

**REVIEW OF THE  
INTERSTATE FISHERY MANAGEMENT PLAN FOR  
SPINY DOGFISH  
(*Squalus acanthias*)**



**May 2004 – April 2005 FISHING YEAR**

**Board Approved: February 2006**

**Prepared by the Spiny Dogfish Plan Review Team:  
Ruth Christiansen, ASMFC, Chair**

## **I. Status of the Fishery Management Plan**

<u>Date of FMP Approval:</u>	November 2002
<u>Date of Addendum I Approval:</u>	November 2005
<u>Management Unit:</u>	Entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ
<u>States With Declared Interest:</u>	Maine - Florida
<u>Active Boards/Committees:</u>	Spiny Dogfish and Coastal Shark Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, and Plan Review Team

In April 1998, the National Marine Fisheries Service (NMFS) declared spiny dogfish overfished. The Mid-Atlantic and New England Fishery Management Councils jointly manage the federal spiny dogfish fishery. NMFS partially approved the federal FMP in September 1999, but implementation did not begin until the May 2000, the start of the 2000-2001 fishing year. The federal FMP uses a target fishing mortality to specify a coastwide commercial quota and splits this quota into two seasonal periods (Period 1: May 1 to October 31 and Period 2: November 1 to April 30). The seasonal periods also have separate possession limits that are specified on an annual basis.

In August 2000, ASMFC took emergency action to close state waters to the commercial harvest, landing, and possession of spiny dogfish when federal waters closed because the quota was fully harvested. With the emergency action in place, the Commission had time to develop an interstate FMP, which prevented the undermining of the federal FMP and prevented further overharvest of the coastwide spiny dogfish population. Needing additional time to complete the interstate FMP, the emergency action was extended twice through January 2003. During that time, the majority of spiny dogfish landings were from state waters because states had either no trip limits or less conservative trip limits than those of the federal FMP. The Interstate Fishery Management Plan for Spiny Dogfish was approved by ASMFC in November 2002 and was implemented for the 2003-2004 fishing year.

The management plan strives to promote stock rebuilding and management of the spiny dogfish fishery in a manner that is biologically, economically, socially, and ecologically sound. To achieve this, the FMP objectives are to reduce fishing mortality and rebuild the spawning stock biomass to prevent recruitment failure and support a more sustainable fishery; coordinate management activities between state, federal, and Canadian waters to ensure complementary regulations throughout the species range; minimize regulatory discards and bycatch; allocate the available resource in a biologically sustainable manner that is equitable to all fishers; and to obtain biological and fishery related data from the federal bottom trawl survey.

The interstate FMP establishes a target fishing mortality rate (F) of 0.03 and an F threshold of 0.11. Additional reference points are based on the female spawning stock biomass (SSB) and are established based on survey units from the NEFSC spring trawl survey; target SSB = 31 kg/tow or 167,000 mt and threshold SSB = 15.5 kg/tow or 72,600 mt. After evaluating the annual status

of the stock, fishing year specifications are recommended by the Technical Committee and approved by the Management Board. The annual specifications include a commercial quota set within the range of zero and maximum allowed by a constant  $F$  of 0.03 and separate trip limits for two different periods (Period 1: May 1 – October 30; Period 2: November 1 – April 30). The annual quota is split by a fixed percentage between the two periods: Period 1 = 57.9%; Period 2: 42.1%. The percent split is based upon historical landings during the different periods. The interstate FMP prohibits finning in state waters.

There are a couple of ways in which the interstate FMP differs from the federal FMP, such as a quota payback provision, which deducts overages from the same period in the following fishing year, and quota rollovers which are prohibited until the stock rebuilds to the target SSB. In addition, the interstate FMP mandates that special permits can be issued for biomedical research only and limits the number of dogfish that can be taken under the special permit to 1,000 fish. Dogfish harvested for dissection or educational purposes can be taken from the commercial quota until it is fully harvested.

In November 2005, the Spiny Dogfish and Coastal Sharks Management Board approved Addendum I to the Interstate Fishery Management Plan for Spiny Dogfish. Addendum I provides the Board with the authority, but not the requirement, to establish spiny dogfish specifications for up to five years. The Mid-Atlantic and New England Fishery Management Councils took similar action under Framework 1, recommending the adoption of multi-year management measures without the requirement of annual review to NOAA Fisheries for final approval. In January 2006, NMFS announced the implementation of Framework 1 to the federal Spiny Dogfish Fishery Management Plan (FMP), which will allow the specification of commercial quotas and other management measures for up to five years.

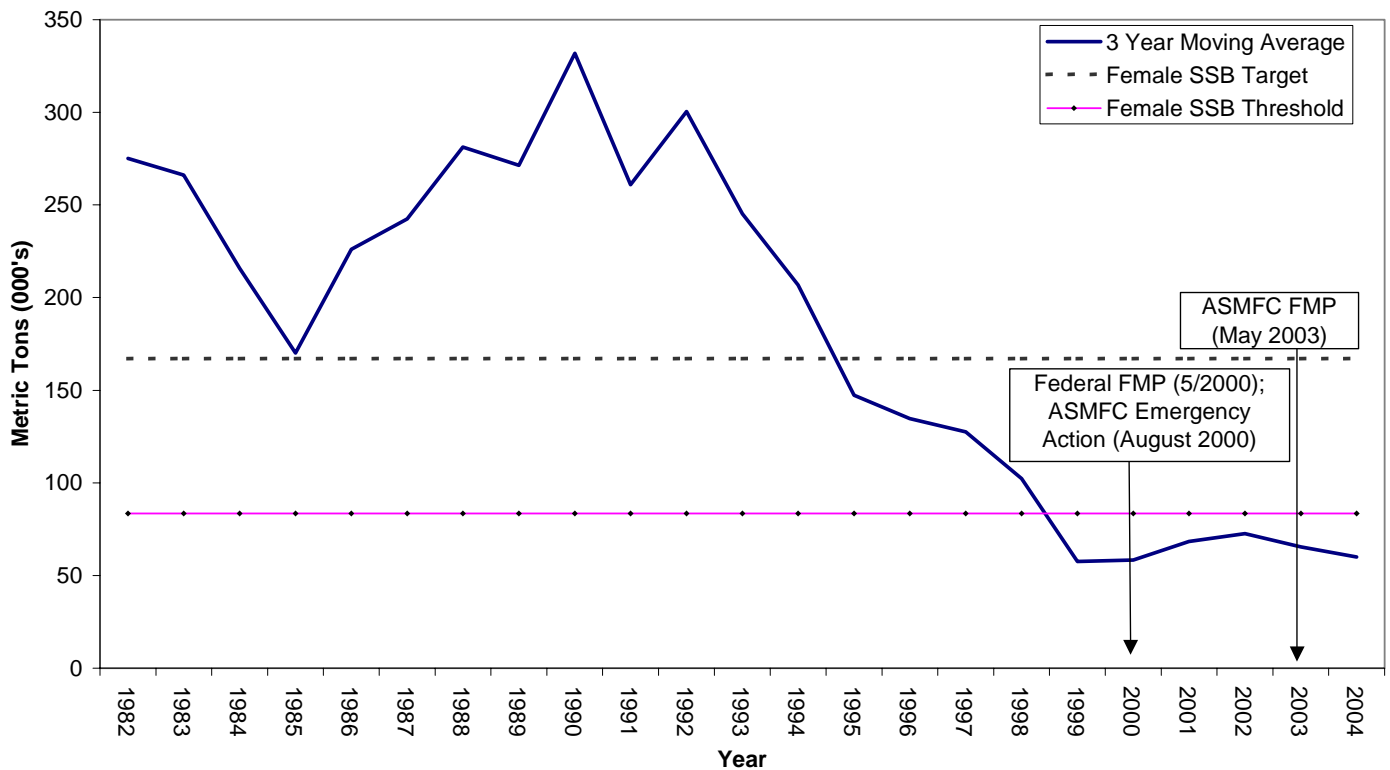
## **II. Status of the Stocks**

For the 2004-2005 fishing year, spiny dogfish are considered overfished, but overfishing is not occurring. The Spiny Dogfish Technical Committee met in September 2005 to review the latest stock assessment information. The majority of information evaluated by the Technical Committee comes from the spring NEFSC trawl survey. The trawl survey values are based on a minimum footprint of the trawl influencing the scaling factor used to express the biomass estimates in metric tons. For a given level of trawl efficiency, the use of the minimum footprint of the trawl survey tends to overestimate the population size and underestimate fishing mortality ( $F$ ). To address the variability in the survey values, all biomass estimates are presented as three year moving averages. The latest three year moving average of total stock biomass (2003-2005; 835 million pounds) declined slightly compared to the 2002-2004 value (857 million pounds). The moving average of mature female biomass declined from 132 to 118 million pounds. The survey-based estimate of pup biomass was at 1,560 mt (3.4 million pounds) last year, a twelve-fold increase compared to the previous seven years. However, this year the estimate of pup biomass dropped to about 690 mt (1.5 million pounds), slightly less than half of last year's estimate. The three-year moving average of pup biomass shows an increasing trend, but is still well below pup biomass estimates in the 1980s.

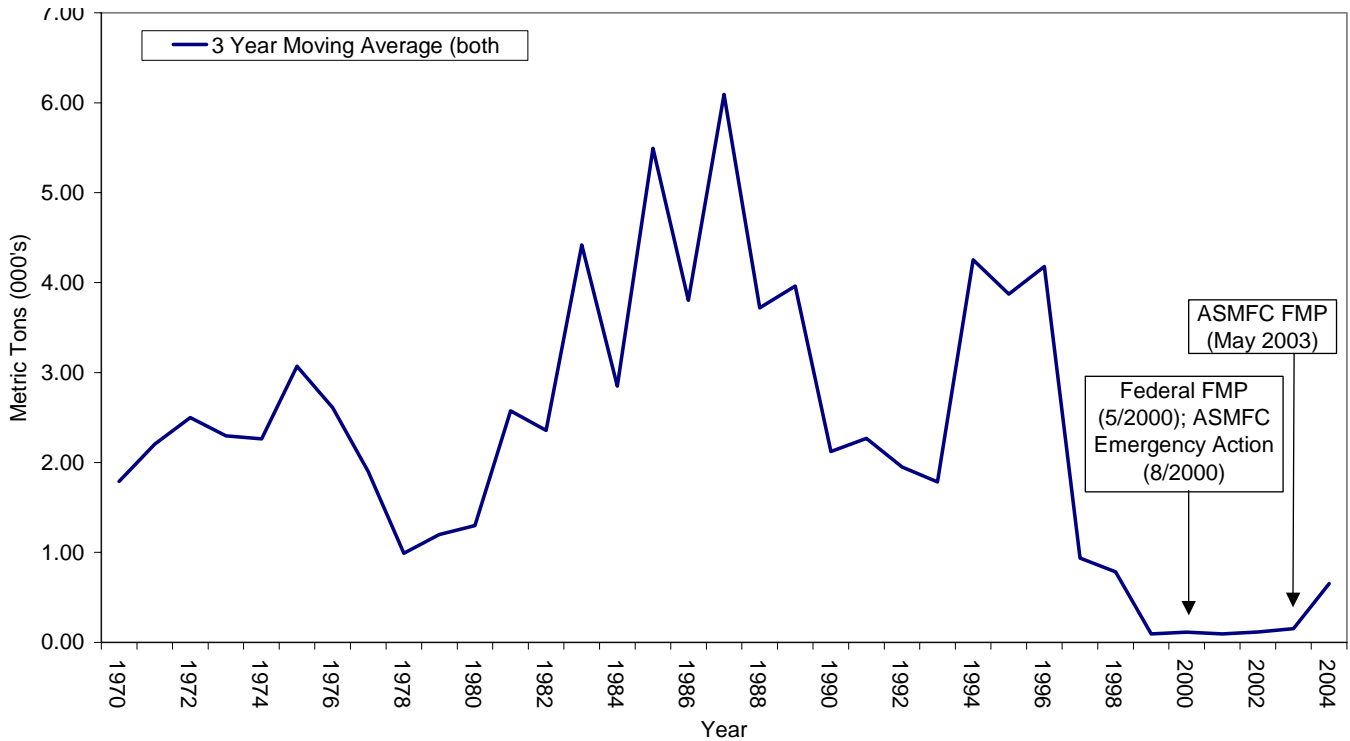
The Interstate FMP for spiny dogfish uses the female spawning stock biomass (SSB) as the target for rebuilding the population and sets the female SSB target at 167,000 mt. The 2002-

2004 female SSB was 53,625 mt, only ~32% of the target (Figure 1). The stock is still considered overfished ( $SSB_{\text{threshold}} = 83,500$  mt) with a slightly declining trend. To rebuild the female SSB to the target levels, the FMP requires  $F$  to be maintained at 0.03. Once the female SSB reaches the building level,  $F$  will be maintained at 0.08 ( $F_{\text{target}}$ ). The threshold  $F$  ( $F_{\text{threshold}}$ ) equals 0.11 and determines whether overfishing is or is not occurring on the stock. The 2004 estimate of fishing mortality is 0.067, slightly above the 2003 estimate of fishing mortality of 0.04;  $F$  values are the female landings from the exploitable female biomass. Since  $F$  was below the  $F_{\text{threshold}}$ , overfishing was not occurring in 2004 or 2003. The decline in  $F$  can be attributed to the significant reduction in US and Canadian landings and limited industry support to process dogfish.

**Figure 1. Three Year Moving Average of NEFSC Spring Trawl Survey Estimate of Female Spawning Stock Biomass (equal to or larger than 80 cm) in metric tons.**



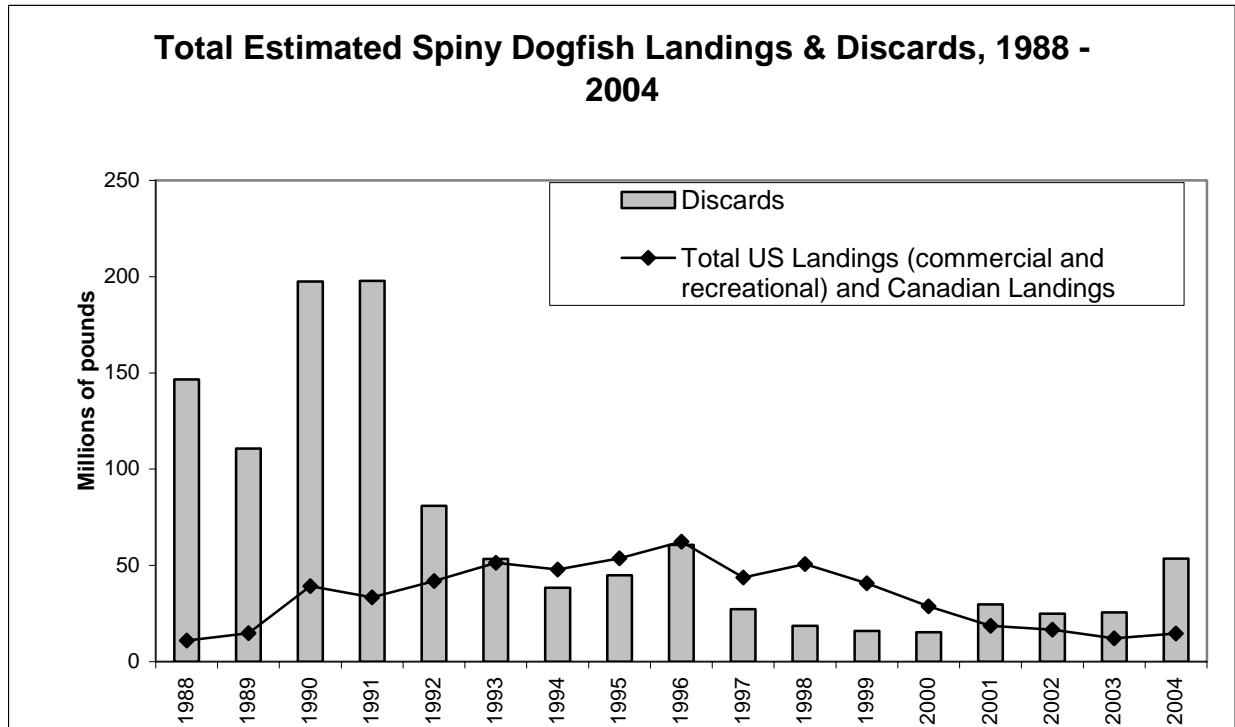
**Figure 2. Three Year Moving Average of NEFSC Spring Trawl Survey Estimate of Pup Biomass in metric tons.**



The spiny dogfish fishery escalated in the early 1990s. During this time, Canadian landings were historically quite low. Canadian landings began to increase in 1998 as US regulations were implemented. These landings dropped slightly in 2002 and 2003, but are back up again in 2004. In 2004, Canadian commercial landings totaled 2336 mt (approximately 5 million pounds). Part of this is due to the Canadian quota. Another part is due to a 700-ton research fishery for acquiring biological data and doing some radiometric aging. It was indicated that the Canadians are going to use spiny dogfish from this year and next for scientific purposes, taking 2500 mt (approximately 5.5 million pounds) each year for research.

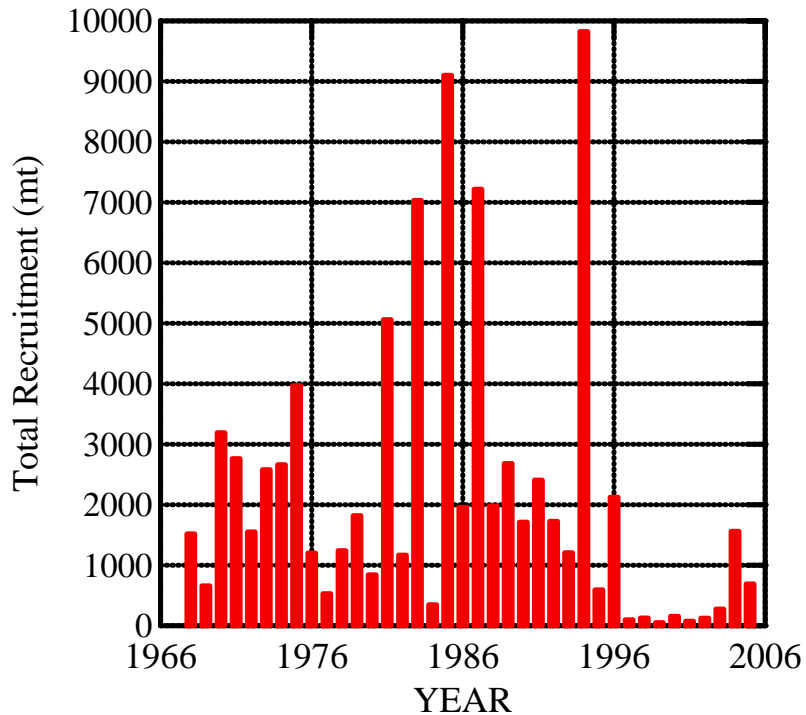
Discarding in the commercial industry is pervasive. Dead discards from US commercial fisheries were estimated to be between 6,400 to 13,285 mt (14.1 and 29.3 million pounds) depending on the assumed discard mortality by gear type. Much of the estimated commercial discard amount came from the mid water trawl fishery for Atlantic herring. Based on experience with other species, like haddock, in the herring fishery, it is hard to characterize the actual discards. Many of the bigger fish are screened out at the herring processing plants. As with estimates for recreational discard rates, the important factor for estimating discards is the projected mortality rates. Assumptions for mortality in each fishery were reviewed; trawl mortality is likely higher due to compression of the fish in the tow. If the catches are light, the dogfish are robust. A number of studies have been proposed to address this issue, which is a critical part of the spiny dogfish assessment.

Figure 3. Comparison of dogfish landings with dead discards.



Pup recruitment is important factor in evaluating the future status of the stock. Pups are considered males and females less than 35 cm. The 2002-2004 pup biomass is 653 mt. For the previous seven years, the stock was considered to be experiencing pup recruitment failure. The 2004 NEFSC trawl survey encountered a few large schools of pups in 2004, increasing the estimate of pup biomass. Recruitment data indicates that smaller dogfish are clearly concentrated offshore at the shelf break. A small increase in biomass estimates was observed in 2005. Historically low recruitment is important in terms of recovery projections that have been done. The sex ratio for spiny dogfish at birth is about 1:1 through the 60 cm range. The sex ratio diverges and becomes more male-dominated at around 80 cm. The females pass through that stage and continue to grow. Above 90 cm, the sex ratio is highly skewed toward females. Looking at the length frequency by sex, the male pattern has stayed about the same, whereas the female curve shows a progressive change. The pre-fishery condition for the females had a higher abundance of fish throughout the size range, but the directed fishery on the mature females and low pup recruitment resulted in a truncated length frequency. Missing pups, from the period 1997 through 2003, clearly shows in the biomass data. While the spiny dogfish stock appears to have oscillations, recovery level will not be reached at any time in the near future. The absence of pups in recent years is reflected in all biomass projection scenarios by a drop, followed by a rise.

Figure 4. Estimated Recruitment of Spiny Dogfish, <36 cm, Spring Survey, 1968-2005



There are many reports of high densities of spiny dogfish and mismatches between fishermen perceptions and actuality. The perception that there are numerous amounts of dogfish is due to their distribution inshore, which is evident from the trawl survey data. The inshore densities are the very highest in the dataset. There is an absence of dogfish in the central part of the basin, off Massachusetts, with a high concentration in Vineyard Sound and other areas. This is one reason there is a mismatch between the assessment and fishermen perceptions. The fraction of the population in inshore waters does appear to have increased in recent years. During the fall NEFSC survey, a much higher proportion of the stock was found inshore, which is consistent with reports of high density from the fisherman. Larger females tend to be inshore in spring, as well as in the fall. An important question centers on what environmental variables (i.e., temperature, salinity) are causing this observed distribution.

### III. Status of the Fishery

US commercial landings of spiny dogfish for 2004 were 980 mt (approximately 2 million pounds). In 2003, the commercial fishery landed 1,170 mt (approximately 2.5 million pounds). Total landings are about 99 percent female. The average size of females landed is increasing over time, primarily due to a shift in fisheries (more gill net and hook, less trawl). This is consistent with the past several years, except during the late 1990's. The ratio of the total landings removed to numbers removed show that the numbers of females landed increased about 16-fold, indicating that the average size greatly decreased. The decrease in large females is a result of removals in the early 1990s.

Figure 5. US and Canadian Commercial Landings for Spiny Dogfish.

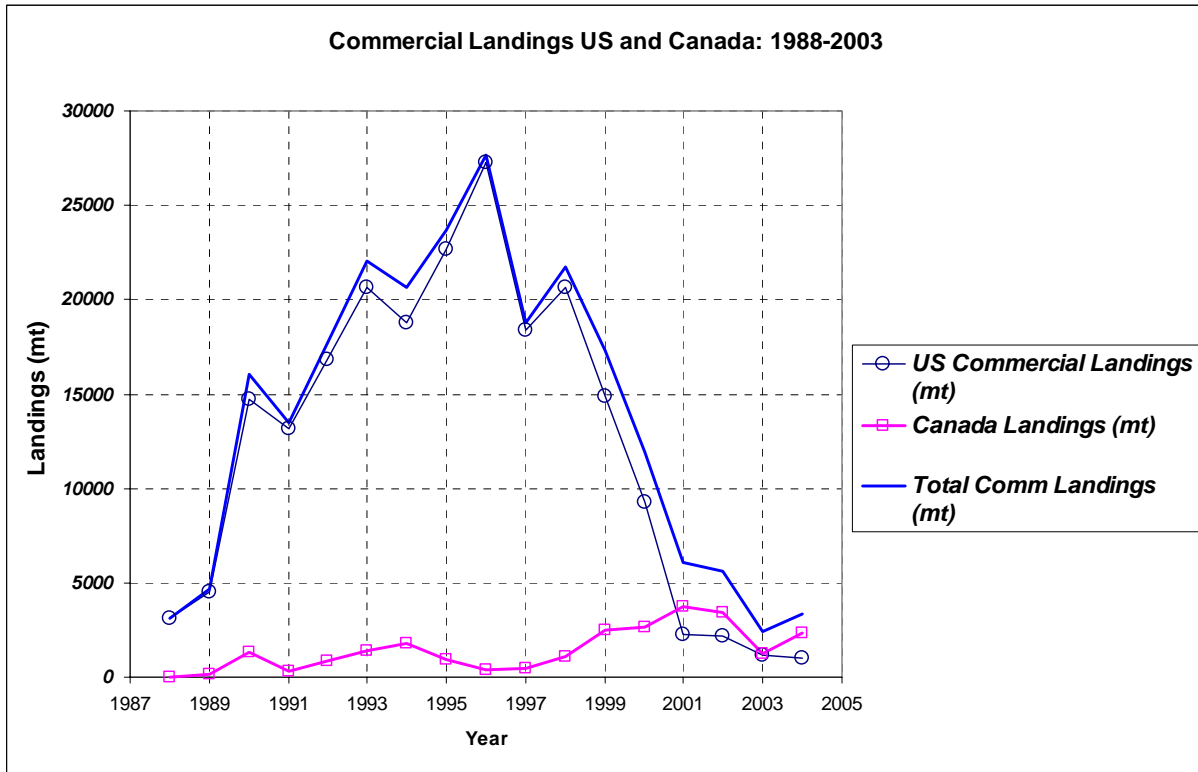
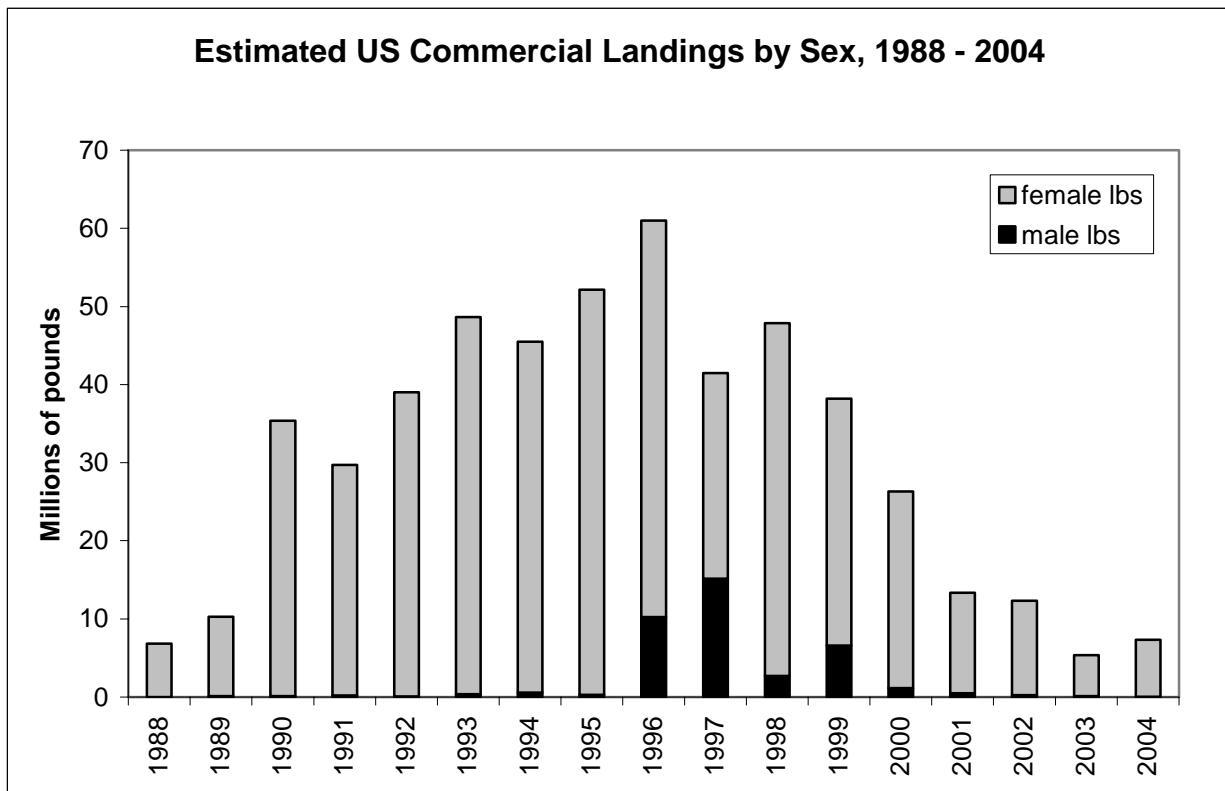


Figure 6. Landings of Spiny Dogfish by sex.





Recreational landings of spiny dogfish increased from a very low number in 2000 to a high value of 81,972 animals in 2002. For 2004, recreational landings were estimated at 42,149 animals. The range of estimated total recreational removal values is dependent upon which combinations of discard mortality and mean weight is assumed (from MRFSS and from SARC 37). The latest stock assessment assumes a 100% discard mortality rate in the recreational fishery. US recreational removals for 2004 ranged from 819 mt (1.8 million pounds) to 3,325 mt (7.3 million pounds). These variable numbers are reflective of a low sample size in the MRFSS survey. The sampling intensity by the MRFSS program and number of intercepts are influential to the number of reported recreational catch. Some smooth dogfish may be inadvertently included in the landings estimates for spiny dogfish. Looking at landings by date and area would help to clear these errors.

Massachusetts landed the greatest portion of the coastwide commercial (74%) and recreational landings (69%) by weight. Virginia came in second for commercial landings with 12% of the total commercial harvest and New Jersey came in second for recreational landings with 7% of the total recreational harvest.

**Table 1. State Recreational Landings (in pounds) for the 2004 Calendar Year and State Commercial Landings (in pounds) for the May 1, 2004 to April 30, 2005 Fishing Year.\***

State	Recreational	Commercial
Maine	4,760	3,331
New Hampshire	15,999	300
Massachusetts	151,762	1,208,815
Rhode Island	6,338	145,389
Connecticut	0	37,990
New York	0	42,334
New Jersey	15,013	3,700
Delaware	2,363	0
Maryland	6,605	410
Virginia	13,726	193,522
North Carolina	0	989
South Carolina	3,115	0
Georgia	0	0
Florida	0	0
<b>Total</b>	<b>219,681</b>	<b>1,636,780</b>

\* Recreational landings are MRFSS data (Type A +B1+B2 with an assumed 100% release mortality) ([www.st.nmfs.gov/st1/recreational/queries/custom/index.html](http://www.st.nmfs.gov/st1/recreational/queries/custom/index.html)); Commercial landings are from the NMFS Weekly Quota Report data ([www.nero.noaa.gov/ro/fso/reports/reports\\_frame.htm](http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm)).

#### IV. Status of Assessment Advice

The 37<sup>th</sup> Stock Assessment Workshop/Stock Assessment Review Committee reviewed the spiny dogfish (*Squalus acanthias*) stock assessment in May 2003 (NEFSC 2004). The stock assessment determines the population's abundance using the NEFSC research vessel survey catch per tow. For this reason, the female spawning stock biomass target and threshold are based on the trawl survey results (SSB target = 167,000 mt). Additionally, the tools used to assess the

status of the population are based on length measurements because there is no accepted methodology for ageing spiny dogfish.

The 37<sup>th</sup> SARC determined that the coastwide population is overfished, but overfishing was not occurring. The 2002 fishing mortality rate (0.09) exceeded the rebuilding target of 0.03 by a factor of 3 and was approaching the threshold  $F$  (0.11). The female spawning stock biomass (SSB) was 29% of the SSB target. The recruitment estimates from the last seven years were the lowest values in the entire time series. Recruitment is directly related to the number and size structure of the spawning females. Because of the reproductive biology of the species and the low female spawning stock biomass, this stock is not expected to rebuild quickly. The SARC advised against a directed fishery on the adult females. The SARC will peer review the next spiny dogfish stock assessment in 2006.

Spiny dogfish are scheduled to undergo a benchmark stock assessment in 2006. The assessment will be comprised of two meetings with the NEFSC taking the lead on each. First, the Working Group will meet May 8-12, 2006. Following that meeting, the peer review is scheduled for the SARC 43 meeting June 6-12, 2006.

## **V. Status of Research and Monitoring**

Under the Interstate Fishery Management for Spiny Dogfish, the states are not required to conduct any fishery dependent or independent studies. The Interstate FMP requires an annual review of recruitment, spawning stock biomass, and fishing mortality. The annual review relies heavily on the NEFSC's spring trawl survey data to determine the annual status of the stock.

States are encouraged to submit any spiny dogfish information collected while surveying for other species. In 2003, New Hampshire sub-sampled the commercial catch of spiny dogfish for size composition and reproductive potential. New Hampshire collected length, number and length of embryos in the uterus, and number and diameter of unfertilized developing eggs in the ovaries of females for 720 spiny dogfish caught in gill nets and landed during the month of September. More information can be found in the report entitled, "Programs Improving Management of ASMFC Managed Species in New Hampshire 2003; Job 3: Commercial Fisheries Data Collection; B. Spiny Dogfish Port Sampling; Final Report" Grant No. NA16FG2546 (Project 2-ACA-130).

Massachusetts has a spring and fall survey that encounters spiny dogfish. This information is usually included in the annual stock status review. MA DMF has discontinued the fishery dependent port sampling for spiny dogfish because the directed fishery has been closed. Connecticut also has a spring and fall trawl survey that encounters spiny dogfish. The spring trawl survey commonly caught spiny dogfish in the spring survey from 1985 to 1991 and has caught fewer than 10 fish per year for the last ten years. Delaware has bottom trawl survey that also encounters spiny dogfish (23 dogfish in 2003 mostly during November and December; 12 dogfish in 2002; 31 dogfish in 2001).

North Carolina conducts dockside sampling of the ocean gill net fishery and collects information on length, sex, and aggregate weight. 1,327 spiny dogfish were sampled from a total of 18 ocean gill net catches targeting spiny dogfish. Additional information on these catch samples can be

found in the report entitled, "Assessment of North Carolina Commercial Fin Fisheries, NCDMF Completion Reports, 1984-2004." Spiny dogfish are also sampled on the SEAMAP Cooperative Striped bass Tagging Cruise, which, this year, took place from January 14<sup>th</sup> to the 24<sup>th</sup>, 2004. The SEAMAP cruise has sampled dogfish since 1997. Dogfish are enumerated by sex and subsamples are measured. The cruise sampled 4,705 spiny dogfish; of which 3,385 were tagged as part of the East Carolina University tagging study.

## **VI. Status of Management Measures and Issues**

### **Interstate Specifications for 2004-2005**

The Spiny Dogfish and Coastal Sharks Management Board approved a commercial quota of 4 million pounds with trip limits of 600 lbs for Period 1 and 300 lbs for Period 2 for the 2004-2005 fishing year. These actions were taken in response to the results and recommendations of the 37<sup>th</sup> Stock Assessment Review Committee and the Commission's Spiny Dogfish Technical Committee.

### **Canadian Regulations**

Canada continues to hold their regulations constant while the Department of Fisheries and Ocean (DFO) completes their five-year spiny dogfish research program. The fixed gear (less than 45 feet) sector is the only group permitted to actively fish for spiny dogfish in eastern Canada. The fixed gear fishery is allotted a 2,500 metric ton (~5.5 million pounds) quota. This quota is further divided among the different community management boards based on catch history and can be transferred among the communities. The inshore and offshore dragger fleets are permitted to retain bycatch in the amount of 25 metric tons for vessels less than 65 feet and vessels larger in size have an annual cap of 10 metric tons.

The 2004-2005 fishing year is the third year of the five-year sampling program. The sampling program is industry funded and collects information such as size, sex, and age. Thus far, sampling has raised questions regarding the assumption that spiny dogfish is a single stock. The DFO has committed a 2,500 mt quota to the fixed gear sector at least until the end of the five year sampling program. Canada has declined to participate in a transboundary assessment until DFO has an initial assessment of the stock in Canadian waters.

In the April 2002 - March 2003 fishing year, Canada had a 2,500 mt quota for the fixed gear sector plus a 700 mt sampling quota; total Canadian landings were 3,408.6 mt (including mobile gear landings). In the 2003-2004 fishing year, the fixed gear fishery landed only 1,270 mt of the 2,500 mt quota. Total landings, with mobile gear landings, were 1,277.2 mt. As of September 9, 2004, Canada landed 1,443 mt of the 2,500 mt quota.

### **Biomedical Harvest**

Maine and New Hampshire were the only two states to request an allowance to issue biomedical permit harvests for the 2004-2005 fishing year. Maine was the only state to issue permits in the 2004-2005 fishing year for the biomedical harvest of spiny dogfish. The Mount Desert Island Biological Labs took a total of 960 dogfish from May 28-September 22, 2004; 615 were females, 285 were males. Average lengths ranged from 52.8 cm to 78.6 cm and weighed from 1.2 kg to 2.3 kg. Maine requested an allowance to issue biomedical harvest permits for the 2005-2006

fishing year. The request was granted by the Management Board so that Maine may issue special permits for biomedical harvest research (limiting the harvest to 1,000 spiny dogfish).

## **CITES**

In late December 2003, Germany submitted a proposal to the United States to list spiny dogfish, *Squalus acanthias*, in Appendix II of the Convention on International Trade of Endangered Species (CITES). An Appendix II listing means the species can be exported commercially under a system of international permits, sustainability determinations, and cooperative law enforcement. The purpose of such a listing is to ensure that a species does not become endangered because of international trade. The CITES Animal Committee met in late March 2004 to discuss, among other issues, the German proposal to list spiny dogfish in Appendix II. The Committee determined that spiny dogfish meets the biological criteria for Appendix II. After the Animal Committee meeting, Germany failed to garner sufficient support from other European Union countries and thus could not submit the proposal during the next CITES conference (Convention of the Parties 13: Bangkok October 3 – 14, 2004). The Animal Committee's finding on the biological status of spiny dogfish and the extent of exploitation around the globe will become part of the official record at the CITES conference, but a listing will not be considered as there is no official proposal for submission. The Secretariat noted that sound management of sharks, in general, is paramount, and CITES cannot fix the problem of uncoordinated, data limited shark management via trade regulations.

## **VII. Annual State Compliance**

The mandatory components of the Interstate Fishery Management Plan are to close state waters when the commercial quota is projected to be harvested, report landings weekly to NMFS, state permitted dealers must report weekly, implement possession limits as determined by the Commission's annual specification setting process, limit the biomedical harvest of spiny dogfish to 1,000 fish per year, and report the amount of dogfish harvested under special permits, and maintain a prohibition on finning.

Table 2 summarizes the states' compliance with the Interstate Fishery Management Plan for spiny dogfish during the 2004-2005 fishing year and provides an update on the regulations for the current fishing year.

## **VIII. PRT Recommendations**

### **State Compliance**

All of the states with a declared interest in the management of spiny dogfish have regulations in place that are compliant with the Interstate Management Plan for Spiny Dogfish.

### **De minimis Status**

When the spiny dogfish Interstate FMP was implemented in 2003, Maine, Delaware, South Carolina, Georgia, and Florida were granted *de minimis* status. To achieve *de minimis* status the FMP requires, "a state's commercial landings of spiny dogfish to be less than 1% of the coastwide commercial total." When given *de minimis* status, it is exempted from biological monitoring of the commercial spiny dogfish fishery, but must continue to report both the state's commercial and recreational spiny dogfish landings. Maine, Delaware, South Carolina, Georgia,

and Florida are requesting *de minimis* status again and continue to meet the FMP requirements for achieving this status. The PRT recommends granting these states *de minimis* status (Table 3).

Table 2. State-by-state compliance with the Interstate Fishery Management Plan for Spiny Dogfish.

	Report Submitted	De Minimis Request		Biomedical Permit Harvest		Finning Prohibition	Trip Limits	
		2004-2005	2005-2006	2004-2005	2005-2006		2004-2005	2005-2006
Maine	8/24/2005	Yes, Approved	Yes, Approved	Yes: 960 fish harvested	Yes, Requested	Yes	600 lb / 300 lb	600 lb / 300 lb
New Hampshire	6/24/2005	No	No	Yes: none harvested	No	Yes	ED set trip limits up to 7,000 lbs depending on ASMFC quotas	ED shall set trip limits up to 7,000 lbs depending on ASMFC quotas <b>and trip limits</b>
Massachusetts	2/20/2006	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
Rhode Island	6/22/2005	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
Connecticut	8/24/2005	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
New York	1/10/2006	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
New Jersey	2/20/2006	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
Delaware	7/8/2005	Yes, Approved	Yes, Approved	No	No	Yes	closed	closed
Maryland	8/5/2005	No	No	No	No	Yes	600 lb without a federal permit/300 lb with federal permit	600 lb / 300 lb
Virginia	7/1/2005	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
North Carolina	6/30/2005	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
South Carolina	7/12/2005	Yes, Approved	Yes, Approved	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
Georgia	6/16/2005	Yes, Approved	Yes, Approved	No	No	Yes	2 fish bag limit / 30" min size	2 fish bag limit / 30" min size
Florida	7/7/2005	Yes, Approved	Yes, Approved	No	No	Yes	fishery prohibited	fishery prohibited

**Table 3. States requesting continued *de minimis* status.**

Year	Total Commercial Landings	ME	% of Total Landings	DE	% of Total Landings	SC	% of Total Landings	GA	% of Total Landings	FL	% of Total Landings
1992	37,164,817	1,719,400	4.63%	.	0%	.	0%	.	0%	.	0%
1993	46,771,518	3,524,780	7.54%	.	0%	.	0%	.	0%	.	0%
1994	40,436,880	1,813,347	4.48%	.	0%	.	0%	.	0%	.	0%
1995	47,592,585	1,663,568	3.50%	62,900	0.13%	.	0%	.	0%	.	0%
1996	59,359,721	911,048	1.53%	.	0%	.	0%	.	0%	.	0%
1997	45,034,113	448,660	1.00%	.	0%	.	0%	.	0%	.	0%
1998	47,428,917	273,752	0.58%	1,905	0%	.	0%	.	0%	.	0%
1999	33,862,195	34,811	0.10%	414	0%	.	0%	.	0%	.	0%
2000	21,208,274	7,661	0.04%	235	0%	.	0%	.	0%	.	0%
2001	4,907,481	257	0.01%	13	0%	.	0%	.	0%	.	0%
2002	4,273,981	589	0.01%	0	0%	.	0%	.	0%	.	0%
2003	2,950,851	0	0%	0	0	.	0%	.	0%	.	0%
2004	1,636,780	3331	0%	0	0	.	0%	.	0%	.	0%

\*Landings from 1991-2001 are from Table 2 of the Interstate FMP for Spiny Dogfish. 2002-2003 commercial landings are from the state reports and NMFS quota monitoring report. There are no recorded commercial landings of spiny dogfish for South Carolina, Georgia, and Florida.

## **Research Recommendations**<sup>1</sup>

### ***Stock Assessment and Population Dynamics***

- Conduct a U.S. – Canadian transboundary assessment for spiny dogfish and increase data sharing.
- Expand the location (nearshore surveys) and duration of sea sampling activities to obtain a more reliable estimate of population size and age class structure. The survey should be expanded further south as spiny dogfish are commonly observed in South Carolina and Georgia during December through March. The southern most portion of the species' range may depend on the severity of the winter temperatures.
- Conduct a stock assessment of spiny dogfish based upon NMFS trawl surveys in the 1960's and 1970's, prior to large decreases in groundfish abundance, for comparisons to current population status.
- Explore an alternative assessment using a standard statistical fisheries modeling approach (i.e.: data inputs not smoothed before fitting the model, and trawl biomass used as relative indices with a selectivity pattern estimated within the model).

### ***Biological***

- Investigate causes for the apparent recruitment failure
- Determine whether or not there is an identifiable area used for pupping.
- Increase the biological sampling of dogfish on research trawl surveys and in the commercial fishery.
- Update maturation and fecundity estimates by length class.
- Recover and encode information on the sex composition prior to 1980 from the survey database.
- Attempt to allocate landings to statistical area (i.e.: attempt prorating) using Vessel Trip Report data for 1994 and later years.
- Evaluate the utility of length frequency for spiny dogfish sampled in the NEFSC Observer Program in the most recent years (2001 and later).
- Ensure the inclusion of recent (2000 and later) MADMF Observer sample data for spiny dogfish in the NEFSC database, for more efficient use in future assessments.

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<sup>1</sup> Research recommendations have been maintained from the 2003-2004 interstate FMP review for spiny dogfish; however, these recommendations are anticipated to change upon completion of the 2006 benchmark stock assessment for spiny dogfish.



- Conduct tagging and genetic studies of spiny dogfish in U.S. and Canadian waters to clarify assumptions about stock structure.
- Conduct discard mortality studies for spiny dogfish, with consideration of the differences in mortality rates among seasons, areas, and gear types.
- Conduct experimental work on NEFSC trawl survey gear performance, with focus on video work to study the fish herding properties of the gear for species like dogfish and other demersal groundfish.
- Investigate the distribution of spiny dogfish beyond the depth range of current NEFSC trawl surveys, possibly using experimental research or supplemental surveys.
- Initiate ageing studies for spiny dogfish age structures (i.e.: fin spines) obtained from NEFSC trawl surveys and other sampling programs. These studies should include additional age validation and age structure exchange. Other ageing methodologies (i.e.: Canadian studies on radiometry) are also in development.
- Additional analyses of the effects of environmental conditions on survey catch rates should be conducted.
- Additional work on the stock –recruitment relationship should be conducted with an eye toward estimation of the intrinsic rate of population increase.

### *Social*

- Update, on a regular basis, the characterization of fishing communities involved in the spiny dogfish fishery, including the processing and harvesting sectors, based upon Hall-Arber et al. (2001) and McCay and Cieri (2000).

### *Economic*

- Characterize the value and demand for spiny dogfish in the biomedical industry on a state-by-state basis.
- Use Multinomial logit and random utility models to provide information on future possession limit analyses and expand upon Steinback and Thunberg's (2002) trip limit analysis. Trip limit cost estimates should be corroborated through industry advisor input or through other sources of data. Sensitivity analyses of Steinback and Thunberg's (2002) analysis should be conducted in the future to determine the range of possible outcomes.
- Characterize the spiny dogfish processor sector.
- Monitor the changes to the foreign export markets for spiny dogfish, and evaluate the potential to recover lost markets or expand existing ones.

