

**REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION'S  
INTERSTATE FISHERY MANAGEMENT PLAN FOR  
SPINY DOGFISH  
(*Squalus acanthias*)**



**2003 – 2004 FISHING YEAR**

**Board Approved: November 9, 2004**

**Prepared by the Spiny Dogfish Plan Review Team:**

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

<u>Date of FMP Approval:</u>	November 2002
<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 it 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 close because the quota was fully harvested. With the emergency action in place, the Commission had time to develop an interstate FMP, prevented the undermining of 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, most of the spiny dogfish landings were from state waters because the states had either no trip limits or less conservative trip limits compared to the federal FMP. The Interstate Fishery Management Plan for Spiny Dogfish was approved by the Commission 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 established a target fishing mortality rate (F) of 0.03 and an F threshold of 0.11. The second set of reference points are based the female spawning stock biomass (SSB) and set 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, the 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 on the historical landings during the different periods. The FMP prohibits finning in state waters.

There are a couple of ways that 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 are prohibited until the stock rebuilds to the target SSB. Finally, the 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 (1,000 fish). Dogfish harvested for dissection or educational purposes can be taken from the commercial quota until it is fully harvested.

## II. Status of the Stocks

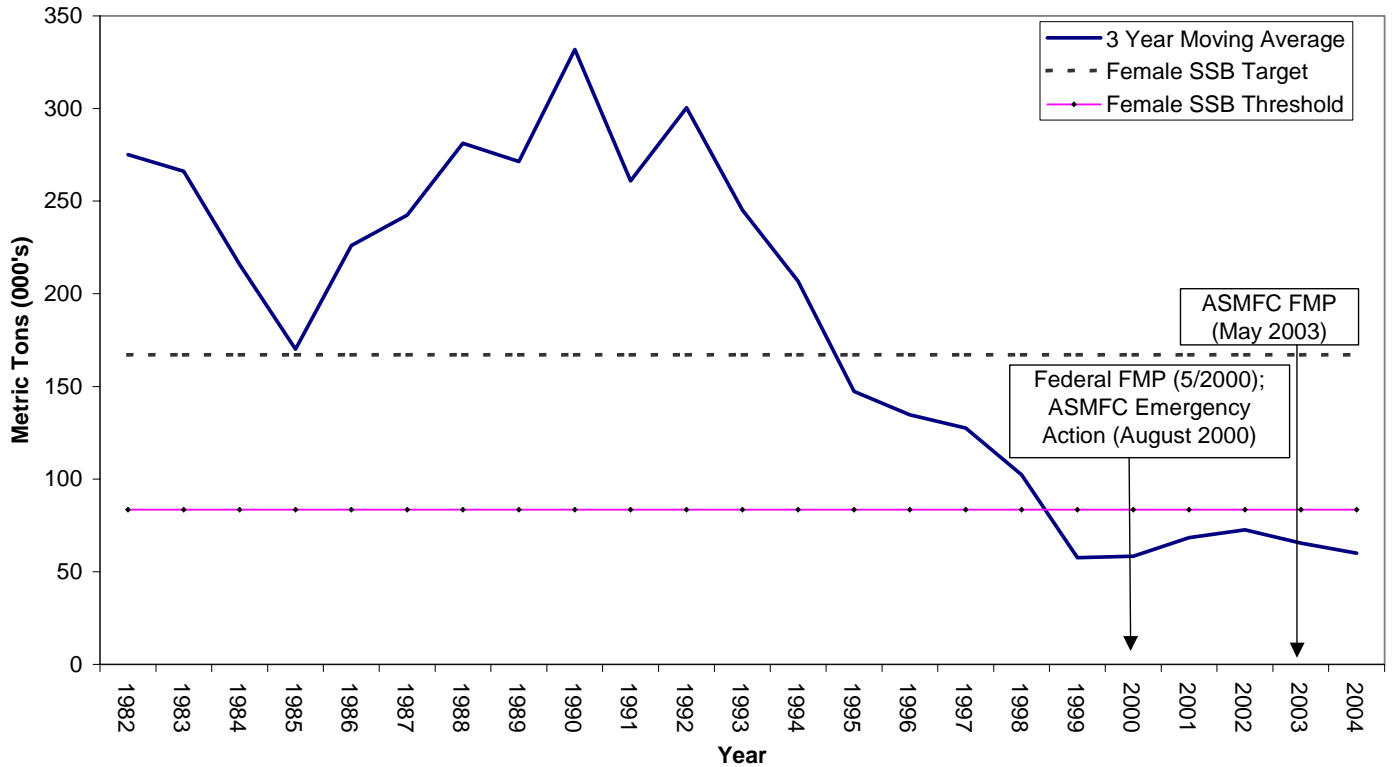
The Spiny Dogfish Technical Committee met on September 24, 2004 to review the latest status of the stock information. Most of the information evaluated by the Technical Committee comes from the spring NEFSC trawl survey. The trawl survey values are based on a minimum footprint of the trawl influencing 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 most current estimate uses survey data from 2002-2004. In some years, there are tows encountering large schools of dogfish resulting in high estimates of biomass or vice versa the trawl may miss the schools of dogfish in any one year producing low estimates of biomass.

The Interstate FMP 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 is 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. About 80% of the dogfish encountered by the NEFSC spring trawl survey are immature male and female dogfish (between 36-79cm). This portion of the biomass is estimated to be in relatively high abundance. The size ranges encountered is narrowing, which is evidence of the pup recruitment failure seen in recent years and fewer pups are available to the intermediate size range.

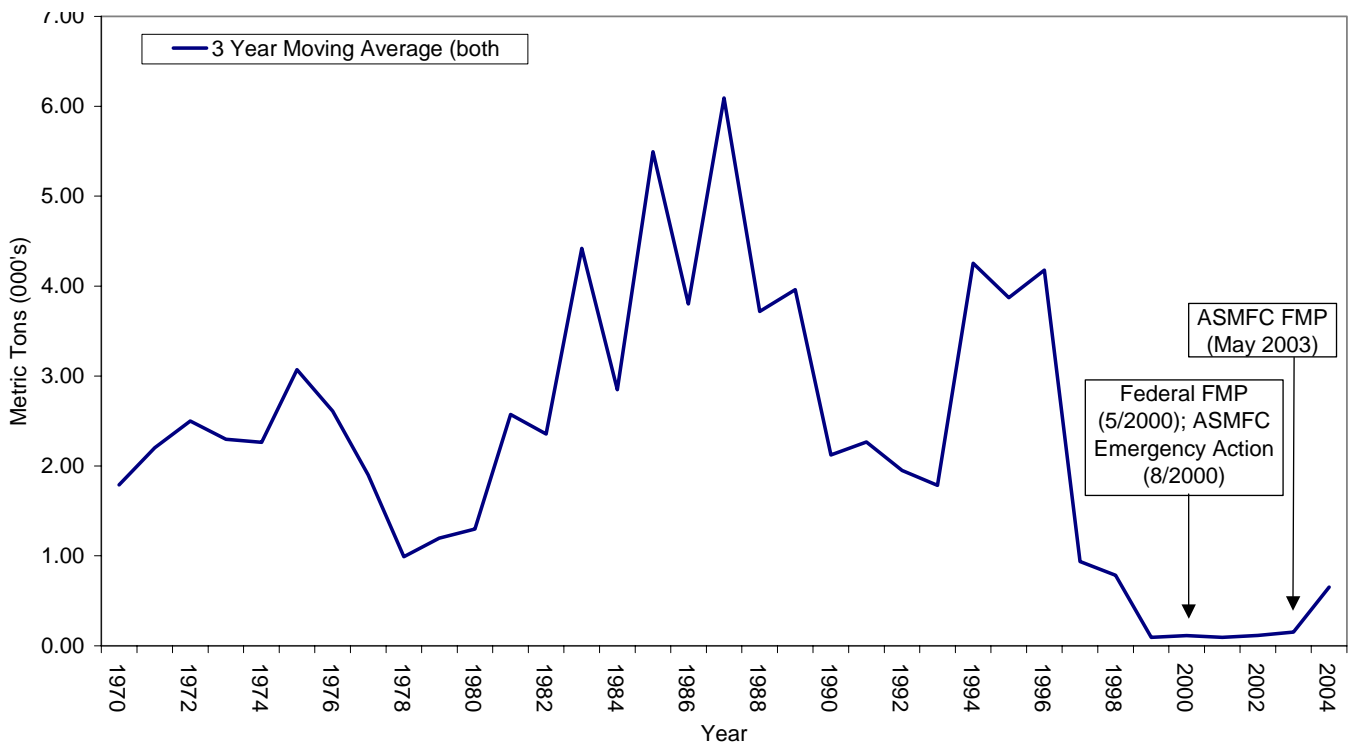
Pup recruitment is important factor in evaluating the future status of the stock. Pups are considered males and females less than 35 cm. The 2002-2004 pup biomass is 653 mt. For the previous seven years, the stock was considered to be experiencing pup recruitment failure. The 2004 NEFSC trawl survey encountered a few large schools of pups in 2004, increasing the estimate of pup biomass.

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 2003 estimate of fishing mortality is 0.04; this  $F$  is the female landings from the exploitable female biomass. Since  $F$  is below the  $F_{\text{threshold}}$ , overfishing was not occurring in

**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.**



2003. The decline in F can be attributed to the significant reduction in US and Canadian landings and limited industry support to process dogfish.

### III. Status of the Fishery

The total commercial landings for the 2003-2004 fishing year was 2,950,851 pounds (NMFS dealer weighout data) (Table 1). The total recreational catch for the 2003 calendar year was 6,684,508 pounds (MRFSS Type A+B1+B2 data, assumed 100% discard mortality). The commercial spiny dogfish landings are a reflection of the regulations in place for both state and federal waters during the 2003-2004 fishing year (see Section VI). For the most part, the recreational harvest of spiny dogfish is unregulated.

Massachusetts landed the greatest portion of the coastwide commercial (67%) and recreational landings (58%) by weight. North Carolina came in second for commercial landings with 14% of the total commercial harvest and New Jersey came in second for recreational landings with 17% of the total recreational harvest.

Recreational landings have progressively increased over the last couple of years from an average of about 2.4 million pounds of dogfish during the 1980's and 1990's to almost 6.7 million pounds in 2003. The 2003 –2004 commercial landings are about 2 million pounds lower than the 2001 (~5 million pounds) and 2002 (~4.8 million pounds) commercial harvest. Prior to 2001, commercial landings were significantly higher and were largely unregulated. The 2003-2004 fishing year marks the first year in since 2000 the federal or state water commercial fishery was not closed due to a fully harvested quota.

**Table 1. State Recreational Landings (in pounds) for the 2003 Calendar Year and State Commercial Landings (in pounds) for the May 1, 2003 to April 30, 2004 Fishing Year.\***

State	Recreational Landings	Commercial Landings
Maine	81,560	0
New Hampshire	1,037,795	174,803
Massachusetts	3,884,903	1,970,151
Rhode Island	172,145	128,949
Connecticut	75,251	605
New York	189,613	37,543
New Jersey	1,143,357	0
Delaware	41,740	21
Maryland	19,360	4,727
Virginia	4,763	211,862
North Carolina	8,459	422,190
South Carolina	0	0
Georgia	25,564	0
Florida	0	0
<b>Total</b>	<b>6,684,508</b>	<b>2,950,851</b>

\* Recreational landings are MRFSS data (Type A +B1+B2 with an assumed 100% release mortality); Commercial landings are from the NMFS Dealer Weighout data.

#### **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.

#### **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 2003-2004**

The Commission approved a commercial quota of 8.8 million pounds with a trip limit up to 7,000 pounds for the 2003-2004 fishing year. In addition to the seasonal allocation of the quota hardwired in the interstate FMP, the Commission approved a regional quota allocation; with about 58% of the quota allocated to Maine, New Hampshire, and Massachusetts and 42% allocated to all of the states from Rhode Island south. These specifications created a significant difference in the regulations governing the state waters fishery and the federal regulations for the EEZ. NOAA Fisheries implemented a commercial quota of 4 million pounds with trip limits of 600 pounds in period one and 300 pounds in period two for the 2003-2004 fishing year. For most of the fishing year, NMFS closed federal waters to the possession, harvest and landing of spiny dogfish due to the concern for potentially overharvesting the resource with the 8.8 million pound quota for state waters.

To address this concern, the states, independent from the Commission, agreed to maintain the commercial harvest below 4.4 million pounds, cutting each of the regional quotas in half and bringing it closer to the federally specified quota. The states continued to have the ability to implement trip limits up to 7,000 pounds. A range of trip limits were implemented throughout the east coast, from the 600 pound/300 pound federal trip limit to a 4,000 pound trip limit in Virginia and North Carolina to a 7,000 pound trip limit in New Hampshire and Massachusetts. The trip limits enabled some states to continue a small-scale directed fishery in state waters during the 2003-2004 fishing year.

NOAA Fisheries re-opened federal waters to harvest of spiny dogfish bycatch in early January with a 300 pound trip limit because the coastwide quota remained largely unharvested. Federal waters remained open through the end of the fishing year. During the 2003-2004 fishing year, the annual, seasonal, and regional quotas were never fully harvested; therefore there was no ASMFC mandated spiny dogfish closure for states waters.

Most of the states do not have any regulations in place for a spiny dogfish recreational fishery; except Maine limits recreational harvest to 1 dogfish per person per day, Georgia limits anglers to 2 fish and a minimum size of 30 inches, and in Florida, all landings are prohibited.

## **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, New Hampshire, Massachusetts, New York, New Jersey, Maryland, North Carolina, South Carolina, and Florida indicated in their implementation report to the Commission that the state may issue special permits for the biomedical harvest (limiting the harvest to 1,000 spiny dogfish). Maine was the only state to issue permits in the 2003-2004 fishing year for the biomedical harvest of spiny dogfish. The Mount Desert Island Biological Labs took a total of 900 dogfish during June 9 to September 10, 2003; 255 were females, 146 were males, 506 specimens were not sexed. Average lengths ranged from 69 cm to 79 cm and weighed from 1.49 kg to 1.98 kg.

## **CITES Update**

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 2003-2004 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.

### **Maine**

The state of Maine has not implemented trip limits for states waters or a prohibition on finning because state waters were closed for most of the previous fishing year and there has not been any activity in Maine's state waters this year. Maine intends to implement trip limits and a finning prohibition in the coming months. Maine will need to implement a trip limit of 600 pounds for period one (May 1, 2004 to October 31, 2004) and a 300-pound trip limit for period 2 (November 1, 2004 to April 30, 2005).

### **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	
		2003-2004	2004-2005	2003-2004	2004-2005		2003-2004	2004-2005
<b>Maine</b>	8/4/2004	Yes, Approved	Yes, <1% total landings	Yes: 900 fish harvested	Requested	<b>No</b>	<b>No trip limits*</b>	<b>600 lb / 300 lb*</b>
<b>New Hampshire</b>	6/21/2004	No	No	Yes: none harvested	Requested	Yes	ED set up to 7,000 lbs	ED sets up to 7,000 lbs depending on ASMFC quotas
<b>Massachusetts</b>	9/2/2004	No	No	Yes: no permits or harvest	No	Yes	8.15 - 10.26: 7,000 lb Jan 19.04: 300 lbs	600 lb
<b>Rhode Island</b>	6/29/2004	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
<b>Connecticut</b>	7/8/2004	No	No	No	No	Yes	600 lb / 300 lb	600 lb / 300 lb
<b>New York</b>	8/18/2004	No	No	Yes: no permits or harvest	No	Yes	600 lb / 300 lb	600 lb / 300 lb****
<b>New Jersey</b>	8/9/2004	No	No	Yes: no permits or harvest	No	Yes	600 lb / 300 lb	600 lb / 300 lb****
<b>Delaware</b>	6/24/2004	Yes, Approved	Yes, <1% total landings	No	No	Yes	closed	closed
<b>Maryland</b>	6/29/2004	No	No	Yes: no permits or harvest	No	Yes	600 lbs (2/27/04) in state waters for non-federal permit holders	600 lbs.**
<b>Virginia</b>	7/1/2004	No	No	No	No	Yes	4,000 lbs	600 lb / 300 lb
<b>North Carolina</b>	6/14/2004	No	No	Yes: no permits or harvest	No	Yes	Jan 1: 2,000 lbs Jan 19: 4,000 lbs Feb 2: 300 lbs Feb 6: closed	600 lb / 300 lb***
<b>South Carolina</b>	6/9/2004	Yes, Approved	Yes, <1% total landings	Yes: no permits or harvest	No	Yes	600 lb / 300 lb***	600 lb / 300 lb****
<b>Georgia</b>	6/22/2004	Yes, Approved	Yes, <1% total landings	No	No	Yes	2 fish bag limit	2 fish bag limit
<b>Florida</b>	5/17/2004	Yes, Approved	Yes, <1% total landings	Yes: no permits or harvest	No	Yes	fishery prohibited	fishery prohibited

\* In 2003, ME was ready to implement emergency trip limit regulations if directed dogfish harvest occurred in state waters. ME has not yet implemented the 600/300 pounds trip limit for the current fishing year.

\*\* MD will need to issue another public notice in November requiring a new trip limit of 300 lbs for spiny dogfish.

\*\*\* trip limits will be implemented through proclamation authority.

\*\*\*\* Follows the federal trip limits.

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

Year	Coastwide Total Commercial Landings	Maine Commercial Landings	% of Total Landings	Delaware Commercial Landings	% of Total Landings	South Carolina Commercial Landings	% of Total Landings	Georgia Commercial Landings	% of Total Landings	Florida Commercial Landings	% of Total Landings
1992	37,164,817	1,719,400	4.63%	.	0.00%	.	0%	.	0%	.	0%
1993	46,771,518	3,524,780	7.54%	.	0.00%	.	0%	.	0%	.	0%
1994	40,436,880	1,813,347	4.48%	.	0.00%	.	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%	.	0.00%	.	0%	.	0%	.	0%
1997	45,034,113	448,660	1.00%	.	0.00%	.	0%	.	0%	.	0%
1998	47,428,917	273,752	0.58%	1,905	0.00%	.	0%	.	0%	.	0%
1999	33,862,195	34,811	0.10%	414	0.00%	.	0%	.	0%	.	0%
2000	21,208,274	7,661	0.04%	235	0.00%	.	0%	.	0%	.	0%
2001	4,907,481	257	0.01%	13	0.00%	.	0%	.	0%	.	0%
2002	4,273,981	589	0.01%	0	0.00%	.	0%	.	0%	.	0%
2003	2,950,851	0	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**

### ***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.
- 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.