

Mary Ingraham

Anglers' Guide to SHARKS of the Northeastern United States MAINE TO CHESAPEAKE BAY

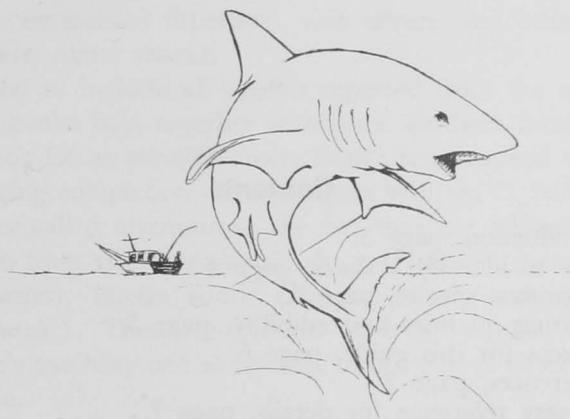


UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Bureau of Sport Fisheries and Wildlife
Circular 179



Anglers' Guide to
SHARKS of the
Northeastern United States
MAINE TO CHESAPEAKE BAY

By John G. Casey
Sandy Hook Marine Laboratory



Bureau of Sport Fisheries
& Wildlife Circular No. 179
Washington • April 1964

UNITED STATES DEPARTMENT OF THE INTERIOR

Stewart L. Udall, *Secretary*

Frank P. Briggs, *Assistant Secretary for Fish and Wildlife*

FISH AND WILDLIFE SERVICE

Clarence F. Pautzke, *Commissioner*

BUREAU OF SPORT FISHERIES AND WILDLIFE

Daniel H. Janzen, *Director*



Contents

- Introduction, page 3.
- How to identify a shark, page 4.
- Dangerous species, page 5.
- Sporting qualities and edibility, page 5.
- Sources for this guide, page 6.
- References, page 7.
- Primary reference for details, page 7.
- Descriptions and drawings of species, pages 8-27.
- Identification key, pages 28-31.
- Abridged key and index, page 32.
- External features of a shark, inside back cover.

INTRODUCTION

In recent years, public interest in sport fishing for sharks has grown rapidly. This has paralleled the growth in numbers of people seeking recreation at the seashore by angling, boating, swimming, and skin diving.

In response to that interest, the Sandy Hook Marine Laboratory undertook in 1961-62 a biological survey of sharks in coastal waters from southern New York to northern Delaware. The survey confirmed the existence of an abundant population of large sharks of several species, whose life histories and habits are little known. The problem of studying them thoroughly throughout the northeast region was beyond the capacity of the laboratory. Fortunately, many shark anglers learned of the program and volunteered to help. They offered to tag and release sharks, keep records, conduct tournaments, and provide specimens for examination. This help made it possible to expand the studies, particularly those dealing with shark migrations.

Sharks are difficult to identify. Cooperating fishermen readily admitted their inability to distinguish more than a few species positively. This guide was prepared to help overcome this difficulty. We hope that it will be useful also to commercial fishermen, skin divers, and others who share a common curiosity about sharks.

We attempted to include all species reported from the western Atlantic north of Chesapeake Bay, together with some southern forms which sportsmen should look for as possible strays from more tropical waters. As this guide was nearing completion, ichthyologists William C. Schroeder and Dr. Victor Springer called attention to the fact that the following species have also been taken from this area: sixgill shark (*Hexanchus griseus*), night shark (*Hypoprion signatus*), kitefin shark (*Dalatius licha*), and Garman's shark (*Paragaleus pectoralis*). These are evidently such rare visitors, and the chances of a sportsman's catching one so remote, that we have chosen to omit them from this guide.

HOW TO IDENTIFY A SHARK

The first step in making an identification is to establish that the animal is in fact a shark. A shark has—

- 5 to 7 paired gill openings located at least partly on the sides of the head;
- a skeleton composed wholly of cartilage;
- jaws, teeth, and paired fins;
- a body shape that is typically fusiform, that is, torpedolike (the exception is the angel shark, which is flattened);
- a skin that, being covered with minute toothlike scales, has a sandpapery texture.

These features help distinguish sharks—

- from lampreys, which lack paired fins and true jaws;
- from skates and rays, in which the body is flattened and the gill openings are entirely on the undersurface of the body;
- from bony fishes, which have only one pair of gill openings;
- from whales and porpoises, which lack gills and scales.

When you are sure that the fish is a shark, the next step is to see how it differs from other sharks in this region. Sharks are distinguished by shape, by size, and often by the presence or absence of anatomical features shown in the drawings on the inside of the back cover of this guide. The position and relative size of fins, gill openings, and eyes are important; to emphasize these characters, a description is given and an outline drawing of a typical shark of each species is shown on a grid background (pp. 8 to 27.) Note that the divisions of the grid show PERCENT OF TOTAL LENGTH, NOT ACTUAL MEASUREMENTS. For instance, the drawing of the spiny dogfish (p. 9) shows, not actual length, but that the tail is generally about 20 percent of the total length—a spiny dogfish might be about 4 feet long while a Greenland shark, shown right above it, might be over 20 feet. When you look at any of the descriptions and drawings it will help to have the flap on the back cover turned out for ready reference.

Species that might be confused are shown together in order to bring out differences. You may leaf through the Guide until you find a drawing that resembles your specimen; then read the DISTINGUISHING CHARACTERS on the page opposite the drawing. The disadvantage of this method is that the drawings show only typical examples of each species. An individual shark will not look exactly like the representative drawing since body proportions vary with size.

A more dependable method is to use the key on pages 28–31. This is a series of alternative descriptions which lead, by successive choices, to the correct identification. It is always necessary to begin at the beginning, that is, with the first pair, 1A and 1B, and follow the directions through the key. An abridged key is provided (p. 32) for those who might find it more convenient; it is a series of brief descriptions that will guide you to a page of drawings, and it serves also as a ready-reference index.

DANGEROUS SPECIES

In northern Atlantic coastal waters there is a large population of sharks of a number of species. Among these are several species reputed to be maneaters, but they rarely attack swimmers in the area covered by this guide. The Shark Research Panel of the American Institute of Biological Sciences has found records of only 22 unprovoked attacks, with 9 fatalities, north of Cape Hatteras, N.C., between 1865 and 1962. The white shark has been definitely identified in reported attacks; it was evidently this species that caused five of the nine fatalities—one white shark was credited with four fatal attacks in New Jersey in 1916, and another with one death in Massachusetts in 1936.

The white shark is not the only one to treat with caution, however. Sharks with very bad reputations in other parts of the world include the tiger shark, the gray sharks (genus *Carcharhinus*), and the hammerheads. Nurse sharks, lemon sharks, and sand sharks have occasionally injured bathers in tropical waters. Although attacks by the mako, porbeagle, blue, and whitetip sharks remain unproven, these large, heavily toothed, and unpredictable animals should be regarded as dangerous.

Only a few individuals of even the most vicious species ever pursue and attack man, but there is little doubt that all sharks will defend themselves when molested. Not only their teeth, but their rough hides and powerful tails can inflict painful wounds. The fisherman or swimmer who carelessly handles, spears, or otherwise provokes any shark, invites injury.

SPORTING QUALITIES AND EDIBILITY

Sharks are increasing in importance as sport fish. A survey by the U.S. Fish and Wildlife Service estimated that sport fishermen caught 1,715,000 sharks in U.S. coastal waters in 1960; about 45 percent of these were taken between Maine and North Carolina.

The mako, blue, porbeagle, white, thresher, tiger, and sawfish sharks rank as big-game fish, and are formally recognized among the 50 species of game fish on which the International Game Fish Association keeps worldwide records. Anglers in the Northeast who are interested in trying for record sharks are in an excellent area. Of the current world records for different tackle sizes, 21 were taken in New Jersey, New York, Rhode Island, and Massachusetts.

Anglers agree that few game fish can equal the spectacular leaps and swift runs of the mako. Although other species seldom leap, and opinions on their fighting qualities may be varied, one thing is certain: any large shark, caught on suitable tackle, will test the fisherman's patience and endurance. The excitement of landing a voracious shark has an appealing element of danger that other fishing seldom affords.

All sharks found off the northeastern coast are edible. The mako, porbeagle, thresher, and dogfish are considered most desirable; young fish are preferred to old. The meat can be boiled, fried, broiled, or chowdered, but

it should be cooked or cured as soon as possible. Cured, the meat is excellent whether smoked, salted, or kippered.

Fresh mako, hammerhead, small dusky, and dogfish are good eating particularly when cooked in sauces or with vegetables and other meats. These sharks have a distinctive flavor, milder than some of the more common food fishes. Elaborate preparations are not necessary, but culinary imagination is a helpful ingredient.

SOURCES FOR THIS GUIDE

The material and figures for all but one of the species in this Guide came from "Sharks," by Henry B. Bigelow and William C. Schroeder—part 1 of "Fishes of the Western North Atlantic," Memoirs of the Sears Foundation for Marine Research, Yale University, 1948. For the use of this material, the Bureau of Sport Fisheries and Wildlife is indebted to those authors and to Dr. Yngve H. Olsen and the Sears Foundation. The drawing of *Carcharhinus altima* is from a photograph supplied by Dr. J. A. F. Garrick of the U.S. National Museum.

For encouragement and advice I am indebted to many anglers and biologists. Particularly generous in supplying information and helpful criticism were Stewart Springer of the Bureau of Commercial Fisheries, Richard Backus of the Woods Hole Oceanographic Institute, Paul Hamer of the New Jersey Department of Conservation and Economic Development, Paul Hess of Lebanon Valley College, and Henry Lyman of "Saltwater Sportsman" magazine.

John Musick and John Hillis assembled material and made preliminary drawings; Miss Christiana Walford assisted in making the Key and preparing the Guide for publication.

Substantial support for the shark survey, and for the preparation of this Guide, came from the Smith Research and Development Corporation of Lewes, Del., in 1961, and from the Office of Naval Research in 1962.

REFERENCES

- American Fisheries Society.
1960. A list of common and scientific names of fishes from the United States and Canada. 2d ed. American Fisheries Society Special Publication No. 2, Ann Arbor, Mich., p. 6-8.
- Backus, Richard H.
1957. Notes on western North Atlantic sharks. *Copeia*, No. 3, p. 246-248.
- Bigelow, Henry B., and William C. Schroeder.
1948. Sharks. *In* Fishes of the Western North Atlantic. Sears Foundation for Marine Research, Memoir No. 1, part 1, p. 59-576.
- Clark, John R.
1962. The 1960 salt-water angling survey. U.S. Fish and Wildlife Service, Circular 153, p. 6.
- Coppleson, V. M.
1958. Shark attack! Angus and Robertson, Sydney, p. 251-255.
- Gilbert, Perry W.
1958. Conference on shark repellents. American Institute of Biological Sciences Bulletin, vol. 8, No. 3, p. 17-19.
1963. Sharks and survival (editor). D. C. Heath & Co., Boston. 578p.
- Gilbert, Perry W., Leonard P. Schultz, and Stewart Springer.
1960. Shark attacks during 1959. *Science*, vol. 132, No. 3423 (August 5), p. 323-326.
- Helm, Thomas.
1962. Shark! Unpredictable killer of the sea. Dodd, Mead & Co., New York, p. 221-256.
- Mather, Frank J., III, and Robert H. Gibbs.
1957. Distribution records of fishes from waters off New England and the Middle Atlantic States. *Copeia*, No. 3, p. 242-244.
- Radcliffe, Lewis.
1918. Sharks as food. U.S. Bureau of Fisheries, Economic Circular 35. 8 p.
- Schultz, Leonard P., Perry W. Gilbert, and Stewart Springer.
1961. Shark Attacks. *Science*, vol. 134, No. 3472, p. 87-88.
- Springer, Stewart.
1960. Natural History of the sandbar shark *Eulamia milberti*. U.S. Fish and Wildlife Service, Fishery Bulletin, No. 178, vol. 61, p. 1-38.
1950. A revision of North American sharks allied to the genus *Carcharhinus*. American Museum Novitates, No. 1451, p. 1-13.
- Thompson, J. R., and Stewart Springer.
1961. Sharks, skates, rays, and chimaeras. U.S. Fish and Wildlife Service, Circular 119, p. 1-10.
- International Game Fish Association.
1962. World Record Marine Fishes. International Game Fish Association, Miami Fla. 15 p.

Primary reference for details

For more detailed accounts of the sharks listed here, the primary reference is part 1 of "Fishes of the Western North Atlantic" (see the Bigelow and Schroeder reference above) which may be consulted in many libraries.

When using the descriptive drawings on pages 28 to 31, fold out the flap on the back cover for easy reference.

Atlantic Angel Shark—*Squatina dumerili*

Distinctive characters: The flattened, skate-like appearance separates this from all other sharks in our area. Distinguished from skates and rays by its sharp teeth and the fact that its gill slits are partly on the side of the body.

Color: Gray above, tinted with red on head and fin margins; white below.

Maximum size: 4 to 5 feet. **Size at birth:** Unknown.

Range: New England to Jamaica.

Remarks: Found in depths of a few feet to several hundred fathoms. Feeds on flatfish, skates, crustaceans, and snails. Most common in summer along middle Atlantic coast (North Carolina to Delaware) but seldom abundant anywhere within its range.

Greenland Shark—*Somniosus microcephalus*

Distinctive characters: Lacks anal fin. The absence of dorsal spines sets this species apart from the next two.

Color: Brown to gray to black below and above; the back and sides sometimes with indistinct dark bands or whitish spots.

Maximum size: 21 feet. **Size at birth:** Unknown.

Range: Both sides of the Atlantic in arctic and subarctic waters; found south to Cape Cod.

Remarks: A cold-water species abundant along the Greenland and Labrador coasts, occurring in New England waters only as a stray. Seldom taken in waters warmer than 50°F. It feeds on a wide variety of fishes, seals, and carrion.

Spiny Dogfish—*Squalus acanthias*

Distinctive characters: Lacks anal fin. Distinguished from the Greenland shark by the presence of dorsal spines, and from the Portuguese shark by the position of the pelvic fins in relation to the second dorsal.

Color: Slate colored above, pale gray to white below; young specimens with white spots scattered on body.

Maximum size: 4 feet. **Size at birth:** 6½ to 13 inches.

Range: Worldwide in temperate and subarctic latitudes.

Remarks: One of our most common sharks found inshore and to depths up to 100 fathoms. It feeds on smaller fishes, squid, worms, shrimps, and jellyfish. The spines are mildly poisonous.

Portuguese Shark—*Centroscymnus coelolepis*

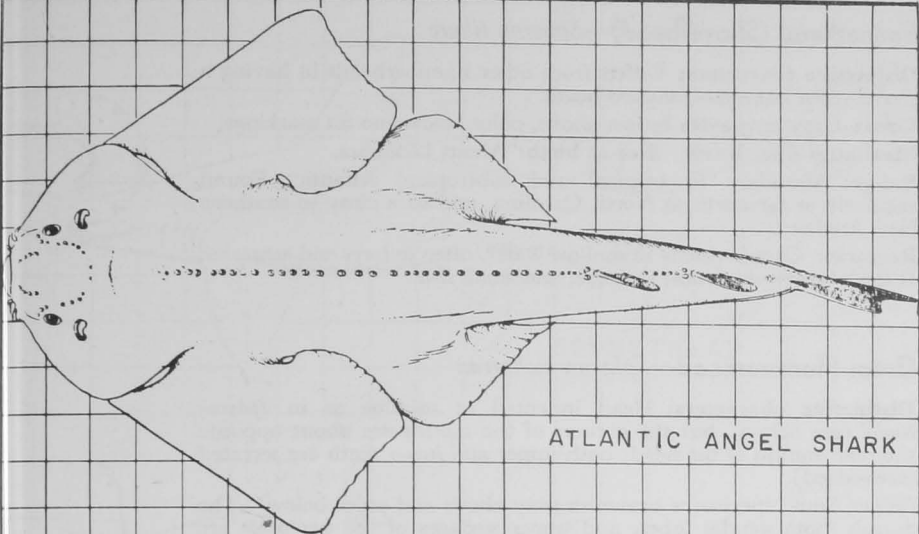
Distinctive characters: Lacks anal fin. Distinguished from the Greenland shark by the presence of dorsal spines, and from the spiny dogfish by the position of the pelvic fins in relation to the second dorsal.

Colors: Dark brown above and below.

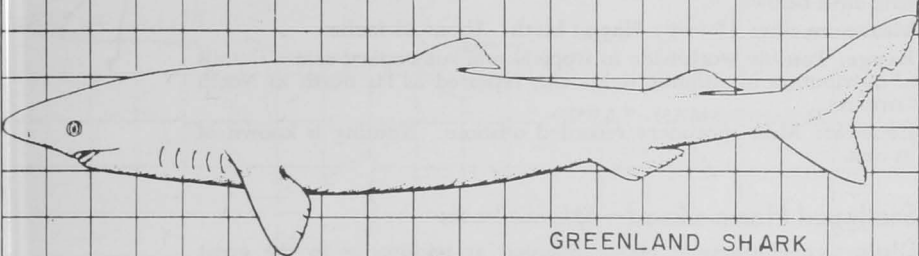
Maximum size: 3 feet 8 inches. **Size at birth:** About 9 inches.

Range: Both sides of the North Atlantic; reported as far north as Grand Banks in the western Atlantic. Southern limit of distribution unknown.

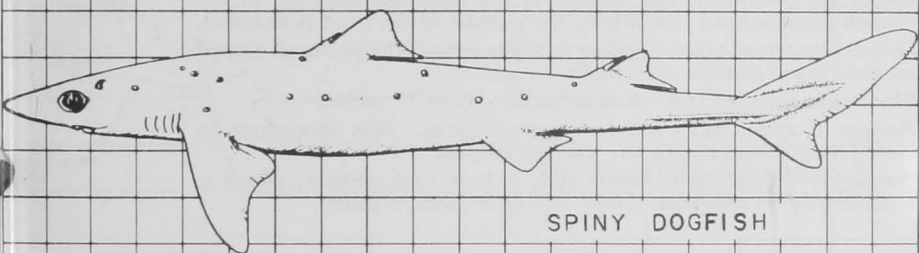
Remarks: Evidently a deep-water species as it has not been reported from waters less than 180 fathoms. Little is known of its habits.



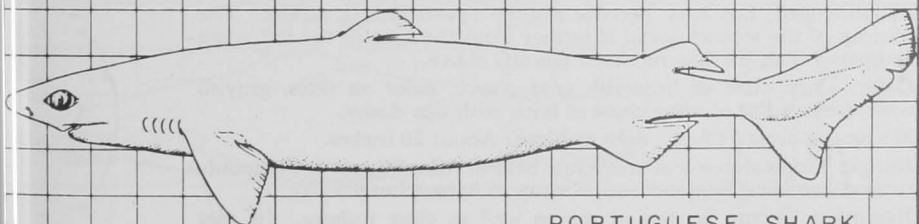
ATLANTIC ANGEL SHARK



GREENLAND SHARK



SPINY DOGFISH



PORTUGUESE SHARK

10 20 30 40 50 60 70 80 90 100

Percent of total length

Bonnethead (Shovelhead)—*Sphyrna tiburo*

Distinctive characters: Differs from other hammerheads in having a shovel- (not hammer-) shaped head.

Color: Gray or grayish brown above, paler below; no fin markings.

Maximum size: 6 feet. **Size at birth:** About 12 inches.

Range: Abundant in tropical and subtropical Atlantic. Found regularly as far north as North Carolina, and as a stray to southern New England.

Remarks: Occurs chiefly in shallow water, often in bays and estuaries. It feeds largely on crabs, shrimps, and small fish.



Great Hammerhead—*Sphyrna mokarran*

Distinctive characters: Head indented at midline as in *Sphyrna lewini* (see below), but the corners of the mouth are about opposite the rear margin of the head; both upper and lower teeth are serrated (saw-edged).

Color: Small specimens brownish gray above and paler below. The dorsals, both caudal lobes, and upper surfaces of the pectorals are dusky toward the tips. Larger specimens are dark olive above and pale olive below.

Maximum size: 15 feet. **Size at birth:** About 28 inches.

Range: Possibly worldwide in tropical and subtropical seas. Details of distribution in Atlantic unknown; reported as far north as North Carolina.

Remarks: Most specimens recorded offshore. Nothing is known of its diet.



Scalloped Hammerhead—*Sphyrna lewini*

Distinctive characters: Head indented at midline as in the great hammerhead, but the teeth are smooth-edged and the corners of the mouth are behind the rear margin of the head (see above). In the smooth hammerhead (see below) the midline of the head is rounded.

Color: Light gray above shading to white below, the pectorals tipped on their lower surfaces with black.

Maximum size: 13 feet. **Size at birth:** About 17 inches.

Range: Tropical and warm-temperate Atlantic. Not uncommon in New Jersey waters during the warmer months.

Remarks: This shark is found both inshore and offshore, where it feeds largely on stingrays, skates, and other bottom fishes.



Smooth Hammerhead—*Sphyrna zygaena*

Distinctive characters: Head rounded at midline; teeth of young are smooth-edged, but may become slightly saw-edged in adults. The rear tip of the second dorsal is farther from the base of the tail when compared with the hammerhead (*lewini*) above.

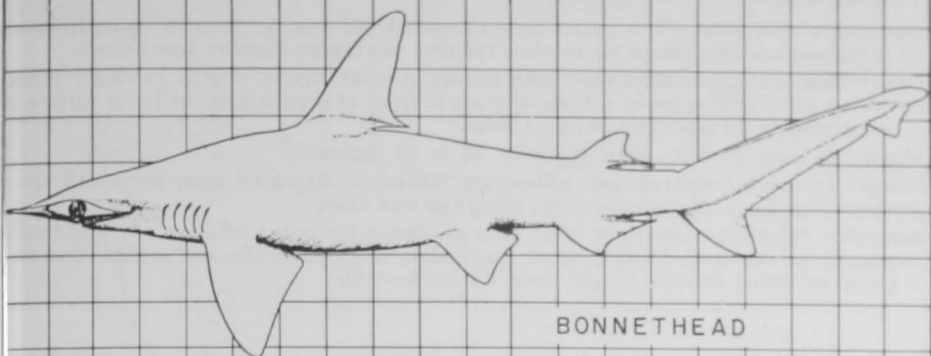
Color: Deep olive or brownish gray above, paler on sides, grayish white below; fins of same color as back with tips dusky.

Maximum size: 14 feet. **Size at birth:** About 20 inches.

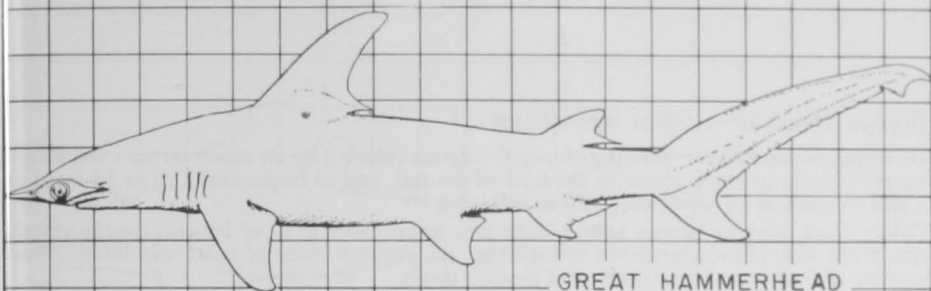
Range: Tropical to warm-temperate belts of Atlantic; north commonly to southern New England and as stray to Massachusetts Bay.

Remarks: Occurs far out at sea as well as close inshore. Its diet consists of stingrays, smaller sharks, shrimp, crabs, and squid.





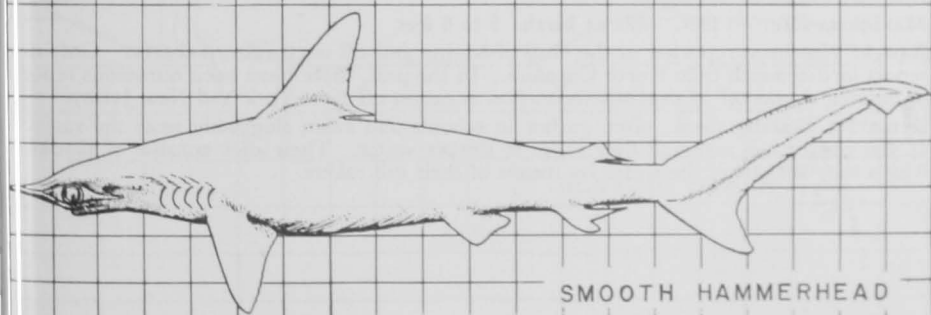
BONNETHEAD



GREAT HAMMERHEAD



SCALLOPED HAMMERHEAD



SMOOTH HAMMERHEAD

10 20 30 40 50 60 70 80 90 100

Percent of total length

Thresher Shark—*Alopias vulpinus*

Distinctive characters: The enormously elongated tail sets the thresher apart from all other Atlantic sharks, except for its close relative, the bigeye thresher (see below).

Color: Back and upper sides vary from brown, through shades of gray to nearly black, becoming white below; lower surface of snout in front of nostrils and the lower surface of pectorals may be of same hue as upper sides.

Maximum size: 20 feet. **Size at birth:** 30 to 49 inches.

Range: In warm temperate and subtropical latitudes. Reported more frequently from southern New England than elsewhere along our east coast.

Remarks: Pelagic species, most often seen at least a few miles offshore. It feeds most commonly on mackerel, bluefish, shad, menhaden, herring, bonito, and squid. Uses tail to group schooling fishes in a tight circle during feeding.

Bigeye Thresher—*Alopias superciliosus*

Distinctive characters: Set apart from *A. vulpinus* (above) by its much larger eyes, longer snout, first dorsal being closer to the base of the tail, and in having only 10 or 11 teeth on a side in each of its jaws (about 20 in *vulpinus*).

Color: Dark gray or brown above, back and upper sides gray or brown; freshly caught specimens may show blue-green iridescence on upper surface of head and body. Rear margin of first dorsal, pectorals, and pelvics dusky.

Maximum size: 18 feet. **Size at birth:** 30 to 43 inches.

Range: Only a few specimens recorded; occurs in both tropical and temperate waters.

Remarks: Extremely large eyes suggest that it is chiefly a deep-water species, but specimens have been seen or caught near the surface. Squid and pelagic fishes are included in its diet. Little is known of the habits of this uncommon shark.

Basking Shark—*Cetorhinus maximus*

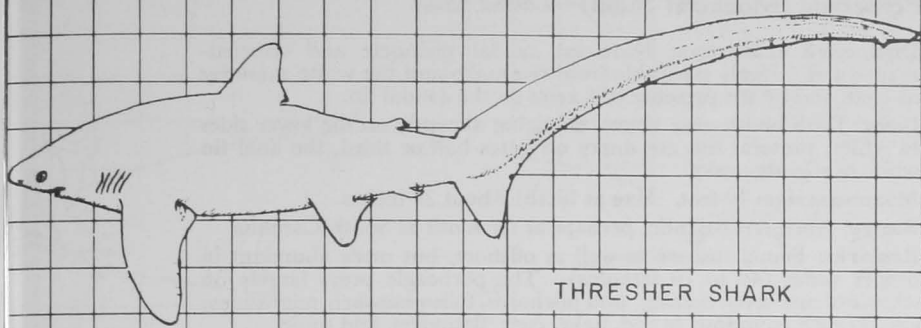
Distinctive characters: The combination of a crescent-shaped tail, enormously long gill openings, long gill rakers, and numerous minute teeth sets the basking shark apart from all others.

Color: Grayish brown to slaty gray or nearly black above; underside may be same color or lighter than the back, sometimes with a triangular white patch under the snout and two pale bands on the belly.

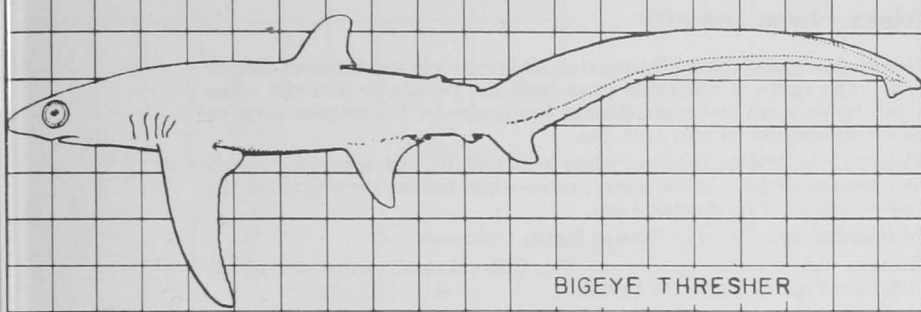
Maximum size: 45 feet. **Size at birth:** 5 to 6 feet.

Range: Has been reported in the Gulf of Maine and off northeastern shores. Only one report farther south than North Carolina. In the past, there have been numerous reports of basking sharks off Massachusetts and on occasion off New York and New Jersey.

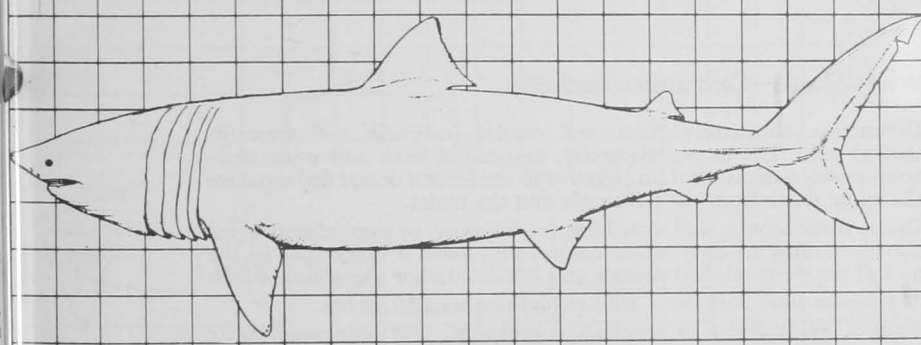
Remarks: Basking sharks often gather in schools and swim sluggishly near the surface. In the winter it is assumed they retire to deeper water. Their diet consists of plankton which they sift out of the water by means of their gill rakers.



THRESHER SHARK



BIGEYE THRESHER



BASKING SHARK

10 20 30 40 50 60 70 80 90 100

Percent of total length

Porbeagle (Mackerel Shark)—*Lamna nasus*

Distinctive characters: Flattened caudal peduncle and crescent-shaped tail. Easily separable from the mako and the white shark by its teeth and by the presence of 2 keels on the caudal fin.

Color: Dark bluish gray above, changing abruptly on the lower sides to white; pectoral fins are dusky on outer half or third, the anal fin white or slightly dusky.

Maximum size: 10 feet. **Size at birth:** About 29 inches.

Range: Northern Atlantic, perhaps as far south as South Carolina.

Remarks: Found inshore as well as offshore, but more abundant in deeper water (40 to 70 fathoms). The porbeagle preys largely on schools of mackerel, herring, and pilchards, following their migrations; also on such groundfish as cod, hake, cusk, flounders, and squid.



Mako—*Isurus oxyrinchus*

Distinctive characters: Flattened caudal peduncle and crescent-shaped tail. The mako is separable from both the porbeagle and the white shark by its teeth and more slender form; also by the relative position of the second dorsal and anal fins.

Color: Deep blue-gray above when fresh caught, but appearing cobalt or ultramarine blue in the water; snow-white below; dirty gray on the lower surface of the pectoral fins.

Maximum size: 12 feet. **Size at birth:** Unknown.

Range: An oceanic species of the tropical and warm-temperate Atlantic; Gulf of Maine to Brazil.

Remarks: Strong-swimming, pelagic shark, known to leap from the water under natural conditions and when hooked. It is a fisheater, preying upon schools of mackerel, herring, and squid. It is considered to be the only natural enemy of the broadbill swordfish.



White Shark—*Carcharodon carcharias*

Distinctive characters: Flattened caudal peduncle and crescent-shaped tail. The large, triangular, saw-edged teeth and more rearward position of the anal fin (relative to the second dorsal fin) separate the white shark from the porbeagle and the mako.

Color: Slaty brown, dull slate blue, leaden gray, or even almost black above, shading to dirty white below; may have a black spot in the axil of the pectoral; the dorsals and caudal darker along rear edges.

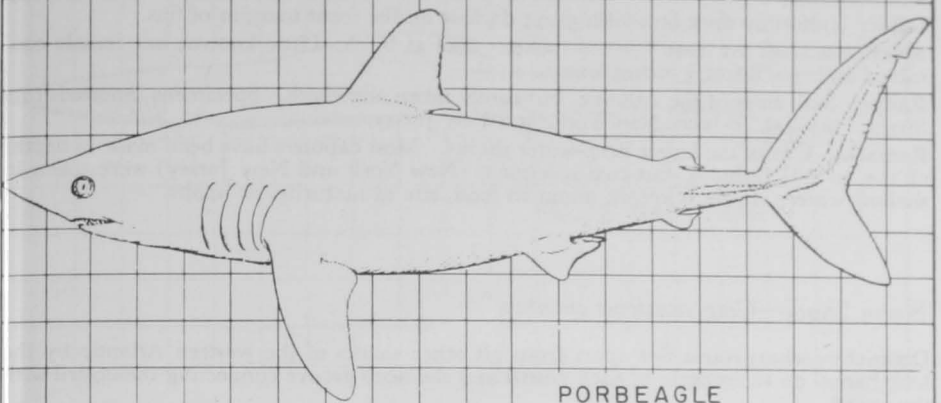
Maximum size: 36½ feet. **Size at birth:** About 50 inches.

Range: Widespread in tropical, subtropical, and warm-temperate belts of all the oceans.

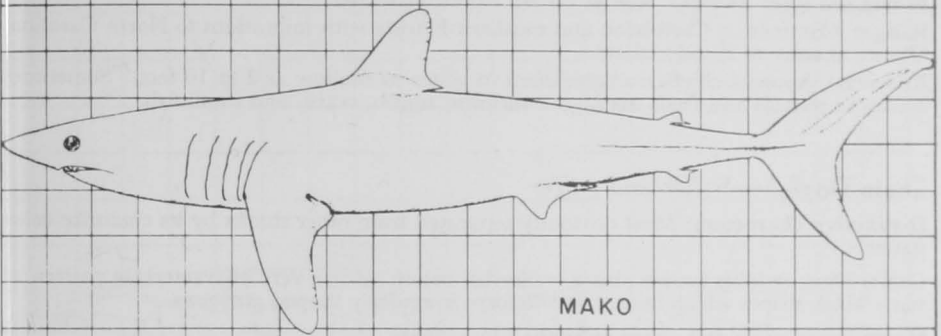
Remarks: Occurs both inshore and offshore. The white shark feeds often on large prey which it devours practically intact, as illustrated by the presence of other sharks (4 to 7 feet), as well as sea lions, seals, sturgeons, and tuna in the stomachs of some specimens. The white shark is credited with numerous attacks on man in tropical and temperate waters the world over and has thus been given the name "man-eater."



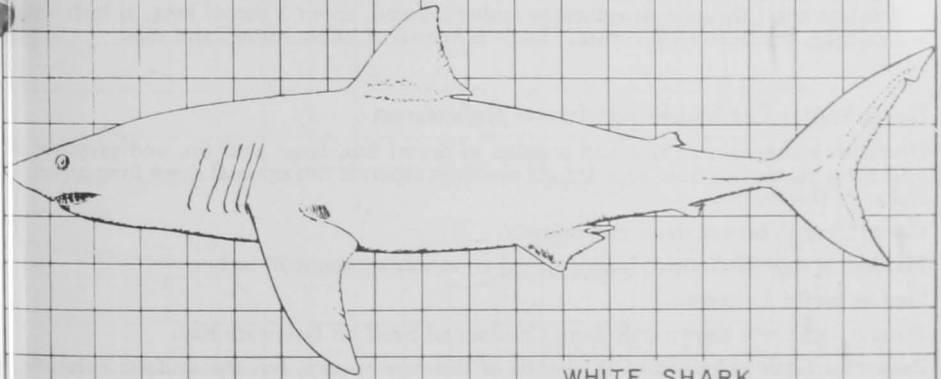
Note: 1st upper and lower tooth of each jaw illustrated above.



PORBEAGLE



MAKO



WHITE SHARK

10 20 30 40 50 60 70 80 90 100
Percent of total length

False Cat Shark—*Pseudotriakis microdon*

Distinctive characters: Separable from all other Atlantic sharks by the great length of its first dorsal fin.

Color: Uniformly dark brownish gray; darkest on the front margins of fins.

Maximum size: At least 9 feet 8 inches. **Size at birth:** Little known; one female contained embryos 2 feet 9 inches long.

Range: Both sides of the Atlantic, but rarely taken anywhere. Specimens reported from Spain, Portugal, Iceland, New York, and New Jersey.

Remarks: One of the larger deep-water sharks. Most captures have been made in depth of 164 to 807 fathoms, but two specimens (New York and New Jersey) were taken in shallow water. Little is known about its food, size at maturity, or habits.

Nurse Shark—*Ginglymostoma cirratum*

Distinctive characters: Set apart from all other sharks of the western Atlantic by the long barbel on the margin of each nostril and the deep groove connecting the nostril with the mouth.

Color: Yellowish to grayish brown, darker above than below. Small specimens may have dark spots on body or brown crossbars on the fins; adults may or may not retain these markings.

Maximum size: 14 feet. **Size at birth:** About 11 inches.

Range: Common in Caribbean and southern Florida with migrations to North Carolina. Occurs as stray to Rhode Island.

Remarks: Appears chiefly inshore, often in water as shallow as 2 to 10 feet. Sometimes travels in schools and feeds mainly on shrimps, squids, crabs, and small fish.

Chain Dogfish—*Scyliorhinus retifer*

Distinctive characters: Most obviously separated from other sharks by its chainlike color pattern.

Color: Dark reddish brown above, yellowish below, with a very characteristic pattern of sooty black stripes which branch out to form irregularly shaped polygons.

Maximum size: 2½ feet. **Size at birth:** 2 to 3 inches.

Range: Offshore (40 to 125 fathoms) from New York to North Carolina.

Remarks: Lives close to bottom on outer part of the Continental Shelf; seldom if ever strays into shoal water. This is the only common shark on the middle Atlantic Coast which lays eggs; they are described as amber colored, about 2 inches long, ¾ inch wide with a long tendril at each corner. Little is known of its life history and diet.

Deep-Water Cat Shark—*Apristurus profundorum*

Distinctive characters: Size and position of dorsal fins, large anal fin, and presence of gill rakers protruding from rounded gill openings separate this unusual shark from all other sharks of this region.

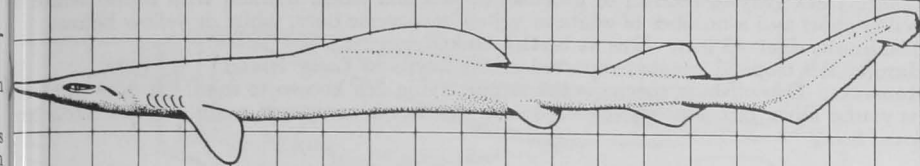
Color: Grayish brown above and below.

Maximum size: Unknown; largest specimen measured about 20 inches.

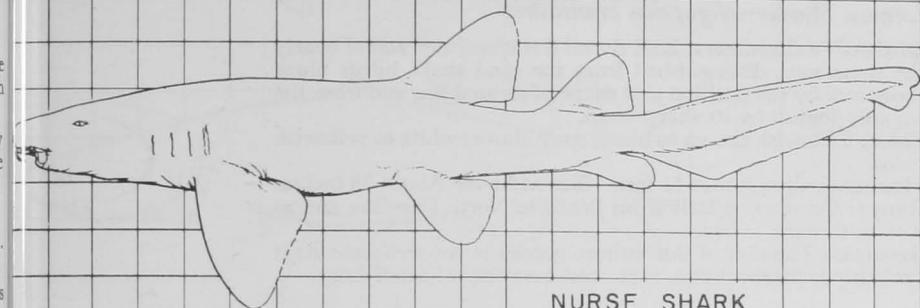
Size at birth: Unknown.

Range: Definitely known only from Continental Shelf off Delaware Bay.

Remarks: Little is known of the habits of this rare species, but the uniform coloration above and below suggest a deep-sea habitat.



FALSE CAT SHARK



NURSE SHARK



CHAIN DOGFISH



DEEP-WATER CAT SHARK

10 20 30 40 50 60 70 80 90 100
Percent of total length

Whale Shark—*Rhincodon typus*

Distinctive characters: Unique because of its great size and spotted color pattern; its mouth is at tip of snout; prominent ridges on the sides of the body.

Color: Dark gray to reddish or greenish brown and sides; marked with round white or yellow spots and a number of white or yellow transverse bars; white or yellow below.

Maximum size: 45 feet. **Size at birth:** Unknown.

Range: All tropical oceans; reported as far north as Long Island.

Remarks: This offshore species is the largest living fish known to man. It does not bear its young alive, but deposits egg capsules. Its diet is composed mainly of plankton and small fishes.

Lemon Shark—*Negaprion brevirostris*

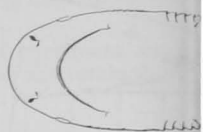
Distinctive characters: Both dorsal fins triangular and of nearly the same size; distinguished from the sand shark by its blunt snout and by the position and shape of its anal fin, and from the smooth dogfish by its sharp teeth.

Color: Yellowish brown to bluish gray above; white to yellowish below.

Maximum size: About 11 feet. **Size at birth:** About 25 inches.

Range: Occurs regularly from Brazil to North Carolina and as a stray to New Jersey.

Remarks: The diet of this inshore species is not well known; it probably feeds on skates, rays, and a variety of small fishes.



Sand Shark—*Carcharias taurus*

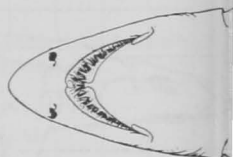
Distinctive characters: Both dorsal fins triangular and of nearly the same size as in the lemon shark (see above) and in the smooth dogfish (see below); easily distinguished from the lemon shark by its more pointed snout, and from the smooth dogfish by its sharp pointed teeth and more rearward position of the first dorsal fin.

Color: Gray-brown above becoming grayish white below; in some specimens darker spots cover the posterior section of the trunk.

Maximum size: 10 feet 5 inches. **Size at birth:** About 36 inches.

Range: Gulf of Maine to Florida.

Remarks: One of our most common large sharks during the summer months. The diet of this inshore species includes black drum, bluefish, butterfish, eels, flatfishes, menhaden, and others; reported to travel in schools and surround other fishes.



Smooth Dogfish—*Mustelus canis*

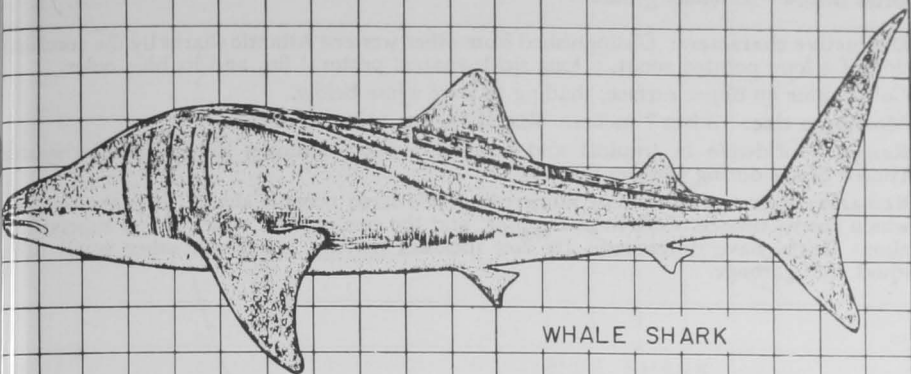
Distinctive characters: Both dorsal fins triangular and of nearly the same size. Separate from the lemon and sand sharks (see above) by the position of the first dorsal fin, and from all sharks in this region by its minute, flat, pavementlike teeth. Sometimes confused with the spiny dogfish (see p. 8) from which it is distinguished by the presence of an anal fin and the absence of dorsal spines.

Color: Gray to brown above and grayish white below.

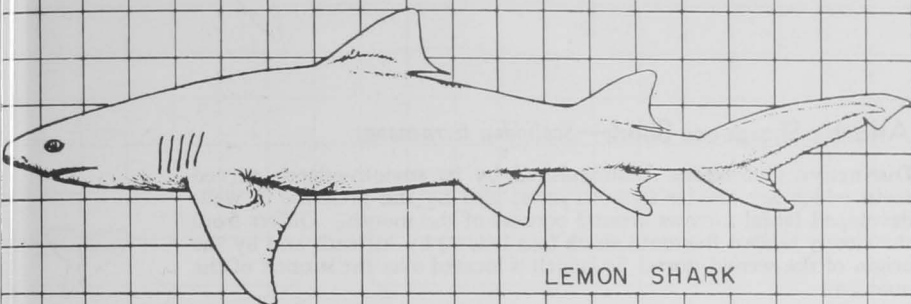
Maximum size: 5 feet. **Size at birth:** About 13 inches.

Range: Cape Cod as far south as Uruguay.

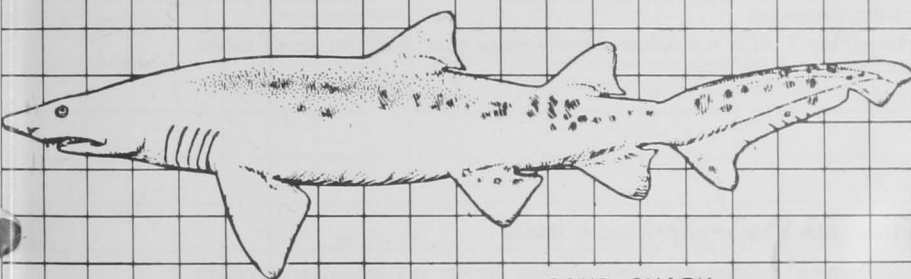
Remarks: One of our most abundant sharks. Preys primarily on crabs, but also on lobster and small fishes.



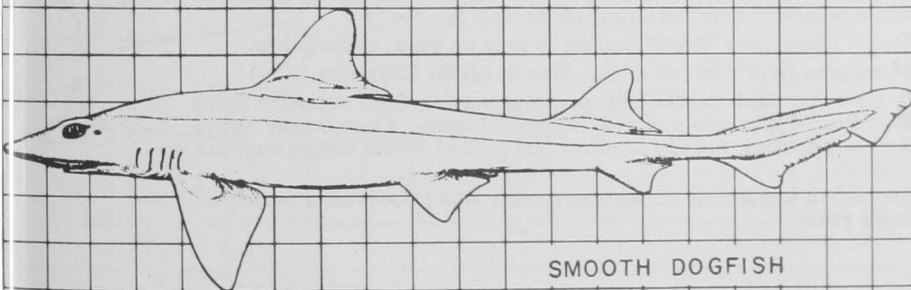
WHALE SHARK



LEMON SHARK



SAND SHARK



SMOOTH DOGFISH

10 20 30 40 50 60 70 80 90 100

Percent of total length

Blue Shark—*Prionace glauca*

Distinctive characters: Distinguished from other western Atlantic sharks by the combination of a long pointed snout, a long sickle-shaped pectoral fin, and its blue color.

Color: Blue on upper surface, shading to pure white below.

Maximum size: 12 feet 7 inches. **Size at birth:** About 21 inches.

Range: Worldwide in tropical and temperate seas; common along the northeastern United States during warmer months.

Remarks: Reputedly the most numerous of the large oceanic sharks; it is the one with which sperm whalers were most familiar, and the one around which many superstitions about sharks have developed. Its diet includes herring, mackerel, other small fishes, squid, and garbage.

Atlantic Sharpnose Shark—*Scoliodon terraenovae*

Distinctive characters: Distinguished by its smooth-edged, curved teeth which are similar in both jaws; also by the presence of well-developed labial furrows around corners of the mouth. Differs from the closely related finetooth shark (see below) by its teeth and by the origin of the second dorsal fin which is located over the MIDDLE of the anal fin.

Color: Brownish to olive gray above; white below.

Maximum size: 3 feet. **Size at birth:** 10½ to 16 inches.

Range: Found on both sides of tropical and subtropical Atlantic. Occasionally strays northward to Canada, but it is uncommon north of the Carolinas.

Remarks: This is a shallow-water species that feeds on small fishes, shrimps, and mollusks.



Finetooth Shark—*Aprionodon isodon*

Distinctive characters: Distinguished by its smooth-edged straight teeth which are similar in both jaws; also by the presence of well-developed labial furrows around corners of the mouth. Differs from the sharpnose shark (see above) by the origin of the second dorsal fin which is located over the ORIGIN of the anal fin.

Color: Bluish gray above, shading to gray on sides; white below.

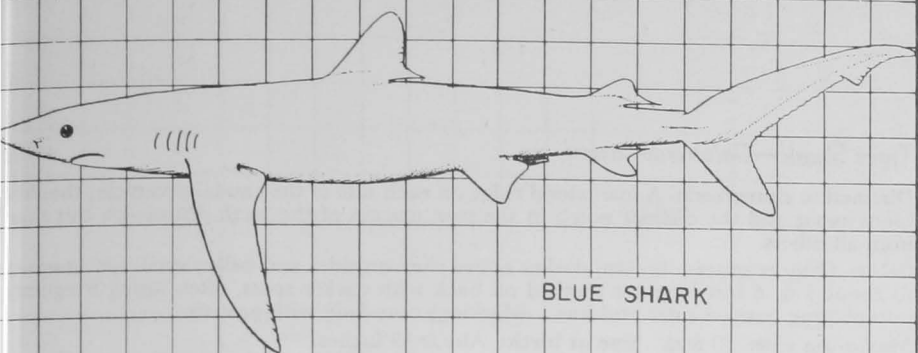
Maximum size: 4 feet or more. **Size at birth:** Unknown.

Range: Tropical species, the majority having been recorded from Florida and the coasts of the Gulf of Mexico. Occasionally strays northward along the east coast of the United States during summer months.

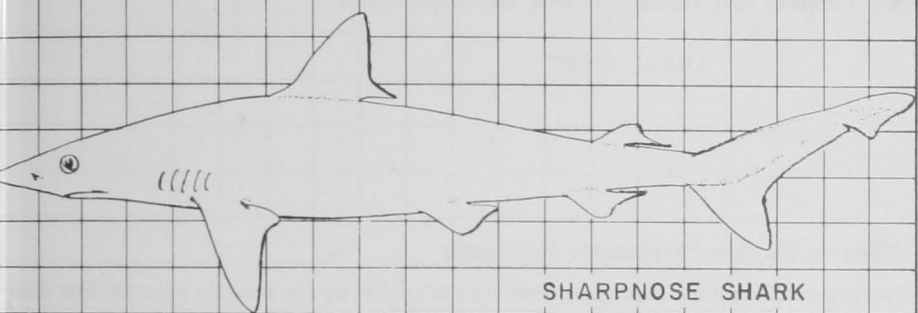
Remarks: Apparently an inshore species which feeds on a variety of small fishes.



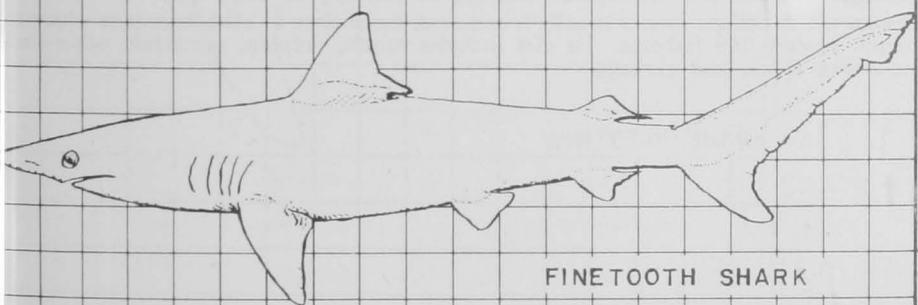
Note: Fourth upper and lower tooth of each jaw illustrated above



BLUE SHARK



SHARPNOSE SHARK



FINETOOTH SHARK

10 20 30 40 50 60 70 80 90 100

Percent of total length

Tiger Shark—*Galeocerdo cuvieri*

Distinctive characters: A low lateral ridge on each side of the caudal peduncle; the short blunt snout and the distinct notch in the rear margin of the teeth distinguish this shark from all others.

Color: Gray or grayish brown, darker above than on sides and belly; small specimens up to about 5 or 6 feet long are marked on back with darker spots, often fusing irregularly into oblique bars on sides and fins. Markings may fade with growth.

Maximum size: 30 feet. **Size at birth:** About 19 inches.

Range: Worldwide in tropical and subtropical seas; not uncommon along New Jersey coasts during warmer months.

Remarks: Occasionally taken far out at sea but more often in coastal waters. Stomach contents of tiger sharks have included squids, horseshoe crabs, stingrays, sharks, and many other fishes, turtles, birds, sea lions, and a remarkable assortment of such garbage as carrion, lumps of coal, tin cans, boards, and empty sacks.



Whitetip Shark—*Pterolamiops longimanus*

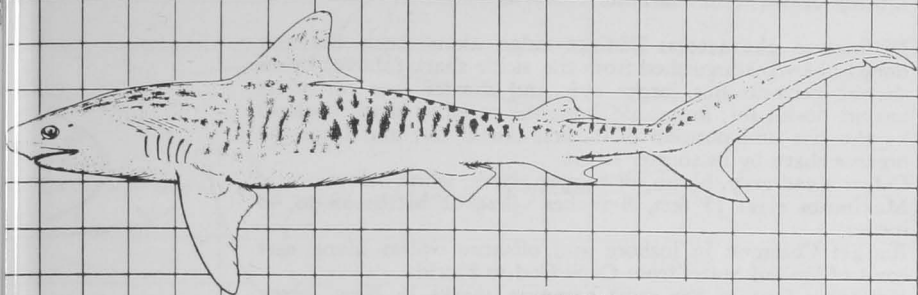
Distinctive characters: Set apart from similar species by the broadly rounded first dorsal fin, short snout, white-tipped fins, and rear tip of the anal fin reaching nearly to the lower precaudal pit.

Color: Varying from grayish brown to light gray or pale brown above, and yellowish or dirty white below. In adults the dorsal and pectoral fins are often, but not always white-tipped. Black-tipped fins are reported on embryos and young specimens.

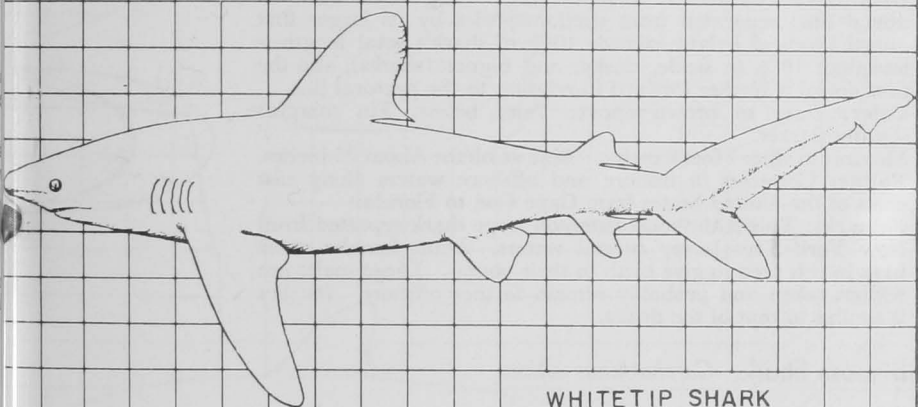
Maximum size: 12 to 13 feet. **Size at birth:** About 27 inches.

Range: Tropical and subtropical Atlantic, occasionally to Cape Cod.

Remarks: A pelagic species usually found near the surface in offshore waters where the depth exceeds 100 fathoms. Its diet includes squids, dolphin, mackerels, other small schooling fishes, and garbage.



TIGER SHARK



WHITETIP SHARK

10 20 30 40 50 60 70 80 90 100

Percent of total length

Sickle Shark—*Carcharhinus falciformis*

Distinctive characters: Distinct ridge along back between dorsal fins as in the sharks below, but separable from similar ridged-back species by the longer pelvic fins and the longer free tip of its second dorsal fin. Also, the sickle shark has a smaller eye than the dusky shark, and its first dorsal fin is not as high as in the sandbar shark and is placed farther back.

Color: Black to gray above, grayish white below.

Maximum size: 10 feet. **Size at birth:** Unknown.

Range: Common in the tropical belt of the western North Atlantic; strays northward to Cape Cod in the summer.

Remarks: An offshore species; its diet probably consists of various small fishes and squids.



Dusky Shark—*Carcharhinus obscurus*

Distinctive characters: Distinct ridge along back between dorsal fins. Distinguished from the sickle shark (above) by its shorter pectoral fins, larger eye, and shorter free tip of its second dorsal fin; separable from the sandbar shark (below) by the size and position of its first dorsal fin; and from the bignose shark by its shorter snout.

Color: Lead gray, bluish, or copper above, white below.

Maximum size: 11 feet, 8 inches. **Size at birth:** 38 to 48 inches.

Range: Common in inshore and offshore waters along east coast of United States from Cape Cod to Florida.

Remarks: One of the most common sharks in New Jersey waters. Feeds primarily on bottom fishes including scrobins, skates, headfish, and flatfish.



Sandbar Shark (Brown Shark)—*Carcharhinus milberti*

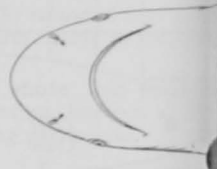
Distinctive characters: Distinct ridge along back between dorsal fins; separated from similar species by its larger first dorsal (vertical height exceeds 10% of shark's total length—less than 10% in sickle, dusky, and bignose sharks), also the first dorsal is further forward in relation to the pectoral fins.

Color: Gray to brown above. Paler below. Fin margins slightly darker.

Maximum size: 7 feet 8 inches. **Size at birth:** About 25 inches.

Range: Common in inshore and offshore waters along east coast of the United States from Cape Cod to Florida.

Remarks: This is the most common large shark reported from New York–New Jersey coastal waters. Adult females enter bays in this area to give birth to their young. Large males are seldom taken and probably remain farther offshore. Its diet is similar to that of the dusky.



Bignose Shark—*Carcharhinus altima*

Distinctive characters: Distinct ridge along back between dorsal fins. This little-known species has a snout length about equal to the width of the mouth (in the sickle, dusky, and sandbar sharks, the length of the snout is less than the width of the mouth).

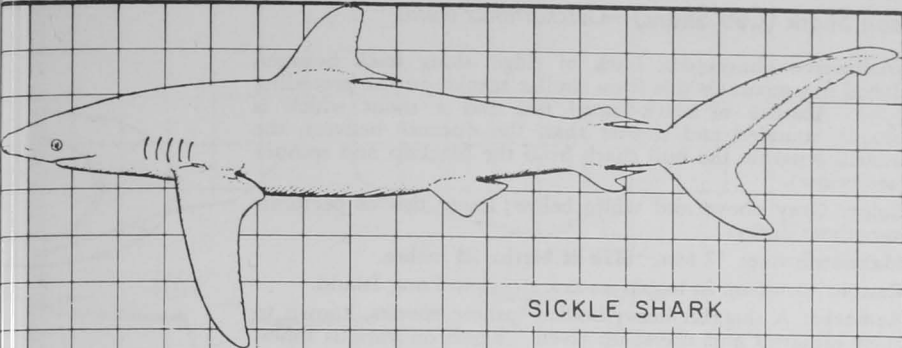
Color: Grayish brown above, sides a lighter tint; belly dirty white.

Maximum Size: 9 feet. **Size at birth:** About 25 inches.

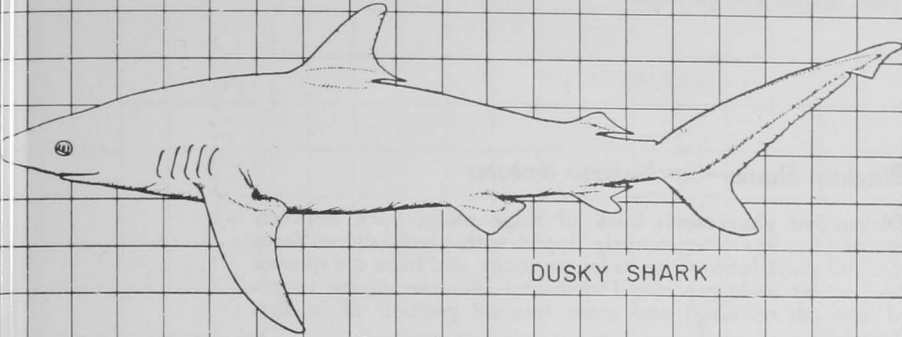
Range: Reported only from subtropical waters of the western North Atlantic; might occur in local offshore waters as a stray.

Remarks: An offshore species which rarely occurs in depths of less than 50 fathoms. Little is known of its habits.

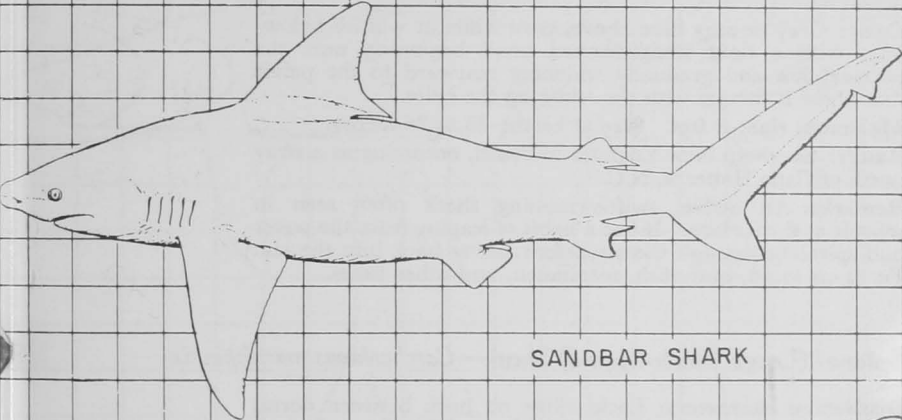




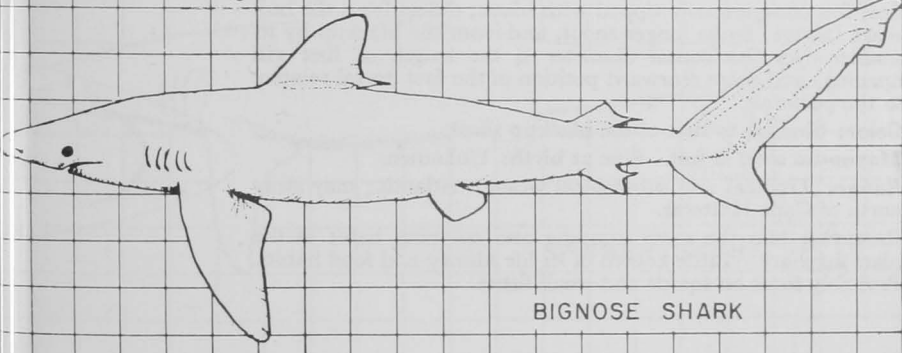
SICKLE SHARK



DUSKY SHARK



SANDBAR SHARK



BIGNOSE SHARK

10 20 30 40 50 60 70 80 90 100

Percent of total length

Bull Shark (Cub Shark)—*Carcharhinus leucas*

Distinctive characters: Lack of ridge along back between dorsal fins separates this from similar species on the preceding page. Absence of black-tipped fins and a snout which is broadly rounded and shorter than the distance between the nostrils separate the bull shark from the blacktip and spinner (see below).

Color: Gray above and white below; lower tips of pectorals sometimes dusky.

Maximum size: 12 feet. **Size at birth:** 28 inches.

Range: Common in tropic waters, strays to Long Island.

Remarks: A sluggish heavy-bodied inshore species, known to enter estuaries and travel up rivers. Feeds on various fishes, other sharks, and garbage.



Blacktip Shark—*Carcharhinus limbatus*

Distinctive characters: Lack of ridge along back between dorsal fins; fins conspicuously tipped with black; differs from the bull shark (above) by its longer snout, and from the spinner (below) by its larger eyes (horizontal diameter $\frac{1}{3}$ the length of first gill opening) and more forward position of its first dorsal fin.

Color: Gray or ashy blue above, pure white or whitish below; sides with a light wedge-shaped band beginning near the pectoral fins and gradually widening rearward to the pelvic fins where it merges with the white on the belly.

Maximum size: 8 feet. **Size at birth:** 23 to 26 inches.

Range: Southern New England to Brazil, occurring as a stray north of Cape Hatteras, N.C.

Remarks: An active, swift-swimming shark often seen in schools at the surface. It has a habit of leaping from the water and spiraling through the air before falling back into the sea. Feeds on squid, butterfish, menhaden, and other fishes.



Spinner (Large Black-tipped) Shark—*Carcharhinus maculipinnis*

Distinctive characters: Lacks ridge on back between dorsal fins; fins conspicuously tipped with black; differs from the bull shark (above) by its longer snout, and from the blacktip by its smaller eyes (horizontal diameter $\frac{1}{4}$ the length of first gill opening) and more rearward position of the first dorsal relative to the pectorals.

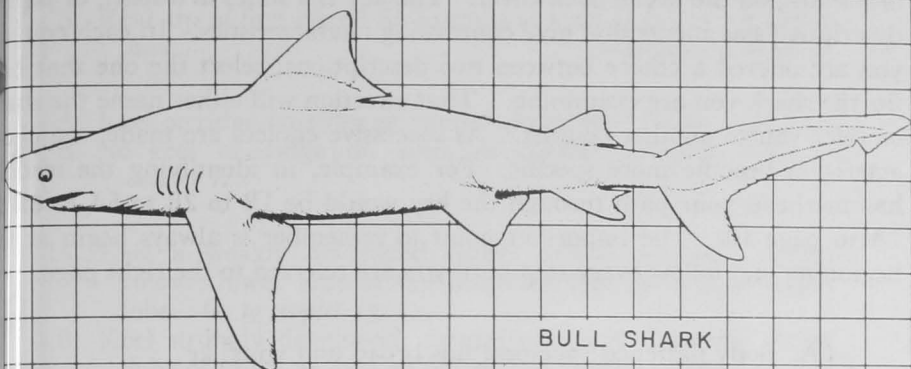
Color: Similiar to that of the blacktip shark.

Maximum size: 8 feet. **Size at birth:** Unknown.

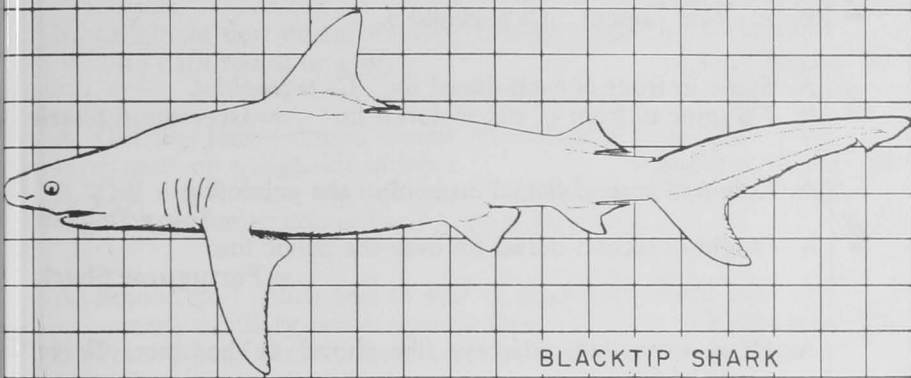
Range: Tropical and subtropical western Atlantic; may stray north of Cape Hatteras.

Remarks: Has the same jumping and spinning habit as the blacktip shark. Little known of its life history and food habits. Probably feeds on squids and small fishes.

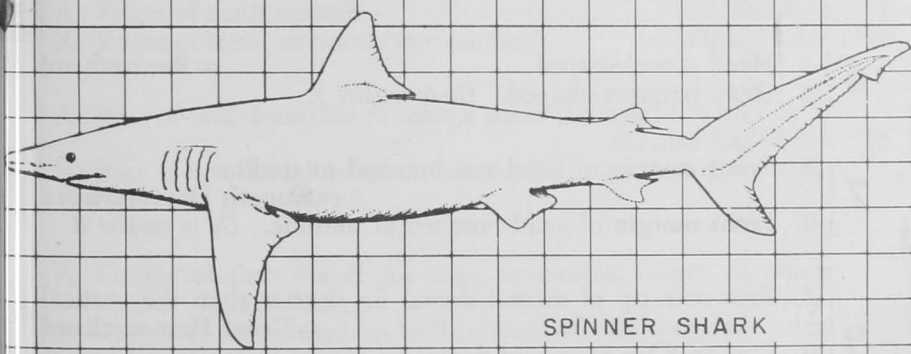




BULL SHARK



BLACKTIP SHARK



SPINNER SHARK

10 20 30 40 50 60 70 80 90 100
Percent of total length

IDENTIFICATION KEY

To use the key, first fold out for reference the drawing of external features of a shark, on the inside back cover. The key is a series of *couplets*, or pairs of descriptive statements that give contrasting characteristics. In each couplet you are offered a choice between two descriptions; select the one that best fits the shark you are examining. That selection will either name the shark or refer you to another couplet. As successive choices are made, the characteristics become more specific. For example, in identifying the smooth hammerhead your path through the key would be 1B to 2B to 5A to 6B to 7A to page 10. The important point to remember is always begin at the beginning and follow every step until you are referred to the right page.

- 1 { A. Body flattened; pectoral fins broad and winglike
= **Atlantic Angel Shark**
B. Body rounded, torpedo-shaped. *Go to couplet 2.*
- 2 { A. Anal fin absent. *Go to couplet 3.*
B. Anal fin present. *Go to couplet 5.*
- 3 { A. Spine in front of each dorsal fin. *Go to couplet 4.*
B. No spine in front of either dorsal fin = **Greenland Shark**
- 4 { A. Origin of second dorsal fin behind the pelvic fins
= **Spiny Dogfish**
B. Origin of second dorsal fin over the pelvic fins
= **Portuguese Shark**
- 5 { A. Head expanded sideways like shovel or hammer. *Go to couplet 6.*
B. Head not expanded sideways like shovel or hammer. *Go to couplet 9.*
- 6 { A. Head shovel-shaped = **Bonnethead**
B. Head hammer-shaped. *Go to couplet 7.*
- 7 { A. Front margin of head not notched at midline
= **Smooth Hammerhead**
B. Front margin of head notched at midline. *Go to couplet 8.*
- 8 { A. Free rear tip of second dorsal fin shorter than the vertical height of the fin = **Great Hammerhead**
B. Free rear tip of second dorsal fin longer than vertical height of the fin = **Scalloped Hammerhead**
- 9 { A. Tail about as long as entire length of body. *Go to couplet 10.*
B. Tail much less than length of body. *Go to couplet 11.*

IDENTIFICATION KEY—Continued

Page

- | | | | |
|----|---|--|----|
| 10 | { | A. Rear tip of first dorsal fin terminates in front of pelvic fins
= Thresher Shark | 12 |
| | | B. Rear tip of first dorsal fin extends at least as far as the pelvic fins
= Bigeye Thresher | 12 |
| 11 | { | A. Keel or ridge on sides of caudal peduncle. <i>Go to couplet 12.</i> | |
| | | B. No keel or ridge on sides of caudal peduncle. <i>Go to couplet 17.</i> | |
| 12 | { | A. Keel a weakly developed ridge; caudal peduncle nearly round; lower lobe of tail less than half as long as upper lobe. <i>Go to couplet 13.</i> | |
| | | B. Keel strongly developed; caudal peduncle flattened; lower lobe of tail $\frac{3}{8}$ as long as upper lobe. <i>Go to couplet 14.</i> | |
| 13 | { | A. Origin of first dorsal fin about opposite rear margin of pectorals; body gray, often with irregular dark bands or spots
= Tiger Shark | 22 |
| | | B. Origin of first dorsal fin well behind pectorals; body blue, no dark bands or spots
= Blue Shark | 20 |
| 14 | { | A. Gill slits long—extend almost full height of head and nearly meet on under side of head
= Basking Shark | 12 |
| | | B. Gill slits shorter—do not extend full height of head or very far on under side of head. <i>Go to couplet 15.</i> | |
| 15 | { | A. Second keel below and to rear of main keel; teeth with two small auxiliary points at their base
= Porbeagle | 14 |
| | | B. Second keel absent; teeth without auxiliary points at base.
<i>Go to couplet 16.</i> | |
| 16 | { | A. Edges of teeth smooth
= Mako | 14 |
| | | B. Edges of teeth serrated (saw toothed)
= White Shark | 14 |
| 17 | { | A. Base of first dorsal fin at least 4 times the height of fin
= False Cat Shark | 16 |
| | | B. Base of first dorsal fin much less than 4 times the height of the fin. <i>Go to couplet 18.</i> | |
| 18 | { | A. Origin of first dorsal fin over or behind origin of pelvic fins. <i>Go to couplet 19.</i> | |
| | | B. Origin of first dorsal fin well in front of origin of pelvic fins.
<i>Go to couplet 21.</i> | |
| 19 | { | A. Origin of first dorsal fin over origin of pelvic fins; a long barbel on each nostril
= Nurse Shark | 16 |
| | | B. Origin of first dorsal fin well behind origin of pelvic fins; barbels absent. <i>Go to couplet 20.</i> | |

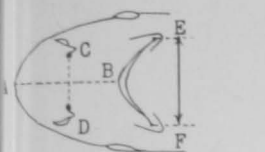
IDENTIFICATION KEY—Continued

- 20 { A. Irregular chain-like markings on side of body = **Chain Dogfish**
 B. No chain-like markings on sides of body = **Deep-Water Cat Shark**
- 21 { A. Mouth at tip of snout = **Whale Shark**
 B. Mouth not at tip of snout. *Go to couplet 22.*
- 22 { A. First and second dorsal fins about equal in size. *Go to couplet 23.*
 B. First dorsal fin much larger than second dorsal fin. *Go to couplet 25.*
- 23 { A. All 5 gill openings in front of pectoral fins = **Sand Shark**
 B. Last 1 or 2 gill openings over or behind origin of pectoral fins. *Go to couplet 24.*
- 24 { A. Origin of anal fin opposite CENTER of second dorsal fin; teeth flat, blunt (pavement-like) = **Smooth Dogfish**
 B. Origin of anal fin opposite ORIGIN of second dorsal fin; teeth pointed and sharp = **Lemon Shark**
- 25 { A. Origin of second dorsal fin about opposite CENTER of anal fin = **Atlantic Sharpnose Shark**
 B. Origin of second dorsal fin about opposite the ORIGIN of anal fin. *Go to couplet 26.*
- 26 { A. Maximum length of pectoral fin as great as or greater than distance from tip of snout to last gill opening; fins often white at tips = **Whitetip Shark**
 B. Maximum length of pectoral fin less than distance from tip of snout to last gill opening; fins without white tips. *Go to couplet 27.*
- 27 { A. Edges on both upper and lower teeth smooth = **Finetooth Shark**
 B. Edges of upper teeth finely to strongly serrated; lower teeth smooth or serrated. *Go to couplet 28.*
- 28 { A. A low but distinct mid-dorsal ridge present in the skin between first and second dorsal fins. *Go to couplet 29.*
 B. Mid-dorsal ridge absent. *Go to couplet 32.*
- 29 { A. Length of free rear tip of second dorsal fin more than twice as long as vertical height of the fin = **Sickle Shark**
 B. Length of free rear tip of second dorsal fin less than twice as long as vertical height of the fin. *Go to couplet 30.*

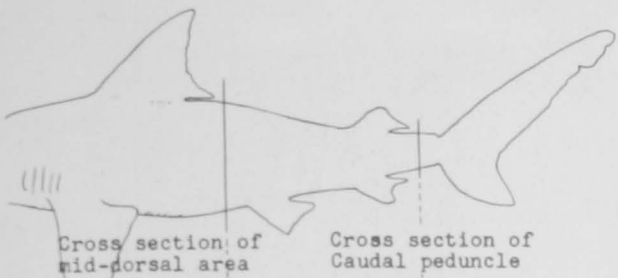
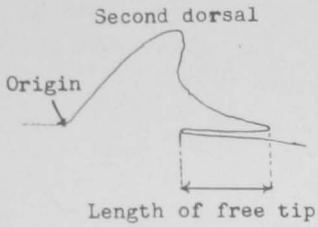
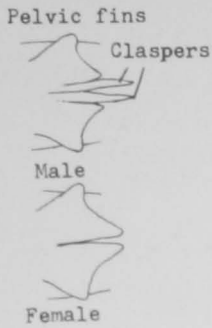
ABRIDGED KEY AND INDEX

[For "Keying," start on first line and proceed down in sequence.]

<i>If it is a shark (see p. 4)—</i>	<i>Refer to—</i>	<i>On page—</i>
with body flattened like skate or ray	Atlantic Angel Shark	
without anal fin, without spines	Greenland Shark	
without anal fin, with spines	{ Spiny Dogfish Portuguese Shark }	
with hammer-like head	Hammerheads	
with tail as long as body	Threshers	
with lower lobe of tail at least $\frac{2}{3}$ as long as upper lobe	{ Porbeagle Mako White Shark }	
but with gill slits longer than length of pectoral fin	Basking shark	
or with mouth at tip of snout	Whale Shark	
with barbel on each nostril	Nurse Shark	
with chain-like markings on body	Chain Dogfish	
with gill filaments protruding from rounded gill openings	Deep-water Cat Shark	
with 1st dorsal fin at least 4 times as long (at base) as its height	False Cat Shark	
without above characteristics and with large triangular dorsals, 2d nearly as large as 1st	{ Smooth Dogfish Lemon Shark Sand Shark }	
with length of pectoral more than twice the height of 1st dorsal, brilliant blue color	Blue Shark	
with mouth twice as wide as length of snout; often with dark stripes on body	Tiger Shark	
with 1st dorsal broadly rounded at tip; fins often tipped with white	Whitetip Shark	
with less obvious characteristics than above, but 1st dorsal much larger than 2d, and—		
with upper and lower teeth smooth edged (no ridge between dorsals)	{ Sharpnose Shark Finetooth Shark }	
with upper teeth strongly saw-edged, lowers smooth or nearly so, and—		
distinct ridge between dorsals	{ Sickle Shark Dusky Shark Sandbar Shark Bignose Shark }	
no ridge between dorsals	{ Bull Shark Blacktip Shark Spinner Shark }	



AB=Snout length
 CD=Interspace between nostrils
 EF=Width of mouth



Mid-dorsal ridge (Sandbar, Dusky, etc.)

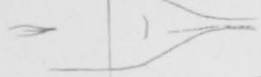


- A No lateral ridges (Sandbar, Dusky, etc.)
- B Low lateral ridges (Blue, Tiger)
- C Well developed keels (Mako, White, Porbeagle)

No mid-dorsal ridge (Blacktip, Bull)



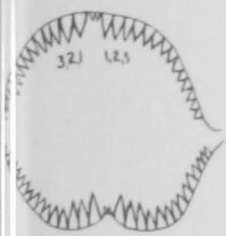
Top view of C-type peduncle



Side view of C-type peduncle



Secondary keel on Porbeagle



Dorsal fin formula $\frac{14-2-14}{14-2-14}$
 (example)

The Department of the Interior, created in 1849, is a department of conservation, concerned with management, conservation, and development of water, wildlife, fish, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As America's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States, now and in the future.



UNITED STATES DEPARTMENT OF THE INTERIOR

Stewart L. Udall, *Secretary*

Frank P. Briggs, *Assistant Secretary for Fish and Wildlife*

FISH AND WILDLIFE SERVICE

Clarence F. Pautzke, *Commissioner*

BUREAU OF SPORT FISHERIES AND WILDLIFE

Daniel H. Janzen, *Director*