
Atlantic Shark Fisheries



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Unit 6

INTRODUCTION

The first Fisheries Management Plan (FMP) for sharks was developed by the National Marine Fisheries Service (NMFS) for the Secretary of Commerce and implemented in 1993 (NMFS, 1993). As new information on the fisheries and on shark biology became available, four shark evaluation workshops were convened in 1994, 1996, 1998, and 2002. As a result, regulation of the fishery was moved under a new Secretarial FMP for Atlantic Tunas, Swordfish, and Sharks published in 1999 (NMFS, 1999a). This FMP was amended in 2003 (NMFS, 2003) to reflect the findings in the stock assessments for small and large coastal sharks conducted in 2002 (Cortés, 2002a; Cortés et al., 2002). Annual shark evaluation reports with updates of shark landings and catches, catch rates, and average sizes were produced in 1999, 2000, 2003, and 2005 (Cortés, 1999, 2000, 2003, 2005).

The latest assessment for large coastal sharks (LCS), completed in 2006, followed the guidelines set forth by the SouthEast Data, Assessment, and Review (SEDAR) process. Although SEDAR is a joint process for stock assessment and review by the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils, NMFS, the Southeast Fisheries Science Center (SEFSC), the Southeast Regional Office (SERO), and the Atlantic and Gulf States Marine Fisheries Commissions, it was felt that this process would work for the large and small coastal shark management groups as well. SEDAR is organized around three workshops: data, assessment, and review. Input data are compiled during the data workshop, population models are developed during the assessment workshop, and an independent peer review of the data and assessment models is provided during the review workshop. SEDAR documents include a data report produced by the data workshop, a stock

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Photo above:
Blue shark.



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SPECIES AND STATUS

Currently, the 2006 FMP divides Atlantic shark species into four management groups: large coastal sharks, small coastal sharks, pelagic sharks, and prohibited species (Table 6-1). Following declines in the abundance of large coastal sharks, new management measures were introduced in 1997. Notably, the commercial quota for the large coastal complex was reduced from 2,570 to 1,285 metric tons (t) dressed weight (dw). A new quota for small coastal sharks was also established at 1,760 t dw. The commercial quota for pelagic sharks was reduced from 1,560 to 580 t dw. Additionally, the recreational bag limit for all Atlantic sharks was reduced to two sharks per vessel per trip, with an additional allowance of two Atlantic sharpnose sharks per person per trip. For all fisheries, possession of five species was prohibited (i.e. whale, basking, sand tiger, bigeye sand tiger, and white sharks).

Based in part on the results of the third shark evaluation workshop (SEFSC, 1998), the 1999 FMP proposed new management measures to further restrict commercial quotas and recreational bag limits. Regulations divided shark species into large coastal species, small coastal species, pelagic species, and deep water and other species, and set total allowable catches (TAC's) for large coastal, small coastal, and pelagic species. New manage-

Bull shark.

assessment report and summary produced by the assessment workshop, a review panel report evaluating the assessment (drafted during the review panel workshop), and collected stock assessment documents considered in the SEDAR process. In October 2006, NMFS announced the availability of the Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (NMFS, 2006a). This new consolidated FMP replaced the former Tunas, Swordfish, and Sharks FMP and currently manages 39 species of sharks.

Table 6-1

Current shark management groups under the consolidated Atlantic Highly Migratory Species FMP (NMFS, 2006).

Large Coastal Sharks	Small Coastal Sharks	Pelagic Sharks	Prohibited Sharks
Blacktip shark	Atlantic sharpnose shark	Blue shark	Atlantic angel shark
Bull shark	Blacknose shark	Oceanic whitetip shark	Basking shark
Great hammerhead	Bonnethead	Porbeagle	Bigeye sand tiger
Lemon shark	Finetooth shark	Shortfin mako	Bigeye sixgill shark
Nurse shark		Thresher shark	Bigeye thresher
Sandbar shark			Bignose shark
Scalloped hammerhead			Caribbean sharpnose shark
Silky shark			Dusky shark
Smooth hammerhead			Galapagos shark
Spinner shark			Longfin mako
Tiger shark			Narrowtooth shark
			Night shark
			Reef shark
			Sand tiger
			Sevengill shark
			Sixgill shark
			Smalltail shark
			Whale shark
			White shark

ment actions included 1) a reduction of the annual commercial quota for large coastal sharks from 1,285 to 816 t dw, apportioned between ridgeback¹ (620 t dw) and non-ridgeback (196 t dw) sharks; 2) a reduction of the annual commercial quota for small coastal sharks from 1,760 to 359 t dw (i.e. 10% higher than the 1997 landings); 3) an increase of the annual commercial quota for pelagic sharks from 580 to 853 t dw, apportioned between porbeagle (92 t dw), blue sharks (273 t dw), and other pelagic sharks (488 t dw), reducing the pelagic shark quota by any overharvest in the blue shark quota; 4) establishment of a minimum size of 137 cm fork length for ridgeback sharks; 5) a reduction of the recreational bag limit from two sharks to one shark per vessel per trip (with a minimum size of 137 cm fork length for all sharks) and an allowance of one Atlantic sharpnose shark per person per trip; 6) a prohibition on possession of 19 species (Atlantic angel, basking, bigeye sand tiger, bigeye sixgill, bigeye thresher, bignose, Caribbean sharpnose, dusky, Galapagos, longfin mako, narrowtooth, night, reef, sand tiger, sevengill, sixgill, smalltail, whale, and white sharks); 7) a requirement to count all sources of mortality, including dead discards and all landings in state waters, against the quota; and 8) a prohibition on finning of all shark species.

Due to litigation, only measures 3, 5, 6, and 8 were initially implemented. Based on stock assessments of large and small coastal sharks in 2002, NMFS classified the large coastal group as overfished, whereas the small coastal group was deemed to be fully utilized. The status of the pelagic group was listed as unknown for lack of adequate data to conduct stock assessments. Owing to its overfished status, the large coastal group has since received more intense attention than the other two management groups. As a result of the 2002 stock assessments and numerous comments received, NMFS decided that many of the management measures in

¹A number of species in the large coastal shark management unit are characterized by a mid-dorsal ridge that is easily identified even after the fish has been gutted and finned. This mid-dorsal ridge is useful as diagnostic characteristic for management and enforcement purposes. Ridgeback sharks include sandbar, dusky, silky, night, and bignose sharks. Non-ridgeback sharks include blacktip, spinner, bull, tiger, nurse, lemon, narrowtooth, and hammerhead sharks.



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Atlantic sharpnose shark fitted with an external acoustic transmitter. NMFS scientists use these transmitters to monitor shark movement patterns.

the 1999 FMP should be reexamined. In November 2003, NMFS released the Final Amendment I to the 1999 FMP (NMFS, 2003), which contained several management changes. Most notably, the ridgeback and non-ridgeback classification of the large coastal shark group was re-aggregated, with the commercial quotas for large coastal sharks being set at 1,017 t dw, small coastal sharks at 454 t dw, and pelagic sharks at 853 t dw, apportioned between porbeagle (92 t dw), blue sharks (273 t dw), and other pelagic sharks (488 t dw). Additional actions included 1) implementation of three fishing seasons per year instead of two; 2) a requirement that state landings after Federal closures be counted against the Federal quota; 3) adjustment to regional quotas; and 4) a time/area closure from January through July off North Carolina. The list of 19 prohibited species and minimum size of 137 cm fork length for the recreational fishery were maintained. The 2006 Consolidated HMS FMP implemented additional management measures, including 1) mandatory shark identification workshops for Federally permitted shark dealers; and 2) a requirement that the second dorsal and anal fins must remain on all sharks through landing. Both measures are designed to improve data collection at the species level.

Determining the quantity of sharks landed or discarded in terms of weight is difficult for several reasons. First, weight estimates for recreational catches are highly variable because a relatively small number of animals are measured and weighed by the biologists collecting recreational data. Second, a significant amount of the commercial catch is only reported under the general category of “sharks,” and species identification either cannot be or is not reported. As a result, these landings are assigned to one of the management groups analytically for

Table 6-2
Productivity in numbers or metric tons (t) and status of Atlantic shark fisheries resources.

Species/stock	Recent average yield (RAY) ¹	Current yield (CY) ²	Sustainable yield (MSY) ³	Stock level relative to B_{MSY}	Harvest rate	Stock status
Large coastal sharks ⁴	273	1,017	Unknown	Unknown	Unknown	Unknown
Blacktip shark (Gulf of Mexico)	127	NA	12,100	Above	Not overfishing	Not overfished
Blacktip shark (Atlantic)	31	NA	Unknown	Unknown	Unknown	Unknown
Sandbar shark	60	NA	202	Below	Overfishing	Overfished
Small coastal sharks ⁵	998	454	2,623	Above	Not overfishing	Not overfished
Atlantic sharpnose shark	442	NA	1,270	Above	Not overfishing	Not overfished
Blacknose shark	84	NA	89	Below	Overfishing	Overfished
Bonnethead	310	NA	569	Above	Not overfishing	Not overfished
Finetooth shark	14	NA	96	Above	Not overfishing	Not overfished
Pelagic sharks ⁶	26	853	Unknown	Unknown	Unknown	Unknown
Blue shark ⁷	3	273	Unknown	Above	Unknown	Unknown
Shortfin mako ⁷	12	488	Unknown	Unknown	Unknown	Unknown
Prohibited shark species ⁸	Unknown	0	Unknown	Unknown		
Dusky shark	19	0	≤23	Below	Overfishing	Overfished
Total ⁹	1,297	2,324	Unknown			

¹2002–04 average for large coastal sharks (LCS); 2003–05 average for small coastal sharks (SCS); 2004–06 average for pelagic sharks; 2001–03 average for dusky sharks. Expressed in thousands of fish, except for dusky sharks, which are in tons dressed weight (t dw). Shark totals are not included in the summary tables of the National Overview.

²Total allowable catches for sharks include quotas and discards. Dead discards and state landings after Federal closures are subtracted from quotas when adjusting the commercial quota for sharks to account adequately for all sources of fishing mortality. Expressed as t dw.

³MSY values are in t dw for LCS and dusky sharks; in thousands of fish for SCS.

⁴Separate stock assessments were conducted for sandbar and blacktip sharks (Gulf of Mexico and Atlantic), but the management unit is large coastal sharks and there are no individual quotas set for these species.

⁵Separate stock assessments were conducted for Atlantic sharpnose, bonnethead, blacknose, and finetooth sharks, but the management unit is small coastal sharks and there are no individual quotas set for these species.

⁶CY is apportioned between porbeagle (92 t dw), blue sharks (273 t dw), and other pelagic sharks (488 t dw).

⁷Separate stock assessments were conducted by ICCAT for blue shark and shortfin mako in the North Atlantic Ocean. Values reported refer to the U.S. portion.

⁸Species that cannot be kept commercially or recreationally.

⁹Total value for RAY does not include any of the prohibited shark species.

statistical purposes. Third, discard estimates are typically reported as numbers of fish. Because of these uncertainties, another set of estimated mean weights per fish for recreational catches or another set of assumptions regarding the allocation of the unidentified commercial shark landings is likely to produce different total weights for the recent average yield (RAY). To help minimize some of the effects of these factors, the landings and catch data used in the large coastal shark stock assessments are typically compiled in numbers of animals instead of weight (Table 6-2).

Large Coastal Sharks

The U.S. Atlantic shark fishery is primarily a southeastern fishery extending from Virginia to

Texas, although sharks are also landed in the states north of Virginia. Figure 6-1 shows the numbers that were reported landed and discarded for sharks in the large coastal management group from 1981 to 2004. Commercial landings collected under the NMFS cooperative statistics program include the period of 1981–2004. Landings are typically reported in dressed weight, and an average weight is used to convert to numbers. Data for average weights are more reliable for 1994–2004 because they were based on an observer program of the directed shark bottom longline fishery. Similarly, commercial landings estimates are more reliable starting in 1995 because of improved species-specific reporting. Unreported commercial landings from 1986 to 1991 are also included. Recreational catches in numbers also span the

period of 1981–2004 and include estimates from the NMFS Marine Recreational Fishery Statistics Survey (MRFSS), headboat survey, and the Texas Parks and Wildlife recreational creel survey. Discards include estimates from the pelagic longline fishery for 1981–2004, the shark bottom longline fishery for 1993–2004, and the menhaden fishery in the Gulf of Mexico for 1994–2004.

Sandbar and blacktip sharks are the two most important species in the large coastal shark (LCS) fishery (Figure 6-1). An assessment of these two species was conducted at the 1998 and 2002 Shark Evaluation Workshops (SEFSC, 1998) and at the 2006 LCS SEDAR (NMFS, 2006b). At the LCS SEDAR it was determined that blacktip sharks in the Gulf of Mexico and the western Atlantic Ocean comprise two separate stocks, based on genetic evidence. As such, two assessments were conducted for that species: blacktip sharks—Gulf of Mexico and blacktip sharks—western Atlantic Ocean. The catch series available for sandbar and blacktip sharks spanned the period from 1981 to 2004, including commercial landings, recreational catches, catches from artisanal fisheries in Mexico, and unreported commercial landings (for 1986–1991). Discards included estimates from the menhaden fishery for 1981–2004.

The report of the Second Shark Evaluation workshop (SEFSC, 1996) concluded that catch rates of many shark species and species groups declined by about 50–75% from the early 1970's to the mid 1980's, but that the rapid rate of decline in catch rates that characterized the stocks in the early 1980's had slowed significantly in the 1990's. Partly based on results from the 1996 workshop, a 50% reduction in catches of large coastal species (i.e. relative to 1995) was targeted. This reduction was to be achieved by a 50% reduction in the commercial quota for the large coastal management group and a reduction of the recreational bag limit to two fish per boat per day (from the previously established recreational bag limit of four fish). During the third Shark Evaluation Workshop (SEFSC, 1998), preliminary data for 1997 were presented and reviewed, and the indications were that commercial catches, in numbers of animals, were reduced from 1995 by more than 50%, but recreational catches were reduced by only 12%. The most recent catch rate data analyzed at that

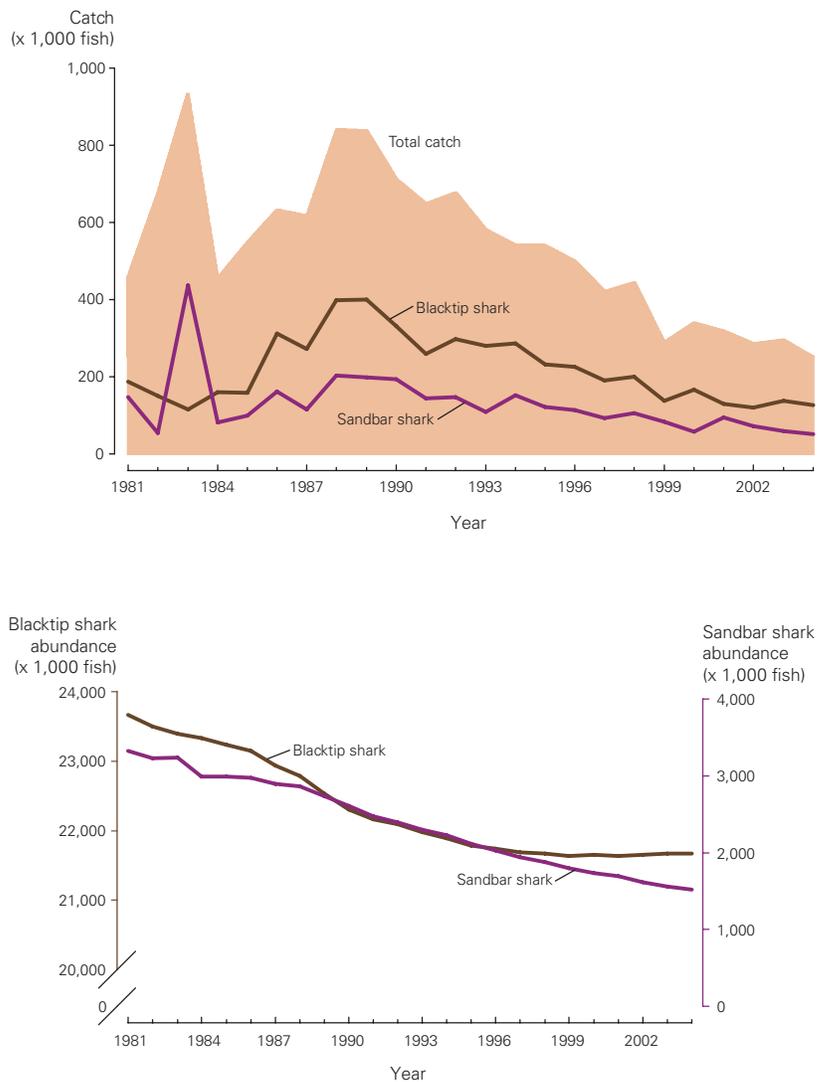


Figure 6-1

Catches (above) of large coastal sharks and estimated stock abundance (below) of blacktip shark (Gulf of Mexico stock) and sandbar shark, 1981–2004.

time continued to show inconsistent trends, many of which were not statistically significant. These findings were not totally unexpected given that the expected rates of change in shark abundance are small and the measures of stock abundance used are uncertain, meaning that longer time series are needed to detect significant changes in stock size following implementation of the most recent management measures.

Biomass dynamic model analyses that utilized catch, catch rate, and demographic data were integrated within a Bayesian statistical estimation approach during the Third Shark Evaluation workshop (SEFSC, 1998). The main findings of these analyses were that 1) for the large coastal



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Hammerhead shark on the deck of a NOAA Fishery Survey Vessel.

complex, the 1998 stock size was estimated to be between 30 and 36% of the stock size producing maximum sustainable yield (MSY); 2) for sandbar shark, the 1998 stock size was between 58 and 70% of MSY levels; and 3) for blacktip shark, the 1998 stock size was between 44 and 50% of MSY levels. A sensitivity analysis undertaken following peer review (Cortés, 2002a) showed that results for blacktip shark were particularly sensitive to some of the estimation techniques used. The 2002 stock assessment (Cortés et al., 2002) conducted for the LCS complex showed that the status of the resource had improved since 1998, but continued to show that overfishing was likely to be occurring and the resource was likely to be overfished. It also indicated that on average a reduction in catch of at least 50% of the 2000 catch level was likely required for the biomass to reach MSY in 10 years.

Multiple models and estimation techniques were used to assess the status of sandbar and blacktip sharks during the 2002 assessment (Cortés et al., 2002). Results indicated on average that the status of sandbar sharks had also improved since 1998 and that 2002 biomass could be near or somewhat above MSY, but overfishing could still be occurring. Most results for blacktip shark indicated that the stock was rebuilt and that 2002 removal levels were sustainable.

For the 2006 assessment, three large coastal shark groupings were assessed: 1) LCS complex in-

cluding all 22 species originally in the management group (1993 FMP); 2) LCS excluding all prohibited species (11 species; current LCS management group); and 3) LCS excluding all prohibited species as well as sandbar and blacktip sharks (nine species). For all assessments prior to 2006, the large coastal aggregate included the species of prohibited sharks that were formally considered part of the LCS management group.

The Review Panel for the 2006 LCS SEDAR determined that, overall, the data utilized in the assessment of the LCS complex were the best available to the analysts at the time, and the assessment of the status of the complex was the best possible given the data available (NMFS, 2006b). However, the assessment performed inadequately at representing the status of the LCS complex (in any of the formulations: 22, 11, or 9 species) because of the potential for conflicting or mismatching information from various species components in the catch and abundance index data. Therefore, it was unclear to the Panel what exactly the results of the assessment represented, making it impossible to support use of the results for management of the complex. Further, the Panel stressed that results of previous assessments that used the same approach and similar data (perhaps of lesser quality) would attract the same or even stronger negative criticisms. They concluded that continued assessment of the LCS complex with the current approach and data was unlikely to produce effective management advice and was not recommended (although for continuity, output from such an approach should be made available when the complex is next subject to review). Instead, research, data analysis, and model development to permit species-specific assessments for the main components (except sandbar and blacktip, which are already assessed separately) of the complex (both permitted and prohibited species) was deemed a priority.

For sandbar sharks, the SEDAR Review Panel determined that the population model and resulting population estimates were the best possible given the data available (NMFS, 2006b). The change in stock status in the 2006 assessment from the more optimistic status in 2002 appears to be mainly attributable to revisions to the life history parameters in the 2006 assessment, along with changes in the input data due to standardization

of many of the relative abundance indices. The population was assessed to be less productive than was assumed in 2002. The Panel was confident that the 2006 assessment provided a more reliable estimate of stock status than the 2002 and earlier assessments did. Stock status was determined from the results of a range of model fits reflecting the Panel's uncertainty about life history parameters. All results indicated that the stock was overfished and that overfishing was occurring. The target year to rebuild the stock was estimated to be 2070.

Blacktip sharks in the Gulf of Mexico were determined not to be overfished, nor was overfishing occurring. The Panel accepted the stock status, but did not accept the absolute estimates of stock abundance. The three abundance indices believed to be most representative of the stock were consistent with each other, suggesting that stock abundance has been increasing over a period of declining catch during the past 10 years. Based on life history characteristics, blacktip sharks are a relatively productive shark species, and a combination of these characteristics and recent increases in the most representative abundance indices suggests that the blacktip stock is relatively healthy. However, there was no scientific basis for advising an increase in catches.

For blacktip sharks in the western Atlantic Ocean, the Panel concluded that the data used for the analyses were treated appropriately (NMFS, 2006b). However, it was unclear whether catch estimates prior to 1991 adequately represented historical removals. Moreover, it was impossible to judge the extent to which each of the standardized catch-rate series reflected real trends in the abundance of the stock. Therefore, given the widely differing results arising from the different models, the status of the stock of Atlantic blacktip shark was deemed to be uncertain, and no reliable estimates of abundance, biomass, or exploitation rates were advanced. Further, in the absence of reliable estimates of abundance, biomass, and exploitation rates, no reliable estimates of stock status were suggested. In summary, given that current status was unknown, no reliable population projections were possible, so no probable values for future population condition and status were provided. However, there was clearly no scientific basis for advising a change in catch levels.

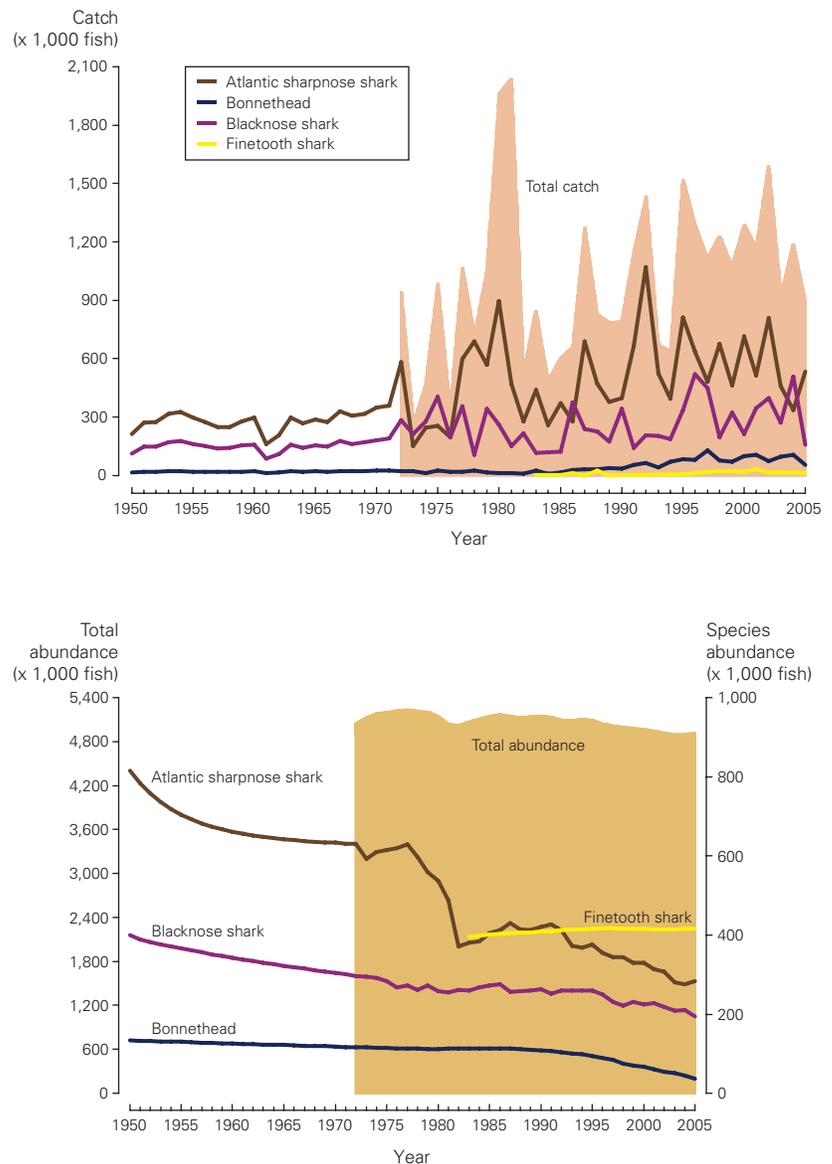


Figure 6-2

Catches (above) and estimated stock abundance (below) of small coastal sharks (1972–2005), Atlantic sharpnose, bonnethead, and blacknose sharks (1950–2005), and finetooth shark (1983–2005).

Small Coastal Sharks

Of the four species (Atlantic sharpnose, bonnethead, blacknose, and finetooth sharks) of small coastal sharks (SCS) in the complex, Atlantic sharpnose and bonnethead sharks account for approximately 94% of the catch (Figure 6-2). Landings represent only a small fraction of all catches because small coastal sharks are also caught as bycatch and discarded in a variety of fisheries, notably shrimp trawl fisheries. Bycatch in the shrimp trawl fishery operating in the Gulf of Mexico and U.S. South Atlantic was estimated based on observer data and

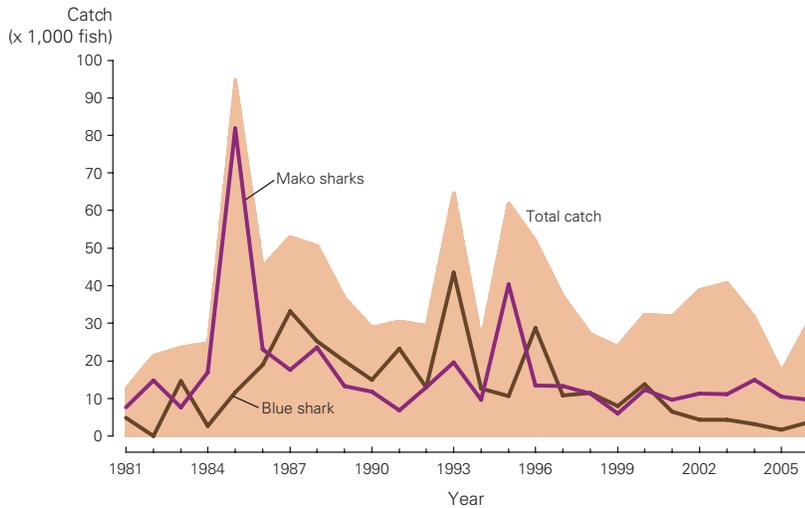


Figure 6-3
Landings in metric tons (t) of pelagic sharks, 1981–2004.

total effort for 1972–2005 for the small coastal shark aggregate, and for 1950–2005 for Atlantic sharpnose, bonnethead, and blacknose sharks, and accounts for the majority of the catches.

The latest stock assessments for the small coastal shark complex, and Atlantic sharpnose, bonnethead, blacknose, and finetooth sharks individually were conducted by the 2007 SCS SEDAR using surplus-production and age-structured approaches and Bayesian estimation techniques (NMFS, 2007). The Review Panel for the 2007 SCS SEDAR concluded that while the assessment of the status of the complex was considered adequate based on the available data, given that species-specific assessments were also conducted, any conclusions should be based on the results of the individual species assessments. Only Bayesian biomass dynamic models could be used to evaluate the status of finetooth sharks. Results, which incorporated uncertainty about life history parameters, catches, and indices of relative abundance, indicated that the stock was not overfished nor was overfishing occurring, in contrast to the results of the 2002 SCS assessment (Cortés, 2002b), which found overfishing was occurring. Because of the general level of uncertainty in the data, the Review Panel suggested cautious management of this resource.

Both biomass dynamic and age-structured models were used for the other three species. For blacknose sharks, the assessment indicated that the stock was overfished and overfishing was occurring both in 2005 and in the preceding 2001–04 period.

However, due to uncertainty in life history parameters, catches, and indices of relative abundance, the Review Panel cautioned that stock status could change substantially in an unpredictable direction in future assessments. In contrast, the assessments for Atlantic sharpnose and bonnethead sharks determined that the stocks were not overfished nor was overfishing occurring. However, for Atlantic sharpnose sharks, F was near F_{MSY} and for bonnethead sharks, fishing mortality rates in recent years had fluctuated above and below F_{MSY} .

Pelagic Sharks

For the pelagic group, the available catch series spans from 1981 to 2006 (Figure 6-3). Commercial landings include the period of 1982–2006, recreational catches include 1981–2006, and dead discard estimates from the pelagic longline fishery are available for 1987–2006. Due to the highly migratory nature of pelagic sharks, these species are harvested or caught as bycatch in the North Atlantic by fishermen from several nations. An assessment of blue sharks and shortfin makos was conducted by the International Commission for the Conservation of Atlantic Tunas (ICCAT) Subcommittee on Bycatch in June 2004 using surplus production, age-structured, and catch-free stock assessment models. Results indicated that blue shark biomass in the North and South Atlantic is above B_{MSY} , while shortfin mako biomass may be below B_{MSY} in the North Atlantic but is above B_{MSY} in the South Atlantic. The conclusions drawn from this assessment were considered to be very preliminary due to limitations on the quantity and quality of available data, and recommendations were made to increase research and monitoring efforts for sharks and other species caught as bycatch in tuna fisheries. The next ICCAT assessment for shortfin mako and blue shark is scheduled for late 2008.

Prohibited Species

Dusky sharks off the U.S. East Coast were classified as a prohibited species by NMFS in 1999, but had not been individually assessed. In 1997, they were also designated by NMFS as a candidate species for listing under the Endangered Species Act (ESA), and in 2004 were listed by the International

Union for the Conservation of Nature (IUCN) Red List of Threatened Species as vulnerable in the northwest Atlantic and Gulf of Mexico.

A stock assessment of dusky sharks was completed in 2006 (Cortés et al., 2006). The multiple indicators used in this assessment all provided a consistent picture of heavy fishing impact and high vulnerability to exploitation of dusky sharks in the northwestern Atlantic Ocean and Gulf of Mexico. Decreasing temporal trends in mean size of catch and catch rates, in tandem with decreasing biomass and increasing fishing mortality rates derived from all the stock assessment methodologies used, indicated that the stock considered has been very heavily exploited. Results obtained with multiple stock assessment methods, which included surplus production, age-structured, and age-structured catch-free modeling approaches, indicated depletions in 2003 ranging from 62 to 93% of virgin biomass, with most models estimating depletions of over 80%. In all, the various stock assessment methodologies used to estimate stock status were all consistent in showing large depletions with respect to virgin (unexploited) levels. Despite some recent signs of recovery, the dusky shark stock in the U.S. Atlantic and Gulf of Mexico has been severely depleted with respect to virgin levels.

ISSUES

Scientific Information and Adequacy of Assessments

The lack of extensive time series for species-specific catch and effort data continues to be a problem that hampers shark stock assessments (NMFS, 1999b). Without reliable species-specific data and stock assessments, management measures will necessarily continue to be based on species aggregates. Several of these important data deficiencies have been recognized in the past (SEFSC, 1998; Cortés et al., 2002; NMFS, 2006b). To continue to improve shark stock assessments, it is critical to 1) continue to improve species- and size-specific catch (landed and discarded animals caught both in U.S. and non-U.S. fisheries) and effort data, and 2) improve fishery-independent measures of shark abundance and productivity. Additionally, it has been recognized that every effort should be



Florida Keys National Marine Sanctuary

Nurse shark resting beneath a coral ledge.

made to assess the status of shark species separately because individual species respond differently to exploitation based on their innate capacity to rebound and fishing history (NMFS, 2006b). Thus, management of coastal shark species aggregates can result in excessive regulation on some species and excessive risk of overfishing on others.

Management Concerns

Although the collection of species-specific data is preferable from a scientific standpoint, reliable species identification continues to pose problems in the practical management of the fisheries, and may only be remedied through observer programs, extensive public outreach, and educational programs. The new mandatory shark identification workshops described in the latest FMP will assist in this process (NMFS, 2006a). The magnitude of recreational catch estimates has surpassed that of commercial landings in several years since 1996. It also appears that the minimum size limit imposed on the recreational sector has been largely ineffective, and a reduced bag limit per trip is not achieved. Significant reductions in mortality from the recreational sector could be realized if these regulations were followed. The issue of incidental catches and discarding of dead sharks in commercial fisheries is also contentious from a management perspective. Amendment 1 to the 1999 FMP incorporated a number of measures to mitigate bycatch in com-

mercial shark fisheries, including gear restrictions and adoption of Vessel Monitoring Systems² (VMS) in some cases (NMFS, 2003). A time/area closure aimed at protecting sandbar and dusky shark nursery and pupping areas off North Carolina from January to July was also implemented. Pending work includes individual assessments of species classified as prohibited, especially night and sand tiger sharks, which were recently designated as Species of Concern³ by NMFS.

Progress

Considerable progress has been made since the first Atlantic shark FMP implemented in 1993. Since that time (when 98% of commercial shark landings were simply reported as “sharks”), mandatory commercial permitting and reporting has significantly reduced the proportion of catch reported as unclassified. Beginning in 1995, a quota monitoring program on permitted shark dealer reports from the Southeast Region has improved the quality of commercial landings data because it supports a more diverse species list. NMFS also funds two observer programs that provide extensive data on species and size composition, catch disposition, distribution of fishing effort, and bycatch in directed shark fisheries. The shark drift gillnet observer program has been in effect since 1993, and the shark bottom longline observer program since 1994. A third observer program providing valuable information on sharks caught as bycatch in pelagic longline fisheries targeting tunas and tuna-like species began in 1992.

A number of improvements have supported more informative and comprehensive assessments of shark stocks. There has been an increase in the number and duration of fishery-independent surveys, and some fishery-dependent time series of relative abundance have become available and have been analyzed through General Linear Modelling

(GLM) techniques. Nursery area and tagging studies in the Atlantic and Gulf of Mexico have been expanded and incorporated into stock assessments to some degree. Population and demographic modeling on several species has also contributed substantially to new stock assessments.

Progress has also been made in domestic management. NMFS’ HMS Management Division is responsible for developing management measures consistent with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act. To that end, an HMS Advisory Panel was formed to help prepare the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks, which amended the 1993 FMP. The 1999 FMP and its amendment (NMFS, 2003) established a rebuilding program for the overfished large coastal shark complex, attempted to prevent further overfishing of sandbar and finetooth sharks, continued to monitor the status of some stocks that were deemed to be rebuilt and healthy (blacktip and all small coastal sharks except the finetooth shark), and limited access to the commercial shark fishery. The 2006 FMP was finalized before the results of the 2006 LCS SEDAR were complete; an amendment to incorporate the 2006 LCS results is under development.

Internationally, the United States continues to play a key role in several shark management forums. The United States participated in the United Nations Food and Agriculture Organization’s Consultation on Shark Conservation and Management. This consultation culminated in the adoption of a National Plan of Action in 2001 to guide national, regional, and international science and management under the precautionary approach. The United States also participates actively in ICCAT as a member of the Shark Working Group of the Sub-Committee on Bycatch, providing data for stock assessments. These efforts contributed to the 2004 stock assessments of blue shark and shortfin mako. In 2001, NMFS implemented the Shark Finning Prohibition Act of 2000 (Public Law 106-557), which effectively bans the practice of finning (landing or possessing shark fins without carcasses) in U.S. territorial waters. Additionally, the United States has been collaborating with Mexico in catch rate analysis of sharks commonly harvested by both countries in the Gulf of Mexico, and a research survey to assess Mexican shark resources in the Gulf

²A device that continuously beams a boat’s location, direction, and speed to a global satellite network that relays the information, alerting NMFS and the Coast Guard when a boat enters a closed area or when it is fishing out of season.

³Species of Concern are species that NMFS has identified as having significant uncertainty regarding status and threats, but insufficient information is available to indicate a need to list the species under the Endangered Species Act.

of Mexico. These bilateral activities are conducted under the auspices of the MEXUS-Gulf Cooperative Program.

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