

Sharks - Greenland (*Somniosus microcephalus*), Shortfin Mako (*Isurus oxyrinchus*), Blue Shark (*Prionace glauca*), Basking Shark (*Cetorhinus maximus*), and Porbeagle (*Lamna nasus*).

Description, Distribution and Biology

There are several shark species found in waters off Newfoundland and Labrador. The blue shark is the most common and commercially valuable of these species, however other species such as the Mako, Greenland, Basking, and Porbeagle sharks, have been assessed for their commercial significance in recent years.

Blue Shark: The blue shark (*Prionace glauca*) is a large pelagic species with a long slender body, narrow head, five-gill slits, large eyes, a pointed snout, and long scythe-like pectoral fins. It has an elongated, sickle shaped caudal fin (tail), which enables it to be a powerful and fast swimmer. This species has a characteristic blue colour on the upper surface shading to a pure white on its abdomen (Fig. 1). The blue shark is one of the fastest growing species of shark, ranging in size from 1.8 to 3.8 m and weighing 29 to 55 kg. The life span of blue sharks is unknown but it is estimated that they can reach a maximum age of 20 years.

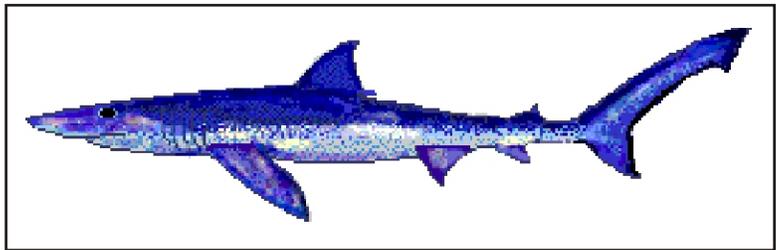


Figure 1. Blue shark. Source: Copyright EnchantedLearning.com. Used by permission

P. glauca is found in both inshore and offshore waters in the Atlantic, Pacific, and Indian Oceans, as well as adjoining seas, approximately 50° N to 50° S. The blue shark is the most widely distributed of all shark species. In the western Atlantic Ocean, the blue shark ranges from Newfoundland and the Gulf of St. Lawrence to Argentina. In Canadian waters, blue shark migrate to the Scotian shelf in late spring. In late summer and autumn the shark is common in the Gulf of St. Lawrence and on the Grand Banks. During the winter, the shark moves to deeper water off the continental shelf. The blue shark prefers near surface temperate water, ranging from 13 to 18°C, but can tolerate from 7 to 27°C.

The blue shark is viviparous, giving birth to fully formed young. Females can retain and nourish the spermatozoa in the oviducal gland for several years waiting for ovulation. After fertilization, the eggs require a gestation period of 9 to 12 months. The embryos obtain nourishment through a yolk-sac placenta attached to the uterine wall of the mother. The number of young produced per litter depends on the size and condition of the mother, and can range from 1 to 135 young with an average of 26-50

pups. Young are typically born in spring or early summer. Females reach sexual maturity between 5 and 6 years of age at a length of 190 cm whereas male blue shark mature earlier at 4 to 5 years of age, and at smaller sizes, approximately 180 cm in length.

The blue shark is an opportunistic feeder but prefers feeding on small pelagic schooling fish such as herring, mackerel, sardine and anchovy. The only natural predators of the blue shark are other larger shark species.

Shortfin Mako Shark: Makos, also called mackerel, blue pointer and bonito sharks, is a fast swimming, predominately pelagic shark identified by its slender body, long narrow pectoral fins, symmetrical caudal fin, conical snouts, and long gill slits that extend partially to the top of the head. The mako shark is typically a brilliant metallic blue on the dorsal side, shading to a white abdomen (Fig.2). Shortfin mako is a rapidly growing fish averaging between 1.5-2.5 m, and can reach upwards of 3.7 m and weigh approximately 450 kg.

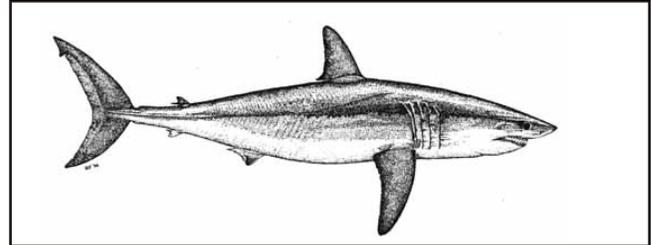


Figure 2. Shortfin Mako. Source: Copyright Ian K. Fergusson, Welwyn Garden City, UK

Mako sharks are widely distributed throughout warm temperate and tropical waters in the Atlantic, Pacific, and Indian Oceans. In the eastern Atlantic, the shark ranges from southern Norway to South Africa. In the western Atlantic it can be found from Newfoundland to Argentina, including the Gulf of Mexico and the Caribbean Sea. The mako shark prefers water temperatures between 17 and 22 °C but has been found in deeper water (740 m) and at cooler temperatures (5-11 °C). Tagging experiments illustrate mako migrate northward and towards coastal areas during the spring and summer and move offshore in the winter. It has been suggested mako occupy wintering grounds in the Gulf Stream and the Sargasso Sea from late autumn until early spring.

The mako shark is ovoviviparous therefore the young are retained and hatched inside the mother's uterus from a thin egg capsule and are typically born after a gestation period of 15 to 18 months. While in the uterus, the embryos obtain nourishment from the consumption of unfertilized eggs, which are continuously produced by the female. The number of young produced ranges from 4 to 21 pups, with an average of 14 to 16 pups per litter. Typical size at birth is approximately 70 cm. Males reach sexual maturity at approximately 2 m, while females are considered to sexually mature at about 2.75 m. Both sexes are mature between 4 and 6 years of age. The diet of mako shark consists primarily of fast moving pelagic fish such as swordfish, tuna and other shark species. It also commonly feeds on squid populations. The main predators of mako are larger shark species.

Greenland Shark: The Greenland shark, also known as the sleeper or gurry shark, has a heavy cylindrical body, short rounded snout, small eyes, two spineless, symmetrical dorsal fins, small pectoral fins, no anal fin, and short caudal (tail) fin. Colouring is typically brown-black to a dark grey color on upper surface, shading to purple on the sides with a dark band or white spots (Fig.3). The average size

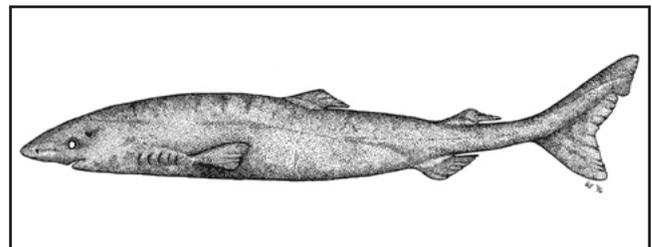


Figure 3. Greenland Shark. Source: Copyright Ian K. Fergusson, Welwyn Garden City, UK

of Greenland shark ranges from 4 to 5 m, but specimens over 6.4 m and weighing over 1,022 kg have been recorded.

The Greenland shark is restricted to the North Atlantic Ocean. In the eastern Atlantic it ranges from Iceland and the Barents Sea southward to the British Isles, and has been reported as far south as Le Havre, France. In the western Atlantic, the Greenland shark can be found off the east and west coast of Greenland, around Baffin Island and Davis Strait, southward to Newfoundland and the Gulf of St. Lawrence. This species prefers cold water, between 0.6 and 12 °C, and depths greater than 200 m. During winter, Greenland shark is common in surface waters in estuaries, shallow bays, and coastal areas, but will move into deeper, cooler waters during the summer.

Little information exists on reproduction and growth rates of Greenland shark. It is known they are ovoviviparous and can have more than 10 pups at a time, measuring approximately 38 cm at birth.

The Greenland shark feeds on a variety of fish species including capelin, halibut, herring, lumpfish, redfish and salmon. It also feeds on sea lion, seal and dead whales. It is assumed that the Greenland shark has few or no natural predators.

Basking Shark: The basking shark, also called sunfish, bone shark, elephant shark, sailfish shark and big mouth shark, is an enormous filter-feeding shark with a short conical snout, small eyes, large gills (which almost encircle the head) dark bristle-like gill rakers, huge mouth, small hooked teeth, and lunate caudal fin. The basking shark is grey-brown to a slate grey dorsally, shading to a lighter abdomen with white patches along the sides and under the mouth and snout (Fig.4). It is the

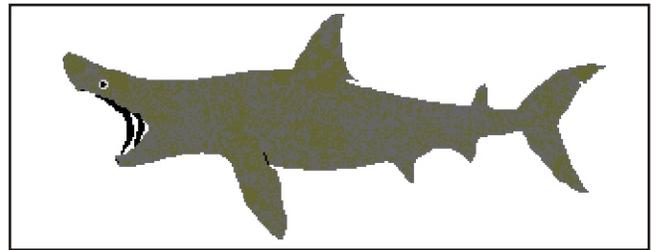


Figure 4. Basking shark. Source: Copyright EnchantedLearning.com. Used by permission

second largest shark species, growing to over 9 m in length and weighing up to 4000 kg.

The basking shark is a coastal-pelagic species distributed through Arctic and temperate waters of the world. In the northwest Atlantic Ocean, it is found from White and Notre Dame Bay in northern Newfoundland, through the Gulf of St. Lawrence, on the Scotian Shelf and southward to Florida. The basking shark is a slow swimming species that can travel alone or in schools of 100 individuals or more. It prefers near surface waters with temperatures between 8 and 12 °C and is often observed in bays and estuaries. The basking shark is also highly migratory species moving southward during the spring, shifting northward in the summer, and disappearing in autumn and winter.

Information on reproduction, growth and life span of basking shark is limited but it is thought to be ovoviviparous; giving birth to young after a lengthy gestation period (more than 3 years). The young are believed to be approximately 1.5 to 1.7 m in length at birth. Males are estimated sexually mature at 3.9 to 5 m in length and between 12 and 16 years, females are thought to mature between 7.5 to 9 m but age of maturity is unknown.

Basking sharks are one of three filter-feeding sharks in the world. Unlike other species, the basking shark relies solely on the passive flow of water through its pharynx when swimming. The numerous gill rakers located in the gills slits strain the food. It feeds almost exclusively on planktonic organisms including copepod, invertebrate larvae, and fish eggs and larvae. It has been suggested the basking shark will feed continuously near the surface when plankton is abundant, then shed its gill rakers during the winter months and migrate to deeper water.

Porbeagle Shark: Porbeagle is a large pelagic shark species from the family Lamnidae. It has a heavy spindle shaped body, stout head, pointed snout, large mouth, and symmetrical caudal fin. It is dark blue-grey to blue-black dorsally, shading to a white abdomen (Fig.5). Porbeagle can grow to 3.2 m, weighing over 250 kg and live upwards of 30 years, however the majority of porbeagle range in size from 1.5 to 3.5 m and weigh 20 to 160 kg.

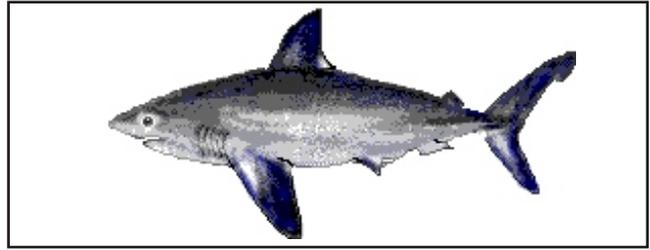


Figure 5. Porbeagle Shark. Source: Copyright EnchantedLearning.com. Used by permission

The porbeagle is distributed in cold-temperate waters (6 to 16 °C) of the Atlantic, Pacific and Indian Oceans. In the eastern Atlantic this species can range from Iceland and the western Barents Sea to Morocco and the Mediterranean. In the northwest Atlantic, porbeagle is common from Newfoundland to New Jersey and has been reported as far as South Carolina.

The porbeagle is ovoviviparous, giving birth to fully developed young after a gestation period of 8 to 9 months. At birth the young measure 0.65 to 0.70 m in length. Females will produce an average of 4 pups per litter. Males reach sexual maturity at approximately 1.8 m in length and 7 years of age, while females are generally mature at 2.1 m in length and 14 years. Porbeagle feeds principally on mid-water and pelagic fish species, such as herring, mackerel, and gaspereau. It is also known to feed on cod, white hake, red hake, haddock and squid. There are few natural predators of the porbeagle except larger more aggressive sharks.

Harvesting and Management

These sharks have been exploited off the east coast of Canada since the early 1960s however the majority of shark landings for eastern Canada have been by-catch in established fisheries such as longline swordfish and other groundfish fixed gear fisheries. Norway, Faeroe Islands, Japan and the United States were involved in harvesting pelagic shark species. Closure and reductions in many of the traditional groundfish fisheries has resulted in more Canadian fishers interested in developing a target fishery for pelagic shark species, particularly for porbeagle, short-fin mako, and the blue shark and to a lesser extent the basking and Greenland sharks. No fishery existed in Newfoundland for shark species prior to 1995, when the Department of Fisheries and Oceans (DFO) established quotas and issued licences in the region. Total landings of shark for Newfoundland averaged 44 metric tonnes (mt) from 1995 to 2002, with 1998 recording the highest value (Fig.6).

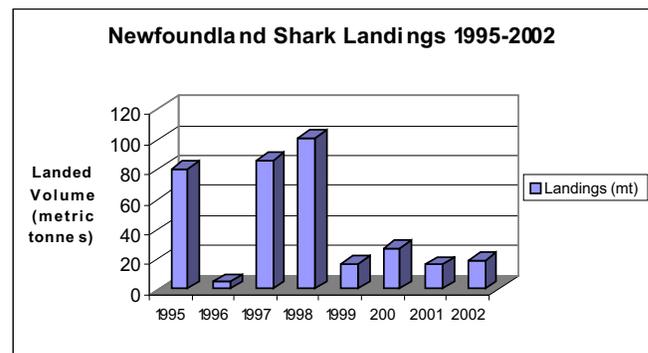


Figure 6. Newfoundland Shark Landings. Source: DFO Statistics, Canada

Prior to a formal shark fishery in Atlantic Canada, it was thought shark resources of the region were underutilized. Shark species are relatively slow growing, long-living organisms with low

reproductive rates, making them highly susceptible to over-harvesting. Therefore, numerous shark fisheries throughout the world have collapsed after a short period of exploitation. Prior to 1994, access to shark resources in Atlantic Canada was not restricted and no formal management measures existed. In 1995, an interim management plan was introduced and by 1997, a multi-year management was initiated (1997-1999) and updated in 2000-2001. Under these new fishery regulations only vessels over 65 feet are allowed to participate, harvesting gear is limited to handline, longline or rod and reel, no by-catch of tunas or swordfish are allowed and all landing are monitored by DFO.

Processing and Marketing

Landed shark must be handled carefully and quickly in order to preserve product quality. Immediately after capture, the shark must be bled by cutting off the head and tail portion, then gutted, washed, and packed in ice and slush solution. When properly handled and iced, shark will remain fresh for 7 to 10 days. There are several products made from shark including oil, whole dressed shark, fresh or frozen steak, leather tanning products and various types of medicine, however the most valuable product is shark fins, which are one of the most expensive fish products in the world. Asia holds the main market for shark fins, with Hong Kong and Singapore being the most important trading centers. The value of the fins depends on the natural colour, size, thickness, and content of the fin-rays or needles. The best commercial value species are the hammerhead, mako and blue shark. A pair of fresh fins can receive up to \$1,000 in Asian markets while dried fins typically sell for \$ 350 per pound.

Greenland shark has traditionally been harvested by Greenland and Europe for its hide, liver oil, and flesh, however its flesh can be extremely poisonous if not washed, cleaned and prepared correctly. Shortfin mako sharks are considered one of the greatest gamefish in the world and have been exploited for recreational purposes in the United States, Australia and New Zealand. Other uses of Shortfin mako include fin soup, leather products, and ornaments made from their jaws and teeth. Basking sharks are also exploited for their oil, meat, fins, and vitamin rich livers.

Processing and Marketing

Future development of the shark fishery will require more research into species distribution and biology to determine abundance and develop management measures for sustainable harvest. In addition, the industry requires processors interested in purchasing and processing whole shark, a consistent supply of top quality shark meat, and greater marketing effort directed at consumer specification and finding new markets niches.

ADDITIONAL READINGS:

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Interesting Web Sites:

<http://www.sharktowntown.com/greenland.htm>
<http://www.herper.com/unusual4.html>
<http://www.enchantedlearning.com/subjects/sharks>
<http://www.mar.dfo-mpo.gc.ca/science/shark>
<http://www.sharktrust.org>
<http://www.amonline.net.au/fishes/fishfacts/fish/pglauca.htm>
http://www.hmsc.orst.edu/odfw/devfish/sp/blue_shark.html
<http://www.elasmo-research.org>
<http://www.flmnh.ufl.edu/fish>

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