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SHARK TEETH, STINGRAY SPINES, AND SHARK FISHING IN ANCIENT MEXICO AND CENTRAL AMERICA*

STEPHAN F. DE BORHEGYI

ALTHOUGH shark teeth have been found in the course of archaeological excavations in North America (Hopewell mounds), Mexico, Guatemala, Costa Rica, and Panama, there have been few attempts to explain their significance, function, and the means by which they were obtained in pre-Columbian times. Only rarely has there been an attempt to identify the species of shark and to indicate whether it was of an Atlantic or Pacific origin.

In Mexico and Central America shark teeth have been reported from nine archaeological sites (see Fig. 1 and Table 1):

Mexico:

1. Las Flores, Tampico, (Vera Cruz)[1]
2. Cerro de las Mesas (Vera Cruz)[2]
3. La Venta (Vera Cruz)[3]
4. Mayapan (Yucatan)[4]
5. Palenque (Chiapas)[5]

Guatemala:

6. Piedras Negras (Peten)[6]
7. Nebaj (Quiche)[7]

Costa Rica:

8. Divala, Chiriqui[8]

Panama:

9. Sitio Conte, Coclé[9]

* The author wishes to express his appreciation to Drs A. V. Kidder, Gordon Ekholm, Matthew Stirling, Harry Pollock, Alberto Ruz, and Nevin Scrimshaw for their help in supplying the archaeological and nutritional data. Those who kindly provided the identification of zoölogical specimens were Drs William Dickinson, Bobb Schaefer, Clayton Ray, and Roberto Dorion.

1 Ekholm, 1944, pp. 389-390, 486, fig. 53*c'*.

2 Drucker, 1943, pp. 12-13.

3 Stirling and Stirling, 1942, pp. 641-642, and pl. 1; Drucker, 1952, pp. 26, 162, 163, 169, 196; Drucker, Heizer, and Squier, 1959, p. 272.

4 Pollock and Ray, 1957, pp. 651-652.

5 Ruz, 1958, p. 79, fig. 4, pl. 18; and pp. 88, 208, 247, figs. 11, 13-14, pls. 23, 37, 68.

6 Coe, 1959, p. 63, fig. 57*g*, and fig. 63*b*, 3.

7 Smith and Kidder, 1951, p. 54. fig. 42, no. 4, and fig. 69*d*.

8 MacCurdy, 1911, p. 43, fig. 5.

9 Lothrop, 1937, p. 22, 99, 156, 197, figs. 32-35, 129*g*, *h*, 132*a*, and 190.

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FIG. 1. Distributional map of pre-Columbian shark-teeth and stingray spine finds in Mexico and Central America. (Line drawing by Leland Tishler)

IDENTIFICATION

The various shark teeth found at the nine archaeological sites have been identified to three living and one fossil species. The fact that in the majority of cases the shark teeth were not identified in the original publication necessitated special inquiries on the part of the author. Unfortunately, many of the original specimens had been since misplaced with the result that not all the shark teeth could be identified.

1. Las Flores, Tampico: 14 small shark teeth. According to Dr Bobb Schaeffer, Curator of Vertebrate Paleontology at the American Museum of Natural History in New York, it "can be assigned to *Carcharinus sp.* without much doubt"[10] (see Fig. 4, Plate 1).
2. Cerro de las Mesas: Several unidentified teeth. Since they were never illustrated and their present whereabouts never mentioned, they could not be identified.[11]

10 Schaeffer, personal communication, 1960.
11 Stirling, personal communication, 1960.

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3. La Venta: 1 shark tooth. This tooth was difficult to identify due to the small size of the photograph. The whereabouts of the original is not known but according to William Dickinson, Curator of Fishes at the Milwaukee Public Museum, it is probably that of the Great White Shark *(Carcharodon carcharias)*.
4. Mayapan: 5 shark teeth. They have been examined by Dr Clayton E. Ray of the Museum of Comparative Zoology at Harvard. According to him, three teeth are from the Tiger or Leopard Shark *(Galeocerdo arcticus)*, one is from a Great White Shark, and one could not be identified as to species.[12]
5. Palenque: 4 shark teeth. According to Dr Roberto Llamas, Director of the Biological Institute in Mexico City, three of the teeth can be assigned to that of a tertiary fossil shark *(Carcharodon megalodon)*, while the fourth might have come from the Cub Shark *(Carcharinus lamia)*.[13]
6. Piedras Negras: 3 shark teeth. One has been identified by Dickinson[14] as that of a Great White Shark. According to Coe, the University Museum of Pennsylvania Field Catalogue lists a questionable shark tooth from Burial 2.[15] This tooth, however, was not illustrated and could not be located for reëxamination. The third tooth, listed as missing by Coe,[16] was located by the author in the Guatemalan National Museum (lot X-72) and is reproduced here as Figure 2A-1. It was first identified by Mr Roberto Dorion in Guatemala City as an upper jaw tooth, left side no. 6 or 7 of the Great White Shark. This identification has since been confirmed by Dickinson.
7. Nebaj: 54 shark teeth. These teeth have been identified as those of a Cub Shark.[17]
8. Divala: 1 shark tooth. Original specimen lost but Dickinson has assigned this tooth, on the basis of a drawing, to the Great White Shark (see footnote 8).
9. Sitio Conte, Coclé: 3 fossil shark teeth and numerous recent shark teeth. Professor Glover M. Allen of Harvard University has identified the fossil teeth as those of the *Carcharodon megalodon*. The recent shark teeth have been tentatively identified by Dickinson on the basis of photographs to Tiger Sharks with a possible intermixture of Cub Shark teeth (see footnote 9).

The same inquiries also disclosed an error. Several teeth found during archaeological excavations at Holmul, Peten, Guatemala (Catalog no. C-5618) in Group

12 Pollock, personal communication, 1960.
13 Ruz, personal communication, 1960.
14 Based on an illustration by Coe, 1959, fig. 57*g*.
15 Coe, 1959, fig. 63*b*, 3.
16 *Idem*, 1959, p. 63.
17 Smith and Kidder, 1959, p. 54.

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2, Building B, Room 2, were reported by Merwin and Vaillant as shark teeth.[18] They were reëxamined by Dr Clayton E. Ray and identified as Gray Fox teeth *(Urocyon cinereoargenteus)*.[19]

The three shark varieties represented by the archaeological shark teeth finds—Great White Shark, Cub Shark, and Tiger Shark—are well-known predators and scavengers. Although they are found more frequently in the tropical waters of the Atlantic, the Great White Shark and the Tiger Shark are also known to frequent the Pacific Ocean and the waters of Australia and New Zealand. The Cub Shark grows to a length of ten feet, the Tiger Shark ranges between 15 and 20 feet in length, and the Great White Shark may reach 40 feet. Adult specimens of the latter species range in weight between 800 and 2000 pounds (see Fig. 2).

METHOD OF SHARK FISHING

Judging by the good condition and relative abundance of these archaeological shark teeth finds, one must assume that the teeth were extracted directly from the jaws of captured sharks. Any teeth discarded naturally by the shark during its lifetime drop to the bottom of the sea. Occasionally sharks attack native dugouts and while it is possible that teeth could be retrieved from the bite mark on the boat, it is usually the tip of the tooth that breaks off rather than the whole tooth (see Fig. 3, Plate 1).

The selachian or shark-like fishes breathe by gill sacs or pouches and possess no air bladder. The result is that a dead shark sinks to the ocean bottom. Only if it dies stranded in shallow water close inshore is there a chance of retrieving it. There are recorded cases of Cub and White Sharks attacking swimmers at river mouths but both are more inclined to be pelagic.

Assuming that the sharks were captured alive in pre-Columbian times, the question arises as to how they were caught and what type of fishing gear was necessary to catch them. Unfortunately, the archaeological picture is practically blank along these lines. There are no archaeological finds or records of harpoons, fishhooks, or any other fishing implements from the Atlantic coast of Mexico. Our only clue comes from an early sixteenth century record concerning Maya fishing near Cozumel Island, Yucatan. Peter Martyr, describing the 1518 exploratory voyage of Juan de Grijalva in his *De Orbe Novo* (first printed in 1521), writes: "Off the coast of Yucatan and well on the way from the island of Cozumel, the Spaniards encountered a canoe filled with fishermen. There were nine of them,

18 Merwin and Vaillant, 1932, pl. 36g.

19 Personal communication, 1960.

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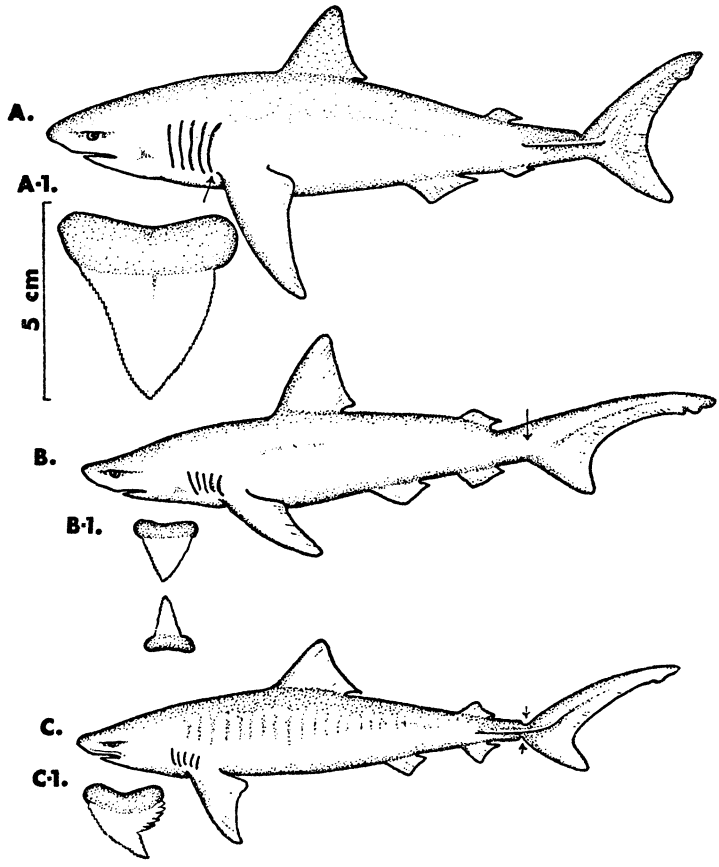

FIG. 2 Sharks referred to in this article: (Line drawings by William Dickinson)

A. Man-eater, or Great White Shark *(Carcharodon carcharias)*. Maximum length: 40 feet. All warm seas.

A-1. Upper jaw left side tooth no. 6 or 7 of Great White Shark. H: 5 cm (cf. MacCurdy, 1911, fig. 51; Stirling and Stirling, 1942, fig. opposite p. 648; and Coe, 1957, fig. 57*g*, Guatemalan Museum Cat. no. X-72, 392-210G from Piedras Negras, Guatemala.

B. Cub Shark *(Carcharinus lamia)*. Maximum length: 10 feet. Tropical Atlantic Ocean waters.

B-1. Upper and lower jaw teeth of the Cub Shark. × ½. (cf. Lothrop, 1937, fig. 129*g*; Smith and Kidder, 1951, fig. 69*d*.

C. Tiger or Leopard Shark *(Galeocerdo arcticus)*. Maximum length: 15 to 20 feet. All tropical seas.

C-1. Upper jaw tooth of the Tiger Shark. × ½. (cf. Lothrop, 1937, fig. 129*h*).

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and they fished with golden hooks."[20] According to Saville the same Juan de Grijalva later obtained by barter, among other gold objects, twenty golden fishhooks from the Indians of Potonchan, near San Juan de Ulua (today's Vera Cruz), Mexico.[21]

Lothrop illustrates a golden fishhook from Veraguas, Panama, a possible trade piece.[22] He also cites a 1502 report by Columbus' son who observed various fishing activities among the people of Veraguas, notably the use of hooks made of tortoise shell and the use of drag and dip nets. Fishhooks of gold were also known to be used on the coast of Columbia and Ecuador in pre-Columbian times.[23] If harpoons were used by the pre-Columbian native fishermen, they could very easily have been a fire-hardened bamboo type. However, a harpoon would have to be thrown with great strength to penetrate the extremely tough hide of a shark. A dainty hook-type arrangement would also have little chance of success because of the ease with which sharks break fish lines without a metal or chain leader. There is the possibility, of course, that the sharks swallowed the bait whole. Once the bait is in the stomach, the shark is very easily dominated. The ensuing pain and discomfort distracts it so that, with a steady pull, it can be brought alongside the canoe and clubbed to death with a mallet. This technique is of considerable antiquity and has been employed widely in the seas near Scandinavia, China, India, and Africa, even in modern times.

An interesting late nineteenth century account of Maya shark fishing by Edward Herbert Thompson, pioneer American archaeologist and Consul of Yucatan may shed some light on the pre-Columbian picture.[24] Some years after his arrival in Yucatan in 1885 (no exact date is given), Thompson spent a few days at the Maya fishing village of Chelem near the port of Progreso. While there he was invited to go on a fishing trip with two natives, called Nabté and Ek, who originally came to Chelem from the region of Cape Catoche in Yucatan. Setting out about four o'clock in the morning, the three pushed off for the open sea in a small dugout canoe armed only with one big oar and with hooks which "looked as if they might have been made from car couplings," and with "swivel chains, attached first to the hooks and then to long coiled ropes, which might easily have once been fastened to coupling pins." "A lance and two long objects like overgrown croquet mallets with heads of hard and heavy wood" completed the inven-

20 Peter Martyr in Saville, 1920, p. 19.
21 *Idem*, pp. 15-16.
22 Lothrop, 1950, fig. 6, p. 5.
23 Saville, 1920, p. 20.
24 E. H. Thompson, 1932, Chapter IV, pp. 28-34.

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tory of their fishing gear. Looking over this arsenal, Thompson became suspicious that they were after some unusually large fish. The following description of the shark hunt is taken directly from Thompson's book,[25] but the italics are my own.

"Look here, Nabté, what are you going to fish for today?" I asked, with somewhat affected carelessness. "Sharks, white man, sharks; the big ones that *we catch for their livers.* You came over to our place once and watched us trying them out for *oil,* huh?" And so I had. I now remembered having seen the big earthen pots and their seething contents, but the fact had not come home to me until I saw Nabté and his companion close to me in the canoe, and I realized that this was a small craft in which to hunt such big game. *A black triangular fin* that to me, sitting low in the canoe, loomed as large as the sail, was slowly circling at a distance from us. Nabté at once stood up and *threw a part of a tarpon toward it.* At the splash the dark triangle turned quickly and came toward us. A second splash and Ek had thrown *another large piece of fish, this time with one of those immense hooks embedded in it, while Nabté clutched the rope fish line.* The fin sank out of sight smoothly, without a ripple, and the canoe was twitched around so suddenly that it seemed to me my body had turned halfway round while my head was yet fixed where it was when I first saw the approaching fin. My neck ached from the shock, but I had other things to occupy my attention. The little canoe danced like a cork on troubled waters, responding lightly to jerking pulls that would have been dangerous to a clumsier, heavier craft, but even so, we were hurled and tossed and twirled about until my back was numb and my neck felt as if it were on the point of dislocation. The events of that day made me lose all respect for bucking broncos and man-eating sharks for, although the sharks discounted all record-bucking broncos, these two Cape Catoche fishermen, with their impassive chocolate faces, managed them as if they were salmon, bluefish, or even trout. When the huge creatures, longer than the canoe that carried us, were whirling, darting, and raging their worst, these fishermen were calmly discussing the locusts that were then devastating the growing corn crop. And then, when it seemed good to them, *they quietly drew the canoe up to the maddened pirate of the seas by a hand-over-hand haul on the line,* and Nabté stood up with one of the long-handled mallets. Balancing himself like an acrobat, he gave several *quick, heavy blows at a certain place on the shark's head.* The *slate-colored* monster gave one agonized convulsion that made the canoe rock until it seemed as if it must turn over and spill us out; and then it stiffened, while tremulous thrills fluttered its thick fins. With almost incredible quickness and dexterity, the *two men ripped open the livid upturned belly and with a large iron hook tore the liver out of the body and threw it into the canoe.* Then, taking the *hook out of the mouth,* by a single twist they pushed the still quivering body away from the craft; and, while I watched its huge outlines gradually become indistinct as it sank into the depths, they prepared for the next event. "*Sharks never float when they are killed,*" said Nabté; "*they sink like a piece of rock.*" *Seven monsters yielded up their lives and livers* on that fishing trip and then, with full fares and deeply laden canoe, we turned homeward.

25 *Idem,* pp. 32-34.

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It is hard to believe that the shark catch witnessed by Thompson was an isolated instance. Thompson, himself, mentioned having witnessed the boiling of shark liver in big earthen pots, for its oil content. Whether this custom of shark fishing still exists in Yucatan is unfortunately not known. Certainly the present accounts are silent about it. It may have died out after the 1930's, when commercial oils were introduced in quantity to Mexico and Yucatan. However, it should not be overlooked that two fishermen, armed with primitive fishing gear and wooden mallets, were able to catch with ease in a matter of a few hours, seven sharks longer than their own canoe. The feat suggests a well integrated and probably age-old tradition of shark fishing. Thompson is silent about the shark species they caught, but judging by the color (black fins, slate color) and size of their catch, they could easily have been Cub Sharks.

NUTRITIONAL SIGNIFICANCE OF SHARK FISHING

It may be assumed that the pre-Columbian Maya fishermen of Yucatan hunted sharks not only for their teeth, but also (or even primarily) for their livers and their meat.

In addition to the reference by Thompson, John Lloyd Stephens, in his book *Incidents of Travel in Central America, Chiapas and Yucatan,*[26] describes a shark hunt from shipboard. He goes so far as to state by hearsay that in Campeche, shark meat was "regularly in the markets and eaten by all classes."

The liver of some sharks, especially that of the Cub Shark, contains a large quantity of oil (16 percent by weight). Shark liver is well known for its very high nutritive value, for its iodine, and for its high fat-soluble vitamin content. If it formed a regular part of the diet of the pre-Columbian and nineteenth century Yucatan Mayas, we can assume that it must have played an important role in their nutritional status. In a personal communication, dated June 1, 1960, Dr Nevin S. Scrimshaw (Director of the Institute of Nutrition of Central America and Panama, in Guatemala City), noted expert on present day Maya Indian nutrition, informed the writer: "There is not the slightest question but that con-

FIG. 3 Interior view of the jaw of the Cub Shark, showing teeth pattern (25 by 25 cm) (*Carcharinus lamia*). Milwaukee Public Museum collection.

FIG. 4 13 Shark teeth (*Carcharinus* sp.). Approx. natural size. Fourteen were found as offerings in Child Burial no. 14, associated with shells, copper, etc. at Las Flores, Tampico (Vera Cruz), Mexico. Photo by American Museum of Natural History, New York.

FIG. 5 Fossil shark teeth (*Carcharodon megalodon*) and Cub Shark tooth (*Carcharinus lamia*). Found as an offering, deposited in a stone box and vase, at Palenque (Chiapas), Mexico, in the sanctuary of Temple V (Ruz, 1958, p. 247, fig. 13, and pl. 37,*b,c*). Photo by Ruz.

26 Stephens, 1841 edition, vol. 2, p. 462.

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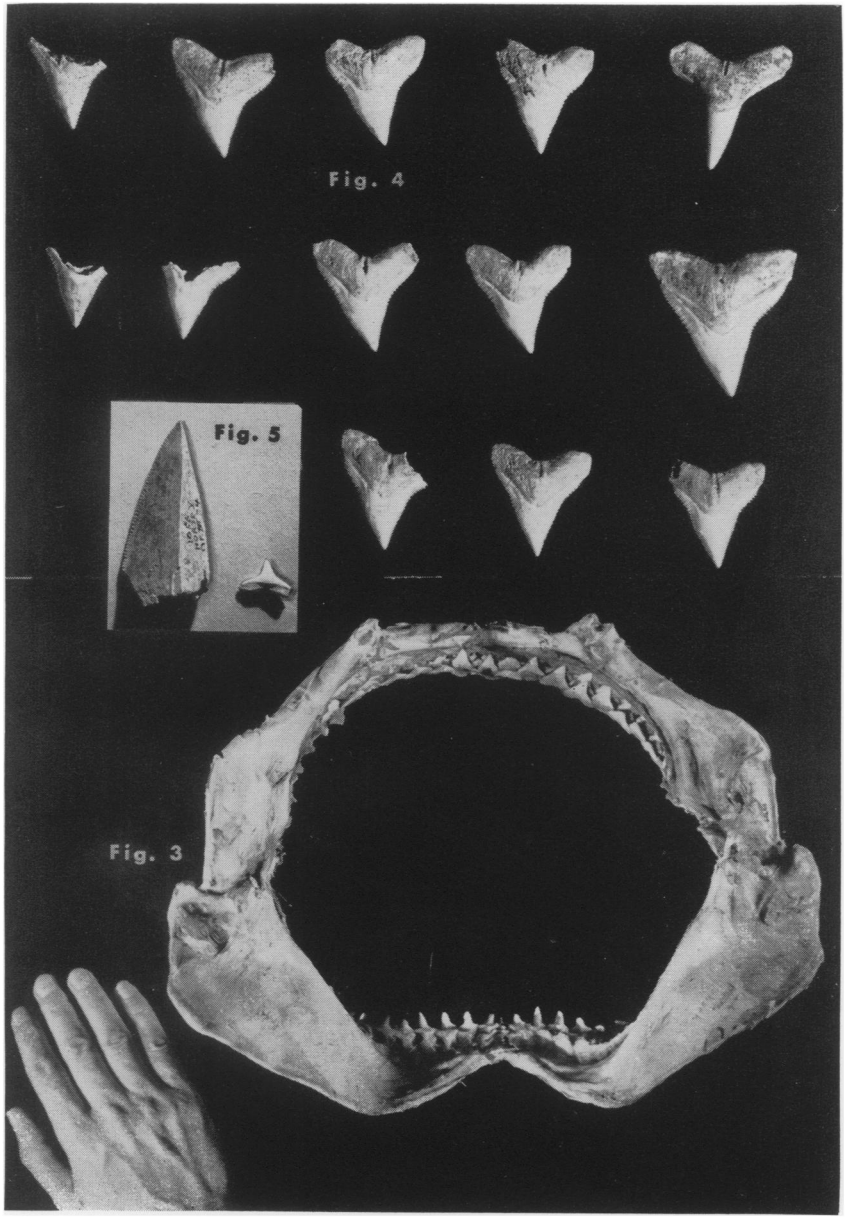

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sumption of shark's liver would be a very rich source of Vitamin D in the diet and would also make a significant contribution to the protein and B-complex content of a diet which otherwise consists primarily of corn and beans. Indeed, such a practice could well make the difference between good nutrition and poor nutrition for a population group, even if it were only a bi-weekly occurrence." In my opinion it is very likely that the consumption of shark meat and oil rich shark liver in pre-Columbian times may have helped prevent such presently known Maya health and nutritional diseases and protein deficiencies as pellagra, rickets, improper metabolism, and anemia. It may even have affected growth factors in general.[27] It is doubly regrettable, therefore, that the Spanish conquistadores, historians, and modern ethnologists have failed to observe or record instances when shark meat and liver (or oil) was consumed by Maya or Mexican natives.

ARCHAELOGICAL SIGNIFICANCE OF SHARK TEETH

There seems to be a basic difference in the utilization of shark teeth between the pre-Columbian Maya and Mexican area and that of Panama and Costa Rica.

Most of the shark teeth reported from Maya and Mexican sites were not perforated and were found either as burial offerings,[28] or as contents of offering vases and prehistoric votive caches, usually associated with other objects of a marine nature, such as sea shells, coral, sand dollars, and stingray spines.[29] This fact suggests their primarily ceremonial or votive nature. Only at one site, Nebaj, were they perforated (each tooth having two slightly conical holes) and used to adorn some sort of a headband.[30]

On the other hand, with the exception of some fossil specimens, all of the shark teeth found in Panama and Costa Rica were perforated (each tooth having one conical hole) and apparently had some definite utilitarian value. They were reportedly used as pendants for necklaces and bracelets at Sitio Conte, Coclé, Panama[31] and at Divala, Chiriqui in Costa Rica.[32]

It has also been suggested that, at least in Panama, some of the perforated

27 See Shattuck, 1938, p. 55.

28 Las Flores: in burial 14; La Venta: in the basalt columnar tomb, Monument 7; Mayapan: burial cist No. 2; Piedras Negras: in Burial 2; Nebaj: in Mound 2, Tomb 1.

29 Cerro de las Mesas: in Trench 34 (Drucker, 1943, pp. 12-13); Palenque: in caches in the Temple of the Cross; Piedras Negras: one tooth in Cache 0-13-37 (Coe, 1959, fig. 57*g*); and another illustrated here as Figure 2A-1 from one of the Structure 0-13 caches.

30 A total of 54 Cub Shark teeth in three parallel rows, the intervening spaces filled with rows of *Spondylus* shell spangles, were sewed in an overlapping shingled order to a backing presumably made of hide. This remarkable assemblage was found behind the head of Skeleton B, in Tomb 1, Mound 2 (Smith and Kidder, 1951, p. 54, fig. 42, no. 4, fig. 69*d*.

31 Lothrop, 1937, figs. 129*g*, *h*, 132*a*.

32 MacCurdy, 1911, fig. 5.

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shark teeth may even have been used for weapons.[33] Like the sharp-edged stingray spines, they were probably attached to the shaft of heavy pikes and arrows. Weapons of this type were described by Gaspar de Espinosa who saw them used by natives in the Gulf of Chiriqui, Panama, during his punitive expedition to Coiba Island in 1516. He states: "They had pikes and lances fashioned like pikes, as long and thick as those used by the Germans, studded for a distance of half a yard from the tip with the teeth of shark and other fish."[34]

The only definitely ceremonial offering in Panama consisted of three unperforated red-and-black painted fossil teeth of the extinct Giant Shark *(Carcharodon megalodon)* which, as in medieval Europe, may have been believed by the natives to contain magical properties.[35] They were found in the form of a votive deposit on the floor of Grave 26, at Sitio Conte, Coclé, associated with an incense burner, stone ear rods, large and small stone celts, and natural stone concretions.

Based on the dating of the associated burial and cache contents, shark teeth were used sparingly as votive offerings in the Mexican and Maya area throughout all archaeological periods. The shark tooth in the columnar tomb (Monument 7) at La Venta dates to the latter part of the Pre-Classic period (Construction phase IV, approximately 450-325 BC).[36] The shark teeth and shell-covered head band at Nebaj is of Early Classic date (300-600 AD). The burials and caches containing shark teeth at Cerro de las Mesas, Palenque, and Piedras Negras are from the Late Classic period (600-900 AD), while the shark teeth found at Las Flores and Mayapan are from the Early and Late Post-Classic period respectively (1100-1500 AD).

On the other hand, the numerically more abundant shark teeth in Panama and Costa Rica were utilized primarily for non-votive, non-ceremonial purposes and date only from shortly before the Spanish Conquest (approximately 1300-1400 AD).

SHARK TEETH AND STINGRAY SPINES

On examination of the literature, the author believes that there may be some hitherto unrecognized relationship between the use of the serrated edged shark teeth and the dorsal spines of the stingray. Stingray spines have been reported from thirteen archaeological sites in Mexico and Central America[37] (see Fig. 1

33 Lothrop, 1957, pp. 21-22, 99, fig. 32.

34 *Idem*, p. 14.

35 Lothrop, 1937, p. 156.

36 Drucker, Heizer, and Squier, 1959, pp. 266-267.

37 Stingray spine finds in tomb burials and structure caches are also reported but not yet published from Tikal, Peten, in Guatemala. They range from Tzakol 3 to Tepeu 2 in date (Mid and Late Classic). Occasional imitation stingray spines carved of bone have been found in Mid

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and Table 1). Of the *nine* occurrences of shark teeth from archaeological sites, *six* were associated in caches or burials with stingray spines. These sites are: La Venta,[38] Mayapan,[39] Palenque,[40] Piedras Negras,[41] Nebaj,[42] and Sitio Conte, Coclé.[43] Although the dorsal spines of the stingray may have served as "spear and arrow points" for the natives in Costa Rica and Panama, as suggested by Lothrop,[44] among the Mayas they were used as sacrificial implements in ceremonial scarifications and bloodletting—to pierce the tongue, the nose, ears, and possibly mutilate the penis.[45] The association of shark teeth with stingray spines suggests that the unperforated shark teeth from the caches and burials at Las Flores, Cerro de las Mesas, La Venta, Mayapan, and Piedras Negras, as well as the fossil shark teeth from Palenque and Coclé may have been used for similar bloodletting and penitential purposes. After use in penitential rites, shark teeth, like stingray spines, were deposited in votive caches, offering vases, or in the tombs of deceased persons.

Aside from the possibility that stingray spines and shark teeth may have been traded together from the Atlantic and Pacific coastal areas to the interior, they may even have been caught together by accident. According to the observations of a shark fisherman,[46] sharks are frequently encountered with stingray barbs embedded in their jaws. [47] The Tiger or Leopard Shark and the Great White Shark are apparently quite adept at catching stingrays. According to Dorion he found in one instance as many as three stingray barbs, or dorsal spines, in the jaws of a Man-eater Shark.

The convenience of locating stingray spines in the jaws of sharks is that they are already cleaned of any poisonous or toxic substances—in contrast to fresh specimens which can inflict those who touch them or step on them with painful and poisonous wounds, sometimes even producing dangerous necrosis of the tis-

Classic burials and structure caches (Hattula Moholy-Nagy, personal correspondence, 1961). Another unpublished stingray spine is in the Vaillant collection in the American Museum of Natural History. It is from Chiconautla, Mexico, and probably dates from the Early Post-Classic or Toltec period (Gordon Ekholm, personal correspondence, 1961).

38 Drucker, Heizer, and Squier, 1959, p. 272.

39 Proskouriakoff and Temple, 1955, pp. 327-328.

40 Ruz, 1958, p. 79, and pl. 18.

41 Coe, 1959, pp. 65-66, fig. 63*b*.

42 In fill above Tomb 1, Mound 2, Smith and Kidder, 1951, p. 57.

43 Lothrop, 1937, Grave 5, fig. 32 ***bottom***.

44 *Idem*, pp. 97-99.

45 For the association of stingray spines with the pelvic area of skeletal remains in burials, and for their distribution and ceremonial use, see Kidder, Jennings, and Shook, 1946, p. 156; Coe, 1959, pp. 64-66; also Landa in Tozzer, 1941, pp. 190-191, and fn. 1003.

46 Roberto Dorion of Guatemala City, personal communication, 1958.

47 See also Norman and Fraser, 1949, p. 43.

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sue.[48] If the pre-Columbian inhabitants of Mexico, Yucatan, Panama, and Costa Rica were capable of capturing sharks for food, oil, shark teeth, or even accidentally while fishing for some other fish, they very likely plucked the cleaned and harmless stingray spines directly from the shark's jaws.

SUMMARY

1. Shark teeth and stingray spines were used in Central America as ceremonial or votive deposits in burials and caches beginning in the Late Pre-Classic period and continuing probably until the Spanish Conquest (from about 500 BC to 1520 AD).

2. Shark teeth offerings in burials and caches were frequently associated with stingray spines and other marine products, such as *Spondylus* shells, corals, sand dollars, etc.

3. Like stingray spines, shark teeth were probably used as weapons in Panama and Costa Rica, and as ceremonial and sacrificial bloodletting implements in the Maya and Mexican areas.

4. Shark and stingray fishing in pre-Columbian times must have been fairly common on both the Atlantic and Pacific shores of Mexico, Yucatan, Panama, and Costa Rica. Shark fishing was probably done in sea-going dugouts, with the use of bait, probably on hard wood or metal (gold) hooks. The sharks were very likely clubbed to death with heavy wooden mallets. Cub Sharks, Tiger or Leopard Sharks, and Great White Sharks were probably the most frequent catches.

5. Shark teeth, stingray spines, *Spondylus* shells, and other marine products were traded from the Atlantic and Pacific shores to such inland sites as Palenque, Piedras Negras, and Nebaj and at least a portion of the pre-Columbian stingray spine supply was probably retrieved from the jaws of dead sharks.[49]

6. Shark meat and shark liver probably formed a regular part of the diet of the inhabitants of the Atlantic coastal parts of Mexico and Yucatan. The shark liver was most likely boiled in big earthenware pots to extract the nutritious oil.

7. The consumption of shark meat and shark liver oil could have supplied the natives of pre-Columbian and nineteenth century Yucatan, Vera Cruz, and Campeche with a rich source of A, D, and B-complex vitamins. This, in turn, may have prevented, at least among the coastal population, such generally known present-day health problems as pellagra, rickets, low metabolism, and anemia.

48 For killing stingrays on the coast of Yucatan with bow and arrow and for the danger of being cut by their spines, see Landa in Tozzer, 1941, p. 191.

49 For distribution of *Spondylus* shell finds in pre-Columbian Mesoamerica see Boekelman, 1935.

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TABLE 1

Distributional chart of shark teeth and stingray spine finds in ancient Mexico and Central America

Site	Shark teeth: Quan.	Shark teeth: Shark Species	Shark teeth: Nature of Find	Shark teeth: Period	Stingray spines: Quan.	Stingray spines: Nature of Find	Stingray spines: Period	References
1. Las Flores, Tampico, Veracruz MEXICO	14	*Carcharinus*, sp.	As offerings in Burial #14. With shells, copper etc. (The burial is that of a small child enclosed between 2 large bowls.) Cat. #30.2-6852	Early Post Cl.	—	—	—	Ekholm, 1944, pp. 389-390, 486 and fig. 53*c*[1] Illustrated in this paper as Fig. 4
2. Cerro de las Mesas, Veracruz MEXICO	"S"	Unidentified	In Trench #34. With offerings in open tripod vessels (vessels are covered with bowls as lids)	Late Cl.	—	—	—	Drucker, 1943, pp. 12-13
3. La Venta, Veracruz MEXICO	1	Great White Shark (*Carcharodon carcharias*)	In basalt columnar tomb, Monument #7. Found in association with jade figurines, beads, clay earspools, obsidian ornaments, etc.	Late Pre-Cl.	6	Perforated specimens. In same tomb. Monument #7. Probably used as a necklace.	Late Pre-Cl.	Stirling and Stirling, 1942, pp. 641, 642, and pl. 1 opposite p. 648 Drucker, Heizer and Squier, 1959, p. 272 Drucker, 1952, pp. 26, 162,163,169,196
4. Mayapan, Yucatan MEXICO	2	Tiger shark (*Galeocerdo arcticus*)	As offerings (?) in a vessel. In a presumed residence of the nobility. Cat. #54-68. Lot A-95	Late Post-Cl.	—	—	—	Thompson, 1954, p. 75, and fig. 2*j* Pollock and Ray, 1957, pp. 651-652
"	—	—	—	—	1	In an undisturbed cache in Str. Q-151. With other offerings. In a redware pot. Lots C-85*a, b, c*	Late Post-Cl.	Shook and Irving, 1955, p. 152, fig. 2*e*, and p. 144, fig. 2*c*A Pollock and Ray, 1957, pp. 651-652

Note: "S" in the quantity column means *several*. The exact quantity is not given in the publication.

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TABLE 1 (continued)

Distributional chart of shark teeth and stingray spine finds in ancient Mexico and Central America

Site	Shark teeth: Quan.	Shark teeth: Shark Species	Shark teeth: Nature of find	Shark teeth: Period	Stingray spines: Quan.	Stingray spines: Nature of find	Stingray spines: Period	References
4. Mayapan, Yucatan MEXICO	1	Great White Shark (*Carcharodon carcharias*)	In a residential mound, Str. R-86*a*. With iguana bones. Cat. #55-81. Lot A-233	Late Post-Cl.	—	—	—	Proskouriakoff and Temple, 1955, pp. 312, 325, 339, 362*a*, and fig. 24*a*
"	1	Unidentified as to species.	As an offering. From Burial Cist #2 in Str. R-86, Lot A-191	Late Post-Cl.	1	In same cist, Burial Cist #2, in Str. R-86, Lot A-191	Late Post-Cl.	Proskouriakoff and Temple, 1955, pp. 327-328 Pollock and Ray, 1957, p. 652
"	1	Tiger shark tooth	From Cache 3, Lot A-208	"				Proskouriakoff and Temple, 1955, p. 328
"	"S"	Several vertebrae fragments. Misidentified as shark vertebrae	In a pit from a house mound. Str. K-52*a*. With shells, sherds, and pounding stones. Lot A-82	Late Post-Cl.	—	—	—	Smith and Ruppert, 1953, p. 195, fig. 8*e* Pollock, personal communication, 1960
"	—	—	—	—	"S"	Several spines in 7 different lots. From burials and caches	Late Post-Cl.	Pollock and Ray, 1957, p. 652
5. Palenque, Chiapas MEXICO	—	—	—	—	4	*Myliobatis*, sp. fossil. Offering No. 1. From Temple of the Cross. With shells and pearls	Late Cl.	Ruz, 1958, p. 79, figs. 4*h*, h*l*, and pl. 18*a*
"	1 7	Fossil shark tooth and 7 shark vertebrae (*Carcharodon megalodon*)	Offering No. 2. From Temple of the Cross	Late Cl.	1	*Myliobatis*, sp. fossil. Offering No. 2. From Temple of the Cross	Late Cl.	Ruz, 1958, p. 79, fig. 4*i*, and pl. 18, *b*, *c*, *d*

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TABLE 1 (continued)

Distributional chart of shark teeth and stingray spine finds in ancient Mexico and Central America

Site	Shark teeth: Quan.	Shark teeth: Shark Species	Shark teeth: Nature of find	Shark teeth: Period	Stingray spines: Quan.	Stingray spines: Nature of find	Stingray spines: Period	References
5. Palenque, Chiapas MEXICO	1	Fossil shark tooth. *(Carcharodon megalodon)*	As an offering. In a bowl covered with a vase. From Temple of the Foliated Cross	Late Cl.	—	—	—	Ruz, 1958, p. 88, figs. 11*d*, d^1, and pl. 23
"	1 1	Fossil shark tooth *(Carcharodon megalodon).* Cub shark tooth *(Carcharinus lamia)*	As an offering. In a stone box and vase. From Temple V. North Group. Offering No. III, in sanctuary	Late Cl.	—	—	—	Ruz, 1958, p. 247, fig. 13, and pl. 37, *b, c* Illustrated in this paper as Fig. 5, Plate 1
"	—	—	—	—	1	Fossil stingray spine. From Tomb III in Templo del Conde. (Badly corroded specimen)	Late Cl.	Ruz, 1958, p. 208, fig. 14*v*, and pl. 68*m*
6. Pomona BRITISH HONDURAS	—	—	—	—	9	From Tomb I. With shells, jade, pottery, etc.	Early Cl.	Kidder and Ekholm, 1951, pp. 128-129
7. Holmul, Peten GUATEMALA	"S"	Mistakenly illustrated as shark teeth. They are jaw bones of Gray Fox *(Urocyon cinereoarganteus)*	Bldg. B, Group II, Room 2. Cat. #C-5618	—	"S"	With skeletons 1, 2, 5, 16. In Bldg. B, Group II. One barb (with skel. #5) has glyphic inscriptions. Many were near pelvic area	Proto-Cl. and Early Cl.	Merwin and Vaillant, 1932, pp. 31, 32, 37, 89 and 90; pl. 36*g* shark teeth; identified by Clayton Ray in 1960 as jawbones of the Gray Fox *ibid.*: pl. 34*d*, 36*e* and fig. 30*b* (stingray barbs)

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TABLE 1 (continued)

Distributional chart of shark teeth and stingray spine finds in ancient Mexico and Central America

Site	Shark teeth: Quan.	Shark Species	Nature of find	Period	Stingray spines: Quan.	Nature of find	Period	References
8. Uaxactun, Peten GUATEMALA	—	—	—	—	19	In various burials and caches (frequently near the pelvic area)	Early Pre-Cl. Early Cl. and Late Cl.	Kidder, 1947, p. 59, fig. 75. R. E. Smith, 1937, figs. 8 and 14. Ricketson and Ricketson, 1937, pp. 205-206, and fig. 134*a*
9. Piedras Negras, Peten GUATEMALA	1	Great White Shark tooth *(Carcharodon charias)* (?)	From Cache O-13-37. Cat. #E-1-42	Late Cl.	—	—	—	Coe, 1959, p. 63, fig. 57*g*
"	1	Unidentified	From Burial #2. Near pelvic area, with stingray spine, shell disks, beads, ornaments and jadeite beads	Late Cl.	1	From Burial #2. Near pelvic area	Late Cl.	Coe, 1959, p. 63, fig. 63*b*, 3-4
"	1	Great White Shark tooth *(Carcharodon charias)*	From Cache in Str. #O-13. Guatemala National Museum Cat. #392-210G. Lot X-72	Late Cl.	—	—	—	Illustrated in this paper as Fig. 2
"	—	—	—	—	"S"	Most of them in burials and caches in Str. #O-13, *a*. Near pelvic area in Burial #5	Early Cl. and Late Cl.	Coe, 1959, pp. 64-67, fig. 55*c*, *f*, and fig. 56 (with hieroglyphic inscriptions)

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TABLE 1 (continued)

Distributional chart of shark teeth and stingray spine finds in ancient Mexico and Central America

	Shark teeth				*Stingray spines*			
Site	*Quan.*	*Shark species*	*Nature of find*	*Period*	*Quan.*	*Nature of find*	*Period*	*References*
10. Nebaj, Quiché GUATEMALA	54	Cub Shark (*Carcharinus lamia*) teeth (perforated)	From Tomb I, in Mound 2. With *spondylus* shell spangles. Found behind head of male Skeleton "B." Headband decoration (?)	Early Cl.	2	From the fill above Tomb I, in Mound 2	Early Cl.	Smith and Kidder, 1951, pp. 54, 57, fig. 69*d* and fig. 42, no. 4
11. San Augustin Acasaguastlán, El Progreso GUATEMALA	—	—	—	—	4	In pottery offering-box, below Tomb I, in Str. 24. With lizard bones, obsidian, etc.	Late Cl.	Smith and Kidder, 1943, pp. 145, 170, and fig. 41*c*
12. Kaminaljuyu, Guatemala GUATEMALA	—	—	—	—	7	From Tomb II, in Mound E-III-3. Near pelvic area of Skeleton #1	Late Pre-Cl.	Shook and Kidder, 1952, p. 117, and fig. 15, no. 158
"		—	—	—	40	From Mounds A and B; 4 tombs. Several found near pelvic area of skeletons	Early Cl.	Kidder, Jennings and Shook, 1946, p. 156, and fig. 26, no. 66, fig. 27, no. 28, fig. 29, no. 50, and fig. 31
13. Copan, Copan HONDURAS	—	—	—	—	"S"	From Tomb II and in caches under Stelae M and I	Early Cl. and Late Cl.	Longyear, 1952, pp. 43, 51, 112, fig. 109*i*
14. Tazumal EL SALVADOR	—	—	—	—	"S"	From various burials	Cl.	Coe, 1959, p. 63

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TABLE 1 (continued)

Distributional chart of shark teeth and stingray spine finds in ancient Mexico and Central America

Site	Shark teeth: Quan.	Shark teeth: Shark Species	Shark teeth: Nature of Find	Shark teeth: Period	Stingray spines: Quan.	Stingray spines: Nature of Find	Stingray spines: Period	References
15. Divala, Chiriqui, Province COSTA RICA	1	Great White Shark tooth (*Carcharodon carcharias*) (perforated tooth)	From a burial	Post-Cl.	—	—	—	MacCurdy, 1911, p. 43, fig. 51
16. Sitio Conte, Coclé PANAMA	3	Fossil shark teeth, (*Carcharodon megalodon*) (Teeth are painted red and black)	From Grave #26. In an association with an incense burner, stone concretions, stone ear rods, and stone celts	Post-Cl.	—	—	—	Lothrop, 1937, p. 197, fig. 190 and fig. 29
"	"S"	A mixture of teeth of the Cub Shark (*Carcharinus lamia*) and Tiger Shark (*Galeocerdo arcticus*)	From burials. Used as necklaces or bracelets	Post-Cl.	—	—	—	Lothrop, 1937, pp. 99, 156, fig. 132*a* Tiger Shark: fig. 129*h* Cub Shark: fig. 129*g*
"		A mixture of teeth of the Cub Shark (*Carcharinus lamia*) and Tiger Shark (*Galeocerdo arcticus*) (perforated teeth)	From burials (Grave #32, etc.). Mixed with stingray spines. Probably used as arrow-points or spike-heads	Post-Cl.	"S"	From burials (Grave #32, etc.). Mixed with shark teeth. Probably used as arrow-points or spike-heads	Post-Cl.	Lothrop, 1937, pp. 22, 97-99, figs. 32 to 35.

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TABLE 2

Distributional chart of shark teeth and stingray spine representations in ancient Mexico and Central America

Site	Shark representations: Quan.	Shark representations: Type of representation	Shark representations: Period	Stingray spine representations: Quan.	Stingray spine representations: Type of representation	Stingray spine representations: Period	References
1. La Venta, Veracruz MEXICO	—	—	—	1	Perforated, stingray spine reproduction. Made of translucent green jade. In a necklace made from 6 actual stingray spines. Found in basalt columnar tomb, Monument #7.	Late Pre-Cl.	Stirling and Stirling, 1942, p. 641, and pl. 1 opposite p. 648 Drucker, 1952, pp. 162, 163, 169
2. Caleta de Ak, Quintana Roo MEXICO	1	Pottery shark figurine. From a trench in front of an altar platform	Late Post-Cl.	—	—	—	Sanders, 1955, p. 203
3. Chichen Itza Yucatan MEXICO	—	—	—	"S"	Stingray representations. On Chacmool murals along with other aquatic forms	Early Post-Cl.	Morris, Charlot, and Morris, 1931, p. 471, and pl. 139 and 159
4. Santa Rita BRITISH HONDURAS	"S"	Small pottery vessels and figurines, in the shape of sharks. From Mounds 2 and 6. With other animal figures, such as tigers, turtles, etc.	Post-Cl.	—	—	—	Tozzer and Allen, 1910, p. 307, pl. 6, fig. 9 Gann, 1897-1898, pl. 34, figs. 1, 3, 4, 7; pl. 35, fig. 2, and pp. 680-685
5. Seibal, Peten GUATEMALA	—	—	—	1	An enormous stingray barb (?) (or sawfish rostrum?), used as spearhead in right hand of bearded individual depicted on Stela #1		Maler, 1908, p. 14, pl. 3, fig. 1 Coe, 1959, p. 66

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TABLE 2 (continued)

Distributional chart of shark teeth and stingray spine representations in ancient Mexico and Central America

Site	Shark representations: Quan.	Shark representations: Type of representation	Shark representations: Period	Stingray spine representations: Quan.	Stingray spine representations: Type of representation	Stingray spine representations: Period	References
6. Alta Gracia, Omotepe Island, Lake Nicaragua NICARAGUA	1	Shark-like monster. Represented as an effigy handle, on top of conical, incense-burner cover	Post-Cl.	—	—	—	Lothrop, 1926, pp. 252-253, and fig. 142
7. Sitio, Conte, Coclé PANAMA	2	Polychrome shark-effigy jars (spouted). From Grave #26	Post-Cl.	"S"	Polychrome and "smoked-ware" effigy and painted vessels. From various graves and caches (Graves 5 and 19; Cache #28)	Post-Cl.	Lothrop, 1942, pp. 113-115. Sharks: figs. 214*a, b*, 285*a*, and 485. Rays: figs. 97*b*, 213, 215 and 328.
	1	Black-and-white on red-ware cup. From Grave #58					
"	—	—	—	1	Imitation stingray spine. Carved of bone	Post-Cl.	Lothrop, 1937, p. 201, fig. 199
8. Southern Veraguas PANAMA	5	Gold pendants. In the form of shark-like fishes	Post-Cl.	—	—	—	Lothrop, 1950, pp. 66-67, figs. 103 and 104
9. "	1	Polychrome pottery bowl. Probably representing a Hammerhead Shark, from Parita	Post-Cl.	1	Polychrome pottery bowl, from Parita	Post-Cl.	Lothrop, 1942, p. 297, figs. 443, *a, b*
10. Colombia SOUTH AMERICA	6	Imitation shark teeth (perforated). Cast in solid gold. In the Museum of the American Indian, Heye Foundation	Post-Cl.	—	—	—	Lothrop, 1937, p. 156, fig. 133

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8. The shark as a mythological monster may have played a more important role in Maya religious life than previously supposed. The monster animal associated with the day *Muluc* was the *xoc* (or *xooc*) which, according to the Vienna dictionary, was a species of shark. The same *xoc* also played an important role in the prophecies in the Chilam Balam of Tizimin,[50] and in the Maya glyphic and rebus writing and counting system.[51] There is even a possibility that the Mexican "Earth-monster," the *cipactli* (or "alligator-fish") was originally a shark.

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50 J.E.S. Thompson, 1950, pp. 162, 163.

51 *Idem*, 1944, pp. 15-17 and fig. 1*g-j*.

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