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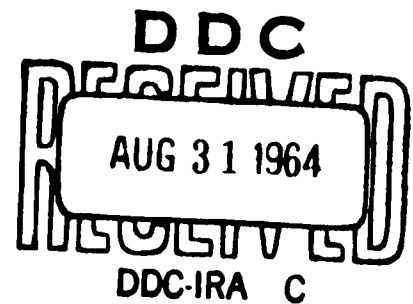
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# **SHARKS and SURVIVAL**

## *Chapter 15* **Attacks by Sharks as Related to the Activities of Man**

By Leonard P. Schultz



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## *Chapter 15* **Attacks by Sharks as Related to the Activities of Man**

By Leonard P. Schultz<sup>1</sup>

AT THE NEW ORLEANS SHARK SYMPOSIUM in April 1958, it was decided that shark attacks on man should be documented on a worldwide basis, and that the Smithsonian Institution was a logical place for maintaining such a file. This study was implemented by a contract between the Office of Naval Research and the Smithsonian Institution (Contract Number NONR 1354(07)).

We searched through many publications, old newspaper files, and other sources where accounts of shark attacks occur. Also, subscriptions to news clipping services resulted in excellent current coverage. These were followed up by writing for information to private individuals, scientists, hospitals, medical doctors, police departments, and divers' clubs. They supplied information by filling in the form prepared for recording shark attacks and also furnished photographic copies of records under their supervision. The shark-attack form, distributed to those with an interest in this subject, is herewith reproduced so that every reader will know what data we needed for this study.

Among 1004 shark attacks, in only about 40 was it possible to obtain a positive identification of the kind of shark. However, strong circumstantial evidence indicated the kind involved in many other attacks in which sharks were caught with parts of human bodies in their stomachs. If photographs were made of the shark, with samples of their teeth preserved and sent to ichthyologists, positive identifications could be made in many additional instances.

We urge that, whenever possible, at least several teeth be saved from sharks involved in attacks on man and on boats. Shark teeth are sometimes found embedded in wounds and are frequently found in the wood of boats. The teeth should be collected and forwarded by mail to the Smithsonian Institution, along with one of the completed reporting forms. All such information and specimens would then become part of the documentation for shark attack studies.

<sup>1</sup> Smithsonian Institution, Washington, D. C.

Form Approved  
Budget Bureau  
#105-R004

The Smithsonian Institution is seeking information for a documented file on shark attacks.  
Please fill in this form and return to:

Division of Fishes  
Museum of Natural History  
United States National Museum  
Smithsonian Institution  
Washington D. C., USA 20560

Victim's name and address: Age \_\_\_\_\_ Sex \_\_\_\_\_ Date \_\_\_\_\_

\_\_\_\_\_ Depth of attack \_\_\_\_\_ Time of day \_\_\_\_\_

\_\_\_\_\_ Temperature: Water \_\_\_\_\_ Air \_\_\_\_\_

\_\_\_\_\_  Bright sun  Cloudy

Distance from shore: \_\_\_\_\_ Water condition:  Clear  Murky

Was victim's body fully clothed:  Yes  No Color of clothing: \_\_\_\_\_

Color of exposed skin:  Light  Tan  Dark

Occupation of victim: \_\_\_\_\_

Locality of attack: \_\_\_\_\_

\_\_\_\_\_

Kind of shark: \_\_\_\_\_ Identified by: \_\_\_\_\_

Number of sharks involved: \_\_\_\_\_

Photographs:  Yes  No Photographer's name: \_\_\_\_\_

Address: \_\_\_\_\_

If hospitalized, name of Hospital: \_\_\_\_\_ Victim's recovery:  Yes  No

Address: \_\_\_\_\_

Name of attending physician: \_\_\_\_\_

Address: \_\_\_\_\_

Names and addresses of witnesses:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(over)

Description of attack: (Describe behavior of shark and victim, both before and after attack; nature of injury, bleeding, rescue and subsequent treatment; use additional pages if necessary.)

*(Space for description)*

Source of above information: \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

Address \_\_\_\_\_

During the next few years, additional information will be accumulated on this subject, which may make it possible to determine the general characteristics of shark attacks and the pattern of events occurring in connection with an attack. Perhaps it will be possible to make suggestions from the data accumulated to aid in the protection of swimmers and divers.

We prepared from our files a tabulated list of shark attacks (see appendix). Each case was given a number for identification purposes, and essential information is cross-indexed, such as name of victim, date, locality, and kind of shark.

We define a case as the unit of attack, which involved one or more victims and one or more sharks and which happened at a given locality around a limited period of time and as a single incident.

We carefully tabulated the latitude and longitude of most of the unprovoked shark attacks, at least as far as feasible, to an accuracy of better than plus or minus 10', and in most instances to plus or minus 1'. The data from these tabulations were plotted on sketches of maps of the more important areas where sharks attack swimmers. See Fig. 1 to 4 as follows: 1. World distribution of dangerous sharks and shark attacks; 2. Australia and Tasmania; 3. Africa; 4. East Coast of North America, Gulf of Mexico, and Caribbean. West Coast of North and Central America.

Each of these figures records the number of shark attacks occurring in each rectangular area bounded by 5° of latitude and 5° of longitude.

Undoubtedly, there have been hundreds of shark attacks in the Indo-Pacific and the Atlantic and elsewhere about which we have no record. Thus our knowledge for many regions is necessarily meager. We have not as yet been able to search the records of our defense department for attacks on aviation accidents and sea disasters.

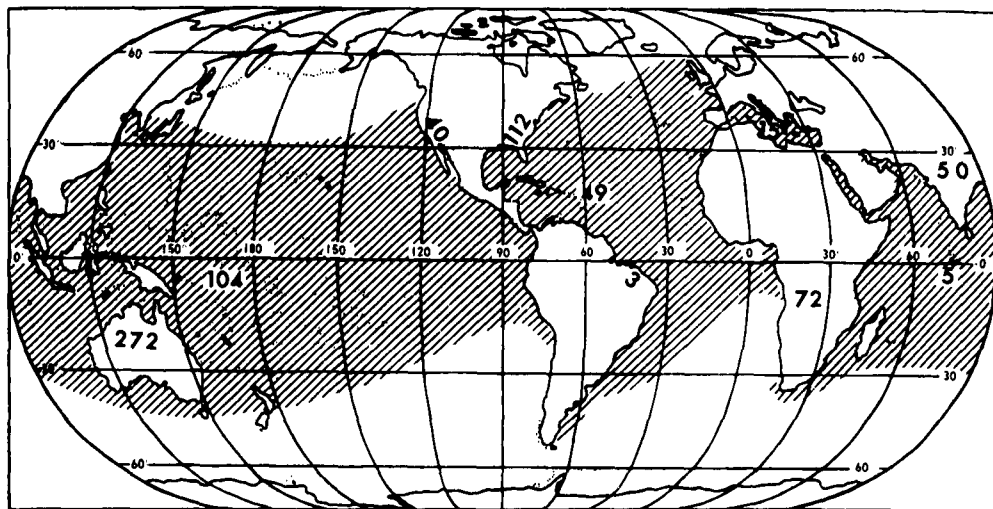
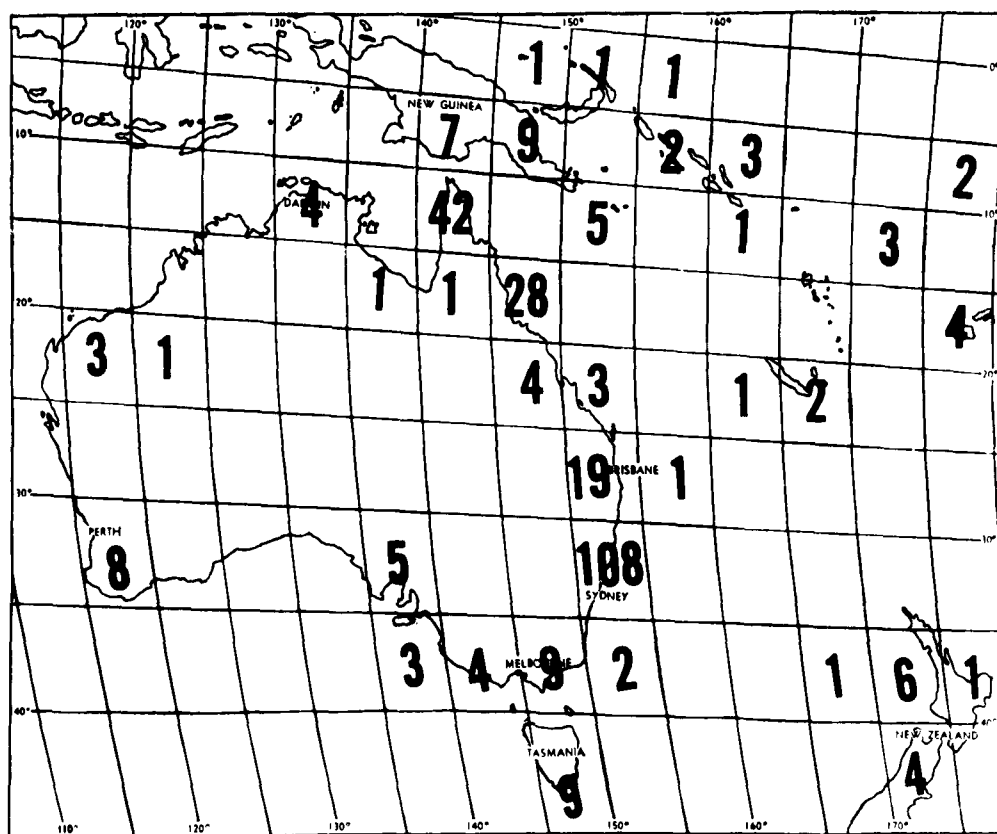


Fig. 1 Lined area shows the general distribution of dangerous sharks; large black figures indicate the number of unprovoked shark attack cases recorded in files of the Smithsonian Institution up to January 31, 1962.

Fig. 2 Numbers in each square of 5° latitude and longitude represent the number of unprovoked shark attack cases in our files on January 31, 1962, for vicinity of Australia, Tasmania, New Zealand, and New Guinea.



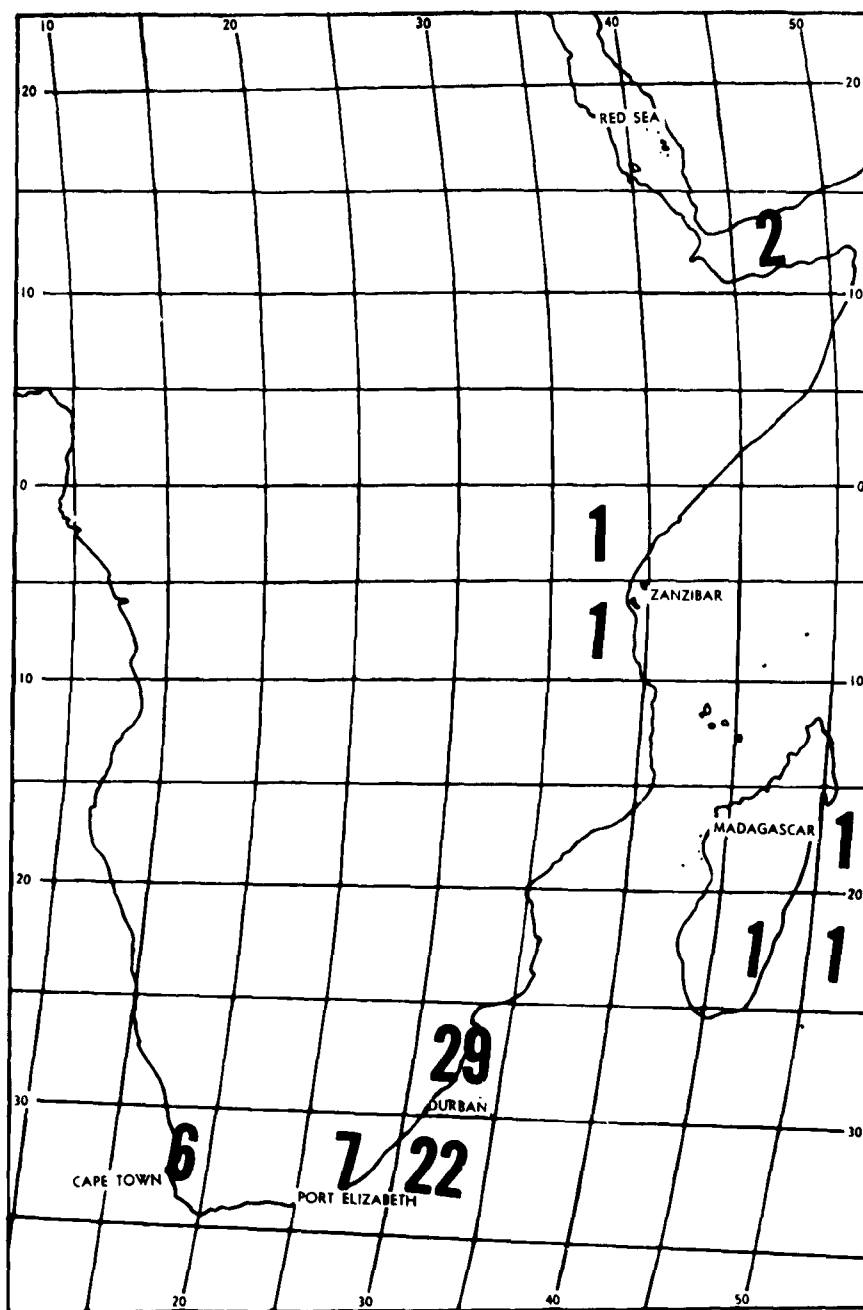


Fig. 3 Numbers in each square of 5° latitude and longitude represent the number of unprovoked shark attack cases in our files on January 31, 1962, for vicinity of eastern and southeastern Africa and Madagascar.



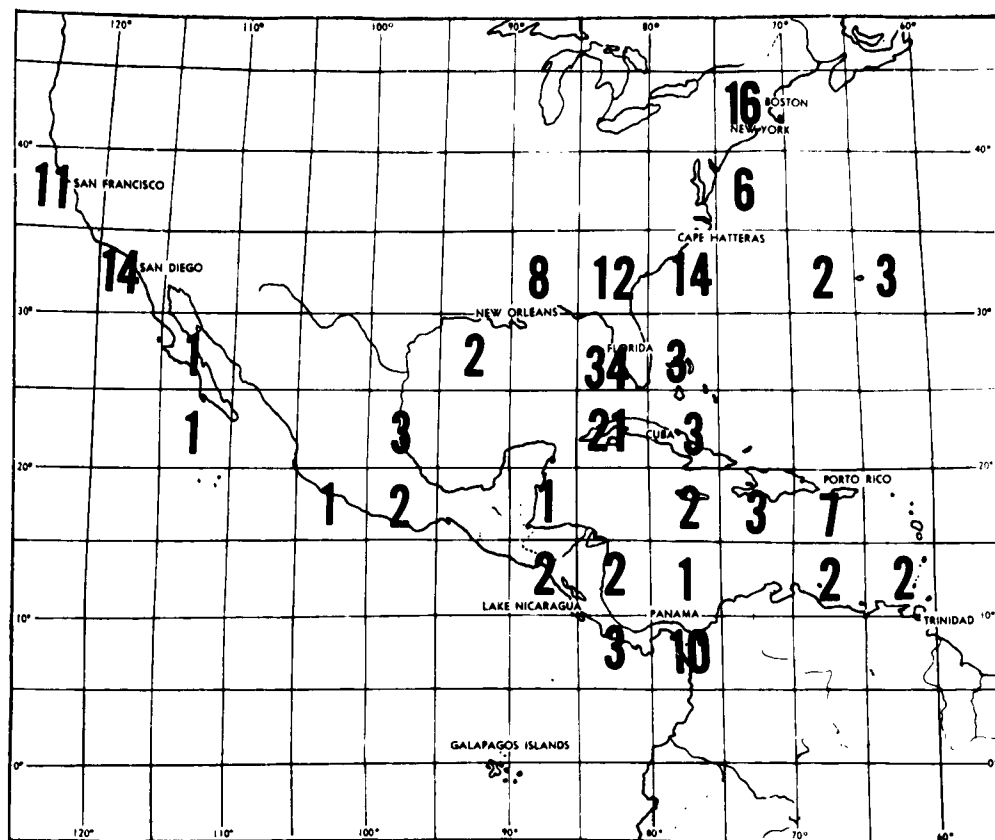


Fig. 4 Numbers in each square of 5° latitude and longitude represent number of unprovoked shark attack cases in our files on January 31, 1962, for North and Central America and the West Indies.

In the tabulation that follows, we set up certain categories for the various kinds of shark attacks.

1. *Unprovoked Shark Attacks* This includes all cases in which "unprovoked" sharks have made physical contact with the victim or the gear he is wearing (Table 1).

2. *Provoked Attacks* This includes all cases in which a shark was caught, trapped, speared, injured, or in some way provoked and then attacked the victim. (Although the use of the terms "unprovoked" and "provoked" raises questions about the separation of attacks into two such categories, we believe it is important to distinguish between the two kinds because it emphasizes what sharks may do when annoyed or injured.)

3. *Boat Attacks* This includes all cases in which an unprovoked or provoked shark deliberately made physical contact with a boat, life raft, water ski, or equipment being used in the operation of a boat.

4. *Air and Sea Disasters* This category includes all cases in which unprovoked sharks have eaten or mutilated victims of such disasters, but there may not be any way of knowing whether the victims died before being attacked or as a result of the shark attack.

**Table 1**  
**SUMMARY OF NUMBER OF SHARK ATTACK CASES FOR THE**  
**WORLD, BASED ON DOCUMENTED SHARK-ATTACK FILE IN**  
**THE DIVISION OF FISHES, SMITHSONIAN INSTITUTION**

LOCALITIES	KINDS OF SHARK ATTACKS					TOTALS
	BOAT	DOUBTFUL	PROVOKED	AIR AND SEA DISASTERS	UNPROVOKED	
Africa	4	2	3	1	72	82
Asia	—	—	—	—	50	50
Atlantic Ocean	8	5	9	24	49	95
Australian region	54	28	25	1	272	380
Europe	1	—	2	—	—	3
Indian Ocean	1	—	—	2	5	8
Mediterranean Sea	—	—	—	1	15	16
North America:						
East Coast	24	13	13	3	112	165
West Coast	6	8	10	3	40	67
Pacific Ocean	3	6	3	19	104	135
South America:						
East Coast	—	—	—	—	3	3
<b>TOTALS</b>	<b>101</b>	<b>62</b>	<b>65</b>	<b>54</b>	<b>722</b>	<b>1004</b>

*5. Doubtful Attacks* This includes all cases in which unprovoked sharks have approached swimmers but failed to make physical contact with them; it also includes cases reported as shark attacks but which subsequent investigations tended to discredit or place in doubt, or where it was found that the victim was dead before being mutilated by a shark.

Because of the large number of cases, it is not possible to publish here all the details of each attack. However, all available photographs, letters, and signed statements are on file for each case.

The numerous cases assembled in the documented shark-attack file in the Smithsonian Institution were segregated into geographical regions, and then the data for each case were summarized and tabulated. By using these tabulations, we analyzed the recorded facts and factors that were common to many attacks as part of the constant search for clues to what stimulates predatory sharks to bite swimmers, divers, and those wading in shallow water or otherwise entering the habitat of sharks.

In the following analysis, we were reasonably careful to exclude unreliable data because we are well aware that documentation grades from excellent to poor. The latter type of information usually includes only locality, year, and sometimes the name of the victim, obtained through newspaper accounts. Therefore, although we studied 722 unprovoked attacks, we may have reliable information for only 75 individuals. In the paragraphs below, we give the number of instances for which the information appears reliable.

The peak period for bathing is during the daylight hours from 8:00 a.m. to 7:00 p.m., which corresponds with the period of the day when most shark attacks occurred. Our records (Table 2) show that most attacks occur from about 10:00 in the forenoon to 6:00 in the afternoon; this was based on 187 instances in which the time of attacks was carefully recorded. When our data are expressed in percentages, we find that from midnight to 6 a.m. only 2.7% of the attacks occurred; from 6:00 a.m. to noon, 25.1%; from noon to 6:00 p.m., 64.2%; and from 6:00 p.m. to midnight, 8.0%.

We pointed out above that most of the shark attacks occurred from 10 a.m. to 6 p.m., presumably the peak period for swimming. Actually, our figures indicate that 94.6% of all attacks occur during daylight hours from 5:00 a.m. to 7:00 p.m. in warm regions, whereas only 5.4% occur during darkness.

One may ask for comparative percentages of nighttime and daytime swimmers. Although we have no data on that point, we believe that the percentage of night swimmers is significantly smaller than 5.4% of all swimmers. If that is true, then it is more dangerous to swim at night. Since we need counts of the number of bathers in the water for each hour of the day and night, life-guards are urged to cooperate in supplying this information.

The time of the year when most attacks occur correlates closely with the swimming season around Australia and Africa (Table 3). About 75% and 80%, respectively, of all attacks have occurred during the summer from mid-November to mid-April; in North America, about 72% have occurred from mid-May to mid-October. Northern Australia, the equatorial regions of the Indo-Pacific Oceans, and southern North America are tropical all the year, and in such warm waters, where presumably bathing is not seasonal, shark attacks take place in nearly equal numbers for each month.

The frequency of shark attacks in water warmer than 66.5° F (Table 4) was first noted by Stewart Springer (1943). Coppleson (1958) believes that most shark attacks occur in waters warmer than 70° F. At least two factors contribute to these observations. First, the more dangerous kinds of sharks, such as the great white, tiger, and gray sharks (*Carcharhinus*), typically are in greatest abundance in warm waters, and, when the seas and river waters become warm during the summer in temperate zones, the "tropical" sharks enter these waters. Second, relatively few swimmers enter water colder than about 65° F. Thus, the warming of temperate waters is accompanied by an increase in the number of dangerous sharks and an increase in the number of bathers.



**Table 3**  
**TIME OF YEAR THAT SHARK ATTACKS HAVE**  
**OCCURRED AND NUMBER OF INDIVIDUALS**  
**ATTACKED IN VARIOUS LOCALITIES**

TIME OF YEAR	AUSTRALIA, TASMANIA, TORRES STRAITS	AFRICA	ASIA	NORTH AMERICA		OCEANS AND ISLANDS		TOTALS
				EAST COAST	WEST COAST	ATLANTIC	PACIFIC	
Jan. 1-15	32	8	1	-	1		3	45
Jan. 16-31	24	6	2	1	-		3	36
Feb. 1-15	15	7	2	1	1	1	2	29
Feb. 16-29	11	3	-	2			2	18
Mar. 1-15	18	7	-	1		1	2	29
Mar. 16-31	13	3	-	4		2	2	24
Apr. 1-15	18	4	-	4	1	1	2	30
Apr. 16-30	7	2	-	2	2	1	2	16
May 1-15	4	-	6	1	2	2		15
May 16-31	4	2	-	3	3	2	1	15
June 1-15	3	1	2	6	3	1	4	20
June 16-30	3	1	2	8	1	1	5	21
July 1-15	2	1	3	16	1	4	4	31
July 16-31	1	-	4	6	3	4	5	23
Aug. 1-15	3	1	3	7	2	3	6	25
Aug. 16-31	9	-	4	7		4	4	28
Sept. 1-15	3	2	5	2	1		3	16
Sept. 16-30	-	1	2	7	1	3	5	19
Oct. 1-15	6	2		2	2	2	4	18
Oct. 16-31	10	-	1	1			2	14
Nov. 1-15	7	-	-	1	1	1	1	11
Nov. 16-30	19	3	1	-		3	1	27
Dec. 1-15	12	3	-	-	1	3	5	24
Dec. 16-31	25	8	-	1			3	37

However, divers with swim suits do enter colder waters, and three attacks have occurred in water of 55° F along the California Coast. We believe that the areas of the world in which shark attacks occur will be expanded as more and more divers enter the domain of predatory sharks in the temperate and subtemperate latitudes.

Table 4

TEMPERATURE OF WATER AT TIME OF SHARK  
ATTACKS AND NUMBER OF SHARK ATTACK  
INSTANCES FOR VARIOUS LOCALITIES

TEMPERATURE (F)	AUSTRALIA	AFRICA	ASIA	NORTH AMERICA		OCEANS AND ISLANDS		TOTALS
				EAST COAST	WEST COAST	ATLANTIC	INDO- PACIFIC	
55	--	--	--	--	3	--	--	3
56	--	--	--	--	--	--	--	--
57	--	--	--	--	--	--	--	--
58	--	--	--	--	--	--	--	--
59	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--
61	--	--	--	--	--	--	--	--
62	--	--	--	--	--	--	--	--
63	--	--	--	--	--	--	--	--
64	--	--	--	--	--	--	--	--
65	--	--	1	1	--	1	--	3
66	--	--	--	--	--	--	--	--
67	1	--	--	--	--	--	--	1
68	--	--	--	1	1	1	--	3
69	--	--	--	--	--	--	--	--
70	4	--	--	1	1	--	--	6
71	8	1	--	--	--	--	--	9
72	4	--	--	--	--	--	--	4
73	2	--	--	--	--	--	1	3
74	8	2	--	--	--	--	--	10
75	1	2	--	1	--	--	--	4
76	1	--	--	--	--	--	--	1
77	--	--	--	--	--	--	1	1
78	2	--	--	--	--	--	--	2
79	--	1	--	--	--	--	--	1
80	--	--	--	1	1	--	--	2
81	--	--	--	--	--	--	1	1
82	--	--	--	--	--	--	1	1
83	--	--	--	1	--	1	1	3
84	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--
86	--	--	--	1	--	--	--	1
87	--	--	--	2	--	--	--	2

**Table 5**  
**DISTANCE FROM SHORE AT WHICH ATTACKS OCCURRED**  
**AND NUMBER OF ATTACKS FOR VARIOUS LOCALITIES**

DISTANCE FROM SHORE	AUS-TRALIAN REGION	AFRICA	ASIA	NORTH AMERICA		OCEANS AND ISLANDS		TOTALS
				EAST COAST	WEST COAST	ATLANTIC, MEDITER-RANEAN	INDO-PACIFIC	
1-25 feet	16	4	—	2	2	2	1	27
26-50 feet	16	6	—	4	2	4	1	33
51-100 feet	13	9	—	2	1	1	4	30
101-150 feet	14	9	2	3	3	2	1	34
151-200 feet	—	5	—	1	1	—	1	8
201-250 feet	2	2	—	—	1	—	—	5
251-300 feet	7	3	—	—	1	1	—	12
301-400 feet	2	—	—	—	—	—	1	3
401-500 feet	2	—	—	3	1	—	—	6
500 feet to $\frac{1}{4}$ mile	4	2	—	1	2	1	1	11
$\frac{1}{4}$ to 1 mile	4	—	2	4	1	2	7	20
1 to 2 miles	2	—	3	1	—	1	3	10
Open sea	5	1	1	8	2	11	20	48
								247

We believe that the Greenland shark *Somniosus microcephalus* and its relative *S. pacificus* of the Pacific Ocean are potentially dangerous to man in sub-arctic and cold temperate waters. They are reliably reported to feed on large fishes, seals, and a variety of other available animals. These sharks, though sluggish when resting, are voracious and active when stimulated by food.

The largest number of shark attacks occur in areas where bathers are most thickly congregated, usually close to shore. Relatively few bathers venture beyond a few hundred feet from the beach. We have 247 reliable records of the distance from shore at which sharks attacked (Table 5), and find that 90, or 36.4%, were within 100 feet of the shore; 42, or 17%, were from 101 to 200 feet from shore; 17, or 6.9%, 201 to 300 feet; 20, or 8.1%, 301 feet to  $\frac{1}{4}$  mile; 30, or 12.2%,  $\frac{1}{4}$  to 2 miles; and 48, or 19.4%, were in the open sea. In summary, 149, or 60.2%, of the attacks occurred within 300 feet of the

**Table 6**  
**DEPTH OF ATTACK AND NUMBER OF INDIVIDUALS**  
**ATTACKED IN VARIOUS LOCALITIES**

DEPTH OF ATTACK	AUS- TRALIAN REGION	AFRICA	ASIA AND EUROPE	NORTH AMERICA		OCEANS AND ISLANDS		TOTALS
				EAST COAST	WEST COAST	ATLANTIC, MEDITER- RANEAN	PACIFIC	
Surface (1 to 5 feet)	83	32	17	40	27	39	28	266
Below surface								
5 to 10 feet	3	1	—	—	—	2	4	10
11 to 20 feet	1	—	1	1	—	1	3	7
21 to 30 feet	—	—	—	1	1	—	1	3
31 to 40 feet	—	—	—	—	—	—	1	1
41 to 50 feet	—	—	—	—	—	—	—	—
51 to 60 feet	—	—	—	—	—	—	—	—
61 to 70 feet	—	—	—	—	—	—	—	—
71 to 80 feet	—	—	—	1	—	—	—	1
Wading or stand- ing knee deep (0.0 to 2 feet)	4	1	—	2	1	—	—	8
Waist deep (2 to 4 feet)	29	8	6	23	—	2	4	72
Shoulder and chin deep (4 to 6 feet)	6	4	1	2	—	1	1	15
								383

shore. This represents the area where the greatest number of swimmers is concentrated.

The commonest depth at which sharks attack coincides with the depth at which there is the greatest concentration of bathers (Table 6). Among 383 individuals, 266, or 69.5%, were in the upper 5 feet of the surface waters; and 95, or 24.8%, were bitten in water from knee-deep to shoulder-deep. Only 22, or 5.7%, were 5 to 80 feet below the surface when attacked.



**Table 7**  
**SUMMARY OF FACTORS RELATED TO ACTIVITIES**  
**OF VICTIMS JUST BEFORE BEING ATTACKED AND**  
**NUMBER OF INDIVIDUALS INVOLVED IN ATTACKS**  
**FOR VARIOUS LOCALITIES**

Factors involved in shark attacks	AUS- TRALIAN REGION	AFRICA	ASIA AND EUROPE	NORTH AMERICA		OCEANS AND ISLANDS		TOTALS
				EAST COAST	WEST COAST	ATLANTIC, MEDITER- RANEAN	INDO- PACIFIC	
Fish being caught or present nearby	11	1	7	8	4	4	11	46
Spear fishing or diving and car- rying fish	6	—	1		4	2	13	26
Swimming at surface	78	32	15	31	22	36	25	239
Resting or floating at surface	—	—	1	3	2	1	1	8
Clinging to float or raft	5	—	1	6	3	2	2	19
Wading or stand- ing in water knee-deep to shoulder-deep	39	13	7	27	1	3	5	95
								433

Table 7 summarizes the activities of 433 individuals just before being attacked by sharks and indicates that 95, or 22%, were wading or standing in water knee-deep to shoulder-deep; 46, or 10.6%, were swimming or standing close to where fish were being caught; 26, or 6.0%, were spearfishing or diving and carrying fish; 27, or 6.2%, were resting, floating, or clinging to a float at the surface; 239, or 55.2%, were swimming at the surface. Our data reveal that it is dangerous to dive off piers, boats, and ships at anchor in shark-infested bays and lagoons; we have several records of divers who have been attacked under such circumstances the moment they entered the water.

**Table 8**  
**SUMMARY OF LOCATIONS OF VICTIMS IN**  
**RELATION TO THAT OF COMPANIONS IN WATER**  
**AT MOMENT OF ATTACK AND NUMBER OF INDIVIDUALS**  
**INVOLVED IN ATTACKS FOR VARIOUS LOCALITIES**

LOCATION OF VICTIM	AUS- TRALIAN REGION	AFRICA	ASIA AND EUROPE	NORTH AMERICA		OCEANS AND ISLANDS		TOTALS
				EAST COAST	WEST COAST	ATLANTIC, MEDITER- RANEAN	INDO- PACIFIC	
Alone in water	28	8	2	16	1	4	12	71
With one other person within a few feet of victim	12	2	—	13	3	5	5	40
Companions about 10 feet from victim	23	9	—	9	6	3	3	53
Companions 10 to 50 feet away from victim	15	2	1	—	1	—	—	19
Companions 50 to 100 feet away from victim	2	1	—	—	—	—	1	4
Companions 100 or more feet away from victim	3	—	1	1	—	—	—	5
								192

Our files include information on the location of companions and other swimmers (Table 8) in relation to the position of the shark-attack victim. Among 192 individuals, 71, or 37.0%, were alone in the water, and for an additional 28, or 14.6%, companions were 10 feet or more away. The victim was attacked in 40 instances (20.8%) when one other person was within a few feet, and 53 others, or 27.6%, had companions about 10 feet away.

How dangerous is it to rescue a person being attacked by a shark? A study of our records (Table 9) indicates that among 75 individuals who have gone to

**Table 9**  
**SUMMARY OF NUMBER OF INDIVIDUALS ATTACKED**  
**WHEN AIDING VICTIMS AND NUMBER OF INDIVIDUALS**  
**INVOLVED IN ATTACKS FOR VARIOUS LOCALITIES**

	AUS- TRALIAN REGION	AFRICA	ASIA AND EUROPE	NORTH AMERICA		OCEANS AND ISLANDS		TOTALS
				EAST COAST	WEST COAST	ATLANTIC, MEDITER- RANEAN	INDO- PACIFIC	
<b>Number of rescuers of victim that were attacked:</b>								
One	5	—	—	2	—	1	3	11
<b>Number of persons aiding victim that were not attacked:</b>								
One	15	3	1	9	4	3	4	39
Two	5	5	—	4	—	—	4	18
Several	5	—	—	—	1	—	1	7
								75

the aid of a victim, 11, or 14.7%, have been attacked. Therefore, the would-be rescuer is definitely placing himself in a dangerous situation.

Weather and other physical factors do not appear to be especially significant in regard to triggering shark attacks (Table 10). Nor do we find evidence that the particular color of clothes or shade of skin has been an important factor in stimulating sharks to attack. Bright, shiny objects or contrasting light and dark objects do attract the attention of sharks. Our data are too scanty and unreliable at present to suggest significant conclusions about physical factors.

The water condition, clear or murky, may be important, because in murky water and at night the swimmer is unable to see the approaching shark and avoid it. Many swimmers in clear oceanic waters have reported that they warded off an attacking shark by striking it a hard blow on the snout. But in other similar instances the shark returned to attack again.

Table 10

SUMMARY OF CERTAIN PHYSICAL FACTORS THAT  
MAY BE IMPORTANT IN REGARD TO SHARK ATTACKS,  
AND NUMBER OF INDIVIDUALS INVOLVED

Suit of light and dark contrasting shades, or shiny or white objects, or dark suit and light skin	26	WATER CONDITION	
		Clear	34
		Murky	43
Dark suit with tan skin and little contrast between shades	10	SKY	
		Clear	32
		Cloudy	32
		Partly cloudy	5
Dark suit with dark skin; no contrasting shades	3	COLOR OF SKIN	
		Light	14
		Tan	22
		Dark	6

The presence of a deep channel near a beach, sandbar, or reef furnishes an excellent place from which a shark can launch an attack. Swimmers should be careful in such areas.

Another factor which needs further clarification is that of the bathing suits worn. We have observed that more attacks have occurred on bathers wearing garments with strong contrasting shades or those that contrast sharply with light or dark skin (Table 10). One bather who was attacked was wearing a fluorescent suit. Others wore bright, shiny objects, such as bracelets and rings.

Some attacks by sharks have been attributed to barracuda. The latter have teeth set in nearly straight lines, whereas the jaws of dangerous sharks have the teeth arranged in a curve or half circle. Thus the bites of these two kinds of creatures are easily distinguished.

Barracuda usually strike once and seldom, if ever, bite twice, whereas the pattern of bites by sharks may be first a mouthing bite, followed by the removal of flesh in several bites. Table 11 summarizes the number of times a shark bites a victim in an attack. Among 58 attacks, 52 victims showed wounds representing 2 to 7 bites. In fact, our records show that in at least 35 instances the body was completely consumed by sharks. Table 12 summarizes the frequencies of bite on various parts of the body.

**Table 11**  
**SUMMARY OF NUMBER OF TIMES A**  
**SHARK BITES A VICTIM IN AN ATTACK**

NUMBER OF BITES	NUMBER OF ATTACKS
1	6
2	17
3	19
4	10
5	1
6	4
7	1
TOTAL	58

At the time this report was prepared, our records of unprovoked attacks indicated that 471 individuals recovered, 349 died, and the fate of 29 more is unknown. In regions remote from immediate medical care, mortality was high after shark attack.

**Table 12**  
**SUMMARY OF FREQUENCIES OF SHARK**  
**BITE ON VARIOUS PARTS OF BODY**

HEAD	SHOULDER	CHEST	WAIT	THIGH	BUTTOCKS	LEGS	FOOT	ARMS	HANDS
7	8	8	26	66	15	115	47	55	36

**Attacks on Boats** This general category may be divided into provoked and unprovoked attacks. Usually the rudder, propeller, or hull of the boat is bitten. Sometimes paddles, oars, skis, or surfboards are attacked.

Provoked attacks on boats usually resulted after a shark was netted, speared, hooked, or in some way annoyed, as when the shark was pursued in a motor boat, after which it turned and attacked.

The sizes of the sharks involved in these attacks have varied from 6 to 20 feet in length; the greatest damage to a boat has been done by sharks 10 feet long and longer. Sharks have broken or bitten holes in the hulls of boats, and

in many instances shark teeth were embedded in the wood and later recovered. Some attacks have been so violent that boats have been lifted partly from the water; others have capsized and spilled the occupants into the sea. However, where boat occupants were attacked, these incidents were recorded in the "unprovoked" shark attack list.

Most attacks on boats have been one or two strikes, lasting only a few minutes, but one shark continued to strike for half an hour; another struck for 2 or 3 hours. The longest period was 4 hours. Sharks have jumped into boats on several occasions.

The kinds of boats attacked include canoes, dinghies, sailboats, rowboats, outboard-motor boats, and motor launches, varying in length from 8 to 40 feet. Slowly turning, shiny propellers have attracted sharks to boats, and in a few instances the shark did bite the propeller.

Sharks that have rushed boats have been knocked unconscious by the impact; others have leaped completely over a boat in an attempted attack. In one instance, every time the occupant showed his head above the boat the shark attacked.

Although only a small percentage of the sharks involved in boat attacks have been identified accurately, there is no doubt that the following kinds are the most frequent offenders: white, mako, blue, tiger, whitetip, hammerhead, and several species of gray sharks (carcharhinids).

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