2. 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).

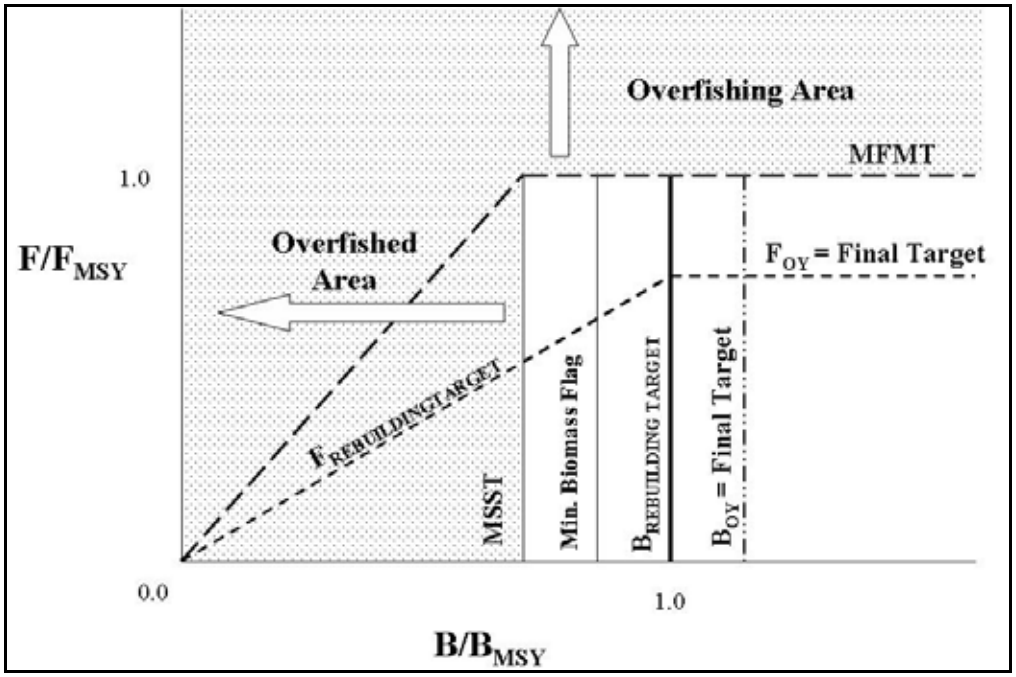

Figure 2.1 Illustration of the Status Determination Criteria and Rebuilding Terms

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) = $B_{limit} = (1\text{-}M)B_{MSY}$ when $M < 0.5$; MSST = $0.5B_{MSY}$ when $M >= 0.5$ (for billfish, the specific MSST values are: blue marlin = $0.9B_{MSY}$; white marlin = $0.85B_{MSY}$; west Atlantic sailfish = $0.75B_{MSY}$); M = natural mortality. In many cases an average M across age classes or sensitivity runs from a stock assessment model is used to calculate MSST. It is important to note that other fishery management organizations may apply different thresholds for stock status determination. For example, ICCAT's SCRS defines an overfished status as B/BMSY<1.0, rather than Byear/BMSY < MSST, which is the standard NMFS applies in domestic fishery management actions.
- 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} = ~1.25 to $1.30B_{MSY}$;
- Minimum biomass flag = $(1\text{-}M)B_{OY}$; and
- Level of certainty of *at least* 50 percent but depends on species and circumstances.
- For some stocks (e.g. bluefin tuna, albacore), spawning stock biomass (SSB) is used as a proxy for biomass
- For sharks, in some cases, spawning stock fecundity (SSF) or number (N) can be used as a proxy for biomass since biomass does not influence pup production in sharks. SSF is the sum of the number mature sharks at age multiplied by pup-production at age.

With the exception of many Atlantic sharks stocks, stock assessments for Atlantic HMS are conducted by ICCAT's SCRS. In 2013, the SCRS completed stock assessments for North Atlantic swordfish, South Atlantic swordfish, and North Atlantic albacore tuna. All SCRS final stock assessment reports can be found at http://www.iccat.int/en/assess.htm.

Atlantic shark stock assessments for large coastal sharks and small coastal sharks are generally completed by the Southeast Data, Assessment, and Review (SEDAR) process. SEDAR assessments for bonnethead and sharpnose sharks were conducted in 2013. 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 2013. 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 are available at: http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm.

Table 2.1 Stock Assessment Summary Table for Atlantic HMS

Species	Current Relative Biomass Level	B_{MSY}	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook – From Status of Stocks for U.S.-Managed Species	Years to Rebuild	Rebuilding Start Date (Rebuilding End Date)
West Atlantic bluefin tuna	SSB_{11}/SSB_{MSY}* = 1.4 (1.14-1.72) (low recruitment) SSB_{11}/SSB_{MSY}* = 0.19 (0.13-0.29) (high recruitment)	SSB_{MSY} = 12,943 mt (low recruitment; 12,717-13,268 mt) SSB_{MSY} = 93,621 mt (high recruitment; 77,288-116,679 mt)	0.86 SSB_{MSY} (11,131 mt; low recruitment) (80,514 mt; high recruitment)	F_{08-10}/F_{MSY}**= 0.61 (0.49-0.74) (low recruitment) F_{08-10}/F_{MSY}**= 1.57 (1.24-1.95) (high recruitment)	F_{MSY} = 0.17 (0.14-0.19) (low recruitment) F_{MSY} = 0.064 (0.056-0.074) (high recruitment)	*Low recruitment scenario: Not overfished; overfishing is not occurring. *High recruitment scenario: Overfished; overfishing is occurring	20	5/1/1999 (2019)
Atlantic bigeye tuna	B_{09}/B_{MSY} = 1.01 (0.72-1.34)	422,630 mt	0.6 B_{MSY} (253,578 mt)	F_{09}/F_{MSY} = 0.95 (0.65-1.55)	F_{MSY} =0.17	Not overfished (Rebuilding); overfishing not occurring.	Not available††	1/1/1999
Atlantic yellowfin tuna	B_{10}/B_{MSY} = 0.85 (0.61-1.12)	*Unknown*	0.5 B_{MSY} (age 2+)	$F_{current}/F_{MSY}$= 0.87 (0.68-1.40)	F_{MSY}	Not overfished; overfishing not occurring.		
North Atlantic albacore tuna	$SSB_{current}/SSB_{MSY}$ =0.94 (0.74-1.14)	SSB_{MSY}=81,110 mt	0.7 B_{MSY} (56,777 mt; based on SSB_{MSY})	$F_{current}/F_{MSY}$ = 0.72 (0.55-0.89)	F_{MSY} = 0.1486	Overfished; overfishing not occurring.	10	1/1/2010 (2020)
West Atlantic skipjack tuna	B_{08}/B_{MSY}: most likely>1	*Unknown*	*Unknown*	F_{08}/F_{MSY}: most likely<1	F_{MSY}	*Unknown*		
North Atlantic swordfish	B_{11}/B_{MSY} = 1.14 (1.05-1.24)	65,060 mt	0.8 B_{MSY}; (52,048 mt)	F_{11}/F_{MSY} = 0.82 (0.73-0.91)	F_{MSY} = 0.21 (0.17-0.26)	Not overfished; overfishing not occurring		

Species	Current Relative Biomass Level	B_{MSY}	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook – From Status of Stocks for U.S.-Managed Species	Years to Rebuild	Rebuilding Start Date (Rebuilding End Date)
South Atlantic swordfish	B_{11}/B_{MSY} = *Unknown but likely above 1*	*Unknown*	*Unknown*	F_{11}/F_{MSY} = *Unknown but likely above 1*	*Unknown*	Not overfished; overfishing not occurring		
Blue marlin	B_{09}/B_{MSY} = 0.67 (0.53-0.81)	25,411 mt (SSB_{MSY})	0.9 B_{MSY} (22,870 mt; based on SSB_{MSY})	F_{09}/F_{MSY} = 1.63 (1.11-2.16)	F_{MSY}= 0.07	Overfished; overfishing is occurring	Not available††	6/1/2001
White marlin (and roundscale spearfish)	B_{2010}/B_{MSY} = 0.5 (0.42-0.60)	29,240 mt (27,260-30,720 mt)	0.85 B_{MSY} (23,171-26,112 mt)	F_{2010}/F_{MSY} = 0.99 (0.75-1.27; low productivity) F_{2010}/F_{MSY} = 0.72 (0.51-0.93; high productivity)	F_{MSY} = 0.03 (0.027-0.035)	Overfished; overfishing may not be occurring	Not available††	6/1/2001
West Atlantic sailfish	$B_{07}<B_{MSY}$: Possibly	*Unknown*	0.78 B_{MSY} *Unknown*	$F_{07}>F_{MSY}$: Possibly	*Unknown*	Overfished; overfishing is occurring	Not available††	1/1/1999
Longbill spearfish	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*		
Large coastal shark complex	*Unknown*	*Unknown*	(1-M) B_{MSY}	*Unknown*	*Unknown*	*Unknown*		
Sandbar	SSF_{09}/SSF_{MSY} = 0.51 – 0.72	SSF_{MSY} = 349,330-1,377,800 (numbers of sharks)	301,821 – 1,190,419 (based on SSF_{MSY})	F_{09}/F_{MSY} = 0.29-2.62	0.004-0.06	Overfished; overfishing is not occurring	66	1/1/2005 (2070)
Gulf of Mexico blacktip	SSF_{2010}/SSF_{MSY} = 2.00-2.66	SSF_{MSY} = 1,570,000 - 6,440,000 (numbers of sharks)	1,327,697 - 5,446,093 (1-M)*SSF_{MSY}	F_{2010}/F_{MSY} = 0.05–0.27	0.021-0.163	Not overfished; overfishing not occurring		
Atlantic blacktip	*Unknown*	*Unknown*	(1-M) B_{MSY}	*Unknown*	*Unknown*	*Unknown*		
Dusky sharks	SSB_{09}/SSB_{MSY} = 0.41-0.50	*Unknown*	(1-M) B_{MSY}	F_{09}/F_{MSY} = 1.39-4.35	0.01-0.05	Overfished; overfishing is occurring	100	7/24/2008 (2108)

Species	Current Relative Biomass Level	B_{MSY}	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook – From Status of Stocks for U.S.-Managed Species	Years to Rebuild	Rebuilding Start Date (Rebuilding End Date)
Scalloped hammerhead sharks	N_{05}/N_{MSY} =0.45	N_{MSY} = 62,000 (numbers of sharks)	(1-M) B_{MSY}	F_{05}/F_{MSY} =1.29	0.11	Overfished; overfishing is occurring	10	7/3/2013 (2023)
Small coastal shark complex	N_{05}/N_{MSY} = 1.69	N_{MSY} = 30,000,000 (numbers of sharks)	21,000,000 (based on N_{MSY})	F_{05}/F_{MSY} = 0.25	0.09	Not overfished; overfishing not occurring		
Bonnethead sharks‡	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*		
Atlantic sharpnose sharks‡	SSF_{2011}/SSF_{MSY} =0.53 – 3.75	SSF_{MSY} = 4,860,000 – 165,000,000 (numbers of sharks)	3,732,480 – 126,720,000 (1-M) SSF_{MSY}	F_{2011}/F_{MSY} = 0.03 – 1.06	0.18 – 0.43	Not overfished; overfishing not occurring		
Atlantic blacknose sharks	SSF_{09}/SSF_{MSY} = 0.43 – 0.64	SSF_{MSY} = 77,577-288,360 (numbers of sharks)	62,294-231,553 (based on SSF_{MSY})	F_{09}/F_{MSY} = 3.26 – 22.53	0.01-0.15	Overfished; overfishing is occurring	30	7/3/2013 (2043)
Gulf of Mexico blacknose sharks	*Unknown*	*Unknown*	(1-M) B_{MSY}	*Unknown*	*Unknown*	*Unknown*		
Finetooth sharks	N_{05}/N_{MSY} = 1.80	N_{MSY} = 3,200,000 (numbers of sharks)	2,400,000 (based on N_{MSY})	F_{05}/F_{MSY} = 0.17	0.03	Not overfished; overfishing not occurring		
Northwest Atlantic porbeagle sharks	B_{08}/B_{MSY} = 0.43 – 0.65	29,382-40,676 mt	(1-M) B_{MSY}	F_{08}/F_{MSY} = 0.03 – 0.36	0.025-0.075	Overfished; overfishing not occurring	100	7/24/2008 (2108)
North Atlantic blue sharks	B_{07}/B_{MSY} = 1.87 - 2.74	*Unknown*	(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_{2010}/B_{MSY} = 1.15 - 2.04	183,612 mt - 863,655 mt†	(1-M) B_{MSY}	F_{2010}/F_{MSY} = 0.16-0.92	0.029-0.104†	Not overfished; overfishing not occurring		
Pelagic sharks	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*		

*Future stock productivity is based upon two hypotheses about future recruitment: a “high recruitment scenario” in which future recruitment has the potential to achieve levels that occurred in the early 1970s and a “low recruitment scenario” in which future recruitment is expected to remain near present levels. 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. **Where F year refers to the geometric mean of the estimates for 2008-2010 (a proxy for recent F levels). †Only the BSP model provided BMSY values. The BMSY range encompasses the16 scenarios run of the BSP model. Both the BSP and catch-free model estimated FMSY. The FMSY range encompasses the lowest estimate of the16 scenarios run of the BSP model and the highest estimate of the 10 scenarios run for the catch-free model. ††There is insufficient information to estimate how many years it will take this stock to rebuild. ‡ The results indicated here are preliminary and are based on the assessment conducted in 2013 and delivered, with a peer review, to the agency in November 2013. At the time of writing this document, NMFS was reviewing the results of that assessment and its review and had not yet made any determination on whether to accept the assessment.

Sources: SCRS, 2007, 2008, 2009a, 2009b, 2010, 2011, 2012a, 2012b, 2013; Gibson and Campana, 2005; Cortés et al., 2006; NMFS, 2006; NMFS, 2007; Hayes et al., 2009; SEDAR 2011a, 2011b, 2011c, 2011d, 2013.

2.1 Stock Assessment Details

The 2012 SCRS report (i.e., the summary report) is available online at: http://www.iccat.int/Documents/Meetings/SCRS2012/2012_SCRS_REP_EN.pdf

Detailed stock assessments for the species in Table 2.1 are available at these websites:

Western Atlantic Bluefin Tuna

Assessed by ICCAT's SCRS in 2012:
http://www.iccat.int/Documents/Meetings/Docs/2012_BFT_ASSESS.pdf

Atlantic Bigeye Tuna

Assessed by ICCAT's SCRS in 2010:
http://www.iccat.int/Documents/Meetings/Docs/2010_BET_Assessment_REP_ENG.pdf

Atlantic Yellowfin Tuna

Assessed by ICCAT's SCRS in 2011:
http://www.iccat.int/Documents/Meetings/Docs/2011_YFT_ASSESS_REP.pdf

North Atlantic Albacore Tuna

Assessed by ICCAT's SCRS in 2013:
http://www.iccat.int/Documents/Meetings/Docs/2013_ALB_ASSESS_REP_ENG.pdf

West Atlantic Skipjack Tuna

Assessed by ICCAT's SCRS in 2008:
http://www.iccat.int/Documents/SCRS/DetRep/DET-YFT-SKJ.pdf

North Atlantic Swordfish

Assessed by ICCAT's SCRS in 2013:
http://www.iccat.int/Documents/Meetings/Docs/2013_SWO_ASSESS_REP_ENG.pdf

South Atlantic Swordfish

Assessed by ICCAT's SCRS in 2013:
http://www.iccat.int/Documents/Meetings/Docs/2013_SWO_ASSESS_REP_ENG.pdf

Blue Marlin

Assessed by ICCAT's SCRS in 2011:
http://www.iccat.int/Documents/Meetings/Docs/2011_BUM_ASSESS_ENG.pdf

White Marlin and Roundscale Spearfish

Assessed by ICCAT's SCRS in 2012:
http://www.iccat.int/Documents/Meetings/Docs/2012_WHM_ASSESS_ENG.pdf

West Atlantic Sailfish

Assessed by ICCAT's SCRS in 2009:
http://www.iccat.int/Documents/Meetings/Docs/2009_SAI_ASSESS_ENG.pdf

Longbill Spearfish

Longbill 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:
http://www.iccat.int/Documents/SCRS/DetRep/DET_sai.pdf

Large Coastal Shark (LCS) Complex

Assessed in 2006 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=11

Sandbar Sharks

Assessed in 2010/2011 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21

Gulf of Mexico Blacktip Sharks

Assessed in 2012 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=29

Atlantic Blacktip Sharks

Assessed in 2006 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=11

Dusky Sharks

Assessed in 2010/2011 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21

Small Coastal Shark (SCS) Complex

Assessed in 2007 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=13

Bonnethead Sharks

Assessed in 2013 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=34

Atlantic Sharpnose Sharks

Assessed in 2013 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=34

Blacknose Sharks (Atlantic and Gulf of Mexico)

Assessed in 2010/2011 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21

Finetooth Sharks

Assessed in 2007 through the SEDAR process:
http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=13

Northwest Atlantic Porbeagle Sharks

Assessed by ICCAT's SCRS in 2009:
http://www.iccat.int/Documents/Meetings/Docs/2009_POR_ASSESS_ENG.pdf

North Atlantic Blue Sharks

Assessed by ICCAT's SCRS in 2008:
http://www.iccat.int/Documents/Meetings/Docs/2008_SHK_Report.pdf

North Atlantic Shortfin Mako Sharks

Assessed by ICCAT's SCRS in 2008:
http://www.iccat.int/Documents/Meetings/Docs/2012_SHK_ASS_ENG.pdf

Scalloped Hammerhead Sharks

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