

Panama, South America, Europe, Russia, China, Japan, Australia, Taiwan, and the state of Hawaii (U. S. A.). Berry and Dhaliwal (1961) report it from Malaya.

Specimens have been deposited with the Division of Biosciences and Marine Studies of the University of Guam.

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TWO NONFATAL SHARK ATTACKS IN THE TRUK DISTRICT, EASTERN CAROLINE ISLANDS.¹ Shark attacks in Micronesia are believed to be far more common than previously reported. This far flung multi-island area falls under the administrative jurisdiction of the Trust Territory of the United States. Most of the indigenous peoples of the area make a subsistence living by fishing, supplemented by limited agriculture. Their primary source of protein is from their fishing. As a result, they spend a great deal of time on and in the waters around their home island reefs and lagoons. These activities

frequently bring them in contact with a number of species of potentially dangerous sharks that abound in tropical waters.

For the most part, this hardy breed of men and women show respect but little outright fear of sharks and have been observed on numerous occasions spearing fishes in the presence of sharks. They have a basic knowledge of which species constitute the greatest danger to them and a rather profound understanding of shark behavior. As will be discussed in one of the two cases below they are often aware of when an individual shark's behavior shifts from a "patrolling" to an "attack" mode. One moment they are spearing fishes among the sharks and in the next they are scrambling to safety.

Dr. Charles Jones, M. D., Chief Surgeon at Truk Hospital estimated an average of at least one attack every three months (personal communication). He suspects that there are far more attacks that go unreported. The inherent toughness of these island people and their frequent isolation both contribute to the failure of more shark attack victims to seek medical aid.

Attack in the Truk Lagoon. The Trust Territory Division of Marine Resources has at present a series of "Starfish Control Teams" operating in each District. These teams are made up of Micronesian divers and were formed in response to the recent epidemic of the coral-destroying crown-of-thorns starfish, *Acanthaster planci*. It is the responsibility of these teams to seek out and destroy, by formalin injection, large aggregations of the starfish. On September 28, 1970, one such team was working inside the barrier reef on the east side of Truk Lagoon when an attack occurred. The team of three men was diving in 34 m. of water from a boat anchored between Boquet Is. and Eli Kanibu Is. The lagoon bottom slopes steeply at this point from the barrier toward the center of the lagoon. Substratum is primarily *Halimeda* sand with a few scattered coral mounds one to two meters high. Water temperature was 29.2°C, the sea was calm, water clear, and light trade winds were blowing. Cloud cover was 5/10 or less.

The attack occurred at 10 a.m. and the victim was Mike Urumai, a 43-year-old Trukese male

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from the Island of Dublon. He was wearing white undershorts, a white long-sleeved sweat-shirt, orange life vest, black mask, and fins. He was using a chrome plated single hose regulator, galvanized SCUBA tank, and wrist depth gauge. The victim was carrying a black bang stick. There were no unusual sounds being generated by the divers and there was no blood, garbage, or other refuse in the water. His skin color is typically dark brown as in most Trukese, probably more deeply tanned due to his occupation with the Starfish Control Team.

The author interviewed all three members on Truk on January 4, 1971. Considerable time was spent looking through reference books to identify the shark. The animal was described as having white patches on the distal margins of the fins and a "big belly". This narrowed the possibilities to the lagoon white tip shark *Triaenodon obesus* (Rüppell), the white margined reef shark *Carcharhinus albimarginatus* (Rüppell), and the pelagic white tip shark *C. longimanus* (Poey). The three divers selected an illustration of *C. longimanus* from the book *Wondrous World of Fishes*. This was the most unlikely species because of its open ocean habitat. When their attention was called to the unusually elongate pectoral fins and their generally rounded tips, all three agreed that this was not the correct species. They said their attacker had pectoral fins of "normal" length which were decidedly pointed. They were quite sure that this shark was not the slender bodied *Triaenodon obesus* with which they are thoroughly familiar from daily encounters. The latter they consider unaggressive and have no fear of. They refer to *T. obesus* as the "crazy shark" (nearest translation from Trukese) because it allows them to push it around. The attacking shark was much thicker in body. Their second choice from the list of illustrations was the heavy bodied bull shark, *Carcharhinus leucas* (Muller and Henle), but they noted the lack of the distinct white fin markings. The combination of characteristics seem to best fit *C. albimarginatus*. The author has encountered this species on several occasions in Micronesia, usually in water deeper than 30 m along submarine cliffs. The victim reported seeing this species of shark once many years before when dynamiting fishes along the

inside of the barrier reef. The only other time he had seen one was recently in 37 m on the outside of the barrier near Ruac Is. It is the opinion of the author the *C. albimarginatus* was probably the attacking shark.

The shark was paired with another of the same species. The attacking shark was estimated at 1.8–2.0 m and the other at 1.2 m.

Both animals approached the divers and circled two or three times above their heads and then continued on in their original direction. The larger shark returned about one minute later, the smaller one was not seen again. The large shark came straight toward the team from above. It nosed over and came down toward Kolean Lukuche who ducked behind a coral head. The shark leveled off and headed toward Mike Urumai and Petrus Edwin. Both men noted at this point that they could tell when a shark was going to attack. They said that this shark was acting in this manner. As a result, Mike brought his bangstick to bear, and Petrus sought shelter behind him. The shark charged, jerking its head back and forth and, at the same time, rolling from side to side. They noted that the shark's back was "arched like a cat" and that it had the pectoral fins pointed downwards at a greater than normal angle. The animal opened its mouth while still two meters away at which point Mike released the bangstick on its rubber sling. The weapon struck the shark solidly on the side of the head but failed to detonate. The animal flinched but continued to bore in with mouth agape. Mike recoiled backward; turned his right shoulder toward the shark and attempted to raise his right arm to ward off the attack, but his right hand tangled in the bangstick sling and the shark struck at the raised right shoulder. Mike felt a solid blow to his shoulder but no pain as the shark passed on by. His mask was knocked off and his regulator was torn from his mouth. He groped blindly for the mouthpiece but failed to find it and was forced to make a free ascent. The shark ignored the injured man and struck this time at Petrus Edwin. Petrus was carrying a "Hawaiian sling spear" but without a sling. He "sidestepped" the shark and drove the spear through its gills. The shark then retreated with the spear still lodged in the gills.

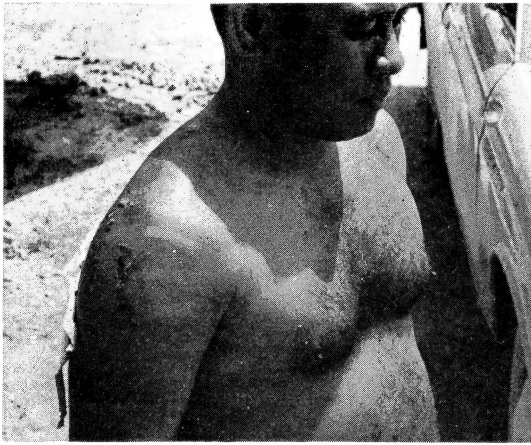


Fig. 1



Fig. 2

The team returned to Moen, Truk, where Mike was treated in Truk Hospital by Dr. Ashley Aikin. Mike's regulator hose was lacerated in several places and ruptured in at least one. His sweatshirt was shredded and his life vest torn. The actual damage to the victim occurred on the upper part of the right arm and shoulder (Figs. 1 and 2). There were about 20 or more punctures (1 cm deep) and in two rows along the inside of the right arm. The latter are presumably from lower jaw teeth and represent surprisingly little damage. The shoulder and back side of the arm were lacerated with cuts at least 1 cm deep. Eight to ten separate cuts required stitching with a total of

about 50 stitches. The victim was not considered seriously hurt, bleeding was not excessive as no major vessels were damaged. It was described as an "oozing" wound. Mike was not hospitalized, and his wounds healed in about two weeks.

The author considers it indeed fortunate that the injury was not more serious. A 1.8–2 m specimen of *C. albimarginatus* would be quite capable of shearing off an arm or at least taking a large portion of muscle tissue with a single bite. Why this did not occur may hinge on several possibilities. First, Petrus, who was hiding behind Mike, noted that in attempting to bite, the shark's lower jaw appeared to be momentarily tangled in the regulator hose. Mike is a thick bodied man and the breadth of his shoulder, toughness of the regulator hose and life vest and the thickness of his sweatshirt may all have combined to save him from further injury. In addition, Petrus noticed a great surge of bubbles of escaping air as the shark cut through the regulator hose. Air ejected at about 100 psi, hit the shark in the mouth and enveloped its head in a cloud of bubbles which might well have "startled" it enough to prevent a solid bite.

A second possibility is related to the fact that there is growing evidence that sharks may attack for reasons other than feeding. Baldrige and Williams (1969) cite evidence that sharks under some circumstances make slashing attacks with the upper jaw teeth only and do not close the lower jaw as they do when feeding. This is thought to be related to some form of aggressive behavior associated perhaps with territoriality or reproductive behavior. The wound characteristics described by Baldrige and Williams are similar to those suffered by Urumai. Of even greater significance is the fact that the "attack pattern" described to me by Urumai and his fellow divers is identical to that describe by the aforementioned authors. This I think is remarkable considering that the episode was related to me entirely in Trukese

through a Peace Corps translator. None of us were aware of the Baldrige and Williams paper at this time.

Attack at Pisarach (Pisaras), Namonuito Atoll. While conducting the interview for the above attack, I learned that another man was at that time in Truk Hospital with a shark bite. The victim in this case was Santiago Kapriel from the island of Pisarach in the Namonuito group. This atoll lies 145 km northwest of Truk proper but is part of the Truk District. The victim is a Trukese male who reckons his age at about 60. He is a fisherman by trade. On the night of December 7, 1970, he was night fishing on the inside of the barrier reef about 400 m southwest of Pisarach. He was wading in waist deep water and using a jig type of lure on a pole and line to catch squirrel fish, *Myripristis* sp. He was with another male fisherman. Neither man had lights, both were relying on moonlight to move about on the reef. There was considerable cloud cover but visibility was good. The sea was calm and clear. The fishermen were making no unusual noises and were moving quietly about their business. Both were wearing dark colored wrap around cloths, typical attire for the people of the outer islands. The shade of their skin was also dark. They each were towing stringers of fish through the water. Santiago had forty to fifty fish on his stringer.

A single shark approached the two men at about 11 p.m. The animal was seen immediately by both men, and it came straight toward Santiago. Again, both men seemed to know instinctively that the animal was in an attack pattern. Santiago immediately threw his fish toward the shark, however, the animal passed under the string of slowly sinking fish without hesitation and bore straight in, seizing the victim on the anterior portion of the thigh. As Santiago turned away from the attack, he was bitten again on the lateral and posterior portions of the thigh. The shark attacked repeatedly and the victim kicked and struck at the animal with his hands. In so doing, several fingers were bitten, and his shins were lacerated. Santiago's companion thrashed at the shark with his fishing pole and both men retreated toward Pisarach and shallow water. The shark continued to attack until the men were in

knee deep water—it continued to follow them parallel to the beach for a few minutes and then disappeared.

The victim was only able to say that this was a dark colored shark about 1.8 m long with no fin markings. The identity of the species remains unknown.

The most serious damage to the victim was the loss of integumentary and muscle tissue from the thigh. The primary wound was oval in shape and spanned the anterior portion of the thigh. It was approximately 16 cm (medio-lateral) by 12 cm (superior-inferior), and 2 or 3 cm deep at the center. The wound was still open and raw at the time of interview and the patient was scheduled for a skin graft the next morning.

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NONFATAL SHARK ATTACK, PALAU ISLANDS. On September 15, 1970 I interviewed Aisamrael Samsel of Koror, a 20-year old tan-colored Palauan male student, at the MacDonald Memorial Hospital in Koror. He had been admitted following a shark attack at 7:45 a.m. September 13, 1970.

During the interview Samsel informed me that a shark had attacked him while he was spearing fish in the company of four others in clear water about twenty feet deep on the seaward slope of the barrier reef. One of the party speared the shark which then approached Samsel at the surface. He tried to ward off