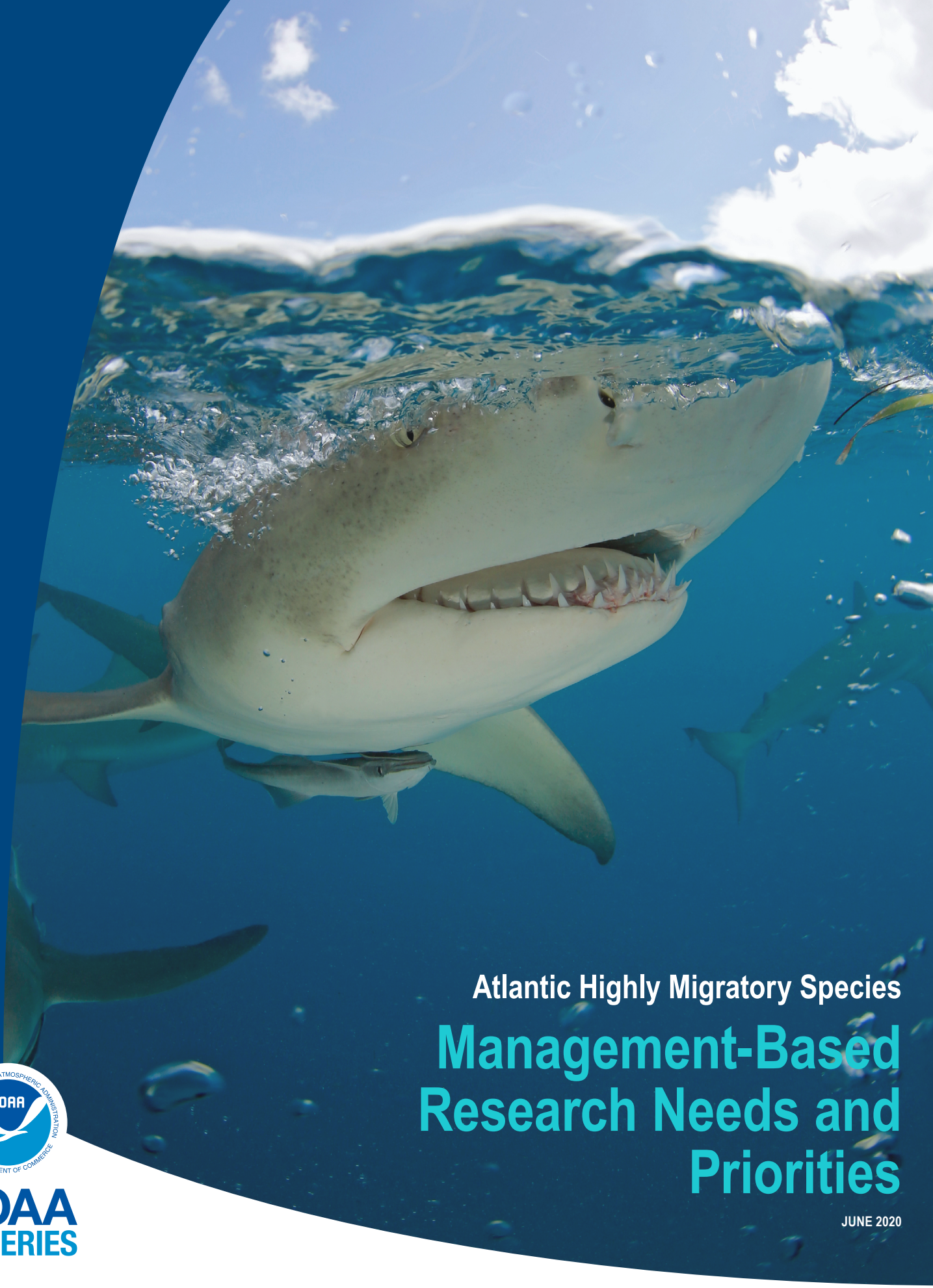

Atlantic Highly Migratory Species

Management-Based Research Needs and Priorities

JUNE 2020

NOAA FISHERIES

ATLANTIC HIGHLY MIGRATORY SPECIES MANAGEMENT-BASED RESEARCH NEEDS AND PRIORITIES

June 2020

Office of Sustainable Fisheries

National Marine Fisheries Service

National Oceanic and Atmospheric Administration

This document was developed by the Atlantic Highly Migratory Species (HMS) Management Division of NOAA Fisheries to update and communicate key research needs that directly support Atlantic HMS management. Atlantic HMS include those species listed in Table 1. This document updates a list last released in 2014 of near- and long-term research needs and priorities that can be used by individuals and groups interested in Atlantic HMS to identify key research needs, improve management, reduce duplication, prioritize limited funding, and form a potential basis for future funding. The priorities range from biological/ecological needs to socioeconomic needs.

Table 1. Species Managed Under the 2006 Consolidated Atlantic HMS Fishery Management Plan and Its Amendments

Common Name	Scientific Name
Skipjack tuna	*Katsuwonus pelamis*
Albacore tuna	*Thunnus alalunga*
Yellowfin tuna	*Thunnus albacares*
Bigeye tuna	*Thunnus obesus*
Bluefin tuna	*Thunnus thynnus*
Swordfish	*Xiphias gladius*
Sailfish	*Istiophorus platypterus*
White marlin	*Kajikia albida*
Blue marlin	*Makaira nigricans*
Roundscale spearfish	*Tetrapturus georgii*
Longbill spearfish	*Tetrapturus pfluegeri*
Bigeye thresher shark	*Alopias superciliosus*
Thresher shark	*Alopias vulpinus*
Blacknose shark	*Carcharhinus acronotus*
Bignose shark	*Carcharhinus altimus*
Narrowtooth shark	*Carcharhinus brachyurus*
Spinner shark	*Carcharhinus brevipinna*
Silky shark	*Carcharhinus falciformis*
Galapagos shark	*Carcharhinus galapagensis*
Finetooth shark	*Carcharhinus isodon*
Bull shark	*Carcharhinus leucas*
Blacktip shark	*Carcharhinus limbatus*
Oceanic whitetip shark	*Carcharhinus longimanus*
Dusky shark	*Carcharhinus obscurus*
Caribbean reef shark	*Carcharhinus perezii*
Sandbar shark	*Carcharhinus plumbeus*
Smalltail shark	*Carcharhinus porosus*
Night shark	*Carcharhinus signatus*
Sand tiger	*Carcharias taurus*
White shark	*Carcharodon carcharias*
Basking shark	*Cetorhinus maximus*
Tiger shark	*Galeocerdo cuvier*
Nurse shark	*Ginglymostoma cirratum*
Sevengill shark	*Heptranchias perlo*
Sixgill shark	*Hexanchus griseus*
Bigeye sixgill shark	*Hexanchus nakamurai*
Shortfin mako shark	*Isurus oxyrinchus*
Longfin mako shark	*Isurus paucus*
Porbeagle shark	*Lamna nasus*
Smooth dogfish	*Mustelus canis*
Florida smoothhound	*Mustelus norrisi*
Gulf smoothhound	*Mustelus sinusmexicanus*
Lemon shark	*Negaprion brevirostris*
Bigeye sand tiger shark	*Odontaspis noronhai*
Blue shark	*Prionace glauca*
Whale shark	*Rhincodon typus*
Caribbean sharpnose shark	*Rhizoprionodon porosus*
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*
Scalloped hammerhead shark	*Sphyrna lewini*
Great hammerhead shark	*Sphyrna mokarran*
Bonnethead shark	*Sphyrna tiburo*
Smooth hammerhead shark	*Sphyrna zygaena*
Atlantic angel shark	*Squatina dumeril*

At this time, specific funding for the priorities outlined in this document has not been identified. However, this document will inform future strategic internal NOAA Fisheries HMS research resource allocations. This priorities document may also be used by interested scientists who are applying for federal funding opportunities (FFOs) as a way to highlight the relevance of their research to HMS management needs. There are several FFOs that support different types of competitively awarded funds for research including the Bycatch Reduction Engineering Program, Cooperative Research Program, and Saltonstall-Kennedy Grant Program. More information on these FFOs is available on the NOAA Fisheries website and grants.gov.

Priorities were identified by the Atlantic HMS Management Division while developing and proposing management measures. Many of the research priorities address key data gaps and/or ways to reduce fishing mortality and/or bycatch to more effectively manage HMS fisheries, either directly or by improving stock assessments. Some items also reflect NOAA Fisheries' broad efforts to improve ecosystem-based fisheries management (EBFM), address climate change, advance habitat conservation, and other priorities. Because these needs were identified by fishery managers, these research priorities may differ somewhat from more technical priorities identified by the scientists across NOAA Fisheries.

While some of the priorities were derived from stock assessment reviews, stock-specific priorities identified in published stock assessment reports are not repeated verbatim here. In general, the Atlantic HMS Management Division implicitly considers any research that would improve an HMS stock assessment, or increase stock assessment output, to be a priority. Please refer to the relevant stock assessment reports (links below) for more detailed information on research priorities supporting specific assessments.

Ongoing survey and monitoring programs are not discussed unless there is a specific suggestion for expansion of an existing program. These survey and monitoring programs, which include but are not limited to shark nursery and essential fish habitat studies, fishery independent surveys, and observer programs, are vital to stock assessments and effective HMS management. These ongoing survey and monitoring programs should continue to be considered a high priority.

Except for those priorities that are applicable across all Atlantic HMS, the list is broken down by species or species group. These research priorities are further characterized as near-term or long-term priorities. Near-term priority items are generally those that are needed to address more pressing management needs. Long-term priorities would provide for more effective HMS management, despite lacking an immediate need. Within the near-term and long-term priorities lists, the needs are not prioritized.

Priorities for All Atlantic HMS

Near-Term Priorities

- Improve the accuracy and precision of all HMS catch data with an emphasis on non- or under-reported catches in international fisheries, artisanal fisheries, bycatch and discards in HMS and non-HMS fisheries, data-limited stocks, and federal and state recreational catch statistics.
- Provide estimates of at-vessel and post-release mortality rates of all HMS across gear types, regions, and age classes and identify factors (e.g., soak time, temperature, handling, etc.) that contribute to that mortality, with an emphasis on overfished or more frequently encountered stocks.
- Assess the ecological and socioeconomic impacts of HMS spatial management and closed areas.
- Identify and address factors limiting the ability of certain HMS fisheries to achieve optimum yield.
- Develop and examine the feasibility of alternative gear types (e.g., buoy gear), conservation engineering technology (e.g., weak hooks, magnetic deterrents), and fishing methods (e.g., net checks, best practices for safe release) to reduce bycatch and discard mortality rates while maintaining target catch and seafood quality.

Long-Term Priorities

- Enhance routine biological sampling of HMS for studies of age, growth, maturity, longevity, population genetics, stock composition, and total reproductive contribution by size and age.
- Characterize the economic value and impact of all recreational and commercial HMS fisheries, by region, and reassess the socioeconomic status of key HMS fishing communities by updating the HMS community profiles.
- Develop a commercial fishing site selection model that will estimate when and where fishermen will go fishing depending on their port of departure, economics, and oceanographic conditions (e.g.,

FishSet for HMS, www.afsc.noaa.gov/REFM/Socioeconomics/current_research.php) to help estimate impacts of management measures.

- Expand the use of species distribution and habitat modeling to address spatial management priorities, and examine the feasibility of dynamic area management based on oceanographic conditions (hindcasts as well as short- and long-term forecasts).
- Continue conventional and electronic tagging studies across HMS stocks, regions, and life stages with an emphasis on filling gaps on movements, seasonal migration and residency patterns, habitat use, stock identification and mixing rates, fisheries exposure, bycatch susceptibility, age validation, and survival rates.
- Develop more cost-effective electronic tag and telemetry products.
- Advance the implementation of EBFM and consideration of integrated ecosystem assessments for HMS,in line with the 2018 Stock Assessment Improvement Plan update and HMS EBFM Implementation Plan, with an emphasis on forage fish distribution and abundance and improved diet studies on HMS.
- Collect data that would allow for all HMS essential fish habitat boundary designations to be based on more than presence/absence data (e.g., electronic tagging data, including spatial, depth and thermal habitat use; catch density correlated with remote sensing data; habitat models).
- Examine the influence of climate change and variability in oceanographic conditions on stock productivity, range, seasonal distribution, migration, spawning or nursery habitat, prey species, and availability to fisheries for HMS.
- Improve fishery- dependent and independent HMS data from U.S. Caribbean and neighboring countries.
- Assess long-term socioeconomic and ecological impacts of the *Deepwater Horizon* oil spill, including beyond the Gulf of Mexico.
- Address public perceptions of HMS fisheries sustainability, stock status, and seafood safety and improve market opportunities.
- Evaluate the impacts of offshore energy development activities (including construction and post-installation monitoring) on HMS and associated fisheries.
- Develop management strategy evaluation processes to address impacts of current management, various harvest control rules, and alternative management objectives.
- Use fishery-independent methods (e.g., electronic tagging) to develop empirical estimates of natural mortality rates across species and size/age classes.
- Examine the effects of seafood certification, labeling, and marketing campaigns (including NOAA FishWatch) on consumer perceptions and consumption of HMS.
- Develop methods that can efficiently measure the socioeconomic benefits of regulatory measures to end overfishing.
- Collect social science information on safe handling and release practices.

Bluefin Tuna

Near-Term Priorities

- Assess the effects of eastern and western stock mixing on stock assessment results and implications for management.
- Investigate potential Slope Sea spawning questions, such as stock of origin of these fish, temporal and spatial stationarity of spawning in this region, and associated population-level implications.
- Evaluate impacts of oceanographic and climate dynamics on stock mixing, migration, availability to fisheries, trophic dynamics, productivity, and stock recruitment.

Long-Term Priorities

- Enhance information on larval distribution to support stock assessments.
- Examine factors that affect the value of bluefin tuna landings, including drivers of fat content and availability to the fishery.

- Determine predatory/prey relationships and forage availability.
- Determine the western Atlantic stock-recruitment relationship (i.e., low vs. high recruitment) and implications for biological reference points and management.
- Improve data on juvenile life stages, including fishing and natural mortality, distribution, and genetic structure.
- Determine factors that affect catchability for handline gear at basin and local scales.

Bigeye, Albacore, Yellowfin, and Skipjack Tunas

Near-Term Priorities

- Assess the economic effects of retention adjustments in the recreational yellowfin and bigeye tuna fisheries.

Long-Term Priorities

- Develop methods to reduce bycatch of juvenile bigeye and yellowfin tuna in the purse seine fishery with fish aggregating devices (international).
- Estimate the connectivity between and dependence of U.S. fisheries on Gulf of Guinea reproduction.
- Determine larval distribution and dynamics.
- Develop in-field, rapid genetic identification techniques to distinguish between species (e.g., are juvenile bluefin tuna misidentified as blackfin or bigeye tuna landings).
- Model effects of retention limits on recreational fishing effort and locations.

Swordfish

Near-Term Priorities

- Investigate methods to reduce bycatch and discard mortality rates of non-target species (including protected species, bluefin tuna, and overfished/overfishing shark stocks) in directed swordfish fisheries, with an emphasis on pelagic longline gear.
- Evaluate possible impacts of deep-drop fishery on all swordfish size classes and assess bycatch.
- Develop methods to incorporate swordfish habitat and environmental information into catch-per-unit-effort standardization.

Long-Term Priorities

- Characterize the demographic changes in the HMS pelagic longline fleet.
- Determine the sales pathways and socioeconomic impacts of illegally sold swordfish, and determine if such illegal sales affect consumer perceptions and consumption of swordfish.
- Determine socioeconomic impacts of swordfish imports on domestic swordfish, including a domestic consumer demand function and the effects of price and quality.
- Assess the impact of weak hooks on pelagic longline gear with a focus on minimizing bycatch (e.g., bluefin tuna, white marlin, dusky sharks, marine mammals) while maintaining or increasing target catch (i.e., swordfish, and bigeye, albacore, yellowfin, or skipjack tunas).
- Identify spawning areas.
- Determine larval distribution and dynamics.

Billfish

Near-Term Priorities

- Determine white marlin and roundscale spearfish species composition in current and historical catch data.
- Develop methods to incorporate blue marlin habitat and environmental information into cost-per-unit-effort standardization.

Long-Term Priorities

- Characterize and quantify changes in the fishing power (i.e. vessel horsepower and speed, quality/quantity of electronics used to locate fish, trolling speeds, etc.) of the recreational/tournament fleets as they pertain to the catchability of blue marlin, white marlin, and sailfish.
- Improve species identification methods for white marlin and roundscale spearfish for fishermen.
- Determine larval distribution and dynamics.
- Determine spawning areas and spawning seasonality, seasonal migration and localized abundance, distribution, and stock structure.

Sharks

Near-Term Priorities

- Determine socioeconomic impacts on shark fisheries due to state shark fin possession bans and shark fin consumption/trade.
- Develop new methods (e.g., other than vertebral band counts) to estimate and validate age and longevity for sharks.
- Develop a comparison and standardization of regional shark surveys, and ensure surveys effectively sample the geographic range of stocks.
- Develop innovative population monitoring and stock assessment methods for sharks to address data limitations, including data-limited models, mark-recapture, aerial surveys, underwater visual census or video surveys, and population genetics (e.g., close-kin mark-recapture) approaches.

Long-Term Priorities

- Determine catch and mortality rates of sharks in commercial and recreational fisheries using J- and circle hooks and wire and non-wire leaders, and consider implications for international fisheries.
- Improve methods for accurate species identification in catch monitoring and enforcement (e.g., education, machine learning, rapid DNA tests).
- Identify and characterize use of key habitats (e.g., nursery areas, pupping grounds, mating grounds, feeding aggregation sites) to improve spatial management.
- Calculate average weight, conversion factors for different landing conditions (dressed, whole, fins attached), and fin-to-carcass ratios, particularly for primary commercial and recreational species.
- Quantify rates of shark depredation in all fisheries, estimate associated economic impacts, and develop ways to reduce depredation.
- Improve estimates of historical species-specific shark landings and evaluate assumptions about when stocks were at virgin biomass.
- For each species, identify the appropriate age/size/stage classes on which to focus fishing mortality reductions. Identify important habitat/areas for these age classes.
- Determine if species life history characteristics (growth, maturity, fecundity, reproductive periodicity, etc.) have changed over time.
- Characterize non-consumptive values of shark populations (e.g., shark dive tourism, ecosystem services), and compare them to the socioeconomic value of shark fisheries.
- Improve electronic monitoring and reporting of shark bycatch.
- Evaluate public perceptions of rebuilding shark stocks (depredation, public safety, etc.).

Other Resources

HMS annual Stock Assessment and Fishery Evaluation Report, which summarizes HMS stock statu and key fishery-dependent data and may reflect additional priorities, data gaps, and research needs: www.fisheries.noaa.gov/atlantic-highly-migratory-species/atlantic-highly-migratory-species-stock-assessment-and-fisheries-evaluation-reports.

International Commission for the Conservation of Atlantic Tunas Standing Committee on Research and Statistics website, which includes data, reports, and stock assessment documents for internationally managed HMS and internationally assessed HMS: www.iccat.int/en/scrs.html.

Southeast Data, Assessment, and Review website, which includes stock assessment documents and research recommendations for domestically managed HMS: sedarweb.org.

Annual Shark Finning Report to Congress, which highlights ongoing research projects conducted by NOAA Fisheries scientists on sharks: www.fisheries.noaa.gov/national/laws-and-policies/shark-conservation-act.

Atlantic States Marine Fisheries Commission Coastal Sharks Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management document: www.asmfc.org/uploads/file/5ac3aa21ResearchPriorities_CoastalSharks_2017.pdf.