6.0 ECONOMIC EVALUATION

This section assesses the economic impacts of the alternatives presented in this document. Additional economic and social considerations and information are discussed in Chapters 4, 7 and 8 of this document and Chapter 5 of the annual SAFE report.

6.1 NUMBER OF FISHING AND DEALER PERMIT HOLDERS

6.1.1 Number of commercial permit holders and dealers

As of October 2002, approximately 376 fishermen had been issued an incidental commercial shark limited access permit and 251 had been issued a directed commercial shark limited access permit (See Table 6.1). In September 2003, there were approximately 351 incidental permit holders and 256 directed permit holders. The addresses of these permit holders range from Texas through Maine with over half (57 percent) of the directed permit holders and 39 percent of the incidental permit holders located in Florida. Most directed permit holders use bottom longline to target sharks. The number of directed permit holders reporting shark landings in logbooks is generally less than 100 in any given year. There were eighty five directed permit holders reporting shark landings in logbooks during 2001. Because of the limited number of permits, the relatively short season lengths, and the relatively little profit available from shark fishing, it is unlikely that the number of active directed shark permit holders would increase substantially.

The number of directed permit holders that use gillnet gear to fish for sharks has been less than 11 vessels in recent years (See Table 6.2). These fishermen fish off the east coast of Florida and Georgia. Because of gear restrictions, the relatively short LCS season, the small profit margin, and the observer coverage requirements for these vessels, it is unlikely that the number of vessels in the gillnet fishery would increase substantially.

Also, as of October 2002, there were 267 dealers permitted to buy sharks (NOAA Fisheries, 2003). Dealer addresses also range from Texas through Maine with 38 percent located in Florida. NOAA Fisheries believes that all permit holders and related businesses (e.g. bait shops, tackle shops, processors, exporters) - all of which are considered small entities - could experience a range of economic impacts because of the preferred alternatives described in this document. These impacts are described in Chapter 4 of this document. Additional economic information is provided in this chapter.

6.1.2 Number of recreational permit holders

As of March 1, 2003 (67 FR 77434), anglers fishing for any HMS are required to have an HMS angling permit. This permit and the HMS charterheadboat permit allow fishermen to catch HMS recreationally and are not species specific. As of September 30, 2003, approximately 18,249 recreational fishermen had been issued an Atlantic HMS angling permit and 4,041 charter/headboat permits had been issued (Table 6.1). These permit numbers have increased

substantially. The addresses of these permit holders range from Texas through Maine and also include addresses in some land-locked states as well.

6.2 GROSS REVENUES OF SHARK FISHERMEN

Of all Atlantic HMS, sharks bring in the lowest total gross revenues (~$2.9 million total in 2001) (See Table 6.3). Directed and incidental permit holders earned $2.7 million and $0.2 million, respectively, of the total gross revenues for shark fishermen during 2001. If the total gross revenues are averaged across the approximately 85 active directed shark permit holders, then the average annual gross revenues per directed shark fisherman is just over $32,800 (ranging from a minimum of $75 to a maximum of $181,215). Incidental shark fishermen had average gross revenues from sharks of just over $5,900 (ranging from a minimum of $75.16 to a maximum of $118,995). The majority of incidental permit holder's gross revenue is expected to come from other fisheries. The total average gross revenues from all shark permit holders will vary depending upon participation in other fisheries.

Average ex-vessel prices of LCS meat across all regions was approximately $0.91 per lb dw in 2001. Pelagic sharks brought in the largest ex-vessel price at $1.11 per lb dw and SCS brought in the lowest ex-vessel price of $0.79 per lb dw during this same time period. Average ex-vessel prices for shark fins was approximately $19.67 per lb in 2001. These prices resulted in gross revenues in 2001 of $1,341,510 for LCS, $66,485 for pelagic sharks, $36,339 for SCS, and $1,554,011 for shark fins (See Table 6.3).

6.3 VARIABLE COSTS, NET REVENUES, AND WILLINGNESS TO PAY

6.3.1 Costs and net revenues of commercial shark fishermen

Little economic data are available on the costs of bottom longline fishing. NOAA Fisheries began selecting 20 percent of all active directed commercial shark fishermen to report cost earnings information in 2003. The collection of this information (OMB No. 0648-0371, expiration June 30, 2005) will greatly improve shark management.

NOAA Fisheries believes that the variable costs for commercial shark fishermen using bottom longline gear are similar to the fishing costs for pelagic longline. There are some costs which may be lower for bottom longline gear. For instance, shark fishermen should not need lightsticks (used to catch swordfish) and often set less gear than pelagic longline fishermen. McHugh and Murray (1997) found that a seven day trip had an average profit (owner's share of catch minus all expenses) of $1,589. Vessels between 40 and 49 feet had an average profit of $1,975 for a seven day trip.

At this time, NOAA Fisheries also has limited information available regarding variable costs of shark gillnet fishing. NOAA Fisheries expects that the fishing costs per trip are less than those of a pelagic longline fishing trip because the trips are usually shorter (an average of 18 hours per

trip), vessels do not fish far offshore (within 30 nautical miles from port), and the gear does not need hooks, bait, or light sticks. Other costs, such as net repair, may be incurred.

Shark gillnet vessels that fish in a strikenet method probably incur higher costs per trip than those vessels that fish in a drift gillnet method. This is because strikenetting usually requires the use of a small vessel (used to run the net around the school of sharks) and a spotter plane (used to spot schools of fish). While the cost per trip is higher than the traditional drift gillnet method, bycatch in this method is extremely low, catch rates of the target species is high, and vessels can complete a set in less time (one hour versus nine hours). NOAA Fisheries estimates that the smaller vessel could cost between $2,000 and $14,000 to buy. Because these second vessels have specific requirements to be sturdy enough to hold the gillnet and move quickly around the school of sharks, it is likely that vessel owners would need to re-fit any used vessel bought for this purpose. Additionally, a second vessel means additional fuel and maintenance costs. Spotter planes in other fisheries are paid based on the percentage of the proceeds from the trip, generally 10 to 25 percent of gross revenues. Thus, given the average gross revenues per trip, converting from drift gillnet fishing to strikenet fishing could be prohibitive if the vessel needs both a second vessel and a spotterplane.

Recently some strikenet vessels have begun striking behind other vessels such as trawl vessels (e.g., shrimp vessels). This negates the need for a spotter plane and could reduce the variable costs substantially. Additionally, some of the smaller drift gillnet vessels have begun to use shorter nets to strike fish without a second vessel (Carlson and Baremore, 2002). Their efforts are moderately successful and could reduce the costs of the fishing in a strikenet method substantially by reducing the amount of net that needs to be repaired and the amount of additional gear needed.

6.3.2 Willingness to pay for Atlantic shark

There are little additional data or new reports regarding willingness to pay to fish for Atlantic sharks caught recreationally.

The most recent data NOAA Fisheries has comes from a 1994 survey of anglers in New England and the Mid-Atlantic (Hicks *et al.*, 1999). The data collected were used to estimate expenditures and economic value of the various groups of recreational fisheries in this area. One category of fishing, called "Big Game" consisted primarily of HMS, including sharks, billfish, and tunas. Although this study is not an exhaustive picture of the entire HMS recreational fishery, the results provide considerable insight into the absolute and relative values of the recreational fisheries for HMS.

Overall average willingness to pay (WTP) for a one-day fishing trip ranged from a low of less than a dollar in New Hampshire to a high of $42 in Virginia. The study found that aggregate WTP (average WTP times the number of trips) ranged from $18,000 in New Hampshire to nearly $1 million in Virginia. Using model results, it was possible to estimate the WTP for a one fish

increase in the expected catch rate across all sites in the choice set. The highest average value was attributed to big game fish, ranging from $5 to $7 per trip (about $5.40 on average), in addition to the value of the trip. The marginal value of an increase in catch per trip was highest for big game fish, and lowest for bottom fish. Thus, increasing the recreational bag limit would have minor impacts, if any, on angler WTP. Additionally, Fisher and Ditton (1992) found that anglers were willing to pay an additional $105 per trip rather than stop fishing for sharks.

The 1994 survey results also indicated that boat fees were responsible for the greatest percentage of expenditures. Roughly 70 percent and 53 percent of total expenditures went for private/rental boats and charter/party boats, respectively. Travel expenses were the smallest portion of expenditures, although travel costs for those fishing on party/charter vessels were about twice as high as for those fishing on private/rental boats ($28 *vs*. $16).

In 1998, a survey was completed of a number of charterboats (96 of an estimated 430) and party boats (21 out of 23) throughout Alabama, Mississippi, Louisiana, and Texas (Sutton *et al.*, 1999). The study found that party boat operators did not frequently target sharks. Specifically, the study indicates that 65 percent of party boat operators reported targeting sharks at least once and that shark trips represented 5 percent of the total effort by party boat operators (Sutton *et al.*, 1999).

The increase in angling permit holders from 13,263 in October 2002 to over 18,000 in October 2003 indicates an increased willingness to pay for HMS permits and gear in order to have the chance to catch HMS recreationally.

6.4 EXPECTED ECONOMIC IMPACTS OF THE COMMERCIAL MANAGEMENT MEASURES

Economic analyses for commercial management measures were performed utilizing a SAS computer program for combining and sorting logbook and permit data. Specifically, NOAA Fisheries combined data from the following 1) 2001 pelagic longline logbooks, 2) 2001 snapper-grouper logbooks, 3) 2001 Northeast multispecies logbooks, and 4) shark permit database. The output information from SAS provided NOAA Fisheries with the number/weight of sharks landed by permit holder. Microsoft Excel was used to convert numbers of fish to pounds, where appropriate, and then the data were combined with 2001 ex-vessel price data (i.e., average ex-vessel prices) for LCS, SCS, and pelagic sharks as well as shark fins to calculate total, minimum, maximum, and average gross revenues (i.e., for both the fishery as well as small entities) by management category, permit type, season, and permit holder. The 2001 gross revenues as described above, were used as a baseline for comparison of economic impacts expected to result from implementation of commercial management alternatives considered.

6.4.1 Expected economic impacts of the LCS classification

NOAA Fisheries considered four separate LCS classification alternatives (See Chapter 2). Under alternatives A1 (separate groups, different closures) and A4 (species specific groups, closure for most vulnerable species), the time required to haul back each set is likely to increase, in the event

that one LCS grouping remains open while the other is closed. This could result in additional costs to fishermen including variable and opportunity costs. Additionally, lengthening of trips may occur in order for fishermen to compensate for lost catches during a partial closure.

Under alternative A2 (separate groups, same closure), fishermen would continue to experience inefficiencies in terms of additional time required to sort catch. This could result also in the lengthening of trips to make up for these inefficiencies. Increased time at sea, which is possible under alternatives A1, A2, and A4, reduces the profits fishermen gain due to increased costs for fuel, bait, and ice.

By comparison, alternative A3 (aggregate, one closure) could result in fewer economic impacts on a trip level. However, because alternative A3 does not allow for increases in quotas on a species level, the overall quotas for the complex could be lower (See Table 2.3). Thus, alternative A3 could have impacts on revenues.

6.4.2 Expected economic impacts of the quota administration

NOAA Fisheries considered five separate quota administration alternatives. Alternative B1 (semi-annual season) could result in economic impacts if semi-annual seasons continue to extend into pupping seasons, which overtime could result in further decline of LCS stocks and economic stability of the fishery. Alternative B2 (no regional quotas) is not anticipated to change fishing costs since fishermen will continue to catch fish until the quota is taken.

While alternative B3 (regional quotas) has not been implemented previously, NOAA Fisheries does not anticipate any significant economic impact given that this alternative will simply establish a quota on the basis of historical landings by region. Concern was noted during public hearings on draft Amendment 1 that estimates of landings on which the regional quotas will be based may be underestimated and may result in additional vessels being forced out of the fishery. NOAA Fisheries combined information from two separate databases containing regional landings information as reported by dealers and states to NOAA Fisheries. NOAA Fisheries believes that the landings reported by dealers and states represents the best available information pertaining to regional data. Given that alternative B3 seeks to maintain historical landings via utilization of regional quotas, as opposed to reducing landings, NOAA Fisheries does not expect this alternative to change previous fishing practices or result in any significant economic impact. Additionally, over time, this alternative may allow NOAA Fisheries the flexibility to manage quotas to each region's maximum economic advantage.

Alternatives B4 (trimester season) and B5 (quarterly season) could result in economic impacts given that markets have not yet been developed for the late spring and late fall, during which commercial seasons have historically been closed. Alternatives B4 and B5 may take time for fishermen and associated communities (e.g., dealers, processors, retail agents) to adapt to, given that new markets will need to be established at different times of the year. Fishery participants will need time (i.e., between two weeks and a month) to work with grocers to advertise shark

products and under the preferred alternative (i.e. B4) the time available for such advertisements may be further limited, as compared with the no action alternative. Additionally, since fishermen may be able to land sharks at the same time as other fish, there could be fluctuations in markets for other fisheries. Spreading open seasons out more evenly over the calendar year could, in the long-term, result in greater economic stability for fishermen and associated communities because the amount of time between open and closed seasons would be reduced. In order to reduce the economic impacts associated with the preferred alternative (i.e., B4), NOAA Fisheries will implement a delay in effectiveness to give fishery participants an opportunity to work with dealers and grocers to enhance markets and advertise in advance of season openings. Additionally, comments received by NOAA Fisheries during the public comment period on draft Amendment 1 suggested that variation in open seasons could result in short-term social and economic burdens, given that fishermen will need to adjust fishing practices, including but not limited to, re-rigging gear more often to fish for shark, as opposed to other species, during what would otherwise be a closed season. Social and economic costs associated with switching gear more often may be minimized, if shark fishery participants use the same gear in other fisheries (e.g. similar gear is used to fish for shark, grouper, and tuna). Trimester seasons are preferred to quarterly seasons because trimesters will minimize the costs of switching gear (i.e., only three times as opposed to four per year) and give a higher percentage of the quota to each open season than would occur under a quarterly season approach.

6.4.3 Expected economic impacts of the quota basis

Overall, NOAA Fisheries considered three separate quota basis alternatives for sharks. However, when considered in combination with the LCS classification alternatives (A1-A5) as described in section 6.4.1 above and in Chapter 2, NOAA Fisheries considered a total of seven separate quota basis alternatives for LCS. No changes are proposed for Pelagic sharks quotas at this time, but NOAA Fisheries may consider revisions, if appropriate, following the next stock assessment.

6.4.3.1 LCS quota basis

Fishermen have been fishing under the LCS quota of 1,285 mt dw, since 1997 except for 2003. When the 1997 quota level went into effect, many shark fishermen left the fishery or made the decision to fish for sharks on a part-time basis. In 2003, NOAA Fisheries increased the LCS quota temporarily to a total of 1,714 mt dw under an emergency rule. However, the emergency rule was meant as an interim measure pending completion of this amendment. As such, the baseline for comparison of economic impacts in this document is the 1997 quota for the LCS complex (1,285 mt dw).

Given this baseline for economic comparison (i.e., 1997 quota for LCS complex ~1,285 mt dw), alternatives considering groupings or species-specific quotas are summed to derive quantitative estimates of economic impacts (See Table 6.4). As such, the group findings are based on the assumption that LCS ridgeback quota plus LCS non-ridgeback quota equal that of the complex. The species-specific findings are based on the assumption that the sandbar quota, plus the

blacktip quota, plus the other LCS quota equal that of the complex. It is notable that the economic impacts of the sum may not equal the economic impacts of the individual parts, if considered separately because some species are worth more than others.

The vast majority of comments received by NOAA Fisheries during the public comment period on draft Amendment 1 were in support of the MSY quota basis (i.e., alternative C2). However, commenters expressed concern about the adoption of a 40-percent reduction versus a 50-percent reduction in catch as recommended in the 2002 stock assessment. NOAA Fisheries indicated in the DEIS that the percent reduction came from the recommended reduction in the 2002 LCS stock assessment, which was reduced slightly for consideration of the following factors: (1) while the stock assessment did say that the LCS complex should be reduced by 50 percent, it also said that the reductions should be on species other than sandbar and blacktip; (2) observer data indicates that sandbar and blacktip sharks comprise approximately 67 percent of the LCS catch, indicating that a quota reduction would mostly apply to those species; (3) the peer reviews indicated that the complex assessment may not be as accurate as individual species because of biological differences between species; (4) CPUE data for silky, tiger, and scalloped hammerhead do not indicate decline; and (5) the other preferred measures such as the time/area closure will reduce mortality and/or dead discards. After considering these factors along side of public comment received, NOAA Fisheries feels that a revised percent reduction (i.e., 45%) in addition to the other preferred alternatives is reasonable and will rebuild the LCS complex. This change in percent reduction will result in an additional economic impact of $202,687 in total gross revenues of the fishery as a whole and $1,689 in average revenues for small entities, from what was originally estimated in the DEIS. These amounts are included in the economic analysis described below.

Alternative C1 (1999 HMS FMP quota) does not allow for changes to the quota and based upon the 2002 stock assessment would establish a quota that is too low to promote achievement of optimum yield (i.e., greatest overall benefit to the Nation). Whereas, alternatives C2 (MSY based quota) and C3 (landings based quota) would promote both achievement of rebuilding targets and optimum yield goals and objectives. Neither alternative C2 or C3 should have significant economic impacts on the fishery as a whole, but the resulting quota when combined with the other preferred alternatives could have a significant impact on small entities.

Economic analyses indicate that the LCS quota was worth $2,895,521 in 2001 under the baseline for comparison (i.e., 1,285 mt dw). Both of the alternatives considered for LCS complex quotas, C2 (MSY based quota) and C3 (landings based quota), would decrease available quota (See Table 2.3). When compared with the baseline, alternative C2 (i.e. MSY complex quota) results in a 21-percent reduction in total gross revenues for the fishery as a whole (See Table 6.4). Whereas, alternative C3 (i.e., landings complex quota) would result in a 28-percent reduction in total gross revenues for the fishery as a whole. Of the three alternatives considered for LCS group quotas, alternative C1 (HMS FMP based quota) would decrease available quota, while C2 and C3 would increase the available quota (See Table 2.3). When compared with the baseline, alternatives C1, C2, and C3 for LCS group quotas result in a 24-percent reduction, 14-percent

increase, and 21-percent increase in total gross revenues for the fishery as a whole, respectively (See Table 6.4). Of the two additional alternatives for LCS species-specific quotas, C2 and C3, both would increase the available quota (See Table 2.3). When compared with the baseline, alternative C2 (i.e. MSY species-specific quota) results in a 33-percent increase in total gross revenues for the fishery as a whole (See Table 6.4). Whereas, alternative C3 (i.e., landings species-specific quota) results in a 16-percent increase in total gross revenues as a whole.

Any decrease in the LCS quota will also lead to shorter seasons. This in turn could lead to lower ex-vessel prices because of market gluts and the difficulty in finding buyers for fish that are only available for a short period of time each year. Thus, these alternatives would likely force additional fishermen out of the fishery and could lead to an incidental only fishery.

By comparison, any increase in the quota could lead to longer seasons. This in turn could lead to higher ex-vessel prices because fishermen would be able to bring LCS to the dock over time, eliminating market gluts, and because fishermen could make arrangements with dealers in advance. However, increases in quota may also result in long-term economic impacts, if LCS stocks do not rebuild and continue to decline over time.

6.4.3.2 SCS quota basis

NOAA Fisheries considered three different SCS quota alternatives (See Table 6.5). Fishermen have been fishing under an SCS quota of 1,760 mt dw, since 1997, except for in 2003 when an emergency rule was in place as an interim measure pending a plan amendment. Commercial fishermen have historically caught a small portion of this quota. For example, the highest landings on record by fishermen was in 2001, where 326 mt dw was accounted for in the commercial fishery. Economic analyses indicate that the SCS quota was worth $36,339 in 2001 under the baseline for comparison (i.e., 1,760 mt dw).

Alternatives C1 (HMS FMP based quota - 359 mt dw) and C2 (MSY based quota - 454 mt dw) propose quota levels that are greater than the total of all reported landings in any year since management began, including the most recent emergency rule and associated extensions. When compared with the baseline, alternative C1 results in no change to ex-vessel prices or economic benefits (See Table 6.5). Whereas, alternative C2 results in an 10-percent increase in total gross revenues for the fishery as a whole.

Alternative C3 (landings based quota - 300 mt dw) could have some minor negative impacts on the fishery as well as fishermen because it is a slight decrease from 2001 landings. When compared to the baseline, alternative C3 results in a 17-percent decrease in total gross revenues for the fishery as a whole (See Table 6.5). This decrease could cause a fishery closure as a result of the quota being exceeded. However, because alternative C3 is the average of recent landings, this alternative should not have significant economic impacts.

6.4.3.3 Pelagic shark quota basis

NOAA Fisheries is not proposing any change to pelagic shark quotas which were adopted under the 1999 HMS FMP. As such, NOAA Fisheries does not anticipate a change in ex-vessel prices or economic benefits as a result of maintaining these quotas.

6.4.4 Expected economic impacts of the minimum size

NOAA Fisheries considered six different minimum size alternatives, five of which provided options for establishing a minimum size in the commercial fishery (i.e., D1- 4.5 feet fork length ridgeback LCS, D3 - 5 feet fork length LCS, D4 - 5 feet fork length ridgeback LCS/4.5 feet fork length non-ridgeback LCS, D5 - 4.5 feet fork length for Atlantic non-ridgeback LCS/4 feet fork length Gulf of Mexico non-ridgeback LCS, and D6 - minimum on overfished species) and one which did not (i.e., D2 - no minimum size). As described in the HMS FMP, implementation of a minimum size could increase fishing costs because fishermen would either have to fish farther offshore to avoid fish smaller than the minimum size or set additional gear in order to catch more fish that meet the minimum size requirement. As such, additional fuel, bait, groceries, and possibly additional gear could be required. However, implementation of a minimum size could also increase ex-vessel price slightly because fishermen would be landing fish that have more meat and that have larger fins. Under alternative D2, NOAA Fisheries does not expect any changes in fishing costs or ex-vessel prices. Given that there has been no minimum size in the commercial fishery to date, there are no economic impacts associated with implementation of alternative D2.

6.4.5 Expected economic impacts of preferred commercial alternatives combined

The preferred alternatives (A3, B3, B4, C2, and D2), when combined, will result in economic impacts to the fishery as a whole, some of which may be significant for small entities/vessel owners. This is especially true of preferred alternatives A3 and C2, which will result in a decrease in available LCS quota. However, all of these alternatives, when compared to the other alternatives described above, mitigate undesirable or greater economic impacts associated with continued overfishing, shortened seasons, and economic instability of fishery participants and associated fishing communities in the long-term. The combination of these preferred alternatives is necessary for LCS to rebuild and SCS to achieve optimum yield.

6.5 Expected Economic Impacts of the Recreational Management Measures

6.5.1 Expected economic impacts of the recreational retention limits

NOAA Fisheries considered seven separate recreational retention limit alternatives (See Chapter 2). Alternative E1, the no action alternative (one shark per vessel per trip plus one Atlantic sharpnose shark per person per trip), is not anticipated to change fishing costs or ex-vessel prices, given that this is the retention limit under which recreational fishermen have been fishing.

As described in Chapter 4, implementation of retention limits under alternatives E2 (existing catch limits (E1) plus one bonnethead shark per person per trip), E3 (existing catch limits (E1) plus the addition of one pelagic shark per vessel per trip), and E4 (existing catch limits (E1) plus an allowance for vessels with HMS angling permits participating in registered tournaments/CHB permit holders on for hire trips, as well as one bonnethead per person per trip) could result in positive economic benefits as increases in retention limits may increase tournament participation and business profits within the charter/headboat industry for sharks. Economic studies described in Chapter 4, indicate that the addition of one shark would only increase WTP by $7. Alternative E5 (other state based retention limit) could result in variable economic costs depending upon what the retention limit is and where anglers are fishing. For example, the economic impacts associated with alternative E5 could be negative if the retention limit is less than the current limit or positive if the retention limit is more than the current limit. By comparison, alternative E6, which would eliminate all retention of sharks, would likely result in negative economic impacts depending upon the willingness for shark anglers to substitute other fish and release sharks that are caught as a result of recreational fishing activity.

Alternative E7 (no retention limit) would likely result in positive economic benefits in the short-term due to increases in recreational fishery participation; however, in the long-term, as discussed in Chapter 4 this alternative may also result in negative impacts should shark stocks decline.

6.5.2 Expected economic impacts of the recreational minimum sizes

As described in Chapter 4, NOAA Fisheries does not expect any changes in fishing costs or ex-vessel prices under the no action alternative, F1 (4.5 feet fork length for all sharks, no size limit for Atlantic sharpnose sharks), because fishermen have been operating under the present minimum size limits since 1999. By comparison, alternative F2 (existing size limits (F1) plus no size limit for bonnethead sharks) could increase recreational willingness to pay, angler consumer surplus, and current revenues to charter/headboat owners/captains and others who would benefit from a retention allowance for bonnethead sharks.

Alternatives F3 (5.0 feet fork length for all sharks, no size limit for Atlantic sharpnose or bonnethead sharks), F4 (5.0 feet fork length for all ridgeback LCS, 4.5 feet fork length all non-ridgeback LCS, SCS, and pelagic sharks, no size limit for Atlantic sharpnose or bonnethead sharks) and F5 (existing size limits (F1) plus regional non-ridgeback shark size limits, and no size limit for bonnethead sharks) would require that anglers release most of the sharks currently caught in the recreational fishery, which could result in variable negative economic impacts in the short-term. However, these impacts would likely be mitigated by the rebuilding of shark stocks over time.

Under alternative F6, no minimum size, there may be an increase in participation in the recreational fishery, thereby resulting in positive economic impacts. However, in the long-term, alternative F6 may contribute to stock declines, which could result in increased fishing costs and reduced revenues.

6.5.3 Expected economic impacts of the authorized gears for recreational shark fishing

NOAA Fisheries does not anticipate a change in ex-vessel prices or economic benefits as a result of maintaining G1 (any authorized gear) or implementing G2 (only allow handline and rod and reel). No economic costs are anticipated because these alternatives address gear restrictions for recreational shark fishing in federal waters, where sharks retained cannot be sold.

6.5.4 Expected economic impacts of preferred recreational alternatives combined

The preferred alternatives (E2, F2, and G2), when combined, will result in economic benefits to the recreational fishery as a whole. This is especially true of preferred alternatives E2 and F2, which will result in increased angler consumer surplus, an increase in willingness to pay and increased revenues to charter/headboat owners/captains and others who rely on the recreational fishery.

6.6 Expected Economic Impacts of the Deepwater and Other Shark Alternatives

NOAA Fisheries does not expect alternatives H1 (retain established species group) or H2 (remove species group from management unit; data collection only) to result in changes to ex-vessel prices or economic benefits because there are no known significant landings of species in this group and The Shark Finning Prohibition Act now bans finning.

6.7 Expected Economic Impacts of the Prohibited Species Alternatives

NOAA Fisheries does not anticipate a change in ex-vessel prices or economic benefits as a result of implementing alternative I1 (retain established species group), because fishermen are already operating under these restrictions. Similarly, implementation of alternative I5 (add deepwater/other species group to prohibited species group) would not result in any substantive economic benefits because there are only minor landings of the deepwater/other species through bycatch in other fisheries.

In general, adding a species to the prohibited species list would have negative economic impacts. Not only would fishermen have to discard the fish but if fishermen are unable to avoid the prohibited species, then fishermen would have to spend time removing fish from the gear. In the long-term, fishermen might gain benefits if the species is removed from the list. As described in Section 4.5, alternatives I2 (return to the five species in 1997), I3 (retain established prohibited species group and add finetooth), and I4 (retain established species group and remove dusky)

could have negative long-term economic impacts. While alternatives I2 and I4 could allow dusky sharks and other occasionally caught sharks to be landed commercially and recreationally, thereby increasing short-term revenues to the fishery, should these species decline, more fishing effort would be required to catch these sharks and this would likely result in increased costs and reduced revenues for commercial fishermen and charter/headboat operations.

Additionally, if dusky or other species are listed under ESA, the whole fishery could be affected and potentially closed. Alternative I3 would likely result in increased costs and reduced revenues for commercial fishermen and charter/headboat operations. Finetooth sharks accounted for over one-third of all commercial SCS landings in 1998-2000 (Cortes, 2002). As such, SCS fisheries could experience as much as a 33-percent reduction in total revenues should landings composition in the SCS fishery remain the same under alternative I3.

By comparison, alternative I6 (retain established prohibited species group and establish criteria for addition and removal of species) could have positive and negative economic impacts, depending upon which species are added/removed to/from the prohibited species group. For instance, if a commercially or recreationally valuable species is added, then a negative economic impact may be incurred in that this species would no longer be available to commercial or recreational fisheries, with the exception of catch and release in the recreational fishery. Alternatively, if a commercially or recreationally valuable species is removed, then a positive economic impact may be incurred in that this species would no longer be prohibited from retention.

6.8 EXPECTED ECONOMIC IMPACTS OF THE BYCATCH REDUCTION MEASURES

6.8.1 Expected economic impacts of the gear restrictions

NOAA Fisheries does not anticipate a significant change in ex-vessel prices or economic benefits as a result of implementing alternative J1 (gillnet net checks, LWTRP, observers/bottom longline post guidelines), primarily because this alternative does not change current fishing practices. Alternative J2 (existing bycatch measures plus closing shark gillnet fishery permanently) would result in significant negative economic impacts for the six vessels actively fishing in the shark gillnet fishery, but minimal economic impacts on the fishery as a whole.

As described in Chapter 4, alternative J3, which would not close the fishery but require use of striknet fishing, could have significant impacts on those vessels not currently strikenetting (ranging between 2 and 4 vessels out of 5). It may result in large decreases in revenues for fishermen who traditionally fished in the drift gillnet fishery and place financial burdens on those fishermen who may need to purchase a second smaller vessel and outfit it for strikenet fishing. NOAA Fisheries estimates that the smaller vessel could cost between $2,000 and $14,000 to purchase. The use of a second vessel for strikenet fishing may also increase associated operating costs. Additionally, several fishermen that currently strikenet fish also use a spotter plane to locate schools of sharks, which may further increase operating costs for fishermen that would be

required to strikenet under this alternative. For those fishermen that currently strikenet fish, this alternative would have less of an impact but may still increase costs if they drift gillnet fished part of the time. Recently, some strikenet vessels have begun striking behind other vessels such as trawl vessels (e.g., shrimp vessels). This negates the need for a spotter plane and could reduce the variable costs substantially. Additionally, some of the smaller drift gillnet vessels have begun to use shorter nets to strike fish without a second vessel (Carlson and Baremore, 2002). Their efforts are moderately successful and could reduce the costs of fishing in a strikenet method substantially. Alternative J3 would allow for a reduction in the current observer coverage levels in gillnet fisheries outside right whale calving season. This could reduce the costs associated with observer coverage and the administrative burden on NOAA Fisheries.

NOAA Fisheries received numerous comments regarding alternative J3 including comments stating that the shark gillnet fishermen generally target Atlantic sharpnose sharks from April 1 through November 15 with drift gillnet gear. The commenters claim that strikenet gear has not been effective at catching Atlantic sharpnose sharks and they feel that drift gillnet gear is the only effective method of targeting this resource. The commenters wrote that strikenet gear cannot be used to target SCS during the summer months because these species do not aggregate during those months. Comment was received from fishermen currently active in the shark gillnet fishery stating that if they were not allowed to use drift gillnet gear, their businesses would no longer be viable. NOAA Fisheries also received comments from a state agency supporting the prohibition of shark gillnets in Federal waters to complement similar prohibitions in state waters, thereby minimizing drains on state law enforcement resources.

The intent of alternative J3 was to allow the commercial shark gillnet fishery to continue and minimize economic impacts, while minimizing interactions with protected resources as well as reducing bycatch of non-target species. Through public comment it has been brought to the attention of NOAA Fisheries that allowing the use of strikenets only would not accomplish this objective. Therefore, the final regulations will permit the use of drift gillnets with possible gear modifications or other measures being implemented through future rulemaking, based upon further study and economic analysis.

Alternative J4 will require vessels to install VMS units, which will result in negative economic impacts in the short-term. However, in the long-term, alternative J4 could result in increased revenues by allowing less burdensome regulations and more fishing time. Under the time/area closure in alternative K2, alternative J4 would result in approximately five gillnet shark fishing vessels and approximately seven directed category bottom longline shark fishing vessels[1] having to install VMS units. Specifically, the costs associated with implementing a VMS program in the Atlantic shark gillnet fishery include an initial average cost per vessel of approximately $2,275

[1]Fourteen bottom longline vessels fished (i.e., on average during 2000 and 2001) in the area near the time/area closure. Seven of these vessels should already have VMS because they are associated with swordfish permits. As such, NOAA Fisheries estimates that the remaining seven vessels will need to purchase VMS units as selected in this amendment. See Appendix 4 for further explanation.

(not including postage costs for returning certification statement), an average annual maintenance cost of approximately $500/year, and approximately $197.28/year for communications during the right whale calving season. Costs associated with implementing a VMS program in the directed shark bottom longline fishery include an initial average cost per vessel of approximately $2,275 (not including postage costs for returning certification statement), an average annual maintenance cost of approximately $500/year, and approximately $305.28/year for communications during the proposed 212 day shark bottom longline time/area closure. Economic analyses of the impacts associated with this VMS requirement indicate that only five percent of the fleet would be affected and that this will result in a eight-percent reduction in total gross revenues for the fishery as a whole and a 26-percent reduction in total gross revenues for the 12 vessels directly affected by this proposed requirement during the first year of implementation. For every year thereafter, economic analyses indicate that annual costs will result in a seven-percent reduction in total gross revenues for the fishery as a whole and a seven-percent reduction in total gross revenues for the 12 vessels directly affected by this proposed requirement. In an attempt to provide vessel owners with flexibility and help minimize costs, NOAA Fisheries has type-approved four VMS units from two manufacturers for use in the pelagic longline fisheries. No VMS units have been type-approved specifically for use in the Atlantic shark fisheries as of this date. Based on the range of VMS units commercially available, NOAA Fisheries expects any VMS unit type-approved for Atlantic shark fisheries to be similar or identical to those type-approved for the pelagic longline fisheries. Additionally, VMS could allow shark vessels to transit closed areas because the signature would indicate whether of not the vessel is fishing. While this is not true for strikenet vessels, the VMS requirement could reduce the need for observer coverage, which would result in short-term economic benefits. Additionally, delayed implementation of the VMS requirement will allow time for type approval and time for vessels to obtain the VMS units and adjust to the new requirements, which will minimize the overall economic impact.

As described in Chapter 4, alternative J5 (existing bycatch reduction measures plus requirement of the use of non-stainless steel corrodible hooks, release equipment, and requirement for bottom longline vessel to move one nautical mile after interaction with a marine mammal or sea turtle) will likely result in increased economic impacts to fishermen, primarily because of increased costs associated with the requirement to reset gear as well as fuel, time and labor costs. The costs associated with purchasing release equipment are minimal. NOAA Fisheries has received comment that these requirements may increase fishing efficiency and result in decreased costs for fishermen. For example, dehooking and disentanglement gear may speed up fishing operations by reducing costs associated with purchasing and replacing lost gear. Additionally, NOAA Fisheries believes that most fishing vessels will move at least one nautical mile during the course of normal operations, so the cost of fuel may be mitigated. Alternatives J6 (existing bycatch reduction measures plus gear limitations for bottom longline vessels) and J7 (existing bycatch measures plus requiring retention of all sharks) would likely result in minimal negative economic impacts. Specifically, alternative J6 could result in increased costs for replacing hooks and re-rigging gear, whereby alternative J7 may result in derby fishing conditions where revenues and market values for shark products may decline. Alternative J8 (existing bycatch reduction measures plus requirement for mandatory workshops) will likely result in minimal economic

impacts to fishermen, as the costs incurred will be those associated with travel and time to attend workshops discussing shark species identification, marine mammal and sea turtle release techniques, and current regulations. Economic costs associated with alternative J8 may be mitigated if stock status improves as a result of more accuracy in identification and increasing fishing efficiency with the use of release equipment and techniques. Furthermore, economic impacts associated with alternative J8 could be further reduced if workshops are held near commercial and recreational ports of interest, during the closed season for shark fishing, and if workshops are conducted by utilizing video-conferencing or internet training options. Additionally, if these workshops are mandatory, then economic costs associated with consequences (e.g. loss of permit, etc.) of not completing such training may also be incurred. Alternative J9 is analyzed under alternative A2.

All of the alternatives listed above (i.e., J1-J9) could have minimal economic benefits if consumers perceive shark fishing vessels as conservation minded or if LCS stocks improve and consumers are willing to pay more for domestic shark meat.

6.9 EXPECTED ECONOMIC IMPACTS OF THE TIME/AREA CLOSURES

NOAA Fisheries does not anticipate a change in ex-vessel prices or economic benefits as a result of implementing alternative K1 (no time/area closure), primarily because this alternative does not change current fishing practices. In the long-term, if this alternative prevents the rebuilding of stocks, then this alternative could have economic impacts. By comparison, alternatives K2 (revised time/area closure for sandbar and dusky sharks off North Carolina) and K3 (time/area closure for all shark nursery and pupping grounds) could all have a negative economic impact on shark fishery participants by closing large sections of coastal waters to shark bottom longline fishing.

Original economic analyses in the DEIS indicated that alternative K2 could have a direct economic impact on a total of 34 vessels (out of 251 total directed permits issued in 2002 ~ 14%) with directed shark permits, of which only 13 vessels with home ports located in South Carolina, North Carolina, and Virginia reported shark landings during 2001. These vessels reported gross revenues totaling $351,600 during that year. Revised economic analyses, which were conducted as a result of public comment and associated revisions to the time/area closure indicate that K2 could have a direct economic impact on a total of 23 vessels (out of 256 total directed permits issued in 2003 ~ 9%) with directed shark permits. Furthermore, revised economic analyses indicate that only 8 vessels with home ports located in North Carolina reported shark landings during 2001. This revised analysis indicates that alternative K2, in a worst case scenario, will result in a 15-percent reduction in total gross revenues for the fishery as a whole and in a three-percent reduction of revenues for the small entities directly affected by the proposed closure. As such, the revised time/area closure mitigates the economic impacts by $17,956 in total gross revenues for the small entities directly affected by the closure as compared with the original preferred alternative. Additionally, fishermen could relocate and fish in another location outside of the time/area closure to mitigate some of these economic impacts.

Because alternative K3 proposes a much larger closed area that would affect all directed permit holders for both the Atlantic and the Gulf of Mexico, the economic impacts associated with this alternative are assumed to be much greater than that of alternative K2, especially in terms of significance to small entities and the fishery as a whole. Fishermen would be directly impacted by a reduction in catch and income from areas that they have traditionally relied upon. Fishing practices and behavior of fishermen would also be affected by requiring fishermen to travel further offshore. Due to greater distances traveled, fishermen would spend more time at sea, and associated costs of food, fuel, and labor could increase. This could cause some fishermen to go out of business, move to new areas, or alter fishing patterns in other ways. This alternative could result in a change in the distribution of benefits and costs, with the financial costs of operating in the fishery increasing and benefits decreasing.

While implementation of either K2 or K3 will have significant impacts for fishermen/small entities directly affected, the LCS quotas would still be taken and fishermen who currently fish in areas outside of the closure could get economic benefits associated with less competition for available quota.

6.10 Expected Economic Impacts of Preferred Bycatch Reduction, Time/area, and Commercial Management Measures Combined

The preferred alternatives (A3, B3, B4, C2, D2, J4, J5, and K2), when combined, will result in economic impacts to the fishery as a whole, some of which would be significant for small entities/vessel owners. This is especially true of preferred alternatives A3 and C2, J4, as well as K2, which will likely result in decreased economic revenues and increased economic costs via decreasing available LCS quota, requiring VMS, and implementing a revised time/area closure for dusky and sandbar sharks. However, all of these alternatives, when compared to the other alternatives described above, mitigate undesirable, or greater economic impacts associated with continued overfishing, shortened seasons, bycatch of vulnerable species, and economic instability of fishery participants and associated fishing communities in the long-term. Moreover, in response to public comment, NOAA Fisheries considered ways in which to minimize economic impacts of the preferred alternatives. The combination of these preferred alternatives is necessary for LCS to rebuild and SCS to achieve optimum yield.

6.11 Expected Economic Impacts of the EFH

NOAA Fisheries does not anticipate a change in ex-vessel prices or economic benefits as a result of implementing any of the alternatives for identifying EFH. The identification of EFH does not generally result in any management measures.

6.12 EXPECTED ECONOMIC IMPACTS OF THE EFP ADMINISTRATION

Since both alternative M1 (maintain combined permitting system) and M2 (separate permitting systems for display and research) deal with EFP administration, NOAA Fisheries does not anticipate a change in ex-vessel prices or economic benefits as a result of implementing either alternative.

Table 6.1 **Number of Atlantic Shark Permit Holders**. The actual number of permit holders are subject to changes and can vary from year to year based on participation rates.

Permit Type	Number of Permits Issued	
	October 2002	September 2003
Shark Directed Limited Access Permits	251	256
Shark Incidental Limited Access Permits	376	351
Atlantic HMS Angling Category*	9,372**	18,249
Atlantic HMS Charter/headboat	4,041	4,041
Total	14,040	22,897

* Contains all HMS permits, not shark specific.
**As of May 2003.

Table 6.2 **Number of Operating Shark Gillnet Vessels.** Source: Trent *et al*., 1997; Carlson and Lee, 1999; Carlson and Baremore, 2001; Carlson, pers comm.

Year	Number of vessels	Year	Number of vessels
1990	11	1997	unknown
1991	unknown	1998	unknown
1992	unknown	1999	4
1993	5	2000	6
1994	6	2001	6
1995	11	2002	5
1996	unknown	2003	Data not available

Table 6.3 Estimates of the Total Ex-vessel Value Gross Revenues of Atlantic Shark Fisheries as Presented in the 2003 SAFE Report. Note: Average ex-vessel prices are the average of averages and may have some weighting errors. Prices are for calendar year 2001. Sources: NOAA Fisheries, 2003.

Species	2001		
	Ex-Vessel Price ($/lb dw)	Weight (lb dw)	Fishery Value ($)
LCS	$0.91	1,474,186.7	$1,341,509.90
Pelagic Sharks	$1.11	59,896.1	$66,484.67
SCS	$0.79	45,999.0	$36,339.21
Shark Fins (weight = 5% of all sharks landed)	$19.67	79,004.1	$1,554,010.65
Total	--	--	$2,998,344.43

Table 6.4 **Economic Impacts of LCS Quota Alternatives Considered**. Sources: 2001 pelagic longline, snapper grouper, and Northeast multispecies logbook data; 2001 Shark permit data; 2001 ex-vessel prices for Atlantic sharks as reported in NOAA Fisheries, 2003.

Alternative	Baseline (1285 mt dw)	Alt C1	Alternative C2				Alternative C3		
			A3 Complex		A1/A2 Group	A4 Species	A3 Complex	A1/A2 Group	A4 Species
			Proposed in DEIS	Selected in this document					
Percent Change in Total Gross Revenues versus Baseline	--	- 24%	-14%	-21%	14%	33%	-28%	21%	16%
Total Gross Revenues for Fishery (minimum - maximum)	$2,895,521	$2,200,595 ($ 2.88 - $65,972)	$2,490,148 ($3.26 - $74,653)	$2,287,461 ($2.99 - $68,577)	$3,358,804 ($4.39 - $100,695)	$4,343,280 ($5.68 - $130,209)	$2,084,775 ($2.73 - $62,500)	$3,648,356 ($4.77 - $109,376)	$3,445,669 ($4.51 - $103,299
Average Revenues for Fishermen (minimum - maximum)	$24,129	$18,338 ($26.83 - $132,883)	$20,751 ($30.36 - $150,368)	$19,062 ($27.89 - $138,129)	$27,990 ($40.96 - $202,822)	$36,194 ($52.96 - $262,270)	$17,373 ($25.42 - $125,890)	$30,403 ($44.49 - $220,307)	$28,714 ($42.02 - $208,068)

Table 6.5 **Economic Impacts of SCS Quota Alternatives Considered**. Sources: 2001 pelagic longline, snapper grouper, and Northeast multispecies logbook data; 2001 Shark permit data; 2001 ex-vessel prices for Atlantic sharks as reported in NOAA Fisheries, 2003.

Alternative	Baseline (1760 mt dw)	Alt C1	Alternative C2	Alternative C3
			Selected in this document	
Percent Change in Total Gross Revenues versus Baseline	--	--	10%	- 17%
Total Gross Revenues for Fishery (minimum - maximum)	$36,339	$36,339 ($0.00 -$4,738)	$40,336 ($0.00 - $5,260)	$30,161 ($0.00 - $3,933)
Average Revenues for Fishermen (minimum - maximum)	$303	$303 ($0.00 - $6,369)	$336 ($0.00 - $7,070)	$251 ($0.00 - $5,286)

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No references cited.

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