New York Bight Distinct Population Segment of Atlantic Sturgeon
(Acipenser oxyrinchus oxyrinchus)

5-Year Review:
Summary and Evaluation

National Marine Fisheries Service
Greater Atlantic Regional Fisheries Office
Gloucester, Massachusetts

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1.0 GENERAL INFORMATION

The New York Bight DPS of Atlantic sturgeon includes Atlantic sturgeon spawned in the watersheds that drain into coastal waters (including bays and sounds) from Chatham, Massachusetts to the Delaware-Maryland border at Fenwick Island, as well as Atlantic sturgeon held in captivity that are progeny of such fish (50 CFR 224.101).

1.1 Reviewers

Lead Regional or Headquarters Office: Greater Atlantic Regional Fisheries Office, Jennifer Anderson, Assistant Regional Administrator for Protected Resources, 978-281-9226, jennifer.anderson@noaa.gov

Cooperating Regional Office: Southeast Regional Office, David Bernhart, Assistant Regional Administrator for Protected Resources, 727-824-5312, david bernhart@noaa.gov

1.2 Methodology used to complete the review

The National Marine Fisheries Service (NMFS), Greater Atlantic Regional Fisheries Office (GARFO) led the 5-year review for the New York Bight Distinct Population Segment (DPS) of Atlantic sturgeon. NMFS is required to consider new information that became available since the New York Bight DPS of Atlantic sturgeon was listed as endangered in February 2012. 16 USC 1533 (4)(c)(2). NMFS reviewed and considered new information for the New York Bight DPS, specifically, as well as other new information for Atlantic sturgeon generally because there is still a relatively limited amount of DPS-specific information.

NMFS used several methods to acquire the new information. In addition to reviewing the literature generally made available (e.g., journal articles sent to us by the author, notifications of new publications via a group email list), NMFS requested a literature search from the NOAA Central Library. Ten public comments were received in response to a Federal Register notice (83 FR 11731; March 16, 2018) of which four were specific to the New York Bight DPS. NMFS also considered the information provided in and the conclusions of the Atlantic States Marine Fisheries Commission (ASMFC) 2017 Atlantic Sturgeon Stock Assessment (hereafter, "Stock Assessment"). NMFS did not request copies of the data compiled by the ASMFC or conduct our own analyses of the data. All of the information in the Stock Assessment that is not yet available through peer-reviewed publications was considered best available information because the Stock Assessment was peer-reviewed in accordance with the ASMFC's procedures. NMFS requested courtesy review and comment from the ASMFC Sturgeon Technical Committee for sections 1.0 through 2.3 of the draft 5-year review to help ensure that we are using the best available information.

1.3 Background

1.3.1 FR Notice citation announcing initiation of this review

83 FR 11731, March 16, 2018 - Initiation of 5-Year Review for the Endangered New York Bight, Chesapeake Bay, Carolina, and South Atlantic Distinct Population Segments of Atlantic Sturgeon and the Threatened Gulf of Maine Distinct Population Segment of Atlantic Sturgeon.

83 FR 12942, March 26, 2018 - Initiation of 5-Year Review for the Endangered New York Bight, Chesapeake Bay, Carolina, and South Atlantic Distinct Population Segments of Atlantic Sturgeon and the Threatened Gulf of Maine Distinct Population Segment of Atlantic Sturgeon; Correction.

1.3.2 Listing history

Original Listing
FR notice: 77 FR 5880
Date listed: February 6, 2012
Entity listed: New York Bight Distinct Population Segment of Atlantic sturgeon
Classification: Endangered

1.3.3 Associated rulemakings

Critical Habitat
FR notice: 82 FR 39160
Date designated: August 17, 2017
Determination: Four critical habitat units were designated for the New York Bight DPS of Atlantic sturgeon encompassing approximately 547 kilometers of tidally-affected waters within the Connecticut, Housatonic, Hudson, and Delaware rivers. All of the critical habitat units occur in the geographic area occupied by the New York Bight DPS.

1.3.4 Review History

1998 Status Review: On June 2, 1997, the U.S. Fish and Wildlife Service (USFWS) and NMFS (collectively, the Services) received a petition from the Biodiversity Legal Foundation requesting that NMFS list Atlantic sturgeon in the United States as threatened or endangered and designate critical habitat within a reasonable period of time following the listing. In 1998, after completing a comprehensive status review, the Services published a 12-month determination in the *Federal Register*, announcing that listing was not warranted at that time (63 FR 50187; September 21, 1998). NMFS retained Atlantic sturgeon on the candidate species list (subsequently changed to the Species of Concern List (69 FR 19975; April 15, 2004)).

2003 Workshop: NMFS sponsored a workshop with USFWS and the ASMFC titled "Status and Management of Atlantic Sturgeon," to discuss the status of Atlantic sturgeon along the Atlantic Coast and determine what obstacles, if any, were impeding their recovery. The results of the workshop indicated some riverine populations seemed to be recovering while others were declining, and bycatch and habitat degradation were noted as possible causes for continued declines (Kahnle et al. 2005).

2007 Status Review: NMFS initiated a new status review of Atlantic sturgeon in 2005 based on the outcomes of the 2003 Workshop and other new information. The Atlantic Sturgeon Status Review Team (ASSRT) concluded in 2007 that Atlantic sturgeon of U.S. origin comprised five DPSs, and the team recommended identifying these as the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs. The ASSRT further recommended that the New York Bight, Chesapeake Bay, and Carolina DPSs be considered threatened under the ESA but made no listing recommendation for the Gulf of Maine or South Atlantic DPSs because of insufficient data. A Notice of Availability of this report was published in the *Federal Register* on April 3, 2007 (72 FR 15865).

On October 6, 2009, NMFS received a petition from the Natural Resources Defense Council to list Atlantic sturgeon throughout its range as endangered under the ESA. As an alternative, the petitioner requested that the species be listed as the five DPSs described in the 2007 Atlantic sturgeon status review with the Gulf of Maine and South Atlantic DPSs listed as threatened, and the remaining three DPSs listed as endangered. NMFS published a Notice of 90-Day Finding on January 6, 2010 (75 FR 838), stating that the petition presented substantial scientific or commercial information indicating that the petitioned actions may be warranted. NMFS considered the information provided in the 2005 Status Review and all other best available information. NMFS proposed and subsequently listed the New York Bight DPS under the ESA as endangered (77 FR 5880; February 6, 2012).

1.3.5 Species' Recovery Priority Number at start of 5-year review

The recovery priority number for the New York Bight DPS is 1C based on the Listing and Recovery Priority Guidelines (84 FR 18243, April 30, 2019) (Recovering Threatened and Endangered Species, FY 2017-2018 Report to Congress; available at https://www.fisheries.noaa.gov/resource/document/recovering-threatened-and-endangered-species-report-congress-fy-2017-2018).

1.3.6 Name of Recovery Plan or Outline

Recovery Outline for the Atlantic Sturgeon Distinct Population Segments (available at https://www.fisheries.noaa.gov/species/atlantic-sturgeon#conservation-management)
Date issued: January 2018
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate? **Yes**

2.1.2 Is the species under review listed as a DPS? **Yes**

2.1.3 Was the DPS listed prior to 1996? **No**

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy? **No**

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria? **No**

2.3 Updated Information and Current Species Status

The biology and life history information for the New York Bight DPS was reviewed for the 2007 Status Review (ASSRT 2007) and updated for the proposed and final rules when the DPS was listed as endangered (75 FR 61872, October 6, 2010; 77 FR 5880, February 6, 2012). The habitat needs for the DPS were reviewed and described in the critical habitat designation (82 FR 39160, August 17, 2017) and in the supplementary document (https://repository.library.noaa.gov/view/noaa/18671). Section 2.3.1 provides a summary of the previously available information, and then provides updates from new information that has become available since the ESA-listing and critical habitat designation for the New York Bight DPS.

2.3.1 Biology and Habitat for the New York Bight DPS of Atlantic Sturgeon at the Time of the ESA-Listing

The New York Bight DPS of Atlantic sturgeon has the same basic life history characteristics of all Atlantic sturgeon. Atlantic sturgeon are reliant upon freshwater for spawning and embryo and larval rearing habitat, and brackish and marine waters for growth and development of the juveniles as well as sustenance of adults. Atlantic sturgeon are easily distinguished from most other fish species within their range because of their relatively large size, visible bony scutes, protruding snout, and heterocercal tail. Atlantic sturgeon belonging to different DPSs can be distinguished from each other based on the unique genetic characteristics of each DPS and of each of the individual spawning river populations.

The New York Bight DPS is comprised of all Atlantic sturgeon spawned in the watersheds that drain into coastal waters from Chatham, Massachusetts to the Delaware-Maryland border on Fenwick Island (77 FR 5880; February 6, 2012). Within this range, Atlantic sturgeon historically spawned in the Connecticut, Delaware, Hudson, Housatonic, and Taunton Rivers (ASSRT 2007). Of these rivers, there was evidence of current spawning in the Hudson River and in the Delaware River when we listed the New York Bight DPS as endangered.

Spawning areas for the New York Bight DPS were identified in the listing rule as occurring in the Hudson River near river kilometer (rkm) 112 and near Hyde Park at approximately rkm 134. Spawning was believed to be occurring in the Delaware River between the Marcus Hook Bar (rkm 134) and the mouth of the Schuylkill River (rkm 148). Known juvenile rearing habitat was the reach of the Hudson River from Tappan Zee through Kingston with concentration areas at Haverstraw and Newburgh bays. Known juvenile rearing habitat in the Delaware River was from approximately New Castle through Roebling with a known concentration area at Marcus Hook, particularly for Atlantic sturgeon in their first year of life (i.e., age 0-1). Atlantic sturgeon likely spend two to three years in the natal estuary, using and moving within the brackish waters of the natal estuary that are most suitable for their growth and development, before emigrating to the marine environment.

The directed movement of subadult[1] and adult Atlantic sturgeon in the spring is from marine waters to river estuaries. River estuaries provide foraging opportunities for subadult and adult Atlantic sturgeon in addition to providing access to spawning habitat. Brackish waters of the Hudson and Delaware river estuaries are used by subadults, non-spawning adults, and post-spawned adults during the spring through fall. These include subadults and adults that are not natal to the river or to the New York Bight DPS. The directed movement of subadult and adult Atlantic sturgeon is reversed in the fall as the fish move back into marine waters for the winter.

In the marine environment, subadults and adults typically occur within the 50-meter (m) depth contour. Genetic analyses indicate the presence of Atlantic sturgeon belonging to the New York Bight DPS in many parts of the marine range including the Bay of Fundy, the New York Bight, and off the Virginia/North Carolina coastline in the winter. Others have been tracked to the southern extent of the range off Florida (77 FR 5880; February 6, 2012).

Life history information for the New York Bight DPS is relatively sparse and most of the available information was collected from sturgeon belonging to the Hudson River spawning population. When NMFS listed the DPS, we considered age at maturity for both sexes to be 11 to 21 years old based on available information for the Hudson River spawning population. The youngest spawners are more likely to be male sturgeon; males grow faster and mature sooner than female Atlantic sturgeon. Spawning periodicity was described as one to five years for males and two to five years for females. NMFS considered that the lifespan for Atlantic sturgeon, in general, was approximately 60 years (Mangin 1964; Stevenson and Secor 1999).

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[1] NMFS uses the term "subadult" here to refer to immature Atlantic sturgeon that have emigrated from the natal river estuary and uses the term "juvenile" to refer to immature fish that have not yet emigrated from the natal river estuary. Some of the published literature for Atlantic sturgeon uses the term juvenile to refer to all sexually immature Atlantic sturgeon, including sexually immature fish that have emigrated from the natal river estuary.

There was no abundance estimate for the New York Bight DPS when NMFS listed it under the ESA. The only available estimate was 870 spawning adults per year for the Hudson River spawning population which was based on data collected from 1985 (Kahnle et al. 2007). The ASSRT (2007) suggested that most of the other spawning populations, including in the Delaware River, likely numbered less than 300 spawning adults per year because the ASSRT considered that the Hudson River spawning population and the Altamaha River spawning population, for which there was an estimate of 343 spawning adults per year, were likely the most robust of all of the Atlantic sturgeon spawning populations. Therefore, the ASSRT made a reasoned conclusion that all of the other Atlantic sturgeon spawning populations likely numbered less than 300 spawning adults per year.

Studies have shown that Atlantic sturgeon can only sustain low levels of anthropogenic mortality (Boreman 1997; ASSRT 2007; Brown and Murphy 2010). NMFS concluded at the time of the listing that the New York Bight DPS was currently at risk of extinction given low abundance, limited spawning, threats to habitat from continued degraded water quality and dredging, anthropogenic mortality of New York Bight DPS Atlantic sturgeon from bycatch and vessel strikes, the lack of measures to address these threats, and the likelihood that some threats (e.g., bycatch) were likely to increase in magnitude in the future.

2.3.1.1 New information on the species' biology and life history

New information has been collected from the use of acoustic telemetry to detect the presence of Atlantic sturgeon. Use of acoustic telemetry for Atlantic sturgeon requires surgically implanting the tag within the sturgeon's body cavity (Kahn and Mohead 2010), and then placing acoustic receivers in the water, which detect and record the unique signal of the tag when the sturgeon is within range of a receiver. Acoustic receivers are often fixed in specific locations but a receiver can also be towed or fixed to a moving object. Researchers use an array of receivers to track the movements of acoustically-tagged sturgeon in areas across the range of each DPS. Data collected on receivers in the Hudson River after the listing determinations confirm the occurrence of acoustically-tagged Atlantic sturgeon as far upriver as the Federal Dam at Troy, New York (Kazyak et al. 2020).

In addition to new acoustic detections, an Atlantic sturgeon carcass was found at Easton, PA (i.e., above the fall line of the Delaware River) in 2014 (NMFS 2017). The new information confirms, but does not change, our previous determinations for the range of the New York Bight DPS in these rivers.

New information from Breece et al. (2021) better informs the spawning periodicity for the Hudson River spawning population, including that both male and female Atlantic sturgeon can spawn annually. Thirty-six of forty-four male Atlantic sturgeon that made more than one presumed spawning run during the seven years of the study returned in consecutive years, and all returned within two years. Six of nine females also exhibited annual spawning runs at least once during the study. However, most of the females had a spawning periodicity of two years at least once (including three of the females that had also spawned in consecutive years), and spawning periods of three and four years were also observed. Based on the information provided, the upper range of spawning periodicity for either sex is not evident because an additional 13 male sturgeon and 8 female sturgeon were detected in the presumed spawning reach in only one spawning season of the study, and information was not provided for when (i.e., which year) within the study period each fish was initially captured and tagged. Therefore, it is unknown whether these fish had a longer spawning periodicity or if they had fewer spawning seasons in which to be detected. The findings do support, however, that males spawn more frequently than females, and that females can spawn in consecutive years but that female spawning periodicity is more variable than males. The findings have implications for estimating total spawning population abundance based on the combination of annual adult spawning abundance and spawning periodicity.

Salvage of a fresh dead Atlantic sturgeon in the Delaware River in May 2016 provided information that further supports what is known about the timing of spring spawning in the Delaware River as well as what is known about potential fecundity, lifespan, and threats to the New York Bight DPS. The previously tagged Atlantic sturgeon was struck and killed by a vessel just upriver of a likely spawning area. The cause of death was witnessed to be a vessel strike that decapitated the fish and cut through the body at the caudal peduncle. The partial carcass was immediately retrieved under the salvage provisions of NMFS permit for scientific research (then permit no. 17273). Examination of the carcass revealed that the fish was a mature female, previously captured and tagged in the Delaware River 24 years prior, and was carrying an estimated 2.1 million eggs when she was killed (I. Park, DE DFW, pers. comm.). Her minimum age and estimated egg count are consistent with the literature that was available to us at the time of the ESA-listing. Her presence in the freshwater reach of the river, near a likely spawning area and in spawning condition, provides further evidence that spawning occurs in the Delaware River in the spring.

The Stock Assessment mentioned a possible fall spawning season in the Delaware River based on tracked movements of tagged fish. However, no further information has become available to demonstrate that a second spawning season exists in the Delaware River; therefore, it is not currently possible to conclude whether fall spawning occurs in the Delaware River based on the available information.

The ASSRT (2007) concluded that the historical Connecticut River Atlantic sturgeon spawning population had likely been extirpated. New, confounding information is available regarding whether the Connecticut River supports a spawning population. In 2014, the Connecticut Department of Energy and Environmental Protection (CT DEEP) captured Atlantic sturgeon in the river that, based on their size, had to be less than one year old. Therefore, given the established life history patterns for Atlantic sturgeon which include remaining in lower salinity water of their natal river estuary for more than one year, the sturgeon were likely spawned in the Connecticut River. However, genetic analysis for 45 of the smallest fish (ranging from 22.5 to 64.0 cm TL) indicated that the sturgeon were most closely related to Atlantic sturgeon belonging to the South Atlantic DPS (Savoy et al. 2017). The conventional thinking is that the Connecticut River was most likely to be recolonized by Atlantic sturgeon from the Hudson River spawning population because: it is the closest of the known spawning rivers to the Connecticut; the most robust of all of the spawning populations; and, occurs within the same, unique, ecological setting. Furthermore, the majority of the Atlantic sturgeon that aggregate in the Lower Connecticut River and Long Island Sound originate from the New York Bight DPS (primarily the Hudson River spawning population) whereas less than 10 percent originate from the South Atlantic DPS (Waldman et al. 2013). The genetic results for the juvenile sturgeon are, therefore, counter to prevailing information regarding straying and the affinity of Atlantic sturgeon for natal homing (see also section 2.3.1.4). The genetic analyses of the juvenile sturgeon also showed that many (i.e., 82%) were full siblings which means that relatively few adults contributed to this cohort. The CT DEEP is conducting a multiyear investigation to further inform the status and origin of Atlantic sturgeon spawning in the river. At this time, we are not able to conclude whether the juvenile sturgeon detected are indicative of sustained spawning in the river or whether they were the result of a single spawning event due to unique straying of the adults from the South Atlantic DPS's spawning rivers.

2.3.1.2 New information on the abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends

There are no abundance estimates for the entire New York Bight DPS or for the entirety of the (i.e., all age classes) Hudson River or Delaware River populations. NMFS also has no estimate of any potential spawning population in the Connecticut River. Collecting this information has proven difficult and time consuming given the Atlantic sturgeon's life history, the environments in which they occur, and mixing of the DPSs in estuarine and marine waters. There is new information on the spawning population abundance in the Hudson River. Kazyak et al. (2020) used side scan sonar technology in conjunction with detections of previously tagged Atlantic sturgeon to estimate a Hudson River spawning run size of 466 sturgeon (95% CRI = 310-745) in 2014. Subsequent estimates could help inform trends in spawning run size, and may be useful for approximating the total number of spawning adults.

Another method for assessing the number of spawning adults is through determinations of effective population size[2], which measures how many adults contributed to producing the next generation based on genetic determinations of parentage from the offspring. Effective population size is always less than the total abundance of a population because it is only a measure of parentage, and it is expected to be less than the total number of adults in a population because not all adults successfully reproduce. Measures of effective population size are also used to inform whether a population is at risk for loss of genetic diversity and inbreeding (see section 2.3.1.3). The estimates of effective population size for the Hudson River spawning population from separate studies and based on different age classes are relatively similar to each other: 198 (95% CI=171.7-230.7) based on sampling of subadults[3] captured off of Long Island across multiple years, 156 (95% CI=138.3-176.1) based on sampling of natal juveniles in multiple years (O'Leary et al. 2014; Waldman et al. 2019), and 144.2 (95% CI=82.9-286.6) based on samples from a combination of juveniles and adults (ASMFC 2017). Estimates for the Delaware River spawning population by the same authors and using the same methods were:

[2] Effective Population Size is the number of individuals that effectively participates in producing the next generation. For further information see https://www.sciencedirect.com/topics/earth-and-planetary-sciences/effective-population-size.

[3] O'Leary et al. refer to the sampled fish as juveniles. However, we use the term "subadult" for immature Atlantic sturgeon that have emigrated from the natal river, and the term "juvenile" for immature fish that have not yet emigrated from the natal river.

108.7 (95% CI=74.7-186.1) and 40 (95% CI=34.7-46.2) for samples from subadults and natal juveniles, respectively (O'Leary et al. 2014; Waldman et al. 2019), and 56.7 (95% CI=42.5-77.0) based on samples from a combination of juveniles and adults (ASMFC 2017). As described above, the CT DEEP determined that very few adults contributed to the juveniles found in the Connecticut River in 2014. Based on the genetic analysis of 45 of the captured juveniles, the effective population size for the Connecticut River was estimated to be 2.4 sturgeon (Savoy et al. 2017). As noted above, the CT DEEP is further investigating the presence of and origins for a spawning population in the Connecticut River.

The estimates of effective population size as well as a study that used samples from juvenile Atlantic sturgeon captured in the Delaware from 2009-2019 to infer annual run size estimates, and new genetic analyses for sturgeon collected in mixed aggregations continue to support that the New York Bight DPS is primarily comprised of Atlantic sturgeon that originate from the Hudson River. The data analysis for annual run size estimates for the Delaware River spawning population is incomplete but the preliminary results suggest that the spawning population is very small (D. Kazyak, USGS, pers. comm.). The results of the coast wide mixed stock analysis and the Delaware River Estuary genetic analysis both indicate that the number of sturgeon that originated from the Delaware River spawning population was approximately one-third of those that originated from the Hudson River (Wirgin et al. 2015a; Wirgin et al. 2015b; Kazyak et al. 2021). Section 2.3.1.5 provides additional results of genetic analyses for sturgeon captured from mixed aggregation areas within the marine range.

Estimates of natal juvenile abundance are another method for estimating abundance and trends of Atlantic sturgeon spawning populations. The Delaware Division of Fish and Wildlife (DFW) has conducted juvenile abundance surveys in the Delaware River in most years since 2010. The estimated abundance in 2014 was 3,656 (95% CI = 1,935–33,041) age 0-1 juvenile Atlantic (Hale et al. 2016). Additional information is available in the final reports (Stetzar et al. 2015; Park 2020). Funding to continue the surveys has not yet been secured and it is uncertain whether DFW will continue the surveys. The New York State Department of Environmental Conservation (DEC) has conducted annual surveys for Atlantic sturgeon juveniles in the Hudson River since 2004. Recent analyses suggest that the abundance of juvenile Atlantic sturgeon belonging to the Hudson River spawning population has increased, with double the average catch rate for the period from 2012-2019 compared to the previous eight years, from 2004-2011 (Pendleton and Adams 2021).

NMFS estimated adult and subadult abundance of the New York Bight DPS based on available information for the genetic composition and the estimated abundance of Atlantic sturgeon in marine waters (Damon-Randall et al. 2013, Kocik et al. 2013). NMFS has relied upon these numbers in the ESA section 7 consultation context, and concluded that subadult and adult abundance of the New York Bight DPS was 34,566 sturgeon (NMFS 2013). This number encompasses many age classes since, across all DPSs, subadults can be as young as one year old when they first enter the marine environment, and adults can live as long as 64 years (Balazik et al. 2012a; Hilton et al. 2016). For example, Dunton et al. (2016) determined that the 742 Atlantic sturgeon that they captured in the New York Bight represented 21 estimated age classes and that, individually, the sturgeon ranged in age from 2 to 35 years old.

Very few data sets are available that cover the full potential life span of an Atlantic sturgeon which can be as much as 40 to 64 years). The ASMFC concluded for the Stock Assessment that it could not estimate abundance of the New York Bight DPS or otherwise quantify the trend in abundance because of the limited available information. However, the Stock Assessment was a comprehensive review of the available information, and used multiple methods and analyses to assess the status of the New York Bight DPS and the coast wide stock of Atlantic sturgeon. For example, the Stock Assessment Subcommittee defined a benchmark, the mortality threshold, against which mortality for the coast wide stock of Atlantic sturgeon as well as for each DPS were compared[4] to assess whether the current mortality experienced by the coast wide stock and each DPS is greater than what it can sustain. This information informs the current trend of the New York Bight DPS.

In the Stock Assessment, the ASMFC concluded that abundance of the New York Bight DPS is "depleted" relative to historical levels but, there is a relatively high probability (75 percent) that the New York Bight DPS abundance has increased since the implementation of the 1998 fishing moratorium, and a 69 percent probability that mortality for the New York Bight DPS does not exceed the mortality threshold used for the assessment (ASMFC 2017).

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.)

There are some indications of genetic bottlenecks in the Hudson and Delaware spawning populations as well as low levels of inbreeding (O'Leary et al. 2014; ASMFC 2017; Waldman et al. 2019). NMFS does not have information to indicate whether or to what extent the New York Bight DPS is negatively affected by any reduced genetic variation.

2.3.1.4 Taxonomic classification or changes in nomenclature

There are no changes in taxonomic classification or changes in nomenclature for the New York Bight DPS of Atlantic sturgeon. Additional genetic analyses were conducted for the Stock Assessment, which concluded that the genetic designations of the Atlantic sturgeon DPSs are sound, and that the general delineations first suggested in 2007 continue to accurately describe the geographic groups of Atlantic sturgeon encountered along the U.S. Atlantic coast (ASMFC 2017). As described in section 2.3.1.5, there is additional, new, information that supports our conclusion in the listing rule that the New York Bight DPS persists in an ecological setting unusual or unique for the taxon, and loss of the DPS would result in a significant gap in the range of the taxon.

As described in section 2.3.1, further study of the Atlantic sturgeon in the Connecticut River is ongoing because of the unexpected finding that the juveniles found there most closely resembled the South Atlantic DPS rather than the New York Bight DPS.

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[4] The analysis considered both a coast wide mortality threshold and a region-specific mortality threshold to evaluate the sensitivity of the model to differences in life history parameters among the different DPSs (e.g., Atlantic sturgeon in the northern region are slower growing, longer lived; Atlantic sturgeon in the southern region are faster growing, shorter lived).

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.)

New information is available from Delaware DFW that demonstrates the importance of the Delaware River habitat near Marcus Hook, Pennsylvania for juvenile Atlantic sturgeon, particularly age 0-1 (Stetzar et al. 2015; Hale et al. 2016; Park 2020). In the 2014 field season, for example, 79.1 percent of the total juvenile detections occurred in the Marcus Hook area (Stetzar et al. 2015). Similar results were found in subsequent years through 2019, and even in 2016 and 2017 when the DFW's capture efforts were affected by sturgeon relocation trawling per the U.S. Army Corp of Engineers (USACE)-led modification of the Delaware River Federal Navigation Channel (Park 2020). Additional information regarding that relocation trawling is provided in section 2.3.2.1.

New ageing analyses of fin spines from 520 Atlantic sturgeon captured in a prior study (Sweka et al. 2007) confirms the use of Newburgh and Haverstraw bays by New York Bight DPS juveniles[5] and, likely, subadults as well. Sturgeon as young as one-year old and as old as eight years were present in the bays in the spring and the fall. Four-year-old sturgeon were the most prevalent age group (Kehler et al. 2018). The presence of fish from age-one through age-eight across multiple seasons confirms that Newburgh and Haverstraw bays are important juvenile habitat for the New York Bight DPS and for the Hudson River spawning population, in particular.

New information is available that better informs the marine range of the New York Bight DPS, and the marine distribution of Atlantic sturgeon belonging to the New York Bight. Based on genetic analyses, Atlantic sturgeon belonging to the New York Bight DPS have been identified among those captured in the Bay of Fundy, Canada as well as in U.S. waters that include Long Island Sound, the lower Connecticut River, and in marine waters off of western Long Island, New Jersey, Delaware, Virginia, and North Carolina. However, the New York Bight DPS was more prevalent relative to the other DPSs in Mid-Atlantic marine waters, bays, and sounds (Dunton et al. 2012; Waldman et al. 2013; Wirgin et al. 2015a; Wirgin et al. 2015b; Wirgin et al. 2018). A comprehensive analysis of Atlantic sturgeon stock composition coast wide provides further evidence that natal origin influences the distribution of Atlantic sturgeon in the marine environment. Atlantic sturgeon that originate from each of the five DPSs and from the Canadian rivers were represented in the 1,704 samples analyzed for the study. However, there were statistically significant differences in the spatial distribution of each DPS, and individuals were most likely to be assigned to a DPS in the same general region where they were collected (Kazyak et al. 2021). For the New York Bight DPS, the results support the findings of previous genetic analyses that Atlantic sturgeon belonging to the DPS occur in the Gulf of Maine and in the South Atlantic Bight but, that they are most prevalent in the Mid-Atlantic Bight.

[5] Some of the published literature for Atlantic sturgeon uses the term juvenile to refer to all sexually immature Atlantic sturgeon, including sexually immature fish that have emigrated from the natal river estuary. We use "juvenile" in reference to immature fish that have not emigrated from the natal river estuary, and we use the term "subadult" for immature Atlantic sturgeon that have emigrated from the natal river estuary.

New information provides more details on marine habitat used by Atlantic sturgeon belonging to the New York Bight DPS, and their movements within the Mid-Atlantic Bight. Captures of subadult Atlantic sturgeon in fishery-independent surveys conducted from Maine through Cape Hatteras, NC indicate that this life stage occur at the mouths of large bays and river estuaries during the fall and spring and typically occurred within the 20 meter depth contour in marine waters (Dunton et al. 2010). Erickson et al. (2011) likewise determined that adult Atlantic sturgeon aggregate in certain areas. Thirteen of the fifteen adult Atlantic sturgeon captured and tagged by Erickson et al. in the tidal freshwater reach of the Hudson River (i.e., belonging to the Hudson River spawning population), made their seasonal migration to marine waters and remained in the Mid-Atlantic Bight during the six month to one year period of data collection. Of the remaining two fish, one traveled as far north as Canadian waters and the second fish traveled south beyond Cape Hatteras[6]. Collectively, all of the tagged sturgeon occurred in marine and estuarine Mid-Atlantic Bight aggregation areas that have been the subject of sampling used for the genetic analyses, including in waters off Long Island, the coasts of New Jersey and Delaware, the Delaware Bay and the Chesapeake Bay. Rothermel et al. (2020) used telemetry to better identify and inform the seasonal movements of Atlantic sturgeon across the continental shelf within mid-Atlantic waters off Maryland. Detections from 352 Atlantic sturgeon provided more detailed information for where and when Atlantic sturgeon occur in Mid-Atlantic waters off Maryland including information on the seasonal inshore and offshore movements of Atlantic sturgeon and the influence of water temperature, and migratory movements along the coast. Breece et al. (2016; 2018a; 2018b) further investigated the distribution and occurrence of Atlantic sturgeon in the Mid-Atlantic Bight based on associated habitat features, as well as the habitat features associated with presence of adults in the Delaware River, and their distribution and movements within Delaware Bay. The research provides evidence that specific habitat features such as substrate composition and distance from the salt front in the river estuary, water depth and water temperature in Delaware Bay, and depth, day-of-year, sea surface temperature, and light absorption by seawater in marine waters affect where and when Atlantic sturgeon occur. Since the majority of Atlantic sturgeon occurring in the Mid-Atlantic Bight belong to the New York Bight DPS, taken together these studies provide: (1) new information describing the environmental factors that influence the presence and movements of New York Bight DPS Atlantic sturgeon in the Mid-Atlantic Bight, the Delaware Bay and the Delaware River; (2) a modeling approach for predicting occurrence and distribution of New York Bight DPS Atlantic sturgeon, particularly in the spring through early fall; and, (3) information to better assess effects to the New York Bight DPS given known, expected, or predicted changes to their habitat.

Erickson et al. (2011) and Breece et al. (2018a; 2018b) provided new information that better informs the seasonal, migratory movements of the New York Bight DPS, and their use of aggregation areas. The new information supports the understanding of the movements of Atlantic sturgeon into deeper waters in the fall compared to the depth of marine waters where they occur in the spring. We knew when we listed the DPS that, in general, there is a northerly coastal migration of subadult and adult Atlantic sturgeon to estuaries in the spring, and a southerly coastal migration from estuaries in the fall. Some marine aggregation areas were suspected of being overwintering areas, such as in waters off the Virginia and North Carolina

[6] As explained in Erickson et al., relocation data for both of these fish were more limited for different reasons. Therefore, more exact locations could not be determined.

coast. However, the adult sturgeon tagged by Erickson et al. did not appear to move to a specific marine area where the fish resided throughout the winter. Instead, the sturgeon occurred within different areas of the Mid-Atlantic Bight and at different depths, occupying deeper and more southern waters in the winter months and more northern and shallow waters in the summer months with spring and fall being transition periods. The model constructed by Breece et al. similarly predicts an increase in probability of occurrence in shallow water during the spring, which shifts to an increase in probability of occurrence in deeper water in the fall. Further evidence of these seasonal nearshore and offshore movements was provided by Ingram et al. (2019). Their study monitored detections of acoustically-tagged Atlantic sturgeon in the New York Wind Energy Area (NY WEA), an area identified for offshore wind leases located between Long Island and the coast of New Jersey that extends 11.5 to 24 nautical miles southeast of Long Island, New York with water depths ranging from 23 m to 41 m. The acoustically-tagged sturgeon were most abundant in the NY WEA in the winter months (i.e., December through February) and occurred throughout the area including the waters furthest from shore and up to 41 m deep. The sturgeon were least abundant, including zero detections in some years, during the months of July through September (Ingram et al. 2019).

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem)

NMFS designated critical habitat for the New York Bight DPS in tidally-affected riverine waters of the Hudson, Delaware, Connecticut, and Housatonic rivers based on the best available information at the time of the designation (82 FR 39160; August 17, 2017). In total, these designations encompass approximately 547 kilometers (340 miles) of aquatic habitat that is essential to the recovery of the New York Bight DPS.

As described in section 2.3.1.5, there is new information describing the distribution of Atlantic sturgeon belonging to the New York Bight DPS in Mid-Atlantic waters, including within the New York Bight, and in Delaware Bay. NMFS did not designate critical habitat in marine waters, bays, or sounds despite evidence that Atlantic sturgeon belonging to the New York Bight DPS are prevalent in certain areas because NMFS is required to designate critical habitat based on the physical or biological features that are essential to the conservation of the listed species, and not based solely on the presence of the listed species. The available information was too limited to inform what the physical or biological features are in the marine environment, bays, or sounds that are essential to the conservation of the New York Bight DPS. Similarly, NMFS received public comment for the critical habitat designations and for this 5-year review that spawning condition Atlantic sturgeon are found within sand wave habitat in the Hudson River, and suggesting that the habitat is essential to the adults as resting or cover habitat. NMFS will continue to consider the new information regarding sand waves as it becomes available and we will propose changes to designated critical habitat as warranted. Section 2.3.2 provides information regarding on-going and emerging threats to designated critical habitat and the habitats that are otherwise used by the New York Bight DPS.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

Section 4(a)(1) of the ESA requires the Services to determine whether a species is endangered or threatened because of any of the following factors (or threats) alone or in combination:

A. The present or threatened destruction, modification, or curtailment of its habitat or range;
B. Overutilization for commercial, recreational, scientific, or educational purposes;
C. Disease or predation;
D. Inadequacy of existing regulatory mechanisms to address identified threats; or
E. Other natural or human factors.

New information relative to each of these factors and the status of the New York Bight DPS is described below.

2.3.2.1 Present or threatened destruction, modification, or curtailment of its habitat or range

Summary of Factor A: NMFS described in the ESA-listing rule that dredging and water quality (e.g., dissolved oxygen levels, water temperature, and contaminants) are threats that affect the habitat or range of the New York Bight DPS. NMFS anticipated that potential changes in water quality because of global climate change could affect the New York Bight DPS but that effects were likely to be more severe for the more southern DPSs, and in areas that were already subject to poor water quality because of eutrophication.

New information is available on the effects of these threats to the New York Bight DPS, and the actions taken to address the threats. Since the listing, NMFS has consulted with the Federal Energy Regulatory Commission (FERC) and with the United States Army Corp of Engineers (USACE) under section 7 of the ESA to consider the effects of the continued operation of the Holyoke Hydroelectric Project on the Connecticut River, Massachusetts. The consultation was reinitiated in 2018 and included consideration of the effects of the Holyoke Hydroelectric Project on designated critical habitat for the New York Bight DPS downriver of the dam. The biological opinion concludes that the continued operation of the Holyoke Hydroelectric Project is not likely to adversely affect the Connecticut River critical habitat unit or any other critical habitat designated for the New York Bight DPS of Atlantic sturgeon (NMFS 2019a). There is no new information for the presence of Atlantic sturgeon at the dam, which is located at the likely historical upstream limit for Atlantic sturgeon in the river.

New information became available after the ESA-listing that confirms the presence of Atlantic sturgeon in the East River (New York), a tidal strait connecting Long Island Sound and Upper New York Bay. Fifteen acoustically tagged Atlantic sturgeon were detected on at least one of the three deployed receivers over a 25-month study period (Tomichek et al. 2014) associated with monitoring Verdant Power's tidal turbine array. The duration of detections for individual fish ranged from hours to minutes but most were detected for less than an hour. This suggests that the fish pass through the area but do not reside there for any length of time. Most were also detected at, or nearly at, slack tide, which may be relevant for whether or to what extent the turbines pose a threat to sturgeon. Verdant Power's tidal turbine project, as described in the

ESA-listing rule was until recently, operational in the East River, NY. However, only pre-commercial in-water testing of the technology at a very limited scale was being conducted (Verdant Power, 2020). FERC notified NMFS in July 2021 that Verdant Power withdrew their license application for the Project and indicated their intent to decommission the Project and remove all Project facilities.

Since the listing, NMFS has consulted with the USACE under section 7 of the ESA to consider the effects of the Delaware River Main Channel Deepening Project (Project) to the New York Bight DPS. NMFS highlighted the Project in the listing rule because of its anticipated impacts, including both direct effects (e.g., capturing and killing of Atlantic sturgeon) and indirect effects (e.g., changes in the river hydrology causing further saltwater intrusion that might affect spawning habitat). The Project called for deepening the existing federal navigation channel from 40 to 45 feet (12.2 to 13.7 m) and included dredging in multiple areas, and blasting and removing river bedrock near Marcus Hook. Twelve river bends were also widened.

Relocation trawling was conducted before and during blasting to move Atlantic sturgeon juveniles from the blast area, which primarily occurred near Marcus Hook. NMFS knew that the Atlantic sturgeon that occurred in the blast areas were juveniles of the Delaware River spawning population because of their size and their presence in low salinity habitat. More than 5,000 juvenile Atlantic sturgeon were relocated from the blast areas over the course of five blasting seasons. Some of the sturgeon were acoustically tagged before being relocated and acoustic receivers detected their return to the blast area. In all but one year, more than half of the acoustically-tagged sturgeon returned to the blast area during the blasting period. However, other than the intentional captures during relocation trawling, relatively few takes are known to have occurred. Based on the results of the post-blast surface monitoring, blasting killed two juvenile Atlantic sturgeon and injured (stunned) a third juvenile. Relocation trawling killed and injured six Atlantic sturgeon.

Nine Atlantic sturgeon were observed taken in hopper dredge gear (two live and seven dead) during maintenance dredging for the Project from 2013 through 2018 (NMFS 2019b). Studies conducted in the Delaware River and in the James River indicate that Atlantic sturgeon do not avoid or move away from vessels, including operating dredge vessels (Reine et al. 2014; Balazik et al. 2017; Barber 2017; DiJohnson 2019; Balazik et al. 2020). A recent pilot study investigated whether chains hung from the drag arm of a hopper dredge could minimize sturgeon interactions by causing the sturgeon to move out of the dredge path. No sturgeon were captured by the dredge but, the results were inconclusive because there was no method to confirm whether sturgeon were present in the dredge area (Welp et al. 2021). The current biological opinion for the Project quantifies the anticipated take of New York Bight DPS Atlantic sturgeon for the 50-year time period from 2020-2070, primarily as a result of maintenance dredging.

The habitat that was targeted for the Project's blasting and clean-up dredging (rkm 108 through rkm 136.8) is made up of exposed bedrock, boulders, gravel, and cobble that are not subject to shoaling and are assumed to be ideal for Atlantic sturgeon spawning and rearing of early life stages (Breece et al. 2013; Stetzar et al. 2015; DiJohnson 2019; Park 2020). The biological opinions document NMFS' consultations with the USACE and NMFS' determinations regarding the Project's effects to the DPS and its critical habitat. NMFS concluded, based on the available data, that the substrate remaining in the channel following blasting still consists of a combination of bedrock, rock fragments, sand, and gravel (USACE 2017). Therefore, NMFS did not anticipate loss of hard bottom substrate that comprises part of designated critical habitat for the New York Bight DPS. In addition, NMFS noted that it was unlikely that the Delaware River salt front would shift far enough upstream to result in a significant restriction of spawning or nursery habitat. All of the biological opinions concluded that the Project may adversely affect but was not likely to jeopardize the continued existence of the New York Bight DPS, and was not likely to adversely affect the DPS's designated critical habitat (available at https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-consultations-greater-atlantic-region).

With respect to new information for threats affecting water quality, low dissolved oxygen levels continue to occur in some areas of the Delaware River in some years, including areas where, and at times when, age 0-1 Atlantic sturgeon would be present. As described above, since the 2012 listing rule and through 2019, the Delaware DFW continued to survey the annual abundance of age 0-1 Atlantic sturgeon. Studies have previously demonstrated the effects of water temperature, salinity, and dissolved oxygen on the growth and survival of juvenile Atlantic sturgeon (Niklitschek and Secor 2009; Niklitschek and Secor 2010). New information suggests that even if juvenile sturgeon are able to avoid areas of low dissolved oxygen, they may be forced to use habitat that is still not optimal, such as higher salinity waters that are not lethal but, negatively impact their growth (Allen et al. 2014). Annual differences in the capture rates of age 0-1 Atlantic sturgeon in the fall and comparisons to annual dissolved oxygen levels during the preceding summer months provide additional evidence that low dissolved oxygen levels are causing or contributing to the death of the young sturgeon in the Delaware River in some years (Moberg and DeLucia 2016; Stetzar et al. 2015; Park 2020).

New information is also available in Chambers et al. (2012) and Roy et al. (2018) that further informs the likely effects to and sensitivity of Atlantic sturgeon early life stages to legacy contamination in the Hudson and Delaware rivers. Both rivers are known to contain chemical contaminants that include polychlorinated biphenyls (PCB's) and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The Chambers et al. study documented reduced hatching success and morphological changes (e.g., effects to body length) of Atlantic sturgeon embryos and larvae exposed to the contaminants at doses likely to occur in the rivers. Based on measures of gene expression, Roy et al. demonstrated that the dose as well as the specific type of PCB contaminant are likely factors with respect to the effect to the larvae. Collectively, the studies demonstrate that Atlantic sturgeon embryos and larvae are likely to be negatively affected when exposed to legacy PCB and TCDD contaminants in the Hudson and Delaware rivers.

Additional information is available that informs the effect of climate change on the New York Bight DPS. There are very few studies that have specifically examined the effects of global climate change to Atlantic sturgeon. However, Hare et al. (2016) provide a method for assessing the vulnerability of Atlantic sturgeon to climate change using the best available information from climate models and what we know of the subspecies life history, biology, and habitat use. Based on their comprehensive assessment, Hare et al. determined that Atlantic sturgeons are highly vulnerable to climate change. Contributing factors include their low potential to change distribution in response to climate change (e.g., spawning locations are specific to a DPS within a specific geographic region), and their exposure to climate change throughout their range, including in estuarine and marine waters. The determinations are supported by the information of Balazik et al. (2010) that suggests individual spawning populations will respond to changing climate temperatures with physiological changes (e.g., changes in growth rate) rather than redistributing to a more southern or northern habitat to maintain their exposure to a consistent temperature regime. The Atlantic sturgeon's low likelihood to change distribution in response to current global climate change will expose them to the effects of climate change on estuarine habitat as well. There is already evidence of habitat changes in the Delaware River from other anthropogenic activities. Modeling by Breece et al. (2013) demonstrates that the Delaware River salt front is likely to advance even further upriver with climate change, which would reduce the amount of transitional salinity habitat available to natal juveniles. Coupled with other climate and anthropogenic changes, such as drought and channel deepening, the already limited amount of tidal freshwater habitat available for spawning could be reduced and the occurrence of low dissolved oxygen within early juvenile rearing habitat could increase. As evidenced by the studies of Hare et al. and Balazik et al., the Delaware spawning population is unlikely to redistribute to another river even if their habitat in the Delaware River is increasingly insufficient to support successful spawning and rearing for the New York Bight DPS due to climate change.

Section 7 consultation with the Nuclear Regulatory Commission was reinitiated in 2020 based on new information that the incidental take of Atlantic sturgeon at the Salem Unit 1 and Unit 2 Nuclear Generating Stations was more than we anticipated would occur. As described in NMFS 2014 Biological Opinion, a number of Atlantic sturgeon are captured and/or killed at the facility each year. Most of the sturgeon that are taken belong to the New York Bight DPS (either spawning population), and most are within the size range of an older juvenile or subadult. The new consultation is on-going. There is no new information for incidental take of Atlantic sturgeon at the Indian Point Nuclear Generating Station on the Hudson River; some monitoring of impingement and entrainment at the cooling water intakes took place in 2019, 2020, and 2021 and no Atlantic sturgeon were detected. The last operating unit was shut down on April 30, 2021, per the planned shut down and retirement of the generating station.

NMFS completed Section 7 consultation with the Bureau of Ocean Energy Management on the effects of the construction, operation, maintenance, and decommissioning of the Vineyard Wind Offshore Wind Project (Lease OCS-A 0501), and we concluded that the proposed action is not likely to adversely affect any DPS of Atlantic sturgeon. However, consultation was reinitiated to consider the effects of several surveys that were not part of the originally proposed project. That consultation is on-going. Other Federal actions related to the construction and operation of wind farms in marine waters have been proposed or are in development within the New York Bight DPSs marine range. NMFS expects to consult with the lead federal agency, as necessary, as each project develops.

NMFS continues to consult with federal agencies to consider other actions that may affect Atlantic sturgeon belonging to the New York Bight DPS, including pipeline, beach renourishment, and shoreline stabilization projects. NMFS' biological opinions for these consultations are available at https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-consultations-greater-atlantic-region.

Conclusion for Factor A: Construction projects and maintenance dredging continue to be a stressor for the New York Bight DPS throughout its range, particularly in the areas nearest to and within the rivers that support spawning habitat. The new information suggests that dredging may pose less of a threat with respect to being a barrier to sturgeon movements. However, injury and mortality of Atlantic sturgeon in dredge gear still occurs and it is currently unclear what effect channel deepening and channel blasting will have on the Delaware River spawning population, particularly for the early life stages that had used habitat in areas where blasting occurred. Water quality also continues to be a stressor for the New York Bight DPS, particularly in the Delaware River. New information shows that Atlantic sturgeon (all DPSs) are highly vulnerable to climate change. Therefore, the new information suggests that the DPS will be more negatively affected by climate change than what NMFS anticipated when the DPS was listed as endangered.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes

Summary of Factor B: A moratorium on the possession and retention of Atlantic sturgeon had already ended directed harvest of Atlantic sturgeon when NMFS listed the five DPSs. However, bycatch in Federal and state regulated fisheries continued to occur and, in the final listing rule (77 FR 5880), NMFS considered bycatch to be one of the primary threats to the New York Bight DPS.

New information continues to demonstrate bycatch of the New York Bight DPS in federally-managed fisheries (NMFS 2021). NMFS completed several biological opinions after the ESA-listings to document our conclusions on the anticipated effects of federally-managed fisheries on the Atlantic sturgeon DPSs. The biological opinion on the continued implementation of the Northeast multispecies, monkfish, spiny dogfish, Atlantic bluefish, Northeast skate complex, mackerel/squid/butterfish, and summer flounder/scup/black sea bass fisheries (aka "batched biological opinion") is the most relevant of the fisheries biological opinions because it includes the fisheries most likely to take Atlantic sturgeon belonging to the New York Bight DPS, and provides the most comprehensive analysis with respect to the number of fisheries considered in one opinion. In the first batched biological opinion that followed the listing, NMFS determined that, on average, 161 sturgeon (adults and subadults combined) belonging to the New York Bight DPS were likely to be killed annually as a result of capture in gillnet and trawl gear that is used in the fisheries (NMFS 2013). NMFS concluded that this level of take was not likely to jeopardize the continued existence of the New York Bight DPS. A new, batched biological opinion was completed in May 2021. The conclusions of the new final opinion are unchanged for the New York Bight DPS; however, the estimate of annual take is different. NMFS concluded that continued operation of the fisheries is likely to result in the average annual lethal take of 118 sturgeon (adults and subadults combined) belonging to the New York Bight DPS, and that this level of take was not likely to jeopardize the continued existence of the New York Bight DPS. The take estimates in the original opinion and in the new opinion are not directly comparable because the approach for distributing the total take among the DPSs changed based on the new information in Kazyak et al. (2021), and the models used to estimate total take of Atlantic sturgeon in the fisheries differed in the two opinions. The total take must be estimated because the actual take is primarily recorded by observers that are part of the Northeast Fisheries Monitoring Program and the At-Sea Monitoring Program, selection of where observer coverage is assigned is not specific to monitoring for take of Atlantic sturgeon, and observers are not present at all times and on all fishing vessels. The biological opinions are available at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-biological-opinions-greater-atlantic-region.

Research has been conducted since the ESA-listing on gear modifications that could reduce the capture of Atlantic sturgeon in the federally-managed gillnet fisheries, and to examine post-release mortality for sturgeon captured in gillnet gear (Fox et al. 2013; He and Jones 2013; Bouyoucos et al. 2014; Fox et al. 2019). Management measures have not been implemented based on the results. Additional research is proposed to be conducted under ESA permit number 17225. The batched biological opinion currently includes requirements that: (1) NMFS must continue to work with the fishing industry and partners to promote, fund, conduct, and/or review research on gear modifications to reduce incidental takes, and the severity of interactions that do occur; (2) GARFO's Sustainable Fisheries Division will convene a working group to review all the available information on Atlantic sturgeon bycatch in the federal large gillnet (≥ 7 inches stretched) mesh fisheries; and, (3) within one year of publication of the batched opinion, the working group will develop an action plan to reduce Atlantic sturgeon bycatch in these fisheries by 2024.

New information also shows that the incidental take of Atlantic sturgeon in state-managed fisheries is still occurring. The reported take of Atlantic sturgeon in each state's managed fisheries is provided annually to the ASMFC. These numbers are likely a minimum count of what actually occurs because many of the state fisheries rely upon voluntary reporting of sturgeon takes (ASMFC 2019). Nearly all of the Atlantic sturgeon takes reported to the ASMFC for the period 2013 through 2017 were attributed to the South Carolina shad fishery, the North Carolina inshore gillnet fishery, and the Georgia shad fishery (ASMFC 2016; ASMFC 2017b; ASMFC 2018; ASMFC 2019). In 2013, South Carolina implemented measures to reduce the take of Atlantic sturgeon in its shad fishery including statewide gear restrictions (i.e., 50 percent statewide reduction in allowable gear; 80 to 90 percent reduction for high priority rivers) (ASMFC 2019). North Carolina and Georgia are each addressing the take of Atlantic sturgeon in their respective fisheries through an ESA section 10 incidental take permit (see section 2.3.2.4 for additional information). Dunton et al. (2015) reviewed bycatch information from NMFS Northeast Fisheries Observer Program and describe the capture of Atlantic sturgeon in trawl gear along the southern coast of Long Island. The paper provides information that better identifies the areas where, and time of year when, there is the greatest risk of sturgeon bycatch in the trawl fisheries that operate off Long Island. As described in section 2.3.1.5, all of the sturgeon DPSs occur in these waters but the majority belong to the New York Bight DPS.

There are anecdotal as well as documented reports of Atlantic sturgeon caught in recreational fishing gear (Dunton et al. 2015; ASMFC 2017). Regulations are in place for all state waters in which Atlantic sturgeon occur that require that the fish be immediately released from the gear. In addition, NMFS provides information for how to safely release Atlantic sturgeon from recreational fishing gear. Based on social media posts and voluntary reports to us, it appears that many recreational fishermen are complying with the regulations and the guidance. However, NMFS does not have complete information to quantify how often Atlantic sturgeon are caught, the fate of individual fish, or to what extent, if any, poaching may occur.

Fourteen permits issued under section 10 of the ESA currently exempt the taking of live, wild, Atlantic sturgeon belonging to the New York Bight DPS for scientific research. In addition, NMFS possesses a permit for the take of opportunistically found dead Atlantic sturgeon or mortalities from other actions (e.g. permitted research, fisheries bycatch, hatchery operations). By maximizing the use of these salvaged specimens through a large network of sturgeon researchers, NMFS provides opportunities to obtain new information while reducing the need for taking (e.g., capture, collecting, sampling) living, wild specimens.

There are currently five active permits issued under section 10 of the ESA for the anticipated incidental take of Atlantic sturgeon belonging to the New York Bight DPS. The activities include: a scientific survey for non-sturgeon fish species in the lower Kennebec River, Maine; a nature education program in the Hudson River; operation of a power generating facility on the Delaware River; and, operation of the North Carolina inshore gillnet fishery and the Georgia shad fishery described above. NMFS issues incidental take permits if the taking will occur incidental to an otherwise legal activity, the permit applicant minimizes and mitigates the impacts of such taking to the maximum extent practicable, the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild, and the applicant ensures that the minimization and mitigation measures will be implemented. Each of the permits is available at https://www.fisheries.noaa.gov/national/endangered-species-conservation/incidental-take-permits.

There are no permits that authorize retention of living Atlantic sturgeon captured from the wild for the purpose of public display or for scientific research. Some Atlantic sturgeon that were brought into captivity before the ESA-listing are on public display for educational purposes or are housed for scientific research. NMFS is unaware of whether any of these belong to the New York Bight DPS.

Conclusion for Factor B: The available information continues to support our conclusion in the listing rule that overutilization of the New York Bight DPS is not occurring as a result of educational or scientific purposes. However, overutilization in terms of bycatch remains one of the primary stressors for the New York Bight DPS. Based on the best available information, bycatch in federally-managed fisheries remains the highest enumerated source of capture, injury, and mortality of Atlantic sturgeon belonging to the New York Bight DPS among all known stressors. All of the Atlantic sturgeon that are killed as bycatch in federally-managed fisheries are subadults or adults. Bycatch as a result of state managed fisheries can result in the capture, injury, and mortality of any of the Atlantic sturgeon life stages depending on where and when those fisheries occur. There continues to be limited information from which to estimate the number of Atlantic sturgeon belonging to the New York Bight DPS that are captured and killed as a result of fisheries bycatch. The lack of information hinders our ability to fully address this threat.

2.3.2.3 Disease or predation

Summary of Factor C: NMFS described in the listing rule that very little is known about natural predators of Atlantic sturgeon. After reviewing the limited information, NMFS concluded that neither disease nor predation are considered primary factors affecting the continued persistence of the New York Bight DPS of Atlantic sturgeon.

Hilton et al. (2016) reviewed diseases and parasites known to affect Atlantic sturgeon. There is limited new information for the New York Bight DPS. Sokolowski et al. (2012) determined that parasitic copepod infections, prevalent in Atlantic sturgeon captured in the New York Bight, have an effect on the sturgeon's osmoregulation and white cell count. However, the long term effects to infected sturgeon are still unknown.

There is new information regarding seal predation on Atlantic sturgeon. On February 9, 2021, a team flying a survey for right whales off Cape Cod, Massachusetts sighted and photographed a grey seal biting into and eating an apparently fresh dead Atlantic sturgeon (Center for Coastal Studies, pers. comm.). There were no other apparent wounds on the sturgeon, which suggests that the seal captured and killed the sturgeon. There are very few documented incidents of seal predation on sturgeon along the U.S. East Coast (Fernandez et al. 2008; SSSRT 2010). There is also new information regarding bird predation on Atlantic sturgeon. Hilton and McGrath (2021) describe the apparent predation of a juvenile Atlantic sturgeon (512 mm total length) along the York River, Virginia by a bird of prey, which was likely an osprey or a bald eagle. This is the first evidence of possible bird predation of a juvenile Atlantic sturgeon. Although the sturgeon likely belonged to the Chesapeake Bay DPS, it also suggests the possibility of predation wherever any juvenile Atlantic sturgeon and birds of prey occur. Given the rarity of these predation events, it is not known whether they were unique incidents or if they are indicative of emerging threats from the increased seal populations occurring within and expanding beyond the Gulf of Maine, and from increased populations of osprey and bald eagles, including throughout the range of the New York Bight DPS.

Conclusion for Factor C: The new, best available, information does not change NMFS determination from the listing rule that neither disease nor predation are primary factors affecting the continued persistence of the New York Bight DPS of Atlantic sturgeon.

2.3.2.4 Inadequacy of existing regulatory mechanisms

Summary of Factor D: The inadequacy of existing regulatory mechanisms was not considered a primary stressor when NMFS listed the New York Bight DPS because regulatory mechanisms to address many of the known stressors, including bycatch in federally-managed fisheries, were available. However, NMFS noted that a lack of information (e.g., for the DPSs life history, or for enumerating the effects of the stressor upon the DPS) made it more difficult to fully utilize the existing regulatory mechanisms.

Information on bycatch of Atlantic sturgeon in state-managed fisheries is still limited. As noted in the Stock Assessment, bycatch of Atlantic sturgeon is not well monitored by the existing fishery-independent and -dependent data collection programs (ASMFC 2017). For the New York Bight DPS, there appears to be the potential for take in fisheries that occur near their natal rivers, such as within the New York Bight (Melnychuk et al. 2017) as well as in other areas of the DPS's range such as within the Chesapeake Bay and its tributaries. Incidental capture of Atlantic sturgeon in Delaware and New Jersey fishery surveys using trawl gear also suggest that capture of Atlantic sturgeon may occur in commercial fisheries that operate in the same areas and at times when sturgeon are present.

The existing regulatory mechanism for addressing Atlantic sturgeon bycatch in state-managed fisheries is through issuance of an ESA section 10 incidental take permit. As described in section 2.3.2.2, NMFS has issued section 10 permits for the incidental take of Atlantic sturgeon belonging to the New York Bight DPS in the North Carolina commercial inshore gillnet fishery, and in the Georgia commercial shad fishery. The permit conditions require each state to implement measures that minimize and mitigate the impacts of such taking to the maximum extent practicable, and to monitor the take of Atlantic sturgeon. Currently, there are no section 10 incidental take permits for fisheries managed by mid-Atlantic states from New York through Virginia, areas where Atlantic sturgeon belonging to the New York Bight DPS are more likely to occur, or for fisheries managed by any of the Gulf of Maine states. Some of the mid-Atlantic states are working to complete applications for a section 10 incidental take permit. Representatives for Maine, New Hampshire, and Massachusetts state that take of Atlantic sturgeon in their respective state-managed fisheries is not expected to occur (ASMFC 2019). The large mesh gillnet restrictions for waters off of Virginia and North Carolina (71 FR 24775; April 26, 2006) also provide some protection to the New York Bight DPS. However, these restrictions extend only as far north as Chincoteague, Virginia.

Section 2.3.2.5 provides new information on the threat of vessel strikes to the New York Bight DPS when the fish are in rivers, bays, and sounds. In general, the three fundamental regulatory mechanisms for addressing threats to ESA-listed species are through rulemaking, section 7 consultation, and permitting. NMFS has not conducted rulemaking to address the threat of vessel strikes for Atlantic sturgeon because it is not yet known what measures are necessary to reduce the number of, or impact from, vessel strikes. NMFS has used rulemaking to require vessel speed restrictions in certain coastal waters (i.e., no more than 10 knots for vessels 19.8 m (65 feet) or greater in overall length) to reduce the likelihood of vessel strikes for North Atlantic right whales at certain times of the year. However, based on the best available information, speed restrictions for vessels in commercialized, navigable rivers (e.g., the Hudson and Delaware rivers) are unlikely to reduce the number of vessel strikes for Atlantic sturgeon. Regulations implemented by the U.S. Coast Guard (see 33 CFR 83.06) require that vessels proceed at a "safe speed" within navigable waters of the Hudson and Delaware rivers but, the regulations do not specify speed limits because many factors can influence what is the safe speed for the conditions. Speed limits are established for certain waterways, including for the Christina River, a tributary of the Delaware River, where vessels over 20 tons may not proceed at speeds over 8 miles per hour (mph) (3.58 meters per second (mps)) (33 FR 162.35). Further, the average swim speed of an adult Atlantic sturgeon is slow (1.27 to 1.86 mph or 0.57 to 0.83 mps; Balazik et al. 2020) relative to vessel speed. Finally, studies conducted in the Delaware River and in the James River indicate that Atlantic sturgeon do not avoid or move away from vessels (Reine et al. 2014; Barber 2017; Balazik et al. 2017; DiJohnson 2019; Balazik et al. 2020). Therefore, in the unlikely scenario that maximum speed at which large (e.g., commercial) vessels could safely proceed in the Hudson and Delaware rivers could be identified, the best available information indicates that vessel strikes may still occur because Atlantic sturgeon are unlikely to avoid or move away from oncoming vessels. Other methods for potentially reducing risk, such as posting a lookout, are not practical because Atlantic sturgeon are not visible below the water surface and a large vessel could not reasonably stop or alter course even if a sturgeon was visible (e.g., jumping out of the water).

Some effects of vessel activity to the New York Bight DPS can be addressed through section 7 consultation if a federal agency is proposing to authorize, fund, or carry out the vessel-related action (e.g., issuing a license or permit for construction of a commercial port). Depending on the outcome of consultation, and consistent with the section 7 regulations, NMFS can include reasonable and prudent measures to minimize the amount or extent of taking any ESA-listed species through the provisions of an Incidental Take Statement; the federal agency must comply with those measures for the exemption from the section 9 prohibitions on take to apply. However, those measures can not alter the basic design, location, scope, duration, or timing of the action and they must involve only minor changes. NMFS' biological opinion for the replacement of the Tappan Zee Bridge over the Hudson River, and NMFS' biological opinion for maintenance dredging and deepening of the Delaware River included measures to monitor for and minimize the impacts of vessel activities to the New York Bight DPS that were associated with those projects. NMFS does not expect, however, to be able to address all of the effects of vessel activities to the New York Bight DPS through section 7 consultation because not all activities will have the necessary federal nexus and even with a federal nexus, we may not be able to identify measures to reduce the amount or extent of that take.

Some effects of vessel activities may also be able to be addressed through a section 10 incidental take permit. For example, the incidental take permit issued for the continued operation of the Eddystone Generating Station includes one lethal take of an Atlantic sturgeon belonging to the New York Bight DPS as a result of vessel activity associated with fuel deliveries to the station. Application for a section 10 incidental take permit is premised, however, on the applicant knowing that take is likely to occur. Operators of either large (e.g., commercial) or small (e.g., recreational) vessels may never anticipate that their vessel will strike a sturgeon because of both a lack of awareness of vessel strike as an issue of concern and the volume of vessel traffic compared to the number of known sturgeon strikes which may make it appear that risk is very low. Additionally, it is unlikely that a vessel operator would know that a sturgeon has been struck because the fish are rarely visible from the surface and the operator could reasonably attribute any sensation of a strike to debris in the water. Discovery of a sturgeon carcass with a vessel strike injury rarely provides information to identify the vessel that struck the sturgeon because it occurs after the fact, and many vessels use the navigable waters. Finally, issuance of a section 10 incidental take permit would only address the take attributed to the individual applicant's activity.

Conclusion for Factor D: The inadequacy of existing regulatory mechanisms is a greater stressor for the New York Bight DPS than NMFS considered when the DPS was listed as endangered. Existing regulatory mechanisms appear to be inadequate to address the threat of vessel strikes for Atlantic sturgeon that belong to the New York Bight DPS.

2.3.2.5 Other natural or manmade factors affecting its continued existence

Summary of Factor E: Vessel strikes were considered a primary threat to the New York Bight DPS when NMFS listed the DPS as endangered. NMFS also considered that artificial stocking of Atlantic sturgeon for use in restoration of extirpated riverine populations or recovery of severely depleted wild riverine populations had the potential to be both a threat to the species and a tool for recovery.

As described above, there is new information to show that vessel strikes of Atlantic sturgeon occur more frequently and in more areas than what NMFS anticipated when the New York Bight DPS was listed as endangered. Multiple studies have shown that Atlantic sturgeon are unlikely to move away from vessels or avoid areas with vessel activity (Reine et al. 2014; Barber 2017; Balazik et al. 2017; DiJohnson 2019; Balazik et al. 2020).

Based on the information that was available when the DPS was listed, NMFS determined that there was little risk of vessel strikes to sturgeon in the Hudson River because the river is generally wider and deeper than either the Delaware River or the James River. NMFS did state, however, that Atlantic sturgeon belonging to the Hudson River spawning population were likely to be impacted by vessel strikes in the Delaware and the James rivers due to the sturgeon's use of those non-natal estuaries. Based on evidence of Atlantic sturgeon vessel strikes since the listing, it is now apparent that vessel strikes are occurring in the Hudson River. For example, the New York DEC reported that at least 17 dead Atlantic sturgeon with vessel strike injuries were found in the river in 2019 of which at least 10 were adults. In addition, vessel struck Atlantic sturgeon have been found in other parts of the New York Bight DPS's range including the Merrimack, Thames, and Nanticoke river estuaries (NMFS Sturgeon Salvage Permit Reporting; Secor et al. 2021). The best available information supports the conclusion that sturgeon are struck by small (e.g., recreational) as well as large vessels. However, examination of the salvaged carcasses indicates that most fatalities are the result of the sturgeon being struck by a large vessel causing either blunt trauma injuries (e.g., broken scutes, bruising, damaged soft tissues) or propeller injuries (e.g., decapitation, complete transection of other parts of the sturgeon body, or deep slices nearly through the body depth of large sturgeon) (Balazik et al. 2012d).

NMFS has only minimum counts of the number of Atlantic sturgeon that are struck and killed by vessels because only sturgeon that are found dead with evidence of a vessel strike are counted. New research, including a study that intentionally placed Atlantic sturgeon carcasses along the Delaware River in areas used by the public, suggests that most Atlantic sturgeon carcasses are not found and, when found, many are not reported to NMFS or to our sturgeon salvage co-investigators (Balazik et al. 2012b, Balazik, pers. comm. in ASMFC 2017; Fox et al. 2020). Based on the reporting rates in their study, Fox et al. estimated that a total of 199 and 213 carcasses were present along the Delaware Estuary shoreline in 2018 and 2019, respectively.

There have been no artificial stocking programs for Atlantic sturgeon since the listings. While it is possible that these could be a tool for recovery in the future, there is no apparent need for these programs at present because current evidence suggests that remnant, albeit very small, populations may exist in rivers where Atlantic sturgeon were previously believed to be extirpated. In addition, it is uncertain whether an artificial stock would establish in a non-natal river. For example, genetic analyses of adult sturgeon captured in the Nanticoke River system (Chesapeake Bay DPS) indicates that the fish are a remnant of the historical spawning population and are not the sturgeon or the progeny of the sturgeon that were introduced to the Nanticoke River in the late 1990s (Secor et al. 2021).

NMFS has received a number of reports from members of the Atlantic sturgeon scientific community regarding the advertised sale for the hobbyist aquarium trade of non-native, non-ESA listed, sturgeon species of the genus *Acipenser*. This is a concern because hybridization between *Acipenser* species is known to occur (Ludwig et al. 2009), and hybridization has even occurred between an *Acipenser* species and American paddlefish (*Polyodon spathula*) (Káldy et al. 2020). Although some rivers have naturally occurring spawning populations of native shortnose sturgeon (*Acipenser brevirostrum*) and native Atlantic sturgeon, including in the Hudson and Delaware rivers, spawning for the two species is separated temporally (i.e., different spawning seasons) and geographically (i.e., different spawning areas of the same river). That might not be the case if non-native sturgeon species were accidentally introduced into rivers where spawning for any one of the Atlantic sturgeon DPSs occurs. There is no current information that any non-ESA listed *Acipenser* species has been intentionally or accidentally released into habitat used by the New York Bight DPS of Atlantic sturgeon. However, the known risk of hybridization as well as other potential threats (such as competition for habitat or food resources) is a concern and a potential threat to the New York Bight DPS that NMFS was not aware of when the DPS was listed as endangered.

Conclusion for Factor E: New information confirms that vessel strikes are a primary threat to the New York Bight DPS and that the number of strikes is far greater than NMFS anticipated when the DPS was listed as endangered. The sale and trade of non-native *Acipenser* species poses a potential threat to the New York Bight DPS.

2.4 Synthesis

NMFS recommended classification for the New York Bight DPS of Atlantic sturgeon is “endangered.” The status of the DPS has likely neither improved nor declined from what it was when the DPS was listed in 2012.

The number of spawning adults in the Hudson River spawning population is only hundreds per year. There are no spawning run estimates for the Delaware River population but the new genetic analyses indicate that the Delaware River spawning population is likely very small and a fraction of the size of the Hudson River spawning population. Information for spawning periodicity of the New York Bight DPS indicates that most males are returning each year, which suggests that annual spawning run estimates are more reflective of the total spawning population than what we anticipated based on the best information available in 2012. The new information supports our determination in the listing rule that the New York Bight DPS has low abundance, and that the current numbers of spawning adults are one to two orders of magnitude smaller than historical levels.

Atlantic sturgeon belonging to the New York Bight DPS are still captured and killed as a result of fishery interactions, vessel strikes, and dredging. Although there is some new information that dredging does not adversely affect Atlantic sturgeon behavior when in the vicinity of dredge gear (e.g., the sturgeon do not avoid areas where dredging is occurring and dredge activity may not pose a barrier to sturgeon that are migrating to and from spawning areas). However, takes of Atlantic sturgeon continue to occur in the dredge gear. As described above, NMFS has issued section 10 permits for the incidental take of Atlantic sturgeon (all DPSs) in the North Carolina commercial inshore gillnet fishery, and in the Georgia commercial shad fishery. The large mesh gillnet restrictions for waters off Virginia and North Carolina (71 FR 24775; April 26, 2006) also provide some protection to the New York Bight DPS. However, capture of Atlantic sturgeon in fishing gear continues to occur in other areas of the DPS's range. Vessel strikes pose a greater risk for Atlantic sturgeon in the Hudson River than we anticipated when we listed the New York Bight DPS.

There is a relatively high probability (75 percent) that the New York Bight DPS abundance has increased since the implementation of the 1998 fishing moratorium, and a relatively high probability (69 percent) that mortality for the New York Bight DPS does not exceed the mortality threshold used for the Stock Assessment (ASMFC 2017). However, new information suggests that these conclusions primarily reflect the status and trend of only the Hudson River spawning population.

Habitat, including critical habitat, for the New York Bight DPS continues to be lost or altered because of anthropogenic activities. In the Delaware River, water quality is still a concern and is likely a threat to the survival of an entire year class in some years when dissolved oxygen levels are low. New information indicates that all Atlantic sturgeons are highly vulnerable to climate change, and that the Atlantic sturgeon's low likelihood to change distribution in response to current global climate change will also expose them to effects of climate change on estuarine habitat such as changes in the occurrence and abundance of prey species in currently identified key foraging areas.

The new information supports our determination in the listing rule that the New York Bight DPS continues to be significantly affected by threats from bycatch and vessel strikes as well as threats to habitat from continued degraded water quality, dredging, and global climate change, and that these threats are considered to be unsustainable at present. Further, the new information supports our determinations in the listing rule that there is a lack of existing regulatory mechanisms to adequately address these threats, particularly to address the threat of vessel strikes.

New information better informs the physical features of marine waters and estuaries where Atlantic sturgeon belonging to the New York Bight DPS occur. The studies demonstrate that the fish are sensitive to and selective of specific habitats with certain features that are often dynamic and only occur at specific times of the year (e.g. sea surface temperature and the degree of light absorption by seawater in marine habitat, and distance from the salt front, substrate composition, and water depth in estuaries). The results may inform NMFS further consideration of critical habitat designations for the New York Bight DPS, particularly in marine waters, bays, and sounds. NMFS could not identify what the specific features are of marine waters, bays, and sounds that make them essential to Atlantic sturgeon conservation when critical habitat was designated for the New York Bight DPS given the limited and confounding information available at the time.

3.0 RESULTS

3.1 Recommended Classification: No change is needed

3.2 New Recovery Priority Number: No change is needed

The New York Bight DPS's demographic risk is "High" because of its low productivity (e.g., relatively few adults compared to historical levels and irregular spawning success), low abundance (e.g., only a few known spawning populations and low DPS abundance, overall), and limited spatial distribution (e.g., limited spawning habitat within each of the few known rivers that support spawning). There is also new information indicating genetic bottlenecks as well as low levels of inbreeding in the Hudson and Delaware spawning populations. Based on the Listing and Recovery Priority Guidelines, meeting any one of these risk conditions ranks the New York Bight DPS as at high demographic risk (84 FR 18243; April 30, 2019).

The New York Bight DPS' potential to recover is, however, also high because man-made threats that have a major impact on the species' ability to persist have been identified (e.g., bycatch in federally-managed fisheries, vessel strikes), the DPS' response to those threats are well understood, management or protective actions to address major threats are primarily under U.S. jurisdiction or authority, and management or protective actions are technically feasible with respect to reducing fisheries bycatch even if they require further testing (e.g., gear modifications to minimize dredge or fishing gear interactions).

As described above, the DPS is in conflict with construction and other developmental projects such as bridge construction projects and changes to the Hudson and Delaware rivers because of industrialization and commercial shipping. Therefore, based on the Listing and Recovery Priority Guidelines (84 FR 18243, April 30, 2019), the recovery priority number for the New York Bight DPS is 1C, and is unchanged.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

NMFS, GARFO, PRD should convene an internal group, with external expert opinion as needed, to identify information needs and next steps to address the threat of vessel strike for the New York Bight DPS.

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NATIONAL MARINE FISHERIES SERVICE
5-YEAR REVIEW
New York Bight Distinct Population Segment of Atlantic Sturgeon
(Acipenser oxyrinchus oxyrinchus)

Current Classification: **Endangered**

Recommendation resulting from the 5-Year Review

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X__ No change is needed

Review Conducted By: Lynn Lankshear, Sturgeon Recovery Coordinator, GARFO, Protected Resources Division

REGIONAL OFFICE APPROVAL:

Lead Regional Administrator, NOAA Fisheries

Approve: ________________________________ Date: __October 21, 2021__

HEADQUARTERS APPROVAL:

Assistant Administrator, NOAA Fisheries

___X__Concur _____ Do Not Concur

Signature RAUCH.SAMUEL.D.III.1365850948 Digitally signed by RAUCH.SAMUEL.D.III.1365850948 Date: 2022.02.16 13:38:26 -05'00' Date_______