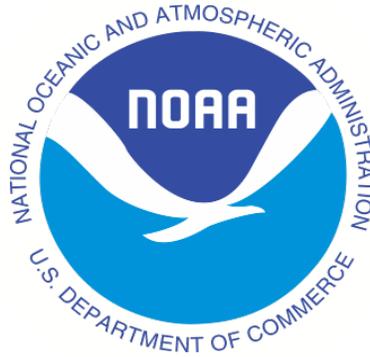


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ATLANTIC HIGHLY MIGRATORY SPECIES (HMS) MANAGEMENT-BASED RESEARCH NEEDS AND PRIORITIES



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Office of Sustainable Fisheries
National Marine Fisheries Service
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ATLANTIC HMS MANAGEMENT-BASED RESEARCH NEEDS AND PRIORITIES

This document was developed by the Atlantic Highly Migratory Species (HMS) Management Division of the National Marine Fisheries Service (NOAA Fisheries or the Agency) 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 (<https://www.fisheries.noaa.gov/resource/document/atlantic-hms-management-based-research-needs-and-priorities>) 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	Common Name	Scientific Name
Skipjack tuna	<i>Katsuwonus pelamis</i>	Sandbar shark	<i>Carcharhinus plumbeus</i>
Albacore tuna	<i>Thunnus alalunga</i>	Smalltail shark	<i>Carcharhinus porosus</i>
Yellowfin tuna	<i>Thunnus albacares</i>	Night shark	<i>Carcharhinus signatus</i>
Bigeye tuna	<i>Thunnus obesus</i>	Sand tiger	<i>Carcharias taurus</i>
Bluefin tuna	<i>Thunnus thynnus</i>	White shark	<i>Carcharodon carcharias</i>
		Basking shark	<i>Cetorhinus maximus</i>
Swordfish	<i>Xiphias gladius</i>	Tiger shark	<i>Galeocerdo cuvier</i>
		Nurse shark	<i>Ginglymostoma cirratum</i>
Sailfish	<i>Istiophorus platypterus</i>	Sevengill shark	<i>Heptranchias perlo</i>
White marlin	<i>Kajikia albida</i>	Sixgill shark	<i>Hexanchus griseus</i>
Blue marlin	<i>Makaira nigricans</i>	Bigeye sixgill shark	<i>Hexanchus nakamurai</i>
Roundscale spearfish	<i>Tetrapturus georgii</i>	Shortfin mako	<i>Isurus oxyrinchus</i>
Longbill spearfish	<i>Tetrapturus pfluegeri</i>	Longfin mako	<i>Isurus paucus</i>
		Porbeagle	<i>Lamna nasus</i>
Bigeye thresher shark	<i>Alopias superciliosus</i>	Smooth dogfish	<i>Mustelus canis</i>
Thresher shark	<i>Alopias vulpinus</i>	Florida smoothhound	<i>Mustelus norrisi</i>
Blacknose shark	<i>Carcharhinus acronotus</i>	Gulf smoothhound	<i>Mustelus sinuomexicanus</i>
Bignose shark	<i>Carcharhinus altimus</i>	Lemon shark	<i>Negaprion brevirostris</i>
Narrowtooth shark	<i>Carcharhinus brachyurus</i>	Bigeye sand tiger	<i>Odontaspis noronhai</i>
Spinner shark	<i>Carcharhinus brevipinna</i>	Blue shark	<i>Prionace glauca</i>
Silky shark	<i>Carcharhinus falciformis</i>	Whale shark	<i>Rhincodon typus</i>
Galapagos shark	<i>Carcharhinus galapagensis</i>	Caribbean sharpnose shark	<i>Rhizoprionodon porosus</i>
Finetooth shark	<i>Carcharhinus isodon</i>	Atlantic sharpnose shark	<i>Rhizoprionodon terraenovae</i>
Bull shark	<i>Carcharhinus leucas</i>	Scalloped hammerhead	<i>Sphyrna lewini</i>
Blacktip shark	<i>Carcharhinus limbatus</i>	Great hammerhead	<i>Sphyrna mokarran</i>
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	Bonnethead	<i>Sphyrna tiburo</i>
Dusky shark	<i>Carcharhinus obscurus</i>	Smooth hammerhead	<i>Sphyrna zygaena</i>
Caribbean reef shark	<i>Carcharhinus perezi</i>	Atlantic angel shark	<i>Squatina dumerili</i>

At this time, specific funding for the priorities outlined in this document has not been identified. However, this document will inform the strategic review of management planning and resource allocations. Additionally, there are several Federal Funding Opportunities (FFOs) that support different types of competitively awarded funds for research. For example, some of these FFOs include funds from the Bycatch Reduction Engineering Program (BREP), Cooperative Research Program (CRP), and Saltonstall-Kennedy Grant Program (SK). More information on these FFOs is available on the NOAA Fisheries website. This priorities document may be used by interested scientists who are applying for these or other funds as a way to highlight the need for their research.

While some of the priorities were derived from stock assessment reviews, other priorities were identified 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, habitat conservation, and other priorities. Because these needs were identified by fishery managers, these research priorities may not correspond directly with the research priorities and needs identified by the scientists throughout NOAA Fisheries. Please refer to the relevant stock assessment reports (links below) for more detailed information on research priorities supporting specific stock 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 high, medium, or low priority depending upon the needs identified by the managers. High priority items are generally those that are needed to address near-term stock assessment or management needs. Medium priority items are generally those that address longer-term needs, while low priority needs would provide for more effective HMS management, despite lacking an immediate need. Within the high, medium, or low priorities lists, the needs are not prioritized.

Priorities for All Atlantic HMS

High Priorities

- Provide estimates of post-release mortality rates of all HMS across gear types. For bluefin tuna, provide estimates by year class.
- Assess the long-term ecological and socioeconomic impacts of spatial management and closed areas for HMS.
- 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.
- Calculate fishing mortality and interactions of HMS in non-HMS fisheries (e.g., Regional Fishery Management Council-managed fisheries).
- Develop a commercial fishing site selection model that will estimate when and where fishermen will go fishing depending on their port of departure, economic, and oceanographic conditions (e.g., [FishSet](#) for HMS) to help estimate impacts of management measures.
- Identify factors contributing to reduced HMS landings in the pelagic longline fishery.

Medium Priorities

- Assess the possibility of ecosystem-based assessments, in line with the 2018 Stock Assessment Improvement Plan update, and explore the feasibility of ecosystem-based management for all HMS.
- Collect data that would allow for all HMS essential fish habitat (EFH) boundary designations to be based on more than presence/absence data (e.g., electronic tagging data, habitat models).
- Examine the influence of climate change and variability on stock productivity, range, migration, spawning or nursery habitat, and prey species for HMS.
- Improve fishery-dependent and -independent HMS data from U.S. Caribbean, and neighboring countries. For sharks, include landings reports from countries that may share domestically-assessed shark stocks.
- Develop and examine the feasibility of alternative gear types (e.g., buoy gear) and technology (e.g., weak hooks, magnetic deterrents) to reduce bycatch while maintaining target catch.
- Assess long-term socioeconomic and ecological impacts of the Deepwater Horizon oil spill.
- Assess the socioeconomic impacts of the Swordfish General Commercial and Caribbean Commercial Small Boat permits on new and existing tuna and swordfish handgear fisheries.
- Research public perceptions of HMS seafood (sustainability, mercury, etc.) to develop methods to help improve market opportunities.
- Characterize the demographic changes in the HMS pelagic longline fleet.
- Examine the feasibility of dynamic area management based on oceanic conditions.
- 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).
- Evaluate the impacts of offshore energy development activities (including construction and post-installation monitoring) on HMS.
- Develop and/or assess innovative approaches to recreational fishing management for data limited stocks.
- Explore the use of Management Strategy Evaluation (MSE) for HMS fisheries.

Low Priorities

- Examine the effects of seafood certification, labeling, and marketing campaigns on consumer perceptions and consumption of HMS, including ways to improve NOAA FishWatch information.
- Develop methods that can efficiently measure the socioeconomic benefits of regulatory measures to end overfishing.

Bluefin Tuna

High Priorities

- Refine western Atlantic bluefin tuna growth rate and size/age of maturity.
- Assess the effects of eastern and western stock mixing on stock assessment results and implications for management.
- Enhance information on larval distribution to support stock assessments.
- Determine seasonal migration and localized abundance information including size, distribution, and stock structure.
- Investigate potential Slope Sea spawning questions and associated impacts on the stock.
- Improve information on post-release mortality rates, especially in bluefin tuna handgear fisheries.
- Develop methods to more adequately quantify dead discards in all fisheries and gear types.

Medium Priorities

- Determine predatory/prey relationships and forage availability.
- Determine the western Atlantic stock-recruitment relationship (i.e., low vs. high recruitment) and implications for management.

Bigeye, Albacore, Yellowfin, and Skipjack (BAYS) Tunas

High Priorities

- Determine seasonal migration and localized abundance, distribution, and stock structure.
- Develop methods to reduce bycatch of juvenile bigeye and yellowfin tuna in the purse seine fishery with FADs (international).
- Assess the economic effects of retention adjustments in the recreational yellowfin and bigeye tuna fisheries.
- Examine shifting distributions based on changes in oceanographic conditions.

Medium Priorities

- Determine predator/prey relationships and forage availability.
- Determine larval distribution.
- Develop in-field, rapid genetic identification techniques to distinguish between species (e.g., are juvenile or adult bluefin tuna misidentified as “blackfin” or “bigeye” tuna landings, respectively).
- Develop/test alternate gears or fishing techniques that reduce bycatch and increase catch quality (e.g., fish quality/grade). Consider regional differences in effectiveness.
- Model effects of retention limits on recreational fishing effort and locations.

Billfish

High Priorities

- Improve life history information, including identifying differences between white marlin and roundscale spearfish.
- Determine white marlin and roundscale spearfish species composition in current and historical catch data.
- Determine spawning areas and spawning seasonality, seasonal migration and localized abundance, distribution, and stock structure.
- Collect additional catch and mortality information for stock assessments, particularly in artisanal fisheries.
- Develop gear and/or fishing techniques to reduce incidental catch of billfish.

Medium Priorities

- Determine predator/prey relationships and forage availability.
- Determine larval distribution.
- Determine age structure and age at length conversions.

Swordfish

High Priorities

- Investigate ways to reduce bycatch and bycatch mortality of non-target species in the directed swordfish fisheries with particular emphasis on pelagic longline gear. Non-target species of concern include sea turtles, bluefin tuna, and some overfished shark species.
- Investigate public perceptions of swordfish and ways to increase desirability of domestic swordfish products (e.g., fish quality education, traceability, highlighting successful fisheries management).

Medium Priorities

- 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 seasonal migration and localized abundance, distribution, and stock structure.
- Characterize and assess impacts of the deep-drop fishery on large (>about 350 lb.) swordfish.
- Determine age structure, age at maturity, and age at length conversions.
- Identify spawning areas.
- Develop a domestic consumer demand function for swordfish, but adjust for impacts of imports, price, and quality.
- Determine socioeconomic impacts of swordfish imports on domestic swordfish.

Low Priorities

- Determine larval distribution.

Sharks

High Priorities

- Provide estimates of at-vessel and post-release mortality rates in all fisheries/gear types for all shark species, particularly primary commercial and recreational species or species that are caught as bycatch frequently, and identify factors that contribute to that mortality (e.g., soak time, handling, temperature).
- Determine migration and stock structure of all sharks. Consider implications for assessments and management of stocks that straddle multiple national jurisdictional boundaries (e.g., Mexico, Caribbean nations, and the United States).
- Determine social and economic impacts on the shark fishery as a whole due to state shark fin possession bans and shark fin consumption/trade.
- Determine catch and mortality rates of sharks in commercial and recreational fisheries using J and circle hooks, and consider implications for international fisheries.
- Improve biological life history parameters for all sharks, particularly commercially and recreationally important species or species that are caught as bycatch frequently (e.g., fecundity, sex specific age/length of maturity, longevity, gestation period, reproductive frequency, natural mortality). Determine if these characteristics have changed over time.
- Improve species-specific catch data, including landings and discards, in all fisheries that catch sharks (including non-HMS and state waters fisheries), and improve methods for accurate species identification (e.g., education, machine learning, rapid DNA tests).
- Improve methods to reduce shark bycatch in non-shark fisheries, especially for overfished or prohibited species (e.g., conservation engineering, bycatch avoidance strategies).
- Evaluate the effectiveness of existing time-area closures for sharks (e.g., Mid-Atlantic Shark Closure Area).
- Evaluate public perceptions of U.S. shark stock status and fisheries sustainability. Assess public attitudes towards shark fishing, and how they are shaped; where public information is sourced from; and who the public considers trusted sources and why.

Medium Priorities

- 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.
- Develop new methods to estimate and validate age and growth relationships for sharks.
- Quantify rates of shark depredation in other fisheries, estimate associated economic impacts, and develop ways to reduce depredation.
- Develop rapid, in-field shark identification techniques (e.g., photo ID, rapid DNA testing) for enforcement officers and fishermen.
- Use electronic tagging and tracking data to provide independent estimates of natural and fishing mortality.

Low Priorities

- For each species, identify the appropriate age classes on which to focus fishing mortality reductions. Identify important habitat/areas for these age classes.
- Develop year-round abundance/distribution estimates of sharks in current closed areas or key habitats (e.g., Mid-Atlantic shark closure, Charleston Bump); consider how and when sharks use certain key habitat areas.
- Develop innovative population monitoring and stock assessment methods for sharks to address data limitations, including data-limited models, mark-recapture, aerial surveys, and population genetics approaches.
- Characterize non-consumptive values of shark populations (e.g., shark ecotourism, ecosystem services), and compare to the socioeconomic value of shark fisheries.

Other Resources

HMS Annual SAFE Report, which summarizes HMS stock status, key fishery-dependent data, and may reflect additional priorities, data gaps, and research needs:

<https://www.fisheries.noaa.gov/atlantic-highly-migratory-species/atlantic-highly-migratory-species-stock-assessment-and-fisheries-evaluation-reports>

Southeast Data, Assessment, and Review (SEDAR) website, which includes stock assessment documents for domestically-managed HMS:

<https://sedarweb.org/>

International Commission for the Conservation of Atlantic Tunas (ICCAT) website, which includes data, stock assessment, and management documents for internationally-managed HMS:

<https://www.iccat.int/en/>

Annual Shark Finning Report to Congress, which highlights ongoing research projects conducted by NMFS scientists on sharks:

<https://www.fisheries.noaa.gov/national/laws-and-policies/shark-conservation-act>