500 miles or more to French Frigate Shoals in the Leeward chain for mating.

Many of the adults spend most of their lives feeding on algae or limu in Hawaiian waters.

Turtles and Seals Find a Home

By Helen Altonn
Star-Bulletin Writer

To most people, it's just "a damn old rock."

But, after seven days and nights on Necker Island, George H. Balazs says, "To me, it's like a great cathedral."

Balazs shared the precipitous islet with Hawaiian monk seals, green turtles, hundreds of thousands of native seabirds and shrines of ancient Polynesians.

"It was a beautiful experience," he said, describing his adventure.

BALAZS IS A research biologist at the University of Hawaii's Institute of Marine Biology and the endangered Hawaiian green turtle is his special interest. He recently was appointed a member of the Marine Turtle Specialist Group of the International Union for Conservation of Nature.

He is in his second year of a three-year study to survey the turtle population in Hawaiian waters, including remote areas of the Leeward chain. He also hopes to learn more about their movements, growth and eating habits.

His research is funded by the State Marine Affairs Coordinator and the National Sea Grant Program.

Gary Naftel, captain of the Easy Rider, was doing fisheries research in the Necker area and dropped Balazs there with a week's supplies on Aug. 19.

NECKER, A narrow fishhook of volcanic rock, is 393 miles northwest of Hawaii in the Hawaiian Islands National Wildlife Refuge. Technically, it is part of the City and County of Honolulu. The rocky island [illegible]

coming in to feed on the seaweed.

"I never saw such lush stands of limu," he said.

Balazs saw "a fair number" of Hawaiian monk seals with young pups born on the island.

"This was new information for Necker," he said. "We hadn't thought of it as a pupping area."

The seals and turtles "team up" on Necker, snoozing together on the ledges, Balazs said. "I'm really amazed at how they are able to live in harmony in a limited area on the rock ledge."

HE ALSO WAS surprised to see the turtles "hauling out on the lava rock and sleeping." On other islands, they bask on coral sand, or crawl under ledges underwater, Balazs said.

The turtles arrived at about 10 or 11 at night and left about 7 or 8 in the morning, he said.

He caught six small turtles with a scoop net to tag and measure them to follow their movements—"if they're moving"—and monitor their growth. He also used a probe sampler to obtain stomach contents to find out what they're feeding on.

There was a "definite changeover" of turtles, Balazs said. "I never caught the same small turtle twice." And, based on his observations, he estimates a minimum of 50 turtles using the nearshore waters.

NECKER SITS on a 650-square-mile bank, with the greatest depth 125 feet, Balazs said.

"It's conceivable the turtles are using the entire bank and the island itself as part of their total cycle," he said.

Necker is about 75 miles from the

gious structures had been destroyed by bombs.

Emory said he learned the Navy was bombing the island during World War II and advised the naval command at Pearl Harbor that the island was covered with ancient ruins.

Balazs found a 250-pound bomb on one section of the island and two more bombs on the northwest cape with birds perched on them.

Balazs would like to go to Lisianski, which he believes may be another important island for turtles, and to other remote islands in the leeward area.

But, he said, there is no transportation into the eight units of the wildlife refuge except for French Frigate Shoals where a Coast Guard navigation station is located.

Star-Bulletin
Section G
Wednesday, October 12, 1977

Seabirds flock around a marae (shrine) built on Necker Island by ancient Polynesian travelers while George Balazs, left, keeps watch from an observation post on a steep cliff.-Photos by George Balazs.

Crown of Thorns Starfish

THE CROWN of thorns starfish, considered a menace a few years ago to reefs off east Molokai and especially to the Great Barrier Reef off Australia, has been out of the news lately.

Word now comes that this coral-eating echinoderm has been causing severe damage to reefs off American Samoa, after first being sighted there in 1976.

The American Samoan government has become so concerned that it is offering a bounty of 15 cents on each dead starfish. The offer, announced last month by Manager Henry Sesapasara of the Office of Marine Resources, applies only to the crown of thorns; other forms of starfish aren't wanted.

The crown of thorns starfish was first noted in 1976 on a reef near the entrance to Pago Pago Harbor and the infestation has spread to reefs on both sides of the harbor entrance.

One official in the Office of Marine Resources thinks there are millions of the starfish eating away and moving into more live coral.

The crown of thorns starfish has been causing severe damage to reefs off American Samoa.

There is some disagreement in scientific circles as to exactly how much of a menace the crown of thorns starfish is. Some scientists, led by Robert Endean of the University of Queensland, think the starfish will destroy vast stretches of reef, especially the Great Barrier Reef but also other reefs in the Pacific and Indian oceans.

OTHER SCIENTISTS think the starfish infestations are natural developments that come in cycles. Edward Frankel, professor of geology at the University of Sydney, made drillings that showed evidence of starfish spines buried deep in the Great Barrier Reef, which would indicate starfish infestations are no recent thing.

The starfish are believed normally present on coral reefs in small numbers; concern has been aroused only when they were found in great numbers.

A big starfish plague was reported off Okinawa in the late 1950s, and then at other places in the Pacific and Indian oceans, including Guam and the Cook Islands.

The crown of thorns was first noted in Hawaii in 1969. The State Fish and Game Division, led by

Harry Whitten

Kenji Ego, Fisheries Branch chief, mobilized divers who used hypodermic needles and syringes to inject ammonium hydroxide (aqua ammonia) into the starfish.

Three expeditions were conducted, in 1970, 1972, and 1975, to the main starfish colony, a three-mile reef off Kawela, Molokai, five miles east of Kaunakakai. Thousands of starfish were poisoned.

EGO SAYS Fish and Game hasn't done anything lately about the Molokai colony and has no plans for any further action in the immediate future. He says the starfish are still there but doesn't know to what extent.

Albert H. Banner, University of Hawaii professor of zoology, says the excitement concerning the crown of thorns starfish has died down. He thinks the whole matter was much overblown eight years ago.

He is interested, however, in what develops concerning the crown of thorns starfish infestation in American Samoa.

Soil Erosion

LEGUMES, SUCH AS BEANS, peas, clover and alfalfa, have long been prized by farmers. Aside from their obvious virtues, they have the ability to take nitrogen from the air and convert it into forms of nitrogen that can be used by plants.

Mainland farmers try to rotate legumes with other crops. Here in Hawaii the U. S. Soil Conservation Service and the Hawaiian Sugar Planters Association Experiment Station are interested in legumes to prevent soil erosion, with an added benefit of savings in cost of fertilizer, plus less energy and less labor needed to apply the fertilizer.

Sugarcane fields erode after harvesting and during the first four to six months of the planting cycle, until the young cane gets bigger. The erosion takes away valuable soil and also washes sediments into streams and coastal waters.

Some new harvesting methods leave a crop residue on fields for soil protection after harvest. Researchers think a ground cover plant could do the job better.

Researchers at the Soil Conservation Services Hawaii Plant Materials Center at Hoolehua, Molokai, started the search for a good ground cover plant two years ago and decided that low-growing legumes would be best.

SEVENTY VARIETIES of legumes were evaluated; two have emerged as most promising for Hawaiian conditions.

"It looks as if our search is drawing to a close," says Robert J. Joy, plant materials specialist and center director.

The two most promising plants are the bur clover and the narrow-leaf trefoil; they will undergo final field observations.

The plant that researchers were looking for must germinate and cover the ground rapidly, be low-growing and not climb the cane. It should not compete for nutrients and should die out as the cane overtopped it. It should reseed itself and should not harm other agriculture if it were to migrate from the canefields.

Both bur clover and trefoil will be planted within the next few weeks on Oahu and Big Island plantations under supervision of Robert D. Wiemer, HSPA sub-station manager and project leader.

These trials are to find out how adaptable the two legumes are to varying field conditions.

The prospective energy conservation results from the legumes' ability to convert atmospheric nitrogen into nitrogen for the soil. Initial testing indicated as much as 500 pounds per acre of nitrogen was fixed in the soil by the legume plantings, which would significantly reduce the amount of nitrogen fertilizer that would ordinarily be applied to the cane fields.

Research has done wonders for American agriculture. The experiments now being conducted with the two legumes shows how research can continue helping to solve problems, including such ones as soil erosion and water sedimentation.

Necker Island

GEORGE BALAZS of the Hawaii Institute of Marine Biology has been tireless in his efforts to save sea turtles and the Hawaiian monk seal.

He recently did research on Necker, one of the Northwestern Hawaiian Islands. He'll discuss and show pictures of the seals, turtles, birds and Polynesian archeology of Necker at a lecture at 7:30 p.m. Friday in the Waikiki Aquarium foyer.

The lecture, open to the public, is sponsored by the Friends of the Waikiki Aquarium.

Honolulu Star-Bulletin Thursday, February 9, 1978

Drought Is Beginning to Kill Big Isle Cattle

By David Shapiro
Big Island Bureau Chief

worse," Kim said. "There has bee
virtually no rain. We're thinking no
of extending the emergency to th

Baker in the past has repeatedly
oken of Government programs,
e Medicaid, as having the fastest
sing costs of all assistance pro-
rams.

His bill would establish a Health
rvices Authority that would pro-
de comprehensive medical serv-
es to those receiving welfare and
other low-income residents. Serv-
es would be provided at a fee for
w-income persons, and without
st to indigents and welfare recipi-

pastures at a slightly higher elevation than Parker, reported no dead animals, but a spokesman said the

study sometime next year on Ha-
state Water Commission finishes its
Legislature should wait until the
said in prepared testimony that the
of Hawai'i Environmental Center,

DOAK C. COX, of the University

salt encroachment."
waste, pollution or deterioration by
vent threat of exhaustion, depletion,
lization, conservation, and to pre-
thority to control and protect
ready give the Land Board the au-
ground water to ensure its best uti-

DROUGHT VICTIM—A calf lies dead in a parched field at South Point. It's one of dozens of cattle that have succumbed to the dry weather in that area of the Big Island. Photo by: George H. Balazs

HONOLULU STAR-BULLETIN MARCH 10 1978 A-1

UGLY BUT NICE—A rare loggerhead turtle gobbles squid at Sea Life Park after a mysterious ocean journey to Hawaii.—Star-Bulletin Photo by Warren Roll.

Battered Vagrant Gets a Lift and Finds a Home in Hawaii

By Helen Altonn
Star-Bulletin Writer

A Waianae veterinarian fishing off Lanai recently rescued an injured stranger in Hawaiian waters—a loggerhead turtle battered by sharks.

Scientists say it's only the second such turtle ever found here. They speculate it may have escaped from captivity somewhere because it isn't afraid of people.

The rare, 200-pound animal is under treatment at Sea Life Park where it is reported "eating squid like a bandit . . . and eating out of people's hands."

DR. LYNN McKINNEY of the Waianae Veterinary Clinic said his family was fishing from a boat at Penguin Banks "and the water was flat, and we thought we saw a log. We always fish by logs and we came up on it."

He said his wife, a reporter for Hawaii Fishing News, discovered the log was a turtle and wanted to get pictures of it.

"We came up close to it, and it tried to get on the boat to rest—it was so tired. We stopped the boat and it went all around looking for a ledge to climb on," McKinney said.

"We thought it was a common old turtle, but we couldn't see leaving him out there. After about half an hour of playing cowboy, we finally got him roped—it's not the easiest thing to get a rope around—and brought him back.

"Being a veterinarian, I still don't know too much about turtles," McKinney said. "I didn't know what to do with him."

HE SAID THE TURTLE had been attacked by sharks and had lost his tail and a flipper. He had a big bite on his head and he was heavily infested with parasites.

"He had two big barnacles on his back that looked like eyes sticking out," McKinney said.

"All turtles cry, and he was sure crying. Tears were running out of his eyes. He was a nice turtle," McKinney added.

He called the National Marine Fisheries Service, which suggested he take the turtle to Edward Shallenberger, director of operations at Sea Life Park.

Park officials said yesterday the turtle was "really emaciated and in extremely bad shape, but he seeems to be recovering nicely."

"He is not a beauty. He's a beat-up turtle and he has a great big head—bigger than most turtles," they said.

GEORGE H. BALAZS, University of Hawaii research biologist and an authority on turtles, noted the loggerhead's condition and surmised, "It's likely that he drifted off track and floated here."

He said loggerhead turtles generally live in the Atlantic Ocean but some are found off Baja California, off Fiji and the south coast of Japan.

"This one is a lost individual from another population," Balazs said.

He said in the late 1930s or early 1940s, former Waikiki Aquarium Director Spencer Tinker identified the only other loggerhead turtle found in the Hawaiian Islands.

Balazs suggested the new arrival might have gotten away from a facility elsewhere because of its unusual acceptance of humans and captive conditions.

"It sticks its head out of the water waiting to be fed," he said. "Wild turtles don't act that way—even sick and tired ones. A wild turtle would be fearful."

Elephant Seal, Eagle Come from Far Away

Unique Visitors Arrive by Ai

By Helen Altonn
Star-Bulletin Writer

Two unique creatures recently turned up in the Hawaiian Island chain — one traveling at least 3,500 miles by sea and another arriving by air, possibly from the Sibera region.

They are an elephant seal, discovered on Midway, and a sea eagle which apparently was blown onto Kure Atoll by a storm.

Hawaii has native monk seals but the elephant seal is the first identified in the Hawaiian Islands since 1825, said George H. Balazs, University of Hawaii research biologist.

A golden eagle was spotted flying over Kauai in 1967 and was reported still soaring there in 1976. But no sea eagles have been sighted in Hawaii until now.

BALAZS IS AN authority on turtles and has been conducting a three-year survey of the turtle population in Hawaiian waters, including the remote Leeward chain.

He happened to be on Midway last month for his research project and was told a seal had come up on the beach.

He said it's very rare to see any seal on the Navy-occupied island, but this one stayed 10 days.

It was thought at first to be a monk seal, but Balazs saw that it was an immigrant elephant seal when Gary Means, honorary game warden on Midway, took him to look at it.

Balazs said an early sailing explorer reported seeing "sea elephants and sea leopards" at Pearl and Hermes Reef and Kure Island in the last century "but most people thought it was a mistake or misidentification . . . .

"WITH THIS report (of the Midway seal) I wonder if he did make a mistake?" Balazs said.

He said elephant seals don't get their name because of their size, although males can get up to a couple tons. The name comes from their upper nose, which gets very long and curls over, he explained.

"But the female doesn't get near that big and doesn't have that nose," Balazs said.

The Midway seal was a northern species, which breed in the Channel Islands off California and at Guadalupe off Baja, Calif.

She was a young female and appeared in good shape, although she had some superficial wounds, Balazs said. "She was sleeping on the beach most of the time there. She seemed to be exhausted and was getting a long sleep."

HE SAID THE seal had a tag with numbers on it and he called John Naughton, biologist with the National Marine Fisheries Service in Honolulu, in hopes of finding out where it had originated.

Naughton checked with the Northwest Fisheries Center in Seattle and learned the seal had been tagged by the center's biologists at San Miguel Island in February 1977.

Their reaction was, "Oh, wow!" Naughton said.

"The only strays they have gotten from tag returns have been off the Aleutians . . . But this was a young female (on Midway) — maybe they are more adventuresome," he said.

He said elephant seals at one time may have ranged throughout the Pacific. "They were very docile and could have been exterminated rapidly."

ELEPHANT SEALS were slaughtered for oil in the 1800s and their population fell to as few as 20 animals.

But Naughton said the population has been growing under federal protection and the animals may be ranging to their original islands.

"It would be extremely interesting if it (the Midway seal) gets back to its rookery (at San Miguel). It would be an indication she knew what she was doing, and wasn't just lost," he said.

Just before leaving for Miday, Balazs received a call from the commander of the Coast Guard Loran Station on Kure with the startling information that "an eagle took up residency there in early February."

So he went on to Kure from Midway to get a look at it and continue his work on turtles.

HE CAME HOME and went to the books to try and identify the eagle. He believes it's an immature Steller's sea eagle, which breeds on the coastal area of the Bering and Okhotsk Seas and in Kamchatka in Siberia, and is distinguished by a yellow bill.

He said the Kure visitor has a prominent yellow beak and yellow, featherless legs.

He said it was probably blown off track during a storm because Coast Guard officials said it was soggy and beat up when it landed on Kure.

But he said it appears to have recovered nicely from its harrowing journey — and is feasting on gooney birds (black-footed and Laysan albatrosses).

"IT'S ALMOST like an eagle paradise for him," Balazs commented. He said thousands of gooneys are on Kure now breeding and raising their young.

"If the eagle stays alive next six months or so, ought to think seriously ab going on," he said, quest effects of the eagle's diet ney bird population.

Kure Atoll is part of the ty of Honolulu and technic the jurisdiction of the sta ment of Land and Na sources.

Balazs reported the ea Walker, state wildlife chie provide him with inform photographs so he can try it positively.

Adding to the excitem elephant seal and eagle, B

HAWAII'S NEW RESIDENT—A sea eagle has comfortably Kure Atoll, dining on the gooney birds. —Photos by George B

VISITOR FROM AFAR—An elephant seal snoozes on the Midway after wandering from its colony at San Miguel Island nia.

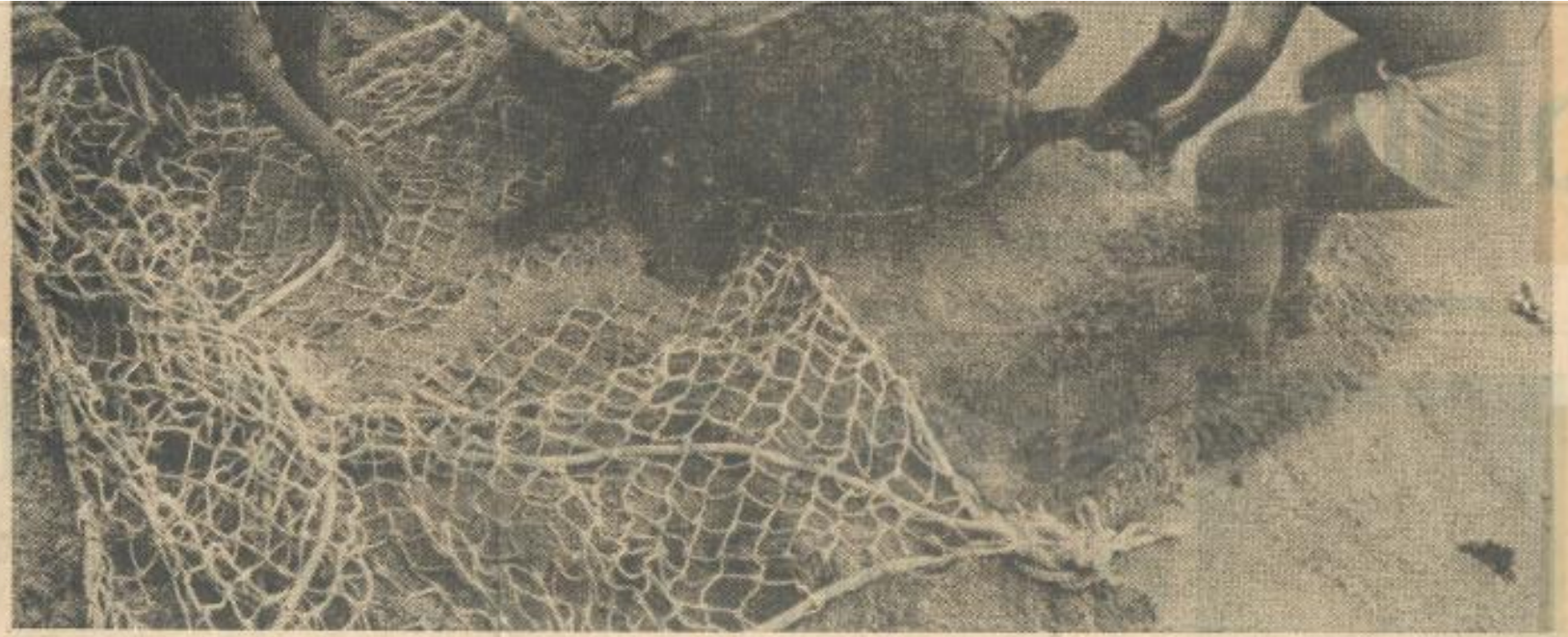
malamalama

The Light of Knowledge
News about the University of Hawaii
Spring 1978
Volume 2, Number 1

Tropical Curiosity. The little fellow on the left could care less, but environmentalists and nature lovers will be glad to know that two University faculty members have put together a comprehensive bibliography on the rare Hawaiian monk seal.

The compilers are George H. Balazs of the Hawaii Institute of Marine Biology and G. Causey Whittow of the P.B.R.C. Kewalo Marine Laboratory. Their subject is a uniquely Hawaiian animal and one of the few species of seals to occur in the tropics. It is one of only two mammals endemic to Hawaii (the other is a bat).

If you'd like to meet one in person, as it were, drop over to the Waikiki Aquarium—they have the sole Hawaiian monk seal in captivity anywhere in the world. If you're lucky, you may even catch him when he's awake.



'BORN FREE'—Two green sea turtles, longtime residents of the Waikiki Aquarium, are returned to native waters. —Photo by George Balazs.

Aquarium Green Turtle Now Living Free in Natural Habitat

By Helen Altonn
Star-Bulletin Writer

One of two green sea turtles returned to the ocean last October after years of tenancy at the the Waikiki Aquarium recently was seen happily basking with other turtles at East Island in French Frigate Shoals.

That is a major nesting area for Hawaiian green sea turtles.

George Balazs, turtle authority at the Hawaii Institute of Marine Biology, saw the aquarium turtle hauled out on the beach at the end of East Island last month.

He didn't recognize the tag number and checked it with Leighton Taylor, aquarium director, who identified it as one of the released aquarium turtles.

"IT'S REALLY neat that an animal that lived here 10 years made it back (to the nesting ground)," Taylor said.

He said the former female resident of the aquarium also was observed to nest and produce live hatchlings.

He said a number of turtles had been on display at the aqauarium for more than 10 years, "but they had outgrown the facility and I didn't feel the facility was proper for them."

In a recent aquarium newsletter, Taylor noted: "In the final analysis, the only justification for placing animals in captivity is to assure the well being of wild populations through increased human knowledge and understanding ....

"BECAUSE OUR green sea turtles, hawksbills and loggerheads had to share space with three large seals to the disadvantage of all the animals, we felt that we were unable to meet the dual responsibility of exhibit standards and therefore had to consider several alternatives."

One was to improve the facilities and a new sea turtle pool was planned with a nesting and basking beach to encourage the turtles to nest.

The 1976 Legislature appropriated $100,000 for the project; the state designed plans, and Gov. George R. Ariyoshi participated in a groundbreaking ceremony.

But the funds were never released.

CONSEQUENTLY, Taylor said the aquarium's hawksbill and loggerhead turtles were given to Sea Life Park and eight adult green sea turtles were set free.

He said the hawksbill was retained because it is an endangered species "and it's unlikely that we would be able to obtain specimens again."

The Atlantic loggerheads weren't released because it was believed they couldn't survive in Pacific waters.

Although they won't see any turtles, members and guests of the Friends of the Waikiki Aquarium are invited to view the facilities and other exhibits at a special event from 5 to 9 p.m. Friday.

Mayor Frank F. Fasi will proclaim it "Friends of Waikiki Aquarium Day."

TASS helps with sealife research

George Balazs, Univerity of Hawaii, Capt. Richard Burdette and MSgt. Harry Edwards discuss the aid given by pilots of the 22nd TASS to sealife research programs. (U.S. Air Force Photo by Capt. Frank Jiron)

Community projects abound in the Air Force. There is one Hawaiian community, however, that the pilots of the 22nd TASS at Wheeler AFB have given their special attention.

For the past two years the pilots and other TASS personnel have been aiding various government agencies concerned with the research of Hawaiian sea life. While flying routine missions around the islands, the pilots report their sea life sightings to MSgt Harry V. Edwards, the squadron coordinator, who turns the reports over the George Balazs of the University of Hawaii, Marine Biology Division and Dr. Ed Shallenberger of Sea Life Park.

Mr. Balazs, Hawaii's noted authority on seaturtles, recently gave enthusiastic praise to the pilot's efforts. "I was amazed at the pilot's concern for the protection of all forms of sea life. Their sightings are invaluable to my research project, intended to aid the Dept. of Land and Natural Resources in making decisions on locations of turtle sanctuaries. And hopefully this research will reveal the need for wildlife management of possible endangered species. Turtle's don't have many friends." Mr. Balazs' research is funded by the State Marine Affairs Coordinator and the National Sea Grant Program.

Dr. Shallenberger, Hawaii's leading authority on whales, uses the pilot's input as a basis for a Humpback Whale population survey; a project funded by the National Marine Fisheries Service. The end product of his research may result in a sanctuary for the affable Humpbacks in Hawaiian waters. "Indications are the Humpback population has dwindled to 5 per cent of what it originally was; therefore, it is an endangered species," said Dr. Shallenberger. "If a sanctuary is located in Hawaii, 22nd TASS pilots will have played a part in its installation."

"The best thing about these projects," adds Edwards, "is that you can see positive results of your efforts if you're ecology oriented. And it doesn't cost the Air Force anything."

News in brief

Pets at Bellows

Beginning Sept. 1, people who rent and use cottages at Bellows recreational areas will no longer be permitted to bring their pets with them, according to officials at Bellows.

The policy change coincides with a

Commander's call

Col. Sharman Stevenson, 15th ABW commander, will be holding his first monthly Wing Commander's Call at 3 p.m. today in the main dining room at

Christian.

April 1982

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Christian

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tinguished Service Award of the Department of Commerce (Gold Medal Award) in 1974. The Canadian government's Bedford Institute of Oceanography awarded him the Huntsman Medal for Excellence in Biological Oceanography in 1983.

On April 27, his friends scattered his ashes from the David Starr Jordan in the sea off Point Loma known as Lasker's Lake (an area where in past years Reuben would always be assured of making a good haul of biological samples). On May 3, his friends and co- workers from the Center and from the Scripps Institution of Oceanography, gathered at Sumner Auditorium to think about Reuben and to celebrate a life well lived.

EVENTS

. . . at the La Jolla Laboratory

Betsy Stevens is Winner of Staff Recognition Award

Elizabeth (Betsy) Stevens is the winner of the Staff Recognition Award at the La Jolla Laboratory for the period April through June, 1988. Betsy is a 25-year veteran in the federal fisheries service, starting as a biological aid and progressing to fishery research biologist.

With a referral from the California State Employment office, Betsy came to work for the then Bureau of Commercial Fisheries, joining a number of other fishery aids sorting plankton at the Scripps Field Annex in Pt. Loma. The next year the laboratory and staff were moved to the newly built Fishery-Oceanography Center in La Jolla establishing

Betsy Stevens

quarters on the first floor of Building C. In the ensuing years, Betsy began to work closely with Dr. Elbert Ahlstrom and senior aid Lois Hunter, learning to identify the more than 250 fish larvae routinely found in plankton tows made on CalCOFI cruises in the California Current.

Singly and with her colleagues, Betsy has authored or co-authored 10 scientific papers. Under the direction of Dr. Geoffrey Moser, Betsy, and her colleagues, Elaine Acuna, David Ambrose, and Barbara MacCall, recently completed 23 CalCOFI Data Reports dealing with fish larvae collected on cooperative CalCOFI cruises during the period 1951-1981.

In her leisure time, Betsy and her husband, Bob, a retired school teacher, travel and visit with their five children and five grandchildren (and counting), actively participate in church and charitable activities, and attend lectures and concerts.

. . . at the Honolulu Laboratory

MMES Tags Unusual Turtle

The flipper tag used by the Marine Mammals and Endangered Species Program (MMES) to identify Hawaiian green turtles is now the latest accessory item worn by Moana ("Quiet Sea"), a green turtle puppet. Moana is one of the newest members of Puppets on the Path, an environmental entertainment troupe from Volcano, Hawaii. Since 1983, the troupe has been using puppetry and song to teach people

Zoologist George Balazs tags Moana, while MMES Program Leader Bill Gilmartin assists and puppeteer Kate Schuerch looks on.

UNITED AIRLINES = 800-225-8900

BRITISH AIRWAYS = 800-247-9297

Dr. Jeanne A. Mortimer
Project Executant, EMPS Project J1: Turtle & Tortoise Conservation
Conservation Division
MInistry of Environment
P.O. Box 445
Victoria, Mahe Republic of Seychelles

I will bring my mobile phone out to the island with me. I can even take it out onto the beach. So, you need not worry about being out of reach at ANY time -- (except if you are snorkelling!!) In fact, I can let you keep it with you ! So you can reassure your family that you will be VERY easy to contact.

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Fax: 011-248 322-555
E-mail: jmort@seychelles.net

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KAILUA HOME
808-254-1740

011-248-
Cousine Island: 32-11-07
My mobile phone: 511-808
My home phone on Mahe: 323-050

"1998"

DEPART HONOLULU 13 JAN. TUES. UNITED FL. 182 10 AM

DEPART SAN FRANCISCO 13 JAN. TUES. BRITISH AIRWAYS 630 PM
FL. 286

DEPART LONDON 14 JAN. Wed. Air Seychelles 440 PM
FL. HM7
TO MAHE, Republic of Seychelles

DEPART Seychelles 20 JAN. TUES. Air Seychelles 10 AM
FL. HM-8
(OVERNIGHT IN LONDON HOTEL)

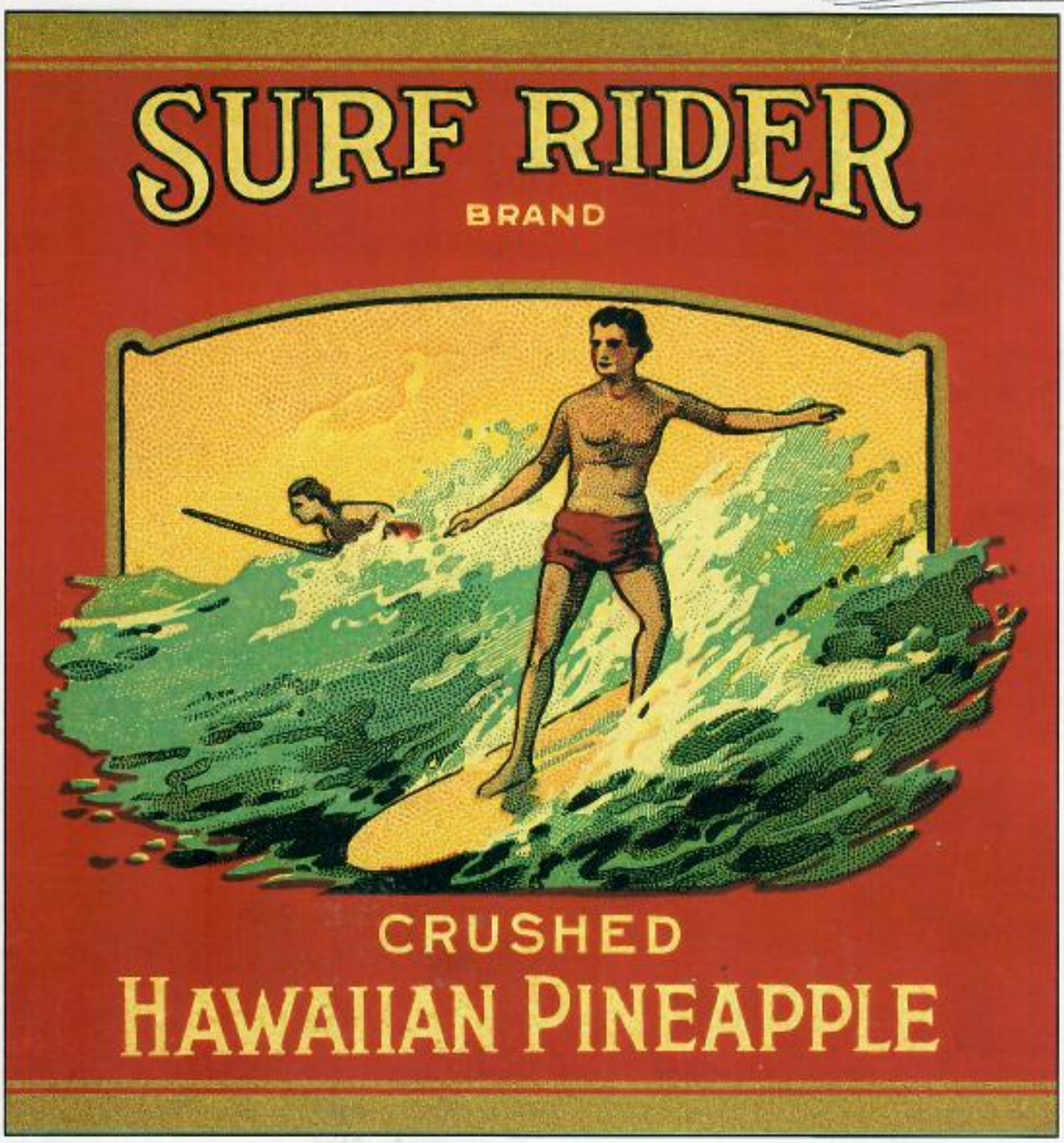
DEPART LONDON 21 JAN. Wed. BRITISH AIRWAYS 1255 PM
FL. 287

DEPART SAN FRANCISCO 21 JAN Wed. 650 PM UNITED
FL. 189
ARRIVE HONOLULU 1016 PM
WED. NIGHT, JAN. 21

AUGUST 1992

Hawaiian Airlines Magazine

GEORGIE: PAGE 15



Tracking Turtles • **Pineapple's Future** • Holy Ghost Church

Underwater USA Aug 92

Divers Join Sea Turtle Researchers on Day Trips

The staff of the Atlantis Reef Divers' has joined forces with the National Marine Fisheries Service to conduct extensive sea turtle research off the coast of world-famous Waikiki Beach in Honolulu, Hawaii.

Atlantis Reef Divers offers logistical support for the undertaking, which is being conducted by George Balazs, a zoologist and leader of the Marine Turtle Research Program. The turtles are listed by the United States as an endangered species, and the overall objective of the project is to promote the long-term conservation and recovery of sea turtles in the Waikiki region. To date, 19 turtles have been spotted and tagged by the researchers.

About once a week Balazs and his crew board one of Atlantis Reef Divers' charters. Aboard the *Explorer,* Atlantis' 60-foot dive vessel, the team studies various habitats used by the sea turtles. In addition, they are determining the approximate number of sea turtles in the area and studying the animals' daily activities such as foraging, nesting and grooming.

For those aboard the turtle-tagging charters, the diving tour also includes the experience of watching a scientific research team in action.

All those participating in Atlantis' certified-diver tours visit Atlantis Reef. This collection of underwater structures, found approximately one mile off Waikiki Beach, includes *YO-257,* a 174-foot World War II U.S. Navy tanker; two airliners and other fish-attracting manmade reefs. Divers also will find an abundance of brilliantly colored Hawaiian fish and, of course, friendly sea turtles are often seen throughout the adventure.

An additional feature of the reef is that it is visited by two 80-ton, battery-operated Atlantis submarines that operate out of Hilton Hawaiian Village. Many divers enjoy entertaining the 46 passengers aboard each of the 65-foot vessels that pass by the reef by emerging from the sunken tanker's smoke stack or waving from the cockpit of one of the submerged airplanes.

For more information on Atlantis Reef Divers, call toll-free: (800) 554-6267.

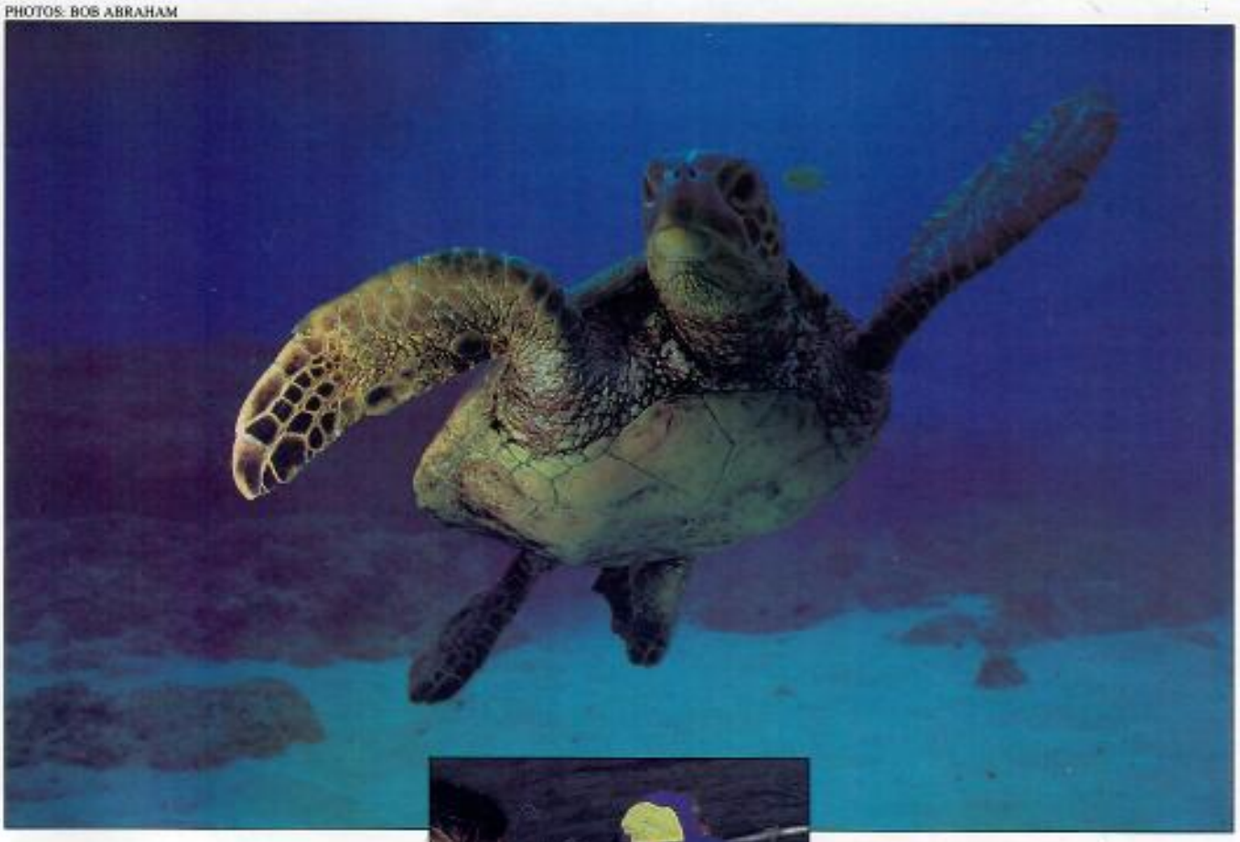
Atlantis Submarine/Christopher Abraham Photo

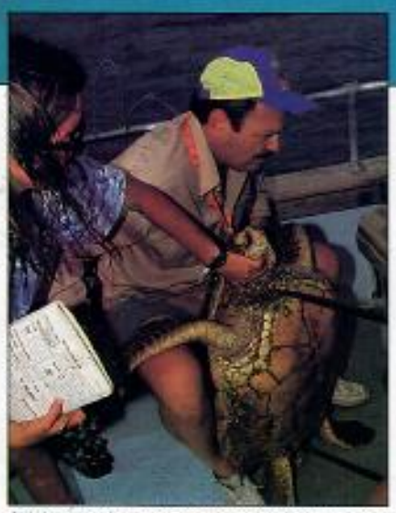
Researcher — George Balazs, zoologist and leader of the Marine Turtle Research Program, measures and tags a sea turtle.

Tracking the Turtle

by Noreen Parks

PHOTOS: BOB ABRAHAM





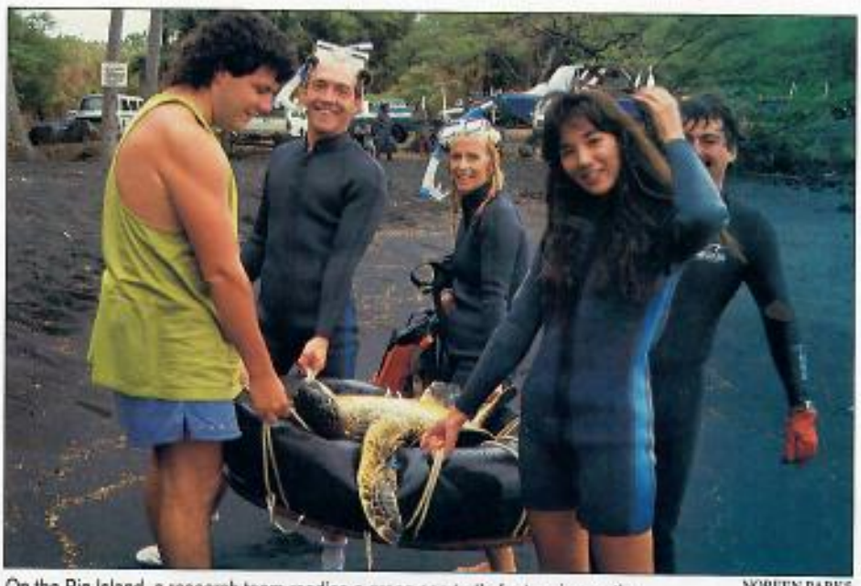
Off Waikiki, George Balazs and staff monitor a *honu* aboard Atlantis Reef Divers' *Explorer*.

The Punalu'u black sand beach lies embedded like a jewel in the forbidding lava cliffs of the Big Island's southeastern coast. Because rainfall is scarce here in the shadow of the ancient volcano Ninole, generations of Hawaiians valued this place for its secret source of fresh water. At the area's underwater springs, divers could fill their water gourds to quench the thirst of their villages. They named it "Punalu'u," or "diving spring."

Legend has it that a pair of supernatural turtles once came here from the far ocean and mated. The female laid a strange egg resembling a piece of native kauila wood that hatched into a turtle bearing a handsome shell. The young turtle possessed the magical ability to change into a girl, who would come to play with the village children and rescue them if they fell into the water. The people named the bubbling spring where the turtle lived "the rising water of Kauila" and they treasured the pure water it gave them.

Today a brigade of enthusiastic

students from the Marine Option Program at the University of Hawaii-Hilo, is returning a measure of kindness to the mythical turtle-girl. Under the direction of researcher George Balazs of the National Marine Fisheries Service, they're assisting in a recovery program for the *honu*, the green sea turtle. Along with the hawksbill and leatherback turtles, the *honu* is listed and protected under the federal Endangered Species Act.



On the Big Island, a research team readies a green sea turtle for tagging on the black sand beach at Punalu'u

NOREEN PARKS

To learn more about green turtle numbers, their diet and their movements in Hawaiian waters, Balazs routinely captures them to check their vital signs. Besides working with volunteer groups at a dozen or so sites around the state, Balazs and his staff often ride the Atlantis Reef Divers' charter boat to study and tag turtles off Waikiki, giving passengers the opportunity to watch the scientific team in action.

At Punalu'u on the Big Island this morning, everyone's been watching the water. After scanning the choppy seas for nearly an hour, they've spotted a reptilian head peering curiously above the water like a submarine gyroscope. Four swimmers wearing wetsuits and snorkels swim toward the turtle, towing a tractor-tire-sized inner tube. Despite its sluggishness on land, the turtle's hydrodynamic body and strong flippers make it a fleet swimmer, clocking up to 15 miles an hour over short distances. Weighing as much as 400 pounds, the *honu* can also wield a hefty flipper chop. After some minutes of thrashing, the team manages to flip their quarry onto his mottled olive-and-brown back astride the rubber water taxi and bring him ashore, cheered on by their cohorts and a gaggle of camera-clicking visitors.

Lying in the shade of the tarp-covered project headquarters, the *honu* wears a dour expression and attempts to prop himself up on his flippers, like an elderly bedridden patient confined against his will. His handlers place a towel gently around his head to calm him. Like many of the turtles captured here, this one sports a couple of small identification tags attached to his flippers during earlier tagging projects. The measurements and observations made today will be correlated with the turtle's past record. Recaptures like this help Balazs, who has been collecting census information for 18 years, to estimate turtle growth rates and population sizes.

Surrounded by onlookers, Balazs and two of the volunteers measure the turtle's carapace (the armor-like shell on his back side), the length of his flippers, and his softer, creamy yellow underside, or plastron. Weighing in at 67 pounds, this juvenile turtle's gender is undetectable. On average, green turtles don't sexually mature until they are around 25 years old. At that stage their carapaces are more than 34 inches long and the males' longer tails distinguish them from females.

The census data shows that green turtles stay in loose groups–like the Punalu'u herd of about 200–in rich feeding grounds to graze the *limu* seaweed from offshore rocks. "The turtles cling to the very edges of the islands," says Balazs. "The 'brim of the hat' is narrow here, with deep drop-offs close to shore, and they are obligated to feed on vegetation in very shallow waters." (This turtle species is called "green" not because of any external coloring, but rather from the hue of its body fat, caused by this vegetarian diet.) Able to stay submerged up to two-and-a-half hours, green turtles rest in underwater caves and ledges as deep as 70 feet.

For adults, however, it's not all surfing, swimming and gorging on *limu*, as the business of making turtle babies happens nearly 800 miles from the Big Island. "We have no idea why they don't nest here," Balazs says, "but turtle logic tells them to go to French Frigate Shoals," an uninhabited group of islets in the remote Northwest Hawaiian Islands.

Green turtles have swum the world's oceans for well over 200 million years, and some scientists believe them to be the only living descendants of a long-extinct group of para-reptiles. Arriving in the Hawaiian Islands probably 15 million years ago, they once bred on Kauai and Oahu, and until the early 1900s on Lanai. But human hunting and habitat disturbance wiped out those nesting areas. Today, following an ancient instinct to return to their natal beaches, they migrate to French Frigate Shoals. In the offshore waters, from May to September, males pursue females with legendary sexual ardor. Able to lay several clutches of eggs after a single copulation, the females go ashore to dig nests in the sand and deposit about a hundred golf-ball-sized eggs. Before turtle hunting began on a mass scale in the 1800s, there were probably close to 10,000 breeding turtles in the Northwest Hawaiian Islands. Today, roughly

a thousand females nest there, though not every year, for they need two or three years to recover from the breeding ordeal.

After two months the eggs hatch, and at some unknown signal, all the hatchlings begin to scrape furiously at the nest's ceiling and compact the sand beneath their tiny flippers to build up the nest floor, so they can break out. (At Kaneohe Bay on Oahu, Balazs once inserted a glass wall into a nest and used a video camera and microphone to record these details.) The mass exodus, usually timed for darkness, maximizes their chances of escape from beach predators like crabs and herons. Once in the water, the *keiki* turtles who survive the appetites of fishes and octopuses head resolutely to the deep blue sea. Their next life-stage remains a mystery, for small turtles are almost never seen. "We think the hatchlings stay out there up to three years and feed on high-protein foods like jellyfish and fish eggs," Balazs explains. "The ocean currents probably carry them back to land, and then they switch their diet to algae and sea grasses."

Balazs has finished scraping the green, flakey remains of the turtle's lunch off the bony plates in his mouth (the turtle version of teeth) and noted a possible fishing-line scar. Hundreds of Hawaiian sea turtles are accidentally snagged every year by high seas drift nets, long-line nets and shrimp trawls. Discarded fishing gear also traps both adults and hatchlings, and turtles sometimes eat plastic debris that can block their digestion and poison them. And, despite steep fines and jail sentences for convicted poachers, sea turtles are still killed illegally for their shells and meat, or just for sport.

Fortunately, this *honu* and most of his fellow turtles at Punalu'u are free of one of the green turtle's biggest scourges–a kind of "Elephant Man" disease that causes tumors large enough to blind and, sometimes, drown them. Among the suspected causes are parasites, viruses and pollutants, but so far the exact culprit remains unknown.

Despite this serious tumor problem, Balazs sees the Hawaiian green turtle's future as "very bright" and he credits public awareness with playing a significant role. "One of the dreams we have for Punalu'u is to get funds for an interpretive center, to educate people about the turtles," he says.

His ten-minute examination complete, the *honu* is released from his makeshift hospital bed. He waddles tentatively across the black sand, pausing long enough for the photos snapped by his new fans, then breaks into a reptilian gallop. There's no hesitation at the water's edge as the *honu*, a symbol of the ancient world, merges back into the timeless sea. ❑

For information on Atlantis Reef Divers' Waikiki research sails, call 522-5801. On the Big Island, July visitors to the Mauna Lani Bay Hotel and Bungalows can participate in the annual Turtle Independence Day. In this joint project with Sea Life Park, the hotel releases young *honu* which have been raised in the area's saltwater ponds. Call 885-6622.

ATOLL RESEARCH BULLETIN
NO. 184

MARINE TURTLES IN THE PHOENIX ISLANDS

by George H. Balazs

Issued by
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For the Protection of Hawaii's Native Wildlife

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SEA TURTLE CONSERVATION

By George H. Balazs**

Recent information relating to the conservation of sea turtles can be divided into three topics. These are (1) the November 1974 task force meeting held by the International Union for Conservation of Nature (IUCN); (2) the efforts to have the Federal government extend protection to the green (Chelonia), loggerhead (Caretta), and Pacific ridley (Lepidochelys olivacea) sea turtles under provision of the U.S. Endangered Species Act of 1973; and (3) my own personal attempts to slow the commerce in sea turtle products by directing correspondence to specific businesses and individuals. Each of these topics will be separately discussed.

1. IUCN Task Force Meeting: During November 22-24, 1974, a meeting of a specially constituted task force was convened in Miami, Florida, by the International Union for Conservation of Nature (Switzerland). In recent years the Survival Service Commission (SSC) of the IUCN has become increasingly concerned over the rapidly expanding trade in sea turtles and their products. Therefore, the purpose of the task force meeting was to review the commercial exploitation of sea turtles, and to give special attention to the state and implications of turtle culture. Invited members in attendance included Professors Archie Carr* and Tom Harrison*, Co-Chairmen of the SSC Marine Turtle Specialist Group; Dr. D. Ehrenfeld, USA; Dr. G. Hughes*, South Africa; Mr. G. Balazs*, USA; Dr. H. Hirth*, USA; Dr. N. Mrosovsky, Canada; Dr. P. Pritchard*, USA; Dr. L. Brongersma*, Netherlands; Mr. G. deSilva*, Malaysia; Dr. W. King*, USA; and Mr. A. Mence*, IUCN/SSC Executive Officer. Following the meeting in Miami, a number of the members (*) proceeded to Grand Cayman Island in the British West Indies to meet with the Directors and staff of Mariculture, Ltd. Mariculture, Ltd. is a commercial operation that has been engaged in the culture of green turtles and the marketing of products on a world-wide basis. The formal results of these meetings took the form of a statement of 'Principles and Recommendations'. During April 1975 these 'Principles and Recommendations' were issued by the IUCN as official conservation guidelines for sea turtles.

IUCN PRINCIPLES AND RECOMMENDATIONS (Reprinted from the IUCN BULLETIN, April 1975)

1. Because the majority of the distinct populations of Chelonia (green turtles) are extinct, threatened or rapidly declining, the entire group should be considered endangered.

2. The reasons for the extinction and decline of populations include particularly exploitation for meat, hides, eggs and other products (including souvenirs), massive killing of turtles in the trawl nets of fishing fleets as well as increasing habitat destruction and disturbance.

3. The situation has become even more critical with the expansion of international commercial trade in sea turtles and their products.

4. As regards trawling, urgent attention should be given to encourage the use of nets designed to minimize undesirable catches of turtles, and research into this question should be given funding priority.

5. As regards souvenirs, the taking and preparing of turtles and turtle products for the primary purpose of souvenirs should be strongly discouraged.

6. As regards primary exploitation (meat, hides, eggs), where it can be demonstrated

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**Hawaii Institute of Marine Biology, P.O. Box 1346, Kaneohe, Hawaii 96744

Baby sea turtles imported to boost local population

By PEGGY HODGE
WINDWARD

Something new has been added to the turquoise waters surrounding Oahu: Baby year-old green sea turtles released last month to help boost the population and breeding.

George H. Balazs, fishery biologist, and William Gilmartin, wildlife biologist with the National Marine Fisheries Service, set the 165 squirming yearlings into Waimanalo and Hanauma bays along the North Shore and in Makaha waters.

The baby turtles weigh an average of 8 pounds and measure 8-10 inches in shell diameter. They were hatched in their native breeding grounds at French frigate Shoals, 500 miles from here, a unit of the Hawaiian Islands National Wildlife Refuge.

Balazs spent the last 10 years immersed in the study of these gentle creatures, spending months at the lonely islands of Hawaii's Leeward islands.

Already one has probably been sighted — at Lanikai recently, by Mr. and Mrs. William Nolan — near shore and resting in shallow waters. It's unusual to see green sea turtles there today, especially young ones, and this one was settling in nicely for several days.

About 20 years ago green sea turtles were common in Lanikai bay and we'd see folks bring in boatloads at a time, turn them over on their backs and let them die. Today they are protected by strict laws.

In the 1930s green sea turtles would be silhouetted in the breaking waves as surfers rode along with them, a thrilling sight.

During the last few years, only one adult was seen close to shore in Lanikai, lifting its head curiously as swimmers watched.

Turtles have to breathe air and surface often when active, but can stay under for hours when resting or sleeping. They tuck their flippers back over their shells in neat fashion.

Those released baby turtles were brought as day old hatchlings to Sea Life Park, where small pieces of white tissue were surgically grafted on their dark black shells, a project in identification. After a year's tending, they were released at sea.

Balazs and Gilmartin tagged the turtles with metal markers on their front flippers. If anyone sees one, Balazs would like to be notified at his office, National Martine Fisheries Service (under U.S. Dept. of Commerce), phone 946-2181.

Look, folks, and gently handle, but no touching — or taking! Today the sale of any product from any species of sea turtle is prohibited in the U.S., including farm-raised products. Civil violation is six months in jail and a $10,000 fine; criminal penalty, a year imprisionment and $20,000 fine.

Turtle info is fascinating. These little turtles will take from 10 to 60 years to grow to adulthood. They mature when their shells are about a yard long and body weight is 200 pounds.

A green sea turtle is tagged while nesting at French Frigate Shoals.

Balazs hopes these released young turtles will eventually become part of the breeding colony as mature adults. In Florida, where a "headstart" project such as Hawaii's was conducted, the results were good, he said.

Sadly enough, though, in this century no major population of any species of sea turtle has increased, either in the wild or as a result of conservation.

The green sea turtle is actually a mottled light to dark brown streaked with olive and is called green because of the color of its fat.

Because the green sea turtle has the best meat and its oil is used in cosmetics, it was almost fished out of existence. The young hatchlings may be wiped out by ants, crabs, lizards, birds and dogs on the beach. And fish and birds may devour them later at sea.

Unlike other turtles, sea turtles cannot retract their heads into their shells, making them even more vulnerable.

Green sea turtles are great migrants and famous navigators. Some of their nesting journeys, made every 2-4 years, are more than 1,000 miles.

The stalwart males are often indiscriminate in their efforts to mate, scientists relate. During breeding season they will attempt to mount crude wooden decoys, other males, skin divers and even small rowboats.

When a lady green wants to say "no," she will bite pursuing males, assume a vertical "refusal" position or leave the water. Wahines note — there is also a "female reserve," an underwater refuge where females can go to escape the advances of sexually aroused males they do not desire. No one knows how this female reserve is established or why, but the stalwart males honor it.

GREEN SEA TURTLES RELEASED AT TURTLE BEACH, MAKAHA

by Sharon Hendrix

During September, 1981, the National Marine Fisheries Service Honolulu Laboraratory released a total of 165 green sea turtles (chelonia mydas) at various coastal sites on Oahu, Kauai, Maui, Hawaii and French Frigate Shoals. On Sept. 24, 15 of the green sea turtles were released at Turtle Beach on our Waianae coast. The released turtles were one year old, weighed about 8 lbs. and were involved in the "headstart" project. The project involved obtaining turtle hatchings at French Frigate Shoals (where green sea turtles go to breed) and transporting these turtles back to Sea Life Park for one year of rearing. The turtles were experimentally marked by surgically grafting small pieces of white tissue into the hatchling's black shells.

Jeanine Ortogero and her daughter Makani carry one of the young turtles to its new ocean home.

The "headstart" project offers potential for aiding the recovery of depleted turtle populations. According to Marty "Smitty" Smith and Wil Pickett and the Cabanas, green sea turtles were often seen at Turtle Beach, however, through man's over-exploitation and habitat encroachment, the green sea turtle population has declined here and throughout the islands.

The green sea turtle is currently protected under the U.S. Endangered Species Act and the wildlife regulations of the State of Hawaii. It is hoped that the turtles released in the "headstart" project will become part of the breeding colony when they mature into adults. Green sea turtles can take as long as 10-60 years to grow into adulthood, and are usually 36 inches in shell length, about 200 lbs. in weight and feed mostly on limu.

Scientists have much to learn about the green sea turtle and hope that the "headstart" project will demonstrate that restocking is a valuable conservation practice ("headstart" projects are currently in practice in several areas of the world). All of the young turtles that have been released are individually indentified with a small numbered metal tag attached to a front flipper. Information from the public on the sightings of these tagged turtles will be appreciated.

FOR FURTHER INFORMATION, TELEPHONE WILLIAM GILMARTIN OR GEORGE BALAZS AT NATIONAL MARINE FISHERIES SERVICE 946-2181.

November 1981 Volume 7 Number 11

Country Livin'

The Leeward Cable & Communities Publication

Established in 1976

Country Livin' is published monthly and is the only regular newspaper or magazine published exclusively for the Leeward Communities. Issues are mailed to Makaha, Waianae, Maili Nanakuli, and selected homes is Honokai hale, Makakilo and Ewa Beach. Country Livin' features articles of specific and general interest to residents living in these areas as well as complete listings of daily cable programs and Pay TV entertainment provided by Cablevision, Inc. and Home Box Office.

COVER PHOTO: A scene from "The Glass Menagerie" featuring WHS Drama Club members Jerry Michaelson, Monique Tremblor and Anna Ibanez (background). Photo by Richard Tanaka.

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ARTICLES

FEATURES

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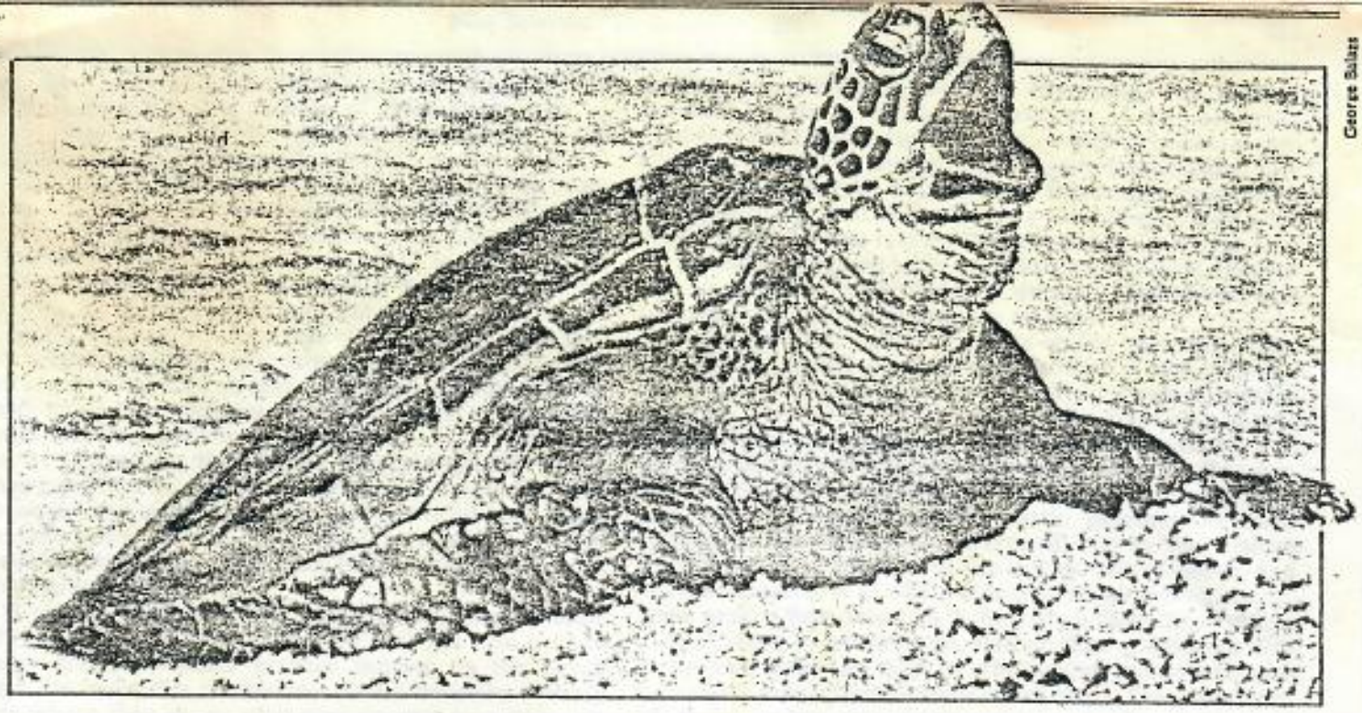


George Solars

The song of the turtle

Sea turtles have been around for 200 million years. Now, these antediluvian animals are threatened by foolish exploitation, but before they can be helped they must be understood

Dr Jeremy Cherfas reports from Washington DC

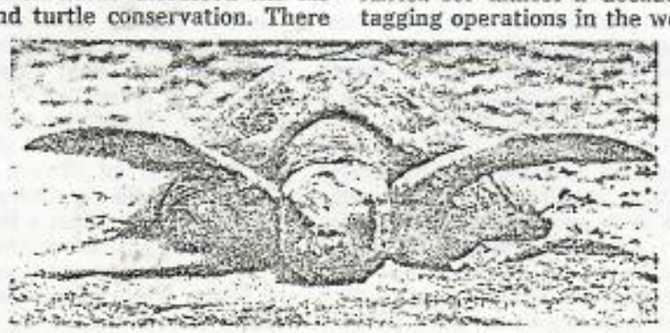
Sea turtles are easy meat. The female hauls out of the water and up the beach to lay her clutch of eggs, abandons them and heads back to the sea. She is vulnerable while she waits in the water offshore to emerge, and even more so when she comes up on land. The eggs, though she does her best to hide the nest site, are easy to find. As a result the turtle and her eggs have long been a valuable source of food in many countries with tropical coastline. Other, larger-scale, activities, however, have put increasing pressure on the world's sea turtle to the extent that six of the seven species are officially endangered (the exception is the small flat-back turtle *Chelonia depressa*).

The plight of the turtles has now been taken up both by the international conservation community and by the enterprises that kill turtles (even accidentally—the US Fisheries and Wildlife Service is keen to end incidental catches of turtles in the nets of shrimp trawlers). The result was the recent five day World Conference on Sea Turtle Conservation in Washington DC. More than 300 representatives from over 40 countries discussed the ins and outs of turtle biology and turtle conservation. There were plentiful arguments on some aspects of conservation (see p 852) but the overwhelming conclusion of the meeting was that we really know very little about the biology of the sea turtles. This profound ignorance hampers rational discussion of the options, and must be rectified; some of the scientists presented the conference with results that point the way to the kind of study that will have to be done, and done quickly, if sea turtles are not to join the list of species exploited to the very edge of extinction.

A thorough understanding of an animal's life cycle is perhaps the most important prerequisite for any attempt at conservation. How fast does it grow? When is it sexually mature? How often does it reproduce? Do many of the young survive? When do they die? Answers to all these questions are vital. The common wisdom—based as much on preconceptions as on the results of tagging programmes—is that the turtle suffers high mortality when young, and that perhaps only one in a hundred hatchlings survives to maturity (about 60 per cent of the eggs in a clutch make it to become hatchlings). Once the turtles reach maturity, at about five years, they come to the beach and lay perhaps three or four clutches of about 100 eggs each in a season. The adults live for quite a long time and return to nest again every three years.

Not one of these assumptions went unchallenged.

George Hughes is a chief conservator with the Natal Parks Board and has worked with the sea turtles of South Africa for almost a decade, supervising one of the best tagging operations in the world. He is particularly worried about the assumption that turtles return to nest more than once. Tagging programmes have been running for 20 or 30 years, and they have provided evidence that some females do indeed return to the nesting beach in accordance with a more or less fixed cycle. At Tortuguero beach in Costa Rica, for example, Archie Carr's group has been tagging green turtles (*Chelonia*



David Hughes/Bruce Coleman

Top, a Hawaiian green turtle basks on the beach. An olive ridley, above, comes ashore to lay, keeping flippers off the hot sand

ydas) for over 20 years. By far the greatest proportion, 49 per cent, return after an absence of three years, with 21 per cent after two and 18 per cent after four years. Carr's tag returns make a good case for cyclical nesting.

What most people do not consider is that in the 21 years of its operation, the Tortuguero operation has tagged something like 12 000 females. The number that have returned in subsequent years is 1412, less than 12 per cent of the total. The figures for cycling are thus based on a rather small portion of the population. The tagging programme in Surinam has a high return rate of 24 per cent, but other green turtle tagging programmes have return rates that are close to 1 per cent, and other species, including Hughes's leatherbacks *(Dermochelys coriacea)* and loggerheads *(Caretta caretta)*, don't do much better.

The myth may be that turtles nest repeatedly, but as Hughes says, "turtles that are tagged and depart the nesting beaches as a single time nester never to be seen again far exceed those that return . . . in future years". Hughes seriously questions the myth, and thinks that most female sea turtles nest once only.

It is easy to measure turtle hatchlings as they scrabble frantically down the sand to the sea, and it's also easy to measure mature females as they lumber up the beach to nest. Between, the turtles are almost invisible. Nobody is sure where they go, or what they do, and herpetologists talk ruefully of the "lost years". Nobody knows, for example, how fast turtles grow or when they become sexually mature. George Balazs lives and works in Hawaii, and he has been tagging and measuring immature green turtles to try and get some answers to these questions.

The green turtles of Hawaii are unique for two reasons. One is that they occasionally crawl up on the beach to bask in the sunshine. They do this only on the remote beaches of uninhabited islands, and Balazs thinks that his basking turtles may be the last remnant able to carry on this tradition unmolested. The Hawaiian turtles are also unique because they provide possibly the best data on growth.

Fast growing off the big island

To date Balazs has tagged 629 immature turtles, and has managed to recapture 70 of these. Roughly half of these had grown measurably, but the rates of growth varied widely. The turtles grew most rapidly around the Kau district of the big island of Hawaii, where they averaged 0·38 to 0·52 cm per month. Contrast this with the turtles that lived around French Frigate Shoals; these grew between 0·02 and 0·13 cm per month.

The smallest turtle to nest in Hawaii measured 81 cm, and the average is 92 cm. Balazs's data suggest that it would take a 35 cm yearling 10·8 years to grow to 92 cm if it lives off Kau, a period that agrees with estimates of between 4 and 11 years based on rates of growth in captive animals. If, however, the turtle lives off French Frigate Shoals, it will take 59·4 years to reach average nesting size!

The fast-growing turtles off Kau have at their disposal large pastures of the alga *Pterocladia capillacea*, whereas those around French Frigate Shoals feed on other algae that are ignored by the turtles at Kau. Balazs thinks that the slow-growing turtles are eating second-rate food, and that these unpreferred foods may well be partially toxic. This would account for their slow growth, but it doesn't tell us much about other turtles, feeding on other plants in other localities. The possibility that a turtle may take more than 50 years to reach maturity means that the populations might be disastrously slow to respond to any help now.

One component of growth is the efficiency with which an animal converts food eaten into its own flesh and blood. Karen Bjorndal, a member of Archie Carr's group at the University of Florida, has done a beautiful study of the nutrition of the Caribbean green turtles that migrate between the nesting beach at Tortuguero in Costa Rica and feeding grounds off the coast of Nicaragua. The feeding grounds are large abundant pastures of the sea-grass *Thalassia testudinum* (turtle grass), which provides a constant source of food throughout the year. Surprisingly, few other herbivores take advantage of this ready supply, and less than 10 per cent of the leaves produced are eaten. One reason might be that turtle grass leaves contain 45 per cent (dry weight) cellulose, which animals cannot digest. Despite this, green turtles very evidently do use *T. testudinum* and Bjorndal has shown how they are able to do so.

The turtle has two prongs to its attack on turtle grass. The first is physiological. Animals cannot digest cellulose but microorganisms can. The guts of grass-eaters contain bacteria that break the cellulose down into components that the animals can utilise. The turtle is no exception; in its hind gut is a flourishing colony of microbes that ferment the cellulose into volatile fatty acids (acetate, butyrate and propionate) and the turtle appropriates these fatty acids for its own use. Fermentation in the caecum alone supplies 15 per cent of the turtles' energy needs, and overall the turtle is as efficient as the cow at getting energy from grass *(New Scientist*, 2 August, p 366). The turtles' second prong is behavioural. Rather than wandering aimlessly and eating as they go, the turtles consistently and repeatedly crop specific stands of sea-grass. The boundaries of these underwater pastures are clearly visible and although Bjorndal is not sure how the turtles establish these cropping areas, she is sure of the benefits they derive. Sea-grass that is being cropped will produce new leaves, and these young blades are much better for the turtle. They are more digestible, because they do not contain as much lignin as older leaves, and they are also more nutritious because they have 6 to 11 per cent more protein than the leaves in ungrazed stands of *T. testudinum*.

Even though the Nicaraguan green turtles have a plentiful supply of food, and can make the most of that supply by virtue of their physiological and behavioural adaptations, they are still limited by the overall low quality of their diet. One reason is that the large amounts of cellulose mean that the food takes longer to be fully digested. This long period for digestion restricts the amount that the turtle can eat each day without pushing the food through too fast to extract the energy from it. The result is that turtles can eat very little—somewhere between 0·24 and 0·33 per cent of their body weight—each day. Compare this with a terrestrial grazer, which might eat up to 8·3 per cent of its body weight in a single day. Another factor that limits the turtles' ability to use their food is that they are not very good at digesting protein. The average terrestrial herbivore digests 75 to 80 per cent of the protein it eats, but the turtles can manage only 50 per cent at most, and because the fermentation microbes are in the hindgut, the turtle has no opportunity to digest and use the bacteria.

So although the turtle is doing as well as it can on a constant, low quality diet, it is still limited by lack of nutrients. This makes for slow growth, delayed sexual maturity, and a low investment in reproduction. This last factor is both chilling and fascinating. Bjorndal made a series of calculations to compare her Nicaraguan turtles with others that nest in Surinam and feed on algae off the coast of Brazil. It turned out that the Nicaraguan turtles invest only 7·5 per cent of their annual energy budget in reproduction (only 3 per cent goes into the eggs themselves). Surinam turtles, with a migration over four times longer, are nevertheless able to channel 23·7 per cent of their energy intake into reproduction.

The alga on which the Surinam turtles feed is obviously a vastly superior source of nutrients than the turtle grass that the Nicaraguan turtles must make do with. And because the Nicaraguan turtles can spare so little for reproduction, they will be slow to respond to a decline in their numbers, even if fully protected from exploitation.

Food, and its limitations, are probably a prime factor in the delayed growth of some populations of turtles, as Balazs and Bjorndal emphasised. And if Hughes's disturbing thoughts on the frequency of nesting are correct, the turtles are indeed in grave danger. They simply will not be able to multiply quickly enough to ensure their survival unless all exploitation is immediately stopped. Of course, if eggs and hatchlings are suffering very high mortality, then one way to save the sea turtles would be to protect the eggs and hatchlings that would ordinarily die. This has been done at many turtle beaches around the world, and vast numbers of hatchlings have been released to the sea. Most of these have come from eggs taken out of nests and incubated in artificial plastic nest boxes.

Eggs from dead turtles

Sometimes the eggs are in "doomed" nests. These are nests built below the high tide mark; they would be flooded and the eggs drowned if not removed. Other eggs come from perfectly ordinary nests, dug up for profit by locals and bought back by conservation programmes, as at Trengganu in Malaysia. Or eggs may be taken from dead turtles, killed in their thousands before they have even had a chance to lay, as they are on the Pacific coast of Mexico (see *New Scientist*, vol 78, p 514). Wherever the eggs come from, it is a fond belief of those rearing them that they are adding to the stock of wild sea turtles when they release these saved hatchlings to the sea. This complacent belief was shattered by Nicholas Mrosovsky, of the University of Toronto. He told the conference of his work with C. L. Yntema, of the Department of Anatomy at the Upstate Medical Center in Syracuse, New York.

Most participants already had some idea of the results because Mrosovsky had given a foretaste of them in the extremely valuable *Marine Turtle Newsletter* that he edits. But the full shock had not, I think, penetrated to all. At worst, Mrosovsky and Yntema are saying that artificial incubation of eggs is a complete waste of time and resources; the reason is sex.

A turtle's sex is not obvious. There are ways to tell adults apart, but it is almost impossible to sex a hatchling. Not even chromosomes can help, for those of a female look the same as those of a male. It is, however, possible to sex a hatchling if you are prepared to cut it open and examine it histologically. The microscopic appearance of the gonads is very different in the two sexes, and when you have stained and sectioned the gonads and looked at them under a microscope it is not hard to tell them apart.

Back in 1976, Yntema had published a paper on the effects of incubation temperature on the sex of hatchling snapping turtles *(Chelydra serpentina)*. He found that the proportion of females in a clutch depended on the temperature at which the eggs were incubated. At 30°C, all the hatchlings were female. At 26°C, they were all male. And at cooler temperatures still, 20°C, the clutch once again gave rise to 100 per cent females. This is interesting, but why should it worry sea turtle conservationists?

Mrosovsky knew that the time it takes for a turtle egg to hatch depends on temperature—cool eggs take longer to develop. The average incubation time, for an egg at 30°C, is about 54 days, and a difference of 1°C alters the incubation time by about five days. He also knew that eggs incubated in plastic boxes often took longer to hatch than eggs left in nests. The delay varies, but in Surinam, for example, it is between 3 and 11 days, for green turtles. This implies that the artificial nests are between 0·6 and 2·2 degrees cooler than eggs in the sand. If the relationship between sex and temperature were as steep in the green turtle as it is in the snapping turtle, a drop of 2 degrees could produce an entirely male clutch. All those hatchlings, saved and returned to the sea, might well be males—good for the present but not for the future.

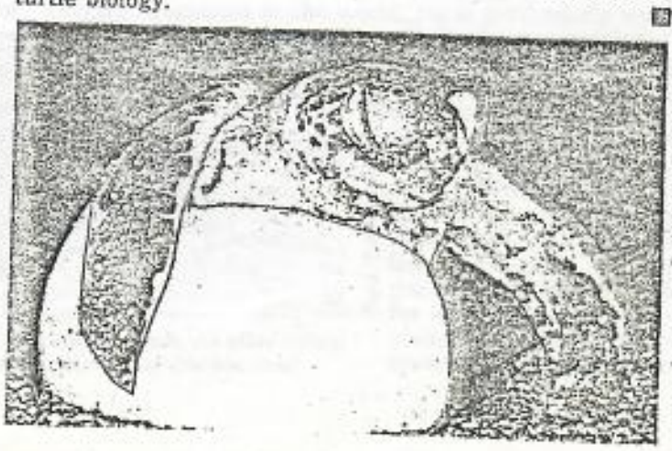
An experimental approach was clearly called for. Mrosovsky and Yntema obtained a clutch of 118 loggerhead eggs from a female laying on Little Cumberland Island, off the coast of Georgia in the US. Aliquots were incubated at different temperatures and the hatchlings sexed. As expected, temperature did affect sex. At 32° and 34°C, all hatchlings were female. At 26° and 28°C, they were all male. And at 30°C, 64 per cent were females.

Admittedly these results are based on one clutch from one species, but they are still worrisome. As Mrosovsky pointed out, before we continue or expand artificial hatching programmes we should answer several questions. What is the natural sex ratio in hatchlings? If we knew, he says, we could at least duplicate it by setting up the required proportion of artificial nests in warm and cool areas. We don't know the relationship between sex and temperature for different populations. For theoretical reasons it is clear that the pivotal temperature, which results in roughly equal numbers of males and females, will be close to the temperature at which the eggs normally find themselves, and there will be intense evolutionary pressure at different temperatures. In the turtle islands of Sarawak green turtles nest year round. Eggs laid in the summer hatch after 54 days. Those laid in February, during monsoon, can take 71 days to hatch. Does one get females in summer and males in the monsoon, or are the females that lay in summer genetically different from those that lay in the monsoon, so that each produces a balance between males and females?

We simply don't know the answers to these questions, and until we do, Mrosovsky cautions, we would do well to be conservative in our efforts at conservation. Arguing that the female knows best, Mrosovsky thinks that we should perhaps focus our efforts on protecting naturally dug nests, rather than struggling to hatch eggs artificially with essentially unknown consequences.

That turtles are in trouble in undeniable. Historical records tell of huge aggregations of the animals, and in the 16th century sailors lost in Caribbean fog could navigate to an island by following the noise of migrating hordes of turtles. A film made as recently as 1947 showed 40 000 Kemp's ridleys *(Lepidochelys kempi)* coming ashore in a single night. In 1979 there are probably less than 2000. The same general pattern holds for almost every other population of sea turtle and the reason, everywhere, is the same—overexploitation.

Turtles will always be easy meat, but they might never again be plentiful. Local people could continue to hunt turtles for personal use, but sustained large-scale commercial operations are now, and may always be, impossible. Sustained commercial use is certainly out of the question until we have the facts on which to base sensible management, but unless exploitation ceases the scientists may never have enough animals to discover the truth about turtle biology. ■



David Hughes/Bruce Coleman

1979

WAIKIKI AQUARIUM

Natural History Lecture Series

THE PALAU ISLANDS AND THE CHAMBERED NAUTILUS - FEBRUARY 13,
Speakers: Gordon Damon and Jacki Kilbride

Gordon and Jacki are highly experienced and well-traveled scuba divers. Together they operate "Deep Dimensions," an underwater photography and tour escort business. They recently accompanied and photographed an Aquarium Nautilus expedition to Palau.

HAWAIIAN MONK SEALS - FEBRUARY 27,
Speakers: Brian and Patti Johnson

Brian and Patti are graduate students at the University of Hawaii studying the behavior of Hawaii's endangered monk seals. They have spent many months living in the Northwestern Hawaiian Islands among these fascinating marine mammals.

PADDLING MY OWN CANOE - MARCH 13,
Speaker: Audrey Sutherland

Audrey, author of Paddling My Own Canoe, is an accomplished outdoorswoman. She will discuss how the natural and archeological history of the islands can be explored in normally inaccessible places with a minimal environmental impact.

HUMPBACK WHALES IN THE HAWAIIAN BREEDING WATERS - MARCH 27,
Speaker: Dr. Lou Herman

Dr. Herman is a professor of psychology at the University of Hawaii and a researcher in the field of cetacean behavior. He has made extensive field studies of the humpback whales' annual visit to Hawaiian waters.

THE NORTHWESTERN HAWAIIAN ISLANDS - APRIL 10,
Speaker: George Balazs

George is well-known in Hawaii for his work on the ecology and conservation of marine turtles. He has visited the Northwestern Hawaiian Islands many times observing and photographing the animals living there. His photographs appear on this year's Dillingham Tide Calendar.

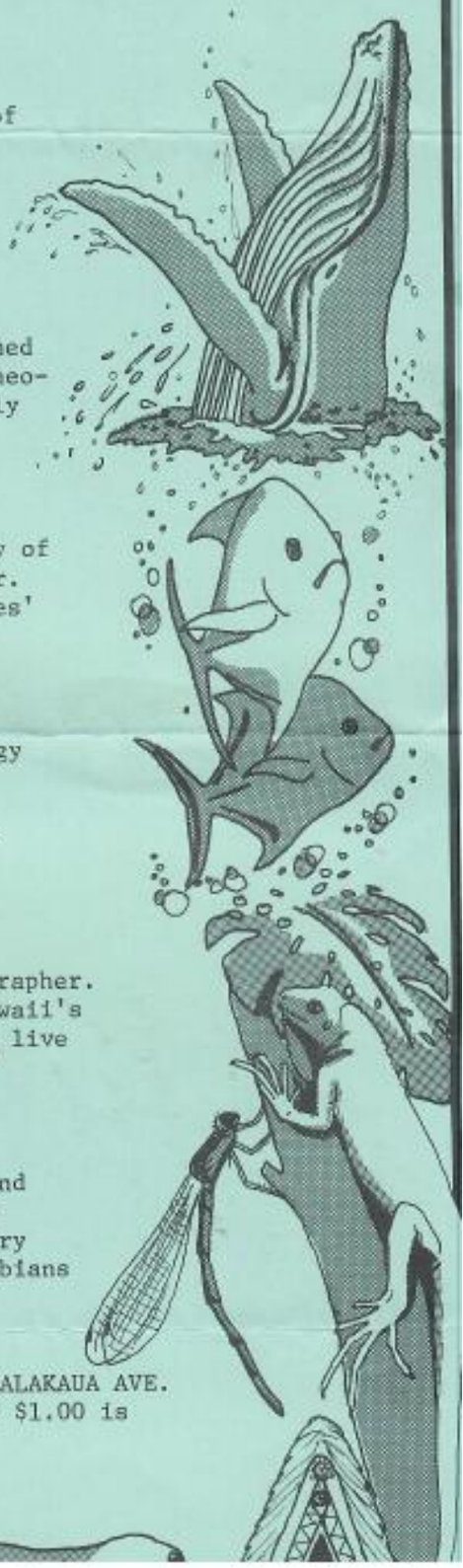
HAWAII'S NATIVE LAND INVERTEBRATES - APRIL 24,
Speaker: William P. Mull

Mr. Mull is an accomplished naturalist and nature photographer. His lecture will include the evolution and ecology of Hawaii's native land snails, spiders and insects illustrated with live color photos.

REPTILES AND AMPHIBIANS OF THE HAWAIIAN ISLANDS - MAY 8,
Speaker: Sean McKeown

Sean is Supervising Herpetologist at the Honolulu Zoo, and author of Hawaiian Reptiles and Amphibians which will be available March 1979. He will discuss the natural history of terrestrial, freshwater and marine reptiles and amphibians of Hawaii and his photographic techniques.

LECTURES WILL BE HELD AT 7:30 p.m., WAIKIKI AQUARIUM, 2777 KALAKAUA AVE. FOR INFORMATION CALL 923-4725. PUBLIC INVITED - DONATION OF $1.00 is SUGGESTED.



RESUME

George H. Balazs
P.O. Box 8195
Honolulu, Hawaii 96815

Married 5' 11" 165 pounds 28 years old

education

University of Hawaii
. Master of Science degree, June 1969.
Majored in Animal Nutrition. Course work included strong background in biological sciences. Thesis title: "The Composition, Digestibility, and Energy Evaluation of Food Waste Products for Swine in Hawaii". Program emphasized independent research, statistical analysis and interpretation, and technical writing.

Bachelor of Science degree, June 1967.
Majored in Agricultural Science with emphasis on Animal Science. Course work consisted of basic agriculture courses (Agronomy, Soil science, Farm Management, Horticulture, etc.) in addition to biological sciences.

experience

Research Assistant - University of Hawaii
. Master of Science Research Assistantship allowed me to obtain over 2 years of quality professional experience. Duties consisted, in part, of laboratory chemical analysis, instrumentation research, data collection and interpretation, animal research planning and implementation, development of feeding, breeding and management procedures, carcass evaluation, library research, statistical analysis, and report writing.

Nonprofessional experience consisted of various part time and full time jobs to finance college education. These included the following: small boat repair, grounds maintenance man, librarian, and laboratory assistant. Since graduation I have taken temporary employment while seeking employment commensurate with my education.

publications

. Hawaii Agricultural Experiment Station Technical Bulletin No. 84 March, 1971.
"The Composition, Digestibility, and Energy Evaluation of Food Waste Products for Swine in Hawaii".

personal background

. Raised in Yucca Valley, California. Attended public schools and graduated in upper 10% of high school class. Active in Boy Scouts of America and DeMolay. Married in 1963 and have lived in Hawaii since January 1965. Wife worked full time during college years to supplement family income.

interests

. Human nutrition, sailing, skin and scuba diving, and dogs.

references

. Dr. Coy Brooks
Dr. William Hugh
Dr. Ernest Ross

University of Hawaii
Animal Science Department
Honolulu, Hawaii 96822
Phone: 944-8356

A Project Proposal For Research To Be Conducted
Within The Hawaiian Islands National Wildlife Refuge

SUBMITTED TO

The United States Department of Interior, Bureau of Sport Fisheries and Wildlife

TITLE

A Preliminary Investigation of the Marine Turtle Nesting Population at East Island, French Frigate Shoals

PRINCIPAL INVESTIGATOR

George H. Balazs

INSTITUTION

Hawaii Institute of Marine Biology, University of Hawaii, P. O. Box 1346; Kaneohe, Hawaii 96744

DURATION

6 weeks (May 31 to July 12, 1973 or as agreeable to the Bureau of Sport Fisheries and Wildlife)

MOTIVATION

The continuing decline in marine turtle populations throughout the world has made it imperative that research be carried out which will ultimately assist in formulating long range programs for the protection and perpetuation of these salt water reptiles. The tagging and measuring of females on the nesting beaches has thus far provided the most valuable contributions to man's knowledge of marine turtle biology. In addition, such projects have formed the basis for the censusing of individual colonies. The importance of population ecology

Biologists Look Forward to

By Harry Whitten
Star-Bulletin Writer

Bob and Susan Schulmeister left "crowded" Kauai yesterday to return to Tern Island, part of the French Frigate Shoals, 500 miles northwest of Honolulu.

And they're looking forward to going back.

"We really enjoy it out there," says Bob. "When we get involved in our studies, it's hard to leave."

On Tern they will have as companions mostly the birds from whom the island takes its name, plus other birds, sea turtles and monk seals.

This summer there will also be some other researchers, including George H. Balaz, who is continuing his study of the endangered sea turtle; Brian and Pattie Johnson, who are studying the Hawaiian monk seal; and Beth Flint, from the University of California at Los Angeles, who is making energetic studies of the sooty tern, calculating how much food it takes to raise one chick, etc.

The Schulmeisters have good news concerning the monk seal. They counted 21 of the sea mammals when they left Tern, the largest number seen there.

Only three to six seals were using the island's beach last September.

THE TWO WERE fresh from three years on Amchitka in the Aleutian Islands when they came to Tern last September.

On Amchitka they did research for the U.S. Fish and Wildlife Service on the Aleutian Canada goose, an endangered species.

There were five people on Amchitka, but for most of their six months on Tern the Schulmeisters were alone, although a fisheries research group was there for three weeks and planes occasionally arrived, with the crew staying overnight.

The Fish and Wildlife Service is adopting a different rotation system for Tern, the tentative new plan being two months on Tern and then one month off.

The two other biologists who will take part in the system are John Andre, who has his master's degree in biology from Utah State University, and Jon Gravning, who has a bachelor's degree from Sacramento State University.

Bob and Susan Schulmeister both have their B.A.s in wildlife management from Humboldt State University, Arcadia, Calif.

THE BIOLOGISTS will spend their month off from Tern at the Fish and Wildlife Service's station at Kilauea Point, Kauai.

There will be flights each month to Tern, to take out supplies and to exchange biologists, according to Robert Shallenberger, supervisory wildlife biologist.

He and Dale Coggeshall, Hawaii area administrator of the Fish and Wildlife Service, recently accompanied officials from the service's regional office in Portland to Tern for a look at what is going on there.

Tern, originally the size of a tennis court, was expanded into a base for airplanes during World War II, turned over to the Territory of Hawaii after the war, and to the Coast Guard in 1952.

The Coast Guard left last July, being replaced by the Fish and Wildlife Service, which is operating the island as part of a tripartite agreement with the National Marine Fisheries Service and the state Division of Fish and Game.

AS PART OF THE agreement, the Fish and Wildlife Service promised to keep equipment on Tern in working order.

This means the biologists have plenty to do besides their research, Schulmeister said.

It means maintaining the diesel generator, sewer, water and electrical systems and once a month grad

Summer Term on Tern Island

ing the runway for the monthly air charter flight.

The biologists were getting their hot water by a solar system, but the big January storm blew the hot water system off the roof.

In their research the biologists take censuses of bird, turtle and seal populations, band birds, make incubation studies, find out what birds eat and study how eating habits affect fisheries, and study the birds that come out at night.

Every two weeks they take trips to Trig, Whaleskate and East, other islands in French Frigate Shoals, for bird population surveys, Schulmeister said.

"IT'S AN EXCITING place, with its numbers of birds," he said of Tern.

The censuses taken by him and his wife indicate there are 65,000 sooty tern nests, 500 albatross nests, 300 red-tailed tropic bird nests, 500 black noddy nests, 300 brown noddy nests, 400 red-footed booby nests, 400 wedgetailed shearwater nests, and smaller numbers of white terns and Bulwer's petrels.

Each nest would represent two birds.

During the Coast Guard's tenure on Tern Island, high seas once forced the servicemen to take refuge on the power plant roof.

Schulmeister said he and Susan didn't notice any particularly high seas during their six months on Tern, as fringing reefs broke up the waves.

5 May 1980

We all send our

love—

Observations on the Preemergence Behavior of the Green Turtle

GEORGE H. BALAZS AND ERNEST ROSS

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TECHNICAL BULLETIN NO. 84 MARCH 1971

COMPOSITION, DIGESTIBILITY, AND ENERGY EVALUATION OF FOOD WASTE PRODUCTS FOR SWINE IN HAWAII

George H. Balazs, Williams I. Hugh, and Coy C. Brooks

HAWAII AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF HAWAII

Mr. and Mrs. George Balazs, Jr.

announce the marriage of

Miss Linda Rae Evans

to their son

Mr. George Harvey Balazs

on Saturday the twentieth day of July

nineteen hundred sixty-three

Las Vegas, Nevada