

In Search of the Giant Green Sea Turtle

by Doug Wallin



Here Mike McCoy attaches a metal tag on the front flipper of a turtle.



Mau Pialug

The green sea turtle, *Chelonia mydas*, ranged widely throughout the Pacific Ocean. However, their existence is being threatened by overfishing, and in many areas a scarcity of turtles is already being experienced. In most of the more developed and modern island locales scattered across the vast expanse of the Pacific, such a scarcity means little more than that visitors to local restaurants must go without the luxury of eating tasty turtle meat; or that tourists will be unable to purchase the numerous kinds of souvenirs and curio items which are fashioned out of the beautiful tortoise shell. But to the people living on the hundreds of small, remote outer islands, turtle meat is not just a luxury, but a necessary part of their diet. For these islanders, a shortage of turtle is a threat to their well-being.

The Trust Territory of the Pacific is the U.S. governmental body which has jurisdiction over Micronesia, and during the preceding years, concern has arisen over the decreasing turtle population, as these animals represent a significant islander food source. Yet, not all areas of Micronesia are similarly effected. This is because many of the tens of thousands of people who inhabit Micronesia live on the larger, more developed islands. The people here are not as dependent on nature as their ancestors were, and a good amount of food is imported. These populous areas contain an airport, and are on major shipping lanes; there are stores, markets, electricity, running water, and in general people don't live off the land and sea to the extent that their ancestors did.

Conversely, on the small, more isolated islands far from these district centers, few products are imported from the outside world. As a result, each of these islands can support only as many people as the existing food supply will allow. On these miniscule specks of land, the islanders live as their forefathers did. They must raise such staple foods as breadfruit, taro, papayas, bananas, and the like. Their meat comes primarily from the sea, and every day small fleets of canoes go out to fish. The struggle for survival consumes their daily lives; often from sunrise to sunset. There is no way to store meat and other perishables, for they spoil rapidly in the humid heat, and thus each day a new supply of food must be gathered.

tative three months-fieldwork schedule calls for visits at 20 to 26 different atolls and islands, proceeding northward up the northeastern (Ratak) chain in the Marshalls, back down the southwestern (Ralik) chain, then on to Kusaie, Pingelap, Mokil, and finally ending up at Ponape.

Directing the archaeological survey is Paul Rosendahl, archaeologist with the Department of Anthropology. The other project personnel are Margaret Luscomb-Rosendahl, a Bishop Museum field archaeologist; expedition organizer Richard Kelton, an attorney and avid sailor from Beverly Hills, California; David Feinstein, a professional sailor from Marina del Rey, California; and a third sailor, still to be selected. Anthropology Department Chairman Yoshihiko Sinoto plans to join the expedition later on Kusaie. In both the Marshalls and Eastern Carolines the expedition party will be accompanied by a Micronesian who will serve as interpreter and guide to help explain the purpose of the expedition to local island and atoll inhabitants, and to obtain permission to conduct site survey and test excavations on privately owned lands.

Expedition personnel will travel aboard the yacht *Enchantress*, a 47-foot Wellington ketch owned by Mr. Kelton. Most cruising will be done under sail, but the boat does carry 440 gallons of fuel, providing a range of about 2500 miles, should cruising under power become necessary. The boat also carries 440 gallons of fresh water, and easily accommodates a crew of five or six people. Particularly useful is the tandem centerboard keel design of the boat, which permits a shallow five-foot draft with the centerboards up.

Very little modern archaeological research has been done to date in Eastern Micronesia, and none specifically in the Marshalls. The purpose of this survey project—essentially a reconnaissance survey—is to locate and record sites with significant potential for more extensive research excavations to be undertaken with separate funding during the next few years. These future research excavations will investigate problems regarding the origins and dating of initial human settlement in Eastern Micronesia, and the nature of human adaptation to atoll environments.

In conducting this initial reconnaissance survey, the Bishop Museum is cooperating closely with various government offices and individuals in the Trust Territory concerned with the identification and preservation of historic sites and other cultural properties and resources. Copies of all data obtained during Museum work will be deposited with the appropriate government offices on Majuro, Kusaie, and Ponape, and with the Territory Historic Preservation Office in Saipan.

Paul Rosendahl
Department of Anthropology
Bernice P. Bishop Museum
Honolulu, Hawaii

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And yet, this food can't be wasted, as these tiny coral islets can sustain only a limited number of inhabitants. This balance of nature is indeed a delicate one, and Mother Nature can be unforgiving to those who upset it. A scarcity of turtle meat, therefore, is of no small importance to the lives of these out-islanders.

In order to alleviate turtle shortages which are already beginning to develop in some areas, as well as looking ahead to reduce the possibility of future shortages, a serious study of the green sea turtle has been sponsored by the Trust Territory. As part of this continuing study, which it is hoped will benefit all of Micronesia and the Pacific, a field trip was organized to examine the green sea turtle in its natural habitat.

I became involved in all this when my boat was chartered out of Guam to act as transportation.

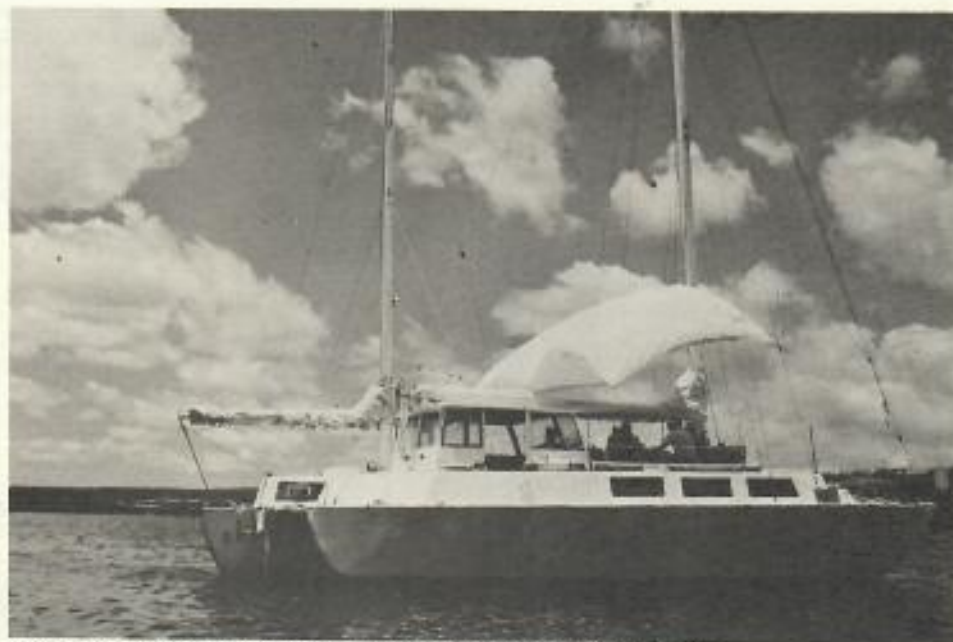
The Trust Territory fishery's biologist in charge of the expedition was a capable young man by the name of Mike McCoy, who had been studying turtles for a number of years. Mike explained to me that the area of Micronesia chosen for this field study was located about 325 miles south of Guam. Here are located three tiny islands, which form a triangle; each being about 50 miles from the other two. The two northern points of the triangle are occupied by the uninhabited islands of West Fayu and Pikelot. The southernmost tip of this triangle is the inhabited island of Satawal, which is but a mile or so long, and supports a population of about 400 people.

This promised to be an ideal location, as the Satawalese have been experiencing a turtle shortage. Almost all of their collecting is done on West Fayu and Pikelot, which they visit regularly in their ocean going sailing canoes. These two islands are well known turtle nesting grounds, and at one time abounded with these large sea creatures. And although the islanders only catch turtles as a necessary food source, a situation of over-fishing has resulted, and the turtle population has noticeably declined.

Actually, this over-fishing isn't entirely the fault of the Satawalese, as islanders from other areas also harvest these turtle grounds. The resultant turtle shortage is due to the fact that too many people are hunting them, and there just aren't enough to go around.

To help improve this situation, Mike had a number of goals planned for the trip, one of the most important of which would be to study turtle behavior in the hopes of bolstering the dwindling population in the future. Toward this end, he intended to tag as many turtles as possible with identification bands, so that their migratory behavior could be analyzed.

Although my 44 foot trimaran sailboat was equipped with electronic navigation aids, and had a crew of four, it was decided that a Satawalese islander should accompany us to help navigate the treacherous reefs of these tiny coralline islands. The



Shot of the 44 foot trimaran sailboat used as transportation during the trip.



This is one of the false nests made by a nesting female turtle on the beach of West Fayu.

man chosen for this job was the famous Micronesian sailor, Pialug. (His most recent accomplishment was as navigator for the canoe, Hokule'a, on its maiden voyage from Hawaii to Tahiti.)

Finally, after many weeks of preparation, our expedition sailed out of Guam's Apra harbor, and headed south for the first landfall, West Fayu.

Although the Guam weather bureau had forecast lovely weather, a low pressure zone developed over our second day out. The weather rapidly deteriorated, and we soon found ourselves in a rather nasty typhoon. During one of my many ensuing visits to the side of the boat to express my seasickness, the thought occurred to me that although the purpose of this voyage was to study a diminishing turtle population, if the storm got much more severe, another ex-

pedition might have to be launched to also study our diminishing numbers!

Cyclonic winds raged all during that day, and on through the night. And while the crew, myself, and Mike McCoy (all of whom are white Americans) suffered untold agonies from being seasick, Pialug presented an interesting contrast. For Pialug had been a sailor from his early childhood on Satawal, and he was conditioned to traveling long distances in small sailing canoes. The 44 foot tri sailboat was like a bucking bronco to us, but for Pialug it was a luxury cruise. And while the rest of us were unable to keep food in our stomachs during the maelstrom of wind and waves, Pialug strolled about leisurely, smoking cigarettes, and eating one hearty meal after another.

Fortunately, our craft weathered the



One vessel which has previously gone aground on the reef of West Fayu is the freighter, *Solar Trader*. This is a shot on the deck showing how the salt spray has rusted the superstructure. The incessant pounding of the waves has eaten away part of the ship's bottom, and one day it will fall completely over on its side.

Arriving for the first time at West Fayu, we here anchor offshore.



storm, and after another few days of delightfully smooth sailing, we reached West Fayu.

Fayu is actually a miniature atoll about two miles in diameter, with only one tiny island built up on the coral reef. We were glad to have Pialug's experience to guide us through the tricky reef into the inner lagoon, for as we approached we noticed two boats ominously perched high and dry on the reef from having gone aground. After years of salt spray, they were now little more than rusty hulks, and they stood like sentinels, warning us of a similar fate if we were not cautious.

The island of West Fayu is barely $\frac{1}{4}$ mile in length, but resplendent in tropical beauty, with its lush green interior being surrounded by a necklace of pure white sand.

West Fayu at one time had been a great turtle nesting ground, and although we had arrived at the height of the turtle mating season, few could be seen in the water. This was an immediate indication of the dwindling population, as they are most plentiful at mating time. For even though it is instinctive to sea turtles to return and mate at the same island where they were born, they don't necessarily live there all year around. This was the reason for tagging a large number of specimens, so as to

determine their migratory habits.

One of the largest contributing factors to the diminishing population is that too many islanders have been collecting too many turtles, and thus there are fewer individuals remaining to mate again the next year. To make matters worse, the people also dig up the turtle eggs which the females bury on the beach, thus further reducing the number of turtles for future procreation.

Mike decided we would stay on Fayu for several days, to see how many turtles would show up. The small number which did arrive were tagged, and demonstrated conclusively to Mike that a dire shortage existed on Fayu.

In order to tag the turtles, Mike waited until they came on land, as they are too quick in the water to allow handling. Besides, shark aggressiveness tends to increase during mating season, as they are attracted to the spawning turtles, and none of us were anxious to get in the water—not even Pialug.

The actual act of mating occurs in the water, and during the day we could observe a few mating pairs floating on the surface.

After mating is complete, the females come ashore at night to nest and lay their eggs. They are particularly vulnerable to capture at such time, since they become

slow and clumsy on land.

The nesting act itself is an incredible thing to observe, and the entire process takes a couple of hours to complete. The animals are actually very selective in their choice of nesting locations, and they prefer to lay the eggs in the sand near the brushy areas which fringe a beach. Even then the females are quite choosy, and will normally spend a great deal of time searching for just the right spot. Oftentimes, Mike reported to me, a fussy lady will be so dissatisfied with the area where she comes ashore, that she will return to the water to wait and try a new place the next night.

But once in a suitable location, the female turtle digs a shallow pit with her flippers, deposits the eggs within, then covers all with sand again.

Whenever Mike found such a female in the process of egg laying, he carefully let her complete the task undisturbed. But once she had finished, and was heading back toward the water, Mike intercepted and flipped the creature onto her back. This really doesn't harm the animal, but merely renders it helpless, and is an effective way of keeping it captive until the tagging operation can be performed in the light of morning.

At the crack of dawn each day, Mike (continued on page 46)

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(continued from page 12)

returned to the turtles he apprehended the night before. To tag the creatures, Mike attached a metal band to the fleshy part of the front flippers with a pair of special pliers. Each band is numbered to indicate where the turtle was tagged. Then, if and when the tagged turtle is ever re-caught elsewhere, the tag hopefully will be returned to the local fisheries office. Thus, eventually a migratory map of the green sea turtle can be plotted.

After the turtles were tagged and released, Mike returned to the nesting areas to view them in the daylight. The reason for this was to observe what are called false nests. For one of the reasons why females take so long to lay their eggs is that before the real nest is made, one or two false ones are constructed first. These are seen as additional oval depressions in the sand, and are all but impossible to distinguish from the nearby real nest. This instinctive behavior on the turtle's part is nature's way of camouflage, and affords the newly laid eggs in the true nest a better chance to survive the hungry onslaught of crabs, birds, and other animals—including man.

The newly laid eggs require an incubation period of about 60 days in the warm beach sand. Then they begin to hatch, and a mad scramble for the water ensues as the baby turtles begin a new life.

This beginning is short-lived for most of the little turtles, however, as few escape the sand crabs and sharks that are waiting. But in nature this is normal, and evolution has produced a specific system of ecological checks and balances, whereby a great number of eggs are laid, but only a few survive. For these newborn turtles are themselves part of the food chain, and although many become a source of food for other animals, enough live and grow to maturity to perpetuate the species.

But over-fishing by man, of not only the adult turtles but also the eggs, has upset nature's balance, resulting in severe turtle shortages on Fayu.

The results obtained by tagging the adult turtles will no doubt be beneficial in future years, but Mike's concern was also to begin increasing the population within the much nearer future. Toward this end, part of his job was to do reconnaissance work for a team of biologists who would be coming down later. Armed with information which Mike was gathering about the turtles on Fayu, this group would arrive before the eggs hatched. Once hatching occurred, it would be the men's job to keep the baby turtles in protective reef enclosures so that predators couldn't devour them. And after the turtles grew large and strong enough to fend for themselves, they would be released. By thus allowing more turtles to survive the incubation and hatching periods than normal, it is hoped that this will help offset the decreasing population, and once again turn Fayu into a major nesting area.

(to be continued in next issue of TAP)

Kosrae District: A New Micronesian Political Entity

by Nancy Kubisko

Representatives from all parts of the Trust Territory and the independent nation of Nauru recently converged on a lush, 42-square mile volcanic island for one of the most lavish and festive celebrations yet seen in Micronesia. The magnetic force drawing such dignitaries as Mr. Peter T. Coleman, acting high commissioner of the Trust Territory; Admiral Kent R. Carroll, U.S. Navy commander-in-chief of the Marianas; COL E.A. Van Netta, commander Kwajalein Missile Range; Mr. Albert Zapanta, assistant secretary for administration and management, U.S. Department of Interior; and Congress of Micronesia representatives from each district of the Trust Territory was the dedication ceremonies officially announcing Kusale Island as a new and separate district of the Trust Territory of the United States.

This is the first time since the Trust Territory was established at the end of WWII that a separate district has been formed. In the past, Kusale had been administered under the jurisdiction of the Ponape District.

For the Kusaiean people, who have a nationalistic pride in their heritage, this was perhaps THE most significant event in their political history. Detailed planning and organizing began months before the influx of visitors flooded into their quiet harbor and sedate villages.

The normal population of 5,000 in-



COL E.A. Van Netta, commander Kwajalein Missile Range (foreground); Jim Pualoa (with umbrella), district administrator for Kosrae District; Admiral Kent Carroll, commander-in-chief Marianas; Commander Dave Burt await arrival of other dignitaries on the Cenpac Rounder.

creased by at least an additional 1,500 in a few days. For an isolated island, the arranging of facilities, planning of activities and the storage of food was a monumental undertaking.

Boat travel is the only transportation alternative to this island some 350 miles southeast of Ponape. Every available Trust Territory boat plus the use of the Cenpac Rounder from Nauru made multiple boat trips to Micronesian ports transporting Kusaieans living elsewhere and other visitors to the celebrations which lasted four days from January 4th through the 7th.

The number four is significant. There are four main Kusaiean villages: Lelu, Utwa, Tafunsak and Malem. Each day the dancing, feasting, singing, feasting, speeches, feasting, canoe racing, and—even more feasting were hosted by a different village with each trying to outdo the others.

The villages would take turns presenting different dances, singing programs and hosting lunches and dinners that would be mind-boggling to any hedonist. Every Kusaiean, young and old, participated. The pageantry of this event will be a highlight of Kusaiean history.

However, the custom which will remain foremost to the foreign eye is their complete and open hospitality. There are no hotels or accommodations. All visitors were fed, housed, transported and cared for in kindly fashion by the villagers.

The Kusaiean culture is an odd mixture of sophistication and innocence. Kusaieans, a curious and sharp-minded people, have had enough outside influence to develop a business-like flair and an urge for modern progress. However, they still retain a family structure, community interaction and social mores distinctly at variance with the outside world.

The missionary influence is perhaps more prevalent here than anywhere else in Micronesia due to the people's receptive quality. The gentle nature of Kusaieans provided ideal conditions for the implantation of Christian teachings. There are no missionaries left now. The decaying remains of the old dormitories, schools and living quarters linger on the inaccessible side of the island far away from the main villages.

According to Bingham Palik, whose family is directly descended from the last King of Kusale, his great-great grandfather accepted Christianity for his people. When he died, his son felt that the concept of Christianity interfered with that of a local king. There could be only one ultimate king. He therefore relinquished his title and the kingdom has never been reestablished.

Christian morals and concepts have been accepted by the islanders and then mixed with their own culture and interpretations to give a distinct flavor. The concrete (continued on page 47)

Kusaiean girls dressed traditionally for a hand dance.





Srenia Derbal and Theodosia Fuziwara selecting rabbitfish spawners from brood tank.



Aerial view of MMDC facility.

training several Micronesian technicians in the hatchery techniques required and in supplying several small ponds built by the MMDC staff to determine the advisability of prawn farming at the village level.

Tuna Baitfish Project: The availability of bait for tuna fishing is frequently the limiting factor in this potentially lucrative industry. The MMDC is working with the University of Hawaii in a cooperative program to utilize a small topwater minnow of the mollie family to expand the amount of bait available to the tuna fishermen. Initial experiments in American Samoa indicate that the mollie is an acceptable baitfish and can be cultured easily and in sufficient numbers to prove economically feasible. Thus far, the MMDC has expanded original brood stock of 25 individuals to over 50,000; constructed three large brood tanks; and built two growout ponds (one a cooperative effort with Van Camp Tuna Co.). Field trials of the baitfish are planned for March when 100 buckets, a full bait load for one boat, will be ready.

Brackishwater Pond Project: Brackishwater ponds are used throughout South East Asia, Indonesia and the Philippines to produce fish and shrimp for protein and income. The MMDC has initiated over 5 acres of brackish ponds in three out of the six districts of Micronesia. Extension services are provided by the MMDC to all those involved in fishpond work and over 60 Micronesians have been trained in the construction and management of brackishwater ponds. Several harvests of milkfish and associated marine shrimp have shown that significant production can be realized if proper management is maintained.

Secondary Projects: Saltwater shrimp, giant clams and edible oysters constitute the remaining programs being investigated for their economic potentials. A sophisticated saltwater shrimp hatchery was completed in the new construction and extensive survey programs to determine the best areas for obtaining juvenile and adult saltwater shrimps are nearing completion. At least five species of commercial shrimp are known to inhabit the

waters of Micronesia. Two species are found commonly in the brackishwater ponds now in production.

Giant clams are a very important resource to Micronesians who value them for their shell and meat. The MMDC has succeeded in spawning three species of giant clams in a small hatchery, several small clams have reached stocking size and it is hoped that an expanded hatchery program could provide seed for depleted reefs throughout Micronesia.

Edible oysters are found commonly in the Palau Islands and have been harvested for the past four years at the encouragement of the MMDC. However, further development is hindered by transportation and marketing problems.

The new facilities completed at the MMDC will enable expansion of many of the programs mentioned above to commercial status. The new dormitory facilities and laboratory space will enable visiting scientists to study their respective interests in the extremely rich waters of Micronesia and at the same time their work will provide a base of knowledge for the proper development of Micronesia's marine resources.

Orranges Thomas, Operations Manager, is responsible for maintenance of all mechanical and electrical systems.

The physical base for the development of a mariculture industry in Micronesia now exists. The new marine laboratory will provide a focus point for training, production and development that has been needed very badly in an area whose greatest natural resource is the sea.

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Hawaii's Shark Fishery

by Karl Evans

The 80 foot fishery research vessel, "Easy Rider," rolled gently in the long swells outside the breakwater of Hilo Harbor, Hawaii island. The Azui winch stopped chugging and pulling in the long setline as an angry tiger shark was dragged to the surface. The ten foot fish rolled on his side and looked at his tormentors in that cold, evil way that all sharks have. Up at the ship's

railing a tall, muscular crewman pointed a carbine at the shark's head and fired 3 shots in rapid succession.

The huge steel grey animal gnashed his teeth and raised hell bashing the thick aluminum hull of the "Easy Rider," with such violent blows of his tail that the entire ship resounded like a struck drum. The carbine cracked out 4 more times before the shark quieted down and wallowed in the swells which were turning red with the fish's blood.

Six crewmen wearing gloves unhooked the shark's dropline from the main setline and dragged the animal through the water toward the fantail of the vessel. A large gate was opened on the starboard after quarter of the ship and, using gaffs to control the big shark, a thick tail rope was placed around the fish and it was towed forward to the winch and boom.

Moments later the Azui chugged and the steel boom began rising upward lifting the shark from the ocean. As the head of the shark cleared the water, the creature opened its mouth and ejected its stomach.

Ejecting the stomach is a spasmodic nervous reaction on the part of the shark and members of the marlin family often do the same thing when caught on rod and reel.

Moments later, the awesome animal from the sea swung inboard, jaws opening and closing in its death throes. As the ship rolled with the motion of the ocean several strong young marine program students from Oahu's Leeward Community College and the University of Hawaii tried to steady the swaying shark. Great care was taken to keep hands and arms away from that deadly mouth. Finally, the great shark was lashed down and left to expire. The process of hauling in the long setlines continued.

For the regular crew members of the "Easy Rider," and Captain Gary "Skip" Naftel, part owner of the vessel, this shark fishing expedition was an old story.

The State of Hawaii, through the Department of Planning and Economic Development, is trying to determine the feasibility of a commercial shark fishing industry here in the islands.

Scientists tell us that, of all the fish in the ocean, sharks are highest in protein content and that, pound for pound, when compared to the tunas and billed fishes, sharks contain a lot less mercury—certainly at such a minimal level as to be perfectly safe for human consumption. And there is another factor to be considered. As a commercial fishery, the world shark population remains literally untouched.

Beyond the basic use of shark meat for human consumption consider the fact that almost every bit of the shark is used for something. Shark skins are cured and, like leather, are used to make shoes and ladies handbags, wallets, billfolds, and bindings for books. Many a drum head is made of shark skin. Teeth from a big shark sell, at the present time, for \$1.25 each—to be fashioned into jewelry items of all kinds.

Extracts from the internal organs of a shark such as the liver and the spleen are making possible certain medical research projects in pursuit of a cure for cancer and human blood disorders.

Aside from the fact that certain sharks do attack man for no apparent good reason, they, the sharks, are a most valuable resource of the sea. Throughout the world people clamor for shark elimination programs. Unreasoning fear of these sea creatures which have survived on earth since the antediluvian age leads people to demand their elimination.

If you mention the word, "shark," people immediately conjure up specters of hideous, toothy monsters attacking and eating human beings. In actuality the majority of the 200 some odd species of sharks are scavengers keeping our oceans clean. Eating everything from dead fish to old tires and plastic beach balls, sharks love to share the fisherman's catch and frequently attack struggling game fish which are hooked up to a sport fisherman's line.

In view of all that the sharks can contribute to our economy, the State of Hawaii is mighty interested in these animals. One major fish cannery operator from the west coast of the mainland has expressed interest in the possibility of canning fresh shark meat here in the islands. The sharks of Hawaii, it is felt, live in relatively pure, unpolluted waters and the meat of these fish is considered prime.

The only problem which originally concerned officials in the shark fishing program was whether or not people would accept the fine white meat of these fish as foodstuff or if, because of inbred fear and hate for the shark, they would turn their noses up at the idea of eating shark meat.

Following a particularly successful fishing trip to the waters off the island of Maui, the marine advisors for the program decided to hold a free beer bust and shark meat tasting party for Honolulu's fish wholesalers, retailers, restaurant operators and night club owners. The press was invited to attend the shark munching party. Held at the Waikiki Aquarium amid a setting of fish swimming about in their tanks the party was a smashing success! Shark meat was served in every form imaginable—broiled, deep fried, boiled, baked, steamed, smoked and in salads with various seafood sauces. Over 100 guests consumed nearly 300 pounds of delicious, tasty shark meat. Mostly they ate Tiger Shark, Galapagos, Mako and Sand Shark. They ate the whole thing!

It was the beginning of the shark meat market. Today, fresh shark meat is showing up in the meat cases of the supermarkets, on restaurant menus and is once again being used by oriental fish cake makers.

The State's fishery research program has been a boon for college level students in the marine program. On each of its shark fishing trips the "Easy Rider," under contract to the State, has carried ten to twelve trainees from college campuses who are learning to be commercial fishermen or



who receive credits toward their degrees in other marine related studies such as oceanography. Learning by doing.

If, at the end of this research program, results indicate we in Hawaii have a viable shark fishery (and it appears we do), and a new industry springs up to can fish and export shark hides and other products, Hawaii will have improved its economy by tapping one of its richest natural resources. In 6 separate trips to catch sharks within the waters of the state of Hawaii more than 400 sharks have been marketed with the largest to date a 1,200 pound Tiger Shark.

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