

# Species Status Assessment

**Common Name:** White shark

**Date Updated:** 1/12/2024

**Scientific Name:** *Carcharodon carcharias*

**Updated by:** Siobhan Keeling

**Class:** Chondrichthyes

**Family:** Lamnidae

**Species Synopsis** (a short paragraph which describes species taxonomy, distribution, recent trends, and habitat in New York):

As the world's largest predatory fish, the white shark, frequently called the great white shark due to its size, plays an important role at the top of the marine food web. Despite its fame and reputation, little is known about its biology and behavior. The great white shark is widely distributed, occurring throughout temperate and sub-tropical regions in the northern and southern hemispheres. They are primarily found in coastal and offshore areas of the continental and insular shelves and offshore continental islands. Off the Atlantic Coast, white sharks occur from Newfoundland, Canada, southward to Argentina. Recent tagging studies show that this species undergoes long-distance and transoceanic migrations (Bonfil et al. 2005). White sharks generally aggregate in coastal waters during autumn and winter, moving offshore into oceanic waters during winter and spring, but sightings in the Mid-Atlantic Bight have occurred year round (Weng et al. 2007). Great white sharks are declining and rare due to a history of being illegally hunted by trophy hunters for fins and teeth. They are often caught as by-catch by commercial fishermen and can also become entangled in beach protection nets. As with most species of shark, white sharks are slow-growing with low productivity and high vulnerability to overfishing and there is a significant lack of data on population numbers, abundance, fecundity, age and growth. Although white shark abundance in the Northwest Atlantic is still below historic abundance estimates, evidence suggests that population trends have gradually increased since the 1990s, likely due to changes in fishing regulations. The estimated white shark abundance in the Northwest Atlantic in 2010 was approximately 30% below historic averages (Curtis et al., 2014).

## I. Status

### a. Current legal protected Status

i. **Federal:** Not Listed **Candidate:** Yes

ii. **New York:** Not listed

### b. Natural Heritage Program

i. **Global:** G2, Imperiled

ii. **New York:** S2S3, Imperiled/Vulnerable **Tracked by NYNHP?:** No

### Other Ranks:

-New York 2025 SGCN status: High Priority Species of Greatest Conservation Need

-IUCN Red List: vulnerable

-Northeast Regional SGCN: RSGCN

-SARA: endangered

-COSEWIC: endangered

-CITES: Appendix II

-CMS: Appendices I & II

-UNCLOS: Annex I

**Status Discussion:**

Because of the importance of this species as a key predator in marine ecosystems, white sharks were granted protection under Appendix II of CITES, indicating that they are vulnerable to exploitation but not at risk of extinction. The northeastern Pacific Ocean population segment is currently a candidate for listing under the Endangered Species Act. The rationale for the IUCN vulnerable listing states that where detailed population data are available, these indicate that the abundance and average size of white sharks have declined (Fergusson et al. 2009).

**II. Abundance and Distribution Trends**

Region	Present?	Abundance	Distribution	Time Frame	Listing status	SGCN?
North America	Yes	Unknown	Unknown			-
Northeastern US	Yes	Unknown	Unknown	(Northwest Atlantic Ocean)		Yes
New York	Yes	Unknown	Unknown			Yes
Connecticut	No data	-	-		Not Listed	No
Massachusetts	No data	-	-		Not Listed	No
New Jersey	No data	-	-		Not Listed	No
Pennsylvania	No	-	-			-
Vermont	No	-	-			-
Ontario	No	-	-			-
Quebec	No	-	-			-

*Column options*

**Present?:** Yes; No; Unknown; No data; (blank) or Choose an Item

**Abundance and Distribution:** Declining; Increasing; Stable; Unknown; Extirpated; N/A; (blank) or Choose an item

**SGCN?:** Yes; No; Unknown; (blank) or Choose an item

**Monitoring in New York** *(specify any monitoring activities or regular surveys that are conducted in New York):*

There are currently no monitoring activities for the white shark in New York.

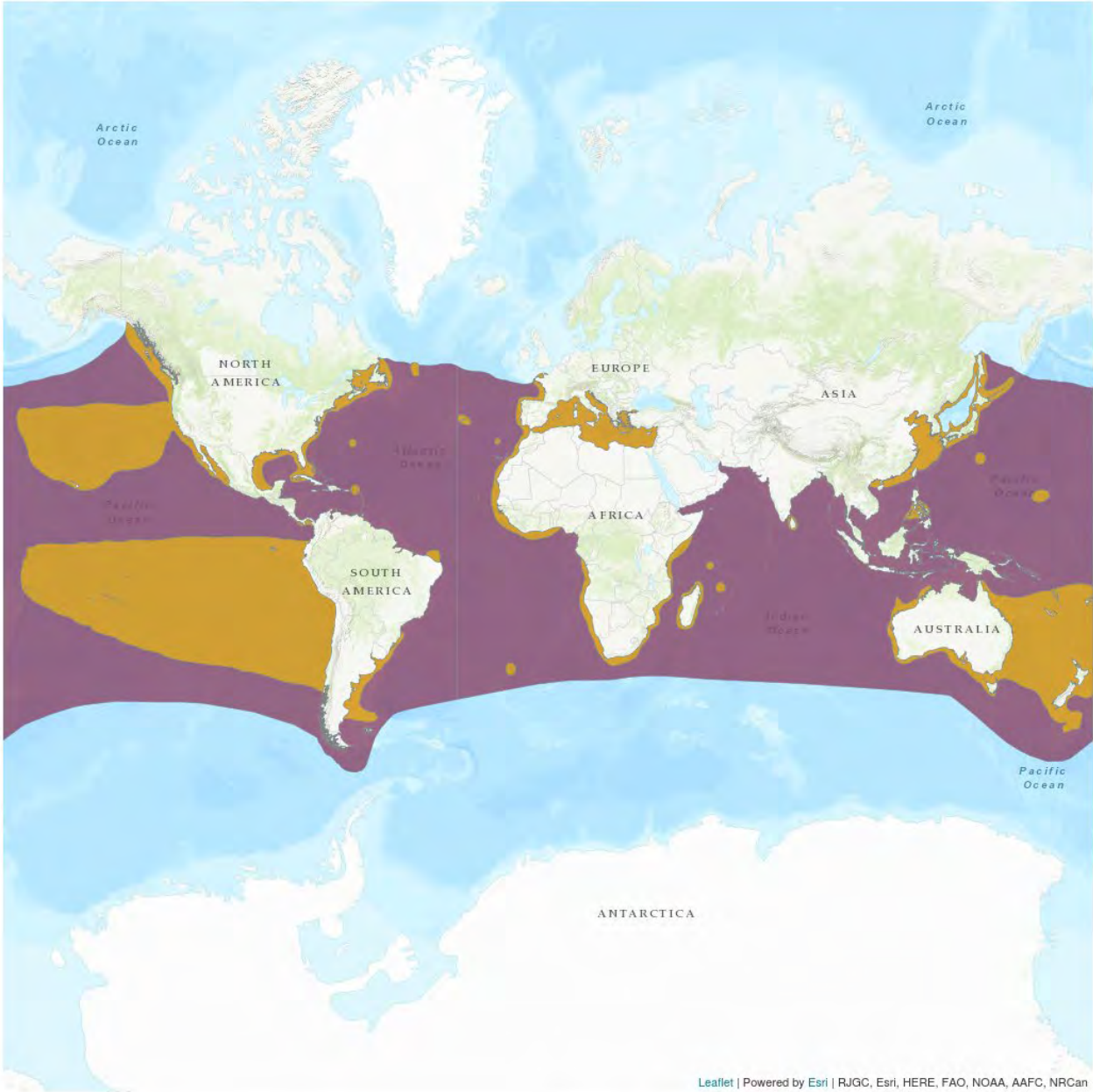
**Trends Discussion** *(insert map of North American/regional distribution and status):*

The current population trend is decreasing according to the IUCN red list (Rigby et al. 2022). While there is uncertainty in the regional trends, the current estimated population trend for White sharks is decreasing. Over three generations (159 years) there is an estimated global reduction of 30 to 49% (Rigby et al. 2022). Baum et al. (2003) analyzed logbook data from the U.S. pelagic longline

swordfish and tuna fleets in the Northwest Atlantic from 1986 to 2000, identifying an estimated 79% decline in CPUE (catch per unit effort) during this period. Global populations have declined 60-95% from the 1950s to the present (CITES 2004).

**Distribution Map**

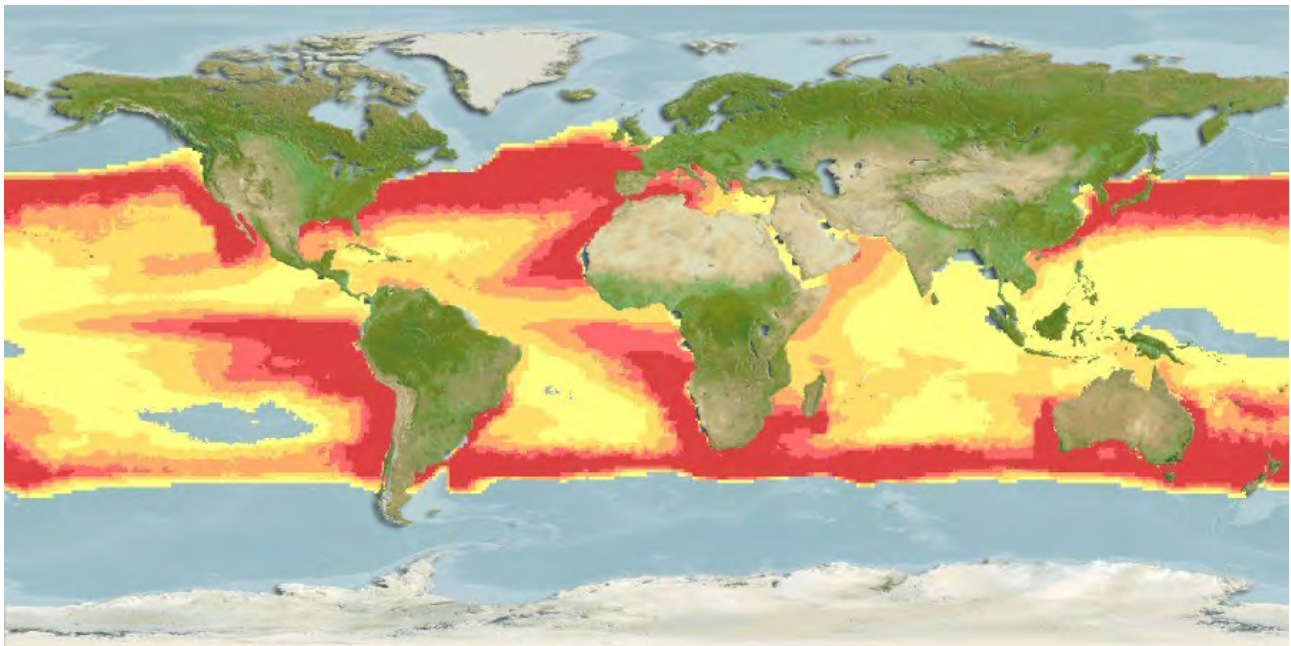
*Carcharodon carcharias*



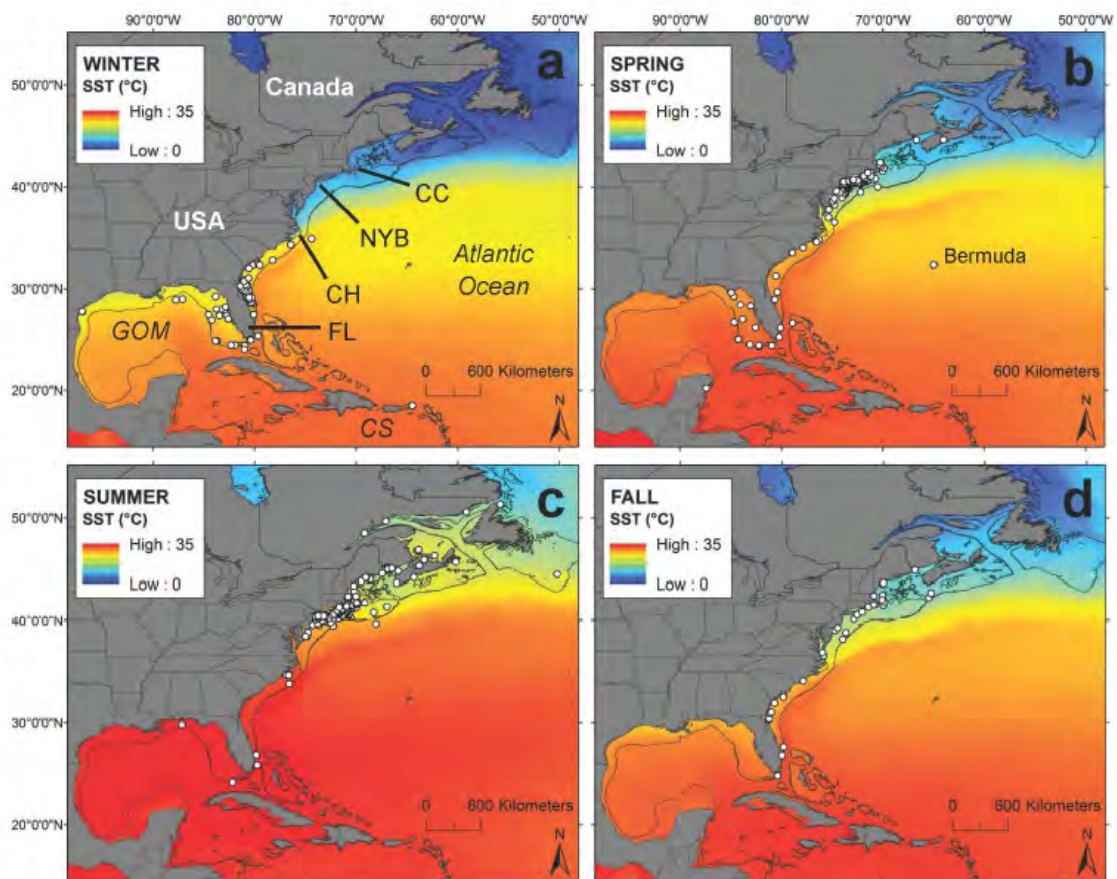
- Legend
- EXTANT (RESIDENT)
  - POSSIBLY EXTANT (RESIDENT)

Compiled by:  
IUCN SSC Shark Specialist Group 2018

**Figure 1.** IUCN Red List White Shark distribution map (Rigby 2022)



**Figure 2.** Global distribution of white sharks (www.aquamaps.org).

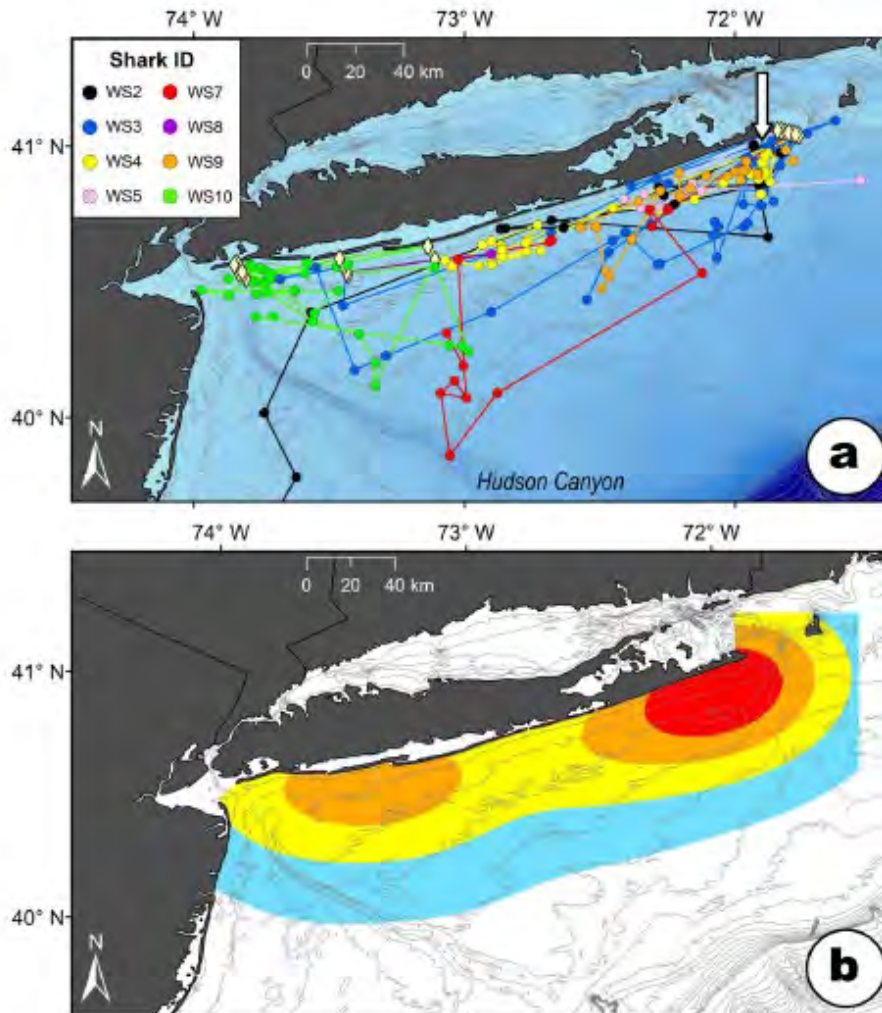


**Figure 3. White shark seasonal distribution.** Distribution of white shark presence records (white circles) in the NWA during (a) winter, (b) spring, (c) summer, and (d) fall. Positions are overlaid on seasonal average SST conditions (1985–2001). The 200 m bathymetric contour is displayed to delineate the edge of the continental shelf. CC = Cape Cod, NYB = New York Bight, CH = Cape Hatteras, FL = Florida, GOM = Gulf of Mexico, and CS = Caribbean Sea.  
doi:10.1371/journal.pone.0099240.g003

**Figure 3.** White shark seasonal distribution in the western north Atlantic (Curtis et al., 2014)

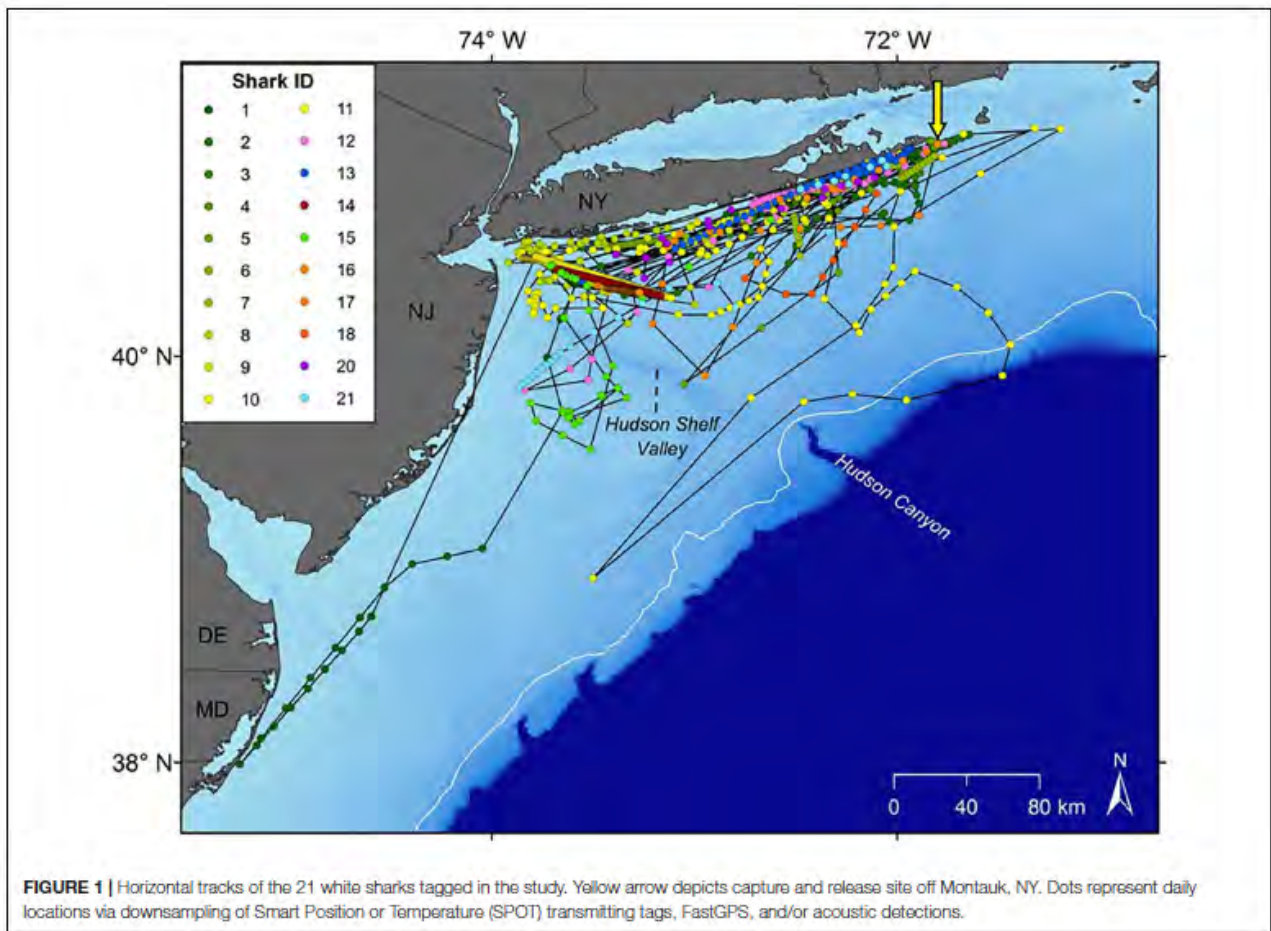
### III. New York Rarity (provide map, numbers, and percent of state occupied)

White sharks are fairly uncommon compared to other widely distributed species, being most frequently reported from South Africa, Australia, California, and the northeast United States (Fergusson et al. 2009). Sightings in New York are most common in fall and winter but have occurred year-round and information on medium and long-range movement patterns in the Atlantic Ocean are lacking.



**Figure 2.** Tracks of eight YOY white sharks (a) and kernel utilization distributions (blue = 95%; yellow = 75%; orange = 50%; red = 25%) of the tagged sharks (b) off Long Island, New York, during August through October, 2016. The arrow indicates the tagging location. Diamond symbols represent locations of acoustic receivers where YOY white sharks were detected. Bathymetric contours (gray lines) are in 10 m increments.

**Figure 4.** YOY white shark movements (Curtis et al., 2018).



**Figure 5.** YOY tagged white sharks (Shaw et al., 2021))

**Details of historic and current occurrence:**

There are NY records of this species with data from several sources (e.g., Curtis et. al. 2014). Young of the year white sharks are found predominantly in the New York Bight (64%), but YOY sharks also occur as far south as the central coast of NJ and as far north as MA bay. In contrast, older sharks were found farther north, between Cape Cod, MA, and Canada. Tracking data from Curtis et al. (2018) revealed that while YOY white sharks were seen up to 90 km offshore, 97% of observations during the summer were within 20 km of the south shore of Long Island (Curtis et al., 2018). This pattern of residency over the summer months suggests that this area is a nursery ground (Curtis et al., 2014, 2018). NOAA has designated the NY Bight as an Essential Fish Habitat for YOY white sharks, and recent work by Shaw et al. (2021) will help refine the habitat designation, which may lead to the creation of a habitat of particular concern.

**New York’s Contribution to Species North American Range:**

Percent of North American Range in NY	Classification of NY Range	Distance to core population, if not in NY
1-25%	Peripheral	

Column options

Percent of North American Range in NY: 100% (endemic); 76-99%; 51-75%; 26-50%; 1-25%; 0%; Choose an item

Classification of NY Range: Core; Peripheral; Disjunct; (blank) or Choose an item

**IV. Primary Habitat or Community Type** (from NY crosswalk of NE Aquatic, Marine, or Terrestrial Habitat Classification Systems):

- a. Marine, Deep Subtidal
- b. Pelagic

**Habitat or Community Type Trend in New York**

Habitat Specialist?	Indicator Species?	Habitat/Community Trend	Time frame of Decline/Increase
No	Yes	Stable	

Column options

**Habitat Specialist and Indicator Species:** Yes; No; Unknown; (blank) or Choose an item

**Habitat/Community Trend:** Declining; Stable; Increasing; Unknown; (blank) or Choose an item

**Habitat Discussion:**

The white shark is principally a pelagic coastal and offshore inhabitant of continental and insular shelves, frequenting waters from the surface to depths of 1,875 meters and preferring waters with surface temperatures of 59 to 72°F (Chewning and Hall 2009). They may be found from the surfline and the intertidal zone to far offshore and near oceanic islands, patrolling for their prey (seals, sea lions and walruses), and occasionally entering shallow bays. Recent research has demonstrated that adults spend most of the year in the oceanic environment and can migrate across ocean basins (Bonfil et al. 2005). Results from this tagging study showed individuals undergoing transoceanic migrations, returning to the original capture location, diving to depths of 980 meters, and tolerating water temperatures as low as 3.4°C. Juveniles remain closer to shore, but also undertake very long-distance coastal migrations, crossing national boundaries. Patterns in movement and abundance within some areas are thought to be linked with temperature variations and life stage, however this may only have a minimal effect on the distribution of white sharks and is not considered responsible for the decline over recent decades (WCS 2004).

White sharks are an important apex predator in marine systems, actively feeding during the daytime on prey species like marine mammals (seals, sea lions, elephant seals, dolphins) and fish (including other sharks and rays) (Fergusson et al. 2009). They play an important role in the marine food web by controlling populations of their prey.

**V. Species Demographics and Life History**

Breeder in NY?	Non-breeder in NY?	Migratory Only?	Summer Resident?	Winter Resident?	Anadromous/Catadromous?
Choose an item.	Choose an item.	Yes	Choose an item.	Choose an item.	Choose an item.

Column options

**First 5 fields:** Yes; No; Unknown; (blank) or Choose an item

**Anadromous/Catadromous:** Anadromous; Catadromous; (blank) or Choose an item

**Species Demographics and Life History Discussion** *(include information about species life span, reproductive longevity, reproductive capacity, age to maturity, and ability to disperse and colonize):*

White sharks have a suspected 2 to 3 year reproductive cycle with a litter size of 2 to 17 pups that are aplacental viviparous with oophagy and histrophy (Rigby et al. 2022). The gestation period is estimated at 12 to 18 months (WCS 2004). At birth white sharks are 120 to 150 cm Total Length (TL) and the maximum size of an individual is estimated at 600 to 640 cm TL. Males reach maturity at 310 to 410 cm TL and females reach maturity at 400 to 500cm TL. For females, their maximum age is estimated around 73 years and they reach maturity around 33 years. (Rigby et al. 2022) Unlike most other fish, white sharks are able to maintain their body temperature higher than that of the surrounding water by using a heat exchange system in their blood vessels (Goldman 1997). Life span is estimated at anywhere between 23-60 years (WCS 2004). Breeding season and nursery locations are unknown. For the most part white sharks are solitary animals but from time to time they are seen in pairs or small groups (Chewning and Hall 2009).

**VI. Threats** *(from NY 2015 SWAP or newly described)*

Threats to white sharks include targeted sport fisheries for game fish records and trophies (jaws and teeth), protective beach meshing, decline in prey abundance from overfishing, media-fanned persecution campaigns to kill great white sharks after a biting incident occurs, and degradation of inshore habitats used as pupping and nursery grounds (Kyne et al. 2012). Coupled with their low reproductive capacity and late maturity, populations are vulnerable and slow to recover from depleted numbers. They are also caught either accidentally as by-catch or targeted and sold for their flesh, skins, oil, and fins. Their habit of congregating at coastal locations and their inquisitive nature make them behaviorally as well as biologically vulnerable to commercial and recreational fisheries (WCS 2004). White sharks are rarely caught in offshore pelagic fisheries abut are caught as bycatch in inshore fisheries (Rigby et al. 2022). Habitat degradation from development, pollution and overfishing also threatens this species and may exclude it from certain coastal areas, possibly traditionally used for feeding or as nurseries, where it was historically more abundant (Fergusson et al. 2009). Direct effects of climate change on white sharks are unknown, but changes in distribution, abundance, and behavior are likely to result from habitat alteration and temperature changes (Harley et al. 2006). However, white sharks are a prohibited species in state and federal waters. Illegal fishing , bycatch, and offshore energy development should remain threats. As top trophic level predators that can accumulate contaminants, pollution (industrial, pesticides etc.) may be included as a threat. Illegal fishing and bycatch are the primary threats to white sharks in the subnation. As apex predators, white sharks can accumulate high concentrations of contaminants, but it is uncertain how this influences population health.

<b>Threat Level 1</b>	<b>Threat Level 2</b>	<b>Threat Level 3</b>	<b>Spatial Extent</b>	<b>Severity</b>	<b>Immediacy</b>	<b>Trend</b>	<b>Certainty</b>
3. Energy Production & Mining	3.3 Renewable Energy	3.3.2 Wind farms (offshore)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
5. Biological Resource Use	5.4 Fishing & Harvesting Aquatic Resources	5.4.1 Recreational or subsistence fishing	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
5. Biological Resource Use	5.4 Fishing & Harvesting Aquatic Resources	5.4.2 Commercial fishing (bycatch/discard)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
5. Biological Resource Use	5.4 Fishing & Harvesting Aquatic Resources	5.4.3 Poaching/persecution of aquatic species	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
11. Climate Change	11.3 Changes in Temperature Regimes	11.3.3 Gradual temperature change (warming ocean temperatures)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.

**Table 1.** Threats to white shark.

**Are there regulatory mechanisms that protect the species or its habitat in New York?**

Yes:  X                       No:                             Unknown:       

**If yes, describe mechanism and whether adequate to protect species/habitat:**

The great white shark is listed under Appendix II of CITES, which covers species that although not currently threatened with extinction, may become so without trade controls. Regulated trade is allowed provided the exporting country issues a permit based on findings that the specimens were legally acquired and trade will not be detrimental to the survival of the species or its role in the ecosystem. Shark finning has been banned in the U.S. since a 1993 Federal FMP for Atlantic sharks was developed, and since 1997 retention and possession of great white sharks has been prohibited for both commercial and recreational fisheries (Kyne et al. 2012). Although laws protecting sharks are strict, loopholes and inadequate enforcement cause problems promoting the black market for white shark products (Fergusson et al. 2009). Because white sharks undergo long-distance, trans-boundary movements, national legislation is no guarantee of survival of the species. New York anglers are prohibited from possessing White sharks (NYSDEC 2021).

**Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:**

Management measures and educational programs are needed to prevent or reduce unintentional mortality of white sharks and reduce the negative stigma associated with this species. Research is needed to better understand if white sharks have nursing areas in New York waters in order to provide protection. Better enforcement of regulations prohibiting white shark possession would help reduce illegal trade of shark products and international coordination is needed to enforce regulations and protect this widespread species. Australia has developed a management plan for white sharks which provides a blueprint of necessary management actions to protect this species and could be applied to other populations.

Action Category	Action	Description
C.6 Design and Plan Conservation	C.6.5.0.0 Conservation planning	Site/area protection
A.2 Direct Species Management	A.2.0.0.0 Direct species management	-Harvest management -Trade management
A.2 Direct Species Management	A.2.0.0.0 Direct species management	Species recovery

**Table 2.** Recommended conservation actions for white shark (Rigby et al. 2022)

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