

Atlantic Dogfish (*Squalus acanthias*)

Common Names: Spiny dogfish, greyfish, piked dogfish, skittledog, spotted dogfish, thorndog, codshark, white-spotted dogfish, and spurdog.

Description, Distribution and Biology

The Atlantic dogfish is a predominately demersal (bottom-dwelling) shark species from the family Squalidae. Its slender elongated body, large eyes, narrow and pointed snout, no anal fin, and sharp poisonous spines that precede each of the dorsal fins, easily distinguishes this species from other sharks in the Atlantic. Dogfish use their back spines for defence by curling around in a bow and striking its attacker, which also makes them hard to handle. Like other sharks, it has a cartilaginous rather than bony skeleton and tough sandpaper like skin. The Atlantic dogfish is typically slate grey on its back and side, gradually shading to a white-grey towards its abdomen (Fig. 1). Rows of irregularly arranged small white spots are displayed on its back and sides, and are generally more noticeable in younger and smaller individuals. Females typically live longer and are larger than the males, growing to a maximum length of 120 cm, while the males have a maximum length of 84 cm. Average weight of dogfish is anywhere between 3 and 5 kg but some mature females can reach 10 to 20 kg.

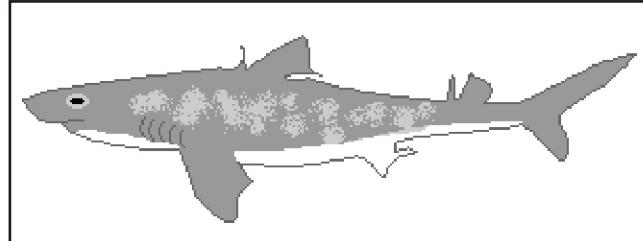


Figure 1. Atlantic Dogfish. Source: Department of Fisheries and Aquaculture, St. John's, NL

The Atlantic dogfish is the most abundant shark species in the world. It is widely distributed in the North Atlantic Ocean, especially in temperate and subarctic waters to depths of 400 m. In the eastern North Atlantic, it is generally found from the Barents Sea southward towards Morocco, including the Mediterranean and Black Sea. In the northwest Atlantic, this species extends from Greenland south to North Carolina, which is a well-known wintering ground (Fig. 2). Dogfish migrate to stay in water between 7 and 15°C. In the spring, schools of dogfish begin their migration northward in response to warmer water temperatures and in search of more abundant food resources in the nutrient-rich waters of the continental shelf of both Newfoundland and Nova Scotia. During the summer months, they can be found in coastal waters off Newfoundland where they are highly concentrated in Placentia, Fortune, and St. Mary's bays. Evidence suggests that a number of immature males and females will remain there or in deep-water channels over the winter months. By late autumn the majority of Atlantic dogfish have migrated south to warmer waters. Tagging research has indicated that some individuals have migrated in both directions across the Atlantic Ocean.

In the northwest Atlantic, mating and birthing of dogfish takes place during the winter months off the southeast coast of the United States. Dogfish are an ovoviviparous species; the young are retained and hatched inside the mother's uterus from a thin egg capsule. They are typically born after a gestation period of 22 to 24 months; the longest gestation period of any vertebrate animal. Mating and fertilization occurs following the birth of dogfish. During the breeding season, sexually mature dogfish form large schools. The males have modified pelvic fins, which form claspers, allowing for internal fertilization of the female. After fertilization, the eggs pass through the female's uterus and are enclosed in a gelatinous capsule, referred to as a candle. The candle will break down after a few months, leaving the embryos free to continue development in the oviduct. Each embryo has an external egg sac attached to its abdomen to serve as a food resource throughout the remaining gestation period.

The number of young born to an individual female dogfish varies according to size; larger females typically having more young. Dogfish embryos can number from 2 to 15, with an average of 6.6 born every two years. During the winter months (November to December), the pups form large schools and remain in surface water in order to feed on jellyfish and other types of plankton. Once the pups mature, they migrate to deeper water feeding mostly on fish species, particularly herring, cod, haddock, mackerel and capelin, but also target squid, shrimp, jellyfish and crab. Growth is relatively quick during the first two years but will slow once the organism reaches 40 cm (5 years). Males typically mature at 78 cm in length (11 years) while females mature much later at 18-21 years and approximately 92 cm in length. This species is long-lived; 30 to 40 years but reports indicate that they can live up to 100 years of age. Dogfish travel and feed in schools that are segregated by sex and size but packs are mixed, especially during mating.

Since dogfish have no scales or otoliths (aid in hearing and balance in bony fish), age is determined using growth rings or zones located on the second dorsal spine. Lighter colour rings represent fast growth while dark rings represent slow growth during winter months.

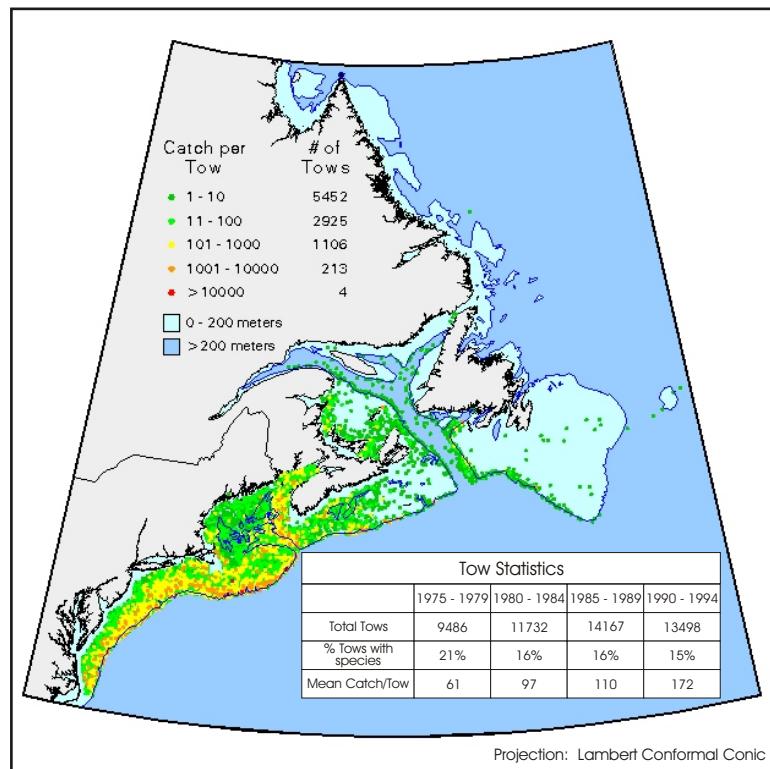


Figure 2. East Coast of North America Strategic Assessment Project. Distribution of Atlantic dogfish. Source: Science Sector, Department of Fisheries and Oceans, Canada Office of Ocean Resources Conservation and Assessment, National Oceanic and Atmospheric Administration, USA

Harvesting and Management

Beginning in the 1930s, dogfish species were harvested mainly for their vitamin A-rich oil contained in the liver. During World War II, a restriction was placed on imports of vitamin A from fish liver oil, resulting in a massive expansion of the dogfish industry in both the Pacific and Atlantic oceans. However, after the introduction of synthesized vitamin A during the 1950s, the industry rapidly diminished. Since the 1970s, dogfish has continued to be moderately harvested by many European countries. The fishery usually begins in May and remains open until October.

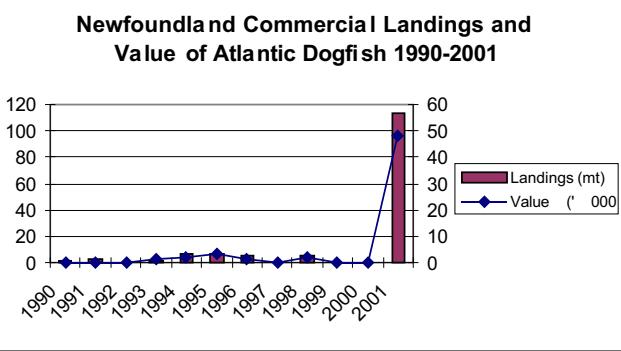


Figure 3. Newfoundland Commercial Landings and Value of Atlantic Dogfish 1990 - 2001. Source: DFO Statistics, Canada

Historically, Atlantic dogfish was regarded as a nuisance species in the waters off Newfoundland and Labrador. When abundant, they are known to destroy harvesting gear for other species. Commercial harvesting of this species is small and concentrated in southern bays of the island. Dogfish is usually captured using standard 150 mm mesh groundfish gillnets, otter trawls, or baited longlines. Landings for Newfoundland averaged 11.8 metric tonnes (mt) between 1990 and 2001, with no recorded landing in 1992, 1997, 1999, or 2000. The average value of these landings was \$4,750 between 1990 and 2001, with the highest value obtained during 2001 at \$48,000 for 114 mt (Fig. 3).

At present, the Canadian Atlantic dogfish fishery has no management guidelines in terms of quota, fishing season, harvesting or area restrictions. However, this species is particularly vulnerable to over-harvesting as a result of its late maturity, low reproductive capacity, long gestation period, longevity and ease of capture. In the North Atlantic, there have been numerous accounts of over-exploitation followed by near-collapses in populations. This species is still harvested in significant numbers throughout the world, some of which are managed and is a valuable commodity in international markets.

Processing and Marketing

After capture, dogfish are sorted, processed, and frozen for shipment to specific markets. Dogfish products bound for European markets are primarily processed into backs, belly flaps and fins. These products are wrapped and frozen either individually or in blocks. A back, which contains the cartilaginous spinal cord, is similar to a log of a shark but without the attached belly flaps and a typical grade for skin-off backs is 1/2 lbs, 2/4 lbs, and 4/up increments. These products are common in fast food packages and popular for the English style fish and chips. In Germany, dogfish bellies are smoked and sold as a delicacy in beer gardens. Dogfish destined for Asia are typically headed and gutted, skin-on products or dogfish fins, which are either dried or frozen, are used in Japanese-Chinese cuisine. Other products manufactured from dogfish include vitamins, sandpaper, leather,

fertilizer, and pet food. It is also regularly used as a preserved specimen for research purposes in medical laboratories and universities throughout the world. Dogfish are also still harvested for their liver oil, which can be broken down into fine grade machine oil.

Constraints and Future Development

With a decline in European dogfish resources over the last decade or more, it is possible that a restricted commercial fishery for this species would be achievable and economically feasible in the northwest Atlantic, particularly off the southern coast of Newfoundland and Labrador. To avoid over-harvesting and therefore loss of stocks, a management plan will have to be implemented and enforced. The fishery will also have to address handling and processing issues, since dogfish excrete urea through the skin.

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