

**U.S. Army Corps of Engineers South Atlantic Division
Pre-Construction Risk Assessment for Maintenance Dredging of Wilmington,
Morehead City, Charleston, Savannah, and Brunswick Harbors in Fiscal Year 2023**

23 June 2023

1. PURPOSE AND BACKGROUND. This document provides the Pre-Construction Risk Assessment that the U.S. Army Corps of Engineers (USACE) South Atlantic Division (SAD) completed in accordance with the 2020 South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States (2020 SARBO) to inform the decisions on when and how operations and maintenance (O&M) dredging is conducted under the South Atlantic Division Regional Harbor Dredging Contract 6.0 (RHDC 6.0). This assessment focuses on the risk to species covered under the Endangered Species Act (ESA) under National Marine Fisheries Service (NMFS) purview and not all risk considered by USACE when determining how, where, and when dredging and material placement projects are completed in accordance with the USACE mission requirements described in Section 1.B below.

This risk assessment supports the regional dredging contract that will cover O&M dredging in North Carolina (Wilmington and Morehead City Harbors), South Carolina (Charleston Harbor), and Georgia (Savannah and Brunswick Harbors) during Fiscal Year 2023 (FY23). Since this risk-assessment is for maintenance dredging of five projects that historically result in a majority of take by hopper dredging of all projects covered under the 2020 SARBO (Figure 1), this assessment is more detailed and therefore longer than other projects that may be covered under the 2020 SARBO.

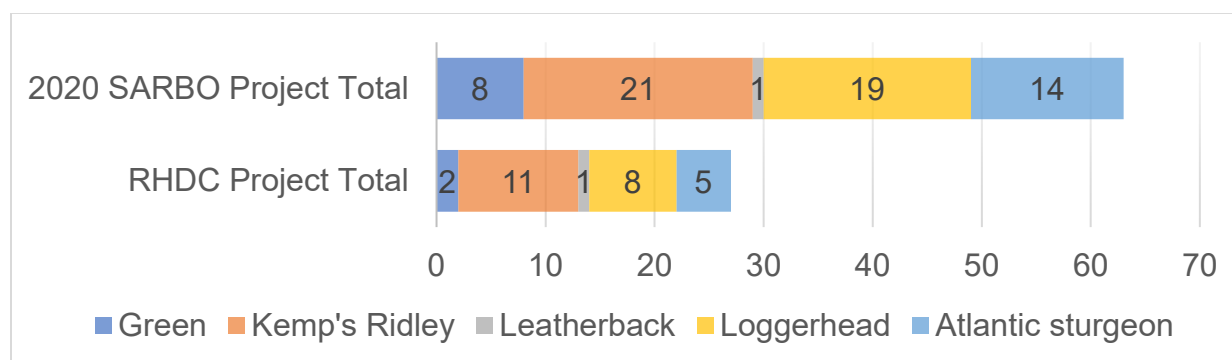


Figure 1. 2020 SARBO Observed Lethal Take (March 2020 - June 2022)

This risk-assessment updates the last (RHDC 5.0), which was the first regional risk-assessment completed and signed by USACE South Atlantic Division (SAD). These assessments reference key points in the 2020 SARBO instead of reiterating them and adds regional-specific details needed to make mitigation recommendations. This risk-

assessment provides updated information and is rearranged including adding Section 2 to provide project details, synopsis of RHDC project work completed since the completion of RHDC 5.0 and take that occurred on those projects. Section 3 considers the probability of effects to ESA-listed species based on the same routes of effects outlined in the 2020 SARBO Section 3 and includes an analysis based on effects observed at prior SARBO projects. Section 4 analyzes the information in Sections 2 and 3 to provide a recommendation for completion of the RHDC projects in FY23.

A. Background – 2020 SARBO and Risk Assessment. Consultation with the NMFS under Section 7 of the ESA for certain dredging (e.g., for maintenance dredging but not including new construction dredging) was concluded with the issuance of the 2020 SARBO, which replaced the 1997 SARBO. Any consultation or coordination with other agencies, such as the U.S. Fish and Wildlife Service, is independent of the 2020 SARBO.

The 2020 SARBO was completed under the ESA-consultation process used to determine the appropriate avoidance and minimization measures needed to minimize the probability of take to species and included an Incidental Take Statement for those species anticipated to experience lethal and non-lethal take based on the proposed action and minimization measures considered as Project Design Criteria (PDCs) in the 2020 SARBO. The 2020 SARBO is based on many years of work with NMFS, reviewing research and coordinating with experts to determine the best minimization measures. The 2020 SARBO implements a risk-based decision process (described in Section 2.9.2 of the 2020 SARBO) to document how it acknowledges that USACE has always and will continue to manage projects to be protective of species while balancing USACE mission requirements. USACE has a long history of closely monitoring all projects and stopping work if a situation becomes undesirable, which is well before any significant risk to the specific species. This evolving process allows USACE to adaptively manage projects based on data, lessons learned from prior projects, and new science allowing USACE to continue to improve.

The risk-based decision-making process under the 2020 SARBO is not a significant change from the 1997 SARBO. Under the 1997 SARBO, the USACE retained flexibility to decide when and where projects would occur, and the equipment type to be used for a particular project – although this flexibility was within defined seasonal dredging windows that limited hopper dredging to winter months. These windows are often referred to as “winter” windows, which is misleading as they extended into Spring (extending until 31 May in Charleston and Savannah Harbors and extending until 15 April in Brunswick Harbor). North Carolina and Florida south of Titusville did not have set dredging windows. Over the years, these windows were further reduced ultimately restricting hopper dredging from North Carolina to Titusville Florida from 15 December to 31 March. The dredging windows were set based on a conclusion formed in the 1980s that these windows were the most protective way to reduce the risk of lethal take of sea turtles. This conclusion hinged on the rationale that sea turtles are less prevalent in winter months and therefore are less likely to be encountered during dredging. However, advances in dredging and a better understanding of sea turtle use of areas by

location and time of year led to an understanding that seasonal windows are not the only way to be protective of sea turtles. For context, sea turtles tend to migrate to and from areas based on water temperatures, as has been long understood. For loggerheads that temperature threshold is believed to be 17°C, triggering loggerheads to move inshore in spring and further offshore in Fall.¹ The 2020 SARBO formalizes and expands the risk assessment process into a robust risk-based adaptive project-management process, which is further informed by coordination with and refinement by the SARBO Team.

A significant change from the 1997 SARBO is that the 2020 SARBO covers more species and designated critical habitat, and it requires risk to be addressed regionally for all covered species. During the development of the 2020 SARBO, the increased number of ESA-listed species in the areas, understanding of species' use of these areas, and identification of interactions that can occur during dredging and material placement activities led to a joint decision by the NMFS, USACE, and Bureau of Ocean Energy Management (BOEM) that an adaptive management strategy without static environmental windows for sea turtles would provide a more comprehensive approach to protect ESA-listed species and designated critical habitat. As noted in section 2.5.2 on p.643 of the 2020 SARBO,

Many of the ESA-listed species within the action area have overlapping ranges and habitats, and some protective measures frequently applied to projects for certain ESA-listed species conflict with protection of other listed species or critical habitats in these overlapping areas. The SARBO Team gave extensive consideration to which ESA-listed species could be affected by an activity covered under this Opinion, the probability of exposure based on project timing and anticipated species abundance in an area, and how to maximize protections for all ESA-listed species and designated critical habitat.

The risk-based adaptive project management process used under the 2020 SARBO process is an ongoing, deliberative, internal process that includes a pre-construction assessment step to consider how and when dredging is initiated and completed and to determine minimization measures to reduce the probability of take. This process requires a continuous evaluation of the probability of take as dredging occurs and may result in changes before and during the project work. This process then includes a consideration of lessons learned after work is complete. The SARBO Team (consisting of members of USACE, NMFS, and BOEM) meets monthly and for an annual review to discuss projects proposed to be covered for the upcoming year and associated minimization measures that may reduce the probability of species take.

¹ Arendt, Michael & Segars, Albert & Byrd, Julia & Boynton, Jessica & Whitaker, J. & Parker, Lindsey & Owens, David & Blanvillain, Gaelle & Quattro, Joseph & Roberts, Mark. (2011). Seasonal distribution patterns of juvenile loggerhead sea turtles (*Caretta caretta*) following capture from a shipping channel in the Northwest Atlantic Ocean. *Marine Biology*. 159. 10.1007/s00227-011-1829-x.

B. Background- USACE Navigation Mission. USACE operates under the requirements for dredging and discharge of dredging materials into waters of the U.S. as defined by law (33 CFR, Section II, Part 336). Part 336 defines the evaluation factors that need to be considered by USACE including defining the “Navigation and Federal Standard” that includes a requirement for projects to be completed in an “environmentally acceptable manner” with consideration to endangered species also defined and copied below:

Navigation and Federal standard. The maintenance of a reliable Federal navigation system is essential to the economic well-being and national defense of the country. The district engineer will give full consideration to the impact of the failure to maintain navigation channels on the national and, as appropriate, regional economy. It is the Corps' policy to regulate the discharge of dredged material from its projects to assure that dredged material disposal occurs in the least costly, environmentally acceptable manner, consistent with engineering requirements established for the project. The environmental assessment or environmental impact statement, in conjunction with the section 404(b)(1) guidelines and public notice coordination process, can be used as a guide in formulating environmentally acceptable alternatives. The least costly alternative, consistent with sound engineering practices and selected through the 404(b)(1) guidelines or ocean disposal criteria, will be designated the Federal standard for the proposed project.

Endangered species. All Corps operations and maintenance activities will be reviewed for the potential impact on threatened or endangered species, pursuant to the Endangered Species Act of 1973. If the district engineer determines that the proposed activity will not affect listed species or their critical habitat, a statement to this effect should be included in the public notice. If the proposed activity may affect listed species or their critical habitat, appropriate discussions will be initiated with the U.S. Fish and Wildlife Service or National Marine Fisheries Service, and a statement to this effect should be included in the public notice. (See 50 CFR part 402).

USACE considers all work completed under the 2020 SARBO to be environmentally acceptable as to the effects on ESA-listed species. It is acknowledged that the 2020 SARBO along with any follow-on risk assessments, does not meet the need to be in overall compliance with NEPA. It is further acknowledged that this assessment does not replace the need to of an EA or EIS for any given project. The effects on ESA-listed species under NMFS purview were considered in the Opinion by the agency responsible for this evaluation and an Incidental Take Statement was provided. USACE must manage the projects under the 2020 SARBO to ensure that individually and cumulatively that appropriate minimization measures as defined in the PDCs are used and any take does not exceed the non-lethal and lethal take outlined in Section 10 of the 2020 SARBO. These limits are provided for most species, including sea turtles and sturgeon on a three consecutive year timeframe to account of natural variability, as described in Section 6 of the 2020 SARBO. Take may fluctuate by location, time of

year, and from one year to another based on many factors including seasonal variability and stochastic events like hurricanes. As stated in Section 2.9.2.1,

Utilizing adaptive management in this manner allowed the USACE to consider the anticipated risk of harm to ESA-listed species in the context of shifting variables (e.g., environmental, financial, regulatory, etc.). Subsequent decisions made regarding project timing and equipment use maximized the ability to complete dredging and material placement projects, while minimizing the risk of incidental take. The USACE has a proven history of using this process to further reduce the likelihood of incidental take and will continue to do so under the 2020 SARBO.

USACE will continue to regionally monitor work covered under the 2020 SARBO to assure the Incidental Take Limits are not exceeded and will continue to work to keep all take low, to the maximum extent practicable, by considering risk to species and USACE mission requirements through the risk-based decision process discussed in this document. If for any reason, USACE deems an individual project or a combination of projects occurring regionally to be undesirable, work will cease. USACE also would not allow a single project to use all take allowed under the SARBO for a single species or combination of species since it must manage all USACE navigation projects covered under the 2020 SARBO. This history of managing take is demonstrated in Table 36 in the 2020 SARBO which lists the minimum, maximum, and average take by species from hopper dredging and was demonstrated again last year in FY22, as discussed in Section 2 of this document.

2. PROJECT DETAILS. The RHDC 6.0 will provide maintenance dredging for five (5) Federal navigation projects in FY23 described below.

A. Work Proposed. The RHDC 6.0 will provide maintenance dredging for five (5) Federal navigation projects, with a focus primarily on maintenance of the entrance channels (Table 1). Dredging by hopper dredge will be allowed for this work with placement of material in Ocean Dredged Material Disposal Sites (ODMDS).

Table 1. FY23 Regional Dredging Contract Project Details

Project Name	Dredging Location	Disposal Location	Estimated Volume (cubic yards)
Morehead City Harbor, North Carolina	Range A (Outer/Inner Entrance), Range B, and Cutoff (Inner Entrance)	Morehead City ODMDS, with Range B and Cutoff having the option of nearshore placement	1,170,000
Wilmington Harbor, North Carolina	Baldhead Shoal Channel Reach 3 (Outer/Inner Entrance)	Wilmington Harbor ODMDS	1,122,000
Charleston Harbor, South Carolina	Charleston Harbor (Outer/Inner Entrance), Shoal 1 Channel, Shoal	Charleston ODMDS	714,000

	2, Channel, Shoal 3, Shoal 4, Shoal 5, Shoal 6, Shoal 7, and Wings		
Savannah Harbor, Georgia	Tybee Knoll Cut Range (Inner Entrance) and Jones Island/Bloody Point Range (Inner/ Outer Entrance)	Savannah ODMDS	775,000
Brunswick Harbor, Georgia	St. Simons Range (Inner/Outer Entrance) and Cedar Hammock Range (Inner Harbor/ Estuary)	Brunswick ODMDS	1,565,000

B. RHDC Projects Completed in FY21 and FY22. The lessons learned from completion of these projects in past years are important to understand the probability of encountering issues on future projects and to managing successful projects. The RHDC 5.0 risk-assessment provided numerous examples of projects USACE adaptively managed in response to take in order to assure that the level of lethal take from hopper dredging and relocation captures remained environmentally acceptable.

In FY22, this adaptive management continued with multiple projects stopped early due to the rate and number of take, acknowledging that the situation at the time may have been leading to an amount that USACE determined to be undesirable. All projects individually and cumulatively were still within the environmentally acceptable range since they would not result in the exceedance of the Incidental Take Statement in the 2020 SARBO. Further, the takes were not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of any of these species and would not have any population effects to these species.

The five RHDC projects covered under the RHDC 5.0 risk-assessment are described below (listed by geographic location from north to south) along with a summary of species take at each project. Species take that has occurred in a project area in the past helps inform the potential risk of take occurring in the future. The observed lethal take reported for these five project areas is provided by fiscal year since 2010 (Figures 2-6). The number of days dredged is also provided for context. Dredge days area calculated by using the first and last day of dredge loads recorded for each hopper dredge at each project as reported to the National Dredging Quality Management Program (DQM), USACE's internal dredge monitoring system. USACE also hired an independent contractor to do a Quality Assurance/Quality Control (QA/QC) review of historic take records for SARBO projects from 2010 to present. Therefore, the total dredge days or reported take may slightly differ from prior reports.

B.5. Morehead City Harbor

FY21 Morehead City Harbor (29 May 2020 to 30 July 2020). Hopper dredging resulted in two loggerhead sea turtle takes.

FY21 (30 May 2021 to 14 June 2021). Hopper dredging again during the summer of 2021 resulted in two loggerhead and one green sea turtle takes with nine sea turtles relocated (six loggerhead and three Kemp's ridley). Since 2010, this area has been hopper dredged five times with three years resulting in no take, four takes occurring in

FY19 with work occurring from 28 February 2019 to 17 April 2019. The two in FY20 and the three in FY21 occurred during warmer months (May through July) indicating work can be done with take that is consistent or lower than spring dredging in FY19 even when there is a known presence of sea turtles as indicated by the relocation trawling captures.

FY22. The Morehead City portion of the FY22 RHDC has not started but is currently scheduled to start early July 2022 and should be completed within the month of July. The project will include use of relocation trawling for the duration of dredging.

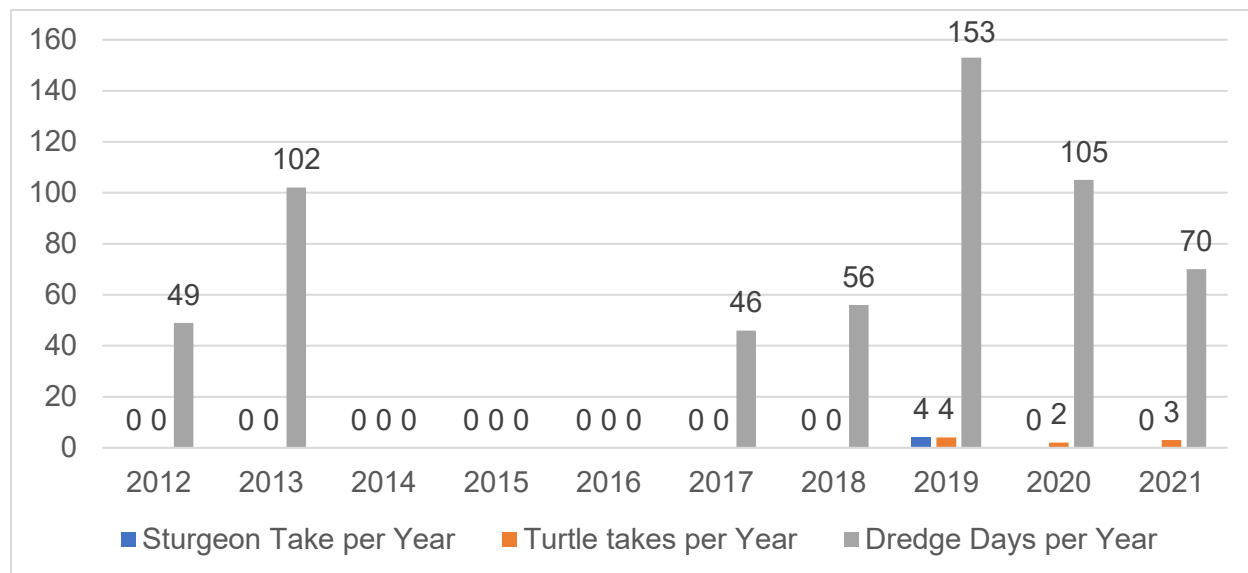


Figure 2. Morehead City Hopper Dredging Take By Year Relative to Effort (Dredge Days) from FY10- FY22

B.4. Wilmington Harbor

FY21 Wilmington Harbor (24 May 2021 to 27 June 2021). Hopper dredging did not result in any sea turtle take, even without relocation trawling. However, after the June dredging was complete, USACE determined that the full dredging template had not been met and dredging resumed to address remaining areas. This resulted in a live capture of a loggerhead sea turtle on 9 August 2021, during hopper dredging that was sent to a rehabilitation center for evaluation and euthanized later that day due to excessive injuries. Since 2010, Wilmington had been dredged every year except 2013. Seven of those years resulted in no sea turtle takes. However, five sea turtle takes occurred in FY17, four occurred in FY19 and two occurred in FY20. FY21 was the first event occurring during summer months and did not result in any take until the hopper dredge returned for cleanup work demonstrating that hopper dredging in this area in summer months may result in similar or lower take than historic windows.

FY22 (5 April 2022 to 30 May 2022). Hopper dredging removed material from the Baldhead Shoal Channel reach of the Entrance Channel and placed it in the Wilmington Harbor ODMDS. One hopper dredge (Ellis Island) worked from 5 April 2022 to

20 April 2022, resulting in two sea turtle takes (one loggerhead on 15 April and one Kemp's ridley on 17 April). Two dredges returned and successfully completed the work with no take (Dodge Island on 21 April, 9-14 May, and Padre Island 10-30 May). Relocation trawling was ongoing during all of the dredging event and relocated 23 loggerheads, two green, two Kemp's ridley, and one leatherback sea turtles plus two Atlantic Sturgeon.

Towards the beginning of the dredging project in early April the Ellis Island experienced heavy woody debris issues causing severe clogging on the overflow skimmers and the overflow screens which were threatening the safety of the vessel. This required the Ellis Island to modifying screening in coordination with USACE by maintaining 100% inflow box screening, 100% outflow skimmer screening, and removing both overflow (weir box) screens. The other two dredges did not report experiencing the same issues with woody debris but did require a variance in the draghead to avoid often encountered hard material below -44 ft. mean lower low water from Stations 160+00 to 195+00 of Baldhead Shoal Channel Reach 3. Adjusting the approach angle for the draghead deflector reduces the amount of the deflector that is embedded in the sediment to avoid damage from rock but increases the probability of species take. The draghead alteration was coordinated with USACE and approved by NMFS as a Supersede request on 11 May 2022. Work completed with the modified draghead screening was completed in 10 days and did not result in any observed take.

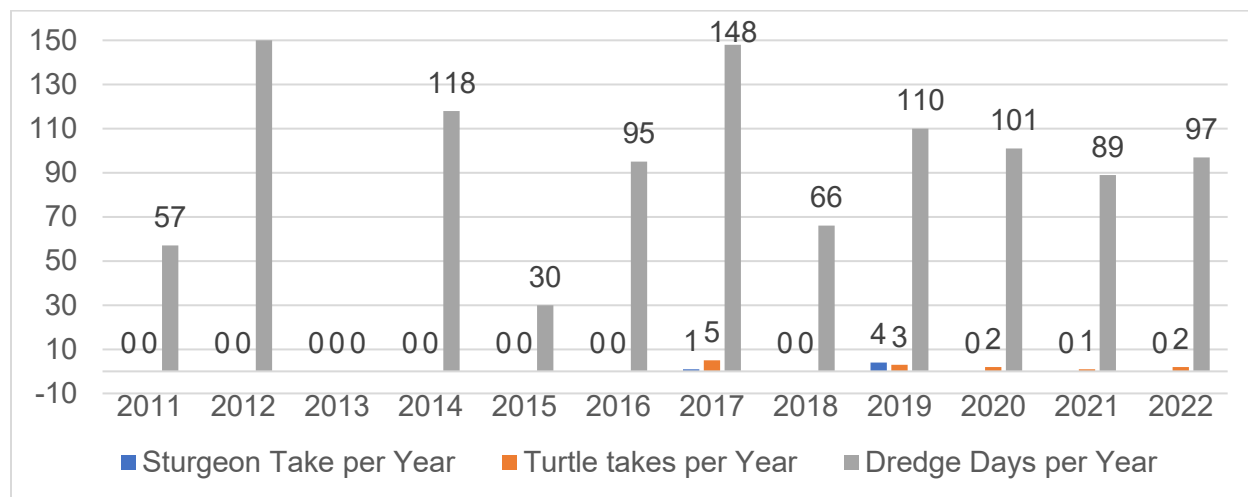


Figure 3. Wilmington Harbor Hopper Dredging Take By Year Relative to Effort (Dredge Days) from FY10- FY22

B.3. Charleston Harbor Maintenance Dredging

FY21. Dredging did not occur in FY21 in Charleston Harbor under the 2020 SARBO. Work did occur under the Charleston Deepening (referred to as Post-45 and covered under a separate NMFS Biological Opinion).

FY22 (18-20 March 2022 and 27 March 2022 to 3 April 2022). One hopper dredge (Ellis Island) removed material in the Charleston Harbor entrance channel and placed it in the

Charleston ODMDS. Work in this area in FY22 included completion of the Charleston Harbor Deepening and maintenance under the 2020 SARBO. Therefore, the same dredge switched back and forth between projects, depending on the area of work needed, and sometimes occurred on both the Post 45 project and the maintenance dredging project on the same day. Post 45 dredging occurred generally over three events from 30 November 2021 to 30 March 2022 and resulted in observed lethal take of three Atlantic sturgeon and one Atlantic sturgeon capture that did not count as lethal take (One take on 16 March and two takes on 26 March plus an incident [not take] on 26 March).

Dredging under the 2020 SARBO occurred in an approximate 1-3/4 mile stretch of the Charleston entrance channel (i.e., Station 770+00 to Station 865+00) starting about 2 miles offshore of the end of the jetties. In the approximately 8 dredging days of work under the 2020 SARBO, observed lethal take included two Kemp's ridley and three loggerhead sea turtles plus one Atlantic sturgeon. Generally, takes occurred on separate days (loggerhead on March 27th then a Kemp's ridley and Atlantic sturgeon on March 30th) until 3 April when five animals were recovered in a single load of which four were counted as lethal take (two loggerhead, one Kemp's ridley, and one Atlantic sturgeon), and one Kemp's ridley was not counted as take).

Relocation trawling was performed (weather permitting) throughout the duration of the hopper dredging in Charleston Harbor in FY22 resulting in the relocation of four Kemp's ridley and one loggerhead sea turtle under the 2020 SARBO and the trawling effort took(?) two Kemp's ridley sea turtles and one Atlantic sturgeon under Post-45.

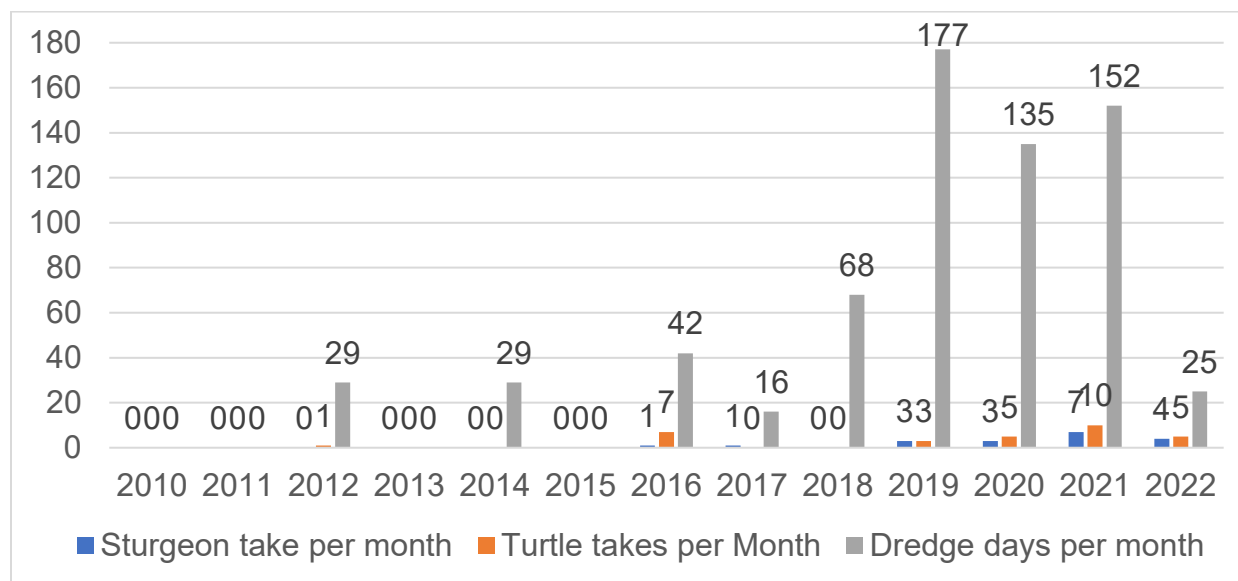


Figure 4. Charleston Harbor Hopper Dredging Take By Year Relative to Effort (Dredge Days) from FY10-FY22

B.1. Savannah Harbor Maintenance Dredging

FY21. Dredging did not occur in FY21 in Savannah Harbor.

FY22 (31 December 2021 to 17 January 2022). This work was successfully completed with no reported issues. Two hopper dredges (Padre Island and the Dodge Island) removed material in the entrance channel and placed it in the Savannah ODMDS. Bed leveling was conducted from 12-15 January (65 hours). There were no reports of stranded sea turtles/sea turtle mortality suspected to have been caused by bed leveling activities, no lethal or non-lethal incidents with ESA-listed species with the hopper dredge, and three North Atlantic right whale (NARW) sightings were reported by the Early Warning System alerts that required vessels to slow to 10 knots.

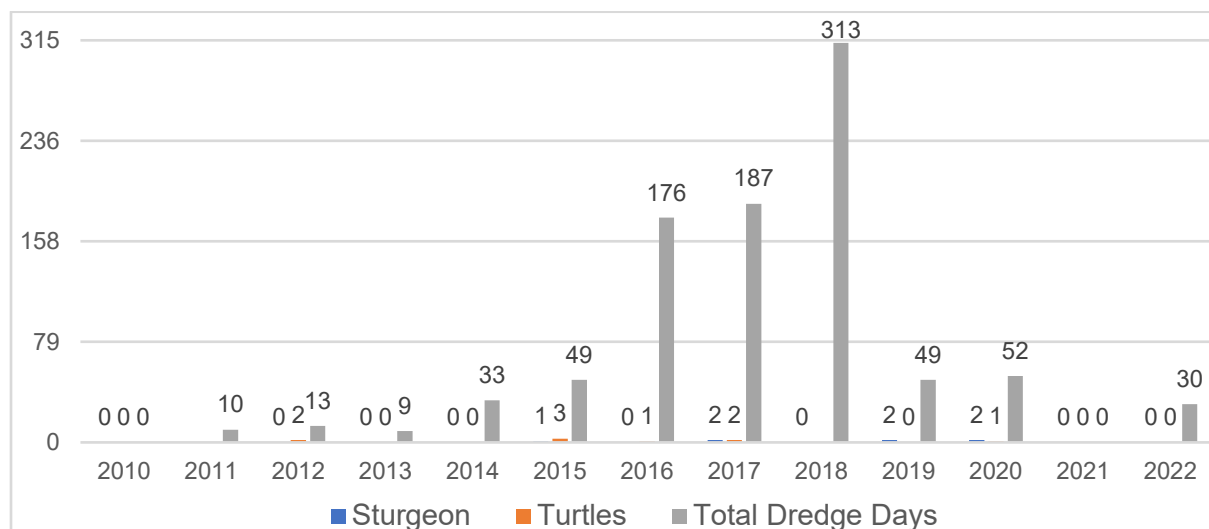


Figure 5. Savannah Harbor Hopper Dredging Take By Year Relative to Effort (Dredge Days) from FY10-FY22

B.2. Brunswick Harbor Maintenance Dredging

FY21. Dredging did not occur in FY21 in Brunswick Harbor.

FY22 (18 January to 20 February 2022 and 20-24 March 2022). Dredging occurred in the Brunswick Harbor's entrance channel and Cedar Hammock Range with all material placed in the Brunswick ODMDS. Two hopper dredges (Padre Island and the Dodge Island) started work. Work continued until 20 February 2022, resulting in observed lethal take of four Atlantic sturgeon (23 January, 23 February, and then two takes on 16 February) and one green sea turtle (13 February). Two Kemp's ridley sea turtles were also recovered, but were moderately decomposed, and not attributed to the project. After each take, the risk of continuing work was evaluated in coordination with USACE SAD, and Georgia Department of Natural Resources was given the opportunity to take possession of all carcasses.

Later, after the dredges had left the site for other work, bathymetry surveys revealed a shoal that required additional dredging. It was decided to resume work using a single hopper dredge (Ellis Island) that arrived on 21 March 2022 and dredged until 24 March 2022. Due to take observed at Kings Bay south of this project, relocation trawling was initiated prior to dredging to reduce the risk of lethal take. Trawling

occurred from 20-24 March 2022. On 23 March 2022, the Ellis Island took two Kemp's ridley in a single load. Risk was evaluated and the decision was made to continue. However, the next day (March 24th) another four Kemp's ridley sea turtles were lethally taken again in a single load. At that point the decision was made that the probability of continued take was too high to continue and dredging operations were terminated leaving approximately 380,000 cubic yards of material left in the channel.

Relocation trawling relocated nine Kemp's ridley and three loggerheads during the approximately 3.5 days of trawling. Bed leveling operations were conducted from 25 January to 25 February 2022 (289 hours) and later from 1-8 April 2022 (78 hours). There were no reports of stranded sea turtles/sea turtle mortality suspected to have been caused by bed leveling activities. Sixteen whale sightings were reported by the NARW Early Warning System within the project area requiring work to slow to 10 knots. There was one reported speed exceedance during a time when all vessels should have been sailing less than 10 knots. The dredging company was notified that was not in compliance with contract specifications and the 2020 SARBO.

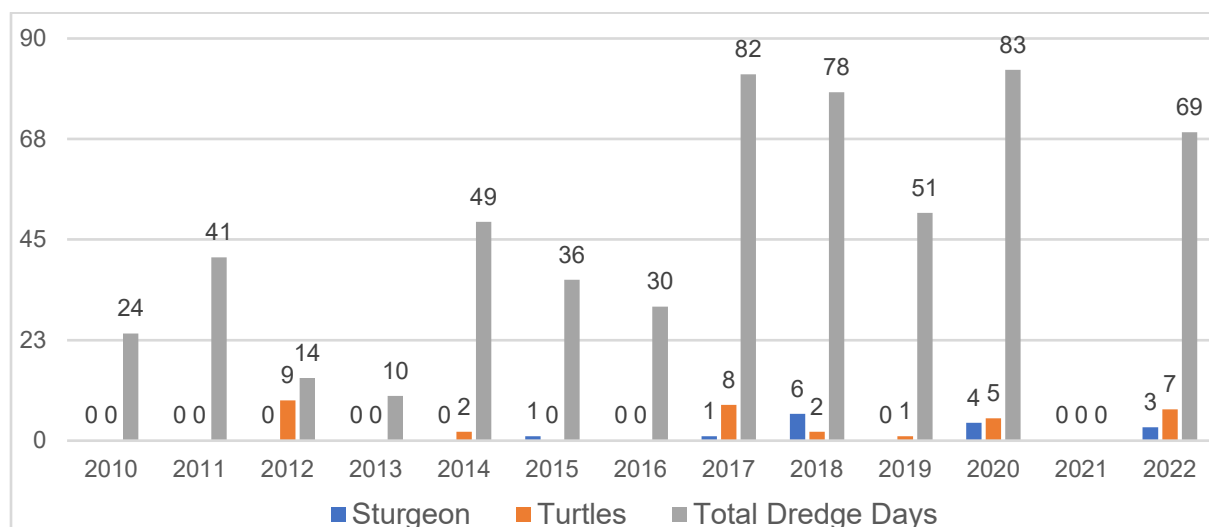


Figure 6. Brunswick Harbor Hopper Dredging Take By Year Relative to Effort (Dredge Days) from FY10-FY22

C. RHDC Project Relocation Trawling Captures. Relocation trawling captures that occurred on projects under the RHDC under the 2020 SARBO are provided in Figure 7 below.

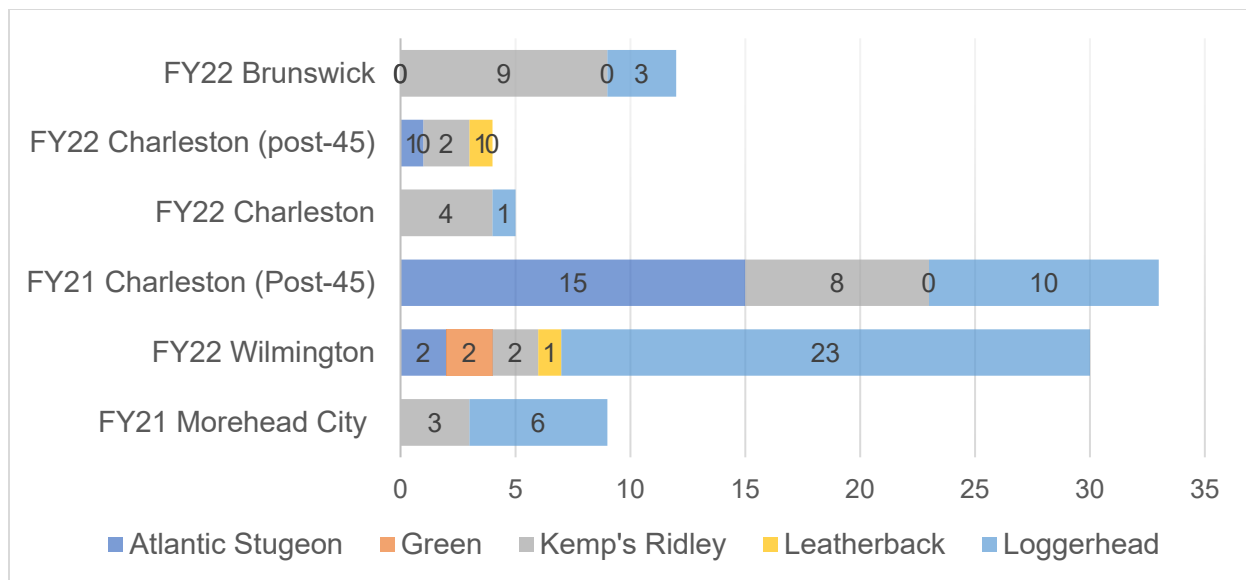


Figure 7. Relocation Trawling Captures at RHDC Project Locations²

3. RISK ASSESSMENT. A risk assessment is completed by considering the species likely to be present and the probability of species or habitat to be affected by the action based on the routes of effects anticipated. While the 2020 SARBO provides a list of all species that may occur within the 2020 SARBO action area from North Carolina to the Caribbean, Table 2 below further analyzes this information by including the probability of encountering each species by state for the states where RHDC projects are located. This risk-assessment considers the routes of effects outlined in the 2020 SARBO Section 3.1 to determine the probability of effects from the five RHDC projects proposed in FY23, based on adherence to the requirements (PDCs) in the 2020 SARBO.

² Includes captures from Charleston Harbor under the Deepening Project (Post-45) for comparison

Table 2. Effects Determination(s) for Species the Action Agencies and/or NMFS Identify as Potentially Affected by the Proposed Action

2020 SARBO, Table 8			Probability of Occurrence in Action Area by District		
ESA-listed Species	ESA Listing Status ³	NMFS Determination ⁴	North Carolina	South Carolina	Georgia
Sea Turtles					
Green (North Atlantic [NA] Distinct Population Segment (DPS))	T	LAA	High	High	High
Green (South Atlantic DPS)	T	LAA	Low	Low	Low
Hawksbill	E	NLAA	Not expected	Not expected	Not expected
Kemp's ridley	E	LAA	Low	Low	Low
Leatherback	E	LAA	Low	Low	Low
Loggerhead (Northwest Atlantic DPS)	T	LAA	High	High	High
Fish					
Atlantic sturgeon (Carolina DPS)	E	LAA	High	High	High
Atlantic sturgeon (SA DPS)	E	LAA	Low	Low	Low
Atlantic sturgeon (Gulf of Maine DPS)	T	LAA	Low	Low	Low
Atlantic sturgeon (New York Bight DPS)	E	LAA	Low	Low	Low
Atlantic sturgeon (Chesapeake Bay DPS)	E	LAA	Low	Low	Low
Shortnose sturgeon	E	LAA	Low	Low	Low
Elasmobranchs					
Giant manta ray	T	LAA	Moderate	Moderate	Moderate
Smalltooth sawfish (U.S. DPS)	E	LAA	Not expected	Not expected	Low
Whales					
Blue whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only
Fin whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only
North Atlantic right whale	E	NLAA	Low, Seasonally	Low, Seasonally	Low, Seasonally
Sei whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only
Sperm whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only

³ E= endangered; T= threatened

⁴ NE = no effect, NLAA (may affect, not likely to adversely affect), LAA (may affect, likely to adversely affect).

A. Species interactions with dredging, relocation trawling, and material placement equipment (2020 SARBO Section 3.1.1 and Section 3.1.3). These interactions include the probability of encountering equipment used on a project covered under the 2020 SARBO (entrainment or impingement⁵) and the potential for the equipment to result in effects to species or habitat from degraded water quality. These routes of effects are listed below and described in more detail for routes of effects with the probability of species encounters.

- Maintenance dredging by hopper dredge. The 2020 SARBO concluded that sea turtles (green, Kemp's ridley, and loggerhead) and sturgeon (Atlantic and shortnose) may be taken by hopper dredging, provided minimization measures as part of the PDCs, and provided a take limit for hopper dredging. A summary of hopper dredging observed lethal take for the five RHDC projects is provided in Section 2.B. of this document. The probability of entrainment of ESA-listed species is highest for sea turtles and sturgeon typically resulting in lethal take. Take limits are provided in the 2020 SARBO for these species, which USACE SAD manages to assure they are not exceeded. The probability of hopper dredging take of sea turtles and sturgeon is discussed further below.
- Relocation trawling. The 2020 SARBO concluded that sea turtles (green, Kemp's ridley, leatherback, and loggerhead), sturgeon (Atlantic and shortnose), giant manta ray, and smalltooth sawfish may be captured by relocation trawling, provided minimization measures as part of the PDCs, and provided a take limit for species captured during trawling. A summary of relocation trawling captures for the five RHDC projects is provided in Section 2.C. of this document. The probability of entrainment of ESA-listed species is highest for sea turtles and sturgeon typically resulting in non-lethal take. Take limits are provided in the 2020 SARBO for these species, which USACE SAD manages to assure they are not exceeded. The probability of capturing and relocating sea turtles and sturgeon is discussed further below.
- Monitoring for and handling of ESA-listed species during hopper dredging and trawling. Protected Species Observers are required on all hopper dredges and relocation trawlers to monitor for take. This route of effect was evaluated in the 2020 SARBO and does not require additional analysis in this risk assessment, based on adherence to the PDCs.

USACE is working on improvements to the digital reporting program that tracks take (i.e., the Operations and Dredging Endangered Species System - ODESS), including improved tracking of bycatch to better understand effects to all species, which

⁵ For this Risk Assessment IAW the 2020 SARBO, entrainment occurs when a species either comes into contact with a suction type of dredge (hopper or cutterhead) or is in close enough proximity that they cannot outswim the suction velocity created by the dredge. Impingement occurs when the species is captured by the equipment (e.g., captured in a mechanical dredge) or stuck to the equipment (e.g., entrained by a hopper dredge, but stopped by grating on the draghead that prevents movement into the hopper).

includes those of concern to other agencies. Historically, relocation trawling observations have been provided on handwritten data sheets. Any captured non-ESA-listed species are recorded as bycatch. In FY22, USACE increased digital tracking of bycatch on most SARBO projects. USACE also has been partnering with contractors and federal partners to have historic records digitized, have historic hopper dredging take records verified, and testing new applications to digitally report trawling capture data. This data will be available to use in risk-based decisions and publicly displayed on ODESS.

- Option for bed-leveling. The 2020 SARBO analyzed the use of bed-leveling and determined this route of effect to be NLAA based on adherence to the PDCs. USACE reviews all bed-leveling designs provided pre-construction and, in a few instances, has determined that they did not meet the requirements to protect species as generally outlined in the 2020 SARBO and were not approved for use unless modified per USACE recommendations. Bed-leveling does not require additional consideration in the risk-assessment.
- Water quality changes. Changes in water quality from dredging, bed-leveling, and material placement are described in detail in the 2020 SARBO Section 3.1.4. In summary, turbidity plumes are expected to be localized and settle out quickly and not expected to result in sedimentation that would harm species or habitat in the area. USACE continues to evaluate the risk to habitat both within and adjacent to dredging and placement areas to ensure that significant effects do not occur.

USACE continues to review water quality information to assure that the risk of effects from sedimentation or turbidity remain low. For example, USACE is collaborating with the North Carolina Division of Environmental Quality, and NMFS Protected Resources and Habitat Conservation Division to complete a three-year study to better understand the effects of dredging, water quality changes, and habitat alteration associated with continued maintenance of Wilmington Harbor and Morehead City. In addition, USACE Engineer Research and Development Center is reviewing available water quality data to summarize results and provide information in future project decision making. At this time, additional consideration in the risk-assessment process is not required.

A.1. Hopper Dredging -Sturgeon Considerations. For sturgeon, the probability of encounters during hopper dredging is more seasonally distinguished than for sea turtles. Atlantic sturgeon inhabit coastal, estuarine, and riverine environments on the Atlantic coast depending on the time of year. Atlantic sturgeon commonly occur in the project areas of these five RHDC projects that are coastal and estuarine areas. Adult sturgeon migrate into spawning rivers, designated as critical habitat, in the spring and likely fall. Shortnose sturgeon, unlike Atlantic sturgeon, tend to spend relatively little time in the ocean, according to the NMFS species directory website. When they do enter marine waters, they generally stay close to shore. In the spring, adults move far upstream and away from saltwater to spawn. This difference resulted in different covered take under the 2020 SARBO as Atlantic sturgeon are more likely to be

encountered by dredging covered under the Opinion than shortnose sturgeon. Atlantic sturgeon comprise five separate Distinct Population Segments (DPS) as described in the rule designating Atlantic sturgeon DPSs (77 FR 5880 and 77 FR 5914, Publication Date 6 February 2012). Sturgeon captured on projects covered under the 2020 SARBO are genetically sampled to track Atlantic sturgeon take by DPS.

As discussed in the RHDC 5.0 risk-assessment, hopper dredge take data reviewed from FY13- FY20 of projects completed from North Carolina to the Florida Keys, revealed that almost 75% of Atlantic sturgeon lethal take occurred at the same three projects areas (i.e., Savannah Harbor, Brunswick Harbor, and Kings Bay). Many projects have resulted in an almost equal number of Atlantic sturgeon take relative to take of all species of sea turtles. These projects have had timing restrictions that seem to coincide with times and areas that sturgeon are likely staging prior to a spawning run. Though large numbers have been successfully relocated when work was limited to historic dredging timeframes, especially in Brunswick Harbor, the long-term effects of these relocations is still not well understood, as discussed further below in the relocation trawling analysis. All sturgeon captures are covered under the 2020 SARBO as non-lethal take. Through the risk-assessment process, considerations include assessing the risk of capture of sturgeon by area and time of year. Moving work to times when sturgeon have moved out of coastal and estuarine areas into spawning rivers will reduce the probability of encounters.

A study⁶ conducted by the South Carolina Department of Natural Resources and Georgia Department of Natural Resources of the “Temporal and spatial distribution of Atlantic sturgeon (*Acipenser oxyrinchus*) in U.S. Territorial waters off South Carolina and Georgia” found, “Significant seasonal differences were observed with respect to the number of days that Atlantic sturgeon were detected relative to the number of actual days monitored ($\chi^2_3 = 282.3$, $P < 0.001$) and also between the number of Atlantic sturgeon detected relative to the total amount of receiver monitoring effort ($\chi^2_3 = 4626.8$, $P < 0.001$). Between 2013 and 2017, at least one Atlantic sturgeon was detected during 99% of January through March monitoring days ($n = 361$), but only 5% of monitoring days between July and September ($n = 368$; Figure 11). A similar but less pronounced pattern was observed with respect to seasonal sums of daily counts for Atlantic sturgeon, with peak occurrence between January through March (13% of ‘receiver days’) and least occurrence (<1%) between July and September (Figure 11).” This aligns with the capture rates during hopper dredging and relocation trawling observed during USACE dredging projects in these areas and supports moving dredging in these areas outside of the January to March timeframe to reduce the probability of Atlantic sturgeon captures.

⁶ MICHAEL ARENDT, WILLIAM POST, BRYAN FRAZIER, MICHELLE TALIERCIO, DANIEL FARRAE, AND TANYA DARDEN South Carolina Department of Natural Resources, FINAL (2013–2017) REPORT TO THE NATIONAL MARINE FISHERIES SERVICE For “Temporal and spatial distribution of Atlantic sturgeon (*Acipenser oxyrinchus*) in U.S. Territorial waters off South Carolina and Georgia”, 22 December 2017

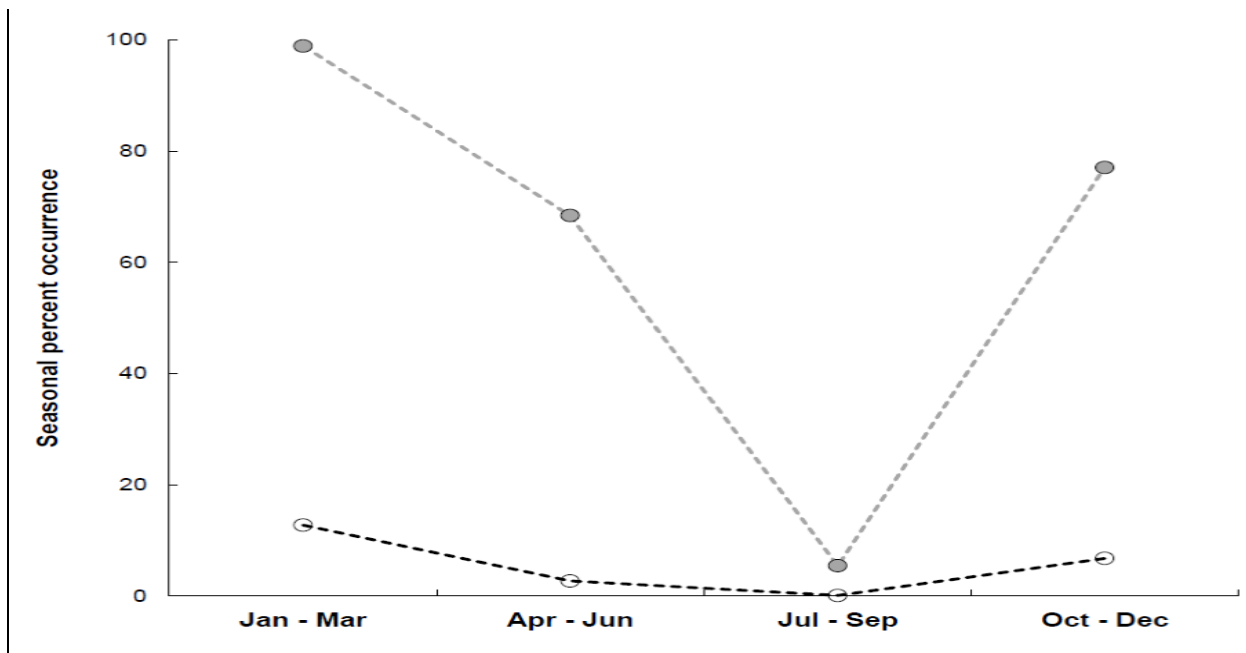


Figure 8. Figure 11 of the study titled, “Atlantic sturgeon were detected in coastal waters off South Carolina and Georgia throughout the year, but great observation occurred between January and March both with respect to general monitoring days (grey series) and relative coverage (black series)”

A.2. Hopper Dredging -Sea Turtle Considerations. For sea turtles, the probability of encounter by hopper dredging is not as clearly defined by season nor is the ability to predict the species of turtle likely to be encountered at a specific location in a specific time period. Loggerhead sea turtles are typically the most frequently encountered in the SARBO action area and the highest allowed take under the 2020 SARBO (107 loggerheads per three-year period, which is approximately 35 per year). Of the 329 reported sea turtle lethal takes under the 1997 SARBO with the species identified⁷, loggerhead sea turtles accounted for 63% of all take (183 reported), followed by an almost even number of green and Kemp’s ridley sea turtles with 18% green (53 reported) and 19% Kemp’s ridley (54 reported), as shown in Figure 9.

The 2020 SARBO Incidental Take Statement provided species take limits in three consecutive year timeframes to account for variability, as was evident by the unprecedented number of Kemp’s ridley sea turtle takes occurred under the 2020 SARBO in FY22. To date, a total of 18 Kemp’s ridley sea turtles were taken under the 2020 SARBO in FY22. Figure 9 compares the percent of Kemp’s ridley sea turtle captured observed on all 2020 SARBO projects in FY22 to those reported under the 1997 SARBO from 1997-2018. The 2020 SARBO Table 36 reported the average hopper dredging lethal take of Kemp’s ridley sea turtles under the 1997 SARBO was three per year with a maximum observed of eight in a single year. The 18 observed

⁷ 2020 SARBO Table 36 provides total hopper dredging takes from 1997-2018 by species covered under the 1997 SARBO (290 turtles identified by species+ 39 Atlantic sturgeon = 329 total identified takes. Five unknown turtle species and three unknown sturgeon were also reported).

lethal take in FY22 is still within the allowed take limits for this species as the 2020 SARBO covers 58 per three consecutive year time period (average of 19 per year).

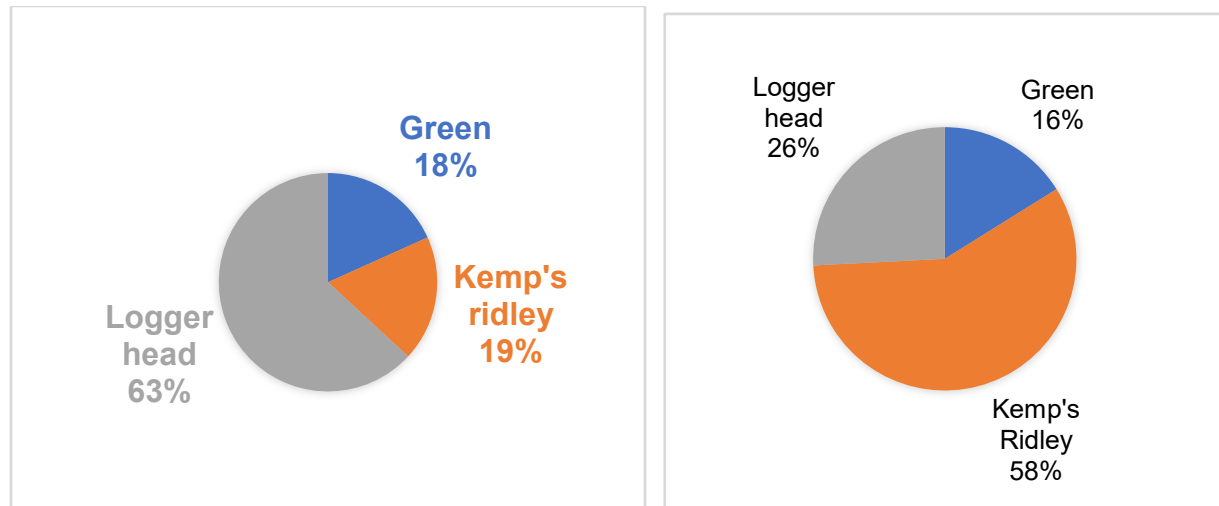


Figure 9. Comparison of Species Captured under the 1997 SARBO (left figure showing take from 1997-2018 per 2020 SARBO, Table 36) and under the 2020 SARBO (right figure showing take from all projects completed March 2020 to June 2022).

As an example of the variability in species take per year, the hopper dredging lethal take observed in Brunswick Harbor is shown in Figure 10 highlighting a spike in Kemp's ridley sea turtles observed in both 2012 and 2022 (10 years apart). According to NMFS, this species seems to appear in higher numbers in certain areas by year using the example of an increase in captures at fishing piers in the Northern Gulf for a few consecutive years and then a return to normal levels. USACE will continue to monitor all take, especially Kemp's ridley sea turtles, over the next few years to assure the take limit is not exceeded.

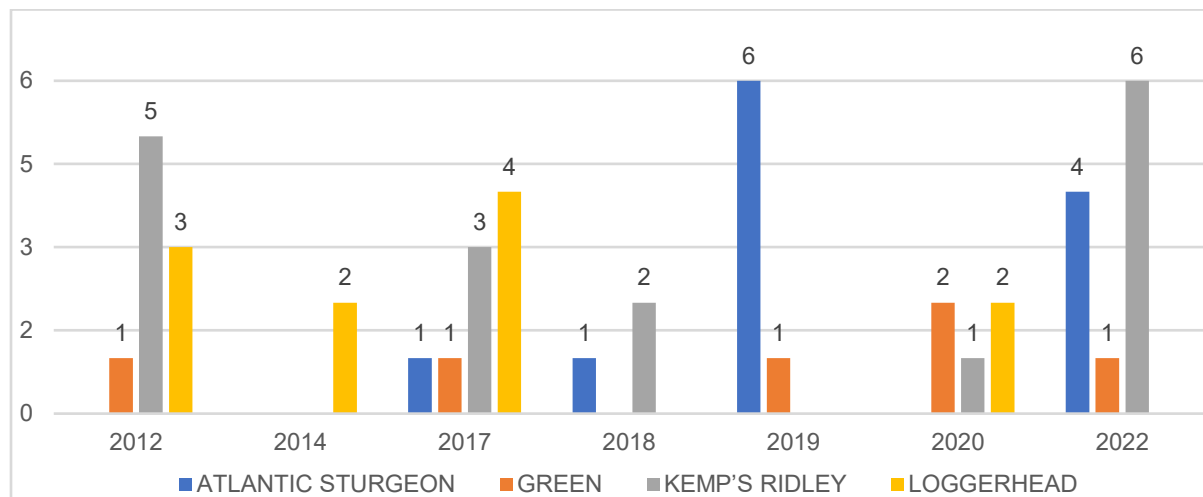


Figure 10. Brunswick Harbor Dredging Take (2010-2022)

How species use an area is another consideration when evaluating the probability of encountering the species. For example, sea turtle nesting areas or migratory areas may result in higher density of animals in the area at that time. USACE considered if species areas are known to have higher density or life cycle importance and if that information could be used to further reduce the probability of take by hopper dredging at these five RHDC projects. For example, NMFS identified key life-cycle areas for loggerhead sea turtles by designating critical habitat for this species in 2014 (79 FR 39855) including identifying nesting beaches (nearshore reproductive habitat), breeding areas, and migratory pathways. When considering probability of take to this species, waters off the outer banks of North Carolina were considered as they are identified as a constricted migratory pathway for loggerhead sea turtles migrating to northern foraging grounds in summer months and back in the fall and an overwintering sites south of Cape Hatteras. Both of these key areas demonstrate abundance of sea turtles in waters off the North Carolina coast but are located east of the outer banks and therefore do not overlap with Wilmington or Morehead City Harbors. Another area of importance identified in the loggerhead critical habitat designation were the waters off the central east coast of Florida that are identified as breeding areas. As reported in the RHDC 5.0 risk-assessment, hopper dredging take data from FY13 - FY20 showed that even though the east coast of Florida has loggerhead sea turtle breeding areas and the largest sea turtle nesting concentration in the 2020 SARBO action area, only 14% of all sea turtle takes occurred on the east coast of Florida south of Kings Bay.

Sea turtle ability to avoid interactions with hopper dredging seems to vary by time of year. However, USACE agrees with NMFS determinations in the 2020 SARBO that limiting work to “winter” months, as was required under the 1997 SARBO and described in Section 1A above, is not the only or even most effective way to reduce risk to sea turtles. Much knowledge has been gained since the decision was made to try to protect sea turtles by restricting hopper dredging to “winter” months, which extended into Spring. Because most take occurs when the dragheads are not firmly embedded in the sediment, USACE has worked to find ways to reduce this risk by adding draghead deflector shields that create a sand wave to move turtles away from the draghead, requiring that draghead pumps are disengaged when not actively dredging, or switching to bed-leveling during clean-up phase when hills and valleys left by hopper dredging make it harder to keep dragheads embedded. In addition, USACE closely monitors dredging using DQM, which is a USACE-Dredging Industry partnership for automated monitoring of dredge activities to provide quality near-real-time data such as monitoring the draghead depths, the velocity of material entering the dragheads, when pumps are engaged and disengaged, and related dredging information to ensure that the 2020 SARBO PDCs are being followed. In addition, closed net relocation trawling, now covered under the 2020 SARBO, has been proven to reduce risk of take during hopper dredging by providing a way to safely move sea turtles out of the project area to avoid hopper dredging interactions.

The 2020 SARBO discussed risk to sea turtle take by time of year and cited an analysis conducted in 2009⁸ considering the probability of hopper dredge lethal take in Brunswick Harbor. This analysis concluded that summer (July to September) dredging may be lower, but spring and fall may be higher when sea turtles are migrating. This analysis was completed based on limited dredging in the area outside of the historic window. Based on the available data, some sea turtle experts conclude that spring may be the worst time for dredging because northern migrations begin and turtles may be moving into coastal waters in these areas. Of the data from FY13 to FY20 that was reviewed for hopper dredging projects from North Carolina to the Florida Keys, almost 60% of sea turtle takes occurred in March, which lends support to increased probability of sea turtle take in March (Spring) despite being in the historic “winter” window required under the 1997 SARBO, which was limited to these timeframes.

A.3. Hopper Dredging- Area and Time-Specific Consideration. The RHDC 5.0 risk-assessment also discussed that a disproportionate amount of all SARBO lethal hopper dredging take occurred in a small area. Specially, from FY13- FY20, almost 60% of all sea turtle takes for all turtle species and also almost 60% of all loggerhead sea turtle takes from North Carolina to the Florida Keys occurred at just three project locations adjacent to each other (Savannah Harbor, Brunswick Harbor, and Kings Bay). While the percent of take by project or region provides some information, it does not consider the number of projects, frequency of projects, or length of time to complete a project. It is concerning to USACE that the most significant number and percent of lethal hopper dredging takes are limited to such a small area of projects covered under 2020 SARBO (i.e., Savannah Harbor, Brunswick Harbor, and Kings Bay). Hopper dredging in these areas has been generally limited to historic dredging windows as a way to minimize take. However, USACE believes that moving hopper dredging outside this timeframe may be more protective of sea turtles, as discussed more in Section 3.A.3 below.

The 2020 SARBO offers flexibility in timing based on a risk-assessment process and has allowed USACE to successfully dredge in months when work had not previously been completed. Prior consideration of the probability of encountering sea turtles and sturgeon by time of year with dredging generally required to end each year by the end of March did not consider updated requirements and risk-minimization measures covered in the 2020 SARBO such as relocation trawling and bed-leveling. It also did not consider that projects historically limited to “winter” hopper dredging windows concluded in March. Increased take reported in March may be related to the probability of encountering sea turtles in a particular area at that time or may have been skewed by the disproportionate number of projects working to end by the required time frame and working in areas that had hills and valleys created by hopper dredging (cleanup phase) that caused the greatest risk of take if the draghead could not remain embedded in the sediment. This risk is minimized by the ability to use bed-leveling under the 2020

⁸ USACE (Dickerson, D. D., and coauthors. 2007. Effectiveness of relocation trawling during hopper dredging for reducing incidental take of sea turtles. U.S. Army Corps of Engineers, Engineer Research and Development Center Research Initiatives and Central Dredging Association, Lake Buena Vista, FL.).

SARBO instead of continuing to hopper dredge after enough material is removed that spreading it out with bed-leveling is an option that is not expected to result in take.

To update the analysis conducted in 2009⁸, USACE reviewed observed lethal hopper dredging take at each of the five RHDC projects (shown in Figures 11-15 below by month) to understand the potential probability of sea turtle and sturgeon take by hopper dredging, by project area and time of year. The analysis indicates that warm waters and/ or high sea turtle density in an area does not necessarily equate to increased probability of sea turtle hopper dredging take. This is demonstrated by the successfully completion of projects outside the prior limited time frame as shown for Morehead City and Wilmington Harbors in Figures 11-12 and described for FY21 and FY22 in Section 2.D above.

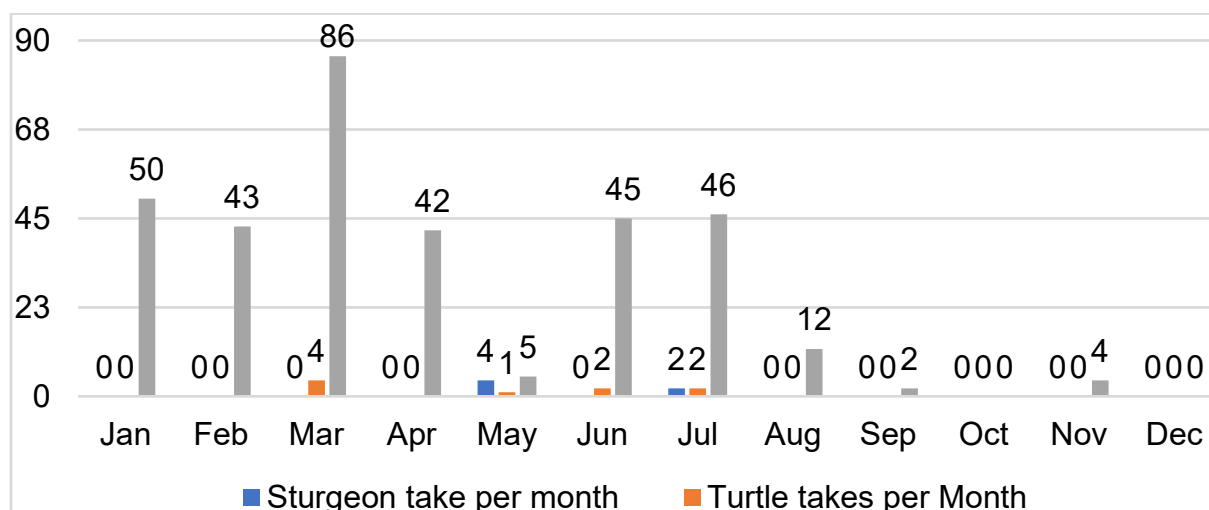


Figure 11. Morehead City Hopper Dredging Take By Month Relative to Effort (Dredge Days) from FY10 - FY22

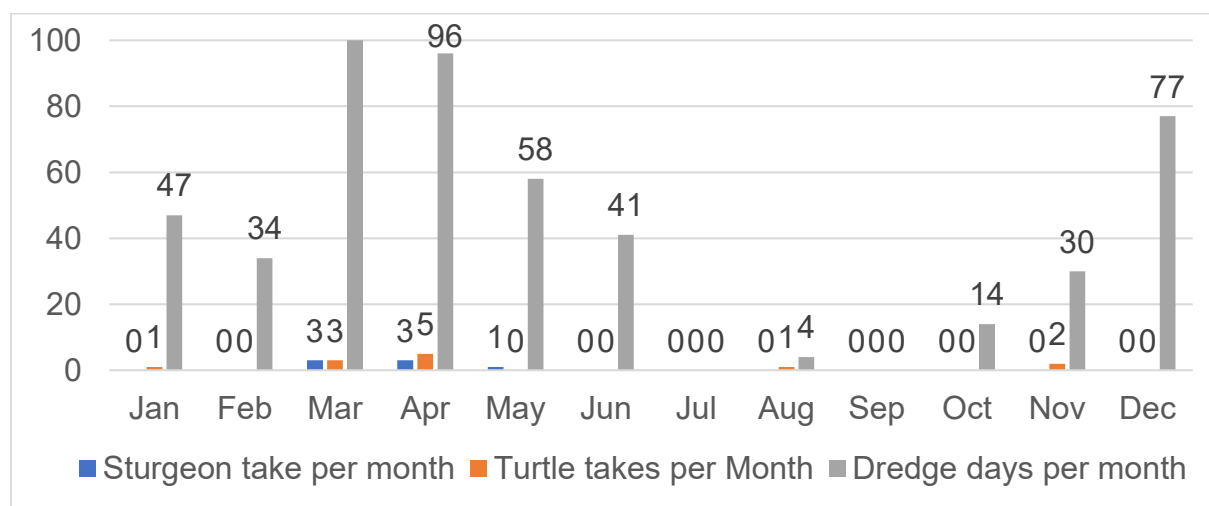


Figure 12. Wilmington Harbor Hopper Dredging Take By Month Relative to Effort (Dredge Days) from FY10 - FY22

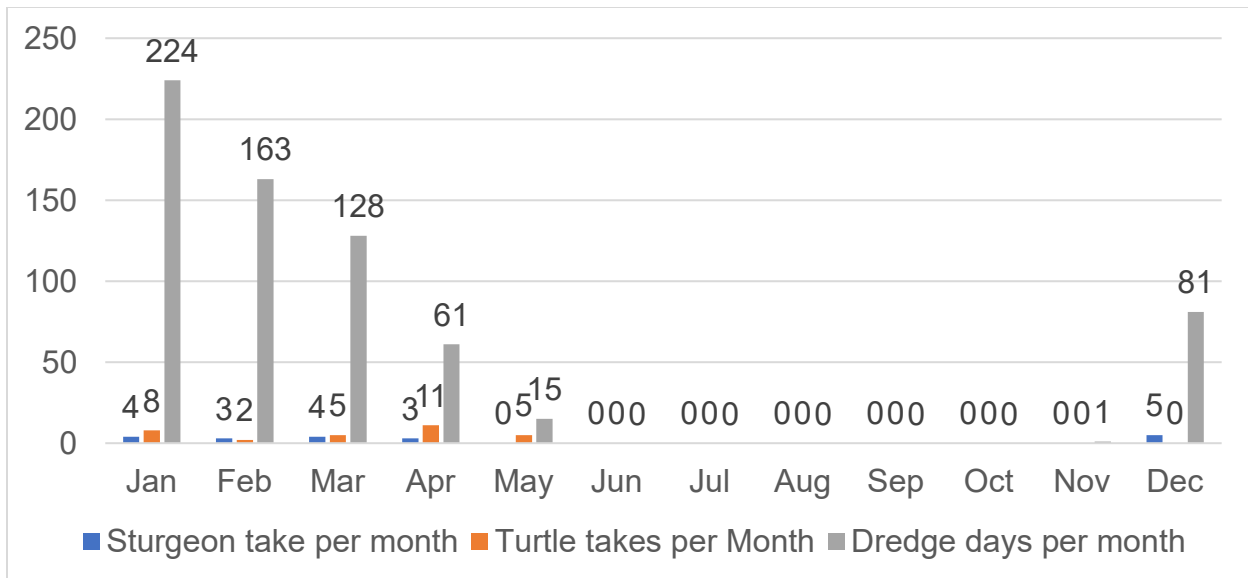


Figure 13. Charleston Harbor Hopper Dredging Take By Month Relative to Effort (Dredge Days) from FY10 - FY22 for both Post-45 Deepening and SARBO Projects

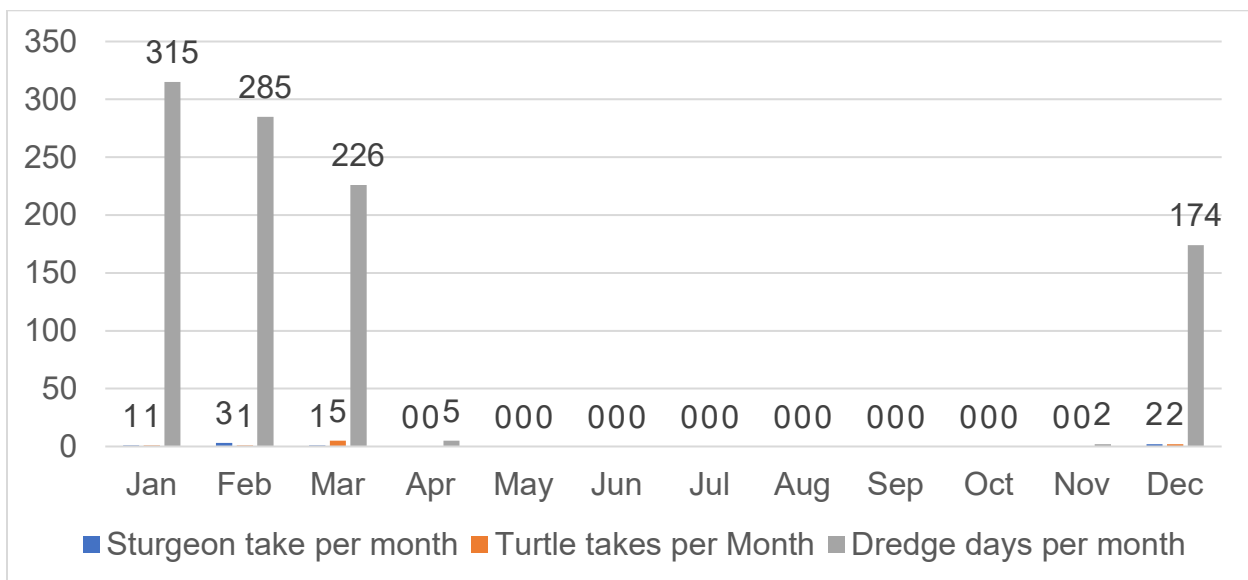


Figure 14. Savannah Harbor Hopper Dredging Take By Month Relative to Effort (Dredge Days) from FY10 - FY22

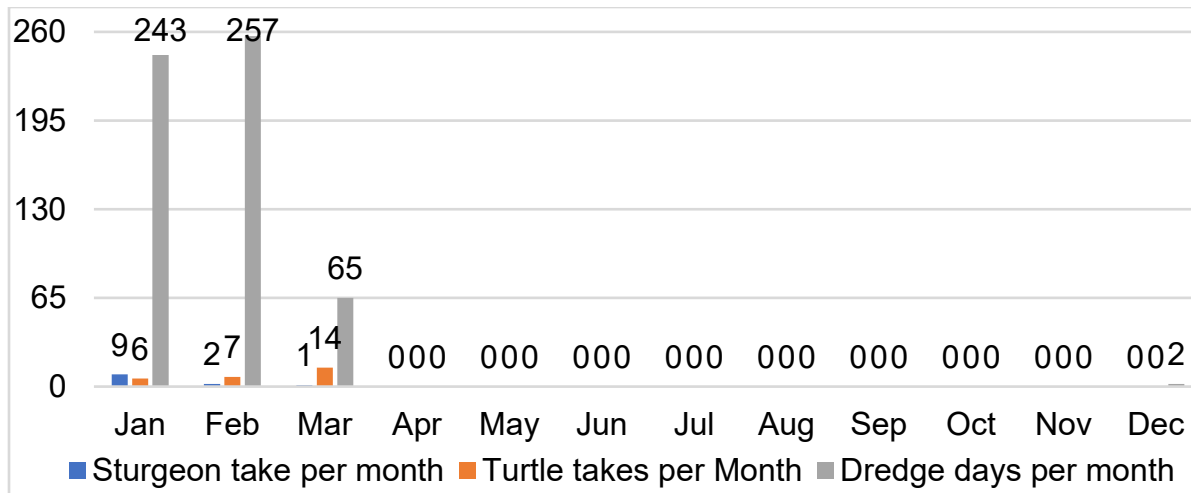


Figure 15. Brunswick Harbor Hopper Dredging Take By Month Relative to Effort (Dredge Days) from FY10 - FY22

The RHDC 5.0 risk-assessment described other successful projects completed in the SARBO action area are listed below:

- Oak Island. Hopper dredging from 6 May 2021 to 22 May 2021, resulted in only one loggerhead lethal take while 34 turtles (19 Kemp's ridley and 15 loggerhead sea turtles) and 12 Atlantic sturgeon were relocated.
- Bogue Banks. Hopper dredging from 21 February 2021 to 6 April 2021, resulted in three sea turtle takes (two Kemp's ridley and one loggerhead) while 24 sea turtles (10 Kemp's ridley and 14 loggerheads) were relocated. In addition, 17 Atlantic sturgeon were relocated. Dredging in FY21 was the third phase of this project. Dredging from 8 March 2019 to 24 April 2019, did not have any lethal hopper dredging take. Dredging from 6 February 2020 to 29 April 2020, dredged 2,270,000 cubic yards of material with only three lethal sea turtle takes (one Kemp's ridley and two loggerheads). Relocation trawling was conducted in both FY19 and FY20 and relocated sea turtles and Atlantic sturgeon (a combined total of eight Kemp's ridley, 14 loggerheads, six green sea turtles, and 17 Atlantic sturgeon). No Atlantic sturgeon were taken in any of the three years of hopper dredging.

Another example cited in the RHDC 5.0 risk-assessment that occurred outside the SARBO action area is the Mississippi Coastal Improvements Program in the northern Gulf of Mexico where work was completed over multiple years and included all seasons, including warm water months with a clear abundance of sea turtles present based on the high numbers relocated, as described below. This area was successfully dredged with the Ellis Island.

- Phase I (SER-2012-09304). Hopper dredging from November 2017 to January 2019 resulted in no sea turtle take and one Gulf sturgeon take while 395 sea turtles were relocated (280 Kemp's ridley, 108 loggerhead, six green, and one leatherback) and two Gulf sturgeon.

- Phases 3 and 4 (SERO-2018-00260, SER-2018-19667). Hopper dredging for Phases 3 and 4 from July to December 2020 resulted in no sea turtle take and one Gulf sturgeon take while 33 sea turtles (26 Kemp's ridley, six loggerheads, and one leatherback) and two Gulf sturgeon were relocated.

However, Brunswick, Savannah, and Charleston Harbor have continued to be completed during those prior limited timeframes due to the need to update environmental documents. These issues resulted in work not being conducted in FY21 in Brunswick and Savannah Harbors. Dredging under these limitations continues to result in a disproportionate amount of all take under the 2020 SARBO to occur in just two project locations (Brunswick Harbor under the RHDC and King's Bay just south of Brunswick Harbor as part of a USACE Regulatory permit for the U.S. Navy). In FY22, those two projects combined resulted in 62% of all take including 91% of all Atlantic sturgeon take and 52% of all sea turtle take (Table 3).

Table 3. FY22 SARBO Hopper Dredging Take

	Green Sea Turtle	Kemp's ridley Sea Turtle	Loggerhead Sea Turtle	Atlantic sturgeon	Total Turtle Take	Total Take
All SARBO Projects	5	18	8	11	31	42
Brunswick	1	6	0	4	7	11
Kings Bay	3	6	0	6	9	15
Total Brunswick + Kings Bay	4	12	0	10	16	26
Percent of Total (Brunswick +Kings Bay)	80%	67%	0%	91%	52%	62%

A study released in 2020 used genetics to determine that the majority (84.4%) of female loggerhead sea turtles nesting in North Carolina, South Carolina and Georgia migrate north to foraging areas north of North Carolina after nesting each summer⁹. However, not all turtles migrate, leaving a smaller resident population that moves shorter distances to forage and overwinter. The 2020 study also concluded that these turtles then migrate back south to wintering areas from Cape Hatteras, North Carolina to West Palm Beach in Florida, “where they can enter warmer waters adjacent to the Gulf Stream while minimizing the migratory distance, time and energy required to return to

⁹ Pfaller JB, Pajuelo M, Vander Zanden HB, Andrews KM, Dodd MG, Godfrey MH, et al. (2020) Identifying patterns in oraging-area origins in breeding aggregations of migratory species: Loggerhead turtles in the Northwest Atlantic. PLoS ONE 15(4): e0231325. <https://doi.org/10.1371/journal.pone.0231325>.

their northern foraging sites when water temperatures rise in the spring.” Due to the greatest number of hopper dredging lethal take of sea turtles being concentrated in this South Georgia/ Northern Florida area, it seems that this area may have a higher number of wintering sea turtles that are too cold to easily avoid interactions with hopper dredging. Some sea turtle experts believe that summer hopper dredging may have the lowest risk to sea turtles, even if abundance is high in the area. In the summer, turtles are warmer and can more easily avoid interactions and may be using areas outside of channels as they disperse throughout the region. Since the majority of loggerhead sea turtles migrate to northern foraging grounds, the density of turtles in the summer (post-nesting) may actually be lower.

USACE will continue to evaluate the probability of sea turtle and sturgeon take by hopper dredging based on an evolving understanding these species use project areas by time of year and in response to factors such as cold-snaps, hurricanes, and prevalence of foraging resources. Understanding species abundance and how the species is using and moving within the area aids in understanding the probability of take by hopper dredging. However, no amount of planning can predict every condition encountered and dredging in certain areas has been seasonally limited resulting in limited understanding of the probability of encounters. Therefore, USACE will continue to adaptively manage projects to assure lethal take of sea turtles at an individual project or cumulatively from all projects covered under the 2020 SARBO do not exceed the take limit.

A.4. Relocation Trawling Considerations. As discussed above, sea turtles and sturgeon are frequently captured when relocation trawling is used as risk-minimization measure to reduce lethal take by hopper dredging. Take limits are provided in the 2020 SARBO and prior captures are listed in Section 2.B above.

Relocation trawling was originally intended to relocate sea turtles out of a project area when the probability of lethal take was high or when multiple takes had occurred. This system of scooping up air breathing turtles and moving them to a new location has been an effective risk-minimization measure on many projects. In recent years, relocation trawling has also been used to move fish (not air breathing) to new locations. As discussed above, Atlantic sturgeon are present in these project areas during specific times of year increasing the probability of encounter during trawling. As stated in the RHDC 5.0 risk-assessment, relocation trawling during historic “winter” months has resulted in the relocation of high numbers of Atlantic sturgeon in some areas, including 79 Atlantic sturgeon relocations in Brunswick Harbor between 18 January to 18 March 2018. In Savannah Harbor, 41 Atlantic sturgeon were relocated between 30 November 2017 to 1 April 2018. Similarly, the three years combined for Charleston Deepening listed in Table 7 above included relocation of a total of 20 sea turtles for all species combined but included relocation of 33 Atlantic sturgeon. While minimal mortality was associated with these relocation efforts, it is stressful to the sturgeon and may result in decreased ability to weather other stresses. As discussed for hopper dredging, Atlantic sturgeon are seasonally present in the RHDC project areas and seem to be concentrated when they stage before entering spawning rivers in the spring.

USACE will continue to monitor captures and work with sturgeon experts to understand how to reduce risk to this species. A breakdown of species relocated at projects covered under the 2020 SARBO in FY22 is provided in Figure 16.

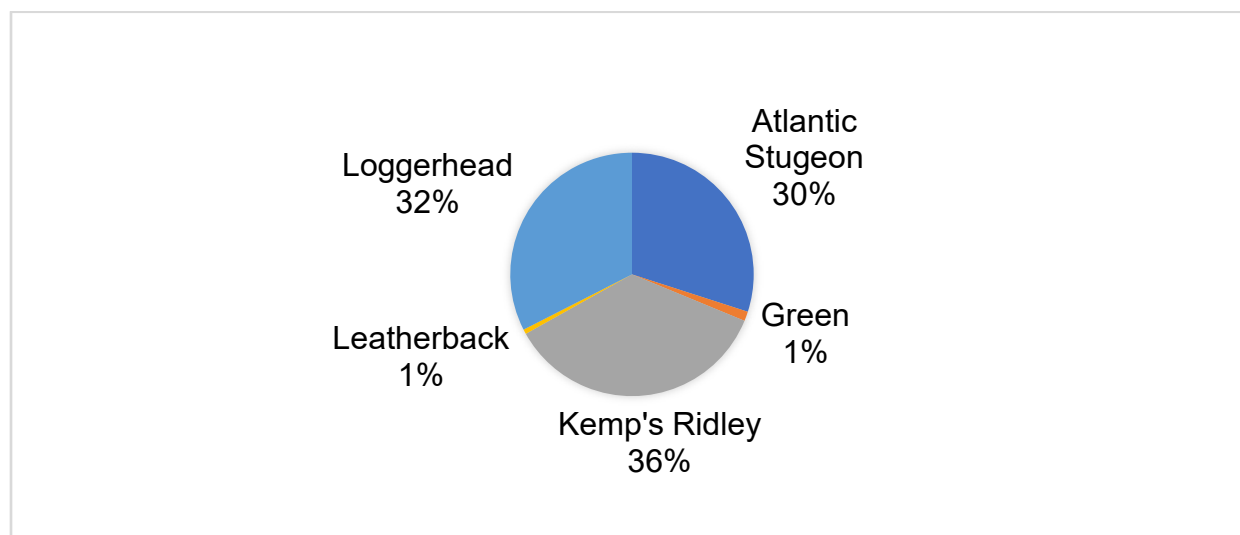


Figure 16. Relocation Trawling Captures by Species (All SARBO Projects FY22)

B. Potential entanglement with equipment (2020 SARBO Section 3.1.2).

This route of effect was determined to be NLAA based on adherence to the PDCs and does not require additional consideration in this risk assessment.

C. Potential for a species to be struck by a vessel (2020 SARBO Section 3.1.4). Vessel strikes may occur during dredging or during the transportation of materials between dredging and material placement locations. This route of effect was determined to be NLAA based on adherence to the PDCs for all species; however, emphasis was placed on the risk of vessel strike to the NARW. The 2020 SARBO includes a North Atlantic right whale conservation plan to address this issue (Appendix F). Therefore, the risk to NARW is discussed further in Section 3.C.3 below.

NARW typically inhabit coastal waters along coastal Georgia and northern Florida each winter, often close to shore. According to the NMFS species directory website, each fall, some right whales travel more than 1,000 miles from North Atlantic feeding grounds to their only known calving grounds in the southeast; the majority of calving occurs in the shallow, coastal waters off Georgia and northeastern Florida. These whales remain near the surface with their new calves and are hard to spot in the water making them susceptible to vessel strikes, which is one of the leading causes of death for this species. In fact, both NARW deaths that occurred in 2021 occurred in the area covered by the 2020 SARBO - with one death caused by a vessel strike in St. Augustine, Florida and the other death off Myrtle Beach, South Carolina from a long-term entanglement. Entanglement is the other leading cause of death for this species and the reason the 2020 SARBO requires all lines associated with work on a project to be non-entangling.

The coastal waters from Cape Fear, North Carolina southward to Cape Canaveral Florida are designated as critical habitat for calving and encompasses the federal navigation channels that are six meters or deeper, offshore placement area (ODMDS), and all areas in between that are transited by dredging and support vessels. None of the actions covered under the 2020 SARBO affect the NARW critical habitat essential features.

This endangered species is of particular concern to NMFS due to its critically low population numbers (estimated at only 368 remaining), low annual calving rates including no calves born in 2018, and an unusual mortality event where 50 individuals have died since 2017. Last year, NMFS believed this loss represented an estimated 10% population loss and has updated that to state this loss equates to a 14% population loss, which is a significant setback to the recovery of the population as summarized in the Figure 17¹⁰.

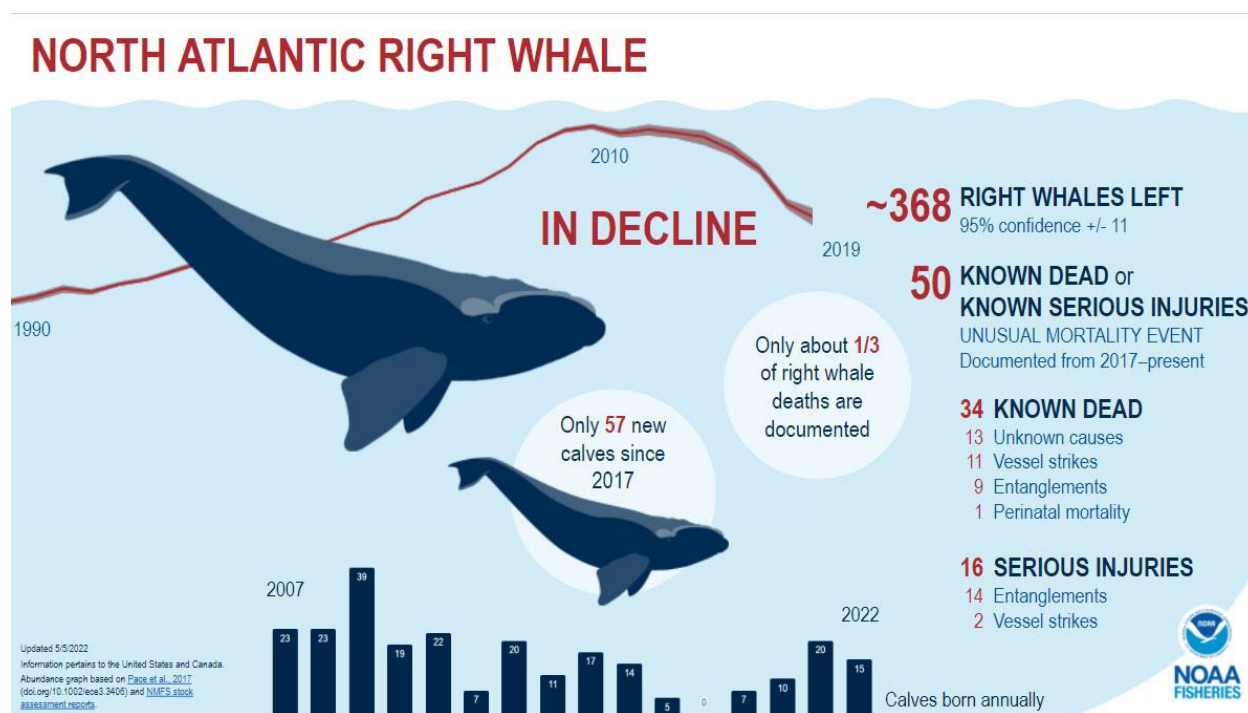


Figure 17. North Atlantic Right Whale Population

As noted in Section 3.1.4.1.4 of the 2020 SARBO,

We [NMFS] believe that the risk of a vessel strike occurring during a project analyzed under this Opinion is very low, [fn omitted] since we are only aware of two reported interactions with vessels related to dredging, worldwide with North Atlantic or the closely related South Atlantic right whales despite decades of dredging both within the action area and globally. However, the consequences of

¹⁰ <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-north-atlantic-right-whale-unusual-mortality-event>

potential take of a North Atlantic right whale to the small population of the species is high. While we do not normally discuss the status of a species when evaluating effects to a species if the effects from the action are not likely to adversely affect the species, the risk of vessel strikes and potential outcome of a strike to a North Atlantic right whale is unique due to the critical status of the population of this species. (emphasis added)

Also in Section 4.1.4.1.4, NMFS stated it was aware of two reports of a hopper dredge collision with a right whale. “One report occurred in South Africa in 1984 involving a Southern right whale and the other report occurred in Brunswick Harbor (within the action area) in 2005, though the report is contested by the USACE.”

The conclusions made by NMFS in the 2020 SARBO are predicated on USACE shifting the majority of dredging for which vessels must transit through NARW calving areas to times when they are not present. As stated in the vessel strike analysis conclusion for NARW in Section 3.1.4.1.4,

Because there are so few North Atlantic right whales, and much of the vessel traffic associated with the proposed action will take place outside of areas and times when North Atlantic right whales may be present, the likelihood of collisions is already very rare. We believe that the implementation of these additional protective measures in the PDCs further reduces the possibility of a vessel strike. When the rarity of occurrence is combined with the requirements of the North Atlantic Right Whale Conservation Plan, we believe a vessel strike is extremely unlikely to occur.

SARBO Section 6.1.1, lists the navigation channels that USACE had proposed to be dredged in warmer months and were analyzed by NMFS (that is, Brunswick Harbor, Savannah Harbor, Charleston Harbor, Wilmington Harbor Entrance/Inner Ocean Bar, Morehead City, and Manteo Entrance Channel). NMFS noted in Section 6.1.1 that any additional locations will be evaluated using the risk-based assessment process.

Under the North Atlantic Right Whale Conservation Plan (2020 SARBO Appendix F), USACE committed to reducing vessel traffic when and where NARW may be found. Specifically, Avoidance Measure NARW.1 states, “Hopper dredging and projects requiring survey vessels over 33-ft in length will be scheduled, to the maximum extent practicable, outside of North Atlantic right whale migration and calving season to avoid impacts to North Atlantic right whales, including reproducing females and newborn calves.” USACE also committed to expanding the aerial surveys used to locate NARW in the southeast. Historically, NARW aerial surveys were limited to Georgia and Northern Florida, which were co-funded by USACE, NMFS, U.S. Navy, and the U.S. Coast Guard. These surveys are used as part of the Early Warning System to alert vessels of their presence to reduce the risk of vessel strikes. The survey area expanded after completion of the 2020 SARBO to include North and South Carolina at the cost of approximately \$1.5 million covered solely by USACE demonstrating USACE commitment to NARW conservation. This expanded aerial survey area expands the

area where whale alerts are provided to mariners to reduce vessel strikes and provides valuable information on NARW use of this area to researchers.

The NARW Conservation Plan states that the USACE and BOEM (as appropriate) will implement the plan within the Atlantic coastal action area extending from the Virginia/North Carolina border south to Cape Canaveral, Florida, during the North Atlantic right whale migration and calving season from 1 November to 30 April. However, aerial survey coverage from Brunswick, Georgia through North Carolina is only required from 15 November through 15 April and NARW Early Warning System surveys are conducted from 1 December to 31 March. Based on available data from the beginning of calving season in 2018 (1 November 2018) to the end of calving season in 2022 (30 April 2022) from North Carolina to Florida (2020 SARBO action area), sightings are rare after March 15 (Figure 18). Only two sightings have been recorded in April and both were in North Carolina in early April as whales migrated back north (6 April 2020, and 4 April 2022). Based on this information, we believe the risk of encountering NARW after 1 April is very low, which has been supported in conversations with other organizations involved in NARW protection.

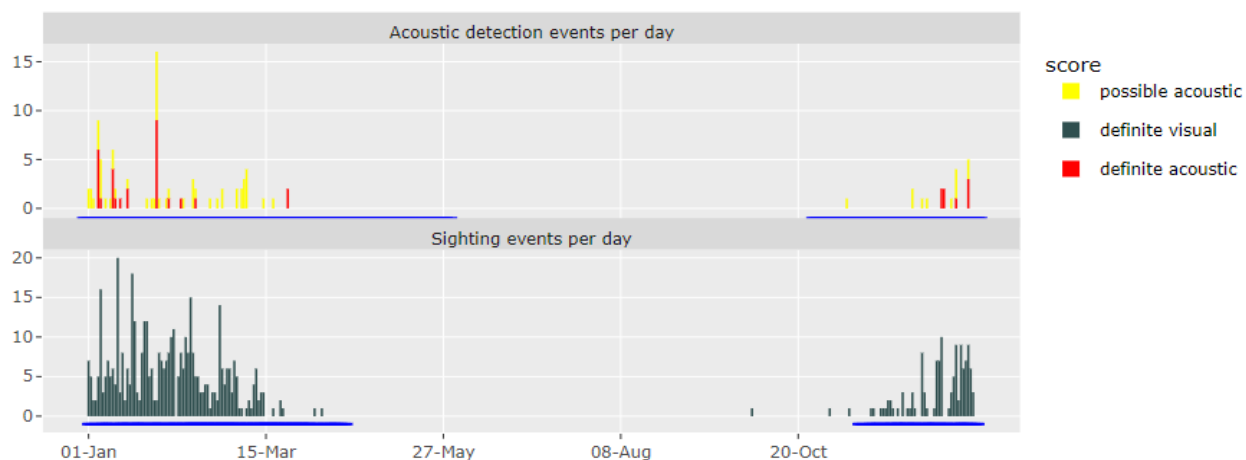


Figure 18. NARW sightings from 1 November 2018 to 30 April 2022. This figure show acoustic and visual sightings along the east coast of North Carolina, South Carolina, Georgia, and Florida. The blue line at the bottom of each table indicates days with survey effort. Map from <https://whalemap.org>.

How species interact with the placement of material (2020 SARBO Section 3.1.5). Placement of dredged material in uplands or ODMDS. This route of effect was determined to be NLAA for the species in these areas based on adherence to the PDCs and does not require additional consideration in the risk assessment.

D. The potential for blocked access by construction activities (2020 SARBO Section 3.1.5). This route of effect was determined to be NLAA based on adherence to the PDCs and does not require additional consideration in the risk-assessment.

E. Habitat alteration for activities covered under this Opinion (2020 SARBO Section 3.1.7). Activities covered are maintenance and are not expected to directly alter sensitive habitat. Placement is limited to ODMDS so alteration of habitat around the dredging sites is limited. The 2020 SARBO also considers the recurring loss of benthic resources within project areas such as foraging resources for sturgeon in maintained channels that are assumed to apply to other species as well. This route of effect was determined to be NLAA based on adherence to the PDCs for species and habitat in the areas covered under the RHDC. As discussed for water quality in 3.1 above, USACE continues to evaluate this risk.

F. Sound generated by activities covered under this Opinion (2020 SARBO Section 3.1.8). Geophysical (G&G) surveys. This route of effect was determined to be NLAA based on adherence to the PDCs and does not require additional consideration in the risk assessment.

4. RECOMMENDATIONS FOR THE RHDC PROJECTS. USACE plans to issue a solicitation for a regional dredging contract to perform maintenance dredging at the five project locations listed in Section 1. So long as work is performed in compliance with any restrictions set by USACE (e.g., earliest start date for work, latest completion date, and use of certain mitigation measures), the exact timing for performing work will be left to the discretion of the company awarded the Regional Dredging Contract.

A. Project Timing. USACE will continue to use the risk-assessment process to consider the probability of encountering species prior to construction and risk-based adaptive management process during construction to evaluate and adjust recommended minimization measures, such as relocation trawling and bed-leveling, before and during dredging. The 2020 SARBO PDCs minimize risk to species and limit take to assure effects to species population and recovery will not occur if the Incidental Take Limit is not exceeded.

Even using all available information to make risk-based decisions, species anomalies have and will continue to happen supporting the need for a three consecutive year take limit provided in the 2020 SARBO. In FY21, a historic number of Kemp's ridley sea turtles were taken (lethal from hopper dredging and non-lethal from relocation trawling). USACE will retain the right to stop work on any project whenever the total take observed under the 2020 SARBO for an individual project or combination of projects is deemed too high or if the probability of continued take is deemed unacceptable.

Section 3 above considered the risk to species by route of effects. This information is summarized in Table 3 below by the level of risk anticipated for the RHDC projects based on the probability of encounter and risk to the species population and recovery if take occurred. Each species risk is considered by the month of the year and includes a short summary of the rationale. These risk-assessment considerations led USACE to conclude that dredging between 1 April and 31 October would greatly reduce the probability of encountering NARW and dredging between 1 April and 30 November,

would greatly reduce the probability of take sturgeon by hopper dredging plus reduce the probability of relocation trawling captures of Atlantic sturgeon.

Table 4. Summary of Risk to ESA-Listed Species under the 2020 SARBO.

(Risk is color coded: red is high, yellow is moderate, and green is low.)

Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Whales (Blue, Fin, Sei, Sperm)	These whale species are deep water pelagic species not expected to be found within areas where activity would occur. The likelihood of encounter is very low. No reported encounters with dredging or related activities. No take covered under SARBO.											
NARW	Present in and/ or near project areas during calving season. Highly susceptible to vessel strikes. No take allowed. Take would affect species population and recovery.			Not expected to be present; migrate north during these months.								
Sea turtles	Sea turtles present year-round. Entrainment: Hopper dredging and trawling frequently result in encounters with higher numbers in Brunswick than Savannah. Loggerheads nest in the area May to mid-August. Infrequent nests from leatherback, green, and Kemp’s ridley. Medium risk because probability of encounters is high, but risk of take changing survivability or recovery of species based on take limits in 2020 SARBO is low.											
Oceanic Whitetip shark	This shark is a deep-water pelagic species. The likelihood of encounter is very low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO.											
Giant manta ray	Based on observations, giant manta ray may be present year-round with higher likelihood in warmer months as they migrate up the Atlantic coast in summer months. No reported encounters with hopper dredges and rare encounters with relocation trawling. Therefore, the likelihood of encounter is low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO. Non-lethal capture by relocation trawling (take) is provided in the 2020 SARBO.											
Smalltooth sawfish	Observations north of Florida are rare and typically limited to Georgia. No reported encounters with hopper dredges and rare encounters with relocation trawling. Therefore, the likelihood of encounter is very low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO. Non-lethal capture by relocation trawling (take) is provided in the 2020 SARBO.											

Atlantic Sturgeon	Frequent encounters by hopper and trawler in winter months, but risk of take changing survivability or recovery of species based on take limits in 2020 SARBO is low.		
Shortnose Sturgeon	Shortnose sturgeon typically stay in spawning rivers year-round and there are no records of hopper dredging take of this species in these project areas. Therefore, the likelihood of encounter is very low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO.		

B. Equipment. It is assumed that a hopper dredge will be used by the company awarded the contract; however, hopper dredge is not required, and the company may use other options, including cutterhead or mechanical dredging. Use of other options is not expected based on past experience and limitations of these equipment types to complete work in these environments. Equipment may be limited by availability or ability to complete the work effectively. For example, maintenance dredging USACE higher priority projects may divert resources such as hopper dredges to address high shoaling in the Mississippi River that typically occurs from February to April.

USACE will also continue to work with species experts and industry to find ways to further reduce risk. If innovative equipment or equipment modifications are deemed appropriate to try to reduce species risk, these changes will be coordinated with NMFS through the “Alternative Project Implementation and Programmatic Modification through the Superseding Process of Review,” which is outlined in Section 2.9.5 of the 2020 SARBO.

B.1. Relocation trawling. Relocation trawling remains a viable option to reduce the risk of hopper dredging take of sea turtles and sturgeon. However, relocating during summer months may encounter gravid (i.e., pregnant, carrying eggs) female sea turtles, and stress and exertion from relocation increases risk (e.g., nonlethal reproductive loss), as analyzed in SARBO Section 6.1.4.1.2 and therefore may result in unobserved take. Therefore, the duration of relocation trawling will be based on a balance of stressors inflicted upon sea turtles during relocation versus risk of lethal entrainment from hopper dredging (i.e., will depend upon number of adult female sea turtles captured versus the number of those entrained).

B.2. Bed-Leveling. Bed-leveling during the final phase of work reduces the probability of take of species as this is when peaks and valleys left by hopper dredging make keeping the draghead firmly embedded in the sediment more challenging.

It is recommended that relocation trawling and bed-leveling be used as appropriate and in coordination with USACE SAD.

C. Reporting Requirements. Accurate and timely reporting is essential to risk-assessment and the adaptive process applied by USACE. Reporting requirements are important and consequently should be included as contract requirements. For example, hopper dredging and relocation trawling reports completed by the Protected Species Observer need to be provided to NMFS after every encounter with an ESA-listed species according to the 2020 SARBO PDCs. The following reporting requirements are recommended:

C.1. Reporting Take of ESA-listed Species. Reporting of hopper dredging take is currently entered in ODESS and relocation trawling reports are handwritten. Once ODESS is upgraded to Version 2, all data will be entered in the new hopper and trawling phone or tablet application. It is recommended that all take reports be provided in a standardized, digital, manipulatable Excel spreadsheet. These spreadsheets will be required after each lethal take and weekly for non-lethal take. The spreadsheets will include all information required in the 2020 SARBO including species type, measurements taken, and confirmation if a tag was applied and genetic sample taken when required. This spreadsheet will provide a total count by species of all ESA-listed species captured.

C.2. Final Reporting. An end of project summary report is also required that includes the complete spreadsheet of ESA-listed species captured and a digital scanned copy of all handwritten reports (e.g., load, tow, daily report), if applicable.

C.3. Bycatch Reporting. All bycatch will be provided in a standardized, digital, manipulatable Excel spreadsheet with the weekly take reports indicating if bycatch occurred, species observed, and estimated numbers of species captured. Emphasis will be placed on tracking bycatch for species provided by USACE.

C.4. Report Recipients. To reduce delay in reporting, all take and bycatch reports will be provided to the USACE District SARBO POC and emailed to SARBO@usace.army.mil, in addition to any other recipients identified in the contract.

D. Project-Specific Recommendations. Based on the risk assessment in Section 2 above, the following is recommended for the dredging of these projects.

D.1. Wilmington and Morehead City Harbors. It is recommended that dredging be initiated on or after 1 April, which is a month later than the initiation of work under last year's contract, as analyzed under RHDC 5.0. The risk assessment supports USACE shifting work a month later to avoid NARW calving season, as described in Section 3.C above. Successful completion of projects in these areas described in Section 2 support this time frame to be low risk to sea turtles and sturgeon. Since dredging is required annually for these two projects, the timing of the work needed to maintain the navigability of the Federal channels cannot be changed significantly from year to year. Relocation trawling should be included in the contract as an optional line item so that it is a measure that USACE, at its discretion, can determine if or when use of relocation trawling begins and ends. The determination regarding relocation trawling

will be based on best available information at the time, including hopper dredging take and relocation trawling captures that may be occurring at other projects in the area. Also, the use of bed-levelers should continue to the maximum extent practicable.

D.2. Charleston and Savannah Harbors. The risk assessment supports USACE moving outside of historic winter dredging windows to dredge these projects. Dredging within the prior windows is not preferred due to the assessment above for Atlantic sturgeon, NARWs, and likely sea turtles. However, dredging should be performed between 15 December and 31 March during FY23 because this timeframe is currently dictated by environmental compliance requirements that are being addressed. Relocation trawling should be included in the contract as an optional line item to provide discretion to USACE to require its use as needed, and the use of bed-levelers should continue to the maximum extent practicable. Once current sources of restrictions are resolved, USACE should update and apply the risk-based assessment and process, as required by the SARBO, to determine the timing, equipment, and mitigation measures for conducting maintenance dredging at these three projects and minimizing the risk of takes.

D.3 Brunswick Harbor. The risk assessment supports USACE moving outside of historic winter dredging windows to dredge these projects. Dredging within the prior windows is not preferred due to the assessment above for Atlantic sturgeon, NARWs, and likely sea turtles; however, in order to reduce potential navigation impacts on the project by making a significant shift in the timing of dredge operations, it is recommended that the majority of work (approx. 1.5MCY) occur within the window for this contract. It is recommended that an option be included as part of the contract for a smaller portion of the work (approx. 500KCY) to be performed between 1 April and 31 August. This will allow USACE to begin transitioning work outside of the traditional window while at the same time begin learning what dredging operations will look like outside of the traditional window.

USACE Savannah District provided input for FY23 for the smaller portion of work to be performed between 1 May and 31 August stating that recommendations were based on the analysis in the RHDC 5.0, the need to avoid of the NARW calving season that officially ends 30 April, and the need to protect sea turtles based on the prior analysis of the risk of sea turtle entrainment by hopper dredging by time of year completed in 2009⁸. However, this RHDC 6.0 analysis updates the timing required to avoid species. For sea turtles, Section 3.A updates the timing considerations since the 2009 analysis. For context, the 2009 analysis was considered in the 2020 SARBO and the RHDC 5.0 analysis and did not result in a new sea turtle timing restriction. For NARW, the information analyzed in Section 3.C updates the timing to minimize risk to this species by recommending work start annually after 1 April. Therefore, the recommendations determined in this analysis are the most appropriate and accurate.

District input are part of the decision process used to make final recommendations to USACE SAD. SAD must evaluate individual project or District recommendations with

the risk of completing all work under the 2020 SARBO regionally. USACE SAD must also consider non-environmental risk-assessment factors to understand the probability of successfully completing all work anticipated based on mission requirements described in Section 1.B above, contract requirements, cost, equipment availability, and more. As described in Section 1 above, USACE has a long history of balancing these needs and stopping work if the risk of continuing work is deemed unacceptable. As it is impossible to predict all situations that may arise on future projects, USACE has always and will continue to actively manage projects by continuing to adjust risk-minimization measures before and during construction as deemed appropriate to be protective of species while balancing USACE mission requirements.

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