

Sharks and the People of Hawaii

Do you ever think about sharks? (Be honest about it.) What kind of feeling does the image of a shark evoke in your mind? Is it awe, fear, respect, anger, admiration? All of the above?

Chances are that the more you know about sharks and the more time you spend in and around the ocean, the more complex your feelings. I would guess that anyone in Hawaii who dives, surfs, or fishes shares a similar complex set of emotions about sharks. But what if your life and the survival of your people depended on the sea? Your attitudes toward sharks might be even deeper and more complicated.

Some scholars have suggested that, in many ways, the ancient Hawaiians possessed a sensitivity and a knowledge of the sea that exceed ours. As a culture long associated with the ocean, the ancient Hawaiians shared a vast lore and oral tradition about sea-creatures. Sadly, only fragments of their knowledge have been passed on to us.

Undoubtedly they knew and believed much about sharks. Some of this ancient information is tangible and sharp-edged. The teeth of long-dead sharks (that might have swum beneath Kamehameha's war canoes) survive in the implements of ancient Hawaii. The world's museums and some fortunate private collectors guard the few tools, weapons, and artistic and religious artifacts that escaped loss. Although Honolulu's Bishop Museum has many such objects, important collections are also held in British institutions: I have examined many of them and compared those ancient teeth with study sets assembled from sharks caught in Hawaii.

Far less tangible are the words of long dead kahuna whose special knowledge of the sea has been incompletely passed to us by elders with a

great respect for tradition but with a reliance on fragmentary sources. However, we can learn much from oral tradition, legends, customs, and the recounting of events. The attitudes of contemporary Hawaiians can also give insight into traditional beliefs about the life of the sea.

What do these diverse sources tell us about the old attitudes of Hawaiians toward sharks? And how do they influence our opinions and experience? My own interest in sharks has been both personal and professional. As a sometime entrant in local long-distance swims like the Waikiki Roughwater and the Maui Channel relay, I'd like to know as much as possible about local shark biology. But as a marine biologist, with a love for Hawaii, I yearn to know what the ancient Islanders knew, believed, and felt about the diversity of sharks in our waters. One good way to learn, or to guess, what they knew is to interpret their artifacts and legends in the light of our modern knowledge of shark biology and behavior.

Sharks are a more diverse group than we generally recognize. Worldwide, in shallow and deep-sea, salt and fresh water, there are at least 350 species. Only a relative few have been reported from Hawaii. From the teeth used in ancient weapons and tools, we know the Hawaiian culture encountered most of the common species.

We have no evidence whether they encountered such deep-sea forms as dog-fish, or the 15 foot-long, deepwater plankton-feeding Megamouth shark discovered (by modern science) in Hawaii in 1976. They must have known the largest shark in the world, the whale shark. Often exceeding 25 long, these calm plankton feeders still frequent our offshore waters. Their tiny teeth must have been almost useless to Hawaiian craftsmen; no artifacts bearing them have been found.

Because each species has distinctively shaped teeth, we can identify the kinds of sharks that Hawaiians used in their tools and weapons. We can only guess the species mentioned in oral tradition and passed along by such recorders as Kamakau, Malo, and others. I think we need to re-examine some of the guesses (often described as 'authoritative reports') made over the years based on our contemporary knowledge of modern sharks. First let's review some of the basic natural history of our more notable species.

The two largest dangerous sharks in Hawaii, the great white (remember Jaws?) and the tiger, have almost as many differences as similarities. In both species adults often reach 15'-18' long. Tigers occur fairly commonly in Hawaiian waters and range in size from newborn 18-inch pups to adults that exceed the length of the biggest of old-style surfboards. In research-fishing programs conducted in Hawaii in 1977-78, 28 tigers were landed ranging in length from 4' to 15' and averaging almost 8' feet long.

In contrast, great white sharks occur only rarely in Hawaii and apparently only as adults. A search of records back to 1886 revealed only eight confirmed reports or landings of white sharks in Hawaii. These rare encounters with humans were diverse and noteworthy. It is likely that the ancient Hawaiians had equally notable and perhaps even more varied experiences with this large and dangerous species.

Whether a given species is rare or common now, it is highly likely that all sharks were more abundant in ancient Hawaii. Today's high population, heavy fishing, and extensive disturbance to nearshore waters take a toll on all the organisms in Hawaiian seas. There is some evidence that sharks are more abundant in the uninhabited (but increasingly fished)

Northwest Hawaiian Islands.

To give an idea of relative abundance, commercial fisherman often report the "number of fish caught per number of hooks set". In research fishing programs in the Hawaiian archipelago, catch rate has exceeded 3 tiger sharks/per 100 hooks, reflecting a fair abundance of tigers. As a part of some shark fishing programs, the State has promoted tiger shark meat (as well as other species) as a product for home and restaurant consumption. Initial resistance to tiger shark steaks was soon overcome when restaurateurs and fish market-operators tasted well-handled and well-prepared shark at a variety of free dinners and pupu parties.

The problem with shark fisheries is the sharp decline in catch-rate with sustained effort. After an initial high yield, the catch of sharks drops dramatically. This effect is desirable if the intent is to reduce the number of sharks in an area; this has been the main purpose of the State's "shark reduction programs" that have usually followed a well-publicized human attack. However, this rapid decrease in numbers with heavy fishing makes it difficult to maintain a dependable fishery.

We know from artifact and story that the ancient Hawaiians actively fished for sharks for food, for teeth to be used as the cutting edges of tools and weapons, for skin to stretch as drum-heads, and for ceremonial purposes. Lacking metal, Hawaiian shark fishermen (and they were fishermen because such fishing was kapu for women) used large wooden hooks tipped with whale bone; leaders and lines were heavy braided sennit.

Recall the scene in the feature film Jaws: the trio of shark fishermen not only had a powerful motor vessel but stainless steel harpoons, floats made from metal drums, and diverse other technological accessories. Even in the real world of documentary films, white sharks

are hunted with very heavy-duty specialized gear. Compare that equipment with the gear available to a band of Hawaiian fishermen. Their struggle to subdue an adult white shark with rope made from plant fiber while braced in a wooden canoe must have been rigorous indeed.

White sharks are strong, active animals that vigorously resist capture. Large tigers are also no easy matter to land but they seem to quickly lose their will to win compared to white sharks. Filmmakers have successfully exploited "fished-out" tigers and drafted them as tractable actors in feature films.

Hawaiians before Captain Cook's arrival may have actively fished for shark but even with the highest estimates for the ancient Hawaiian population, it is unlikely that shark abundance was markedly reduced, although their numbers must certainly have been affected.

The reason shark populations are so sensitive to heavy fishing lies in their reproductive biology. Unlike most fishes, which release hundreds of thousands of eggs into the sea, sharks give birth to a very few young. A mother tiger shark may deliver a litter of small (12"-18") pups numbering in the dozens. By contrast, a great white shark of the same size will give birth to one or two pups each perhaps four feet long.

These two species play different sides of the biological gaming table: by producing a greater number of smaller young, the tiger shark enhances the chances that several young will survive. On the other hand, the larger size at birth of white shark pups gives them a head-start in a hard world.

Although white sharks are rare in Hawaii, their occasional visits here have understandably been of human interest whether before or after Captain Cook. In May 1926, a twelve and a half foot specimen was caught

by fishermen off Kahuku, Oahu; its stomach contained human remains. At Makaha, Oahu in March 1969, a white shark attacked a surfboard, resulting in a frightened surfer with a lacerated calf, a stronger love of the land, and tooth fragments embedded in the board. The attacker swam away but its identity was confirmed by biologists who examined the typical shape of the tooth fragments and impressions.

White sharks are most commonly found along continental coasts in temperate waters, especially where seals and sea lions are abundant. Such areas include South Africa, Southern Australia, the Pacific and Atlantic coasts of North and South America. The usual food of white sharks of the size caught in Hawaii are seals and sea lions; white shark attacks on these animals are frequently witnessed and recorded by biologists working at the Farallon Islands just off California's Golden Gate.

The high islands of Hawaii do not have a resident seal population, although a small population of endangered Hawaiian monk seals survives in the Northwest Hawaiian Islands. No one has yet reported tangible evidence that seals ever occurred in the main islands, although in recent years, stragglers from the northwest have been sighted on Kauai, Oahu and Hawaii.

Recent work on Hawaiian midden material and on fossil birds suggests that colonizing Polynesians may have rapidly exterminated defenseless species such as flightless birds and perhaps large colonies of monk seals. It may be possible that great white sharks were more abundant in Hawaii during a period when monk seals may have colonized the main islands. We do know that the Hawaiians were using white shark teeth in tools and weapons made before James Cook's arrival.

To even a casual observer, great whites seem more powerful and graceful than other sharks. They are certainly larger, reaching at least 20 feet. They are adapted to prey on large fast-swimming warm blooded mammals--seals, sea lions, dolphins--and occasionally, probably mistakenly--humans. This impression of strength and threat derives not only from its predatory habits, but from the adaptations for such markedly graceful swimming power--- the streamlined body shape, sharply pointed head (almost conical in cross section) and powerful, crescent-shaped tail.

Most sharks typically have an asymmetrical tail with the upper lobe much longer than the lower lobe. However, the tail of white sharks is symmetrical and preceded by sharp horizontal keel--a condition very similar to the tail structure in other powerful swimmers such as tuna, swordfish, and mako sharks. Also shared with these fishes is the ability to increase muscle temperature above that of the ambient seawater. Hotter muscles make a stronger hunter.

Such characteristics in white sharks very probably influenced a number of legends in Hawaiian tradition. One major feature of a successful dominator of any environment is keen eyesight. White sharks possess excellent vision and are one of the few sharks we know to have color vision. Hawaiian legend recounts that during her pregnancy the mother of Kamehameha was struck by an intense longing to eat the eye of the "niuhi" and (at probably some inconvenience to others) the rare dish was provided for her. It was later said that the keen vision of Kamehameha's leadership was influenced by the shark's spirit. Another Hawaiian chief, Kiwala-o, a fellow warrior of Kamehameha, also sought strength from the great white shark. His feather cloak (now in the

Bishop Museum) is boldly decorated with a series of five equilateral triangles, a motif representing an abstraction of sharks teeth, with the fierceness of the predator intended to be associated with the wearer of the cloak. The design of equilateral triangles are strongly suggestive of the adult teeth of the fierce and powerful great white shark.

These teeth are distinctively triangular with finely serrated edges. Although many sharks have approximately triangular shaped teeth, only the white shark have equilateral shapes. Researchers have shown that smaller white sharks, less than eight feet or so, have teeth that are not quite equilateral, but that become so as the shark increases in size. This have been explained as an adaptation for a shift in diet from large fish when sharks are smaller to large mammals. For sheer practical reasons, the equilateral shape of white shark teeth make excellent cutting edges for weapons and tools. Adult teeth are thick and the broad base gives added strength to the tooth.

In a survey of tools and weapons collected during Capt. Cook's trip and now distributed among several world museums, I have found eight implements that utilize white shark teeth. Anthropologists generally assume that the artifacts collected on Cook's trip were made before the Hawaiian culture was influenced by Western tradition. We can assume that the Hawaiians probably actively fished for great white sharks in order to obtain the teeth (and perhaps the eye--for pregnant queens). The Hawaiians must have held this species in great respect.

We are not certain how Hawaiians used implements with shark teeth. Some are obviously knives; others look like toothed fist-loads for hand-to hand combat. Some writers have suggested that they were used in hand-to-hand combat to deliver a mortal blow to the opponents mid-

section. I've held these implements and they fit the hand in at least three positions. Perhaps they were used as weapons, but one can imagine that they were highly valued as tools for detailed carving.

The shape of the tooth of the white shark makes a particularly efficient tool from an engineering sense, but it is possible that the broad-based triangle was also a motif associated with spiritual power. I have examined two post-Cook implements that are very similar to the pre-Cook tools containing genuine white sharks teeth. However these two later articles have been made with whale bone and iron in shapes made to resemble a tooth of a white shark . The whale bone was even notched on the margin to simulate dental serrations. Although these may have been crude attempts by western owners to replace a lost genuine tooth, I prefer to think that they represent an attempt to impose the mana of the white shark tooth by imitating its shape with other significant materials.

As significant as the white shark must have been in Hawaiian culture, the more abundant and equally large tiger shark may have more important. Tiger shark teeth are certainly more common in tools and weapons: in knives, fist weapons, heavy clubs, and light wooden scepters. The semi-circular, obliquely-notched shape of the tooth is unique and distinctively different from any other species.

Just as the tooth shape differs from white sharks, so does the tiger shark's behavior and habits. Tigers are famous for their indiscriminate palate. Adults take floating sea-birds, sleeping turtles, and poke their blunt noses into caves to pull out lobsters. Modern tigers are renowned for eating garbage and have been caught with trash-can lids in their stomachs.

Presumably, the tiger sharks in Kamehameha's day were no different. It seems unlikely that such an animal (even a large individual) would have

been imbued with the same mystical power and strength as that attributed to the white shark.

Various interpreters and recounters of Hawaiian legends have called the large dangerous sharks of Hawaii *niuhi*. However it is seldom clear which large species, the tiger or the white, is meant. I think the two species have been confused in several stories. Based on the differences in the two animals, we can make some educated guesses about which species is which.

For example, Kamakau told of a special method of fishing for *niuhi*: "A fisherman sailed far out on the ocean until the land looked level with the sea, that was the place for shark fishing. When all was ready, the prow of the canoe was turned into the current so that the upswell of the current would be behind the canoe. The net containing the decomposed pig mixed with pebbles and broken kukui nut shells was tied to the starboard side of the canoe at the forward boom. Then the net was splashed into the sea and poked with a stick until the grease ran through the pebbles and shells. A shark would scent the grease, his dorsal fin would break through the surface of the sea, and it would snap its teeth close to the canoe. The large sharks were the *niuhi*; they could be tamed like pet pigs and be tickled and patted on the head. The fisherman would pat the shark on the head until it became used to being touched. Then he rested his chin on the head of shark and slipped a noose over its head with his hands, turning his palms away from the shark lest it see their whiteness and turn and bite them. When the snare reached the gills, the fisherman eased it downward to the center of the body and tightened the noose. If it were a big shark there would be a furious tugging and battling."

It seems likely that the large *niuhi* described in this account is a tiger shark rather than the more violent great white shark. Large tigers are

known to be quite tractable and can be handled relatively easily. Thirty years ago in Honolulu an enterprising fisherman took advantage of the tractability of tigers and opened a "Sharkquarium" at Kewalo Basin. Here, a curious public paid to see young men riding on the backs of large tiger sharks. Although the "Sharkquarium" is gone, the exhibit tanks remain and are now used by the University of Hawaii to house bottlenose porpoises for research in cetacean communication. (The "Sharkquarium" also featured, for almost two days, a listless captive white shark. To my knowledge this is the first white shark ever to be on public display. Despite subsequent efforts by major aquariums, no white shark has been successfully kept. Like the Honolulu specimen, all have reached captivity suffering the fatal effects of an intense struggle during capture).

Another probable case of tigers being mistaken for whites appears in Armine Von Tempski's charming memoir of her girlhood on a large Maui ranch early in this century. She described a cattle drive from the slopes of Haleakala to Makena Beach. Here the cattle were pulled into the sea and dragged to a waiting ship to be hauled aboard and shipped to Honolulu. She describes her father warning of tiger sharks that occurred only infrequently and which viciously attacked the floundering cattle. The infrequent occurrence and the vicious attack are far more suggestive of a white shark.

An individual tiger shark may range over a wide area but is usually predictably and regularly present for long periods in a given area. (In a study conducted at French Frigate Shoals in 1977, I and other University of Hawaii biologists tracked a large tiger shark that we had caught and tagged with a sonar transmitter. Using hydrophones we could follow it by boat. Although we listened for only two days, the shark appeared to have

a repeated patrol pattern around a specific area.

The story of Kapa'aheo, the Kohala shark god seems almost unarguably to be a great white shark. Heloke Mookini has related it to scholars at the Bishop Museum:

"Long ago young girls enjoyed swimming in a lovely cove in Kohala on the Big Island. Often a swimmer would disappear and never be seen again. The people were very afraid and wanted to learn what had happened to the girls. A fisherman noticed that when a swimmer disappeared, a mysterious stranger named Kapa'aheo could be seen sitting on the shore nearby. This fisherman then got all of the other fishermen together and they were on hand when the girls went swimming again. As before the stranger was sitting on the rocks overlooking the cove. When he disappeared the leader of the fishermen ordered the others to dive into the water and form a protective circle around the girls.. The shark swam toward the group and a huge fight began. Many times the shark was wounded by the spears of the fishermen. Finally the shark swam away. When the men were back on shore, they found the stranger dying from many wounds that looked like they were made by fishing spears. When the man died from the wounds, he was transformed into the stone found near the edge of the cliff by the ocean."

This stone, a 7'6" reclining column of pahoehoe lava, was moved from near the Upolu Airport to Honolulu and eventually to Bishop Museum. It now reclines in a lovely peaceful garden--- but touch it, gaze upon its conically pointed nose, stroke its massive length. I dare you not to hear the sharp scream of a young Hawaiian girl and see the crescent tail of a white shark slash the ocean's surface.

But not all of the sharks in Hawaii are as big as boats. Smaller but still dangerous species once abounded in nearshore waters. They are still here but in greatly diminished numbers.

The Hawaiian concept of aumakua (guardian animals) may be related to one or more of these smaller species--sharks like the grey reef shark, the reef blacktip, and the reef white tip. It is an ancient Hawaiian belief that deceased family members sometimes would be reincarnated in animal

form (aumakua), often as a shark. The aumakua could be found in specific areas of the reef and could be relied upon for fishing assistance and protection. It seems likely that this belief involved a smaller territorial species rather than a large shark such as the great white.

A tattooing motif of small triangles encircling the ankle of a Hawaiian protected by an aumakua is said to have its origin in an incident which would also argue against the white shark as aumakua:

a woman swimming across a bay on the Island of Hawaii was attacked by a shark who began to bite off her foot. She recognized the shark as her aumakua and shouted its name. The shark then released her and said "I'm sorry, I didn't realize it was you. Whenever I see the anklet of scars which I have made, I will recognize and protect you."

The Hawaiians also built heiau (temple platforms) near the shore in areas where sharks seasonally aggregated. Legends tell of Hawaiians swimming freely with these sharks and predicting the time of their return from year to year. It seems likely that this species is the grey reef shark.

Large aggregations have been observed regularly and predictably over the past eight years in a number of study sites in Hawaiian islands, including Laysan and French Frigate Shoals. Fellow biologists and I have noticed that these sharks are female; the few that we have collected have been pregnant. They gather in the reef shallows at the time of year (May-September) and day (about 11:00 am to 3:00pm) when the water is sun-warmed a few degrees higher than offshore where these sharks are normally found. We do know that sharks in these groups do not seem bothered by people swimming among them and they will not take bait. Perhaps, pregnant sharks have adapted to gathering in the warmer waters to speed the development of their young. Such shy, non-feeding behavior is typical of most pregnant sharks.

Relatively harmless sharks like the reef white tip can be found regularly for years in a row in the same cave or rocky overhang. Leaders of dive tours on Maui and the Big Island have trained white-tips to be hand fed for the added thrill of mainland dive customers. One can imagine that the sea-conscious fishermen of old may have shared their catch with the white tip , grey reef, or blacktip that lived in their fishing area.

The shark most likely to be encountered in shallow waters is the scalloped hammerhead, referred to by Hawaiians as the "angular shark", (mano kihikihi). In spring, pregnant females enter embayments, such as Kaneohe Bay, Pearl Harbor, and Honolulu Harbor. Litters of a dozen or so 12-inch pups are delivered in the upper reaches of the bays where they are protected from predation by large fishes (including other sharks) that are more common in deeper, offshore waters. The adults leave soon after they give birth but the young stay in the shallows, gradually moving to outer waters as they grow. By December, the bays are generally empty of pups but during spring and summer fishermen frequently catch young hammerheads by hook and line from piers and in gill nets. Sometimes many young are stranded in the dry-docks at Pearl Harbor.

The mano kihikihi of Pearl Harbor may have been among the sharks protected by the shark goddess Ka'ahupahau. In 1913, Western insensitivity to the old culture resulted in a predictable--or coincidental? -- event. The U.S. Navy had selected a site for a large drydock in Pearl Harbor in an area known to belong to the shark deity. The builders ignored the warnings of old Hawaiians and proceeded with construction. Just as the project was almost complete, the entire structure suddenly collapsed. The Navy's official record does not implicate the shark goddess, but when the work resumed, a kahuna was requested to appease Ka'ahupahau with

appropriate prayers and an offering. This time the project was successfully finished.

Like any culture, that of ancient Hawaii continually evolved during many generations of adapting to changing influences, of surviving hardships large and small, of trying to make sense of events, and to relate cause and effect. But cultures, ancient or modern, are only partly rational. Sometimes what we *want* to believe influences how we explain events.

We would like to believe that sharks no longer attack or kill people in Hawaii. The fact is they do--rarely, but it happens. The records researched and maintained by local marine biologist George Balazs indicate that there were 24 shark attacks in Hawaii in 1980-1989 with nine involving fatalities. In two recent cases, official medical examiners have been reluctant to assign the cause of death to sharks even in the face of strong circumstantial evidence.

As difficult as it may be to deal with such tragedies, we should--like the ancient Hawaiians--accept them as natural events, sometimes subject to our modification but never totally under our control. A haole surfer (resident on Kauai) who survived a damaging attack by a large tiger shark several years ago exemplifies this enlightened attitude. Despite the loss of his right hand, he is without rancor and explains, "The water was murky after heavy rains that day and I shouldn't have been out there. The shark mistook my board for a turtle-- besides...it's his ocean."

Sharks, like the multitude of other organisms that enrich Hawaii, are a natural, essential element of our marine environment. To live among such islands without sharks might seem safer, might seem better--but it would be not only unnatural, it would be impossible.

HAWAIIAN SHARKS

There are at least three replies to the question,

"How many kinds of sharks are there in Hawaii?"

The short answer: two kinds--mean and friendly.

The somewhat short: three kinds--small, medium, and large.

The longest and most scientific answer : At least 17 species, with probably more to be discovered.

Some of these 17 kinds live in deep water or are rare and seldom seen. The following list includes those species that the ancient Hawaiians probably encountered regularly.

| | |
|---|----------------------------|
| Thresher shark (<i>Alopias</i> spp.) | offshore surface waters |
| Sand bar shark (<i>Carcharhinus plumbeus</i>) | shallow reefs |
| Grey reef shark (<i>C. amblyrhynchos</i>) | shallow reefs |
| Galapagos shark (<i>C. galpagensis</i>) | deeper reefs |
| Blacktip reef shark (<i>C. melanopterus</i>) | shallow reefs |
| Blacktip shark (<i>C. limbatus</i>) | offshore from reefs |
| Oceanic whitetip shark (<i>C. longimanus</i>) | offshore |
| Mako shark (<i>Isurus oxyrinchus</i>) | offshore from reefs |
| Great blue shark (<i>Prionace glauca</i>) | offshore |
| Whale shark (<i>Rhincodon typus</i>) | offshore from reefs |
| Scalloped hammerhead (<i>Sphyrna lewini</i>) | as pups in bays, estuaries |
| Reef whitetip shark (<i>Triaenodon obesus</i>) | reefs |
| Great white shark (<i>Carcharodon carcharias</i>) | reefs and offshore |
| Tiger shark (<i>Galeocerdo cuvier</i>) | reefs and offshore |

SUGGESTED ILLUSTRATIONS AND SOURCES: ("Sharks and the People of
Hawaii")

(all are color 35mm transparencies unless otherwise noted)

Ol= Ocean Images
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992A Awaawaanoa Place
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- underwater(=uw) shots of free swimming great-white sharks, tigers (Ol), grey-reef sharks (Ol, ER)
- The feather cloak of Kiwala-o (see enclosed photocopy) (BM)
- Stone shark image from Kohala, Hawaii (see enclosed photo copies) (BM) Also: this 7'8" stone is in the courtyard at B.P. B.M. surrounded by plants; it can easily be photographed.
- Hawaiian implements with teeth of white shark, tiger shark, and diverse species (LT)

- Surface shot of aggregation of grey-reef sharks with two snorkelers amongst them at Laysan Island (LT)
- Underwater shots of above (without humans) (LT)
- Underwater shot of diver hand-feeding a reef-white tip shark (ER)
- Monk seal shots; tiger sharks eating sea-birds at surface; sea turtles (GB)
- Wooden shark image from Pu'ukohola Heiau (see enclosed photocopy);
this is a black and white photo. It may be possible to get a color shot but there may be some restrictions on photographing it; ask Toni Han (BM)
- Underwater shots of divers wrangling live tigers for filming of "For Your Eyes Only" (James Bond feature film) (OI)

LEIGHTON TAYLOR & ASSOCIATES

Planning, Design and Management
Consulting to Aquariums, Museums and Zoos

Shank
File

June 8, 1989

George Balazs
NOAA-National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear George,

As usual, I am late on my correspondence but here goes anyway. Thanks very much for your note. I'm sorry I missed you on my recent trip to Hawaii, but I was pleased to read about the work of Elliot Jacobsen and your collaboration with him. Please keep me posted. I did not see the footage or the television spot that you mentioned, but the reporter did tell me that two days previous to the interview they had shot some footage of a dead whale with many sharks around it and that they were going to use that. It sounded spectacular too, but the footage you mentioned must be yet another incident

Thanks very much for the heroic pose of the conquering federal biologist from the Kridler School of Data Collection. I'd appreciate any clippings about the attack on Kauai which you referred to. Finally but most importantly, I am very excited about your suggestion of applying to OHA for a shark fishing expedition. I think the cultural aspect is very important. Do they really have the money to support that kind of research? I would be happy to involve real fishermen in the project. I've always been interested in which species were matched up to Hawaiian folklore. I've published a little bit about that but would certainly like to do more. I think the main area of sensitivity with OHA (in addition to the money) would be the idea of jeopardizing somebodies 'aumakua.

Best regards to Linda and the family.

Sincerely,



Leighton Taylor

Helping people discover Nature

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LEIGHTON TAYLOR & ASSOCIATES

Planning, Design and Management
Consulting to Aquariums, Museums and Zoos

August 22, 1989

George Balazs
NOAA - NMFS
2570 Dole Street
Honolulu, HI 96822-2396

Dear George,

Thanks very much for your letter of August 4th and your continuing enthusiasm for a "Historical Hawaiian Shark Expedition". I've been talking to Al Giddings about a number of television projects and have taken the liberty to sharing your suggestion with him. I have sent him the enclosed notes on Hawaiian sharks and told him of your interest. Enclosed is a copy of my letter to him.

The enclosed notes are for your review and might provide the basis of the pre-proposal that you mentioned, although I'm not sure how to approach the budget that you suggest. I definitely feel that interviewing or involving a person of Hawaiian ancestry would be essential, and I think we need to talk to as many people as we can. This would be an opportunity to document some oral tradition. I think Ruby Johnson could be a big help (you recall that she translated the Kumulipo recently) and may know people. Certainly the places to look would be Maui, Molokai and the Big Island. We would have to get somebody reliable and not in the Alika Cooper mold.

I'd be interested in your reaction to the enclosed notes. Thanks for providing me with your recent compilation of shark attacks. I definitely think that it should be published, however *Pacific Science* takes forever and a day. Is there some other journal that would be faster? How about the Hawaii Visitor's Bureau newsletter?!

Best regards,


Leighton Taylor

LRT:ch

Enclosures

Helping people discover Nature

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August 21, 1989

Al Giddings
Ocean Images
8001 Capwell Drive
Oakland, CA 94261

Dear Al,

Here are some additional thoughts which I hope will be helpful for the proposed shark program. They are stimulated by recent correspondence with an old friend and colleague in Hawaii, George Balazs. George is a biologist with the National Marine Fisheries Service in Honolulu and an internationally known researcher in sea turtle biology. He and I have collaborated on shark projects in the past. His special interest is in tiger sharks because of their habit of eating his turtles. When I was doing shark research in Hawaii we found that the tiger sharks we caught frequently had sea turtle in their gut Thus George learned something about shark predation and at the same time got free turtle specimens that he didn't have to kill.

Of course, both sharks and sea turtle were important to Hawaiian culture for a great variety of reasons from spiritual to food. Recently George has suggested to me that we consider co-authoring a proposal to the Office of Hawaiian Affairs to support (for lack of a better name) a "Historical Hawaiian Shark Expedition" to document the factual basis for Hawaiian legends. I think such a proposal has merit and I've assembled the attached thoughts which I've sent on to George. I also feel that these could be rich subjects for the film project you and I have been discussing, whether for Dennis Cain or for the Peter Guber project. In any case, I send them along for your interest and our future discussion.

Also for your interest, George and I have had the common project of recording shark attacks in Hawaii. He has passed along his most recent compilation—I thought you might be interested.

Best regards,

Leighton Taylor

LRT:ch

Enclosures



George Balazs
992 A Awaawaanoa Place
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May 19, 1990

Dear George,

Enclosed is the MS submitted to Honolulu Magazine and tentatively scheduled for the November issue. I would appreciate your comments, changes, additions and corrections. I've told the editor Brian Nicol that I've sent it to you for review. I've also asked Jack Randall and Roger Rose (Bishop Museum anthropologist) to look it over.

The list of suggested sources for color slides of seals, turtles, sharks and hootchy-kootchy dancers had your name on it.

Many thanks.

Sincerely,



Dear George,

July 19-89

"Hi"

"Thanks for much," for that interesting information, you sent up.

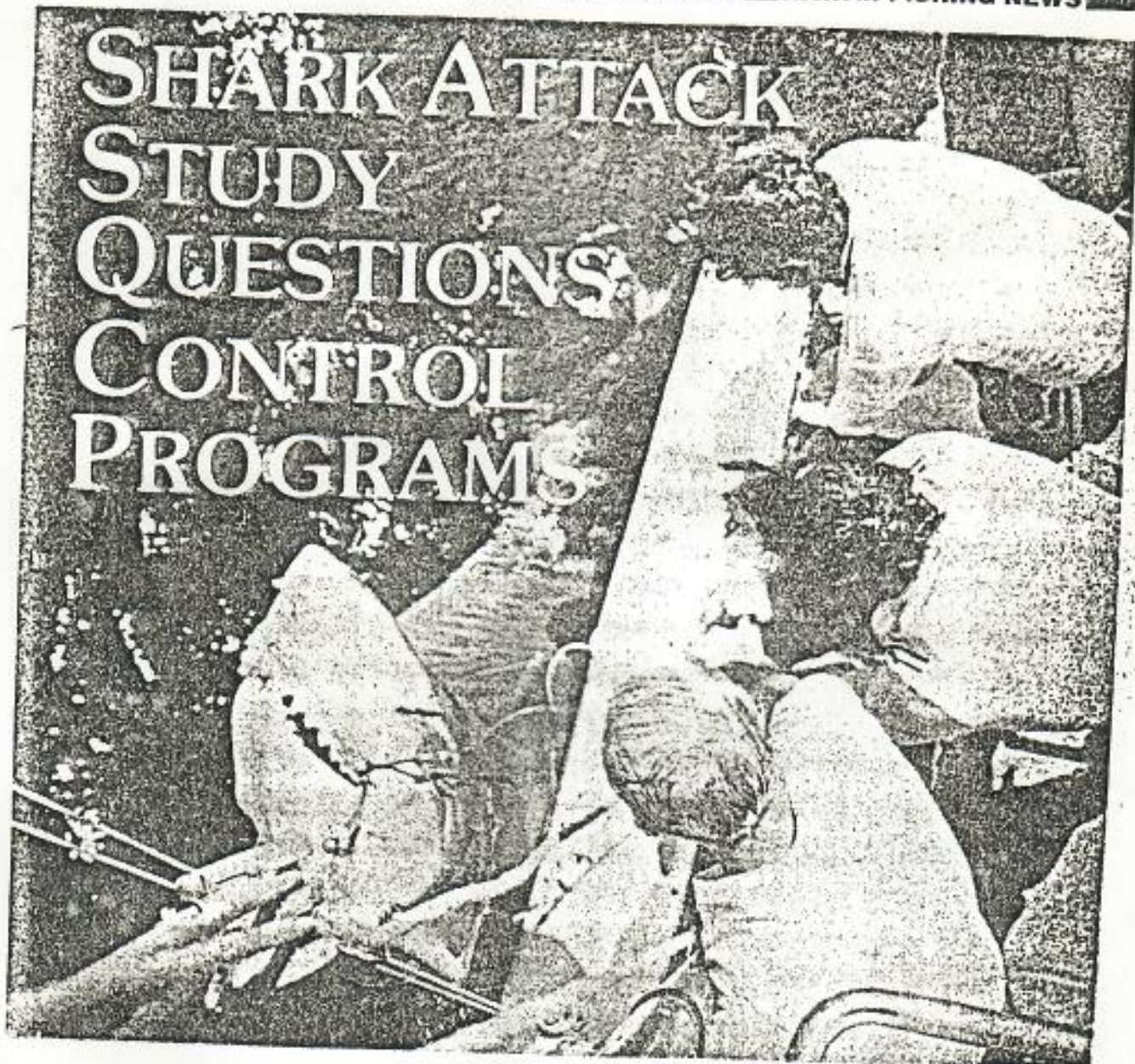
Earls shark bite occurred on Jan. 20, 1989. - ~~Earls~~; Will look forward, to a copy of his story - as soon as you write it up. — I reviewed the story, I'd given you, with Earl; and I must have misunderstood him the 1st time. ^(on this) — He only was wearing 1 fin, at the time — and the foot bitten was the naked foot. "Sorry"; he said he tore his other flippers the same day on coral.

"Much thanks" for the interest.

Much Aloha

Diane Dunnam
Diane Dunnam

SHARK ATTACK STUDY QUESTIONS CONTROL PROGRAMS



by Rick Klemm

■ Just offshore of Hawaii's coastlines, large, evil-toothed sharks wait eagerly in watery shadows for the smallest opportunities to dine on humans. Such is the kind of mythology many people seem to have about sharks. The "Jaws" movies, which have given terrifying thrills to throngs of movie-goers in recent years, exemplify the fears of the shark as a "man-eater" by exploiting them.

When the first "Jaws" movie appeared in Hawaii in the summer of 1975, an editorial in a local newspaper, citing the potential harm shark attacks could have on tourism, urged legislators to review shark control programs, which had been conducted in 1961, 1967-69, and 1971.

The editorial said, "Now that the horror of shark attacks has been brought home to thousands of islanders by the film, "Jaws," the legislators may be willing to review the (shark) control program." It continued, "Although shark attacks are not common here (in Hawaii), even a few are too many. It would only take a few well-publicized attacks to do tremendous harm to the tourist industry."

A recent study, "A Review of Shark Attacks in the Hawaiian Islands," confirms that public attitudes about the hazard posed by shark attacks may be exaggerated. What the data in the study shows is that in the period studied, shark attacks in Hawaii occurred at a rate of slightly more than one attack every two years. When compared to other hazards, including other water hazards, the hazard of shark attack appears to be a very limited one.

In contrast, for example, 325 surfing accidents occurred in a one year period alone — July 1979-to-June 1980 — near Oahu's guarded beaches. And, more than 40 civilian scuba divers in 1980 were treated for decompression sickness at the Pearl Harbor Naval Hyperbaric Facility.

The study, which appears in the April issue of "Elepaio, Journal of the Hawaii Audubon Society," was conducted by George Balazs, fishery biologist with the National Marine Fisheries Service, and Alan Kam, biological technician at the Hawaii Institute of Marine Biology. The study was funded in part by the state's Office of the Marine Affairs Coordinator and by the University of Hawaii Sea Grant College Program.

The authors concluded that: "The number of attacks in Hawaiian waters do not seem substantial," and strongly imply that shark control programs implemented for reasons of human safety may be unwarranted and may cause unnecessary harm to the marine environment. "Control programs aimed at substantially reducing the numbers of sharks have potential for adversely altering the Hawaiian marine ecosystem.

Such programs should only be undertaken when clear and proven needs exist."

In the ninety-four years, from 1886 to 1980, covered in the study, fifty-two cases of shark attack were recorded. Balazs and Kam compiled their data by searching the literature and newspaper files. In seven of the cases they found that circumstances surrounding the shark attacks could not be determined.

In the other forty-five cases, where more details were available, Balazs and Kam found that shark attacks were associated with these human activities:

- Twenty-three shark attacks were associated with fishing activities such as spearfishing and net fishing;
- Nine attacks with swimming activities;
- Eight attacks with surfing activities;
- Two attacks with scuba diving; and
- Three attacks with other activities.

More than half of the forty-five cases involved fishing activities. All of the attacks associated with surfing and scuba diving took place since 1958, as well as three of the nine attacks related to swimming.

Nineteen deaths were connected with the forty-five cases. In twelve of the deaths, the causes could not be positively determined, according to the study's authors. They surmised, however, that four deaths likely resulted directly from shark attacks, while three deaths probably resulted from drownings before attacks occurred. In the other five deaths, there was not enough information to even speculate about causes, the authors reported.

Not surprisingly, the largest number of attacks—twenty-five—occurred off Oahu, the most populous island. Sixteen of these have occurred since 1950. Since 1886, the Island of Hawaii has had ten cases of shark attack reported; Maui, eight; and Molokai and Kauai, three each. No shark attacks have been reported off the islands of Lanai, Kahoolawe, and Niihau.

In the eleven years from 1970 to 1980, eleven shark attacks were recorded in the state, two involving death. One fatality occurred at Waimea Bay, Oahu, and the other near Koloa, Kauai.

To be sure, a shark attack is a grisly thought. But, the study's data support those who believe that decisions affecting sharks should be made on reliable information, not on emotional grounds.

In his 1963 book on shark attacks worldwide, "Sharks and Survival," Dr. Perry Gilbert of Cornell University wrote, "Although it is probable that most people would regard a statement on the rarity of attacks in the statistical sense as correct and reasonable, it appears that people in general are less willing to accept a risk involving sharks than greater risks of almost any other kind."

... Rick

1977
MS THESIS
(plan B)
Dr. ^{TIM} Smith
(ADVISOR)

ESTIMATIONS OF SHARK ABUNDANCE IN HAWAII
AND SOME INFORMATION ABOUT MOVEMENT PATTERNS FOR TWO SPECIES

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Abstract

There have been four shark fishing programs in Hawaii since 1960 each employing longline fishing methods. There is enough similarity between three of the programs to allow direct comparisons of catch rates. One program from 1967 to 1969 conducted extensive fishing around the island of Oahu, and significant reductions in catch per unit effort occurred. It is possible to apply the Leslie and DeLury regression techniques of looking at declines in catch per unit effort to the Oahu data to estimate the initial population levels and q , the catchability, for two species of sharks, Carcharhinus milberti and Galeocerdo cuvier, around that island. Initial catch rates around the other islands can then be compared to those on Oahu where a population estimate is possible and densities estimated as sharks per mile of coast. The data indicates that there are at best a few thousand sandbar and tiger sharks in the vicinity of the main Hawaiian Islands and that they are very vulnerable to over-fishing. There is evidence that inter-island movement between Oahu and the other islands is negligible over short time periods of one year or so but that some along-shore movement does occur.