Endangered Species Act- Section 7 Consultation

Biological Opinion

Agency: National Oceanic and Atmospheric Administration (NOAA). National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO)

Activity: Reinitiation of Endangered Species Act (ESA) Section 7 Consultation on the Continued Implementation of the Sea Tmtle Conservation Regulations under the ESA and the Continued Authorization of the Southeast U.S. Shrimp Fisheries in Federal Waters under the Magnuson-Stevens Fishery Management and Conservation Act (l'vfSFMCA)

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Consulting Agency: NOAA, NMFS. SERO, Protected Resources Division (F/SER3) and Sustainable Fisheries Division (F/SER2)

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6.0 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions reasonably certain to occur within the action area considered in this opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Cumulative effects from unrelated, non-federal actions occurring in the action area may affect sea turtles, smalltooth sawfish, Atlantic and Gulf sturgeon, and their habitats. Stranding data indicate sea turtles in the action area die of various natural causes, including cold stunning and hurricanes, as well as human activities, such as incidental capture in state fisheries, ingestion of and/or entanglement in debris, ship strikes, and degradation of nesting habitat. The cause of death of most sea turtles recovered by the stranding network is unknown.

The fisheries described as occurring within the action area (see Sections 3 and 4, the Status of the Species, and the Environmental Baseline, respectively) are expected to continue as described into the foreseeable future, concurrent with the proposed action. Numerous fisheries in state waters of the South Atlantic and Gulf of Mexico regions have also been known to adversely affect sea turtles, smalltooth sawfish, and Atlantic and Gulf sturgeon. The past and present impacts of these activates have been discussed in the Environmental Baseline section of this opinion. NMFS is not aware of any proposed or anticipated changes in these fisheries that would substantially change the impacts each fishery has on sea turtles, smalltooth sawfish, and Gulf sturgeon covered by this opinion.

In addition to fisheries, NMFS is not aware of any proposed or anticipated changes in other human-related actions (e.g., poaching, habitat degradation, or activities that affect water quality and quantity such as farming) or natural conditions (e.g., over-abundance of land or sea predators, changes in oceanic conditions, etc.) that would substantially change the impacts that each threat has on the sea turtles, smalltooth sawfish, and Atlantic and Gulf sturgeon covered by this opinion. NMFS will continue to work with states to develop ESA Section 6 agreements and with researchers in Section 10 permits to enhance programs to quantify and mitigate these takes. Therefore, NMFS expects that the levels of take of sea turtles, smalltooth sawfish, and Atlantic and Gulf sturgeon described for each of the fisheries and non-fisheries will continue at similar levels into the foreseeable future.

7.0 Jeopardy Analyses

The analyses conducted in the previous sections of this opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of

any ESA-listed sea turtles, smalltooth sawfish, or sturgeon species. In Section 5, we outlined how the proposed action would affect these species at the individual level and the extent of those effects in terms of the number of associated interactions, captures, and mortalities of each species to the extent possible with the best available data. Now we assess each of these species' response to this impact, in terms of overall population effects, and whether those effects of the proposed action, in the context of the status of the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), will jeopardize their continued existence.

"To jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). In making this conclusion for each species, we first look at whether there will be a reduction in the reproduction, numbers, or distribution. Then, if there is a reduction in one or more of these elements, we evaluate whether it will cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

The NMFS and USFWS's ESA Section 7 Handbook (USFWS and NMFS 1998) defines *survival* and *recovery*, as they apply to the ESA's jeopardy standard. *Survival* means "the species' persistence… beyond the conditions leading to its endangerment, with sufficient resilience to allow recovery from endangerment." Survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. *Recovery* means "improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the Act." Recovery is the process by which species' ecosystems are restored and/or threats to the species are removed so self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities.

All of our species analyses focus on the effects of lethal interactions attributed to the proposed action. Non-lethal interactions from the proposed action are not expected to have any measurable impact on the reproduction, numbers, or distribution on any species. We have approached the number of captures and mortalities conservatively to ensure that sea turtles, smalltooth sawfish, and Atlantic sturgeon that are likely to be seriously injured via interactions with shrimp trawls are counted as lethal interactions. The anticipated non-lethal interactions are not expected to impact the reproductive potential, fitness, or growth of any of the captured species because they will be released unharmed shortly after entering a trawl, or released with only minor injuries. The individuals are expected to fully recover such that no reductions in reproduction or numbers from the non-lethal interactions are anticipated. Also, since these interactions may generally occur anywhere in the action area and would be released within the general area where each individual is caught, no changes in the distribution of any affected species are anticipated.

7.1 Loggerhead Sea Turtles

In Section 5, for all Southeast shrimp fisheries combined (i.e., otter, skimmer, and pusher-head trawls and wing nets(butterfly trawls) and try nets) we produced a combined estimate of 81,358 interactions with loggerhead sea turtles annually of which 7,778 were estimated to die. However, as explained in Section 5.1.6, these estimates are all highly uncertain. The estimates rely on bycatch studies conducted in the late 1990s which even then were subject to many variables, assumptions, and biases because of data gaps. We also made many new assumptions to try and account for the effects that TED violations have on trawl sea turtle capture rates. As noted earlier, while our capture rate analysis based on boarding data was certainly reasonable, it was based on little empirical data and conservative assumptions, thus was also highly uncertain. In our synthesis of effects on sea turtles (Section 5.1.7), we more generally concluded that the proposed action is anticipated to result in at least thousands and possibly tens of thousands of loggerhead sea turtle interactions annually, of which at least hundreds and possibly thousands are expected to be lethal. The vast majority of these loggerhead sea turtles are expected to be benthic juveniles with a 30:70 male to female ratio (NMFS-SEFSC 2009b).

The lethal interactions associated with the proposed action represent a reduction in numbers. These lethal takes would also result in a future reduction in reproduction as a result of lost reproductive potential, as some of these individuals would be females who would have survived other threats and reproduced in the future, thus eliminating each female individual's contribution to future generations. For example, an adult female loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2 to 4 years, with 100 to 130 eggs per clutch. The annual loss of adult female sea turtles, on average, could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. A reduction in the distribution of loggerhead sea turtles is not expected from lethal takes attributed to the proposed action. Because all the potential interactions are expected to occur at random throughout the proposed action area and sea turtles generally have large ranges in which they disperse, the distribution of loggerhead sea turtles in the action area is expected to be unaffected.

Whether or not the reductions in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival for loggerheads depends on what effect these reductions in numbers and reproduction would have on overall population sizes and trends, i.e., whether the estimated reductions, when viewed within the context of the environmental baseline and status of the species, are to such extent that adverse effects on population dynamics are appreciable.

SEFSC (2009) estimates the adult female population size for the NW Atlantic DPS is likely between approximately 20,000 to 40,000 individuals, with a low likelihood of being up to 70,000 individuals. A more recent conservative estimate for the entire western North Atlantic population was a mean of 38,334 adult females using data from 2001-2010 (Richards et al. In Review). A much less robust estimate for total benthic females in the western North Atlantic was also obtained, with a likely range of approximately 30,000-300,000 individuals, up to less than 1 million. Further insight into the numbers of loggerhead sea turtles along the U.S. coast is available in NEFSC (2011), which reported a conservative estimate of 588,000 juvenile and adult loggerhead sea turtles present on the continental shelf from the mouth of the Gulf of St.

Lawrence to Cape Canaveral, Florida, when using only positively identified loggerhead sightings from an aerial survey. A less conservative analysis from the same study resulted in an estimate of 801,000 loggerheads in the same geographical area when a proportion of the unidentified hardshell turtles were categorized as loggerheads. This study did not include Florida's east coast south of Cape Canaveral or the Gulf of Mexico, which are areas where large numbers of loggerheads are also expected.

A detailed analysis of Florida's long-term loggerhead nesting data (1989-2012) revealed three distinct annual trends. Following a 23% increase between 1989 and 1998, nest counts declined sharply over nearly a decade. However, annual nest counts show a strong increase over the last five years. Examining only the period between the high-count nesting season in 1998 and the most recent (2012) nesting season, researchers found no demonstrable trend, indicating a reversal of the post-1998 decline. The overall change in counts from 1989 to 2012 is positive. Nest counts in 2012, corrected for subtle variation in survey effort, were slightly below the high nest count recorded in 1998. Florida accounts for more than 90% of U.S. loggerhead nesting (Florida Fish and Wildlife Conservation Commission (FWC) data, http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/).

The increasing trends on Florida core nesting beaches includes the most recent nesting season (2012), which had 58,172 loggerhead nests counted – the second highest count in 24 years. Index beaches in the Florida Panhandle, which are not part of the set of core beaches, also had high loggerhead nest counts in 2012. Following a general decline in counts since 1997 when surveys of Panhandle index beaches began, the 2012 season had the highest number recorded in 16 years of nest counts.

Southeast shrimp fisheries have been taking large numbers of loggerheads sea turtles for decades. Our loggerhead bycatch estimates cannot be compared directly to the old 2002 estimates because of changing assumptions (e.g., capture rates associated with documented compliance versus a 100% compliance assumption) and incorporation of additional gear types (i.e., skimmer trawls and try nets). However, some inferences about anticipated effects relative to past effects can be made by recognizing those differences. First, our 2002 estimates were unrealistically low because they assumed 100% compliance with sea turtle conservation regulations which we have demonstrated has very likely never been the case. Anticipated TED compliance levels are at least the same, and more likely much better, than past average levels. Also, overall effort and otter trawl effort in Southeastern shrimp fisheries are expected to remain near 2009 levels, which were undeniably substantially lower than in past decades. Anticipated skimmer trawl effort levels are also anticipated to remain near recent levels.

The question we are left with for this analysis is whether the effects of the proposed action are too much, given the current status of the species and predicted population trajectories, and taking into account the impacts of the DWH oil release event, which are expected to have created at least a temporary change in the environmental baseline for the action area.

As described in the Environmental Baseline section, we believe that the DWH oil release event had an adverse impact on loggerhead sea turtles, and resulted in mortalities to an unquantified number of individuals, along with unknown lingering impacts resulting from nest relocations,

non-lethal exposure, and foraging resource impacts. However, there is no information to indicate, or basis to believe, that a significant population-level impact has occurred that would have changed the species' status to an extent that the expected interactions from Southeast shrimp fisheries would result in a detectable change in the population status of the NWA DPS of loggerhead turtles. This is especially true given the size of the population and that, unlike Kemp's ridleys, the NWA DPS is proportionally much less intrinsically linked with the Gulf of Mexico.

It is possible that the DWH oil release event reduced that survival rate of all age classes to varying degrees, and may continue to do so for some undetermined time into the future. However, there is no information at this time that it has, or should be expected to have, substantially altered the long-term survival rates in a manner that would significantly change the population dynamics compared to the conservative estimates used in this opinion. Any impacts are not thought to alter the population status to a degree in which the number of mortalities from the proposed action could be seen as reducing the likelihood of survival and recovery of the species.

We believe that the incidental take and resulting mortality of loggerhead sea turtles associated with the proposed action are not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA DPS of loggerhead sea turtles. We believe the current population is large (i.e., several hundred thousand individuals) and is showing encouraging signs of stabilizing and possibly increasing. Over at least the next several decades, we expect the western North Atlantic population to remain large (i.e., hundreds of thousands of individuals) and to retain the potential for recovery, and that the proposed action will not cause the population to lose genetic heterogeneity, broad demographic representation, or successful reproduction, nor affect loggerheads' ability to meet their lifecycle requirements, including reproduction, sustenance, and shelter.

The Services' recovery plan for the Northwest Atlantic population of the loggerhead turtle (NMFS and USFWS 2008a) which is the same as the NWA DPS, provides additional explanation of the goals and vision for recovery for this population. The objectives of the recovery plan most pertinent to the threats posed by the proposed action are numbers 1, 2, 10, and 11:

1. Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females.
2. Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes.

10. Minimize bycatch in domestic and international commercial and artisanal fisheries.
11. Minimize trophic changes from fishery harvest and habitat alteration.

The recovery plan anticipates that, with implementation of the plan, the western North Atlantic population will recover within 50 to 150 years, but notes that reaching recovery in only 50 years would require a rapid reversal of the then declining trends of the Northern, Peninsular Florida, and Northern Gulf of Mexico Recovery Units. The recovery plan includes 8 different recovery actions directly related to the proposed action of this opinion.

Priority 1 actions (i.e., actions that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future) include:

- Monitor and reduce effort in the domestic commercial shrimp trawl fishery to minimize loggerhead bycatch (Priority 1).

Priority 2 actions (i.e., actions that must be taken to prevent a significant decline in species population/habitat quality or some other significant impacts short of extinction) include:

- Increase observer coverage to a statistically robust level to adequately monitor bycatch levels in the domestic commercial shrimp fishery and modify TED regulations if necessary.
- Promulgate regulations to require TEDs in all try nets in the domestic commercial shrimp fishery.
- Implement statistically valid observer programs to determine bycatch levels in domestic commercial skimmer trawl fisheries and require TEDs if necessary.
- Investigate turtle exclusion rates for soft TEDs under field conditions using videography.
- Investigate the physiological effects of multiple captures and exclusions of loggerheads in domestic commercial shrimp trawls equipped with TEDs.

Priority 3 actions (i.e., actions necessary to provide for full recovery of the species) include:

- Continue efforts to educate domestic commercial shrimp fishers on the proper installation and use of larger-opening TEDs.
- Describe and characterize domestic commercial and recreational shrimp trawl fisheries.

Recovery is the process of removing threats so self-sustaining populations persist in the wild. The sea turtle conservation regulations support or implement the Service's recovery plan developed for the NWA loggerhead DPS (NMFS and USFWS 2008a). The proposed action would not impede progress on carrying out any aspect of the recovery program or achieving the overall recovery strategy. The recovery plan estimates that the population will reach recovery in 50 to 150 years, as recovery actions are implemented. The minimum end of the range assumes a rapid reversal of the current declining trends; the higher end assumes that additional time will be needed for recovery actions to bring about population growth.

Recovery objective 1, "Ensure that the number of nests in each recovery unit is increasing…," is the plan's overarching objective and has associated demographic criteria. Currently, none of the plan's criteria are being met, but the plan acknowledges that it will take 50-150 years to do so. Further reduction of multiple threats throughout the North Atlantic, Gulf of Mexico, and Greater Caribbean will be needed for strong, positive population growth, following implementation of more of the plan's actions. However, we believe that because the effects of the proposed action would be less than those previously associated with Southeast shrimp fisheries, they would not appreciably reduce the likelihood of a recovery that is not anticipated for 50-150 years. Both the Peninsular Florida Recovery Unit, the largest loggerhead nesting assemblage in the Northwest Atlantic, and the Northern Florida Recovery Units are showing encouraging signs of increasing.

Continuation of the proposed action is not believed to be counter to the recovery plan's objective 10, "minimize bycatch in domestic and international commercial and artisanal fisheries." While the proposed action does not reduce interactions in Southeast shrimp fisheries, it is designed to further minimize the impact of those interactions. Therefore, we believe that the effects on loggerhead turtles associated with the proposed action are not reasonably expected to cause an appreciable reduction in the likelihood of recovery of the NWA loggerhead DPS, even in light of the impacts of the DWH oil release event.

Conclusion
In conclusion, we believe that the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of the NWA loggerhead DPS in the wild. This analysis has been conducted in light of the most recently available information on its status as well as the environmental baseline that describes the environmental conditions that impact them, including what information we currently have available on the recent DWH oil spill event. The remaining impacts from the proposed action will not appreciably affect the population's persistence into the future or its potential for recovery.

7.2 Green Sea Turtles

In Section 5, for all Southeast shrimp fisheries combined (i.e., otter, skimmer, and pusher-head trawls and wing [butterfly] nets and try nets) we produced a combined estimate of 13,910 interactions annually of which 1,543 were estimated to die. However, as explained in Section 5.6, these estimates are highly uncertain. In addition to the problems noted for our loggerhead sea turtle estimates, these estimates are based on the assumption that CPUE and population growth rate are linearly related, which is of questionable validity (see Section 5.1.6 for more detail). Thus, in our synthesis of effects on sea turtles (Section 5.1.7), we more generally concluded that the proposed action is anticipated to result in at least thousands and possibly tens of thousands of green sea turtle interactions annually, of which at least hundreds and possibly thousands are expected to be lethal.

Lethal interactions would reduce the number of green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Lethal interactions would also result in a potential reduction in future reproduction, assuming some individuals would be females and would have survived otherwise to reproduce. For example, an adult green sea turtle can lay 1-7 clutches (usually 2-3) of eggs every 2 to 4 years, with 110-115 eggs/nest of which a small percentage is expected to survive to sexual maturity. The anticipated lethal interactions are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of green sea turtles is expected from these takes. Whether the reductions in numbers and reproduction of these species would appreciably reduce their likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends.

The 5-year status review for green sea turtles states that of the seven green sea turtle nesting concentrations in the Atlantic Basin for which abundance trend information is available, all were

determined to be either stable or increasing (NMFS and USFWS 2007a). That review also states that the annual nesting female population in the Atlantic basin ranges from 29,243-50,539 individuals. Additionally, the pattern of green sea turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in Florida in 1989. An average of 5,039 green turtle nests were laid annually in Florida between 2001 and 2006 with a low of 581 in 2001 and a high of 9,644 in 2005 (NMFS and USFWS 2007a). Data from the index nesting beaches program in Florida substantiate the dramatic increase in nesting. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008, further dropping under 3,000 in 2009, but that consecutive drop was a temporary deviation from the normal biennial nesting cycle for green turtles, as 2010 saw an increase back to 8,426 nests on the index nesting beaches (FWC Index Nesting Beach Survey Database). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica, population growing at 4.9% annually.

We believe the proposed action is not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of the green sea turtle in the wild. Although the anticipated mortalities would result in an instantaneous reduction in absolute population numbers, the U.S. populations of green sea turtles would not be appreciably affected. For a population to remain stable, sea turtles must replace themselves through successful reproduction at least once over the course of their reproductive lives, and at least one offspring must survive to reproduce itself. If the hatchling survival rate to maturity is greater than the mortality rate of the population, the loss of breeding individuals would be exceeded through recruitment of new breeding individuals from successful reproduction in the overall population. Since the abundance trend information for green sea turtles is clearly increasing, in spite of the fact that the shrimp fishery has been operating and adversely affecting the population for decades, we believe the lethal interactions attributed to the proposed action will not have any measurable effect on that trend.

As described in the Environmental Baseline section, although the DWH oil spill is expected to have resulted in adverse impacts to green turtles, there is no information to indicate, or basis to believe, that a significant population-level impact has occurred that would have changed the species' status to an extent that the expected interactions from Southeast shrimp fisheries would result in a detectable change in the population status of green turtles in the Atlantic. Any impacts are not thought to alter the population status to a degree in which the number of mortalities from the proposed action could be seen as reducing the likelihood of survival and recovery of the species.

The Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) lists the following relevant recovery objectives over a period of 25 continuous years:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years;
    - Green sea turtle nesting in Florida between 2001-2006 was documented as follows: 2001 – 581 nests; 2002 – 9,201 nests; 2003 – 2,622 nests; 2004 – 3,577 nests; 2005 – 9,644 nests; 2006 – 4,970 nests. The average is 5,039 nests annually over those 6

years (2001-2006) (NMFS and USFWS 2007a). Subsequent nesting has shown even higher average numbers (i.e., 2007 – 9,455 nests; 2008 – 6,385 nests; 2009 – 3, 000 nests; 2010 – 8,426 nests; 2011 – 10,701 nests), thus, this recovery criteria continues to be met.

- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.
    - Several actions are being taken to address this objective; however, there are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds have increased by at least the same amount. This opinion's effects analysis assumes that in-water abundance has increased at the same rate as Tortuguero nesting (i.e., growing 4.9% annually).

The recovery plan includes three different recovery actions directly related to the proposed action of this opinion: (1) Implement and enforce TED regulations (Priority 1), (2) Promulgate regulations to reduce fishery related mortality (Priority 2), and (3) Provide technology transfer for installation and use of TEDs (Priority). The proposed action does all of these things, thus supports continued implementation of the recovery plan.

Lethal interactions of green sea turtles attributed to the proposed action are not likely to reduce population numbers over time due to current population sizes and expected recruitment. Despite the higher level of lethal interactions that occurred in the past, we have still seen positive trends in the status of this species. Thus, the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of green sea turtles' recovery in the wild.

Conclusion
In conclusion, we believe that the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of green sea turtles in the wild.

7.3 Hawksbill Sea Turtles

Hawksbill sea turtles are the least affected sea turtle species by the proposed action. While we could not estimate the number of total hawksbill sea turtle interactions with the available data, we did produce an estimate of the number of lethal interactions; we conservatively estimated that no more than 71 mortalities would occur as a result of the proposed action. As noted in our effects analysis, while we did attempt to limit the records included to those that could possibly be attributed to shrimp fisheries, it is likely that some and possibly most of these records are really attributable to other causes.

The possible lethal interactions of 71 hawksbill sea turtles would reduce the number of hawksbill sea turtles, compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. Potential lethal interactions could also result in a reduction in future reproduction, assuming one or more individuals would be female and would survive otherwise to reproduce in the future. For example, an adult hawksbill sea

turtle can lay 3-5 clutches of eggs every few years (Meylan and Donnelly 1999; Richardson et al. 1999) with up to 250 eggs/nest (Hirth 1980). Thus, the loss of any females could preclude the production of thousands of eggs and hatchlings, of which a fraction would otherwise survive to sexual maturity and contribute to future generations. Sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of hawksbill sea turtles is expected from these takes. Likewise, as explained in the Environmental Baseline section, while a few individuals were found to have been impacted by the Deepwater Horizon oil event, there is no information to indicate, or basis to believe, that a significant population-level impact has occurred that would have changed the species' status to an extent that the expected interactions from Southeast shrimp fisheries would result in a detectable change in the population status of hawksbill turtles in the Atlantic. Any impacts are not thought to alter the population status to a degree in which the number of mortalities from the proposed action could be seen as reducing the likelihood of survival and recovery of the species.

We believe hawksbill sea turtles have a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. There are currently no reliable estimates of population abundance and trends for non-nesting hawksbills at the time of this consultation; therefore, nesting beach data is currently the primary information source for evaluating trends in abundance. Mortimer and Donnelly (2008) found that nesting populations in the Atlantic (especially in the Insular Caribbean and Western Caribbean Mainland), 9 of the 10 sites with recent data (within past 20 years), showed recent nesting increases were located in the Caribbean. These increases have been observed in spite of the fact that the shrimp fishery has been operating and adversely affecting the population for decades. Since the number of interactions is expected to be no greater than has occurred in recent years, and much lower than had been occurring in past decades, we believe the proposed action will not result in an appreciable reduction in the likelihood of hawksbill sea turtles' survival in the wild.

The Recovery Plan for the population of the hawksbill sea turtles (NMFS and USFWS 1993) lists the following relevant recovery objectives over a period of 25 continuous years:

- The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests at five index beaches, including Mona Island and Buck Island Reef National Monument.
- The numbers of adults, sub-adults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, USVI, and Florida.

The recovery plan lists six major actions that are needed to achieve recovery, including:

- Provide long-term protection to important nesting beaches.
- Ensure at least 75% hatching success rate on major nesting beaches.
- Determine distribution and seasonal movements of turtles in all life stages in the marine environment.

- Minimize threat from illegal exploitation.
- End international trade in hawksbill products.
- Ensure long-term protection of important foraging habitats

Of the hawksbill sea turtle rookeries regularly monitored—Jumby Bay (Antigua/Barbuda), Barbados, Mona Island (Puerto Rico), and Buck Island Reef National Monument (USVI), all show increasing trends in the annual number of nests (NMFS and USFWS 2007b). In-water research projects at Mona Island, Puerto Rico, and the Marquesas, Florida, which involve the observation and capture of juvenile hawksbill turtles, are underway. Although there are 15 years of data for the Mona Island project, abundance indices have not yet been incorporated into a rigorous analysis or a published trend assessment. The time series for the Marquesas project is not long enough to detect a trend (NMFS and USFWS 2007b).

Unlike the case for other sea turtle species, none of the major actions specified for recovery are specific to shrimp bycatch or even fishery bycatch in general. While incidental capture in commercial and recreational fisheries is listed as one of the threats to the species, the only related action, "Monitor and reduce mortality from incidental capture in fisheries" is ranked as a priority 3.

The potential effects on hawksbill sea turtles from the proposed action are not likely to reduce overall population numbers over time due to current population sizes and expected recruitment and the relatively low impact of shrimp fisheries on hawksbills. Our estimate of potential future mortalities is based our belief that the same level of take occurred in the past, and with that level we have still seen positive trends in the status of these species. Thus, we believe the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of hawksbill sea turtles' recovery in the wild.

Conclusion
In conclusion, we believe that the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of Hawksbill sea turtles in the wild.

7.4 Kemp's Ridley Sea Turtles

In Section 5, for all Southeast shrimp fisheries combined (i.e., otter, skimmer, and pusher-head trawls and wing [butterfly] nets and try nets), we produced a combined estimate of 430,787 Kemp's ridley sea turtle interactions annually of which 44,257 were estimated to die. However, as explained in Section 5.6, these estimates are highly uncertain. As with green sea turtles, in addition to the problems noted for our loggerhead sea turtle estimates, these estimates are based on the assumption that CPUE and population growth rate are linearly related which is of questionable validity (see Section 5.1.6 for more detail). Thus, in our synthesis of effects on sea turtles (Section 5.1.7), we more generally concluded that the proposed action is estimated to result in at least tens of thousands and possibly hundreds of thousands of Kemp's ridley sea turtle interactions, of which thousands and possibly tens of thousands are expected to be lethal annually. The vast majority of these Kemp ridley sea turtles are expected to be benthic juveniles because their benthic foraging habitat overlaps with the shrimp fishery.

The proposed action would reduce the species' population compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. The proposed action could also result in a potential reduction in future reproduction, assuming at least some of these individuals would be female and would have survived to reproduce in the future. The annual loss of adult females could preclude the production of thousands of eggs and hatchlings, of which a small percentage is expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a reduction in sea turtle reproduction. The anticipated takes are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of Kemp's ridley sea turtles is expected from the take of these individuals.

Concentrated in the shallow waters of the Gulf of Mexico and Atlantic coast where shrimp pressure is also concentrated, Kemp's ridley sea turtles are the species most affected by shrimp trawls.

Whether the reductions in numbers and reproduction of Kemp's ridley sea turtles would appreciably reduce their likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends.

Heppell et al. (2005) predicted in a population model that the Kemp's ridley sea turtle population is expected to increase at least 12-16% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2015. NMFS et al. (2011b) contains an updated model which predicts that the population is expected to increase 19% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesters on the beach, based on an average 2.5 nests/nesting female. In 2009 the population was on track with 21,144 nests, but an unexpected and as yet unexplained drop in nesting occurred in 2010 (13,302), deviating from the NMFS et al. (2011b) model prediction. A subsequent increase to 20,570 nests in 2011 occurred and then a record high of 21,797 occurred in 2012, but in 2013 there was a second significant decline, with only 16,385 nests recorded (Gladys Porter Zoo nesting database 2013. We will not know if the population is continuing the general trajectory predicted by the model until future nesting data are available. Of course, this updated model assumes that current survival rates within each life stage remain constant. The recent increases in Kemp's ridley sea turtle nesting seen in the last two decades is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of TEDs, reduced trawling effort in Mexico and the U.S., and possibly other changes in vital rates (TEWG 1998; TEWG 2000a). While these results are encouraging, the species' limited range as well as low global abundance makes it particularly vulnerable to new sources of mortality as well as demographic and environmental stochasticity, all of which are often difficult to predict with any certainty.

Kemp's ridleys mature and nest at an age of 7-15 years, which is earlier than other sea turtles. A younger age at maturity may be a factor in the response of this species to recovery actions. The required use of TEDs in shrimp trawls in the United States under the sea turtle conservation regulations and in Mexican waters as required by their federal regulations has had dramatic

effects on the recovery of Kemp's ridley sea turtles. Kemp's ridley sea turtles total mortality (all sources) declined by about one-third with the early implementation of TEDs. After 1996, with our TED regulations improvement in 1995 and 1996 focused on effectiveness for Kemp's and our improved enforcement and outreach (requirements of a 1994 RPA), mortality declined by almost 60% compared to pre-TED levels.

Although the number of mortalities attributed to shrimp trawls may be very large, clearly the population is able to compensate for that mortality, given such high predictions.

It is likely that the Kemp's ridley sea turtle was the sea turtle species most affected by the DWH oil spill on a population level. In addition, the sea turtle strandings documented in 2011-2013 in Alabama, Louisiana, and Mississippi primarily involved Kemp's ridley sea turtles (see Environmental Baseline section). Nevertheless, the effects on Kemp's ridley sea turtles from the proposed action are not likely to appreciably reduce overall population numbers over time due to current population sizes, expected recruitment, and continuing strong nesting numbers relative to the past decade, even in light of the adverse impacts expected to have occurred from the DWH oil spill and the strandings documented in 2011-2013. The proposed action is expected to further reduce the effects of Southeast shrimp fisheries from past levels. It is worth noting that despite higher levels of effects in the past, we have still seen tremendous growth in the population. Thus, we believe the proposed action is will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' survival in the wild.

The recovery plan for the Kemp's ridley sea turtle (NMFS et al. 2011b) lists the following relevant recovery objectives:

- A population of at least 10,000 nesting females in a season (as measured by clutch frequency per female per season) distributed at the primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) in Mexico is attained. Methodology and capacity to implement and ensure accurate nesting female counts have been developed.

NMFS and USFWS (2011b) states "the highest priority needs for Kemp's ridley recovery are to maintain and strengthen the conservation efforts that have proven successful. In the water, successful conservation efforts include maintaining the use of TEDs in fisheries currently required to use them, expanding TED use to all trawl fisheries of concern, and reducing mortality in gillnet fisheries. Adequate enforcement in both the terrestrial and marine environment also is also noted essential to meeting recovery goals."

We believe the proposed action supports the recovery objectives above and will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' recovery in the wild.

The recovery plan states average nests per female is 2.5 and the recovery goal of 10,000 nesting females is associated with 25,000 nest. About 30,000 nests are indicative of 10,000 nesting females in a season (NMFS and USFWS 2007c). As of February 2011, 13,302 nests had been observed in the State of Tamaulipas, Mexico (Gladys Porter Zoo 2011). A small nesting population is emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 128 in 2007, to a record high of 209 nests in 2012 (National Park Service data

http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm).

The estimated number of interactions provided in Section 5 is highly uncertain and is unlikely to accurately represent actual interactions occurring in shrimp trawls in the Southeast. Assuming, as a worst case scenario, that the conservative approach taken in the analysis is accurate, and the numbers accurately reflect what is actually occurring, the interactions represent large numbers of animals. Based on what we know about historical shrimp trawling effort, i.e., that there has been much higher effort in the recent past, it is likely that even larger numbers of turtles were being impacted by shrimp trawls for the past decade or more. Despite this fact, estimated population size has continued to increase.

Conclusion
In conclusion, we believe that the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of Kemp's ridley sea turtles in the wild.

7.5 Leatherback Sea Turtles

In Section 5, for all Southeast shrimp fisheries combined (i.e., otter, skimmer, and pusher-head trawls and wing (butterfly) and try nets) we produced a combined estimate of 1,427 leatherback interactions annually of which 144 were estimated to die. However, as explained in Section 5.6, these estimates are highly uncertain. The estimates rely on bycatch studies conducted in the late 1990s which even then were subject to many variables, assumptions, and biases because of data gaps. We also made many new assumptions to try and account for the effects that TED violations have on trawl sea turtle capture rates. As noted earlier, while our capture rate analysis based on boarding data was certainly reasonable, it was based on little empirical data and conservative assumptions, thus was also highly uncertain. Thus, in our synthesis of effects on sea turtles (Section 5.1.7), we more generally concluded that the proposed action is anticipated to result in a relatively small number of leatherback sea turtle lethal interactions compared to Kemp's ridley and loggerhead sea turtles. Due to the offshore habits of leatherback sea turtles, these interactions are anticipated to only occur in shrimp otter trawls.

The lethal take of leatherback sea turtles would reduce their respective populations compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. The lethal takes could also result in a potential reduction in future reproduction, assuming one or more of these individuals would be female and would have survived otherwise to reproduce in the future. For example, an adult female leatherback sea turtle can produce up to 700 eggs or more per nesting season (Schultz 1975). Although a significant portion (up to approximately 30%) of the eggs can be infertile, the annual loss of adult female sea turtles, on average, could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. Thus, the death of any female leatherbacks that would have survived otherwise to reproduce would eliminate its and its future offspring's contribution to future generations. The anticipated lethal interactions are expected to occur anywhere in the offshore portion of the action area. Given

these sea turtles generally have large ranges in which they disperse, no reduction in the distribution of leatherback sea turtles is expected from the proposed action.

Whether the estimated reductions in numbers and reproduction of these species would appreciably reduce their likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends.

The Leatherback Turtle Expert Working Group estimates there are between 34,000-95,000 total adults (20,000-56,000 adult females; 10,000-21,000 nesting females) in the North Atlantic. Of the five leatherback populations or groups of populations in the North Atlantic, three show an increasing or stable trend (Florida, Northern Caribbean, and Southern Caribbean). This includes the largest nesting population, located in the Southern Caribbean at Suriname and French Guiana. Of the remaining two populations, there is not enough information available on the West African population to conduct a trend analysis, and, for the Western Caribbean, a slight decline in annual population growth rate was detected (TEWG 2007). An annual growth rate of 1.0 is considered a stable population; the growth rates of two nesting populations in the Western Caribbean were 0.98 and 0.96 (TEWG 2007).

We believe the proposed action is not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of leatherback sea turtles in the wild. Although the anticipated mortalities would result in a reduction in absolute population numbers, it is not likely this reduction would appreciably reduce the likelihood of survival of this sea turtle species. If the hatchling survival rate to maturity is greater than the mortality rate of the population, the loss of breeding individuals would be replaced through recruitment of new breeding individuals from successful reproduction of sea turtles unaffected by the proposed action. Considering that nesting trends for the Florida and Northern Caribbean populations and the largest nesting population, the Southern Caribbean population, are all either stable or increasing, we believe the proposed action is not likely to have any measurable effect on overall population trends. These trends already reflect the past impact of Southeastern shrimp fisheries and the proposed action is expected to control those impacts by maintaining compliance levels. As explained in the Environmental Baseline section, although no direct leatherback impacts (i.e., oiled turtles or nests) from the DWH oil spill in the northern GOM were observed, some impacts from that event may be expected. However, there is no information to indicate, or basis to believe, that a significant population-level impact has occurred that would change the species' status to an extent that the expected interactions from southeast shrimp fisheries would result in a detectable change in the population status of leatherback sea turtles. Any impacts are not thought to alter the population status to a degree in which the number of mortalities from the proposed action could be seen as reducing the likelihood of survival and recovery of the species.

The Atlantic recovery plan for the U.S. population of the leatherback sea turtles (NMFS and USFWS 1992a) lists the following relevant recovery objective:

- The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico; St. Croix, USVI; and along the east coast of Florida.

We believe the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of leatherback sea turtles' recovery in the wild.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, nesting increased in Puerto Rico from a minimum of 9 nests recorded in 1978 and to 469-882 nests recorded each year between 2000 and 2005. Annual growth rate was estimated to be 1.1 with a growth rate interval between 1.04 and 1.12, using nest numbers between 1978 and 2005 (NMFS and USFWS 2007d).

In the U.S. Virgin Islands, researchers estimated a population growth of approximately 13% per year on Sandy Point National Wildlife Refuge from 1994 through 2001. Between 1990 and 2005, the number of nests recorded has ranged from 143 (1990) to 1,008 (2001). The average annual growth rate was calculated as approximately 1.10 (with an estimated interval of 1.07 to 1.13) (NMFS and USFWS 2007d)

In Florida, a Statewide Nesting Beach Survey program has documented an increase in leatherback nesting numbers from 98 (1989) to 800-900 (early 2000s). Based on standardized nest counts made at Index Nesting Beach Survey sites surveyed with constant effort over time, there has been a substantial increase in leatherback nesting in Florida since 1989. The estimated annual growth rate was approximately 1.18 (with an estimated 95% interval of 1.1 to 1.21) (NMFS and USFWS 2007d).

Lethal interactions of leatherback sea turtles from the proposed action are not likely to reduce population numbers over time due to current population sizes and expected recruitment. Additionally, our estimate of future take is expected to be less than the level of take that occurred in past decades. It is worth noting that despite that past higher level of take, we have still seen stable or increasing trends in the status of the species in most Atlantic populations.

Conclusion

In conclusion, we believe that the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of leatherback sea turtles in the wild.

7.6 Smalltooth Sawfish

The loss of up to 105 smalltooth sawfish from the proposed action every three years would represent a reduction in numbers. These lethal interactions would also result in a reduction in future reproduction, presuming some of the individuals taken would be female and would have survived other threats and reproduced in the future. An adult female smalltooth sawfish may have a litter of approximately 10 pups probably every two years, and because smalltooth sawfish produce more well-developed young, it is likely that some portion of these pups would have survived. Thus, the death of any females eliminates any individual's contribution to future generations, and the proposed action would result in a reduction in future smalltooth sawfish reproduction. A reduction in the distribution of the smalltooth sawfish is not expected as the anticipated lethal interactions are expected to be dispersed throughout the range of smalltooth sawfish that overlaps with the proposed action (i.e. mainly off Florida and the Florida Keys).

Although lethal take of 105 smalltooth sawfish every three years will result in an instantaneous reduction in absolute population numbers, we believe these mortalities associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of the U.S. DPS population of smalltooth sawfish in the wild. This is because we do not believe these mortalities will have any measurable effect on these trends. The taking of 105 sub-adult/adult animals is significant for a population that is currently estimated to be at a level less than 5% of its size at the time of the European settlement. However, available data summarized in Section 3 indicates the smalltooth sawfish population is stable or increasing (Carlson and Osborne 2012a). Using a demographic approach and life history data from similar species, Simpfendorfer (2000) estimates the most likely range for the intrinsic rate of increase is 0.08 per year to 0.13 per year with population doubling times of 10.3 to 13.5 years. Although this rate is very slow, the lethal take of 105 sub-adult/adult males or females over a 3-year period is not expected to have any measureable impact on this rate of population doubling-time. This is because effort and associated smalltooth sawfish mortality in the federal shrimp has decreased significantly from the amount that existed when that doubling rate was measured. Even with the ongoing fishing activities associated with the federal shrimp fishery, the smalltooth sawfish population still remains stable or increasing (Carlson and Osborne 2012a).

Whether the reduction in numbers and reproduction of smalltooth sawfish attributed to the proposed action would appreciably reduce the species' likelihood of recovering depends on the probable effect the changes in numbers and reproduction would have on the population's growth rate, and whether the growth rate would allow the species to recover. Although lethal take will result in an instantaneous reduction in absolute population numbers, the U.S. DPS population of smalltooth sawfish would not be appreciably affected. The lethal taking of 105 sub-adult/adult animals is significant for a population that is currently estimated to be at a level less than 5% of its size at the time of the European settlement. Available data summarized in Section 3 indicates the smalltooth sawfish population is stable or increasing (Carlson and Osborne 2012a). Using a demographic approach and life history data from similar species, Simpfendorfer (2000) estimates the most likely range for the intrinsic rate of increase is 0.08 per year to 0.13 per year with population doubling times of 10.3 to 13.5 years. Although this rate is very slow, the lethal take of 105 sub-adult/adult males or females over a 3-year period is not expected to have any measureable impact on this rate of population doubling-time. This is because effort and associated smalltooth sawfish mortality in the federal shrimp has decreased significantly from the amount that existed when that doubling rate was measured. Even with the ongoing fishing activities associated with the federal shrimp fishery, the smalltooth sawfish population still remains stable or increasing (Carlson and Osborne 2012a).

The following analysis considers the effects of the take on the likelihood of recovery in the wild. The U.S. DPS of Smalltooth Sawfish Recovery Plan (NMFS 2009d) identifies two relevant recovery objectives over a period of 100 years:

- Minimize human interactions and associated injury and mortality.

Ensure smalltooth sawfish abundance increases substantially and the species reoccupies areas from which it had been previously extirpated. The Recovery Plan anticipates that, with full

implementation of the Recovery Plan, the U.S. DPS of smalltooth sawfish will recover within 100 years. The Recovery Plan includes multiple recovery actions that are particularly relevant to the proposed action of this opinion:

1.1.1 Monitor the take and fate of the species in commercial and recreational fisheries throughout the species' range.

1.1.2 Improve the capacity and geographic coverage of the sawfish encounter data collection program to enable full investigation, review, and evaluation of each report of smalltooth sawfish fishery interactions.

1.1.3 Determine the post-release mortality of smalltooth sawfish from various types of fishing gear.

1.1.4 Integrate collection of data on smalltooth sawfish into current commercial fishery observer programs and implement new programs where required.

1.1.6 Implement and adequately fund observer programs over the long term.

1.1.7 Use PVA or other types of population models to evaluate the effect of fishery takes on the species' viability.

1.1.8 Implement strategies to reduce bycatch, mortality, and injury, in specific fisheries to ensure the species' viability.

1.1.15 Monitor trawl fisheries to ensure they do not threaten the viability of the population.

1.1.16 Investigate fishing devices, gear modifications, and techniques (physical, electronic, chemical, net configuration, etc.) that reduce the likelihood of sawfish capture, improve the chances of sawfish escapement, minimize harm to sawfish and humans from capture, and facilitate successful release of healthy sawfish.

1.1.17 Recommend the use of fishing devices, gear modifications, and/or techniques found to be effective at reducing bycatch of smalltooth sawfish and/or mitigating the effects of capture in areas frequented by sawfish, other important sawfish habitats, and in trawl fisheries encountering significant numbers of sawfish.

1.3.3 Develop, distribute, and implement Safe Handling and Release Guidelines for smalltooth sawfish for recreational and commercial fisheries to minimize interactions, injury, and mortality.

2.3.2 Investigate short-term movement patterns of adult sawfish to provide information on habitat use patterns.

2.3.4 Investigate seasonal patterns of occurrence and habitat use of adults.

2.3.6 Monitor abundance of adult smalltooth sawfish in aggregation areas.

3.2.1 Assess the east and west coasts of Florida to determine the most appropriate location and timing of surveys for adult smalltooth sawfish.

3.2.2 Evaluate fishery observer programs to determine their suitability to act as surveys of relative abundance of adult smalltooth sawfish.

3.2.4 Conduct regular surveys to determine the relative abundance of smalltooth sawfish off the east and west coasts of Florida.

3.2.5 Analyze annual relative abundance data for adult smalltooth sawfish and determine if it meets the criteria in Objective 3.

3.2.6 Conduct tagging studies, potentially using satellite and/or archival technology, to study seasonal migrations along the U.S. East Coast and within the Gulf of Mexico.

3.2.7 Continue existing effective sawfish encounter reporting systems with outreach efforts throughout the historic range, with special efforts focused on the north central Gulf of Mexico, Georgia, South Carolina, and North Carolina.

NMFS is currently funding several actions identified in the Recovery Plan for smalltooth sawfish; adult satellite tagging studies, the NSED, and monitoring take in commercial fisheries. Additionally, NMFS has developed safe handling guidelines for the species. Despite the ongoing threats from the federal shrimp fisheries, we have still seen a stable or slightly increasing trend in the status of this species. Thus, the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of the U.S. DPS of smalltooth sawfish's recovery in the wild.

Conclusion
NMFS must continue to monitor the status of the population to ensure the species continues to recover. Based on the best available information, we conclude the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of US DPS of smalltooth sawfish in the wild.

7.7 Atlantic sturgeon

Our jeopardy focuses on the federal fishery because that's the only place where adverse effect from the proposed action area expected. Effects from the sea turtle conservation regulations are expected to be solely beneficial.

The expected lethal capture of up to nine Atlantic sturgeon by the South Atlantic shrimp fishery in federal waters, with one to seven lethal captures of Atlantic sturgeon originating from each of the five DPSs, would result in a reduction in numbers within each DPS. These lethal interactions

would also result in a reduction in their future reproduction, if some of the individuals taken would be female and would have survived other threats and reproduced in the future. With that exception, the proposed action is not likely to cause a reduction in reproduction. Atlantic sturgeon spawn in the far upstream portions of rivers, while the federal shrimp fishery in the South Atlantic occurs at least 3 miles offshore. Changes in the distribution of Atlantic sturgeon are also not expected from lethal takes attributed to the proposed action. Because all of the potential interactions are expected to occur at random throughout the proposed action area and Atlantic sturgeon are known to disperse widely in the marine environment, the distribution of Atlantic sturgeon in the action area is expected to be unaffected. Additionally, shrimping in federal waters is not expected to have adverse effects on marine habitat utilized by Atlantic sturgeon and will have no effect on spawning, nursery, or foraging habitat found in rivers and estuaries.

We do not believe the reductions in numbers resulting from the proposed action are likely to reduce the population's ability to persist into the future. The majority of Atlantic sturgeon interacting with otter trawl gear in the South Atlantic shrimp fishery in federal waters are expected to survive, with little or no injury, because of the ability of Atlantic sturgeon to evade capture by escaping through TEDs. No mortality is anticipated in try nets. The loss of such small numbers of individuals will not significantly decrease the overall populations of the DPSs. Based on this information, the proposed action will not appreciably reduce the likelihood of the five Atlantic sturgeon DPS's survival within their ranges.

Because of the recent listing of the five DPSs of Atlantic sturgeon, a recovery plan for the species has not yet been developed. However, recovery is the process by which listed species and their ecosystems are restored, and their future is safeguarded to the point that protections under the ESA are no longer needed. The first step in recovering a species is to reduce identified threats; only by alleviating threats can lasting recovery be achieved. An increase in the population to a size that maintains a steady recruitment of individuals representing all life stages would provide population stability and enable the population to sustain itself even in the event of unforeseen and unavoidable impacts. Major threats affecting the five Atlantic sturgeon DPSs were summarized in the final listing and include:

1) Dredging that can displace sturgeon while it is occurring and affect the quality of the habitat afterwards by changing the depth, sediment characteristics, and prey availability.

2) Degraded water quality in areas throughout the range of the five DPSs as a result of withdrawals for public use, runoff from agriculture, industrial discharges, and the alteration of river systems by dams and reservoirs.

3) Impeded access to historical habitat by dams and reservoirs.

4) Bycatch of Atlantic sturgeon in commercial fisheries.

5) Vessel strikes in within the riverine portions of the range of the New York Bight and Chesapeake Bay DPSs.

6) Inadequacy of regulatory mechanisms to control bycatch and the modification and curtailment of Atlantic sturgeon habitat.

While bycatch of Atlantic sturgeon from each of the DPSs is expected to occur in federal waters, mortality associated with the South Atlantic shrimp fishery is expected to be very low. The use of TEDs will reduce the degree of bycatch of Atlantic sturgeon that occurs and increase the survival of Atlantic sturgeon that interact with the South Atlantic shrimp fishery. We therefore conclude the proposed action will not appreciably diminish the likelihood of recovery for any of the five DPSs of Atlantic sturgeon.

Conclusion
In conclusion, we believe that the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of any Atlantic sturgeon DPS' survival or recovery in the wild.

7.8 Gulf Sturgeon

Our jeopardy focuses on the federal fishery because that is the only place where adverse effect from the proposed action area expected. Effects from the sea turtle conservation regulations are expected to be solely beneficial.

In Section 5, with the limited available data, we concluded that observed captures in federally authorized shrimp trawls will not exceed one per year, and that an additional 8 Gulf sturgeon may interact with shrimp trawls, but escape through a TED and be undetected. The number of actual interactions and the number resulting in captures are unknown. However, because we believe the temporal and spatial overlap of Gulf sturgeon and the federal Gulf of Mexico shrimp fishery is very limited, few Gulf sturgeon are expected to interact with the federal shrimp fishery conducted in the Gulf of Mexico. Of the few that do interact with the otter trawl gear, the vast majority are expected to survive, with little or no injury, given their ability to escape capture by passing through TEDs that are required under the proposed action. The vast majority of the Gulf sturgeon captured by federal shrimp trawls are also expected to be released alive (i.e. we concluded a mortality may be documented every four years.

Although the loss of any adult Gulf sturgeon will reduce number and potential reproductive output, the reduction is not likely to appreciably reduce the likelihood of survival for Gulf sturgeon. The number of individuals within each riverine populations is variable across their range, but generally over the last decade (USFWS and NMFS 2009) populations in the eastern part of the range (Suwannee, Apalachicola, Choctawhatchee) appear to be relatively stable in number or have a slightly increasing population trend. The action will not affect Gulf sturgeon in a way that prevents the species from having a sufficient population, and number of sexually mature individuals producing viable offspring, and it will not result in effects to the environment which would prevent Gulf sturgeon from completing their entire life cycle, including reproduction, sustenance, and shelter (i.e., it will not increase the risk of extinction faced by this species). The loss of only small numbers of individuals will not significantly decrease the overall population of Gulf sturgeon or reduce its distribution. Additionally, the proposed action will not create any barrier to pre-spawning sturgeon accessing the overwintering sites or impede

Gulf sturgeon from accessing any seasonal concentration areas, including foraging, spawning or overwintering grounds in the Gulf of Mexico.

Recovery is defined as the improvement in status such that listing is no longer appropriate. The Gulf Sturgeon Recovery/Management Plan was created in 1995 (USFWS 1995). During the most recent 5-year review (NMFS 2009), it was determined that the 1995 criteria do not directly address the five statutory listing/recovery factors. Five-factor-based criteria are necessary for measuring progress towards reducing threats and for determining when the protections of the Act are no longer necessary for the taxon. New criteria in a revised recovery plan should use demographic parameters that can be estimated from mark-recapture studies, including population abundance, and other appropriate metrics organized according to the statutory five factors. To evaluate whether the reductions in numbers and reproduction from the proposed action will appreciably reduce the Gulf sturgeons likelihood of recovery in the wild, we evaluated whether these reductions would in turn reduce the likelihood that the status of the Gulf sturgeon can improve to the point where it is recovered and could be delisted.

The proposed action is not expected to modify, curtail or destroy the range of the species since it will result in only a small reduction in the number of Gulf sturgeon in the Gulf of Mexico and therefore, it will not affect the overall distribution of Gulf sturgeon. The reduction in numbers and future reproduction is very small, therefore will not change the status of the species. The effects of the proposed action will not delay the recovery timeline or otherwise decrease the likelihood of recovery since the action will cause the mortality of a small percentage of the species as a whole and this mortality is not expected to result in the reduction of overall reproductive fitness for the species as a whole. We therefore conclude that the proposed action is not expected to appreciably reduce the likelihood of the Gulf sturgeon's recovery in the Gulf of Mexico.

Conclusion

In conclusion, we believe that the effects associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of Gulf sturgeon survival or recovery in the wild.

8.0 Conclusion

We have analyzed the best available data, the current status of the species, the environmental baseline, the effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of any listed species. Our green, hawksbill, and leatherback sea turtle analyses focused on the impacts to, and population response of, sea turtles in the Atlantic basin. However, the impact of the effects of the proposed action on these Atlantic sea turtles populations must be directly linked to the global populations of the species, and the final jeopardy analysis is for the global populations as listed in the ESA. Because the proposed action will not reduce the likelihood of survival and recovery of any of these Atlantic populations of sea turtles, it is our opinion that the proposed action is not likely to jeopardize the continued existence of green (both the Florida breeding population and non-Florida breeding population), hawksbill, or leatherback sea turtles. Our other analyses focused on the full listed entity. Based on those analyses, it is also our opinion that the proposed action is

not likely to jeopardize the continued existence of Kemp's ridley sea turtles, loggerhead sea turtles (the Northwest Atlantic Ocean DPS), Atlantic sturgeon (Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, or South Atlantic DPSs), Gulf sturgeon, or smalltooth sawfish (U.S. DPS).

9.0 Incidental Take Statement (ITS)

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the RPMs and terms and conditions of the ITS. Take that occurs while fishing not in compliance with the requirements of the proposed action does not constitute authorized incidental take because it is not incidental to an otherwise lawful activity. Accordingly, such take is not covered by the ITS and constitutes unlawful take.

Section 7(b)(4)(c) of the ESA specifies that to provide an ITS for an endangered or threatened species of marine mammal, the taking must be authorized under Section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is expected or has been authorized under Section 101(a)(5) of the MMPA, no statement on incidental take of protected marine mammals is provided and no take is authorized. F/SER2 must immediately notify NMFS's Office of Protected Resources should a take of a listed marine mammal occur.

This opinion establishes an ITS with RPMs and terms and conditions for incidental take coverage for sea turtle takes throughout the action area and for Atlantic sturgeon and smalltooth sawfish takes in the federal shrimp fishery. NMFS has not issued an ESA Section 4(d) rule prohibiting the take of threatened Gulf sturgeon so no incidental take coverage is needed, despite expected takes in the federal fishery. However, if new information indicates effects are greater than those anticipated in Section 5.4 of this opinion that were the basis for our jeopardy analysis in Section 7.8, consultation must be reinitiated.

9.1 Anticipated Amount or Extent of Incidental Take

Section 7 of the ESA requires ITSs to specify the "impact" of the incidental takings on the species (16 U.S.C. § 1536(b)(4)(i)). In its discussion of §7(b)(4), Congress indicated that it preferred the ITS to contain a numerical value: "Where possible, the impact should be specified in terms of a numerical limitation on the Federal agency or permittee or licensee." (H.R.Rep. No. 97-567, at 27 (1982), reprinted in 1982 U.S.C.C.A.N. 2807, 2827). Congress recognized, however, that a numerical value would not always be available: "…The Committee intends only that such numbers be established where possible." Id.

Unlike other fisheries, direct observer data cannot be used to determine the numbers of sea turtles taken in the shrimp fisheries. As explained in more detail in Section 5.1.3.2, this is due in

large part to inability to observe most sea turtle takes via conventional observer programs. TEDs properly used in otter trawls result in the release of the vast majority of sea turtles underwater where they are unobserved by persons at the surface. Sea turtles that fail to escape through the TED can go undocumented by observers due to the animals falling out of non-compliant TEDs during haulback of the gear. This event is more likely to occur with high-angle TEDs (>55 degrees from the horizontal) than other types of violations because sea turtles can become impinged on deflector bars due to water pressure/flow against the carapace, particularly juveniles which have less strength to overcome drag. While "ghost captures" are less likely to occur with top-opening TEDs, SEFSC gear specialists have observed large-frame, top-opening TEDs without flotation rolling over (inverting) at the surface, which could also result in turtles falling out of the opening even in top-opening TEDs. In addition, some of the captured sea turtles may fall out of the front of the net as the lazy line is used to haul up the cod end of the net. These sea turtles may or may not be observed depending on conditions (e.g., high sea state or at night) and where the observer is positioned aboard the vessel. Waters fished for shrimp in the action area tend to be very murky, thus even turtles falling out near the surface can be easily missed.

We also have not been able to reliably quantify the anticipated amount of take of sea turtles, using the best available information. The last real physical observations of fishery interactions are based on "naked net" studies conducted in the late 1990s. These studies, which were used as the basis for the estimates generated in 2002 and which were then subject to many variables, assumptions, and biases to overcome data gaps, are now nearly fifteen years old. It is not possible to update the survey data in order to estimate the number of takings, since to collect such data is cost prohibitive. According to estimates by the SEFSC it would cost approximately 14 million dollars to gather all the information necessary to develop reliable estimates for the entire action area. We believe using catch rate and aerial survey data that have not been updated in over a decade is inappropriate because we expect sea turtle populations have changed over the last decade.

In trying to determine numerical take values we attempted to update the data, described above, to reflect documented dramatic increases in abundance in Kemp's ridleys and greens. To do this we had to assume that CPUE and population growth rate are linearly related, which is of questionable validity because small changes in this relationship could have large impacts on the catch and mortality estimates, meaning this relationship is most likely not linear. For this reason and others as described in more detail in Section 5 of this document, we could not reliably determine actual take numbers for sea turtle species adversely affected by the U.S. Southeast shrimp fisheries. Therefore, our jeopardy analyses for these species were largely qualitative using our knowledge of sea turtle population trends based on nesting and other information and relating that information to the magnitude of the effects of the industry based on effort and compliance.

For the ITS to be valid, we must have a procedure to determine if the impacts of our proposed action exceed those expected based on our analysis in Section 5 in this opinion and subsequently used in our jeopardy analyses for the affected sea turtle species. Even if we could reliably estimate take, we cannot effectively monitor take relative to these numbers. The only reliable means of monitoring and limiting take, which is necessary to know that impacts analyzed have not been exceeded or that reinitiation is required, is to monitor effort and compliance. Effort and

compliance are readily observable and are two of the variables that greatly influence our estimate as well as actual take. We therefore propose to monitor effort and TED compliance to ensure compliance with the ITS and determine the need to reinitiate consultation if take has been exceeded. We propose to use these two parameters because effort is directly related to the number of turtles that interact with shrimp trawls, and compliance is directly related to the number of turtles captured and how many of those turtles are subsequently killed.

We believe that the most effective way to monitor effects is to compare future annual effort and compliance levels to our anticipated effort estimates and compliance levels. Our sea turtle effects analyses were based on 2009 effort levels because anticipated annual effort in Southeast shrimp fisheries is not expected to increase in the future. Therefore, we will use those levels (i.e., 132,900 days fished in the Gulf of Mexico [based on 108,501 days fished for otter trawls in 2009 and 24,399 days fished for skimmer trawls] and 14,560 trips in the South Atlantic [based on 13,464 trips for otter trawls in 2009 and 1,096 trips for skimmer trawls in 2009 or 2010[30]]) as our baseline. Similarly, future compliance levels are expected to result in TEDs being 88% effective, thus that level will be used as our compliance baseline. The methods on how these parameters must be monitored are described in detail in Section 2.1.1 and the RPMs and their implementing terms and conditions. At the end of each year, both the effort and compliance data must be analyzed using the methods we used in our analysis in Section 5 of this document to determine if the effects of the proposed action on sea turtle species exceed these predicted baseline levels. If we exceed these effort or compliance levels, we will infer that take has been exceeded and that effects on sea turtles were greater than analyzed. If sea turtle effects exceed those in this opinion for any given year then NMFS, in its action agency capacity, must decide whether it must reinitiate consultation, and whether rule making to address the activities leading to the greater effects is warranted.

Unlike the case for sea turtles, we are able to monitor the number of Atlantic sturgeon and smalltooth sawfish incidental takes that are anticipated to result from the proposed action by extrapolating observed interactions to the entire fleet using effort data. For sturgeon, this is because we are able to infer the number of unobservable interactions that pass through TEDs using the number of observed captures and experimental research on sturgeon TED exclusion rates. There is no data to suggest that Atlantic sturgeon or smalltooth sawfish captured in trawl nets go unobserved and unaccounted for because of fall out during haulback or the other problems we discussed for sea turtles. In the case of smalltooth sawfish, none are expected to be excluded by TEDs, so all smalltooth sawfish interactions are expected to be observable.

The numbers presented for Atlantic sturgeon and smalltooth sawfish represent total takes over 3-year periods. Annual take estimates of these species can have high variability because of natural and anthropogenic variation and because observed interactions are relatively rare. As a result, monitoring fisheries using 1-year estimated take levels based on observer data is largely impractical. Some years may have no observed interactions and thus no estimated captures. This makes it easy to exceed average take levels in years when interactions are observed. Based

[30] 2009 data was used for skimmer trawl effort in the Gulf of Mexico and 2010 data was used for skimmer trawl effort in the South Atlantic (i.e., North Carolina).

on our experience monitoring fisheries, we believe a 3-year time period is appropriate for meaningful monitoring. This approach will allow us to reduce the likelihood of requiring reinitiation unnecessarily because of inherent variability in take levels, but still allow for an accurate assessment of how the proposed action is affecting these species versus our expectations.

Table 9.1. Anticipated Takes.

Species	Otter Trawl Interactions, Captures, and Mortalities	Try Net Interactions**, Captures, and Mortalities	Otter Trawl and Try Net Combined Interactions, Captures, and Mortalities
Atlantic Sturgeon [31]	1710 total interactions, including 222 captures of which 27 are expected to be lethal every three years*, with DPS limits as follows: • Gulf of Maine DPS ≤ 156 interactions, including 21 captures, of which 3 are expected to be lethal • New York Bight DPS ≤ 447 interactions, including 60 captures, of which 9 are expected to be lethal • Chesapeake Bay DPS ≤ 309 interactions, including 42 captures, of which 6 are expected to be lethal • Carolina DPS ≤ 498 interactions, including 66 captures, of which 9 are expected to be lethal • South Atlantic DPS ≤ 1353 interactions, including 177 captures, of which 21 are expected to be lethal	63total interactions, all resulting in capture and of which none are expected to be lethal every three years*, with DPS limits as follows: • Gulf of Maine DPS ≤ 6 interactions all resulting in captures, of which none are expected to be lethal • New York Bight DPS ≤ 18 capture, of which none are expected to be lethal • Chesapeake Bay DPS ≤ 12 interactions, all resulting in capture, of which none are expected to be lethal • Carolina DPS ≤ 21 interactions all resulting in capture, of which none are expected to be lethal • South Atlantic DPS ≤ 51 interactions all which resulting in capture, of which none are expected to be lethal	1773 total interactions, including 285 captures of which 27 are expected to be lethal every three years*, with DPS limits as follows: • Gulf of Maine DPS ≤ 162 interactions, including 27 captures, of which 3 are expected to be lethal • New York Bight DPS ≤ 465 interactions, including 66 captures, of which 9 are expected to be lethal • Chesapeake Bay DPS ≤ 312 interactions, including 54 captures, of which 6 are expected to be lethal • Carolina DPS ≤ 519 interactions, including 87 captures, of which 9 are expected to be lethal • South Atlantic DPS ≤ 1404 interactions, including 228 captures, of which 21 are expected to be lethal
Smalltooth Sawfish	288 (105) every three years	--	288 (105) every three years

*Incidental take will be monitored based on the 3-year running totals (e.g., 2012-2014, 2013-2015)
**All try net interactions result in captures

[31] Note that the total of each category of interactions by DPS will be greater than the total number of interactions due to the usage of the highest percentage calculated by the MSA for each DPS.

9.2 Effect of the Take

NMFS has determined that the level of anticipated take associated with the proposed action and exempted from ESA Section 9 take prohibitions in this ITS is not likely to jeopardize the continued existence of green, hawksbill, Kemp's ridley, leatherback, or loggerhead (NWA DPS) sea turtles, Atlantic sturgeon (any DPS), or smalltooth sawfish (U.S. DPS).[32]

9.3 Reasonable and Prudent Measures (RPMs)

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of Kemp's ridley, green, loggerhead, leatherback, and hawksbill sea turtles:

1) NMFS must monitor effort in state and federal shrimp fisheries and continue to work to better determine the effects these fisheries have on sea turtles.

2) NMFS must monitor compliance with TED regulations and must ensure compliance with TED regulations is at or below the anticipated levels in the ITS of this opinion.

3) NMFS must continue outreach programs to train fishermen and net shop personnel in the proper installation and use of TEDs.

4) NMFS must continue to work with industry on TED development and to conduct research to better understand the nature of sea turtle interactions, particularly very small juvenile sea turtle interactions, with shrimp trawls in inshore and nearshore waters.

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of smalltooth sawfish:

5) NMFS must conduct research to better understand the nature of smalltooth sawfish interactions with shrimp trawls.

6) NMFS must conduct outreach to Southwest and South Florida fishers to ensure that they know and use the safe handling guidelines for sawfish release to minimize post-release mortality.

NMFS believes the following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take of Atlantic sturgeon:

7) NMFS must conduct research to better understand the nature of Atlantic sturgeon interactions with the shrimp fishery.

[32] NMFS has also determined that the proposed action is not likely to jeopardize Gulf sturgeon, but because NMFS has not issued a 4(d) rule prohibiting the take of threatened Gulf sturgeon, no incidental take exemption is need for the anticipated takes in the federal fishery.

9.4 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, NMFS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement RPM No. 1.

1) NMFS must coordinate with the states to monitor shrimp fishing effort in major gear types and must use this information to determine effort trends in U.S. Southeast shrimp fisheries and possible effects of these trends on sea turtles.

    a) NMFS must encourage states to revise their licensing or work on other alternatives as needed to include specific gear types used (e.g., identify otter trawl versus skimmer trawl), allow for estimation of the active number of vessels by gear type, and make progress on accounting for latent permits.
    b) NMFS must produce a report documenting total shrimp trawl effort by major gear type (i.e., otter trawl and "other") each year.

2) NMFS must collect logbook data in the South Atlantic comparable to the logbook data collected in the Gulf or work with the states to collect these data.

3) NMFS must advance sea turtle population estimates beyond a nesting index by including in-water monitoring of sea turtles to achieve more accurate status assessments for these species and to better assess the impacts of incidental take in shrimp fisheries. NMFS must produce an in-water abundance report using the best available data for all species of sea turtles in the Southeast region of the United States within a year and half of the date of this opinion.

4) Observers should gather scientific information on any incidental takes of sea turtles that are observed to gain as much knowledge from and about sea turtle interactions with shrimp fisheries as possible. This opinion serves as the permitting authority for taking associated with handling, identifying, measuring, weighing, photographing, flipper tagging, passive integrated transponder (PIT) tagging, skin biopsying, and releasing any incidental sea turtle takes (without the need for an ESA Section 10 permit). Samples collected must be analyzed to determine the genetic identity of individual sea turtles takes.

5) NMFS must increase the amount of empirical and other data it has on trawl sea turtle capture probabilities associated with TED violations that are documented by observers, GMT, and OLE capture probabilities. These additional data must be used to test and revise as needed the violation and capture rate matrix used in this opinion (i.e., Table 15 of Section 5.1.3.2).

6) Because observers are unable to detect the majority of sea turtle interactions in shrimp trawl fisheries that use TEDs, NMFS must investigate alternative methods that can be used to detect sea turtle interactions in shrimp trawls with TEDs.

7) NMFS must explore requiring new technologies in Southeast shrimp fisheries (e.g., vessel monitoring systems) to better understand the potential interaction and relationship, if any, of fishery effort and seasonal and/or periodic sea turtle stranding events. NMFS must produce a report outlining potential options and their feasibility within one year of the date of this opinion.

8) NMFS must conduct an analysis of sea turtle stranding data to document whether the size of sea turtles that strand has changed since implementation of the 2003 larger TED requirement. This analysis must be completed within two years of the date of this opinion.

The following terms and conditions implement RPM No. 2.

9) NMFS must continue to require its observers to be trained during initial or refresher observer training sessions by NMFS gear specialists in identifying and inspecting TEDs and in recording such information for any trip observed.

10) NMFS must continue to monitor compliance with TED regulations using one or more of four following elements: SEFSC GMT, NMFS OLE, observer data, and other partner agencies.
    a) The SEFSC GMT must continually monitor shrimp fishing vessels dockside and at sea throughout the Gulf and South Atlantic areas. The SEFSC GMT personnel must record all monitoring efforts using standardized boarding forms.
    b) NMFS OLE must continue to enforce TED regulations and must keep records of all of its TED compliance boardings using standardized boarding forms.
    c) NMFS must work with state enforcement agencies and the USCG to improve and standardize enforcement of TED regulations, such as promoting the use of standardized boarding forms.

11) NMFS SERO PRD must establish a centralized TED compliance evaluation database to allow SEFSC GMT, NMFS OLE, and other partner agencies to remotely enter data from standardized TED inspection boarding forms within one year of the date of this opinion.

12) NMFS SERO PRD must coordinate with the SEFSC GMT, the SEFSC observer program, NMFS OLE, USCG, and state enforcement agencies to gather and insure that quality and timely monitoring of information on compliance with TED regulations in the shrimp fisheries is provided to NMFS SERO PRD and is entered into the TED compliance evaluation database.

13) NMFS must use data on TED compliance to target outreach, enforcement effort, and emergency rules, if warranted, ranging from possible TED modifications to closures of areas to shrimp fishing.

14) NMFS must develop a policy specifying data requirements or minimum data standards for taking various actions (e.g. time area closures) to address non-compliance. Our goal is to

use observer data for compliance analyses because the program is based on representative sample and avoids potential biases from using enforcement data. However, until that time we must to rely on OLE and GMT data and increased enforcement. As part of this policy, NMFS must develop a general policy or guidelines outlining methods and standards for determining if a documented lack of compliance is throughout the entire Gulf area or Atlantic area) or concentrated in certain portions of an area. This policy must be finalized within one year of completing the opinion and be updated as necessary.

15) If unusual increases in strandings occur in an area, NMFS must analyze this information and take appropriate action.

a) NMFS must have as many of the stranded animals necropsied as possible; at the same time the SEFSC GMT and NMFS enforcement must coordinate to investigate shrimp fishing activities and any other activities that may have resulted in the increased standings.
b) If shrimp fishing is believed to be the most likely cause then NMFS must concentrate enforcement in the fishing area believed to be the problem and must work with affected states and the USCG to increase the enforcement presence in that area.
c) If strandings continue at elevated levels and shrimping continues to be the most likely cause, then NMFS must consider emergency rule making to temporarily close the area to shrimp fishing until strandings subside.

The following terms and conditions implements RPM No. 3.

16) NMFS must continue funding the SEFSC GMT to conduct outreach and training of TED installation and use.

17) NMFS must continue training Southeast fishermen and net shop owners on the proper installation and use of TEDs.

18) The SEFSC GMT must report to SERO monthly on its TED training and outreach activities.

19) NMFS must form a working group including SEFSC GMT, OLE, and SERO staff to develop procedural guidelines for improving coordination during unusual sea turtle stranding and enforcement events and to improve data and reporting quality of such events.

The following terms and conditions implements RPM No. 4.

20) NMFS must continue to work with industry to develop new gear, especially TEDs that will be effective at releasing all sizes and all species of sea turtles while still retaining catch.

a) NMFS must continue to fund gear research and annual gear testing conducted by the NMFS SEFSC's Harvesting Systems Branch.

b) NMFS SERO PRD must continue to issue permits under 50 CFR § 223.207(e)(2) to industry to test industry-developed TEDs.

21) NMFS must conduct research to evaluate TED designs for use in the skimmer and wing net trawl fisheries, as well as inshore otter trawl fisheries, which effectively reduce bycatch of juvenile sea turtles.

The following terms and conditions implements RPM No. 5.

22) NMFS must complete a pilot study to test video monitoring hardware and software to determine the feasibility of developing a cost-effective and reliable system for monitoring smalltooth sawfish bycatch, release mortality, and other shipboard practices aboard shrimp trawl vessels in the southwest Florida area adjacent to the Florida Keys.

23) NMFS must require its observers to follow standard protocols for collecting smalltooth sawfish data onboard shrimp trawl vessels as outlined by the NOAA Fisheries-Galveston, Texas, Laboratory.
   a) Observers must be trained to tag smalltooth sawfish captured in shrimp trawls
   b) For each observed sawfish take, a total length measurement or estimate, time and location (i.e., lat./long. and approximate water depth) of capture, circumstances of capture (e.g., position of sawfish in the trawl net), and status (i.e., dead, alive, injured) upon return to the water must be reported to the extent possible. All smalltooth sawfish captured in shrimp trawls should be tagged to the extent feasible. Biological samples should also be collected as feasible consistent with sampling protocols developed by the Sawfish Implementation Team. The condition of each sawfish must be identified as one the following and photo-documented: (1) Sawfish completely wrapped or significantly wrapped in the shrimp trawl, appears moribund and unresponsive on deck, (2) Sawfish completely wrapped or significantly wrapped in the shrimp trawl, is responsive on deck with spiracles exhibiting movement, (3) Sawfish is partially wrapped in shrimp trawl, is responsive on deck with spiracles exhibiting movement, or (4) Sawfish is partially wrapped in the shrimp trawl and is very responsive on deck.
   c) Retrieved dead smalltooth sawfish must not be returned to the water. All dead carcasses of smalltooth sawfish must be placed on ice and transferred to the SEFSC (Dr. John Carlson).

24) NMFS must use available observer data and any other appropriate data sources to update the 3-year take average as new data becomes available.

25) NMFS must evaluate post-release mortality rates for smalltooth sawfish in the shrimp fishery via classifying sawfish conditions and by tagging animals alive on deck with a pop-up archival transmitting (PAT) tag as described in Carlson et al. (in review) prior to release, as feasible, and via modeling the probability of survival after release using survival analysis following Therneau and Grambsch (2000).

26) NMFS must conduct outreach on the NSED, the importance of reporting any sawfish sighting or interactions to NSED, and how to report information.

The following term and condition implements RPM No. 6.

27) NMFS must develop outreach materials that include the safe handling guidelines for sawfish release, these materials must include at a minimum the following:
    a) Keep sawfish, especially the gills, in the water as much as possible.
    b) Use line cutting pole or knife to cut any net tangled along the saw by cutting the mesh along the length of the saw.

The following terms and conditions (T&Cs) implement RPM No. 7.

28) NMFS must observe shrimp trawls in North Carolina, South Carolina, and Georgia, where Atlantic sturgeon interactions are most likely to occur, for a total of at least 140 sea days annually. If more than 1 sturgeon is observed caught during any year, NMFS will increase the number of sea days observed by 5% the following year. NMFS must use the observer data to produce an Atlantic sturgeon bycatch estimate; this estimate must be updated annually.

    a) Observers must be trained during initial or refresher training sessions in tagging techniques for Atlantic sturgeon.
    b) When possible:
        i) any Atlantic sturgeon caught in a shrimp trawl must be tagged, tissue sampled, and scanned for PIT tags.
        ii) for each observed sturgeon take, a total length measurement or estimate, weight measurement or estimate, sex (if discernible), time and location (i.e., lat./long. and approximate water depth) of capture, whether or not had or was tagged and if so what type of tag was used, and status (i.e., dead, alive, injured) shall be recorded prior to its release.
        iii) Tissue samples must be taken from any sturgeon handled onboard a shrimp boat. Tissue samples should be a small (1.0 cm^2) fin clip collected from soft pelvic fin tissue using a pair of sharp scissors. Tissue samples should be preserved in individually labeled vials containing either alcohol (70 to 100%) or SDS-UREA or other preservative. Data required in 17(b) should accompany the tissue sample. Keep the tissue sample out of direct sun, but refrigeration is not necessary. Contact Ms. Kelly Shotts (Kelly.Shotts@noaa.gov or (727) 551-5603) for instructions on submitting the tissue samples to NMFS. Send samples and supporting data within one month of the date the sample is taken.

29) Any sturgeon captured with a PAT tag evaluated for post–release mortality.

30) All dead observed Atlantic sturgeon must be reported to Ms. Kelly Shotts (Kelly.Shotts@noaa.gov or (727) 551-5603). After activities described in T&C No. 28 are complete, the remaining specimen(s) or body parts of dead Atlantic sturgeon must be preserved (iced or refrigerated) until sampling and disposal procedures are discussed with NMFS.

31) Flatbar Flynet TED testing documented an 87% reduction in Atlantic sturgeon captures by number, but a 95% reduction of Atlantic sturgeon by weight (i.e., 6 kg of Atlantic sturgeon were captured in the net with the TED versus 109.1 kg of Atlantic sturgeon in the control net), suggesting that the Gulf sturgeon that do not exit the net through the TED are smaller individuals. NMFS must monitor for any new information indicating that more small Atlantic sturgeon are or may be encountered by shrimp trawls.

10.0 Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Sea Turtles:

1. NMFS should support in-water abundance estimates of sea turtles to achieve more accurate status assessments for these species and to better assess the impacts of incidental take in fisheries.

2. NMFS should assess the feasibility of alternative regulatory, permitting, and analytical approaches to reduce bycatch in western North Atlantic fisheries more rapidly and more comprehensively. While the loggerhead recovery plan includes several actions to address the problem of bycatch in various gear types, a more specific plan to address fishery bycatch of loggerhead sea turtles—which we believe to be the main barrier to loggerhead recovery in the Western North Atlantic—is needed to guide NMFS, the States, and the Councils. Development of scientifically-based quantitative bycatch reduction targets and timelines are particularly needed.

Smalltooth Sawfish:

1. NMFS should conduct or fund research or alternative methods (e.g., surveys) on the distribution, abundance, and migratory behavior of adult smalltooth sawfish off southwest Florida to better understand their occurrence in federal waters and potential for interaction with otter trawls.

2. NMFS should conduct or fund reproductive behavioral studies to ensure that the incidental capture of smalltooth sawfish in shrimp trawls is not disrupting any such activities.

3. NMFS should conduct or fund surveys or other alternative methods for determining smalltooth sawfish abundance in federal fishing areas off southwest Florida, adjacent to areas where smalltooth sawfish are known to occur in the greatest concentration (e.g., off the Florida Keys).

4. NMFS should investigate whether exclusion from trawls may be improved by lining or replacing the section of the net ahead of the TED with a difference material (e.g., canvas, fine metal mesh, or tough flexible plastic) as suggested by Brewer et al. (2006).

Sturgeon:

1. NMFS should collect data describing Atlantic and Gulf sturgeon location and movement in the Atlantic and Gulf of Mexico, respectively, by depth and substrate to assist in future assessments of interactions between the shrimp trawl fishery and sturgeon migratory and feeding behavior.

2. NMFS should collect information on incidental catch rates and condition of sturgeon captured in shrimp trawls to assist in future assessments of gear impacts to sturgeon.

3. NMFS should continue to collect information on rates of sturgeon escape from shrimp trawl gear through TEDS that would assist in future assessments of sturgeon interactions with gear.

11.0 Reinitiation of Consultation

This concludes formal consultation on the proposed action. As provided in 50 CFR 402.16, reinitiation of formal consultation is required if discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of the taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, F/SER2 must immediately request reinitiation of formal consultation.