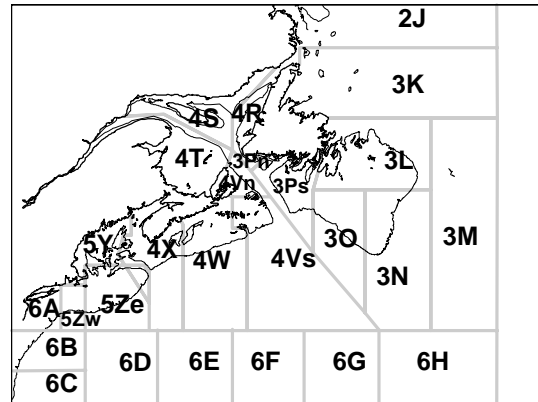




Don Harrison
Scott & Scott 1988

**NAFO SUBAREA 3 - 6
PORBEAGLE SHARK**



Background

The porbeagle shark (*Lamna nasus*) is a cold-temperate species that occurs in the north Atlantic, south Atlantic and south Pacific oceans. The species range extends from Newfoundland to New Jersey and possibly to South Carolina in the west Atlantic and from Iceland and the western Barents Sea to Madeira and Morocco and into the Mediterranean in the east Atlantic. In the northwest Atlantic, this pelagic shark inhabits inshore and offshore waters colder than 16°C, and is commonly seen in the 10 - 14°C range. Porbeagle sharks move onto the Scotian Shelf in late spring and into the Gulf of St. Lawrence and onto the Grand Banks during the summer and early fall. Segregation occurs by sex and size. There is evidence to suggest that mating occurs in September - November on the Grand Banks. Porbeagle move into deeper water in late fall and are taken off the continental shelf in winter. They are also taken in deep water basins such as Emerald Basin and the Gulf of Maine during the winter.

Stock structure of the porbeagle shark is presently unknown, although the history of the fishery suggests that separate populations may exist in the east and west Atlantic. Based on tagging, there is no evidence of long distance migrations, as in blue and mako sharks. For pragmatic purposes, the stock is defined by NAFO SA 3 - 6.

Unlike most of the teleosts (bony fishes), the fertilization of eggs occurs internally in elasmobranchs (sharks, skates and rays). In most species of sharks, fertilized eggs continue to develop in the uterus of the female and young are born as fully formed juveniles or "pups". Development is prolonged and young are born at a relatively large size, which reduces the number of potential predators of the young. Pregnant females continue to release eggs and the embryos obtain nourishment by consuming unfertilized eggs in the uterus. The number of young produced annually (litter size) ranges from 1 to 5, with an average of 4 pups per litter. Size at birth is approximately 70cm. Males mature at 150 to 200cm total length while females mature at 200 to 250cm total length. It has been estimated that first maturity in females occurs at age 8. Porbeagle sharks are among the faster-growing species of sharks. Maximum reported size is 365cm total length and greater than 230kg; however specimens over 250cm are rare.

Diet of the porbeagle shark consists primarily of small pelagic schooling fishes, such as mackerel and herring, but includes squid, silver hake and a variety of other fishes. The only likely natural predators are other large sharks.

Summary

- The fishery in the Northwest Atlantic started in 1961 when Norway and Faroe Islands reported landing 1924t. Landings reached 9283t in 1964 and the resource appeared to have collapsed by 1967.
- The Faroe Islands reported annual landings of about 350t during the 1970s-1980s, which appeared sustainable. Canada started directing for porbeagle in 1991. Landings rose to 1,925t by 1992 and dropped to 1425t in 1993 when the Faroese fleet left the fishery.
- Landings were 1054t and 1338t in 1996 and 1997 against quotas of 1500t and 1000t respectively.
- Porbeagle has a relatively low pup production rate and is consequently very sensitive to over-exploitation.
- Since 1991, landings have averaged about 1500t annually. There is some evidence of declines in spring catch rates in recent years which suggests that abundance may have declined.
- Given uncertainties in our knowledge of the resource, it would not be prudent to harvest above the 1997 TAC of 1000t until the observed declines in catch rates can be explained.

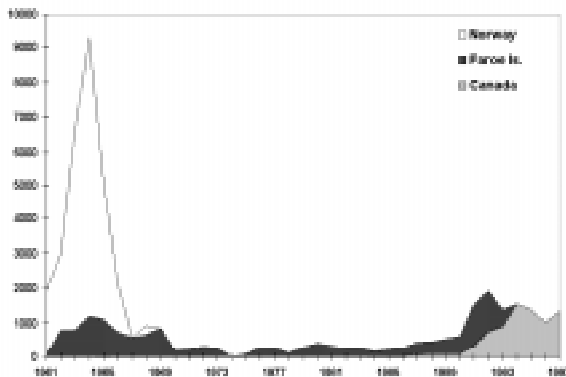
The Fishery

Landings (t)

Year ¹	Avg	Avg.	Avg.	1994	1995	1996	1997
	1970-79	1980-89	1990-93				
TAC ²	-	-	-	-	1500	1500	1000
Foreign	339	315	869	64	0	39	0
Canada		33	517	1550	1375	1015	1338
TOTAL	339	348	1386	1614	1375	1054	1338

1. All landings provisional

2. In 1995 and 1996, the catch levels were non-restrictive



The **directed fishery** for porbeagle sharks in the Northwest Atlantic (NAFO areas 3 - 6) started in 1961 when Norwegian vessels began exploratory fishing using pelagic longline. These vessels had previously fished for porbeagle in the Northeast Atlantic. They were joined by vessels from the Faroe Islands during the next few years. **Reported landings** in the Northwest Atlantic rose from 1,924t in 1961 to 9,283t in 1964 and then fell to less than 1,000t in 1970. There are indications that the porbeagle shark stock in the Northwest Atlantic was over-exploited during this period. Although the fishery was unrestricted, reported landings were less than 500t until 1989. Reported landings rose to 1,544t in 1991 and 1,925t in 1992, due to increased effort by Faroese vessels and also due to the entry of Canadian interests into this fishery. Participation by Faroese vessels in the fishery was restricted in 1993 and total landings dropped to 1,425t. Faroese participation was

eliminated from the directed fishery by 1994, at which time total landings by three Canadian offshore pelagic longline vessels and a number of inshore vessels was 1614t. Reports of landings of porbeagle from SA 3 - 6 by other countries in recent years are minor although the statistics are incomplete.

Canada introduced a shark management plan in 1995 which defined a non-restrictive catch level of 1,500t. Landings in that year dropped to 1375t on account of one of the offshore vessels leaving the fleet. In contrast, landings by the inshore fleet increased from 87t in 1994 to 185t in 1995. In 1996, total landings declined to 1054t, primarily on account of reduced offshore effort, although landings from the inshore fleet increased to 275t. In 1997, a TAC of 1000t was imposed under the new **1997-99 Shark Management Plan**, however, landings were 1338t due to reporting problems. Landings in the first two months of 1998 were lower than those in previous years. This may be due to the presence of abnormally cold water on the Scotian Shelf during this time.

Porbeagle sharks are taken as a **by-catch** in the Canadian swordfish longline fishery; however observer reports suggest the levels are low. In 1997, while the directed porbeagle fishery reported 1284t, the bycatch in the swordfish was only 5t. About 15t of porbeagle was taken as by-catch in a variety of inshore fisheries. Porbeagle sharks are also taken as a by-catch in the Japanese tuna longline fishery; observer estimates being 2t in 1994, zero in 1995, one in 1996 and zero in 1997.

Angling for sharks has increased in Atlantic Canada over the last few years, based primarily on blue shark catches, but porbeagle sharks are only occasionally taken. Information on removals by this developing recreational fishery is not available.

Resource Status

Porbeagle **segregate by sex and size**. Young males first enter the southern Scotian Shelf in March. They are joined by older males and mature (greater than 200cm) females in increasing numbers by the summer. The latter migrate up the coast to reach the Grand Banks by September, where they are believed to mate. While many of the details of the **reproductive cycle** of porbeagle remain to be elucidated, it is becoming increasingly apparent that the female gives birth to about 4 pups per year. This level of pup production is very low for a shark species.

Interpretation of catch rates is made difficult by the presence of interactions of month, area and vessel with year. These may be due to the complex seasonal movements undertaken by the different sexes and sizes of porbeagle. An analysis undertaken to account for these interactions provides some evidence of declines in 1991- 97 **catch rates** in the offshore spring Canadian and Faroe Islands fisheries. This suggests that abundance may have declined in recent years. Industry has suggested that the recent declines in spring catch rates may be due to environmental influences as they have not experienced similar declines in the aggregated yearly catch rates.

Outlook

Porbeagle sharks are long-lived, and produce low numbers of offspring. This combination of life history characteristics makes porbeagle sharks highly susceptible to over-exploitation. The high catch levels experienced in the early 1960s did not appear sustainable. However, the fishery appeared sustainable during the 1970s and 1980s when landings averaged 350t annually. The catch level of 1,500t in the 1995 and 1996 Management Plans was not based upon estimates of stock abundance and may not be sustainable.

Since 1991, landings have averaged about 1500t annually, and there is some evidence from spring catch rates to suggest that abundance may have declined. Given the uncertainties in our knowledge of the resource, it would not be prudent to harvest above the 1997 TAC of 1000t until the observed recent declines in catch rates can be explained. Further, while a 1000t TAC in 1998 would represent a reduction in catch, it is uncertain if this reduction would be sufficient to arrest the decline in population abundance suggested by the decline in catch rates.

It is very important that the provisions of the 1997-99 Shark Management Plan be implemented to ensure orderly harvesting of the resource. In particular, the scientific component to collect the information necessary to fill the identified knowledge gaps should be enhanced.

This species is part of a large pelagic species complex that includes tunas, swordfish, billfishes, and other species of large sharks. Management of the porbeagle shark fishery needs to consider interactions with other species in the complex.

The stock area of this species extends beyond the Canadian Zone. Management of this resource in the future could require bilateral cooperation. Notwithstanding this, benefits to Canadian fisheries could be realized through unilateral action.

For More Information

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References

O'Boyle, R., M. Fowler, P. Hurley, and M. Showell. 1998. Update on the Status of NAFO Subarea 3 - 6 Porbeagle Shark (*Lamna nasus*). DFO Canadian Stock Assessment Secretariat Res Doc. 98/41.

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