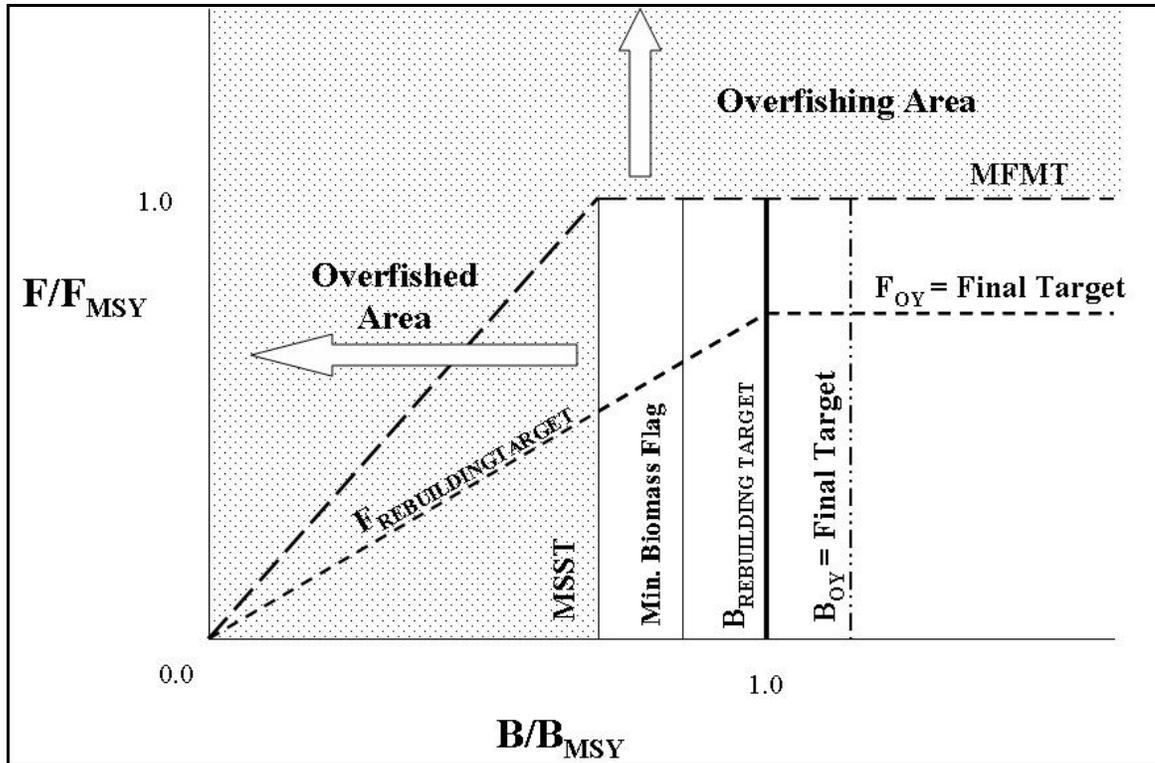


## 2.0 STATUS OF THE STOCKS

The thresholds used to determine the status of Atlantic HMS are presented in Figure 2.1. They are fully described in Chapter 3 of the 1999 Tunas, Swordfish, and Shark FMP (1999 FMP) and in Amendment 1 to the Billfish FMP. These thresholds were carried over in full in the 2006 Consolidated HMS FMP and are based upon the thresholds described in a paper providing the technical guidance for implementing NS 1 of the Magnuson-Stevens Act (Restrepo *et al.*, 1998).



**Figure 2.1 Illustration of the status determination criteria and rebuilding terms**

In summary, a species is considered overfished when the current biomass ( $B$ ) is less than the minimum stock size threshold ( $B < B_{MSST}$ ). The minimum stock size threshold ( $MSST$ ) is determined based on the natural mortality of the stock and the biomass at maximum sustainable yield ( $B_{MSY}$ ). Maximum sustainable yield ( $MSY$ ) is the maximum long-term average yield that can be produced by a stock on a continuing basis. The biomass can be lower than  $B_{MSY}$ , and the stock not be declared overfished as long as the biomass is above  $B_{MSST}$ . It is important to note that other bodies, such as ICCAT, use different thresholds for stock status determination. For instance, the ICCAT Convention defines an overfished status as  $B/B_{MSY} < 1.0$ , not  $B_{year}/B_{MSY} < MSST$ .

Overfishing may be occurring on a species if the current fishing mortality ( $F$ ) is greater than the fishing mortality at  $MSY$  ( $F_{MSY}$ ) ( $F > F_{MSY}$ ). In the case of  $F$ , the maximum fishing mortality threshold is  $F_{MSY}$ . Thus, if  $F$  exceeds  $F_{MSY}$ , the stock is experiencing overfishing.

If a species is declared overfished or overfishing is occurring, action to rebuild the stock and/or prevent further overfishing is required by law. A species is considered rebuilt when  $B$  is greater than  $B_{MSY}$  and  $F$  is less than  $F_{MSY}$ . A species is considered healthy when  $B$  is greater than or equal to the biomass at optimum yield ( $B_{OY}$ ) and  $F$  is less than or equal to the fishing mortality at optimum yield ( $F_{OY}$ ).

In summary, the thresholds used to calculate the status of Atlantic HMS, as described in the 1999 FMP and Amendment 1 to the Billfish FMP, are:

- Maximum Fishing Mortality Threshold (MFMT) =  $F_{limit} = F_{MSY}$ ;
- Overfishing is occurring when  $F_{year} > F_{MSY}$ ;
- Minimum Stock Size Threshold (MSST) =  $B_{limit} = (1-M)B_{MSY}$  when  $M < 0.5$ ; MSST =  $0.5B_{MSY}$  when  $M \geq 0.5$  (for billfish, the specific MSST values are: blue marlin =  $0.9B_{MSY}$ ; white marlin =  $0.85B_{MSY}$ ; west Atlantic sailfish =  $0.75B_{MSY}$ );
- Overfished when  $B_{year}/B_{MSY} < MSST$ ;
- Biomass target during rebuilding =  $B_{MSY}$ ;
- Fishing mortality during rebuilding  $< F_{MSY}$ ;
- Fishing mortality for healthy stocks =  $0.75F_{MSY}$ ;
- Biomass for healthy stocks =  $B_{OY} = \sim 1.25$  to  $1.30B_{MSY}$ ;
- Minimum biomass flag =  $(1-M)B_{OY}$ ; and
- Level of certainty of *at least* 50 percent but depends on species and circumstances.
- For bluefin tuna, spawning stock biomass (SSB) is used as a proxy for biomass
- For sharks, in some cases, spawning stock fecundity (SSF) or spawning stock number (SSN) can be used as a proxy for biomass since biomass does not influence pup production in sharks.

With the exception of many Atlantic sharks stocks, stock assessments for Atlantic HMS are conducted by ICCAT's SCRS. In 2011, the SCRS completed stock assessments for Atlantic yellowfin tuna, south Atlantic albacore, and blue marlin. All SCRS final stock assessment reports can be found at <http://www.iccat.int/en/assess.htm>.

Atlantic shark stock assessments for LCS and small coastal sharks (SCS) are generally completed by the Southeast Data, Assessment, and Review (SEDAR) process. SEDAR assessments for sandbar, blacknose, and dusky sharks were recently completed in September 2011. In some cases, NMFS looks to available resources, including peer reviewed literature, for external assessments that, if deemed appropriate, could be used for domestic management purposes. NMFS followed this process in determining the stock status of scalloped hammerhead sharks based on an assessment for scalloped hammerhead sharks that was completed by Hayes et al. (2009). The results of all these assessments are shown below in Table 2.1.

Table 2.1 summarizes stock assessment information and the current status of Atlantic HMS as of November 2011. In addition, NMFS updates all U.S. fisheries stock statuses each quarter and provides a Status of U.S. Fisheries Report to Congress on an annual basis. The status of the stock reports can be found at:

<http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm>.

**Table 2.1 Stock Assessment Summary Table for Atlantic tunas, swordfish, and marlin. Source: SCRS, 2007; SCRS, 2008; SCRS, 2009a; SCRS, 2009b; SCRS 2010; SCRS 2011; Gibson and Campana, 2005; Cortés *et al.*, 2006; NMFS, 2006; NMFS, 2007; Hayes *et al.*, 2009; SEDAR 2011a, 2011b, 2011c, 2011d).**

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook – From Status of Stocks for U.S. managed species*
<b>West Atlantic Bluefin Tuna</b>	*SSB <sub>09</sub> /SSB <sub>MSY</sub> $\gamma = 1.1$ (0.89-1.35) (low recruitment)	0.86SSB <sub>MSY</sub> (10,941t; low recruitment)	F <sub>06-08</sub> /F <sub>MSY</sub> = 0.73 (0.59-0.91) (low recruitment)	**F <sub>MSY</sub> = 0.16 (0.14-0.18) (low recruitment)	Low recruitment scenario: Not overfished; overfishing is not occurring.
	SSB <sub>09</sub> /SSB <sub>MSY</sub> = 0.15 (0.10-0.22) (high recruitment)	(78,872t; high recruitment)	F <sub>06-08</sub> /F <sub>MSY</sub> = 1.88 (1.49-2.35) (high recruitment)	F <sub>MSY</sub> = 0.06 (0.06-0.07) (high recruitment)	High recruitment scenario: Overfished; overfishing is occurring
SSB <sub>09</sub> /SSB <sub>75</sub> = 0.34					
The SCRS, as stated in the stock assessment, has no strong evidence to favor either scenario over the other and notes that both are reasonable (but not extreme) lower and upper bounds on rebuilding potential.					
<b>Atlantic Bigeye Tuna</b>	B <sub>10</sub> /B <sub>MSY</sub> = 1.01 (0.72-1.34)	0.6B <sub>MSY</sub> (253,578t)	F <sub>09</sub> /F <sub>MSY</sub> = 0.95 (0.65-1.55)	F <sub>MSY</sub> = 0.17	Not overfished (Rebuilding); overfishing not occurring.
<b>Atlantic Yellowfin Tuna</b>	B <sub>10</sub> /B <sub>MSY</sub> = 0.85 (0.61-1.12)	0.5B <sub>MSY</sub> (age 2+)	F <sub>current</sub> /F <sub>MSY</sub> = 0.87 (0.68-1.40)	F <sub>MSY</sub>	Not overfished; overfishing not occurring.
<b>North Atlantic Albacore Tuna</b>	B <sub>07</sub> /B <sub>MSY</sub> = 0.62 (0.45-0.79)	0.7B <sub>MSY</sub> (120,680t; based on B <sub>MSY</sub> ) (40,719t; based on SSB <sub>MSY</sub> )	F <sub>07</sub> /F <sub>MSY</sub> = 1.05 (0.85-1.23)	F <sub>MSY</sub> = 0.17	Overfished; overfishing is occurring.
<b>West Atlantic Skipjack Tuna</b>	B <sub>08</sub> /B <sub>MSY</sub> : most likely > 1	Unknown	F <sub>08</sub> /F <sub>MSY</sub> : most likely < 1	F <sub>MSY</sub>	Unknown
<b>North Atlantic Swordfish</b>	B <sub>09</sub> /B <sub>MSY</sub> = 1.05 (0.94-1.24)	0.8B <sub>MSY</sub> ; (B <sub>MSY</sub> = 61,860t)	F <sub>08</sub> /F <sub>MSY</sub> = 0.76 (0.67-0.96)	F <sub>MSY</sub> = 0.22 (0.14-0.27)	Not overfished; overfishing not occurring
<b>South Atlantic Swordfish</b>	B <sub>09</sub> /B <sub>MSY</sub> = 1.04 (0.82-1.22)	0.8B <sub>MSY</sub>	F <sub>08</sub> /F <sub>MSY</sub> = 0.75 (0.60-1.01)	F <sub>MSY</sub> = 0.31	Unknown

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook – From Status of Stocks for U.S. managed species*
<b>Blue Marlin</b>	$B_{09}/B_{MSY} = 0.67$ (0.53-0.81)	$0.9B_{MSY}$ (22,870 t; based on $SSB_{MSY}$ )	$F_{09}/F_{MSY} = 1.63$ (1.11-2.16)	$F_{MSY} = 0.07$	Overfished; overfishing is occurring
<b>White Marlin</b>	$B_{04} < B_{MSY}$ : yes	$0.85B_{MSY}$ (13,104- 23,619 mt)	$F_{04} > F_{MSY}$ : Possibly	0.07-0.11	Overfished; overfishing is occurring
<b>West Atlantic Sailfish</b>	$B_{07} < B_{MSY}$ : Possibly	$0.78B_{MSY}$ <i>Unknown</i>	$F_{07} > F_{MSY}$ : Possibly	<i>Unknown</i>	Overfished; overfishing is occurring
<b>Longbill Spearfish</b>	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>
<b>Roundscale Spearfish</b>	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>
<b>LCS Complex</b>	<i>Unknown</i>	$(1-M)B_{MSY}$	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>
<b>Sandbar</b>	$SSF_{09}/SSF_{MSY} = 0.51 - 0.72$	$(1-M)B_{MSY}$ (3.9 - 4.2 E+05)	$F_{09}/F_{MSY} = 0.29-2.62$	0.004-0.06	Overfished; overfishing is not occurring
<b>Gulf of Mexico Blacktip</b>	$SSF_{04}/SSF_{MSY} = 2.54-2.56$	$(1-M)B_{MSY}$ (0.99- 1.07E+07)	$F_{04}/F_{MSY} = 0.03-0.04$	0.20	Not overfished; overfishing not occurring
<b>Atlantic Blacktip</b>	<i>Unknown</i>	$(1-M)B_{MSY}$	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>
<b>Dusky Sharks</b>	$SSB_{09}/SSB_{MSY} = 0.41-0.50$	$(1-M)B_{MSY}$	$F_{09}/F_{MSY} = 1.39-4.35$	0.01-0.05	Overfished; overfishing is occurring
<b>Scalloped Hammerhead Sharks</b>	$N_{05}/N_{MSY} = 1.29$	$(1-M)B_{MSY}$	$F_{05}/F_{MSY} = 0.45$	0.11	Overfished; overfishing is occurring
<b>SCS Complex</b>	$N_{05}/N_{MSY} = 1.69$	$(1-M)B_{MSY}$ (2.1E+07)	$F_{05}/F_{MSY} = 0.25$	0.09	Not overfished; overfishing not occurring
<b>Bonnethead Sharks</b>	$SSF_{05}/SSF_{MSY} = 1.13$	$(1-M)B_{MSY}$ (1.4 E+06)	$F_{05}/F_{MSY} = 0.6$	0.31	Not overfished; overfishing not occurring
<b>Atlantic Sharpnose Sharks</b>	$SSF_{05}/SSF_{MSY} = 1.47$	$(1-M)B_{MSY}$ (4.09 E+06)	$F_{05}/F_{MSY} = 0.74$	0.19	Not overfished; overfishing not occurring
<b>Atlantic Blacknose Sharks</b>	$SSF_{09}/SSF_{MSY} = 0.43 - 0.64$	$(1-M)B_{MSY}$ (7.7. E +04 - 2.8 E+05)	$F_{09}/F_{MSY} = 3.26 - 22.53$	0.01-0.15	Overfished; overfishing is occurring
<b>Gulf of Mexico Blacknose Sharks</b>	<i>Unknown</i>	$(1-M)B_{MSY}$	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>
<b>Finetooth Sharks</b>	$N_{05}/N_{MSY} = 1.80$	$(1-M)B_{MSY}$ (2.4E+06)	$F_{05}/F_{MSY} = 0.17$	0.03	Not overfished; overfishing not occurring

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook – From Status of Stocks for U.S. managed species*
Northwest Atlantic Porbeagle Sharks	$B_{08}/B_{MSY} = 0.43 - 0.65$	$(1-M)B_{MSY}$	$F_{08}/F_{MSY} = 0.03 - 0.36$	0.025-0.075	Approaching an overfished status; overfishing is occurring
North Atlantic Blue Sharks	$B_{07}/B_{MSY} = 1.87-2.74$	$(1-M)B_{MSY}$	$F_{07}/F_{MSY} = 0.13-0.17$	0.15	Not overfished; overfishing not occurring
North Atlantic Shortfin Mako Sharks	$B_{07}/B_{MSY} = 0.95-1.65$	$(1-M)B_{MSY}$	$F_{07}/F_{MSY} = 0.48-3.77$	0.007-0.05	Approaching an overfished status; overfishing is occurring

\* Note: The Species Information System (SIS), which informs the Status of the Stocks Report, allows only one status determination per stock. Therefore, a joint distribution was calculated assuming equal plausibility of the high and low recruitment scenarios for Western Atlantic bluefin tuna.  $F_{current}$  refers to the geometric mean of the estimates for 2006-2008 (a proxy for recent F levels; median and 10th percentile-90th percentile shown).  $SSB_{2009}/SSB_{MSY}$ : 0.48 (0.12-1.26);  $F_{current}/F_{MSY}$ : 1.15 (0.63-2.17);  $SSB_{MSY}$ : 38410 (12570-102460);  $F_{MSY}$ : 0.11 (0.06-0.18)

\*\* Where F year refers to the geometric mean of the estimates for 2006-2008 (a proxy for recent F levels).

## 2.1 Stock Assessment Details

Detailed stock assessments for each of the species listed in Table 2.1 can be found in the websites listed below.

### Western Atlantic Bluefin Tuna

Assessed by ICCAT's SCRS in 2010. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2010\\_BFT\\_ASSESS\\_REP\\_ENG.pdf](http://www.iccat.int/Documents/Meetings/Docs/2010_BFT_ASSESS_REP_ENG.pdf)

### Atlantic Bigeye Tuna

Assessed by ICCAT's SCRS in 2010. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2010\\_BET\\_Assessment\\_REP\\_ENG.pdf](http://www.iccat.int/Documents/Meetings/Docs/2010_BET_Assessment_REP_ENG.pdf)

### Atlantic Yellowfin Tuna

Assessed by ICCAT's SCRS in 2011. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2011\\_YFT\\_ASSESS\\_REP.pdf](http://www.iccat.int/Documents/Meetings/Docs/2011_YFT_ASSESS_REP.pdf)

### North Atlantic Albacore Tuna

Assessed by ICCAT's SCRS in 2009. The stock assessment can be found online: <http://www.iccat.int/Documents/SCRS/DetRep/DET-ALB-NA.pdf>

### West Atlantic Skipjack Tuna

Assessed by ICCAT's SCRS in 2008. The stock assessment can be found online: <http://www.iccat.int/Documents/SCRS/DetRep/DET-YFT-SKJ.pdf>

### **North Atlantic Swordfish**

Assessed by ICCAT's SCRS in 2009. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2009\\_SWO\\_ASSESS\\_ENG.pdf](http://www.iccat.int/Documents/Meetings/Docs/2009_SWO_ASSESS_ENG.pdf)

### **South Atlantic Swordfish**

Assessed by ICCAT's SCRS in 2009. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2009\\_SWO\\_ASSESS\\_ENG.pdf](http://www.iccat.int/Documents/Meetings/Docs/2009_SWO_ASSESS_ENG.pdf)

### **Blue Marlin**

Assessed by ICCAT's SCRS in 2011. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2011\\_BUM\\_ASSESS\\_ENG.pdf](http://www.iccat.int/Documents/Meetings/Docs/2011_BUM_ASSESS_ENG.pdf)

### **White Marlin**

Assessed by ICCAT's SCRS in 2006. The stock assessment can be found online: [http://www.iccat.int/Documents/SCRS/DetRep/DET\\_BUM-WHM.pdf](http://www.iccat.int/Documents/SCRS/DetRep/DET_BUM-WHM.pdf)

### **West Atlantic Sailfish**

Assessed by ICCAT's SCRS in 2009. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2009\\_SAI\\_ASSESS\\_ENG.pdf](http://www.iccat.int/Documents/Meetings/Docs/2009_SAI_ASSESS_ENG.pdf)

### **Spearfish**

Spearfish have not been individually assessed by ICCAT's SCRS due to the paucity of data. Some information can be found in the 2001 sailfish stock assessment located online: [http://www.iccat.int/Documents/SCRS/DetRep/DET\\_sai.pdf](http://www.iccat.int/Documents/SCRS/DetRep/DET_sai.pdf)

### **LCS Complex**

Assessed in 2006 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=11](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=11)

### **Sandbar**

Assessed in 2010/2011 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=21](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21)

### **Gulf of Mexico Blacktip**

Assessed in 2006 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=11](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=11)

### **Atlantic Blacktip**

Assessed in 2006 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=11](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=11)

### **Dusky Sharks**

Assessed in 2010/2011 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=21](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21)

### **SCS Complex**

Assessed in 2007 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=13](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=13)

### **Bonnethead Sharks**

Assessed in 2007 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=13](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=13)

### **Atlantic Sharpnose Sharks**

Assessed in 2007 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=13](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=13)

### **Blacknose Sharks (Atlantic and Gulf of Mexico)**

Assessed in 2010/2011 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=21](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21)

### **Finetooth Sharks**

Assessed in 2007 through the SEDAR process. The stock assessment can be found online: [http://www.sefsc.noaa.gov/sedar/Sedar\\_Workshops.jsp?WorkshopNum=13](http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=13)

### **Northwest Atlantic Porbeagle Sharks**

Assessed by ICCAT's SCRS in 2009. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2009\\_POR\\_ASSESS\\_ENG.pdf](http://www.iccat.int/Documents/Meetings/Docs/2009_POR_ASSESS_ENG.pdf)

### **North Atlantic Blue Sharks**

Assessed by ICCAT's SCRS in 2008. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2008\\_SHK\\_Report.pdf](http://www.iccat.int/Documents/Meetings/Docs/2008_SHK_Report.pdf)

### **North Atlantic Shortfin Mako Sharks**

Assessed by ICCAT's SCRS in 2008. The stock assessment can be found online: [http://www.iccat.int/Documents/Meetings/Docs/2008\\_SHK\\_Report.pdf](http://www.iccat.int/Documents/Meetings/Docs/2008_SHK_Report.pdf)

### **Scalloped Hammerhead Sharks**

Assessed in a peer reviewed paper: Hayes, C.G., Y. Jiao, and E. Cortes. 2009. Stock Assessment of Scalloped Hammerheads in the Western North Atlantic Ocean and Gulf of Mexico. North American Journal of Fisheries Management 29:1406-1417.

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