

**The Decline of the Cape Breton Swordfish Fishery:
An Exploration of the Past and Recommendations for the Future
of the Nova Scotia Fishery**

by Gretchen Fitzgerald

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To contact the author or to obtain more copies, contact:

Marine Issues Committee
Ecology Action Centre
1568 Argyle Street, Suite 31
Halifax, Nova Scotia
B3J 2B3
Fax: (902) 422-6410
E-mail: eac_hfx@istar.ca

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INTRODUCTION

The Marine Issues Committee of the Ecology Action Centre commissioned this report. The goals of the Committee are to promote marine conservation and sustainable ocean-based livelihoods in Nova Scotia. We became interested in the swordfish fishery in 1995 because of reports from fishermen of high levels of bycatch of juvenile fish and non-target species in the longline fleet. We also felt that harpooning was not being recognized as a more sustainable way of catching swordfish. While this report focuses on the Canadian swordfish fishery, and in particular the decline of Cape Breton fishery, we hope that it will be of interest to all those who care about the swordfish fishery and our open-ocean ecosystem.

At the beginning of this project, we were confronted with the mysterious collapse of the swordfish fishery off of Cape Breton in the early 1960's. The collapse of the fishery began to take on the appearance of a "whodunit," and several "suspects" were investigated for committing this thirty-five year old crime. Factors that might have contributed to the collapse include over-fishing, changes in ocean circulation, the construction of the Canso Causeway, and changes in fishing patterns. We thought that by examining why the Cape Breton fishery collapsed, we would come to a better understanding of how the present fishery could be regulated so that such collapse do not occur again.

**Mark Butler, Marine Co-ordinator
Ecology Action Centre**

MOTIVATION

The objective of this report is to outline the history of the swordfish fishery in Nova Scotia, with a focus on the decline of this fishery off the coast of the Cape Breton Island (Figure 1). As much as possible, I have sought to relate the story of this fishery in the words of fishermen themselves, so that the reader will get a sense of the culture that characterizes this fishery (see Appendix A). By listening to how the fishery has changed over the years and explanations for why these changes have occurred, I have formulated some recommendations for the future management of this fishery.

There are a number of reasons for concern about how the modern swordfish fishery is being managed. The International Commission for the Conservation of Atlantic Tunas (ICCAT) currently regulates fisheries for tuna and tuna-like species in the Atlantic. In 1996, stock assessments showed that the North Atlantic swordfish stock had declined by 68% since 1968 (Anon. 1998a). ICCAT has recommended decreases in the swordfish quota since 1995, and the most recent assessment indicates that the declines of the North Atlantic stock may have been halted and that the stock may even be recovering. However, it will take time for the swordfish stock to recover. In addition, there is a lack of monitoring and enforcement of ICCAT recommendations, such that the effectiveness of actions taken by this body is questionable.

At present, approximately 50 longline vessels catch approximately 90% of the Canadian quota for swordfish (Figure 2 illustrates the management areas of the Canadian swordfish fishery). The remainder of the quota is caught by 100-150 harpoon vessels.¹ Upon reading observer reports from the longline fishery and listening to swordfish fishermen, I became concerned that longlining was not a sustainable method of fishing because of the number of immature fish caught by this gear type. I also began to suspect that longlining could have effects on non-target pelagic species, such as sharks, tunas, and marine turtles. From a socio-economic standpoint, it became apparent that the capital-intensive longlining resulted in a concentration of wealth derived from the fishery. Harpooning is relatively low cost, and results in a more equitable distribution of wealth.

In 1998, the Nova Scotia Swordfish Association (NSSA), an organization that represents the interests of longliners, proposed that Canada split its portion of the ICCAT quota amongst the two gear types. A split in the quota might make management and prosecution of the fishery easier and more predictable from year to year, but it might also lead to further marginalization and even the disappearance of the small-scale harpoon fishery. Setting aside a fixed portion of Canada's quota for the harpoon fleet might pave the way for the establishment of individual transferable quotas amongst longliners. Canada's Department of Fisheries and Oceans (DFO) has privatized other Canadian fisheries, with the result that the small-scale operations are edged out and larger fishing companies or individuals end up owning a majority of the quota. The harpooners rejected a split in quota in 1998, but the NSSA continues to lobby for the quota split.

¹ Over the last 10 years, harpooners caught an average of 8.6% of the Canadian quota for swordfish (with a broad range of 1.25 – 21.5%; Anon. 1997b).

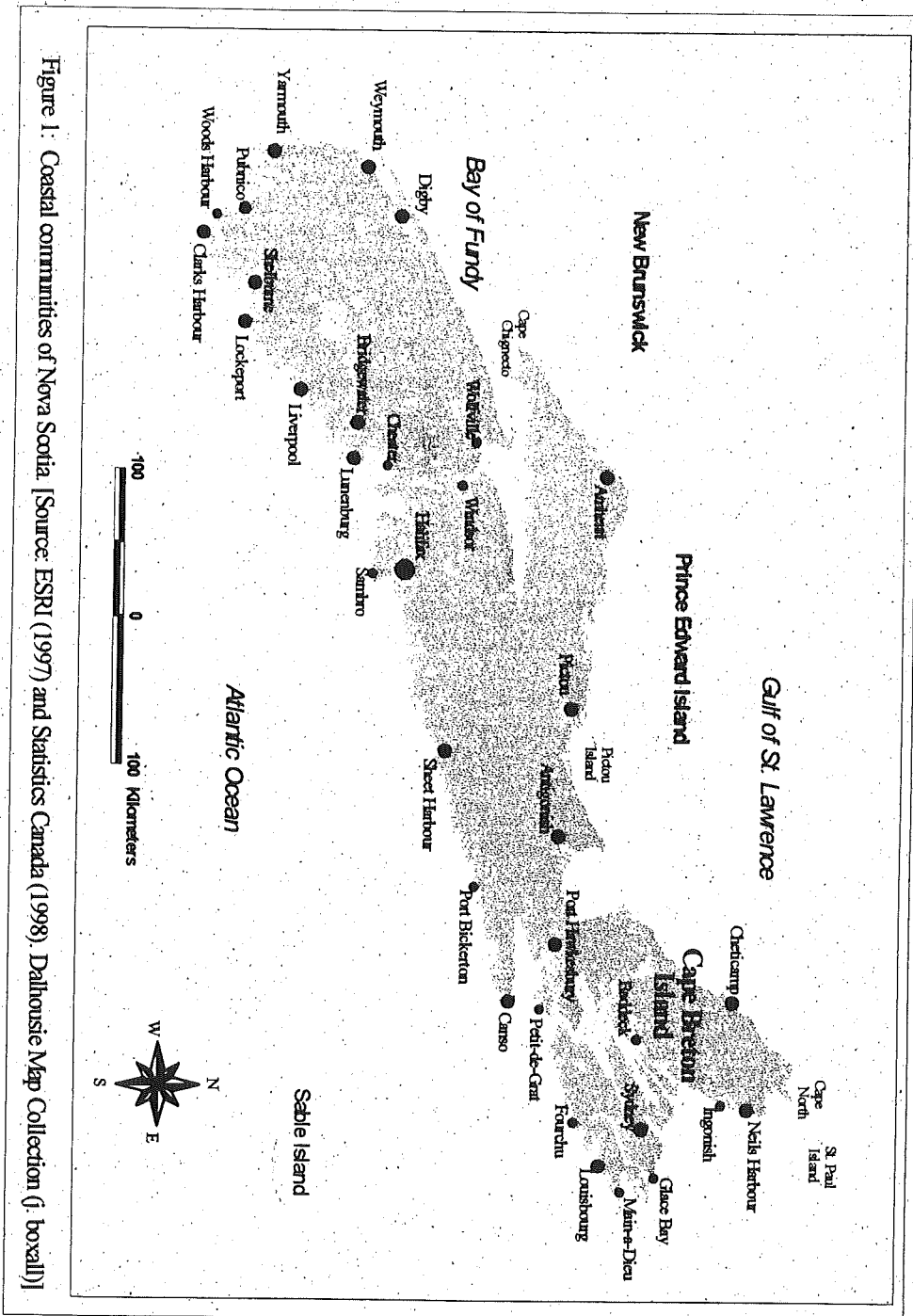


Figure 1: Coastal communities of Nova Scotia. [Source: ESRI (1997) and Statistics Canada (1998). Dalhousie Map Collection (j. boxall)]

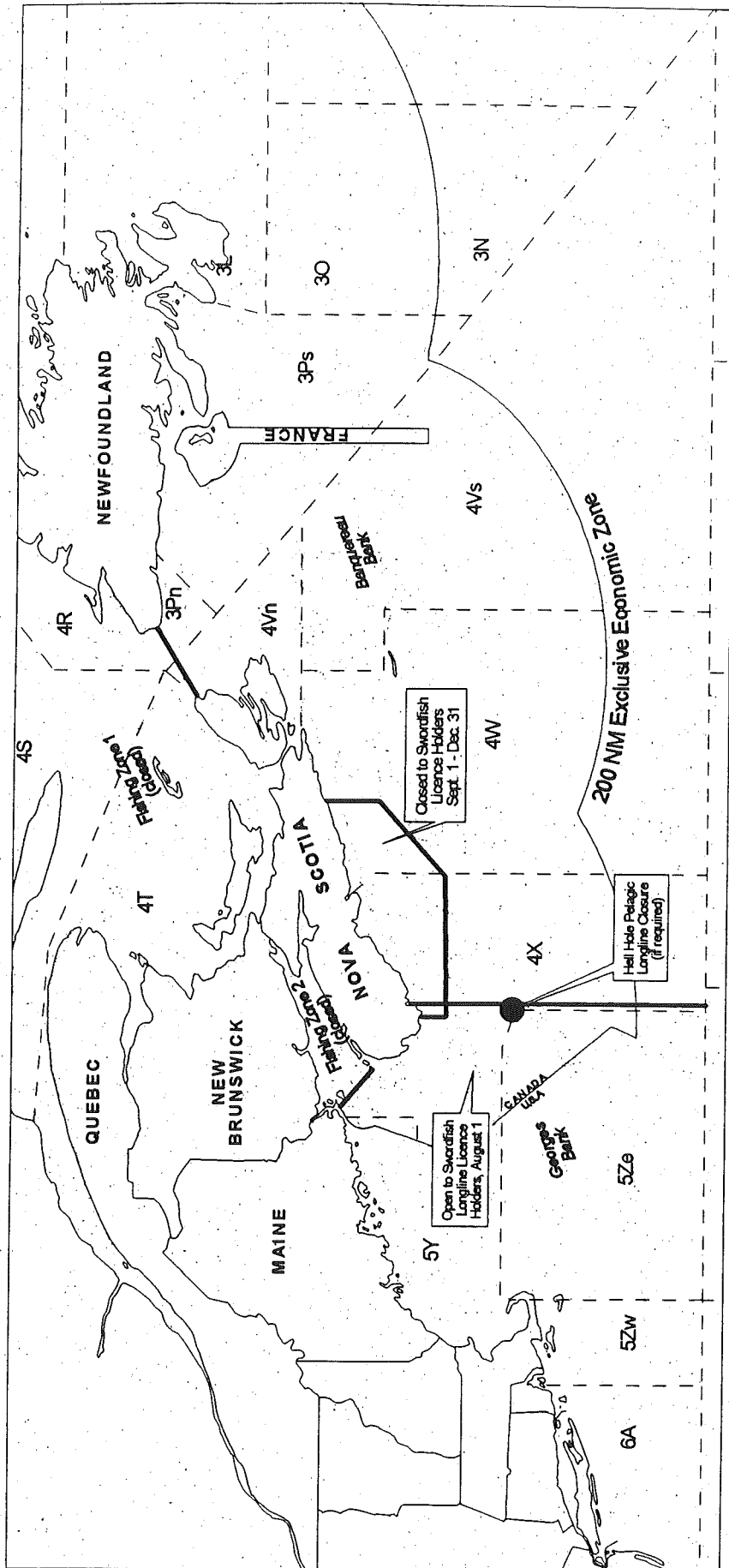


Figure 2: Canadian swordfish management areas, 1997 - 1998 (Anon. 197b). [Sources: GEBCO Digital Atlas (NERK, UK 1997); ESRI Digital Chart of the World (1993); NAFO (1997). Produced using Arcview 3.1 (ESRI, 1998), Dalhousie Map Collection (s. hornbrook)]

2.0 Methods

Collection of Traditional Ecological Knowledge

Key informants were asked to supply the names of fishermen who participated in the swordfish fishery. In total, 40 fishermen and retired fishermen were interviewed (Appendix C). Interviews were conducted in a semi-structured manner. A list of the questions and topics covered in each interview is given in Appendix B. Fishermen interviewed were asked to supply the names of people they thought might provide further information on the swordfish fishery, and attempts were made to contact these informants.

Other Sources of Information

Fisheries scientists involved in analyzing the Canadian swordfish fishery were contacted. Greater understanding of industry and scientific concerns was gleaned by attending the ICCAT Regional Assessment Process Working Group meeting at St. Andrew's Biological Station, New Brunswick and Canada's Pre-ALPAC meeting in Halifax, Nova Scotia. A review of the relevant scientific and government documents was conducted at the Killam Library of Dalhousie University and the library of the Bedford Institute of Oceanography. Searches were also conducted on the worldwide web to gather information about the swordfish fishery, swordfish biology, and the history of Nova Scotia's fishery.

3.0 The Swordfish

Throughout history, fishermen and naturalists have remarked on the swordfish (*Xiphus gladius*) because of its distinctive “sword” and its use of this sword in attacks against other species of fish, marine mammals, and marine vessels. Swordfish were hunted by inhabitants of the East Coast of North America 4500 years ago (Figure 3; Bourque, 1975).

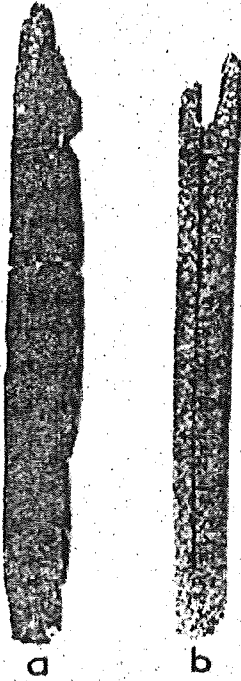


Figure 3: Tools made out of swordfish swords found at Occupation 2 of Turner Farm archaeological dig in Penobscot Bay, Maine. a. Lance tip. b. Harpoon foreshaft. Approximately 4500 years ago, it is believed that a population that exploited both marine and terrestrial animals such as white-tailed deer and swordfish occupied this site. The hunting of swordfish by these people indicates that swordfish were present in coastal waters, suggesting that the climate of the period was warmer than in recent times. (From Bourque, Bruce J. “Comments on the Late Archaic Populations of Central Maine: The View from the Turner Farm.” *Arctic Anthropology*. Vol. XII, Number 2. Copyright 1975. Reprinted by permission of The University of Wisconsin Press.)

One of the first written records of swordfish in the northwest Atlantic is included in *Two Voyages to New England*, published in 1674, in which John Josselyn mentions observing swordfish swimming and gives an account of a swordfish piercing the hull of his ship:

... in the afternoon, we saw a great fish called the *vehuella* or Sword fish, having a long, strong and sharp fin like a Sword-blade on the top of his head, with which he pierced our Ship, and broke it off with striving to get loose, one of our Sailors dived and brought it aboard (Josselyn, 1988, p. 11).

In the past, harpooned swordfish were “played out” by men in dories that were launched from larger fishing schooners after the fish had been struck. It was not unusual for these small boats to be pierced by their injured prey:

I’ve had them come up through the stern, clean up to the eyes...the sword tears through the bottom like a of piece rotten cloth. - Respondent #12

Recent accounts of swordfish attacks include an attack on the Wood’s Hole submersible DSV Alvin in 1967 (Zarudski, 1967). The sword of a swordfish can be a dangerous weapon even after the fish has been captured, as one longlining captain can testify, having been injured by a sword as a fish slid on the rolling deck of his vessel.

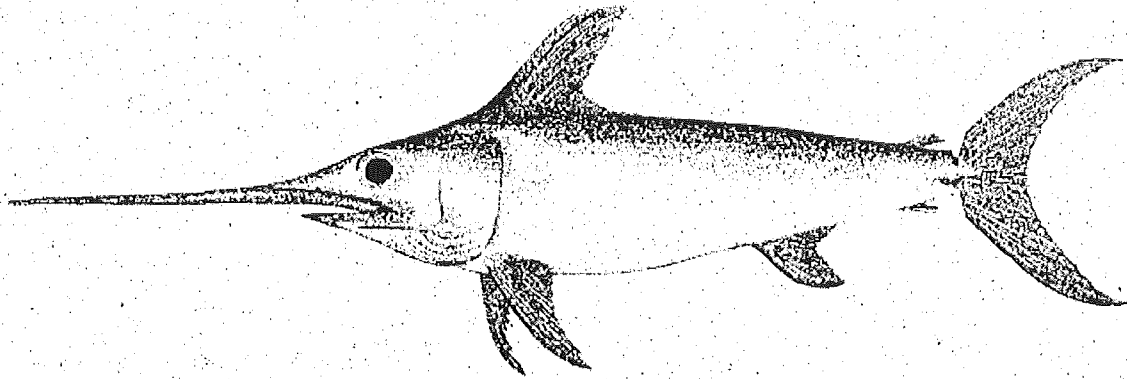
3.1 Evolution and Physical Characteristics

Have you ever seen a swordfish? Well, when you were up in the spar and you seen the blue underwater and the sword going this way and that ... it's beautiful. - Respondent #6

A swordfish is the prettiest blue you'd ever see. I'd be seeing it in my sleep. - Respondent #1

Aristotle named the swordfish *Xiphias* [Greek, meaning sword] 2400 years ago. Swordfish (*Xiphias gladius*; *gladius* – Latin, meaning sword) belong to the suborder Scombridae, and are related to tunas, mackerel, marlins, and sailfish. Evolutionary biologists consider swordfish to be distinct from these other groups of fish, so they have classified swordfish as the only members of the Family Xiphiidae (Bond, 1996).

Figure 3: The swordfish, *Xiphias gladius*, L. (Source: Anon. 1997b).



Swordfish can live to be more than 25 years of age and can reach a size of 1200 pounds, round weight.² The swordfish's distinctive sword or rostrum is approximately one third the length of an adult fish and is an outgrowth of its upper jaw. Aside from being an offensive weapon, the sword of the swordfish is used in capturing food, and many fishermen reported seeing swordfish swimming through schools of fish thrashing their heads from side to side, apparently “carving up the bait.” Scientists have also speculated that the sword may improve the hydrodynamics of the fish when it is swimming (McGowan, 1988). Contents of swordfish stomachs have been found to be full of fish that have apparently been hacked in this way prior to being swallowed (Scott and Tibbo, 1968).

Other distinguishing physical features of the adult swordfish include its lack of scales and teeth, lack of pelvic fins, and relatively large eyes. Fishermen often remarked on the beauty and power of this fish, and the “prettiness” of its deep blue coloring, which is darker on the dorsal surface than on the fish’s belly. Interestingly, swordfish seem to change

² Round weight is a term which refers to the weight of the entire fish. Dressed weight refers to the weight of a fish after it has been cleaned and the innards and head have been removed.

colour when they are killed, turning from a silver-blue to a brown colour. On rare occasions, swordfish turn a silver colour when they are struck by harpoon.

Swordfish prey upon a variety of species such as squid, mackerel, lancetfish, lanternfish, and krill (Tibbo et al. 1961). This diverse diet reflects the broad geographical distribution of the species and the fact that swordfish range from the surface to depths greater than 600 metres (Carey and Robison, 1981). One longline fishermen referred to swordfish as the "King of the Night" because they tend to feed during the night (Respondent #17).

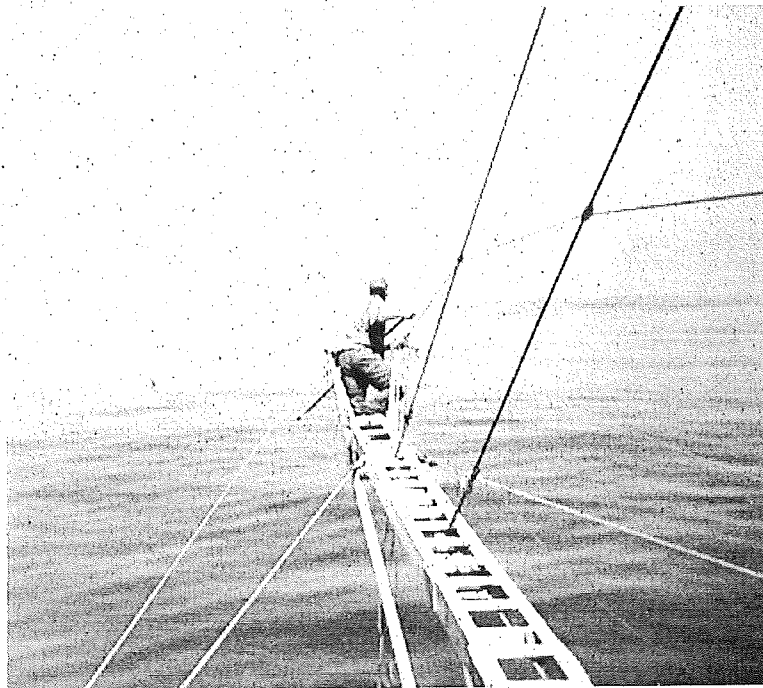
3.2 Distribution and Migration

Swordfish is like a bird. A bird's got wings and they got fins. Where they go until next July no one knows. - Respondent #1

Swordfish have the widest distribution of all billfish species and are found in tropical to temperate regions of the Atlantic, Pacific, and Indian Oceans, as well as in the Mediterranean Sea (Palko et al. 1981). In the Atlantic Ocean, genetic analysis indicates that there are two separate stocks of swordfish (Alvarado Bremer et al. 1996): the northern and southern stocks. ICCAT has designated the management boundary between these two stocks at latitude 5°N. The northern and southern stocks are assessed as distinct populations and different quotas are recommended for each stock.

The distribution of swordfish is highly dependent on seasonal changes in water temperature. In the winter, swordfish are found within the Gulf Stream, where surface temperatures are greater than 18°C (Beckett, 1974). Fish are much more widely distributed during the summer months, when the warm waters of the Gulf Stream move inland over the Scotian Shelf. The mixing of cold, Arctic water with warm water of the Gulf Stream tends to concentrate nutrients and create an abundance of food. The combination of warm water and abundant food draws swordfish to the fishing banks off the coasts of Nova Scotia and Newfoundland.

The harpoon fishery is carried out from late June until late August or September. Harpooners tend to spot swordfish fins in water that is between 58 and 65°F or around 15°C. The best times for spotting swordfish are on clear clam days or "slickers," from noon until about three o'clock in the afternoon. Harpooners also look for concentrations of bait species and animals feeding on this bait such as whales, porpoises and birds because swordfish tend to be seen where there is lots of "life."



Longlining starts in May to early June and, if the quota isn't caught, the season can continue until December. According to longline captains, locating swordfish is a fine art, and longliners are continually learning new things about where to locate fish. Longline skippers set their gear along what is known as "the edge," where the body of cold shelf water intersects with warm, Gulf Stream water: "you follow the edge like you follow the edge of the highway" (Respondent #9). This "edge" tends to be found in the same area as the 100 fathom edge of the continental shelf. More fish tend to be caught during the full moon. The colour of the water is also used as an indicator of the depth of the warm water body that longliners are looking for: green water indicates that there is no depth to the

warm water mass, whereas blue water indicates that the water is warm "all the way down." (Respondent #7).



Top: Setting sights on a fish. (Photo courtesy of Larry Sears.)
Left: Longliners haul aboard their catch. (Photo courtesy of Marty Henneberry.)

Most of those interviewed thought that the swordfish they caught were part of a northward migration of fish. Some felt that fish might migrate in an east-west fashion, remaining in the Gulf Stream year round and moving onshore with the current in the summer. Others believed that swordfish are present year round, and reported incidences of swordfish being caught incidentally by foreign fishing vessels in May (Respondent #7) and even January (Respondent #17). Swordfish fishermen from Cape Breton believed that catches of swordfish later in the year were part of a return migration from the north. These return fish were "fatter," more passive, and swam closer to shore than fish caught earlier in the season.

Fishermen confirmed that different sizes are found in different areas and that larger fish tend to be found in colder water. To date, tagging studies have not been able to produce a complete picture of the typical migratory path of swordfish. Preliminary data supports the hypothesis that fish in the North Atlantic migrate north during the summer months and return south during the colder months. There is evidence that fish tend to be found in the same areas from year to year (Beckett, 1974; Stone, 1999). However, tagged fish are also found quite far from where they were released, suggesting that fish can change their migratory route in response to changes in the Gulf Stream (Stone, 1999).

3.3 Life History

Some of them 4 or 5 pound fish you'd bring in and fellas would want to get them mounted. They was pretty as a picture: the sword was soft, and the little dorsal fin ran all the way down the back. - Respondent #30

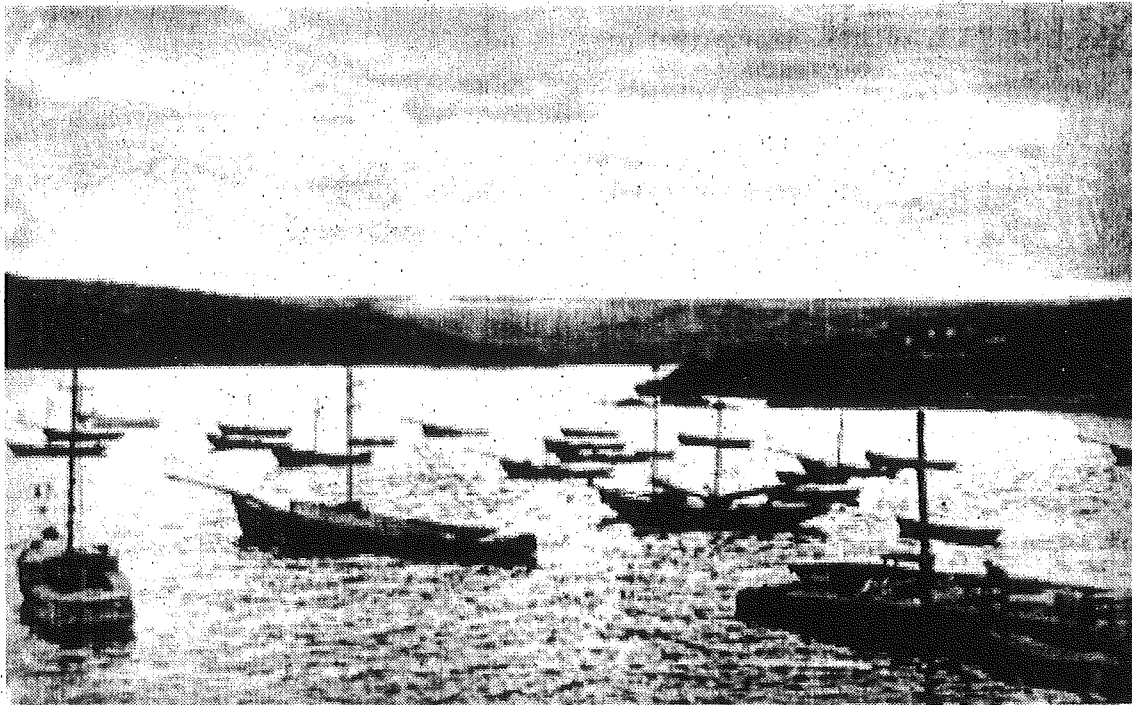
Larval distribution (Tibbo and Lauzier, 1969) and the ratio of males to females caught in longline fisheries have allowed researchers to deduce that swordfish spawn in tropical and subtropical waters (Ortiz et al. 1999). In the western north Atlantic, spawning is believed to occur in the Straits of Yucatan, the Straits of Florida and in the Lesser Antilles. Spawning occurs year round, except during the month of July, and a single spawning female can produce millions of eggs (Palko et al. 1981).

Nova Scotian longliners occasionally catch juvenile swordfish, which are described as being quite distinct from the adult fish, possessing a "ribbon" of a dorsal fin which extends all the way along the back of the animal. Fishermen reported that the developing sword of young swordfish is flexible and rubbery, unlike the hardened weapon possessed by adult fish. Female swordfish grow faster and are larger at maturity than male swordfish.

Little is known about the reproductive behaviour of swordfish, although pairings of these normally solitary fish have been observed. It is believed that fish become sexually mature at age 4 or 5, which corresponds to a size of approximately 110 pounds dressed weight (DW) for females and 90 pounds DW for males (Anon. 1997c). One respondent informed me that he had observed a male fish circling a female fish several times in a way that he thought might be related to mating (Respondent #21). Only one fisherman interviewed had ever seen "spawn" or eggs in the swordfish caught off of Nova Scotia and this fish appeared "to have something wrong with it" (Respondent #4).

4.0 The Cape Breton Fishery

You could always count on fish off of Cape Breton – it was a sure thing.
- Respondent #13



Watching them at anchor, Neils Harbour, Cape Breton. 13

Postcard image (circa 1935) of swordfish vessels moored off of Neil's Harbour, Cape Breton (Photo courtesy of Sheevaun Nelson; Source: Nelson, 2000.)

The earliest record of a commercial Canadian swordfish fishery is the 1903 Annual Report of the Department of Marine and Fisheries:

Sword fish – A new industry sprang up around here this year in the catching of sword fish and quite a number were caught. The catching of these excellent fish has been an industry for a number of years on the coast of the United States,³ but has never been followed here. It was discovered this year that the fish were unusually abundant in our waters and as the price is usually a good one, our fishermen fitted out with harpoons and other appliances to capture them with the result that quite a number were taken and another year will probably see an important business done if the sword fish are as numerous as they were this season. They are among the best of the edible fishes, as all who have tasted can testify. Our fishermen proved adept in the art of catching them, after a very little practice. We predict a good future for the sword fish business (Anon. 1903, p. 301)

³New England fishermen had been targeting swordfish on the Scotian Shelf since 1880 (Gibson, 1998).

This same year, the Fisheries Officer at Canso reported that “[s]wordfish were plentiful on September 21, and about 20 fish were landed the week of the 28th” (Anon. 1903, p.304).

It was not until 1909 that swordfish landings were recorded in Canadian fisheries statistics¹

The amount and value of swordfish caught on the Nova Scotia coast are recorded in the returns this year for the first time, and show a total of 146,611 lbs¹ in quantity and \$13,695 in value. ...The fish weighed on average, about 300 lbs., and the price is from 10 to 12 cents per pound (Anon. 1910, p. xxii).

4.1 Description of the Fishery

We used to love going up to Cape Breton in the summertime; they used to call it the fisherman's vacation. - Respondent #36

Between 1909 and 1959, more than half of the swordfish caught in Canada were landed in Cape Breton (Figure 4, Tibbo et al. 1961). The Cape Breton Fishery took place mainly from mid to late July until the end of September, with “the odd fish” or “straggler” caught in October or November.

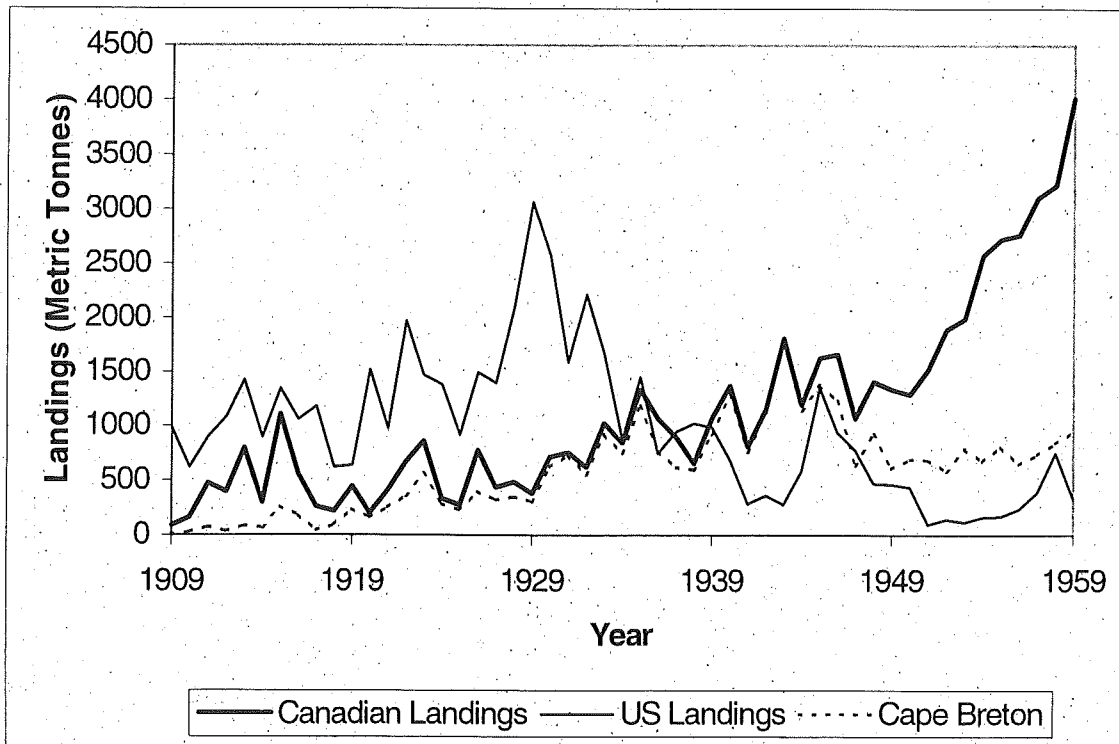
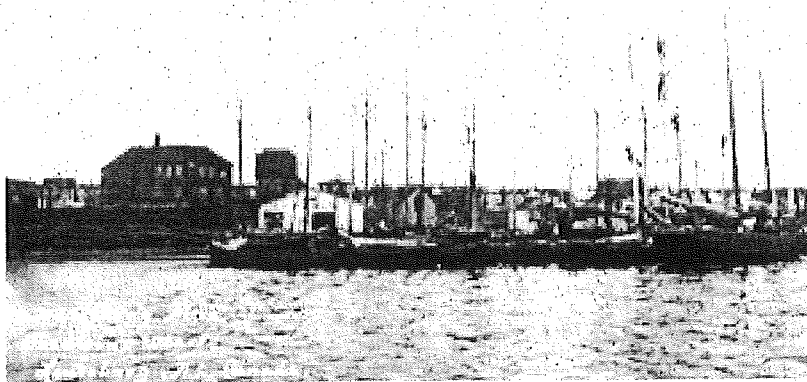


Figure 4: Landings (metric tonnes) of swordfish for Canada and the US for the years 1909-1959. The portion of the Canadian catch landed in Cape Breton is indicated (Source: Tibbo et al. 1961).

¹ Equivalent of 66.6 metric tonnes.

Fishing boats from communities such as Yarmouth, Pubnico, Sambro, and Lunenburg (Figure 1) would migrate up the coast to fish for swordfish off of Cape Breton. These migrant fishermen joined local fishermen in participating in the harpoon swordfish fishery. Mi'kmaq fishermen would move from inland Cape Breton to coastal areas such as Canso to fish during the summer months, and some of these fishermen participated in the hunt for swordfish. In Glace Bay, miners would take an "unofficial leave of absence" to join in the fishery:

We had two or three miners for crew members for years. It was swordfishing, it was special. I seen mine managers come down and go in the fo'c'sle because they didn't want the fellas in the mine to see them going out. - Respondent #29



Swordfish fleet in Louisbourg. (Photo courtesy of Martha Farrar and Sheevaun Nelson; Source: Nelson, 2000.)

In the 1930's and 1940's, hundreds of swordfish were landed in harbours such as Louisbourg, Glace Bay, Main-à-Dieu, Dingwall, and Neil's Harbour. It was estimated that there was anywhere from 100 to 400 boats in Louisbourg Harbour fishing for swordfish. Fishermen in Glace Bay, Louisbourg, and Main-à-Dieu said there were so many boats in the

harbour, "you could walk across them from one side to the other" (Respondent #1). The harbours would be so full of boats that it was difficult to keep clear of each other:

Jesus Mother of God, it was a job to get out of Dingwall Harbour in the mornings. - Respondent #34

There'd be 300 boats in Dingwall. One guy broke his stand off trying to get out of the harbour. - Respondent #14

Every fisherman who took part in the Cape Breton fishery can recall sticking swordfish within sight of shore and seeing swordfish fins in the harbours. One fisherman reported that a swordfish had been stuck from a boat that was tied at the wharf (Respondent #34). Fishermen repeatedly remarked upon the abundance of fish off Cape Breton in years gone by, emphasizing the change that has been observed in this fishery over the past few decades.

By 9 a.m., you could tell there was fish because there was dories out there by the mouth of the harbour. - Respondent #29

We'd come in the Cove and the women would be hollerin' to the men [that they saw swordfish]. - Respondent #14



Swordfish boats in Glace Bay Harbour. (Photo courtesy of a resident of Tancook Island via Martha Farrar and Sheevaun Nelson; Source: Nelson, 2000.)

The closest fish I got was half a mile from shore, by the Neil's Harbour buoy. A lot of fish was stuck there. – Respondent #2

Hardly get a day that you wouldn't see one...fish would be in the coves in the late fall. – Respondent #24

We was drinking beer in the Legion in Ingonish and the bartender said: 'You guys aren't very good swordfishermen' – that was a real insult, then – and we said, 'Why not?' and he said 'Well, there goes one.' He could see a swordfish from the window of the Legion. - Respondent #29

Sometimes, we'd be filling our water jugs from a hole in the bank and we'd see a swordfish and we'd go stick him. – Respondent #37

When he was eleven years old, he was in Louisbourg harbour playing in a dory, he saw a swordfish right beside him, he takes the oar and wacks it – he hits the fish in the head. This excited the fish, which turned and buried its sword in the mud flats...his first swordfish...this is an indication of how many fish there were. – Respondent #21

One afternoon, off Louisbourg, we saw two women on the beach waving and I said, "They must see something." [My shipmate said,] "To hell with them, they just want to take our picture." Next thing you know, two fins came out of the water. We stuck the fish and they took our picture with the fish. - Respondent #3

4.2 Participants in the Fishery

I've listened to swordfishing tales since I was five years old. The whole family was into it. It's a disease, an addiction...it's got pot all beat to hell. - Respondent # 40

The fishery in Cape Breton was practiced by two groups of fishermen. One group was made up of fishermen who owned "little decked boats with put-puts (make-or-break engines) that turned slow and went slow" (Respondent #2). Evidence of the small scale of some of these operations were reports that smaller boats would tow captured fish into shore because their catch could not be hoisted aboard:

Pretty well everyone on shore had a little stand on their boat and took a little jab at swordfish. You'd see little boats, 25 feet, with the sword on one side and the tail on the other. They had to go along side another boat to get the fish aboard. - Respondent #8

Usually, these fishermen would fish within 20 miles of shore. These fishermen reported catching anywhere from 5 or 6 fish a season to 120 fish a season, depending on their skill level, success in other fisheries, and effort exerted swordfish fishing. On average, smaller boats tended to catch between 30-35 fish. By the 1960's, it was reported that these small boats were struggling to make ends meet and that on average they caught only two fish a season (Tibbo et al. 1961).

The second group of harpooners that participated in the swordfish fishery had bigger boats and could travel further offshore, where the fish tended to be concentrated around the edge of the banks. These larger vessels would travel 30-40 miles offshore, the most adventurous fishermen travelling as far as the Grand Banks in search of swordfish (see Figure 2). The offshore fleet was made up of 80 to 100 foot auxiliary powered schooners that would carrying between 3-5 dories (Tibbo et al. 1961).

Reported catches for these larger boats ranged from between 20-40 to even 75 fish a day, although more typical catch would be 14 or 15 fish. Of course, the days of legendary catches are imprinted on the minds of fishermen, over-shadowing the memories of days when no fish were spotted: "Inside of Stone Fence, on Banquereau, we got 70 in one day. I was the harpooner. I must have run in and out on that stand 170 times, maybe more" (Respondent #38). The largest catch reported was a twelve-day on trip in the 1940's when 222 fish, weighing, on average, 230 pounds, were stuck on Banquereau Bank and the Stone Fence. Days when only three or four fish were caught were common and some fishermen admitted that occasionally, they "went skunk" and no fish were caught.

There was (and is) very little demand for swordfish in Canada, and most of the swordfish landed were shipped by train or by boat to the United States.

Little boats had no ice, they had to sell their fish every day...We'd cut ice on a pond with ponies and we had boxes like coffins for the fish. We packed the fish's bellies with ice and they took them to Boston in a boxcar with water streaming out of it from the ice. - Respondent #33

There was surprisingly little interest in taking swordfish for personal consumption, although the heart of the swordfish was considered a delicacy by many fishermen: "when you went

home your mother fried up the hearts, there's no way you'd throw that away" (Respondent #1).

Many swordfish fishermen started fishing in their early teens with their fathers or uncles. For fishermen that went to Cape Breton, going swordfish fishing in the summer was often the first time they had been away from their families for extended periods of time.

I was 9 years old when my father took me for the first time for two months. We lived aboard, and I learned to cook and all about the boat. – Respondent #39

Sticking your first swordfish was almost a rite of passage for a young man:

The first swordfish I ever stuck, [Name] and I were on the spar and the other four were down to supper... Father had been missing so many fish – he was 55 or 60 years old then. So I said to N, 'If we sees a fish while them fellas is eating, don't make a sound, I'll try and stick him.'... And sure enough, we saw a fish. There was a porthole on the foredeck, and if you passed by it, they'd see a shadow... Well, by the time I got on the stand, they were all up on deck. When I nailed him, my father said 'The finest kind, [son], you stay out there.' I was striker and engineer after that. – Respondent #39

The fishery was generally looked upon as a break from the back-breaking labour of other types of fishing; and the swordfish fishery was often referred to as the "fisherman's picnic" or the "fisherman's vacation." There was a comradeship and sportsmanship surrounding the swordfish harpoon fishery that was remembered with warmth by everyone who took part in this fishery.

4.3 Economics

*Aught from aught,
figur' from figur',
all for Sweeney⁵
and none for Jigger.* – Respondent #42

*It was hard times when I was a kid: mice was going around in the cupboards
with tears in their eyes.* - Respondent #11

It is difficult to assess the economic importance of the Cape Breton fishery in modern terms. The prices offered for swordfish seem ridiculous to modern fishermen, who may earn a couple of thousand dollars for a single fish. In the Annual Report of the Department of Marine and Fisheries for 1909-10, the first year that the commercial landings of swordfish were recorded in Canada, it was reported that the price offered for fish weighing between 250 to 500 pounds was \$15 to \$30 (Anon. 1910). The price of swordfish per pound in 1959 was 20.6 cents per pound (Tibbo et al. 1961), which converts to

⁵ The name of a fish merchant.

approximately \$3.75 a pound in 1992 dollars.⁶ The lowest price offered for swordfish was reported to be one and a half cents a pound:

Dad said that when he was fishing, the price went down to a cent and a half a pound in Glace Bay. They went to look off on the pier, to see what the weather was like. My father said it doesn't make any difference what the weather is like, he wouldn't go out for a cent and a half. They used to say he started the strikes in Cape Breton. – Respondent #38

Harpooning swordfish is highly dependent on weather conditions and annual changes in fish abundance, and sometimes the success of a trip had as much to do with luck as skill:

It was the kind of job where you could have 30 boats in a ten mile area and everywhere there's a dory being put over and you've never seen a fish and a boy next to you could have seven fish. – Respondent #29

As a result of the unpredictable nature of the fishery, investing in swordfishing could be a risky venture:

One boat did so poor they took up a collection to get gas money to get home... they sold their darts, so when they saw a lot [of swordfish] on the trip home they only had four or five darts to use. – Respondent #24

Some swordfish fishermen were “making more in two months than we did the rest of the year” (Respondent #38). In 1950, a crewmember on a swordfish boat made between 700 to 1000 dollars a season, which made up a significant portion of annual earnings that were estimated at approximately \$3000. Tibbo et al. (1961) estimated that offshore vessels in 1959 would make \$3000 per trip, which converts to \$54,750 in 1992 dollars. This amount would have to be shared amongst crewmembers and to pay for expenses, but it would seem to indicate that, for many of the 124 vessels participating in the fishery, the swordfish fishery was not just a “vacation” but a serious business.

For others, the swordfish fishery was “something to do in the summer months” and did not represent a significant amount of income (Respondent #2). These more casual swordfish fishermen might be targeting other species, but were rigged up for swordfish fishing in the event that the opportunity arose to stick some swordfish. Sticking a swordfish was a way of supplementing other sources of income. One fisherman told a story of being out in a boat with his fiancée, when they stuck a four hundred pound fish, which provided “enough to pay for our wedding rings” (Respondent #1).

5.0 Moving Offshore: 1945-1959

Landings of the Canadian swordfish fishery show an erratic but gradually increasing trend up until the late 1940's, after which there was a dramatic increase from 2 million pounds (approx. 900 metric tonnes, MT) to almost 7 million pounds (approx. 3000 MT; Figure 4). Between 1949 and 1959, the Canadian swordfish fishery doubled in value from

⁶ Conversions made using Statistics Canada Consumer Price Index (all items) for 1992, P=100000.

approximately \$10 million in 1949 to \$25 million in 1959 (Tibbo et al. 1961).⁷ During this period, the landed value of the Cape Breton fishery increased by approximately 1 million dollars, indicating the relative decline in the Cape Breton fishery relative to other areas of the province.



Unloading the *Emma Marie* in Wood's Harbour, circa 1948. Everett Goreham (left) and Cecil Atkinson haul up one of the 60 fish they stuck that week on Georges Bank. The experience aboard the *Emma Marie* during the hurricane of 1950 is related in Section A.5.2, Appendix A. (Photo courtesy of Everett Goreham.)

There are two probable reasons for the increase in landings of swordfish in Canada between 1949 and 1959. First, the market for Canadian groundfish, such as cod, declined during the summer months, making it more profitable for Canadian fishermen to target other species such as swordfish (Gibson, 1998). Second, during the 1940's, the federal government began to subsidize capital investment in the fishery. These subsidies were originally meant to address the problem of food shortages brought on by Canada's participation in the Second World War. However, programmes such those administered by Nova Scotia's Fishermen's Loan Board continued to be implemented after the war. The aim of these programmes was to make the Atlantic fishery more "modern and efficient" and to encourage investment in the fishery, both by small-scale fishermen and new company-owned dragger fleets (Proskie, 1967, p.9).

These programmes encouraged fishermen to invest in larger vessels that could target fish further offshore. Forty to 60 foot groundfish draggers could travel to the edge of the Scotian Shelf where swordfish were concentrated. As shown in Figure 5, there was a decline in the number of swordfish landed in Cape Breton even as the total Canadian landings of swordfish increased. Thus, one obvious reason for the decline of the Cape Breton fishery was that fishermen in the rest of the province could target swordfish out of their own harbours, rather than making the seasonal migration down North.

⁷Amounts expressed in 1992 dollars. Conversion made using Statistics Canada Consumer Price Index (all items) for 1992, P = 100000.

Canadian swordfish fishermen began longlining in the early 1960's. According to most reports, the idea of catching swordfish using hook and line was drawn from observing foreign vessels, probably Norwegian or Japanese, using longlines to target shark and other large pelagic species. Japanese vessels had been longlining for tuna in the Atlantic since 1956. In 1961, Norwegian vessels began targeting porbeagle sharks in the waters off of Nova Scotia and Newfoundland.

The foreigners came around, Russians or Japanese, fishing for sharks with trawls and they were getting as many swordfish as sharks. I never saw it, but I was told they would go in at Halifax and they were loaded with swords... - Respondent #19

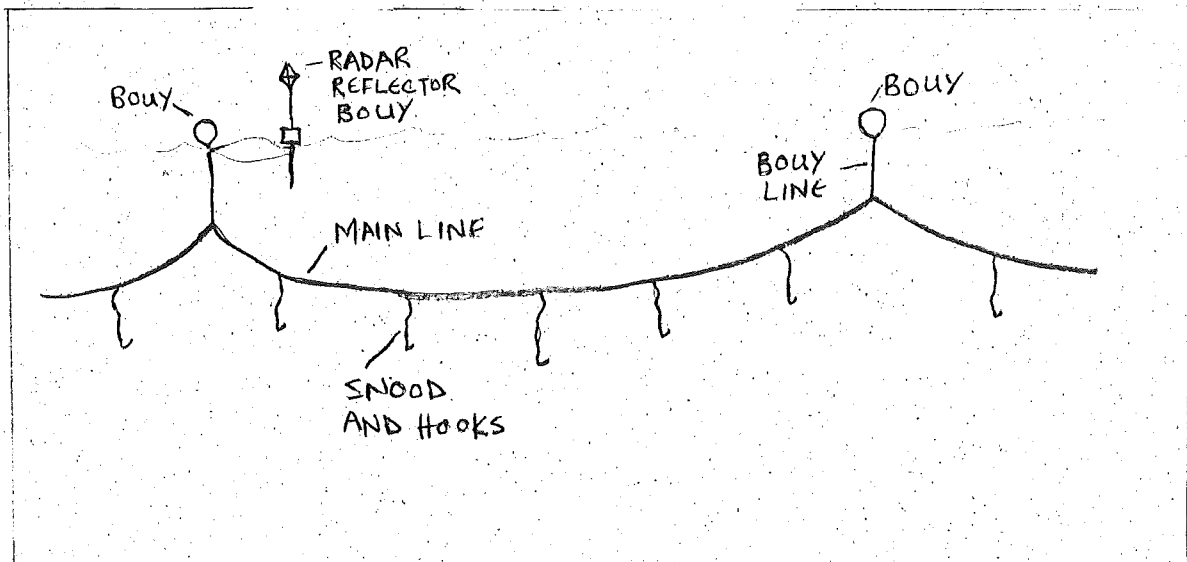


Figure 6: Sketch of a section of modern swordfish longline gear. Gear is set in the evening and hauled in again in the morning. Longline sets are approximately 40 miles long and contain 1000-1200 hooks. Hooks are usually baited with mackerel (Respondent #7).

Others believed that the idea of longlining for swordfish was borrowed from the groundfish fishery:

What happened was there was a guy from Newfoundland in North Sydney who set a halibut trawl and pulled back 4 or 5 swordfish so he went to North Sydney and got buoys and hooks...in a couple of days on St. Pierre Bank he got 70 odd fish. Then everyone started. - Respondent #3

Regardless of how longlining began, it "rubbed off quickly" on the rest of the Canadian fleet, and by 1964, 100 boats were participating in the swordfish longline fishery. The fishery in the 1960's was virtually unchecked by rules and regulations. There was no quota, no licensing restriction, and no minimum size limit. Fishing could be prosecuted year round by boats that followed the southward migration of fish during the winter months.

The first longline trawls were set by hand and hauled by hand, rather than being hauled by a hydraulic trawler. Gear was coiled in large tubs rather than being coiled on large drums. Car inner tubes were used as buoys. Smaller operations would set 9-12 miles of gear with

licensing restriction, and no minimum size limit. Fishing could be prosecuted year round by boats that followed the southward migration of fish during the winter months.

The first longline trawls were set by hand and hauled by hand, rather than being hauled by a hydraulic trawler. Gear was coiled in large tubs rather than being coiled on large drums. Car inner tubes were used as buoys. Smaller operations would set 9-12 miles of gear with approximately 1500 hooks per set (Respondents #16, 30). Larger operations would set 25-30 miles of gear. The number of fish caught could vary from 12 fish to even 80 fish on a set (Respondent #16). One fisherman reported catching 260 fish, weighing on average 200 pounds per fish, on four sets of ten miles of gear (Respondent #37). Many boats would set trawl at night, haul their gear in the morning and harpoon swordfish in the afternoon.

The increase in landings that occurred in the early 1960's (Figure 7) is testimony to the greater catches to be had by converting to longline. Canadian landings soared from 2092 MT in 1962 to 7482 MT in 1963 (Anon, 1998b). A single trip longlining could result in catches that exceeded an entire season's worth of fishing with a harpoon:

We used to get 40-50 on a set. We got 100 on a set one time the first year we started, in '62. Some little fish, 40-50 pounds, little things like pulp [wood] joints. You'd take them by the nape and pile them one on top of the other. My God, it was beyond... - Respondent # 30.

Off Cape Hatteras we got 112-14 in one day. Harpooning, you'd get four or five a day, 10 or 12, if you was lucky. - Respondent #4

Effort expended in the fishery increased by 2.5 times between 1963 and 1964 (Hurley and Iles, 1980). In spite of this increase in effort, landings declined slightly from 7482 MT in 1963 to 7099 in 1964 (Figure 9). By 1965, landings in the fishery had fallen 4674 MT, and catch levels varied between 4000 and 5000 MT for the remainder of the decade.

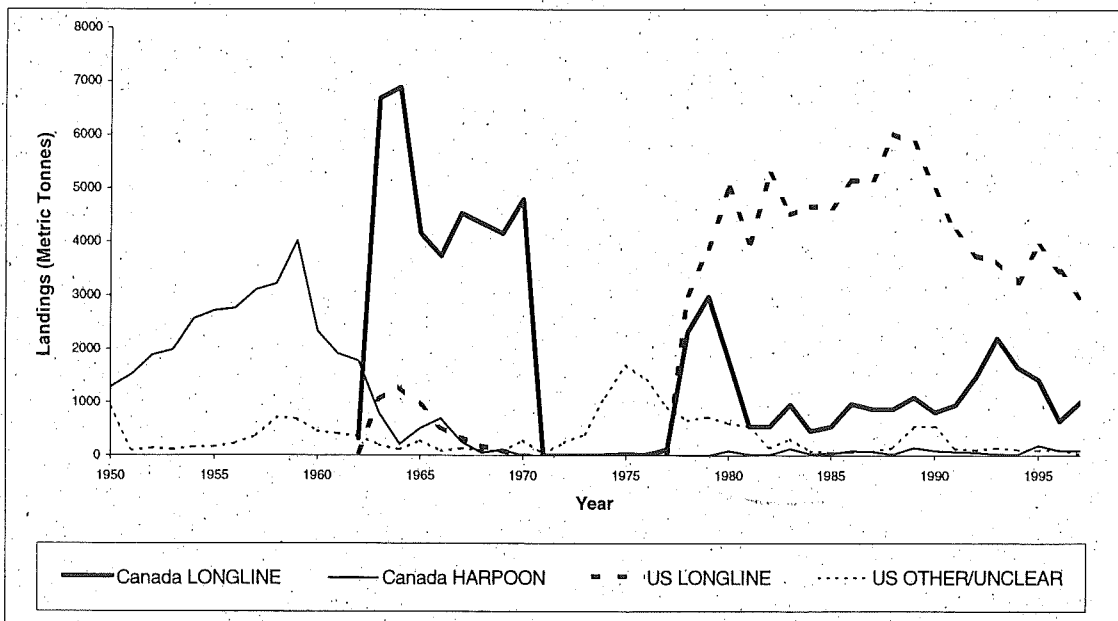


Figure 7: Landings (metric tonnes) of swordfish by country and gear type for the years 1950-1997 (Source: Anon. 1998b).

There were those who were not comfortable with this new technology. For some, the transition to longlining signaled that it was time to leave the fishery:

Seemed like they got out of it; the older fishermen got out of it and the younger ones took it up - Respondent #16

That wasn't swordfishing. I seen us get 18-20 fish before daylight. You wouldn't be up yet if you were harpooning. - Respondent # 29

Nobody liked [longlining] anyway ... you'd do better with the pole anyway. If the fish were bigger, you'd get more. - Respondent #10

Hook and line is a cowardly way to catch fish - Respondent #13

Others were alarmed with the number of small fish that were caught and with the other species that were caught incidentally using longlines:

Longlining took the goodness out of swordfish fishing. - Respondent #15

I didn't like to kill all them young ones. All of 'em on the hook was dead or didn't make it to the bottom, their gills pulled out after being hauled six knots sideways. - Respondent #2

Longlining is not my bag. I've seen so many small fish ... when all was said and done, I didn't want to be one of the ones that destroyed [the fishery]. - Respondent #27

We got so sick of it: the little teeny fish, the leatherbacks, blackfish [pilot whales] all balled up, sharks by the thousands. - Respondent #42

Blue dogs [sharks] are looked at as a nuisance, but they're going to clean those ones out in a while. - Respondent #42

You could get a thousand sharks, one on every hook. The last few years, they've been finning...that's a bad thing because someday someone's going to want 'em. It's like taking the tongues out of the buffalo. - Respondent #36

We were getting a pile of fish, that was the hell of it. When you were longlining you got fish that big, 70-80 small fish some days...it was a damn shame to get those babies. - Respondent #25

We got a blackfish [pilot whale] snarled up in the trawl - we cut the tail off and blood went flying everywhere. - Respondent #37

Many fishermen reported getting "sharked up" on longline, catching as many as 200-300 to even a thousand sharks on a single set. The number of sharks caught is highly dependent on water temperature, and one fishermen reported that during the first few days of a trip,

he could catch about 300 sharks on a set, but the number of sharks caught would decline as he moved into warmer water (Respondent #7). One fisherman estimated that the number of sharks he caught on a longline outnumbered the number of swordfish caught by as much as five to one (Respondent #28).

One retired longliner reported feeling a sense of shame at catching the small fish and that even though there was no limit on the size of fish that could be caught, "you wouldn't bring in the 10 pounders -- you just didn't want people to see" (Respondent #36).

In hindsight, many fishermen who participated in the early years of longlining seemed to regret their involvement in the industry:

When we first started setting hooks, we thought it was cute, it was smart. It was not smart. All you could see was inner tubes [used as buoys] on the water...we were getting a lot of fish. - Respondent # 25

I was a longliner and I became sick about what I was seeing... Longlining is a way of making money. I didn't like it because we were killing a lot of small fish. After you haul up so many small fish you knew nothing good would come of it. But when you're doing it, you make up your mind that there's no end. - Respondent #21

We were cutting our own throats. Now you look up [the] harbour, it should be the best, it should be the best and they're laid to the wharf. - Respondent #11

I used to trawl and that's the reason I gave up...The first trip I made, I said 'it's the end of swordfish fishing'...We set no more than 6 miles with hooks 10 fathoms apart and we got 125 fish that night. In the morning, it was oily calm and the inner tubes [used as buoys] were standing up because the fish was pulling down on them. - Respondent #3

The skills and labour involved in swordfish fishing were very different from those required for harpooning, and some swordfish fishermen did not become longliners because this type of work didn't suit them

I trawled for three or four years, then I stopped. I got tired. All day, you haul gear, then you bait up, then you sit you all night to watch the buoys and the highfliers. - Respondent #3

The range of sizes of fish caught on longline was a surprise to most fishermen, some of whom had never seen a swordfish below 30 or 40 pounds before longlining began. On a single set, one might catch a fish that was over 500 pounds, dressed weight, and on the same line there might be a fish weighing nine pounds, "sword and all." Others noted with amazement the different appearance of juvenile fish when compared to the adults:

The second year we caught over 2000 fish, some of them 4 or 5 pound fish. You'd bring it in and some fellas would want to get it mounted. They was pretty as a picture, the sword was soft, the little dorsal fin went all the way to the tail. - Respondent #30

One creative swordfish fisherman had fashioned some small swordfish into decorative letter-openers.

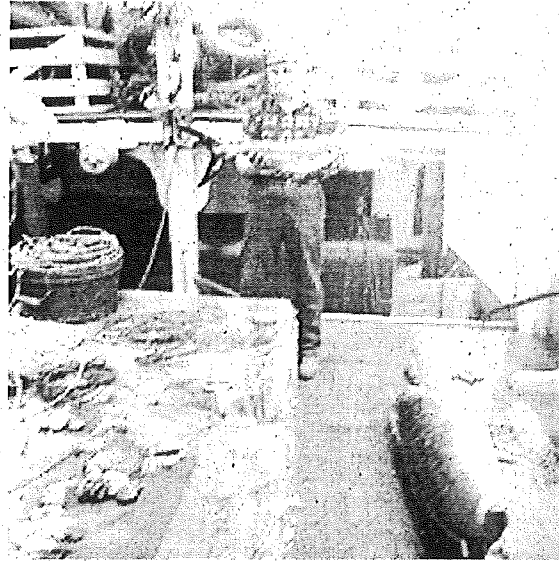
When swordfish landings were first recorded in 1909, the average size of fish caught was estimated as 300 pounds (Anon. 1910). In 1959, the average size of swordfish caught was 264 pounds, dressed weight (DW; Tibbo et al. 1961). These fish were all large females, since the smaller male fish do not tend to bask at the surface and thus become the target of harpooners. Male and female fish of all sizes were caught on longline, and, as a result, there was a decline in the average size of fish caught. In 1962, the average size of fish caught was 180 pounds, DW. By 1970, the average size of fish caught was 88 pounds (Hurley and Iles, 1980). One longlining captain pointed out that as more boats entered the fishery, there were more boats fighting for a berth on the critical edge of the warm water. This led to catches of small fish because more boats were forced to fish further into the Gulf Stream where smaller fish tend to be found (Respondent #36).

A new terminology was developed to refer to the different size range of fish caught. A swordfish that was above 100 pounds was a "mark," under a hundred pounds was a "pup" or a "rat", and under 50 pounds was a "puppy." Some fishermen referred to fish that were 10 to 15 pounds as "bolonies" or "lawn darts."

As well as targeting a different size-range of fish, longlining for swordfish also meant that the season could start earlier; it was no longer necessary to wait for the "superfine" days of summer to spot fish finning on the surface. Longliners began moving further and further offshore, following the warm water of the Gulf Stream as it moved off of the continental shelf in the fall. Some larger boats continued longlining year round, targeting fish off of Cape Hatteras from January to April (Beckett, 1971).

With the beginning of longlining in the 1960's there was a dramatic change in where, how, and when swordfish were caught. Cape Breton fishermen who participated in this fishery witnessed an end to the seasonal migration of Nova Scotian fishermen to their shores. Small-scale inshore fishermen continued to harpoon fish, but this fishery was less successful than it was historically, perhaps because fewer people were looking for swordfish or perhaps because swordfish stocks were beginning to decline.

Swordfish fishermen from mainland Nova Scotia remain in contact with fishermen they used to know in Cape Breton, and there is considerable nostalgia for summers spent looking for fins "til you thought your eyes would burn out of your head," hauling swordfish by hand in dories, and coming in every night to harbours such as Louisbourg, Main-à-Dieu, Glace Bay, Neil's Harbour, and Ingonish. Old timers have fond memories of baseball games, cribbage, poker, and "hootenannies" complete with live music and the occasional scrap.



In 1964, small fish like this one were a novelty to swordfish fishermen. Car innertubes were used as buoys by the first longliners. (Photo courtesy of Harold Fudge.)

7.0 After the Mercury Ban: 1978 - Present

In 1972, the American Food and Drug Association (FDA) banned imports of swordfish into the United States because of concerns about high levels of mercury in these fish. In 1978, the ban was essentially lifted as the FDA raised the level of mercury that it considered acceptable in swordfish flesh.

Officially, the mercury ban put a stop to the Canadian swordfish fishery, although many fishermen, particularly in southwest Nova Scotia, continued to fish, selling their catches on the black market or trans-shipping their illicit cargo to American boats that could land swordfish legally in their own ports. Some fishermen left the swordfish fishery at this time, while others were recruited to join the US swordfish fleet on longlining and harpooning vessels. The Cape Breton swordfish fishery was essentially halted during these years, except for the odd fish that was caught and sold to tourists or taken for personal consumption.

In the early 1980's, four of the fishermen interviewed (Respondents #30, 2, 13,24) noticed a slight increase in the number of swordfish seen off of Cape Breton. During this period, fishermen reported catching between six and 12 fish a season. Some attributed this increase to the fact that there had been a decrease in fishing pressure on the stocks during the mercury ban. This is a possible explanation, however, it is difficult to assess fishing effort during the mercury ban because of the clandestine nature of the fishery at that time. After this brief resurgence, "that was it again; it went back to two or three [fish] a season" (Respondent #30). Fishermen that have been looking for swordfish around Cape Breton for the past ten seasons reported catching six fish in ten years. Many of those I spoke with no longer bother to rig up for the fishery anymore, but hope remained that some day the swordfish will return:

I wouldn't mind seeing it come back so smaller boats could go out. – Respondent #12

It'd be nice to see them come back and make employment for people. We're losing all other industries ... coal and steel. Soon, all we'll have is tourists and we could lose that too. – Respondent #37

8.0 Causes for the Decline of the Cape Breton Fishery

Every year, you hear the comment that the swordfish will come back this year. – Respondent #6

With the many changes observed in the commercial Canadian swordfish fishery from its origins at the start of this century, it is difficult to pinpoint a single cause for the decline of the Cape Breton fishery. Most of the fishermen interviewed had more than one explanation for the changes they had witnessed over the years. While some fishermen associated the decline with the commencement of the longline fishery in the 1960's, others observed that the Cape Breton fishery was declining before the introduction of longlining.

8.1 Too Many Hooks

You can't hurt a fishery with hook and line. It's not like a gill net. I'm mystified as to why there is a different perspective on using hook and line for groundfish than using hook and line for pelagics. – Respondent #20

All of a sudden, there was none, after they started trawling. There was always lots of 'em as long as they were harpooning. – Respondent #33

The majority of the fishermen interviewed thought that the impacts of longlining were the cause of the decline in stock abundance.

When they first started longlining, they were catching 50, 60, 70 fish a day, especially on the Grand Banks. In two or three years the bottom fell right out of it...It was a sign of the times. The fish declined, but they fished more days, with big boats and make the numbers go up. – Respondent #29

Now we have none. If they stayed with harpooning, we'd still have lots of swordfish. – Respondent #13

Then a big mistake was made. We could have had swordfish 'til the end of time. – Respondent #38

Swordfish was in at the shore when we were sticking fish. I think they fished 'em out. ... If we hadn't fished trawl, there'd always be swordfish. – Respondent #4



A modern longliner steams home with her catch. Much has changed since longlining began in 1962. The Canadian longline fleet is subject to ICCAT quotas, dock-side monitoring, size restrictions, time-area closures (Figure 2), and observer coverage.

Aside from simply exerting too much effort on the stocks, longlining was also criticized because of the catches of juvenile fish. It is probable that in the early days of the fishery, there was a greater amount of bycatch than in the current fishery. There was no limit on the size of fish that could be taken, little knowledge of how to target larger fish, and fishermen were fishing beyond the 200-mile limit (imposed in 1977) in waters where smaller fish are more abundant. Two retired fisherman thought that the average size of fish caught on longline had increased since the first years of longlining: "sometimes, we'd get 80-90 small fish on a set - that's unusual nowadays" (Respondent #36).

Since 1996, Canadian longline fishermen have been required to release fish that are smaller than 119 cm in length, regardless of whether the fish are alive or dead. In 1998, 10% observer coverage of the longline fleet showed that, on average, 33% of the total number of swordfish caught were released because they were undersized (Porter et al. 1999). These discarded fish weighed, on average, 13.3 kg or 30 pounds, round weight. Fifty eight percent of these releases were dead while the remaining fish were released alive. It was extrapolated that 51.7 MT or 3887 fish were discarded dead by the entire fleet 1998. The survival rate of live releases in the Canadian swordfish longline fishery are not known at this time, so the number of live releases that do not survive capture are not included in estimates of dead discards.

Those currently longlining argue that their fishery is no more "dirty" than other fisheries, such as longlining for groundfish:

There isn't a clean fishery out there... You can't put a sign on a hook. -
Respondent #20.

And although this may be the case, others argued that bycatch of juvenile swordfish could have greater impacts than longlining for groundfish, and that for this reason, longlining could be an inappropriate means of catching swordfish:

If you take juvenile swordfish, you take a lot more out of the species than juvenile codfish ... they have a limited stock, the sheer numbers are not as bountiful as codfish. - Respondent #22

Swordfish don't multiply as fast as codfish, and they come and go: migrate.
- Respondent #37

Some fishermen expressed concern about the number of sharks, turtles and other species that are caught on longlines (Figure 8). Observer reports from eleven longlining trips made in 1997 showed that discards of blue shark exceeded the catch of swordfish, in terms of both numbers and weight. In eleven trips, the number of blue sharks discarded dead (1086) was almost as high as the number of swordfish kept (1179). It is important to note this data does not represent the activities of the entire fleet, since it is derived from observer coverage within a limited geographical area. However, because sharks have lower reproductive rates than other fish species, they are highly susceptible to over-fishing. The incidental catches of sharks on longline are also of concern because there is increasing interest in targeting sharks in commercial fisheries (Anon. 1997a).

According to observer reports, 35% of the weight of catch or 23% of the individual animals caught were brought to the wharf. The observer reports also showed that twenty-three species other than swordfish were caught on longlines, including marine turtles (59

alive, 1 dead), tuna, several species of sharks, and even seabirds. This would seem to indicate that longlining has an impact on species other than swordfish.

However, one fisherman argued that he "would be in trouble" if they caught more sharks than they did swordfish and that "I know that with the methods I use I should be able to stay clear of the animals you guys are concerned about" (Respondent #5). According to a fisherman who is currently longlining, it is very rare for marine mammals to become entangled in gear. He has observed whales swimming along gear, harvesting what was on the hooks without getting caught (Respondent #7).

I received very little consensus when I asked about changes in wildlife observed while fishing, but seven fisherman noted that there had been declines in the number of sharks seen in recent years, and two of these fishermen blamed longlining for the declines they had observed: "There used to be thousands of sharks. Now there's none; they're all caught up by longliners." This fisherman further hypothesized that the seal population was increasing because there were fewer sharks around. Two respondents thought there was an increase in the number of sharks, while the remainder had not noticed a change in shark abundance.

There was considerable disgruntlement with the fact that bluefin tuna, when caught as bycatch, cannot be landed. As a result, these huge and valuable fish are sometimes stacked off and sunk to the bottom (Respondent #7). It was noted that in the past, when the market for bluefin tuna was low, swordfish longliners would bring in the occasional fish to sell for dogfood or catfood. Many longliners believed that they should be given an allocation of bluefin to allow them to bring in dead fish.

Incidental catches in the harpoon fishery are not unheard of, although incidences of harpooners targeting other species are rare. Harpooners reported taking pot shots at sharks, sunfish, tuna, marlin, and, according to one retired fisherman, even porpoises. Some fishermen indicated that it wouldn't be worth their time to target other species when they could be getting a swordfish and that attempting to harpoon sharks could result in the loss of the harpoon dart. One swordfish harpooner commented that "not too many who would go after a porpoise. They look too pitiful and too intelligent. They look up at ya... How could you kill something like that?" (Respondent #36).

Fifteen fishermen believed that longlining for swordfish should be stopped, for anywhere from 2 to 10 years so that the stocks could recover:

It should be cut out...we never could have done it with the harpoons. We would have done all right, it's low cost...and we didn't know about temperature then. - Respondent #37

It almost brings tears to my eyes to see 'em discharging 30 pound, 50-pound fish. I'd hate like hell to see them not make a living, but if I had anything to do with it, I'd have gillnetting and longlining outlawed. - Respondent #40

If they stopped for 5 years trawling, these little baby pups could go offshore and get big. - Respondent #11