United States Department of the Interior

FISH AND WILDLIFE SERVICE

International Affairs
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Falls Church, VA 22041-3803

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MEMORANDUM

To: Chief, Division of Management Authority

From: Chief, Division of Scientific Authority Rosemarie Gnam, Ph.D.

Subject: General advice for the export of wild *Sphyrna lewini* (scalloped hammerhead shark), *Sphyrna mokarran* (great hammerhead shark) and *Sphyrna zygaena* (smooth hammerhead shark) harvested in the commercial fishery by U.S. fisherman in the Atlantic Ocean and Gulf of Mexico in the 2017 harvest season.

Advice: *The Division of Scientific Authority (DSA) finds that the export of wild Sphyrna lewini (scalloped hammerhead shark), Sphyrna mokarran (great hammerhead shark) and Sphyrna zygaena (smooth hammerhead shark) harvested by U.S. fisherman in the 2017 harvest season* in *the Atlantic Ocean and Gulf of Mexico is not detrimental to the survival of the species, provided that the harvest is in compliance with U.S. management plan in place for the species.*

We will review and re-issue a general advice for these hammerhead sharks annually, in an effort to be responsive to new data and information that may become available. This finding only pertains to hammerhead sharks caught in the Atlantic Ocean and the Gulf of Mexico and applications for the export of hammerhead sharks caught in U.S. waters other than the Atlantic Ocean and Gulf of Mexico will be reviewed separately.

Basis for advice:

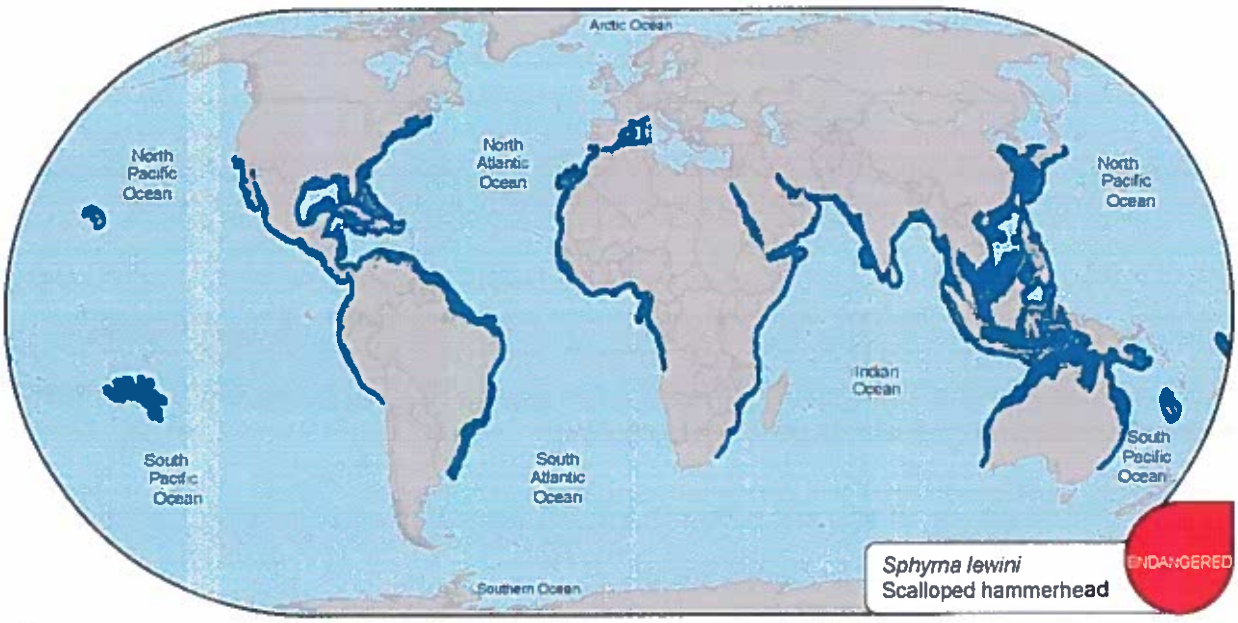
Species Distribution/Range in the United States

Sphyrna lewini (scalloped hammerhead shark), *Sphyrna mokarran* (great hammerhead shark) and *Sphyrna zygaena* (smooth hammerhead shark) are wide-ranging, primarily coastal species which are also occasionally found in the open oceans. These species are found primarily in warm temperate and tropical waters worldwide at depths to 1000 meters; however, most often these species are associated with continental shelf habitat. In the Western Atlantic the scalloped hammerhead is found from New Jersey to Brazil, including Gulf of Mexico and the Caribbean, while the great hammerhead and smooth hammerhead are found as far northward as North Carolina and Nova Scotia, respectively (Compagno, 1984).

The scalloped hammerhead (*Sphyrna lewini*) is found world-wide in coastal warm temperate and tropical seas. It is primarily a coastal species, occasionally documented in open ocean, and is found from the surface and intertidal areas to greater than 275 m deep (Morales et al. 2007).

The great hammerhead has a wide ranging population throughout tropical waters of the world, from approximately latitudes 40°N to 35°S. It is migratory, with some populations moving poleward in the summer, as seen along the Florida coast and in the South China Sea. This species is found throughout the south-west Indian Ocean but in South Africa is confined to the KwaZulu-Natal coast, where it co-exists with the scalloped hammerhead *S. lewini*, also an inhabitant of the tropics, and the smooth hammerhead *S. zygaena*, which favors cooler waters. There is a pupping and nursery ground in a coastal mangrove estuarine area of southern Belize (Denham et al. 2007).

The distribution of the smooth hammerhead is not well known partially because it is believed that it is occasionally misidentified as the scalloped hammerhead. Nevertheless it is known to have a wider range than the other two species since it is more tolerant of cooler water (Casper et al. 2005). Compared to the scalloped and great hammerheads, the smooth hammerhead stays closer to the surface and is generally found in water less than 20 meters (66 ft) deep.



Distribution map for *Sphryna lewini* (from IUCN).

Biological characteristics

These three species of hammerhead are the largest species within the family Sphyrnidae. Hammerhead sharks are viviparous with reproductive cycles including an 8-12 month gestation period followed by a one year resting period. The northwestern Atlantic population of scalloped hammerhead appears to grow more slowly and to a smaller overall size than conspecifics in the eastern and western Pacific Ocean. The oldest known specimen, including both males and females, was from the northwestern Atlantic and was estimated to be 31.5 years of age (Kotas et al. 2011), while Piercy et al. (2007) estimated the oldest age of males and females in the Gulf of Mexico to be 30.5 years.

Although the scalloped hammerhead is relatively fecund compared to other large sharks (with litters of 12-38 pups) the generation period is greater than 15 years in the Gulf of Mexico and its life-history characteristics mean that it resilience to exploitation is relatively low (Morales et al. 2007). This species is also expected to have a low resilience to exploitation because of its tendency to aggregate during certain life history phases (Maguire et al. 2006). Maximum size reported in different studies of the scalloped hammerhead ranged from 219-340 cm total length (TL) for males and 296-346 cm for females (Morales et al. 2007). A growth study by Branstetter (1987) in the Gulf of Mexico found maximum length for both sexes to be 329 cm TL. The age and size of first maturity in the Gulf of Mexico has been estimated at 10 years and 180 cm TL for males and 15 years and 250 cm TL for females (Branstetter 1987).

The great hammerhead (*S. mokarran*) is viviparous with females breeding only once every two years. Litter size ranges between 6 and 42 pups after an 11 month gestation period. Size at birth is 50 to 70 cm. The species suffers from very high bycatch mortality, making it vulnerable to over-exploitation and population depletion (Lemine et al. 2007). Generally solitary, it is unlikely to be abundant wherever it occurs. The maximum total length is reported to be between 550 and 610 cm however, 400 cm is more common for a mature adult. Males mature at between 234 and 269 cm, and reach at least 341 cm. Females mature at between 250 and 300 cm and reach between 482 and 549 cm (Lemine et al. 2007).

The smooth hammerhead (*Sphryna zygaena*) is encountered least among the three species (Ha 2006). While this species is primarily a coastal-pelagic and semi-oceanic species which occurs on the continental shelf to 200 m depth, it has also been observed in freshwater in the Indian River in Florida (Ebert 2003). While there is limited biological data available, the smooth hammerhead is believed to have a lifespan of at least 20 years (FLMNH 2008) and reach a maximum size of between 370 and 400 cm TL (Compagno 2007). Gravid smooth hammerhead females have been reported at sizes ranging from 220 to 255 cm forked length (FL), however, no conversion factor between FL and TL was provided. Work on the coast of West Africa showed, of 21 sampled specimens, there was a mean litter size 33.5 (Castro and Mejuto 1995).

Population Status and Trends:
The IUCN Redlist assessed the smooth hammerhead (*Sphryna zygaena*) in 2005 and the scalloped hammerhead (*Sphryna lewini*) and great hammerhead (*Sphryna mokarran*) in 2007. *Sphyrna lewini* was assessed as Endangered with an unknown population trend, *Sphryna mokarran* as Endangered with decreasing population and *Sphryna zygaena* as Vulnerable with a decreasing population trend. All of these were global assessments. Since each species in found worldwide, and there are known to be discrete populations in different areas of the world, threats and population statuses will vary locally.

In late 2011, the scalloped hammerhead was reviewed by the National Marine Fisheries Service (NMFS) for an Endangered Species Act (ESA) listing. During that review six distinct population segments (DPS) were identified including the Northwest Atlantic and Gulf of Mexico DPS, Central and Southwest Atlantic DPS, Eastern Atlantic DPS, Indo-West Pacific DPS, Central Pacific DPS, and Eastern Pacific DPS (Miller et al. 2013, Hayes 2008). In July 2014, NMFS determined that while the Northwest Atlantic and Gulf of Mexico DPS did not warrant an ESA listing, the Eastern Atlantic and Eastern Pacific DPSs warranted an Endangered designation

and the Central and Southwestern Atlantic and Indo-Pacific DPSs warranted a Threatened designation (Miller et al. 2013).

The total global catch of hammerhead species is estimated between 2000 and 6000 tonnes over the past decade and continues to rise (Simpfendorfer 2014). Multiple sources of data point to severe population declines of the scalloped hammerhead in the Atlantic over the past few decades. It is likely that scalloped hammerheads have experienced periodic overfishing from 1983 - 2005 and overfishing began in the Northwest Atlantic and Gulf of Mexico in the early 1980s (Jiao et al. 2011). In the Northwest Atlantic, longline fleets exert intense fishing pressure on sharks and in an analysis of grouped hammerhead data from U.S. pelagic longline logbook data it was estimated that hammerhead shark abundance declined by up to 91% since 1986 (Baum et al. 2003). The primary component of the harvest was scalloped hammerhead and data from the Virginia Institute of Marine Science indicates that the harvest of the scalloped hammerhead outnumbered that of the smooth hammerhead by more than ten to one (Ha 2006). Both the pelagic and bottom longline observer programs in the United States have recorded a 2 to 3:1 ratio for the scalloped hammerhead to the great hammerhead (Denham et al. 2007, Lemine et al. 2007).

Sphryna lewini populations in the northwestern Atlantic may be overestimated due to the recent discovery of a cryptic species that morphologically appears to be almost identical to the scalloped hammerhead shark (Naylor et al. 2012, Quatro et al. 2006, Quatro et al. 2013). The new species, the Carolina hammerhead (*Sphyrna gilbert* sp. nov.), was originally identified within South Carolina waters (Quatro et al. 2006, Quatro et al. 2013) but can be found from South Carolina to Brazil (Pinhal et al. 2011), thus overlapping the current range of *S. lewini*. Coastal South Carolina is also believed to be a nursery ground for this new, cryptic species (Quattro et al. 2006). Currently, there are no available data regarding the ratio of this new, cryptic species to the Atlantic *S. lewini* population (Miller et al. 2013).

Multiple data sources from the Atlantic Ocean have documented substantial declines in populations of the scalloped hammerhead but few population assessments are available for the species. In the Northwest Atlantic Ocean however, Hayes et al. (2009) conducted an assessment from which NMFS determined that scalloped hammerhead sharks were overfished and experiencing overfishing (76 FR 23794, April 28, 2011). That assessment also informed a NMFS management plan that uses a quota system to regulate harvest of the hammerhead species complex (*S. lewini*, S. *mokarran* and *S. zygaena*). The assessment indicated that the scalloped hammerhead population size had declined between 83 and 85 percent between 1981 and 2005 with the population in 1981 estimated at between 142,000 and 169,000 individuals, but by 2005 the population estimate had declined to about 24,000 sharks (Hayes et al. 2009). An assessment for the hammerhead complex in the northwest Atlantic Ocean, utilizing catch and population trend data from multiple studies, found a 72% decline in abundance from 1981-2005 (Jiao et al. 2008). A standardized catch rate index of a hammerhead complex (*S. lewini, S. mokarran, and S. zygaena*) from commercial fishing logbook data in the U.S. pelagic longline fishery between 1986-2000, and from observer data between 1992-2005, estimated a decline of 89%, while pelagic longline observer data indicated that *Sphyrna spp.* declined by 76% between 1992-2005 (Camhi et al. 2009, Baum *et al.* 2003).

Catch of all species within the hammerhead complex by the commercial sector in the Hawaiian coastal and pelagic waters is very low, averaging only 226 pounds per year over the years 1953-2013 and there was no indication of a trend over this time period. Most of the hammerheads were either smooth or scalloped and no catches of great hammerheads have been documented in these waters by fisheries observers since the observer program was initiated in the region in 1990 (Miller et al. 2014).

Threats

Globally, overharvest in both directed and bycatch fisheries is the primary threat. Fishing on juvenile members of the stocks is of particular concern since these fish will never have the opportunity to reproduce and replace themselves in the population. The directed and bycatch fisheries primarily utilize the fins but some meat is also utilized, especially for local consumption. Fins are primarily consumed in the Asian market. The high price for "grade-A" fins, the grade assigned to all three hammerhead species, is an important factor driving unsustainable harvest.

Species Management:

At the global level, the entire family Sphyrnidae, which includes the three CITES listed hammerhead sharks, are listed among the Highly Migratory Species (Annex 1) in the United Nations (UN) Convention on the Law of the Sea (UNCLOS). The Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, which builds on UNCLOS and has been in force since 2001, encourages States to cooperate on these multijurisdictional stocks through regional and sub-regional management bodies. Since the Agreement's inception there have been regional agreements aimed at conserving these migratory stocks but while the agreement's aim is conservation, there are relatively few enforcement measures.

Also globally, on November 9, 2014, the scalloped hammerhead (*Sphyrna lewini*) and the great hammerhead (*Sphyrna mokarran*) were listed under Appendix II of the Convention on Migratory Species of Wild Animals (CMS or Bonn Convention). The CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. A CMS Appendix II listing acknowledges that these species need, or would greatly benefit from, international cooperation on management and encourages Parties to take cooperative actions on management, including establishing global or regional measures to conserve the species. CMS decisions may also trigger management responses nationally. It should be noted that the United States is not a Party to CMS.

At the regional level, the International Commission for the Conservation of Atlantic Tunas (ICCAT) manages tunas and tuna-like species and adopts measures to address bycatch of other species caught in association with ICCAT fisheries. ICCAT, an intergovernmental regional fishery management organization founded in 1969, has 50 Contracting Parties and its Convention area spans the entire Atlantic Ocean, including the Gulf of Mexico, Caribbean and Mediterranean Seas. Under a recommendation adopted in 2004, ICCAT Parties are required to report data on catches of sharks in all fisheries managed by ICCAT. However, catch data for sharks (including hammerheads) are still not reported by many Contracting Parties. Effective in

2011, ICCAT Recommendation 10-08 established a prohibition on retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of a hammerhead shark of the family Sphyrnidae (except *Sphyrna tiburo*) taken in the Convention area in association with ICCAT fisheries. Annual reporting of hammerhead discards and releases is required by this measure, although these data are also incomplete.

At the national level, the United States has a species management plan for the hammerhead shark complex (scalloped, great, smooth) in the Atlantic, Gulf of Mexico, and Caribbean Sea, which was developed as part of the larger National Marine Fisheries Service 2006 Consolidated Atlantic Highly Migratory Species (HMS) Management Plan. The hammerhead management plan, included in Amendment 5a of the 2006 plan, incorporates regulatory mechanisms designed to rebuild the hammerhead stock complex over a 10 year period with the rebuilding starting July 3, 2013 (NMFS 2013). The regulations that implement the management plan provide for a quota system which allows U.S. Atlantic permitted fishermen, both commercial and recreational, to harvest a specified amount of hammerhead sharks on an annual basis. The harvest quota is based on the best available science which currently includes a stock assessment for the scalloped hammerhead (Hayes et al. 2009) and historical catch data from each of the fisheries.

The hammerhead sharks in the management complex (great, scalloped, and smooth) are included under a single hammerhead shark fisheries harvest quota, which is based on the scalloped hammerhead stock assessment performed by Hayes et al. in 2009. The harvest quota is split and allocated separately for the Gulf of Mexico fishery, with the Gulf being split into separate allocations for the Eastern Gulf and Western Gulf, and the Atlantic coastal fishery. A single harvest quota was established for the hammerhead shark complex because it is difficult to differentiate among these three hammerhead species, particularly when dressed.

The Atlantic and Gulf of Mexico commercial quotas were calculated by subtracting recreational landings, commercial discards, and research set-aside from the hammerhead shark total allowable catch (TAC) of 79.6 metric tons (mt) dressed weight (dw). This calculation was based on a harvest of 2,853 scalloped hammerhead sharks having average dressed weight of 61.5 pounds per individual. The resultant total commercial quota for all hammerhead shark species is 52.4 mt dw (115,457 lb dw), which is then divided into the Atlantic and Gulf of Mexico regions using the average percentage of total hammerhead shark landings in each region over the years 2008 through 2011; 51.7 percent in the Atlantic and 48.3 percent in the Gulf of Mexico. Consequently, the Atlantic hammerhead shark complex commercial base quota is 27.1 mt dw (59,736 lb dw) and the Gulf of Mexico commercial base quota is 25.3 mt dw (NMFS 2013). In 2015, under Amendment 6 of the 2006 HMS Fishery Management Plan, the shark fishery harvest quota in the Gulf of Mexico was split into an eastern quota and a western quota to allow for better regulation of the fishery (FR Notice 2015 19914). The NMFS made their sub-regional quota calculation using 2014 eDealer landings data and these calculations resulted in an Eastern Gulf quota of 13.4 mt dw (29,421 lb dw), and a Western Gulf quota of 11.9 mt dw (23,301 lb dw) (FR Notice 2015 19914). Together, these quotas equal the overall Gulf of Mexico harvest quota of 25.3 mt dw.

In the Atlantic Ocean, including the Gulf of Mexico and Caribbean, in addition to the annual harvest quota, license and reporting requirements, size limit and gear restrictions for recreational

fishermen are used to regulate the harvest. Commercial permits are issued for both the directed and bycatch fisheries. In the directed fishery, fishermen target hammerhead sharks, while in the bycatch fishery, fisherman target other species but retain the hammerheads that are caught incidentally. A Directed permit allows the holder to harvest up to a default maximum of 45 hammerheads per day up to the annual quota, but if the harvest is not progressing as expected, a maximum of 55 hammerhead sharks per day is allowed, after notification is issued by the NMFS (FR Notice 2015 19914). An Incidental permit allows the holder to retain up to three hammerhead sharks per trip. Once the annual harvest quota is reached, the fishery is closed and neither directed nor incidental permit holders may land hammerhead sharks but shark dealers are allowed to sell any hammerhead sharks that were stored before the closure. Commercial fishermen may use bottom longline, gillnet, rod and reel, handline, and bandit gear; fishermen using pelagic longline gear cannot land, possess, or sell hammerhead sharks. A Recreational permit is issued to an individual who may harvest up to one hammerhead shark per day provided no tunas, swordfish, or billfish are onboard the vessel; the fish must be a minimum of 87 inches (fork length); a recreationally caught hammerhead shark cannot be sold. Recreational fishing for hammerhead sharks is allowed year-round and only rod and reel and handline are allowed. All fish landed in both the recreational and commercial fisheries must be landed with their fins naturally attached. Dealers who purchase hammerhead shark from commercial fisherman must adhere to strict reporting requirements.

The harvest of the Atlantic hammerhead shark complex is monitored through reporting by fishermen and dealers. The commercial fishermen must report their directed and incidental catch to NMFS within seven days of landing at the dock and the dealers must report activity every Tuesday for purchases made the previous Sunday through Saturday time period. When a level of 80% of the annual quota has been reported, the fishery is closed to further harvest; this closure becomes effective five days after a notice is issued. The buffer of the additional 20% of quota is to allow time for fish already harvested to be landed and reported. If the annual quota is exceeded, the overharvest is deducted from the following year's harvest quota. Through this accounting measure, the calculated annual harvest quota averages out to the allowed annual harvest over a series of years. Also, due to the real-time nature of the harvest reporting, there is less chance of harvesting significantly more than any one year's quota allocation.

A linked quota system reduces bycatch and overharvest by allowing for the simultaneous closure of two shark management groups in a region where shark species that are in separate management groups have the potential to be caught together on the same shark fishing trip. In both the Atlantic and the Gulf of Mexico (for management purposes, the Gulf of Mexico includes fish landed in the Caribbean), the hammerhead management group (scalloped, great and smooth hammerheads) is linked to the Aggregated Large Coastal Sharks Species Group (LCS) (silk, tiger, blacktip, spinner, bull, lemon and nurse sharks). If either the hammerhead management group or the LCS group reaches the 80% harvest limit explained above, both of these management groups are closed to harvest simultaneously, even if only one of the groups has reached 80% of their quota. The splitting of the Gulf of Mexico shark fishery into an eastern and western component in 2015 in Amendment 6 also split the hammerhead/LCS linkages into eastern and western components; each section follows the 80% harvest limit closure described previously (FR Notice 2015 19914). During the first two years of the quota linkages (2013 and 2014), the quantity of hammerheads caught had only reached approximately 50% of the quota

when the harvest season was closed because the linked LCS complex quota had been reached. The Gulf of Mexico hammerhead and LCS harvest season opened its 2015 season on January 1, 2015, and closed on May 3, 2015 with only 55% (13.8 mt dw) of Gulf of Mexico hammerhead quota harvested.

The Atlantic and Gulf of Mexico hammerhead and LCS 2016 harvest seasons opened on January 1, 2016; both the opening of the season and the seasonal quota are adjusted annually based on harvest from the prior year (NMFS 2013; FR Notice 2015 19914). In 2016, a commercial retention limit for directed shark limited access permit holders was implemented in the Gulf of Mexico allowing a maximum of 45 large coastal sharks, other than sandbar sharks, to be taken per vessel per trip; in the Atlantic this new regulation allowed for a maximum of 25 large coastal sharks other than sandbar sharks to be taken per vessel per trip. Also in the 2016 fishing season, the Gulf of Mexico was split into eastern and western sections to better manage the harvest (FR Notice 2015 19914). With this division the eastern portion received 52.8% of the hammerhead landings allocated to the Gulf of Mexico (13.4 mt dw) while the western portion received 47.2% (11.9 mt dw) of the allocation. With the division the TAC of hammerhead sharks within the entire Gulf of Mexico remained at 25.3 mt dw. During the 2016 commercial hammerhead harvest season (as of 12/31/2016), there were 23.4 mt dw harvested in the entire Gulf of Mexico and 14.0 mt dw harvested in the Atlantic. Both of these harvests were below the allowed quotas for their respective regions (NOAA Fisheries 2017).

The 2017 LCS harvest season for hammerheads in the Atlantic, and in the eastern Gulf of Mexico, starts on January 1, 2017; the 2017 season in the western Gulf of Mexico begins on February 1, 2017. Harvest quotas are the same as in 2016 with the eastern and western Gulf of Mexico allowed 13.4 mt dw and 11.9 mt dw, respectively, while in the Atlantic a 27.1 mt dw harvest is allowed (FR Notice 2016 84491; NOAA Fisheries 2016).

Hammerhead shark regulations are set on both state and federal levels, and state regulations are consistent with regulations issued by NMFS. In the Atlantic, state fishery regulations are promulgated jointly among the states within the Atlantic States Marine Fisheries Commission (ASMFC). In certain instances, state regulations may be more restrictive than the corresponding federal regulations but they cannot allow for a harvest in excess of the federally established TAC. State specific regulations apply to fisheries within three nautical miles from the shoreline, while federal regulations apply to fisheries from the three mile limit to the 200 mile nautical mile EEZ (ASMFC 2008, ASMFC 2013).

Summary

The hammerhead shark fisheries in U.S. waters of the Northwestern Atlantic and Eastern and Western Gulf of Mexico are managed under a quota system which allows harvest from directed, bycatch and recreational fisheries. Anyone participating in these fisheries is required to be licensed, either by the NMFS or in the state where they are fishing. The quotas under which this system is managed are determined based on the best available data which includes a 2009 species assessment, a species assessment of the scalloped hammerhead in 2013, a species assessment of the great hammerhead in 2014, and historical harvest records from the directed, bycatch and recreational fisheries. The annual harvest is closed to fishermen when the NMFS

determines, through harvester and dealer reports, that 80% of the annual quota has been harvested. The harvest quota is adjusted annually, based on the previous year's harvest, to insure the quota is not exceeded, over a multi-year period. If there is overharvest in one year, the TAC for the following year is reduced. There is one TAC quota for the three species of hammerhead which are harvested in U.S. Atlantic, the Eastern Gulf of Mexico, the Western Gulf of Mexico and Caribbean waters and it encompasses all fish harvested whether they are taken from waters governed by state or federal regulations. The species management plan currently being followed is designed so that the population will rebuild within 10 years (by 2023) and the harvests since the plan was implemented have not exceeded the established quotas.

Conclusion

The Division of Scientific Authority (DSA), based on the information and data available, and management measures currently in place, finds that the export of wild hammerhead sharks harvested by U.S. fisherman in the Atlantic Ocean and Eastern and Western sections of the Gulf of Mexico in the 2017 harvest season is not detrimental to the survival of the species, provided that the harvest is in compliance with the U.S. management plan in place for the species.

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